



Tennessee Department of Transportation  
Regional ITS Architectures and Deployment Plans

## Cleveland Region

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# Regional ITS Deployment Plan

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## LIST OF ACRONYMS

AD	Archived Data
APTS	Advanced Public Transportation System
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CVISN	Commercial Vehicle Information Systems and Networks
DMS	Dynamic Message Sign
EM	Emergency Management
EMA	Emergency Management Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HRI	Highway-Rail Intersection
ITS	Intelligent Transportation System
MC	Maintenance and Construction
MDT	Mobile Data Terminal
MP	Milepost
MPO	Metropolitan Planning Organization
SETHRA	Southeast Tennessee Human Resource Agency
TDOT	Tennessee Department of Transportation
TMC	Transportation Management Center
TOC	Traffic Operations Center
TPO	Transportation Planning Organization

## 1. INTRODUCTION

### 1.1 Project Overview

The Cleveland Region has developed a Regional Intelligent Transportation System (ITS) Architecture under the direction of the Tennessee Department of Transportation (TDOT) with support from the Cleveland Urban Area Metropolitan Planning Organization (MPO). ITS architectures provide a framework for implementing ITS projects, encourage interoperability and resource sharing among agencies, identify applicable standards to apply to projects, and allow for cohesive long-range planning among regional stakeholders. The Cleveland Regional ITS Architecture focuses on the functionality that ITS provides in the Region as well as how those functions can operate for agencies in and around the Cleveland 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 require that regions develop an ITS architecture and show how ITS projects conform to that regional ITS architecture in order to receive federal funding.

The ITS Deployment Plan, while not required by FHWA and FTA, is a useful tool for regions to identify specific projects that are able to be deployed in order to implement their ITS Architecture. The ITS Deployment Plan builds on the 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 ITS Deployment Plan also shows the correlation between each project and the 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 ITS Architecture can be revised while in draft format; therefore, the resulting ITS deployment projects from this effort should be clearly supported by the ITS Architecture.

The Cleveland Regional ITS Architecture and ITS Deployment Plan were both developed with significant input from local, state, and federal officials. A series of four workshops was held to solicit input from stakeholders and ensure that the plan reflected the unique needs of the Region. Copies of the draft reports were made available to all stakeholders. The Regional ITS Architecture and Deployment Plan developed reflects an accurate snapshot of existing ITS deployments and future ITS plans in the Region. Needs and priorities of the Region will change over time and, in order to remain effective, this plan should be periodically reviewed and updated.

### 1.2 Document Overview

The Cleveland Regional ITS Deployment Plan is organized into four key sections:

#### **Section 1 – Introduction**

This section provides an overview of the Cleveland Regional ITS Deployment Plan and the key features and stakeholders in the Cleveland Region.

#### **Section 2 –Regional ITS Architecture Market Package Implementation**

A summary of the market packages selected and prioritized for the Region is provided in this section. Each market package is defined and is accompanied by a listing of projects that support implementation of the market package services.

### **Section 3 – 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, the responsible agency or agencies, an opinion of probable cost and whether or not funding was identified, deployment timeframe, and a listing of market packages associated with the project.

### **Section 4 – Maintaining the Regional ITS Deployment Plan**

A brief description of the maintenance procedure for the Regional ITS Deployment Plan is provided in this section.

## **1.3 Cleveland Region**

### *1.3.1 Region Overview*

The Cleveland Region includes all of Bradley County plus a portion of McMinn County along the I-75 corridor to Exit 42. The segment of McMinn County was included in the Cleveland Regional ITS Architecture for continuity with planning for management of fog events that impact I-75.

### *1.3.2 Stakeholders*

ITS often extends beyond traditional transportation infrastructure; therefore, the involvement of non-traditional stakeholders, such as police and fire, is important in the architecture development and visioning process. Input from these stakeholders, both public and private, is a crucial part of defining the interfaces, integration needs, and overall vision for ITS in a region.

