Chattanooga-Hamilton County

RPA

Regional Planning Agency

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Chattanooga
Regional ITS Architecture

Regional ITS Deployment Plan

A Chattanooga-Hamilton County/North Georgia Transportation Planning Organization Project

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AD	Archived Data
APTS	Advanced Public Transportation System
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
CARTA	Chattanooga Area Regional Transportation Authority
CCTV	Closed Circuit Television
CHCNGA-TPO	Chattanooga-Hamilton County/North Georgia Transportation Planning Organization
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
EM	Emergency Management
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GDOT	Georgia Department of Transportation
HAR	Highway Advisory Radio
ITS	Intelligent Transportation System
LRTP	Long Range Transportation Plan
MC	Maintenance and Construction
NWGRC	Northwest Georgia Regional Commission
RDS	Radar Detection System
RPA	Regional Planning Authority
RWIS	Road Weather Information System
TDOT	Tennessee Department of Transportation
TMC	Traffic Management Center
TOC	Traffic Operations Center
TPO	Transportation Planning Organization

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1. INTRODUCTION

1.1 Project Overview

In 2010 the Chattanooga Regional Intelligent Transportation System (ITS) Architecture was updated under the direction of the Chattanooga-Hamilton County/North Georgia Transportation Planning Organization (TPO) with support from the Tennessee Department of Transportation (TDOT). The Regional ITS Architecture provides a framework for implementing ITS projects, encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to projects, and allows for cohesive long-range planning among regional stakeholders. The Chattanooga Regional ITS Architecture focuses on the functionality that ITS provides in the Region as well as how those functions are operated by agencies in and around the Region. The Regional ITS Architecture also satisfies an important requirement from the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) regarding transportation funding. An FHWA Final Rule and an FTA Final Policy issued in 2001 requires that regions have an updated regional ITS architecture and show how ITS projects conform to that regional ITS architecture in order to receive federal funding for those projects.

The 2010 Chattanooga Regional ITS Deployment Plan was developed as a companion document to the Chattanooga Regional ITS Architecture. Although it is not required by FHWA and FTA, the Regional ITS Deployment Plan is a useful tool for regions to identify specific projects that should be deployed in order to achieve the desired functionality identified in their Regional ITS Architecture. The Regional ITS Deployment Plan builds on the Regional ITS Architecture by outlining specific ITS project recommendations and strategies for the Region and identifying deployment timeframes so that the recommended projects and strategies can be implemented over time.

The Regional ITS Deployment Plan also shows the correlation between each project and the Regional ITS Architecture by identifying the market packages that correspond with each project. If projects are identified that do not correspond to a market package, the Regional ITS Architecture can be revised while in draft format; therefore, the resulting ITS deployment projects from this effort should be clearly supported by the Regional ITS Architecture.

The Chattanooga Regional ITS Architecture and Deployment Plan were both developed with significant input from local, state, and federal officials. A series of three workshops was held to solicit input from stakeholders and ensure that the plan reflected the unique needs of stakeholders in the Region. Electronic copies of the draft reports were made available to all stakeholders for their review and comment during the development of the plans, and comments were addressed with the entire stakeholder group during the workshops.

The geographic boundaries were defined for the Chattanooga Regional ITS Architecture using the boundaries of the Chattanooga-Hamilton County/North Georgia TPO plus a portion of I-75 in Bradley County where TDOT has deployed a fog detection system. The TPO includes all of Hamilton County in Tennessee and portions of Dade, Walker, and Catoosa Counties in Georgia. A map of the Chattanooga-Hamilton County/North Georgia TPO boundaries has been provided in **Figure 1**.
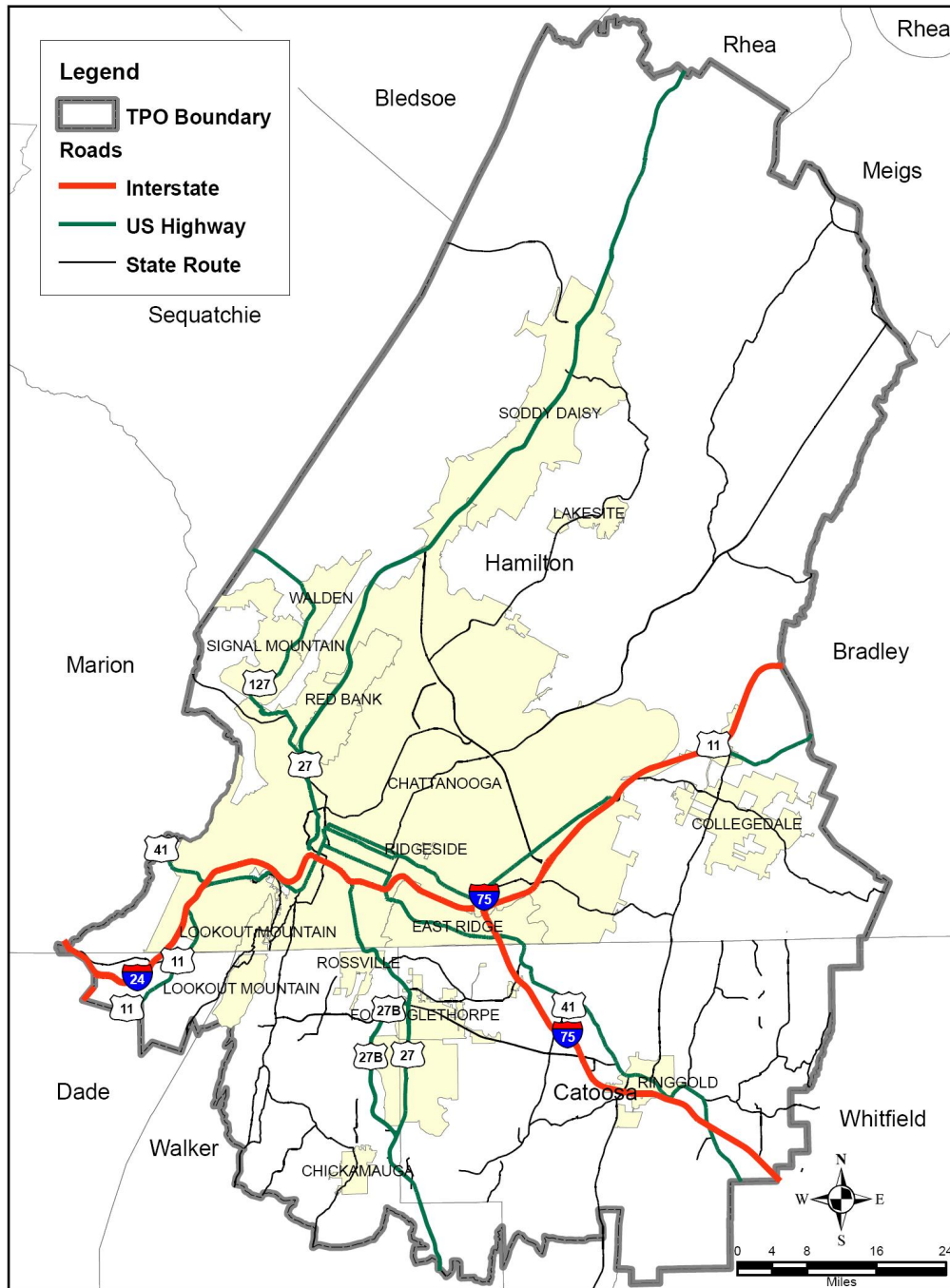
Figure 1 – Chattanooga-Hamilton County/North Georgia TPO Boundaries

Stakeholders that participated in the update of the Regional ITS Architecture and Deployment Plan process included representatives from city, county, regional, state, and federal agencies. Groups such as traffic, transit, and emergency management were represented. Stakeholders included both representatives from local agencies as well as representatives from the TDOT Long Range Planning Division in Nashville, Georgia Department of Transportation (GDOT) in Atlanta, and FHWA Tennessee and Georgia Division Offices. A list of the participating stakeholder agencies is provided below. A complete list of individuals representing the agencies has been provided in the Chattanooga Regional ITS Architecture document.

- Chattanooga Area Regional Transportation Authority (CARTA);
- Chattanooga-Hamilton County Health Department;
- Chattanooga-Hamilton County Regional Planning Agency (RPA);
- City of Chattanooga;
- City of East Ridge;
- Federal Highway Administration – Georgia Division;
- Federal Highway Administration – Tennessee Division;
- Georgia Department of Public Safety;
- Georgia Department of Transportation;
- Northwest Georgia Regional Commission (NWGRC);
- TDOT Long Range Planning Division;
- TDOT Region 2; and
- Tennessee Highway Patrol.

1.2 Deployment Plan Project Development Process

An overview of the process used to develop the Regional ITS Deployment Plan is provided in **Figure 2**. This figure demonstrates that a variety of inputs were used to gather information and develop a set of ITS projects for selection by stakeholders. Through an ITS Deployment Plan Workshop with regional stakeholders in February 2010, and subsequent review of the plan by the stakeholders, the projects for inclusion in the ITS Deployment Plan were selected and defined. The resulting Chattanooga Regional ITS Deployment Plan will provide stakeholders with a list of regionally significant ITS projects that are consistent with the Regional ITS Architecture and assist with addressing transportation needs in the Region.

The inputs identified in Step 1 of **Figure 2** include regional ITS needs, ITS market package priorities, regional and local plans, and stakeholder recommendations. Each of these is expanded on in Section 2 of this report. The ITS needs were gathered through the Regional ITS Architecture Kickoff Workshop which was held in October 2009 with all stakeholders. In the second Regional ITS Architecture Workshop, which was held in December 2009, stakeholders discussed and selected ITS market packages for the Chattanooga Region. ITS market packages represent the services that ITS can provide, such as Network Surveillance and Traffic Information Dissemination. In the Regional ITS Architecture, the Chattanooga Region stakeholders identified 38 market packages for consideration in the Region and later ranked those market packages as high, medium, or low priority. Planning documents, such as the Draft Chattanooga-Hamilton County/North Georgia 2035 Long-Range Transportation Plan, were reviewed by the project team to identify other needs and priorities not specifically discussed in the workshops. Finally, stakeholders were asked directly for their project ideas to include in the Regional ITS Deployment Plan.

The inputs in Step 1 led to the project selection in Step 2. Project selection was completed through a combination of the ITS Deployment Plan Workshop held with stakeholders in February

2010 as well as stakeholder review of the Draft Regional ITS Deployment Plan. Through this two part review the final projects were selected and further defined for the plan.

The outputs of the plan, shown in Step 3, will provide stakeholders and the Chattanooga-Hamilton County/North Georgia TPO with a list of many of the priority ITS projects for the Chattanooga Region. Each of the projects recommended in the Regional ITS Deployment Plan has been checked against the Chattanooga Regional ITS Architecture to ensure they are in conformance. This should assist agencies deploying these projects in the future with meeting FHWA and FTA requirements for ITS architecture conformity. Finally, the Regional ITS Deployment Plan is something that could feed into the long-range planning process and provide agencies with a list of priority ITS projects for consideration during future calls for projects from the TPO.
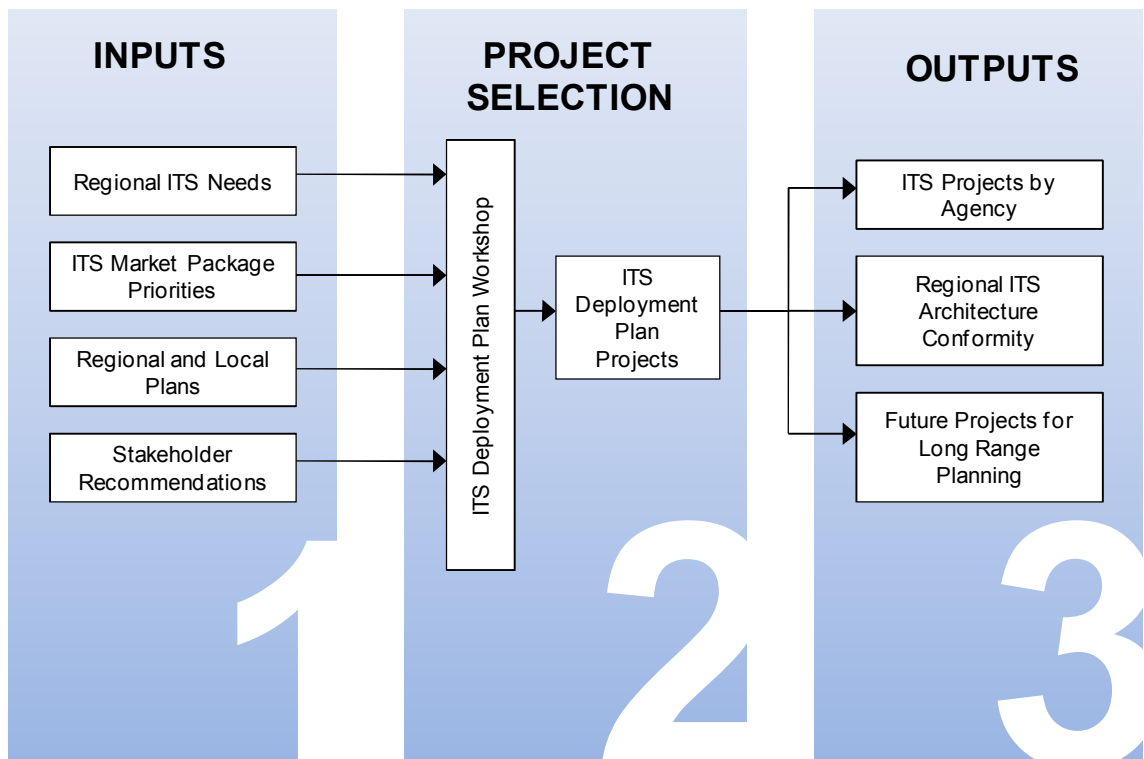
Figure 2 – Chattanooga Regional ITS Deployment Plan Development Process

1.3   Document Overview

The Chattanooga Regional ITS Deployment Plan is organized into five sections:

Section 1 – Introduction

This section provides an overview of the Chattanooga Regional ITS Deployment Plan development process and an overview of the geographic boundaries and stakeholders in the Region.

Section 2 – ITS Project Identification and Selection

This sections identifies the inputs that were gathered to develop the ITS project recommendations and discusses the types of ITS projects that were considered for implementation in the Chattanooga Region.

Section 3 – ITS Market Package Implementation

A summary of the ITS market packages that were selected and prioritized for the Region is provided in this section. Each ITS market package includes a definition and a listing of projects that support implementation of the market package services.

Section 4 – ITS Project Recommendations

This section contains project recommendations to address stakeholder needs and goals for ITS implementation in the Region. Each project includes a description of the project, deployment time-frame, agency responsible for deployment, an opinion of probable cost, status of funding, and a listing of ITS market packages associated with the project.

Section 5 – Use and Maintenance of the Regional ITS Deployment Plan

This section contains an overview of the systems engineering analysis process and a discussion on determining ITS architecture conformity for future ITS projects. Use and maintenance of the Regional ITS Architecture and Deployment Plan is also discussed.

2. ITS PROJECT IDENTIFICATION AND SELECTION

In Section 2 the process used to identify and select ITS projects for the Chattanooga Region is presented. This consisted of two primary phases. The first was the gathering of inputs to develop projects. Inputs included a review of regional ITS needs, ITS market packages, existing and planned infrastructure, and stakeholder inputs. Based on the inputs received, a series of ITS project types were developed for consideration in the Chattanooga Region. These ITS project types were presented to stakeholders and used as the basis for developing more specific project recommendation for deployment by the stakeholder agencies in Region.

2.1 Project Development Inputs

Section 2.1.1 through 2.1.4 provides an overview of the four primary types of project inputs gathered to develop the Chattanooga Regional ITS Deployment Plan. While each input was important, the primary driver of the Regional ITS Deployment Plan was the direct input from the stakeholder agencies. Each of the recommended ITS projects in the Regional ITS Deployment Plan was discussed with the stakeholders at the February 2010 ITS Deployment Plan Workshop and the projects presented in this plan are intended to directly reflect the decisions made by the stakeholders.

2.1.1 Regional ITS Needs

Regional needs were documented throughout the Regional ITS Architecture and Deployment Plan development process. Though some needs were very specific, such as the need for joint closed circuit television (CCTV) camera control capabilities between TDOT and the City of Chattanooga, others were more general in nature and are supported by a variety of projects including those needs identified from the Chattanooga-Hamilton County/North Georgia 2035 Long-Range Transportation Plan. Still others are important needs for the area, but are dependent on many other factors and are therefore such long-term needs that projects were not specifically identified.

Some of the primary regional ITS needs that were identified for the Chattanooga Region are included below. These represent many of the needs that were first identified at the ITS Architecture Kick-off Workshop held in October 2009 and continued to be discussed throughout the project.

- Develop and maintain a transportation system which provides for the safe and secure movement of people and goods (2035 Long-Range Transportation Plan goal);
- Develop system operations strategies that improve travel mobility and maximize the life of the transportation system (2035 Long-Range Transportation Plan goal);
- Establish coordination between the TDOT Region 2 SmartWay Traffic Management Center (TMC) and the City of Chattanooga Traffic Operations Center (TOC) for joint control of the CCTV cameras deployed in the freeway system;
- Expand traffic signal system communications and system detection capabilities;
- Optimize traffic signal timing throughout the Region;
- Improve traffic signal coordination between cities at jurisdictional boundaries;
- Develop advanced plans for the traffic management response to roadway closures resulting from incidents, special events, or construction that address detour routing and arterial management (including alternate timing plans and dynamic message signs (DMS) messages); and

- Implement a coordinated regional dispatch system for transit that is accessible through a single telephone number.

2.1.2   ITS Market Package Prioritization

Of the 91 ITS market packages available in Version 6.1 of the National ITS Architecture, 38 were selected by stakeholders and customized for deployment in the Chattanooga Region as part of the Regional ITS Architecture development process.   The market packages outline the services that ITS can provide in the Region and include the agencies that will be involved, elements that need to be deployed, and the interfaces that need to be established to integrate functionality and share data.   The selected market packages were prioritized as high, medium, or low by stakeholders at the ITS Deployment Plan Workshop in February 2010.

Many of the recommended ITS projects in the Chattanooga Regional ITS Deployment Plan have been based on the high priority ITS market packages, especially those related to Traffic Management.   The prioritized market packages that were selected by stakeholders are shown in **Table 1**.

Table 1 – Chattanooga Region ITS Market Package Prioritization by Functional Area

High Priority Market Packages	Medium Priority Market Packages	Low Priority Market Packages
Traffic Management		
ATMS01 Network Surveillance ATMS03 Surface Street Control ATMS06 Traffic Information Dissemination ATMS07 Regional Traffic Management ATMS08 Traffic Incident Management System	ATMS04 Freeway Control ATMS13 Standard Railroad Grade Crossing ATMS19 Speed Monitoring ATMS21 Roadway Closure Management	ATMS10 Electronic Toll Collection ATMS11 Emissions Monitoring and Management
Emergency Management		
EM01 Emergency Call-Taking and Dispatch EM02 Emergency Routing EM04 Roadway Service Patrols	EM06 Wide-Area Alert EM08 Disaster Response and Recovery EM09 Evacuation and Reentry Management EM10 Disaster Traveler Information	
Maintenance and Construction Management		
MC08 Work Zone Management MC10 Maintenance and Construction Activity Coordination MC03 Road Weather Data Collection MC04 Weather Information Processing and Distribution	MC01 Maintenance and Construction Vehicle and Equipment Tracking	
Public Transportation Management		
APTS01 Transit Vehicle Tracking APTS02 Transit Fixed-Route Operations APTS03 Demand Response Transit Operations APTS08 Transit Traveler Information	APTS04 Transit Fare Collection Management APTS05 Transit Security APTS06 Transit Fleet Management APTS07 Multi-Modal Coordination APTS09 Transit Signal Priority APTS10 Transit Passenger Counting	
Traveler Information		
ATIS01 Broadcast Traveler Information ATIS02 Interactive Traveler Information		
Commercial Vehicle Operations		
	CVO06 Weigh-in-Motion	
Archived Data Management		
	AD1 ITS Data Mart	AD3 ITS Virtual Data Warehouse

2.1.3 Existing Infrastructure and Planning Efforts

The Chattanooga Region is in the process of implementing several major ITS deployments including the TDOT SmartWay ITS System, Regional Advanced Traffic Management System (ATMS) Signal System, and a comprehensive ITS deployment for CARTA.

The largest deployment in the Chattanooga urban area has been the TDOT SmartWay Program. The program began with the early deployment of CCTV cameras in 2007 and a deployment is presently underway to supplement the CCTV coverage with DMS, radar detection systems (RDS), and highway advisory radio (HAR). A new SmartWay Region 2 TMC is also being constructed. When the deployment is complete, roughly 50 miles of freeways in the Chattanooga Region will be covered by the system. **Figure 3** provides an overview of the ITS field components currently deployed or under construction in the Chattanooga Region. TDOT deployments also include the HELP service patrols and a statewide 511 traveler information number.

The City of Chattanooga is upgrading traffic control hardware and installing a central control system for their traffic signals in the Central Business District as part of the City of Chattanooga ATMS. The City of Chattanooga is also preparing plans for signal upgrades and interconnect on traffic signals throughout the Region including those outside the City of Chattanooga. This Regional ATMS project will provide other cities within the Region with plans and allow them to move forward with implementation as soon as funds are available.