The following stakeholder agencies have participated in the Cleveland Region project workshops or provided input to the study team:

- Bradley County;
- Chattanooga-Hamilton County/North Georgia Transportation Planning Organization (TPO);
- City of Cleveland;
- Cleveland-Bradley County Emergency Management Agency (EMA);
- Cleveland Urban Area MPO;
- Cleveland Transit;
- Cleveland Utilities;
- Federal Highway Administration – Tennessee Division;
- Southeast Tennessee Human Resource Agency (SETHRA) Public Transportation;
- Tennessee Department of Transportation – Design Division, Signals and Signing Section;
- Tennessee Department of Transportation – Long-Range Planning Division; and
- Tennessee Department of Transportation – Region 2.

A more detailed list of stakeholders, including the individuals representing each agency, is provided in the Regional ITS Architecture report.

## 2. REGIONAL ITS ARCHITECTURE MARKET PACKAGE IMPLEMENTATION

Of the 91 market packages available in Version 6.0 of the National ITS Architecture, 36 were selected by stakeholders and customized for deployment in the Cleveland Region as part of the Regional ITS Architecture development process. The market packages outline the functions that stakeholders envision ITS to perform in coming years. The Regional ITS Deployment Plan builds on those market packages through the development of project concepts to implement in the Region.

### 2.1 Market Package Prioritization

Stakeholders were asked to prioritize the market packages into high, medium, and low priorities based on regional needs, feasibility, likelihood of deployment, and overall contribution of the market package to the goals and vision for ITS functionality in the Region. A summary of these prioritized market packages is shown in **Table 1**. More detail on the market packages is provided in the Cleveland Regional ITS Architecture report.

**Table 1 – Cleveland Market Package Prioritization by Functional Area**

High Priority Market Packages		Medium Priority Market Packages		Low Priority Market Packages	
<b><i>Travel and Traffic Management</i></b>					
ATMS01	Network Surveillance	ATMS07	Regional Traffic Management	ATMS11	Emissions Monitoring and Management
ATMS03	Surface Street Control	ATMS13	Standard Railroad Grade Crossing	ATMS15	Railroad Operations Coordination
ATMS06	Traffic Information Dissemination	ATMS19	Speed Monitoring		
ATMS08	Traffic Incident Management System				
ATMS21	Roadway Closure Management				
<b><i>Emergency Management</i></b>					
EM01	Emergency Call-Taking and Dispatch	EM04	Roadway Service Patrols		
EM02	Emergency Routing	EM08	Disaster Response and Recovery		
EM06	Wide-Area Alert	EM09	Evacuation and Reentry Management		
EM10	Disaster Traveler Information				
<b><i>Maintenance and Construction Management</i></b>					
MC03	Road Weather Data Collection	MC01	Maintenance and Construction Vehicle and Equipment Tracking	MC02	Maintenance and Construction Vehicle Maintenance
MC04	Weather Information Processing and Distribution				
MC08	Work Zone Management				
MC10	Maintenance and Construction Activity Coordination				

**Table 1 – Cleveland Market Package Prioritization by Functional Area (continued)**

High Priority Market Packages		Medium Priority Market Packages		Low Priority Market Packages	
<b>Public Transportation Management</b>					
APTS01	Transit Vehicle Tracking	APTS04	Transit Fare Collection Management	APTS06	Transit Fleet Management
APTS02	Transit Fixed-Route Operations	APTS08	Transit Traveler Information		
APTS03	Demand Response Transit Operations	APTS10	Transit Passenger Counting		
APTS05	Transit Security				
<b>Commercial Vehicle Operations</b>					
		CVO10	HAZMAT Management		
<b>Traveler Information</b>					
ATIS01	Broadcast Traveler Information				
ATIS02	Interactive Traveler Information				
<b>Archived Data Management</b>					
		AD1	ITS Data Mart	AD2	ITS Data Warehouse

The market package prioritization was a primary factor in developing recommendations for ITS deployment and integration in the Cleveland Region. These priorities identified the key ITS services desired by stakeholders in the Cleveland Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements. The high, medium, and low prioritization does not necessarily correspond to any specific time frame (such as five-, ten-, or twenty-year deployment horizon). For example, a market package can be a high priority, but due to funding needs or prerequisite project requirements, deployment might not be feasible for several years. Maturity and availability of technology were also considered in prioritizing the market packages along with determining if the market package was more suitable for private deployment and operations or public sector deployment.