CARTA is currently in the process of a major comprehensive ITS deployment. Their system will include automated vehicle location (AVL) on buses to allow real-time transit vehicle location, next-bus arrival DMS at transit transfer stations and bus stops, and real-time transit information available on a web-site. The CARTA ITS deployment will also increase security with on-board video cameras and transit vehicle alarms. Automated passenger counters and electronic fare payment are also being deployed on buses.
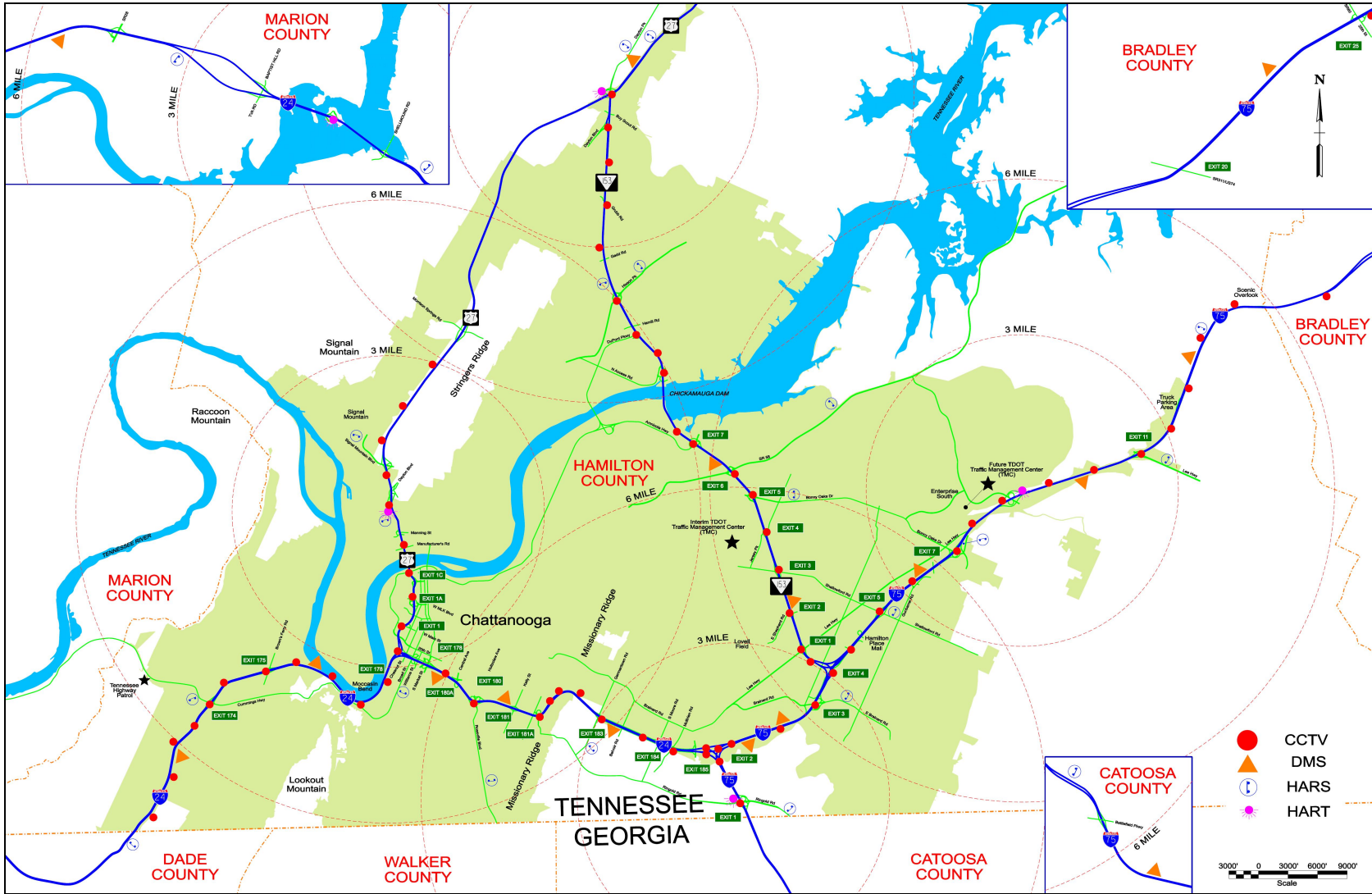
Figure 3 – TDOT Region 2 SmartWay ITS System

2.1.4 Stakeholder Input

The primary source of stakeholder input came from discussions at the three stakeholder workshops conducted in Chattanooga as part of the update of the Chattanooga Regional ITS Architecture and Deployment Plan. In particular, the ITS Deployment Plan Workshop held in February 2010 focused almost entirely on identifying and discussing ITS projects that could be deployed in the Region to assist in implementing the services identified through the ITS market packages. At this workshop stakeholders identified specific projects and timeframes for deployment by their agencies. The ITS Deployment Plan is not fiscally constrained so even though many of the ITS projects identified do not have any funding associated with them, they do represent projects that are important in the Region.

In addition to the ITS Deployment Plan Workshop, stakeholders were also provided with a form for providing input to the project team on any ITS projects that were planned or desired by their agency.

2.2 Project Types for Consideration

To assist in the development of the ITS Deployment Plan, a number of project types were considered and presented to stakeholders as part of a straw man list of ITS projects. The list allowed stakeholders to consider many different project types and select those that they felt were most beneficial and feasible for deployment by their agency. Projects were generally assigned to one of five different categories of projects and included:

- Traffic Management and Traveler Information Projects;
- Emergency Management Projects;
- Maintenance and Construction Management Projects;
- Transit Management Projects; and
- Archived Data Management Projects.

In Section 2.2.1 through 2.2.5 the project types that were considered are provided with a description of the type of project. The ITS market packages that correspond to each project type have also been provided.

2.2.1 Traffic Management and Traveler Information Project Types

TDOT SmartWay ITS Extension

Projects to extend the TDOT SmartWay ITS coverage area or add functionality are a combination of deployments that may include CCTV cameras, DMS, HAR, and the communications to support the expansion. This could include deployments in Georgia in coordination with GDOT.

Associated Market Packages: ATMS01–Network Surveillance, ATMS06–Traffic Information Dissemination

Traffic Management Center or Traffic Operations Center

The term traffic management center (TMC) is typically used to describe a large, dedicated traffic management facility that may also house other agencies, such as service patrol dispatch or a police department representative. TMCs tend to control many types of ITS equipment and are frequently staffed 24 hours a day. A traffic operations center (TOC) is typically thought of as a single agency facility, commonly incorporated into the agency's regular office space or signal maintenance facility. Traffic signal operations are generally the primary focus, although other devices may also be operated from the center.

Associated Market Packages: ATMS01–Network Surveillance, ATMS03–Surface Street Control, ATMS04–Freeway Control, ATMS06–Traffic Information Dissemination, ATMS07–Regional Traffic Management, ATMS08–Traffic Incident Management System

Interagency Traffic Information Coordination

Through either a direct communication link or web-based information exchange portal, interagency information coordination projects support regional traffic management. Information shared can include video feeds, traffic conditions, and incident locations. Data can be exchanged between states; between municipalities and states, such as a TDOT Region 2 SmartWay TMC and municipal TOC connection; or between municipalities.

Associated Market Packages: ATMS07–Regional Traffic Management, ATMS08–Traffic Incident Management System

Advanced Traffic Management System Signal System Implementation or Upgrades

The Advanced Traffic Management System (ATMS) signal system includes the communication system, field hardware, and traffic signal control software to allow real-time monitoring and control the traffic signal system. Depending on the needs of the agency, the ATMS could also be implemented to allow monitor and control DMS, process data from volume and speed detection stations, and provide video switching capabilities for CCTV cameras. Frequently the ATMS will also feed data directly onto a real-time traffic conditions website. At the municipal level the ATMS is typically chosen as part of the signal system selection process and modules are added to that software as needed to support other ITS deployments.

Associated Market Packages: ATMS03–Surface Street Control

Closed Circuit Television Camera Deployment

CCTV cameras are used to monitor traffic conditions and aid incident detection and emergency response. Though most of the existing deployments in the Region are on freeways and operated by TDOT, CCTV cameras can be useful tools for arterial traffic management as well. Camera feeds are frequently shared between agencies through center-to-center communications or web based portals to facilitate incident management.

Associated Market Packages: ATMS01–Network Surveillance

Dynamic Message Sign Deployment

DMS can be deployed on freeways or arterials to provide traveler information such as travel times; information about incidents, road conditions, and construction closures; and to support special event management.

Associated Market Packages: ATMS06–Traffic Information Dissemination

Volume and Speed Detection

Volume and speed data is primarily used for real-time incident detection and the calculation of travel times, but is also useful in planning. The freeway application is probably the most common implementation of vehicle detection, such as algorithms that process detector data to identify slowdowns that may indicate that an incident has occurred and to provide travel time data. At the municipal level, midblock arterial detection can support arterial traffic management in much the same way. Vehicle detection that is used exclusively for traffic signal operations in not included in this project type.

Associated Market Packages: ATMS01–Network Surveillance

Railroad Grade Crossing Advance Notification System

In many areas at-grade rail crossings cause significant traffic issues and can delay emergency response times. Advance notification system projects can address these concerns. Through the deployment of arterial DMS or blank out static message signs, drivers can be alerted of blocked crossings in advance so that they can detour before getting caught in a queue waiting for a crossing to clear. To facilitate efficient dispatch, emergency dispatchers can route responders around the blocked crossings or dispatch from a different station altogether if they know of blocked crossings in advance. Though separate detection can be deployed, this is typically accomplished using the traffic signal system infrastructure. When a signal is preempted by a train, the signal system can activate any advance warning signage and pass the information along to emergency dispatchers using interagency information coordination mechanisms.

Associated Market Packages: ATMS13–Standard Railroad Control

Real-Time Traveler Information Websites

This project type covers the creation of new traveler information websites or improvements to add functionality to existing sites. The goal of these sites is to provide real-time information about road conditions including incidents, construction closures, or weather-related issues. Sometimes users can subscribe to automated alerts through this type of website.

Associated Market Packages: ATMS01–Network Surveillance, ATIS02–Traffic Probe Surveillance

2.2.2 Emergency Management Project Types

Interagency Incident Management Information Coordination

Through either a direct communication link or web-based information exchange portal, interagency information coordination projects support regional incident management. Information shared between traffic and emergency management agencies can include video feeds, traffic conditions, and incident locations.

Associated Market Packages: ATMS08–Traffic Incident Management System

Emergency Vehicle Traffic Signal Preemption

Traffic signal preemption for emergency vehicles improves incident response times and emergency responder safety. Systems can be either GPS-based or utilize transmitters. Preemption capability has traditionally been limited to fire and emergency medical services as the quantity of police officers could lead to very frequent preemption requests that can impact the ability to maintain signal coordination.

Associated Market Packages: ATMS03–Surface Street Control, EM02–Emergency Routing

Speed Monitoring

Speed monitoring is different from speed and volume detection in the way that the data is used. Data from speed monitoring locations is provided to police to identify the need for targeted enforcement efforts. This is not automated enforcement. The same equipment used for speed and volume detection can also be used to provide this information or specific monitoring sites can be established.

Associated Market Packages: ATMS19–Speed Monitoring

2.2.3 Maintenance and Construction Management Project Types

Road Weather Information System

Road weather information system (RWIS) are road condition monitoring systems that collect pavement temperature, moisture, and wind information to support maintenance operations such as the application of anti-icing chemicals or closure of a road due to flooding.

Associated Market Packages: MC03–Road Weather Data Collection

2.2.4 Transit Management Project Types

Interagency Information Coordination for Transit Operations

Using either a direct communication link or web-based information exchange portal, interagency information coordination projects support transit operations. This connection primarily benefits the transit agency by facilitating dispatch and managing delays, but information regarding incidents involving transit vehicles can be useful for traffic or emergency management agencies as well.

Associated Market Packages: ATMS08–Traffic Incident Management System, APTS02–Transit Fixed Route Operations, APTS03–Demand Response Transit Operations, APTS05–Transit Security

Transit Vehicle Tracking

The deployment of automated vehicle location (AVL) on transit vehicles allows transit system operators to monitor vehicle locations. The data can be used to provide system users with real-time information about bus arrivals and to provide specific location information to maintenance or emergency responders in case of a breakdown or incident involving the vehicle.

Associated Market Packages: APTS01–Transit Vehicle Tracking, APTS02–Transit Fixed Route Operations, APTS03–Demand Response Transit Operations, APTS05–Transit Security

Transit On-board Security Cameras

Security cameras on transit vehicles are most frequently used for local recording only and are reviewed only if there is an issue. As communications capabilities improve, more transit agencies are deploying cameras that can be monitored real-time from a remote location.

Associated Market Packages: APTS05–Transit Security

Transit Alarm System

Silent alarms that can be activated by the driver in case of emergency send a trouble alarm to dispatchers who can then contact police for assistance.

Associated Market Packages: APTS05–Transit Security

Automated Passenger Counters

Transit passenger counting systems automate the collection of ridership data and when tied to GPS coordinates can determine the number of passengers boarding and alighting at each transit stop.

Associated Market Packages: APTS10–Transit Passenger Counting

Real-Time Next-Bus Arrival Information

Next-bus arrival information is typically provided to transit riders at a transit stop or transfer station on a DMS or kiosk. The information is calculated using the transit vehicle tracking data collected from the AVL system.

Associated Market Packages: APTS08–Transit Traveler Information

Real-Time Transit Traveler Information Website

This project type covers the creation of new transit traveler information websites or improvements to add functionality to existing sites. The goal of these sites is to provide real-time information about bus locations, next bus arrival times, or any system disruptions. Additional features can include personal trip planners and subscription based automated alerts.

Associated Market Packages: APTS08–Transit Traveler Information

Transit Signal Priority

Transit priority allows transit buses to request priority at traffic signals to extend or accelerate the call for green. The system can be GPS based or use a transmitter activated by the driver to request priority when buses are running behind schedule.

Associated Market Packages: APTS09–Transit Signal Priority

2.2.5   Archived Data Management Project Types

Data Archive

Database to store operational data collected by an agency from the ITS equipment deployed. Examples include a transit ridership database or traffic speed and volume database.

Associated Market Packages: AD1–ITS Data Mart

Data Warehouse

Data collection system for information from multiple agencies; such as one established by a TPO to track operational data from multiple agencies. The data warehouse can either physically consolidate the data in a central location or link to the individual data archives using a virtual data warehouse. With the volume of data warehousing involves, more and more agencies are choosing the virtual data warehouse.

Associated Market Packages: AD2–ITS Data Warehouse, AD3–ITS Virtual Data Warehouse

2.3 Project Selection

As mentioned previously in Section 2.1.4, the majority of project selection took place at the ITS Deployment Plan Workshop held with stakeholders in February 2010. The regional needs provided the foundation for the first draft of project recommendations and the deployment plan discussions gave stakeholders an opportunity to build on each other's ideas and identify opportunities to incorporate interagency coordination into the projects. With the potential project types described in Section 2.2 as a springboard, the group modified and added projects to reach the list presented in Section 4.

Project timeframes, costs, and funding status were also discussed with stakeholders and incorporated into the project recommendations. However, the project list is not fiscally constrained so the timeframes reflect the importance of the need and any necessary phasing without necessarily taking funding into account. With the ongoing funding challenges faced by agencies this provides an opportunity to express and document their most significant needs; these are the projects they would fund immediately if money was available. The costs presented are planning level costs as no preliminary engineering or design was performed as part of the project development process. Costs for any projects where funding has already been identified may be more specific.

3. ITS MARKET PACKAGE IMPLEMENTATION

In order to implement the ITS market package services in the Chattanooga Region, each market package was reviewed to determine which projects should be deployed. Stakeholders provided a great deal of feedback on these projects through the Regional ITS Architecture Workshops. Although the timeframe of the Regional ITS Deployment Plan extended as far as twenty years, stakeholders generally focused on identifying shorter term projects that were more likely to be funded.

Not every ITS market package has an associated ITS project. Several market packages were identified as being important to the Region; however, at this time stakeholders decided there were no projects feasible enough to document in the ITS Deployment Plan. In the future, additional projects will likely be added to the ITS Deployment Plan to implement these market packages.

The ITS market packages in the following subsections are organized by service areas in the order they appear in the National ITS Architecture. Each market package includes:

- A brief definition of the ITS market package (which were modified from the National ITS Architecture definitions);
- Stakeholder priority for the ITS market package;
- Recommended projects that will address some or all of the services that are contained in the ITS market package; and
- Additional projects that support the services that are contained in the ITS market package (if applicable).

The projects listed in the Recommended Projects section of the ITS market package tables are those that can be directly tied back to a particular market package and will help support the implementation of that market package. The projects listed in the Additional Supporting Projects section are projects that will support the market package but are not a specific part of the actual implementation of the market package. For example, the Municipal CCTV project will support operations of the Municipal/County Advanced Traffic Management System Signal System Implementation captured in the ATMS03 – Surface Street Control market package by allowing traffic operations personnel to visually monitor traffic signal operations at an intersection within range of a CCTV camera. However, the ATMS03 – Surface Street Control market package does not include any CCTV camera elements or data flows for traffic images and therefore the Municipal CCTV Camera project supports its operations but does not contribute to its implementation.

3.1 Traffic Management Service Area

The following ITS market packages and related projects implement the traffic management service area functions. These traffic management service areas represent some of the most commonly deployed projects, such as traffic signal systems, CCTV cameras, DMS, and TOCs. Many of the market packages in this service area are expected to be deployed prior to market packages in other service areas.

Table 2 – Traffic Management Market Packages and Projects

Network Surveillance (ATMS01)	High Priority
Includes traffic detectors, CCTV cameras, other surveillance equipment, supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to a traffic management center.	
Recommended Projects	
▪ Municipal CCTV Cameras ▪ Municipal TOC ▪ Regional ATMS Signal System ▪ TDOT Region 2 SmartWay Freeway Management System Deployment ▪ TDOT Region 2 SmartWay TMC ▪ TDOT Region 2 SmartWay Freeway Management System Central Operating Platform ▪ TDOT Region 2 SmartWay Freeway Management System Expansion ▪ TDOT Region 2 SmartWay CCTV Cameras	
Additional Supporting Projects	
▪ Municipal Railroad Grade Crossing Advance Notification System	

Surface Street Control (ATMS03)	High Priority
Provides the central control and monitoring equipment, communication links, and signal control equipment that support local street and/or arterial traffic management. This market package is consistent with typical urban traffic signal control systems.	
Recommended Projects	
▪ CARTA Fixed Route Transit Priority ▪ City of Chattanooga ATMS Central Business District Signal System ▪ Municipal Fire Department Signal Preemption ▪ Municipal TOC ▪ Regional ATMS Signal System	
Additional Supporting Projects	
▪ Municipal CCTV Cameras	

Table 2 – Traffic Management Market Packages and Projects (continued)

Freeway Control (ATMS04)	Medium Priority
Provides the communications and roadside equipment to support ramp control, lane controls and interchange control for freeways. The market package is consistent with typical urban traffic freeway control systems. Also includes the capability to utilize surveillance information for detection of incidents.	
Recommended Projects	
No projects have been identified at this time. The Freeway Control market package was customized and included in the ITS Architecture to reflect the possibility for ramp metering at some point in the future.	

Traffic Information Dissemination (ATMS06)	High Priority
Provides information to drivers using roadway equipment such as DMS or highway advisory radio (HAR). Information can include traffic and road conditions, closure and detour information, incident information, emergency alerts and driver advisories.	
Recommended Projects	
▪ Municipal DMS ▪ Municipal TOC ▪ Regional ATMS Signal System ▪ TDOT Region 2 SmartWay Freeway Management System Deployment ▪ TDOT Region 2 SmartWay TMC ▪ TDOT Region 2 SmartWay Freeway Management System Central Operating Platform ▪ TDOT Region 2 SmartWay Freeway Management System Expansion ▪ TDOT Region 2 SmartWay DMS	
Additional Supporting Projects	
▪ Municipal Railroad Grade Crossing Advance Notification System	

Regional Traffic Management (ATMS07)	High Priority
Sharing of traffic information and control among traffic management centers to support a regional management strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions.	
Recommended Projects	
▪ Municipal TOC Coordination with the TDOT Region 2 SmartWay TMC	
Additional Supporting Projects	
▪ Municipal TOC	

Table 2 – Traffic Management Market Packages and Projects (continued)

Traffic Incident Management System (ATMS08)	High Priority
Manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. This market package includes incident detection capabilities and coordination with other agencies. It supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel.	

Recommended Projects
▪ Hamilton County 911 Dispatch Coordination with the Municipal TOCs
▪ Municipal TOC
▪ Municipal TOC Coordination with the TDOT Region 2 SmartWay TMC
▪ TDOT Region 2 SmartWay TMC
▪ TDOT Region 2 SmartWay Freeway Management System Central Operating Platform

Additional Supporting Projects
▪ Municipal CCTV Cameras
▪ Municipal DMS
▪ Regional ATMS Signal System
▪ TDOT Region 2 SmartWay Freeway Management System Deployment
▪ TDOT Region 2 SmartWay Freeway Management System Expansion
▪ TDOT Region 2 SmartWay CCTV Cameras
▪ TDOT Region 2 SmartWay Dynamic Message Signs

Electronic Toll Collection (ATMS10)	Low Priority
Provides toll operators with the ability to collect tolls electronically and detect and process violations.	