## 2.2 Market Packages and Supporting Projects

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

Not every 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 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 market package (which were modified from the National ITS Architecture definitions);
- Stakeholder priority for the market package;
- Recommended projects that will address some or all of the services that are contained in the market package; and
- Additional projects that support the services that are contained in the market package (if applicable).

The projects listed in the Recommended Projects section of the market package tables are those that can be directly tied back to the particular market package. The projects listed in the Additional Supporting Projects section will support the market package but are not a specific part of the market package. For example, the City of Cleveland Vehicle Detection project will support operations of the City of Cleveland signal system captured in the ATMS03 – Surface Street Control market package, but vehicle detection is not a part of the ATMS03 market package. Rather, vehicle detection is part of the ATMS01 – Network Surveillance market package.

### 2.2.1 Traffic Management Service Area

The following 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 closed circuit television (CCTV) cameras, dynamic message signs (DMS), transportation management centers (TMCs), traffic operations centers (TOCs), and traffic signal systems. 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.	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland CCTV Cameras</li> <li>▪ City of Cleveland Overheight Detection and Warning System on SR 40/US 64</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> <li>▪ City of Cleveland Speed Monitoring System</li> <li>▪ City of Cleveland Vehicle Detection</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Camera at MP 14</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Cameras</li> <li>▪ TDOT Smart-Way Deployment on I-75 – Vehicle Detection</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch Railroad Crossing Blockage Notification System</li> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> </ul>	



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

<b>Surface Street Control (ATMS03)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Emergency Vehicle Signal Preemption Expansion</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> <li>▪ City of Cleveland Signal System Upgrades</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland School Zone Flasher Control System</li> <li>▪ City of Cleveland Speed Monitoring System</li> <li>▪ City of Cleveland Vehicle Detection</li> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> </ul>	

<b>Traffic Information Dissemination (ATMS06)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland DMS</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> </ul>	



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

<b>Regional Traffic Management (ATMS07)</b>	<b>Medium Priority</b>
Facilitates the sharing of traffic information and control among traffic management centers to support a regional control strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> </ul>	

<b>Traffic Incident Management System (ATMS08)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch CAD Connection to City of Cleveland Public Works</li> <li>▪ Bradley County 911 Dispatch CCTV Camera Image Sharing</li> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland CCTV Cameras</li> <li>▪ City of Cleveland DMS</li> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> <li>▪ City of Cleveland Vehicle Detection</li> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ Regional Media Liaison and Coordination</li> <li>▪ TDOT HELP Vehicle Service Area Expansion</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Camera at MP 14</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> <li>▪ TDOT Smart-Way Deployment on I-75 – Vehicle Detection</li> </ul>	

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

<b>Emissions Monitoring and Management (ATMS11)</b>	<b>Low Priority</b>
Monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The gathered information can be used to implement environmentally sensitive travel demand management programs, policies, and regulations.	
<b>Recommended Projects</b> No projects have been identified at this time. This market package has been included in the architecture as a low priority to support anticipated future needs for emissions monitoring in the Region, but at this time there is no interest in specific projects.	

<b>Standard Railroad Grade Crossing (ATMS13)</b>	<b>Medium Priority</b>
Manages highway traffic at highway-rail intersections (HRIs) where rail operations speeds are less than 80 mph.	
<b>Recommended Projects</b> <ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch Railroad Crossing Blockage Notification System</li> </ul>	
<b>Additional Supporting Projects</b> <ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch CAD Connection to City of Cleveland Public Works</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> <li>▪ City of Cleveland Signal System Upgrades</li> </ul>	

<b>Railroad Operations Coordination (ATMS15)</b>	<b>Low Priority</b>
Provides an additional level of strategic coordination between freight rail operations and traffic management centers. Rail operations provide train schedules, maintenance schedules, and any other forecast events that will result in HRI closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.	
<b>Recommended Projects</b> No projects have been identified at this time. The Railroad Operations Coordination market package was customized and included in the ITS Architecture to reflect the desire for future coordination with railroad operations, however at this time significant institutional issues are obstacles to the development of any projects.	