Recommended Projects
No projects have been identified at this time. The Electronic Toll Collection market package was customized and included in the ITS Architecture to reflect the potential for toll roads in the Region in the future.

Emissions Monitoring and Management (ATMS11)	Low Priority
Monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data.	

Recommended Projects
No projects have been identified at this time. The Chattanooga-Hamilton County Air Pollution Control Board has existing air quality sensors deployed around the County.

Table 2 – Traffic Management Market Packages and Projects (continued)

Standard Railroad Grade Crossing (ATMS13)	**Medium Priority**
Manages highway traffic at highway-rail intersections where rail operational speeds are less than 80 mph..	
Recommended Projects	
▪ Municipal Railroad Grade Crossing Advance Notification System	

Speed Monitoring (ATMS19)	**Medium Priority**
Monitors the speeds of vehicles traveling through a roadway system.	
Recommended Projects	
▪ Municipal Speed Monitoring System	

Roadway Closure Management (ATMS21)	**Medium Priority**
Closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, or other situations. Market package covers general road closures applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other market packages.	
Recommended Projects	
No projects have been identified at this time.	

3.2   Emergency Management Service Area

The following ITS market packages and related projects implement ITS functions that support emergency management activities. These market packages are important for incident response, coordination of the emergency management and transportation systems, traveler information during disasters, and protection of the transportation infrastructure.

Table 3 – Emergency Management Market Packages and Projects

Emergency Call-Taking and Dispatch (EM01)	High Priority
Provides basic public safety call-taking and dispatch services. Includes emergency vehicle equipment, equipment used to receive and route emergency calls, wireless communications, and coordination between emergency management agencies.	
Recommended Projects	
▪ Municipal Fire Department AVL and MDTs	
Additional Supporting Projects	
▪ Hamilton County 911 Dispatch Coordination with the Municipal TOCs	

Emergency Routing (EM02)	High Priority
Supports automated vehicle location (AVL) and dynamic routing of emergency vehicles. Traffic information, road conditions and suggested routing information are provided to enhance emergency vehicle routing. Includes signal preemption and priority applications.	
Recommended Projects	
▪ Hamilton County 911 Dispatch Coordination with the Municipal TOCs	
▪ Municipal Fire Department AVL and MDTs	
▪ Municipal Fire Department Signal Preemption	
Additional Supporting Projects	
▪ Municipal Railroad Grade Crossing Advance Notification System	

Roadway Service Patrols (EM04)	High Priority
Supports the roadway service patrol vehicles that aid motorists, offering rapid response to minor incidents (flat tire, crashes, out of gas) to minimize disruption to the traffic stream. This market package monitors service patrol vehicle locations and supports vehicle dispatch.	
Recommended Projects	
▪ TDOT Region 2 SmartWay TMC	

Table 3 – Emergency Management Market Packages and Projects (continued)

Wide-Area Alert (EM06)	Medium Priority
Uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather, civil emergencies or other situations that pose a threat to life and property.	
Recommended Projects	
No projects have been identified at this time specifically for wide area alerts. Disseminating this information is a high priority for the Region and is supported by several deployments that, although primarily implemented for traffic management purposes, could also be used for the dissemination of wide area alert information.	
Additional Supporting Projects	
▪ Municipal DMS ▪ TDOT Region 2 SmartWay Dynamic Message Signs	

Disaster Response and Recovery (EM08)	Medium Priority
Enhances the ability of the surface transportation system to respond to and recover from disasters. Supports coordination of emergency response plans, provides enhanced access to the scene and better information about the transportation system in the vicinity of the disaster, and maintains situation awareness.	
Recommended Projects	
▪ Hamilton County Emergency Management EOC Back-up Operations for the Municipal TOCs	
Additional Supporting Projects	
▪ Hamilton County 911 Dispatch Coordination with the Municipal TOCs	

Evacuation and Reentry Management (EM09)	Medium Priority
Supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. This market package supports both anticipated, well-planned, and orderly evacuations such as for a hurricane, as well as sudden evacuations with little or no time for preparation or public warning such as a terrorist act. Employs a number of strategies to maximize capacity along an evacuation route including coordination with transit.	
Recommended Projects	
▪ Hamilton County Emergency Management EOC Back-up Operations for the Municipal TOCs	
Additional Supporting Projects	
▪ Hamilton County 911 Dispatch Coordination with the Municipal TOCs ▪ Municipal CCTV Cameras ▪ Municipal DMS ▪ Regional ATMS Signal System ▪ TDOT Region 2 SmartWay Freeway Management System Deployment ▪ TDOT Region 2 SmartWay Freeway Management System Expansion ▪ TDOT Region 2 SmartWay CCTV Cameras ▪ TDOT Region 2 SmartWay DMS	

Table 3 – Emergency Management Market Packages and Projects (continued)

Disaster Traveler Information (EM10)	Medium Priority
Uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster.	
Recommended Projects	
No projects were identified specifically for disaster traveler information. However, several traveler information projects will provide useful dissemination tool in the event of a disaster.	
Additional Supporting Projects	

- Municipal DMS
- Municipal Real-Time Traveler Information Website
- TDOT Region 2 SmartWay Freeway Management System Deployment
- TDOT Region 2 SmartWay Freeway Management System Expansion
- TDOT Region 2 SmartWay DMS

3.3 Maintenance and Construction Management Service Area

The following ITS market packages and related projects implement maintenance and construction management ITS functions. The priorities identified for the Region included road weather data collection, work zone management, and maintenance and construction activity coordination.

Table 4 – Maintenance and Construction Management Market Packages and Projects

Maintenance and Construction Vehicle and Equipment Tracking (MC01)	Medium Priority
Tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities.	
Recommended Projects	
No projects have been identified at this time.	

Road Weather Data Collection (MC03)	High Priority
Collects current road weather conditions using data collected from environmental sensors deployed on and about the roadway.	
Recommended Projects	
▪ Municipal Road Weather Information System Detection ▪ TDOT Region 2 SmartWay Weather Detection	

Weather Information Processing and Distribution (MC04)	High Priority
Processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators can make decisions on corrective actions to take.	
Recommended Projects	
No projects have been identified at this time.	

Work Zone Management (MC08)	High Priority
Directs activity in work zones, controlling traffic through portable DMS and informing other groups of activity for better coordination management. Also provides speed and delay information to motorists prior to the work zone.	
Recommended Projects	
No projects have been identified at this time.	
Additional Supporting Projects	

- Municipal CCTV Cameras

- Municipal DMS

- Regional ATMS Signal System

- TDOT Region 2 SmartWay Freeway Management System Deployment

- TDOT Region 2 SmartWay Freeway Management System Expansion

- TDOT Region 2 SmartWay CCTV Cameras

- TDOT Region 2 SmartWay DMS

Maintenance and Construction Activity Coordination (MC10)	High Priority
Supports the dissemination of maintenance and construction activity information to centers that can utilize it as part of their operations (i.e., traffic management, transit, emergency management).	
Recommended Projects	
No projects have been identified at this time.	

3.4 Public Transportation Management Service Area

The following ITS market packages implement public transportation management ITS functions. Many of these market packages were in the process of being implemented by CARTA through a comprehensive transit ITS program during the development of the Chattanooga Regional ITS Deployment Plan.

Table 5 – Public Transportation Management Market Packages and Projects

Transit Vehicle Tracking (APTS01)	High Priority
Monitors current transit vehicle location using an AVL system. Location data may be used to determine real time schedule adherence and update the transit system's schedule in real time.	
Recommended Projects	
▪ CARTA SmartBus Project	

Transit Fixed-Route Operations (APTS02)	High Priority
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for fixed-route and flexible-route transit services.	
Recommended Projects	
▪ CARTA SmartBus Project	

Demand Response Transit Operations (APTS03)	High Priority
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for demand responsive transit services.	
Recommended Projects	
▪ CARTA SmartBus Project	

Transit Fare Collection Management (APTS04)	Medium Priority
Manages transit fare collection on-board transit vehicles and at transit stops using electronic means. Allows the use of a traveler card or other electronic payment device.	
Recommended Projects	
▪ CARTA SmartBus Project	

Transit Security (APTS05)	Medium Priority
Provides for the physical security of transit passengers and transit vehicle operators. Includes on-board security cameras and panic buttons.	
Recommended Projects	
▪ CARTA On-Board Security Cameras	
▪ CARTA SmartBus Project	

Transit Fleet Management (APTS06)	Medium Priority
Supports automatic transit maintenance scheduling and monitoring for both routine and corrective maintenance.	
Recommended Projects	
▪ CARTA SmartBus Project	

Multi-modal Coordination (APTS07)	Medium Priority
Establishes two way communications between multiple transit and traffic agencies to improve service coordination.	
Recommended Projects	
No projects have been identified at this time.	

Transit Traveler Information (APTS08)	High Priority
Provides transit users at transit stops and on board transit vehicles with ready access to transit information. Services include stop annunciation, imminent arrival signs, and real-time transit schedule displays. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.	
Recommended Projects	
▪ CARTA Next-Bus Arrival Dynamic Message Sign Expansion ▪ CARTA SmartBus Project	

Transit Signal Priority (APTS09)	Medium Priority
Determines the need for transit priority on routs and at certain intersections and requests transit vehicle priority at these locations to improve on-time performance of the transit system.	
Recommended Projects	
▪ CARTA Fixed Route Transit Priority	

Transit Passenger Counting (APTS10)	Medium Priority
Counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center.	
Recommended Projects	
▪ CARTA SmartBus Project	

3.5 Traveler Information Service Area

The following ITS market packages and related projects implement traveler information ITS functions. Traveler information service area projects address market packages that make traveler information available to the public over a wide area such as the 511 traveler information phone number. Traveler information provided at specific locations on the roadway, such as DMS, is addressed in the ATMS06 – Traffic Information Dissemination market package in Section 3.1.

Table 6 – Traveler Information Market Packages and Projects

Broadcast Traveler Information (ATIS01)	**High Priority**
Collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures (radio, cell phones, etc.).	
Recommended Projects	
▪ Municipal Real-Time Traveler Information Website	

Interactive Traveler Information (ATIS02)	**High Priority**
Provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours, and pricing information.	
Recommended Projects	
No projects were specifically identified for local implementation. 511 traveler information phone and web-based services are being provided on a statewide level in Tennessee.	

3.6 Commercial Vehicle Operations

The following ITS market packages and related projects implement commercial vehicle operations ITS functions. Planning for commercial vehicle operations is being performed on a statewide level as part of the Commercial Vehicle Information Systems and Networks (CVISN) program. As part of this program projects are being developed on a statewide basis rather than a regional basis.

Table 7 – Commercial Vehicle Operations Market Packages and Projects

Weigh-in-Motion (CVO06)	Medium Priority
Provides for high speed weigh-in-motion with or without automated vehicle identification capabilities.	
Recommended Projects	
No projects have been identified at this time.	

3.7 Archived Data Management Service Area

The following ITS market packages and related projects implement archived data management ITS functions. Data collected through ITS deployments can be housed in several different formats. The market packages selected by stakeholders will allow data from a specific agency to be housed by that agency (considered an ITS data mart), or data from throughout the Region can be sent to a site to be housed together (considered an ITS virtual data warehouse). Data housed by an agency as part of an ITS data mart would likely be implemented as part of another project deployment. For example, DMS implementation might include software to archive all of the messages placed on the DMS over a period of time. The archived DMS data would be considered an ITS data mart.

Table 8 – Archived Data Management Market Packages and Projects

ITS Data Mart (AD1)	Medium Priority
Provides a focused archive that houses data collected and owned by a single agency or other organization. Focused archive typically covers a single transportation mode and one jurisdiction.	
Recommended Projects	
▪ CARTA SmartBus Project	

ITS Virtual Data Warehouse (AD3)	Low Priority
Provides the same broad access to multimodal, multidimensional data from varied sources as in the ITS Data Warehouse Market Package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed.	
Recommended Projects	
▪ Chattanooga-Hamilton County/North Georgia TPO Archive Data Warehouse	

4. ITS PROJECT RECOMMENDATIONS

In order to achieve the ITS deployment levels outlined in their Regional ITS Architecture, a region must deploy carefully developed projects that provide the functionality and interoperability identified in their ITS Architecture. A key step toward achieving the Chattanooga Region's ITS vision as established in the Regional ITS Architecture is the development of an ITS Deployment Plan that identifies specific projects, timeframes, and responsible agencies.

Input from all stakeholders is required for stakeholders to have ownership of the ITS Deployment Plan and to ensure that the plan has realistically identified projects and timeframes for deployment. Cost is another important factor—cost can vary a great deal for many ITS elements, depending on the level of deployment, maturity of the technology, type of communications, etc. For example, freeway network surveillance could be adequately achieved for one region by the deployment of still frame CCTV cameras only at freeway interchanges. In another region, full motion cameras may be deployed at one-mile intervals to provide complete coverage of the freeway. The infrastructure and telecommunications costs for these two projects would vary a great deal, yet either one could be suitable for a particular region.

To achieve input from stakeholders, an ITS Deployment Plan Workshop was held with stakeholders in Chattanooga on February 25, 2010 to discuss potential projects. Each project recommended for the Regional ITS Deployment Plan was discussed, and consensus was reached by the stakeholders on the project description and the timeframe for deployment.

Regional projects are identified in **Table 9** through **Table 13**. The tables are divided by primary responsible agency as follows:

- **Table 9** – TDOT Recommended ITS Projects;
- **Table 10** – Municipal Recommended ITS Projects;
- **Table 11** – Hamilton Country Recommended ITS Projects;
- **Table 12** – Transit Recommended ITS Projects; and
- **Table 13** – Chattanooga-Hamilton Country/North Georgia TPO Recommended ITS Projects.

The projects identified in the tables represent priority projects for each agency that are needed in order to implement the ITS services that were identified as part of the Regional ITS Architecture development. Many of the projects identified are not funded and identification of a funding source will likely be the most significant challenge in getting the projects implemented.

For each project, the following categories are discussed:

- **Project** – Identifies the project name including the agency responsible for implementation where applicable.
- **Description** – Provides a description of the project including notes on deployment locations, timeframe for deployment, and cost. The level of detail in the project descriptions varies depending on the implementing agency and how much detail they wanted to include regarding a project. In some cases projects had not been discussed beyond a very high conceptual level while in other cases an agency had begun detailed planning for a project implementation and more detail is provided in the description.
- **Deployment Timeframe and Responsible Agency** – Provides a recommended timeframe for deployment for each project. Timeframes have been identified as short-term (deployment recommended in 0-5 years), mid-term (deployment recommended in 5-10 years), and long-term (deployment recommended beyond 10 years). Recommendations for deployment timeframes were based on input from each agency and considered the project priority, possibility of funding, and dependency on other project deployments.

- **Opinion of Probable Cost and Funding Status** – Provides an opinion of probable cost of each project. Because design has not been undertaken for any projects, the opinion of probable cost should not be considered an estimate and should only be used for planning purposes. Costs are presented either as a total project cost when the project has been defined in more detail or as a unit cost per element when a project is at a higher conceptual level and has not been defined to the point where a total project cost opinion can be provided. In some cases an estimate of cost is not possible, particularly when the communication systems have not been designed and could have a great impact on the cost. For each project it is also noted whether funding has been identified or is still needed.
- **Applicable Market Packages** – Identifies the ITS market packages from the Regional ITS Architecture that each project will assist in implementing. Knowing which market packages each project identifies is an important part of an ITS architecture conformance review.

4.1 TDOT Recommended ITS Projects

Table 9 – TDOT Recommended ITS Projects

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
TDOT Region 2 SmartWay Freeway Management System Deployment	Implement approximately 50 miles of freeway management system (FMS) coverage in the Chattanooga urban area. The FMS includes the deployment of closed circuit television (CCTV) cameras, dynamic message signs (DMS), radar detection system (RDS), and highway advisory radio (HAR) along I-75, I-24, US 27, and SR 153. The SmartWay FMS also includes approximately 70 miles of fiber optic communication backbone.	Short-Term: TDOT	Cost: $22,000,000 Funding Identified: Yes (Under Construction)	ATMS01 – Network Surveillance ATMS06 – Traffic Information Dissemination
TDOT Region 2 SmartWay TMC	Implement the TDOT Region 2 SmartWay Traffic Management Center (TMC). The TMC will house the SmartWay operating platforms for the freeway management system and serve as the backup operations center for the I-75 Fog Detection System in Bradley and McMinn Counties. The TMC will also serve as the central dispatch for the TDOT HELP fleet in the Chattanooga Region.	Short-Term: TDOT	Cost: $2,300,000 Building $2,000,000 Software, network, furniture, etc. Funding Identified: Yes (Under Construction)	ATMS01 – Network Surveillance ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System EM04 – Roadway Service Patrols
TDOT Region 2 SmartWay Freeway Management System Central Operating Platform	Procure and implement a central operating platform for the SmartWay FMS field devices under construction in the Chattanooga urban area. The central operating platform will provide a universal operating platform for managing all of the FMS devices and replace the various vendor software that will temporarily be used for managing the devices. Funding for this project could come from the $2,000,000 identified for the TDOT Region 2 SmartWay TMC software and other components if funds remain once the TMC is complete.	Short-Term: TDOT	Cost: May be included in the $2,000,000 for TDOT Region 2 SmartWay TMC software identified above if additional funds remain. Funding Identified: Possibly	ATMS01 – Network Surveillance ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System

Table 9 – TDOT Recommended ITS Projects (Continued)

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
TDOT Region 2 SmartWay Freeway Management System Extension	Extend the coverage of the SmartWay FMS from the northern limits on I-75 to the recently completed I-75 Fog Detection System. The extension will cover approximately 12 miles and will include CCTV cameras, DMS, RDS, and HAR. A communication backbone to support the deployment is being implemented as part of the current SmartWay FMS construction.	Mid to Long-Term: TDOT	Cost: $2,000,000 Funding Identified: No (Planned 2012-2015)	ATMS01 – Network Surveillance ATMS06 – Traffic Information Dissemination
TDOT Region 2 SmartWay CCTV Cameras	Implement CCTV cameras to monitor traffic conditions and aid in incident management in the Chattanooga Region. The purpose of the CCTV cameras in this project would be to supplement the SmartWay freeway management system deployment at locations that are not covered by existing SmartWay deployments.	Mid to Long-Term: TDOT	Cost: $30,000/Site Funding Identified: No	ATMS01 – Network Surveillance
TDOT Region 2 SmartWay DMS	Implement DMS to disseminate incident, weather, construction, and general traffic information in the Chattanooga Region. The purpose of the DMS in this project would be to supplement the SmartWay freeway management system deployment at locations that are not covered by existing SmartWay deployments.	Mid to Long-Term: TDOT	Cost: $175,000/Site Funding Identified: No	ATMS06 – Traffic Information Dissemination
TDOT Region 2 SmartWay Weather Detection	Implement weather detection systems for snow, ice, flooding, and other severe weather conditions at various locations in the Chattanooga Region.	Mid to Long-Term: TDOT	Cost: $10,000 - $25,000/Site Funding Identified: No	MC03 – Road Weather Data Collection

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

[2]The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

4.2 Municipal Recommended ITS Projects

Table 10 – Municipal Recommended ITS Projects

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
City of Chattanooga ATMS Central Business District Signal System	Replace the traffic control hardware at 86 intersections in the Chattanooga Central Business District and install a central control system for traffic signal control as part of the City of Chattanooga Advanced Traffic Management System (ATMS).	Short-Term: City of Chattanooga	Cost: $1,500,000 Funding Identified: Yes Programmed 2010-2011	ATMS03 – Surface Street Control
Regional ATMS Signal System	This project will include the design of signal system upgrades, real-time monitoring capabilities, and communications for signals throughout Hamilton County. The City of Chattanooga is leading this effort but signals in other jurisdictions will be included. Implementation will be dependent on funding in each jurisdiction. This project could also include the deployment of CCTV cameras and DMS on arterials.	Short to Long-Term: City of Chattanooga (Lead) Other Municipalities	Cost: Approximately $10,000,000 Funding Identified: Yes Planned 2012-2015	ATMS01 – Network Surveillance ATMS03 – Surface Street Control ATMS06 – Traffic Information Dissemination
Municipal TOC	Establish a Municipal Traffic Operations Center (TOC). The TOC will manage the traffic signal system, monitor CCTV cameras and vehicle detection, and control DMS. Cost represents equipment costs and those costs associated with modifying space in an existing facility for use as a TOC.	Short-Term: City of East Ridge Mid to Long-Term: Other Municipalities	Cost: $100,000 - $200,000 Funding Identified: No	ATMS01 – Network Surveillance ATMS03 – Surface Street Control ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System
Municipal CCTV Cameras	Implement closed circuit television (CCTV) cameras on key sections of roadway. CCTV cameras can be used to monitor traffic conditions and to aid in incident management. Video feeds can be shared with emergency management agencies to facilitate emergency response. Cost shown includes the pole and camera. The cost will be lower if the camera is installed on a signal mast arm or other existing roadside structure.	Short to Long-Term: Municipalities	Cost: $30,000/Site Funding Identified: No	ATMS01 – Network Surveillance

Table 10 – Municipal Recommended ITS Projects (Continued)