<b>Speed Monitoring (ATMS19)</b>	<b>Medium Priority</b>
Monitors the speed of vehicles traveling through a roadway system.	
<b>Recommended Projects</b> <ul style="list-style-type: none"> <li>▪ City of Cleveland School Zone Flasher Control System</li> <li>▪ City of Cleveland Speed Monitoring System</li> </ul>	

### 2.2.2 Emergency Management Service Area

The following 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**

<b>Emergency Call-Taking and Dispatch (EM01)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
No projects have been identified at this time specifically related to emergency call-taking and dispatch. Call-taking and dispatch functions in the Region are primarily the responsibility of the Bradley County 911 Dispatch and there are no projects anticipated that would impact their internal dispatch operations that are related to the transportation infrastructure. Any additional information that can be shared between agencies would have the potential to support dispatch operations and have been listed as supporting projects.	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch CCTV Camera Image Sharing</li> </ul>	
<b>Emergency Routing (EM02)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch CAD Connection to City of Cleveland Public Works</li> <li>▪ Bradley County 911 Dispatch Railroad Crossing Blockage Notification System</li> <li>▪ City of Cleveland Emergency Vehicle Signal Preemption Expansion</li> </ul>	
<b>Roadway Service Patrols (EM04)</b>	<b>Medium Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ TDOT HELP Vehicle Service Area Expansion</li> </ul>	



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

<b>Wide-Area Alert (EM06)</b>	<b>High Priority</b>
<p>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.</p>	
<p><b>Recommended Projects</b></p> <p>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.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland DMS</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> </ul>	

<b>Disaster Response and Recovery (EM08)</b>	<b>Medium Priority</b>
<p>Enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> <li>▪ Cleveland-Bradley County EMA CCTV Camera Image Sharing</li> </ul>	

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

<b>Evacuation and Reentry Management (EM09)</b>	<b>Medium Priority</b>
<p>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.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department</li> <li>▪ Cleveland-Bradley County EMA CCTV Camera Image Sharing</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland CCTV Cameras</li> <li>▪ City of Cleveland DMS</li> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> <li>▪ City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Camera at MP 14</li> <li>▪ TDOT Smart-Way Deployment on I-75 – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> <li>▪ TDOT Smart-Way Deployment on I-75 – Vehicle Detection</li> </ul>	
<b>Disaster Traveler Information (EM10)</b>	<b>High Priority</b>
<p>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.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time specifically for disaster traveler information. Traveler information during an emergency is a high priority for the Region and is supported by several deployments that, although primarily implemented for traffic management purposes, would also provide a disaster traveler information benefit during an emergency.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland DMS</li> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> </ul>	

### 2.2.3 Maintenance and Construction Management Service Area

The following market packages and related projects implement maintenance and construction management ITS functions. The priorities identified for the Region were maintenance and construction activity coordination and automated vehicle location (AVL) for public works department vehicles.

**Table 4 – Maintenance and Construction Management Market Packages and Projects**

<b>Maintenance and Construction Vehicle and Equipment Tracking (MC01)</b>	<b>Medium Priority</b>
Tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Vehicle AVL</li> </ul>	

<b>Maintenance and Construction Vehicle Maintenance (MC02)</b>	<b>Low Priority</b>
Performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities. Includes on-board sensors capable of automatically performing diagnostics.	
<b>Recommended Projects</b>	
No projects have been identified at this time. Stakeholders expressed an interest in several of the technologies available but determined that this market package was not a high enough priority to develop specific project recommendations.	