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
Municipal DMS	Deploy dynamic message signs (DMS) to provide traveler information, incident management, and special event management capabilities.	Mid to Long-Term: Municipalities	Cost: $75,000/Site Funding Identified: No	ATMS06 – Traffic Information Dissemination
Municipal Railroad Grade Crossing Advance Notification System	Implement advanced warning signs at railroad crossings to alert motorists of road blockages due to stopped trains.	Mid to Long-Term: Municipalities	Cost: $10,000 - $20,000/Site Funding Identified: No	ATMS13 – Standard Railroad Grade Crossing
Municipal Road Weather Information System Detection	Implement weather detection systems for snow, ice, flooding, and other severe weather conditions at various locations in the Region.	Mid to Long-Term: Municipalities	Cost: $10,000 - $40,000/Site Funding Identified: No	MC03 – Road Weather Data Collection
Municipal Speed Monitoring System	Implement vehicle detection locations to monitor roadway speeds and determine locations for targeted enforcement. In select locations, such as school zones, the detection will also include driver feedback signs to inform the driver of their speed.	Mid to Long-Term: Municipalities	Cost: $5,000 - $20,000/ Site Funding Identified: No	ATMS19 – Speed Monitoring
Municipal Real-Time Traveler Information Website	Add real-time traveler information, such as incident locations, speed, and CCTV camera images to the Municipal website.	Mid to Long-Term: Municipalities	Cost: $50,000 - $100,000 Funding Identified: No	ATIS01 – Broadcast Traveler Information
Municipal TOC Coordination with the TDOT Region 2 SmartWay TMC	Establish a communications connection between the Municipal TOCs and the TDOT Region 2 SmartWay TMC for the coordination of traffic information. This sharing will facilitate the inclusion of regional information in the Tennessee 511 System as well as the sharing of video feeds and weather information as additional TDOT and Municipal deployments are made in the Region. This connection currently exists between the City of Chattanooga TOC and TDOT but does not exist for any other Municipal TOCs.	Mid to Long-Term: Municipalities	Cost: To Be Determined Funding Identified: No	ATMS07 – Regional Traffic Management ATMS08 – Traffic Incident Management System
Municipal Fire Department AVL and MDTs	Implement AVL and MDTs on Municipal Fire Department vehicles. Cost represents in-vehicle equipment as well as supporting software.	Short to Mid-Term: Municipalities	Cost: $5,000/Vehicle Funding Identified: No	EM01 – Emergency Call-Taking and Dispatch EM02 – Emergency Routing

Table 10 – Municipal Recommended ITS Projects (Continued)

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
Municipal Fire Department Signal Preemption	Implement emergency vehicle signal preemption for the Municipal Fire Department to improve incident response times and emergency responder safety.	Short to Mid-Term: Municipalities	Cost: $6,000/Intersection $1,500/Vehicle Funding Identified: No	ATMS03 – Surface Street Control EM02 – Emergency Routing

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

[2]The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

4.3 Hamilton County Recommended ITS Projects

Table 11 – County Recommended ITS Projects

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
Hamilton County 911 Dispatch Coordination with the Municipal TOCs	Establish a connection to allow the Municipal TOCs to share CCTV camera images, railroad crossing closure status, and other information with the Hamilton County 911 Dispatch to aid in incident management. This project could also include the integration of the 911 Dispatch CAD system and the TOCs to allow the TOCs to receive automated notification about incidents that might affect the roadway network. Integration of the 911 Dispatch CAD system could also allow the TOCs to provide 911 Dispatch with real-time traffic and road conditions for use in emergency vehicle dispatch.	Mid to Long-Term: Hamilton County and Municipalities	Cost: To Be Determined Funding Identified: No	ATMS08 – Traffic Incident Management System EM02 – Emergency Routing
Hamilton County Emergency Management EOC Back-up Operations for the Municipal TOCs	Implement a workstation and appropriate software at the Hamilton County Emergency Operation Center (EOC) to allow Emergency Management the ability to monitor and control all of the Municipal TOCs capabilities.	Mid to Long-Term: Hamilton County and Municipalities	Cost: To Be Determined Funding Identified: No	EM08 – Disaster Recovery and Response EM09 – Evacuation and Reentry Management

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

[2]The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

4.4 Transit Recommended ITS Projects

Table 12 – Transit Recommended ITS Projects

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
CARTA SmartBus Project	SmartBus is CARTA's comprehensive transit ITS program that includes a wide variety of transit ITS deployments. SmartBus is in the process of being implemented an includes: • Data warehousing and reporting software; • Operations management software to support fixed-route scheduling and demand response scheduling and dispatch; • Remote diagnostics maintenance system for transit vehicles; • On-board systems including mobile data computers, computer aided dispatch, automated vehicle location, covert alarms, automated passenger counters, and next stop automated announcement system; and • Multi-modal transit and parking smart card electronic fare payment system.	Short-Term: CARTA	Cost: Total Cost Not Available Funding Identified: Yes	APTS01 – Transit Vehicle Tracking APTS02 – Transit Fixed Route Operations APTS03 – Demand Response Transit Operations APTS04 – Transit Fare Collection Management APTS05 – Transit Security APTS06 – Transit Fleet Management APTS08 – Transit Traveler Information APTS10 – Transit Passenger Counting AD1 – ITS Data Mart
CARTA On-Board Security Cameras	Add cameras to buses for on-board video recording with live feeds provided to operators monitoring buses.	Short-Term: CARTA	Cost: Currently Out for Bid Funding Identified: Yes	APTS05 – Transit Security
CARTA Fixed Route Transit Priority	Add automated transit signal priority system that will provide buses that are behind schedule with automated transit signal priority. The current system only allows priority when manually requested by drivers using a button on the bus.	Short to Mid-Term: CARTA and the City of Chattanooga	Cost: $6,000/Intersection $1,500/Vehicle Funding Identified: No	ATMS03 – Surface Street Control APTS09 – Transit Signal Priority
CARTA Next-bus Arrival Dynamic Message Sign Expansion	Add next-bus arrival dynamic message signs at additional bus stops throughout the CARTA service area.	CARTA	Cost: $10,000 - $15,000/Site Funding Identified: No	APTS08 – Transit Traveler Information

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

[2]The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

4.5 Chattanooga-Hamilton County/North Georgia TPO Recommended ITS Projects

Table 13 – Chattanooga-Hamilton Country/North Georgia TPO Recommended ITS Projects

Project	Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status[2]	Applicable Market Packages
Chattanooga-Hamilton County/North Georgia TPO Archive Data Warehouse	Establish a data warehouse to archive data from cities and transit agencies within the TPO boundaries for use in regional planning. Cost for this project represents an average range for developing a data warehouse system. Cost could vary widely depending on the level of detail and functionality of the system as well as the amount of development that is done in-house by the TPO. It is possible that this project could be done at a statewide level by TDOT rather than regionally by MPOs and TPOs.	Chattanooga-Hamilton County/North Georgia TPO	Cost: $200,000 - $400,000 Funding Identified: No	AD3 – ITS Virtual Data Warehouse

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

[2]The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

5. USE AND MAINTENANCE OF THE REGIONAL ITS DEPLOYMENT PLAN

In 2001 the FHWA issued Final Rule 23 CFR 940, which required that ITS projects using federal funds (or ITS projects that integrate with systems that were deployed with federal funds) conform to a regional ITS architecture and also be developed using a systems engineering process. The purpose of this Section is to discuss how the Chattanooga Regional ITS Architecture and ITS Deployment Plan can be used to support meeting the ITS architecture conformity and systems engineering requirements. A process for maintaining the Regional ITS Architecture and Deployment Plan is also presented. In Section 5.1 the systems engineering analysis requirements and the guidance provided by TDOT and the FHWA Tennessee Division are discussed. In Section 5.2, the process for determining ITS architecture conformity of an ITS project is presented. The conformity process documented in Section 5.2 has also been included in the Chattanooga Regional ITS Architecture document.

The Regional ITS Architecture and Regional ITS Deployment Plan are both considered living documents. Shifts in regional focus and priorities, changes and new developments in technology, and changes to the National ITS Architecture will necessitate that the Chattanooga Regional ITS Architecture and Deployment Plan be updated to remain a useful resource for the Region. In the Regional ITS Architecture, a process for maintaining the plan was developed in coordination with stakeholders. The processes cover both major updates to the Regional ITS Architecture and Deployment Plan that will happen approximately every four years as well as minor changes that may be needed between major updates of the documents. These processes have been included in this document in Sections 5.3 and 5.4.

5.1 Systems Engineering Analysis

In order to assist agencies with meeting the requirements of the FHWA Final Rule 23 CFR 940, TDOT and the FHWA Tennessee Division Office developed a guidance document entitled "Standardized Procedures for Implementing ITS Regulations." The guidance document indicates that unless projects are categorically excluded, a systems engineering analysis must be performed for the project. Categorically excluded projects are those that do not utilize a centralized control, do not share data with another agency, or are expansions or enhancements to existing systems that do not add any new functionality. For example, installation of an isolated traffic signal or expansion of a freeway management system through the deployment of additional CCTV cameras would be categorically excluded and not require a systems engineering analysis.

The goal of performing a systems engineering analysis is to systematically think through the project deployment process. Thorough upfront planning has been shown to help control costs and ensure schedule adherence. The Tennessee procedures indicate that the following should be included in a systems engineering analysis:

- Identification of portions of the Regional ITS Architecture being implemented;
- Identification of participating agencies roles and responsibilities;
- Definition of system requirements;
- Analysis of alternative system configurations and technology options the meet the system requirements;
- Identification of various procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Documentation of the procedures and resources necessary for operations and management of the system.

The Chattanooga Regional ITS Architecture and associated Turbo Architecture database can supply information for many of the required components for a systems engineering analysis. These include:

- Portions of the Regional ITS Architecture being implemented (discussed in Section 5.2 of the Chattanooga Regional ITS Deployment Plan document);
- Participating agencies roles and responsibilities (identified in the Chattanooga Regional ITS Architecture document);
- Definition of system requirements (identified in the Chattanooga Regional ITS Architecture Turbo Architecture database equipment packages); and
- Applicable ITS standards (identified using the ITS market package data flows from the Chattanooga Regional ITS Architecture document and the National standards associated with the ITS market package data flows).