<b>Road Weather Data Collection (MC03)</b>	<b>High Priority</b>
Collects current road weather conditions using data collected from environmental sensors deployed on and about the roadway.	
<b>Recommended Projects</b>	
No additional projects have been identified at this time for implementation in the Region. TDOT has recently deployed several road weather information system stations in and around the Region and extensive detection for fog on the segment of I-75 just north of Cleveland that is prone to fog conditions.	

<b>Weather Information Processing and Distribution (MC04)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
No additional projects have been identified at this time for implementation in the Region. TDOT has recently upgraded the fog detection system on I-75 just north of Cleveland and as part of this project connected the local Tennessee Highway Patrol office directly to the fog system to improve dissemination of information and timely response during a fog event.	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Coordination with TDOT SmartWay Center</li> </ul>	



**Table 4 – Maintenance and Construction Management Market Packages and Projects (continued)**

<b>Work Zone Management (MC08)</b>	<b>High Priority</b>
<p>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.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time although this market package is a high priority for the Region. Several projects have been listed below that will support traffic management in work zones, but ultimately most work zone traffic control is primarily managed by the contractor as part of each individual construction contract.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland DMS</li> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> <li>▪ I-75 Detour Route DMS</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20</li> <li>▪ TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20</li> </ul>	

<b>Maintenance and Construction Activity Coordination (MC10)</b>	<b>High Priority</b>
<p>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).</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Bradley County 911 Dispatch CAD Connection to City of Cleveland Public Works</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Connection with TDOT SmartWay Center</li> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> </ul>	

### 2.2.4 Public Transportation Management Service Area

The following market packages and related projects implement public transportation management ITS functions. Public transportation projects for the Cleveland Urban Area Transit Authority and SETRHA Transportation were identified for a number of market packages. Many of these market packages were considered high priority and plans are underway for several implementations in the near future.

**Table 5 – Public Transportation Management Market Packages and Projects**

<b>Transit Vehicle Tracking (APTS01)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area Transit System AVL, MDTs, and Mayday Alarms</li> <li>▪ SETHRA Transportation AVL, MDTs, and Mayday Alarms</li> </ul>	
<b>Transit Fixed-Route Operations (APTS02)</b>	<b>High Priority</b>
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for fixed-route and flexible-route transit services.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area Transit System AVL, MDTs, and Mayday Alarms</li> </ul>	
<b>Demand Response Transit Operations (APTS03)</b>	<b>High Priority</b>
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for demand responsive transit services.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ SETHRA Transportation AVL, MDTs, and Mayday Alarms</li> </ul>	
<b>Transit Fare Collection Management (APTS04)</b>	<b>Medium Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area Transit System Electronic Fare Collection</li> </ul>	

**Table 5 – Public Transportation Management Market Packages and Projects  
(continued)**

<b>Transit Security (APTS05)</b>	<b>High Priority</b>
Provides for the physical security of transit passengers and transit vehicle operators. Includes on-board security cameras and panic buttons.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area Transit System AVL, MDTs, and Mayday Alarms</li> <li>▪ Cleveland Urban Area Transit System On-Board Security Monitoring</li> <li>▪ SETHRA Transportation AVL, MDTs, and Mayday Alarms</li> <li>▪ SETHRA Transportation On-Board Security Monitoring</li> </ul>	
<b>Transit Fleet Management (APTS06)</b>	<b>Low Priority</b>
Supports automatic transit maintenance scheduling and monitoring for both routine and corrective maintenance.	
<b>Recommended Projects</b>	
No projects have been identified at this time. Stakeholders expressed an interest in several of the technologies available but determined that this market package was not a high enough priority to develop specific project recommendations.	
<b>Transit Traveler Information (APTS08)</b>	<b>Medium Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area Transit System Stop Annunciation</li> </ul>	
<b>Transit Passenger Counting (APTS10)</b>	<b>Medium Priority</b>
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.	
<b>Recommended Projects</b>	
No projects have been identified at this time. Stakeholders expressed an interest in passenger counting technologies but determined that this market package was not a high enough priority to develop specific project recommendations.	