The Vee Diagram, shown as **Figure 4**, is frequently used in systems engineering discussions to demonstrate where the Regional ITS Architecture and systems engineering process fits into the life cycle of an ITS project. The Regional ITS Architecture is shown unattached from the rest of the diagram because it is not specifically project related and an undetermined amount of time can pass between the architecture development and the beginning of project implementation. Traveling along the diagram the systems engineering process addresses concept exploration, the systems engineering management plan framework, concept of operations, and systems requirements.
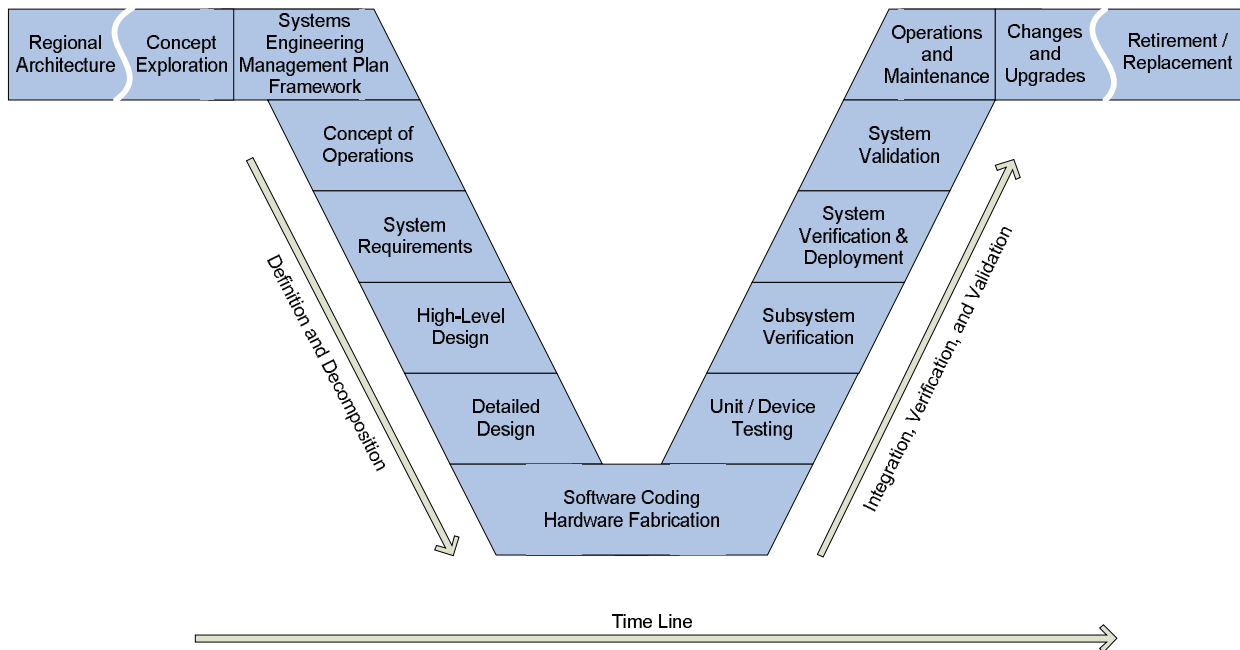

Figure 4 – Systems Engineering Vee Diagram

The Tennessee guidance document contains an example worksheet to aid in the preparation of a systems engineering analysis. During the process, if it is determined that a project is not adequately addressed in the Regional ITS Architecture, the Regional ITS Architecture maintenance process should be used to document the necessary changes.

5.2 Process for Determining ITS Architecture Conformity

The Chattanooga Regional ITS Architecture documents the customized market packages that were developed as part of the ITS architecture process. To satisfy FHWA and FTA requirements and remain eligible to use Federal funds, a project must be accurately documented. The steps of the process are as follows:

- Identify the ITS components in the project;
- Identify the corresponding market packages(s) from the Regional ITS Architecture;
- Locate the component within the market package;
- Compare the connections to other agencies or elements documented in the ITS architecture as well as the information flows between them to the connections that will be part of the project; and
- Document any changes necessary to the Regional ITS Architecture or the project to ensure there is conformance.

The steps for determining ITS architecture conformity of a project are described in more detail below.

Step 1 – Identify the ITS Components

ITS components can be fairly apparent in an ITS focused project such as CCTV or DMS deployments, but could also be included in other types of projects where they are not as apparent. For example, an arterial widening project could include the installation of a signal system interconnect, signal upgrades, and the incorporation of the signals in the project limits into a city's closed loop signal system. These are all ITS functions and should be included in the ITS Architecture.

Step 2 – Identify the Corresponding Market Packages

If a project was included in the projects identified in the Chattanooga Regional ITS Deployment Plan, then the applicable ITS market package(s) for that project are identified in a column of the tables. However, ITS projects are not required to be included in the ITS Deployment Plan in order to be eligible for federal funding; therefore, market packages might need to be identified for projects that have not been covered in the ITS Deployment Plan. In that case, the market packages selected and customized for the Chattanooga Region should be reviewed to determine if they adequately cover the project. Customized market package diagrams for the Region can be found in the Chattanooga Regional ITS Architecture. The project concepts presented in Section 2.2 provide another resource to assist in determining what market packages correspond to a particular project type.

Step 3 – Identify the Component within the Market Package

Once the element is located within the appropriate ITS market package the evaluator should determine if the element name used in the market package is accurate or if a change to the name is needed. For example, a planned element called the City of East Ridge TOC was included in the Chattanooga Regional ITS Architecture. As the planning progresses it is possible the City of East Ridge could select a different name for the TOC. Such a name change should be documented using the process outlined in Section 5.4.

Step 4 – Evaluate the Connections and Flows

The connections and architecture flows documented in the ITS market package diagrams were selected based on the information available at the time the Regional ITS Architecture was developed. As the projects are designed, decisions will be made on the system layout that might differ from what is shown in the market package. These changes in the project should be documented in the ITS market packages using the process outlined in Section 5.4.

Step 5 – Document Required Changes

If any changes are needed to accommodate the project under review, Section 5.4 describes how those changes should be documented. Any changes will be incorporated during the next Regional ITS Architecture update. Conformance will be accomplished by documenting how the ITS market package(s) should be modified so that the connections and data flows are consistent with the project.

5.3 Process for Maintaining the Regional ITS Architecture and Deployment Plan

The Chattanooga-Hamilton County RPA will be responsible for leading the process to update the Chattanooga Regional ITS Architecture and Deployment Plan in coordination with the TDOT Long Range Planning Division. **Table 14** summarizes the maintenance process agreed upon by stakeholders in the Region.

Table 14 – Chattanooga Regional ITS Architecture and Deployment Plan Maintenance Summary

Maintenance Details	Regional ITS Architecture		Regional ITS Deployment Plan	
	Minor Update	**Major Update**	**Minor Update**	**Major Update**
Timeframe for Updates	As needed	Approximately every 4 years	Annually	Approximately every 4 years
Scope of Update	Review and update market packages to satisfy architecture compliance requirements of projects or to document other changes that impact the Regional ITS Architecture	Entire Regional ITS Architecture	Review and update project status and add or remove projects as needed	Entire Regional ITS Deployment Plan
Lead Agency	Chattanooga-Hamilton County RPA		Chattanooga-Hamilton County RPA	
Participants	Stakeholders impacted by market package modifications	Entire stakeholder group	Entire stakeholder group	
Results	Market package or other change(s) documented for next complete update	Updated Regional ITS Architecture document, Appendices, and Turbo Architecture database	Updated project tables	Updated Regional ITS Deployment Plan document

Stakeholders agreed that a full update of the Regional ITS Architecture and Deployment Plan should occur approximately every four years in the year preceding the Long Range Transportation Plan (LRTP) update. By completing a full update in the year prior to the LRTP update, stakeholders will be able to determine the ITS needs and projects that are most important to the Region and document those needs and projects for consideration when developing the LRTP. The Chattanooga-Hamilton County RPA, in coordination with the TDOT Long Range Planning Division, will be responsible for completing the full updates. During the update process all of the stakeholder agencies that participated in the original development of the Regional ITS Architecture and Deployment Plan should be included as well as any other agencies in the Region that are deploying or may be impacted by ITS projects.

Minor changes to the Regional ITS Architecture should occur as needed between full updates of the plan. In Section 5.4 of this document the procedure for submitting a change to the Regional ITS Architecture is documented. Documentation of changes to the Regional ITS Architecture is particularly important if a project is being deployed and requires a change to the Regional ITS Architecture in order to establish conformity.

Stakeholders recommended that the Chattanooga-Hamilton County RPA lead an annual meeting to review projects in the Regional ITS Deployment Plan to update project status, remove projects that were completed, add project detail when available, and add new projects. Minor changes to the Regional ITS Deployment Plan should be noted by the Chattanooga-Hamilton County RPA.

Any corresponding changes to the Regional ITS Architecture will be documented and retained by the RPA for inclusion during the next complete update.

5.4 Procedure for Submitting ITS Architecture Changes Between Major Updates

Updates to the Chattanooga Regional ITS Architecture will occur on a regular basis as described in Section 5.3 to maintain the architecture as a useful planning tool. Between major plan updates, smaller modifications will likely be required to accommodate ITS projects in the Region. Section 5.2 contains step by step guidance for determining whether or not a project requires architecture modifications to the Regional ITS Architecture.

For situations where a change is required, an Architecture Maintenance Documentation Form was developed and is included in the Chattanooga Regional ITS Architecture. This form should be completed and submitted to the architecture maintenance contact person identified on the form whenever a change to the Regional ITS Architecture is proposed. There are several key questions that need to be answered when completing the Architecture Maintenance Documentation Form including those described below.

Change Information: The type of change that is being requested can include an Administrative Change, Functional Change – Single Agency, Functional Change – Multiple Agency, or a Project Change. A description of each type of change is summarized below.

- Administrative Change: Basic changes that do not affect the structure of the ITS market packages in the Regional ITS Architecture. Examples include changes to stakeholder or element names, element status, or data flow status.
- Functional Change – Single Agency: Structural changes to the ITS market packages that impact only one agency in the Regional ITS Architecture. Examples include the addition of a new ITS market package or changes to data flow connections of an existing market package. The addition or change would only impact a single agency.
- Functional Change – Multiple Agencies: Structural changes to the ITS market packages that have the potential to impact multiple agencies in the Regional ITS Architecture. Examples include the addition of a new ITS market package or changes to data flow connections of an existing ITS market package. The addition or changes would impact multiple agencies and require coordination between the agencies.
- Project Change: Addition, modification, or removal of a project in the Regional ITS Deployment Plan.

Description of the requested change: A brief description of the type of change being requested should be included.

Market packages being impacted by the change: Each of the ITS market packages that are impacted by the proposed change should be listed on the ITS Architecture Maintenance Documentation Form. If the proposed change involves creating or modifying an ITS market package then the agency completing the ITS Architecture Maintenance Documentation Form is asked to include a sketch of the new or modified market package.

Impact of proposed change on other stakeholders: If the proposed change is expected to have any impact on other stakeholders in the Region, then those stakeholders should be listed on the ITS Architecture Maintenance Documentation Form. A description of any coordination that has occurred with other stakeholders that may be impacted by the change should be also included. Ideally all stakeholders that may be impacted by the change should be contacted and consensus

should be reached on any new or modified ITS market packages that will be included as part of the Regional ITS Architecture.

The Chattanooga-Hamilton County RPA will review and accept the proposed changes and forward the form to the TDOT Long Range Planning Division for their records. When a major update is performed all of the documented changes should be incorporated into the Regional ITS Architecture.