### 2.2.5 Commercial Vehicle Operations Service Area

Planning for commercial vehicle operations is primarily being done 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. In the Cleveland Region stakeholders expressed an interest in the management of HAZMAT vehicles, particularly during an incident on I-75. **Table 6** shows that although a market package was identified for local deployment, no projects were currently identified for implementation.

**Table 6 – Commercial Vehicle Operations Market Packages and Projects**

HAZMAT Management (CVO10)	Medium Priority
Integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents.	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time. The transportation of hazardous materials through the Region is a concern for stakeholder agencies, particularly during an incident on I-75 or a detour situation where commercial vehicle traffic leaves the interstate and travels on other routes. The Region wanted to document this market package as a priority, but acknowledges that most systems to facilitate management of a HAZMAT incident would likely originate on a statewide or national basis and therefore identified no local projects.</p>	

## 2.2.6 Traveler Information Service Area

The following market packages and related projects implement traveler information ITS functions. Traveler information service area projects address market packages that broadcast traveler information over a wide area such as the 511 traveler information phone number. Traveler information provided at a specific locations on the roadway, such as DMS, is addressed in the ATMS06 – Traffic Information Dissemination market package in Section 2.2.1.

**Table 7 – Traveler Information Market Packages and Projects**

<b>Broadcast Traveler Information (ATIS01)</b>	<b>High Priority</b>
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.).	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> <li>▪ Regional Media Liaison and Coordination</li> </ul>	
<b>Interactive Traveler Information (ATIS02)</b>	<b>High Priority</b>
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.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Cleveland Public Works Department Real-Time Traveler Information Website</li> </ul>	

### 2.2.7 Archived Data Management Service Area

The following 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, or data from throughout the Region can be sent to a site to be housed together. Data housed by an agency as part of an ITS data mart would likely be part of another project deployment and are not selected separately in this section. For example, DMS implementation might include software to archive all of the messages placed on the DMS over a period of time.

**Table 8 – Archived Data Management Market Packages and Projects**

<b>ITS Data Mart (AD1)</b>	<b>Medium Priority</b>
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.	
<b>Recommended Projects</b>	
No projects have been identified at this time, as ITS deployments come on line and the quantity of available data increases it is likely that stakeholder agencies might develop data mart projects.	
<b>ITS Data Warehouse (AD2)</b>	<b>Low Priority</b>
Includes all the data collection and management capabilities of the ITS Data Mart. Adds the functionality to allow collection of data from multiple agencies and data sources across modal and jurisdictional boundaries.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Cleveland Urban Area MPO Archive Data Warehouse</li> </ul>	

### 3. 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 Cleveland Region's ITS goals 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, a workshop was held in the Cleveland Region on January 25, 2008 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.

In the following sections all of the projects that were recommended for deployment by stakeholders are discussed. In Section 3.1 maps that identify locations of field elements for many of the priority projects in the Cleveland Region are presented. In Section 3.2 tables are provided with the ITS projects that have been identified for the stakeholder agencies in the Region.

#### 3.1 ITS Infrastructure Deployment Maps

Existing, planned and future ITS infrastructure in the Cleveland Region is shown on the ITS infrastructure deployment maps included in this section. **Figure 1** depicts field element deployments for state agencies and **Figure 2** covers local agency deployments. Some of the field element deployments on the maps are already fully implemented and are not shown in the project tables in Section 3.2.

The ITS infrastructure deployment maps do not represent a design of the system. Prior to the deployment of any of the ITS field elements, the location of each of the field elements should be reviewed. The maps were developed with significant stakeholder input to assist the Region in developing an initial concept of how ITS can be deployed throughout the Region.

ITS field elements are typically shown as existing, planned, or future. Existing elements have either been fully deployed or were in the process of being deployed at the time this report was developed. Planned elements represent elements that will be implemented as part of a project that has been funded and a date for implementation has been identified. Future elements are those elements that are not part of a funded project but have been identified as important to the Region. Each of the planned and future elements shown in **Figures 1 and 2** are part of the projects described in the project tables in Section 3.2.

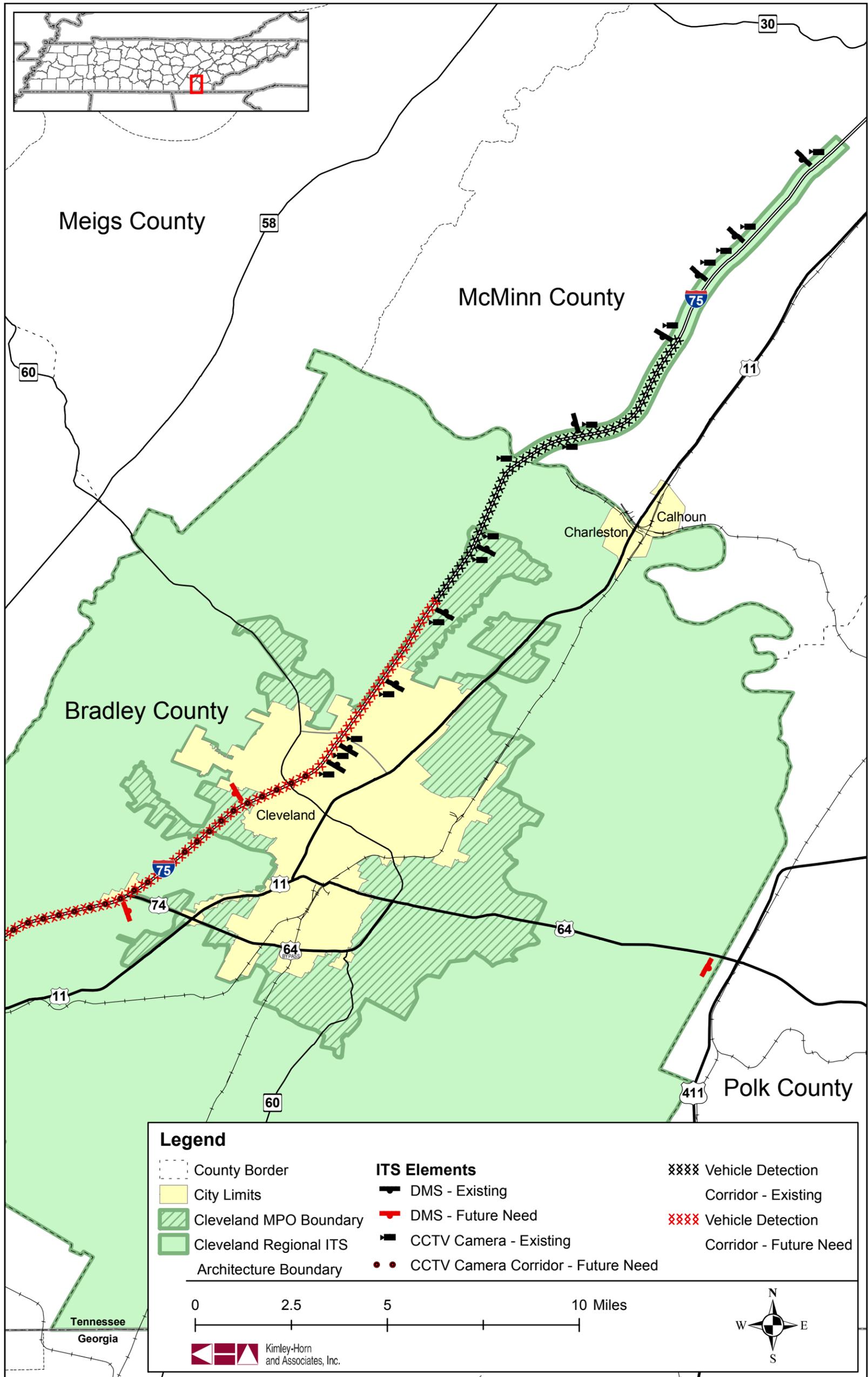


Figure 1 – State Agency ITS Field Element Deployments

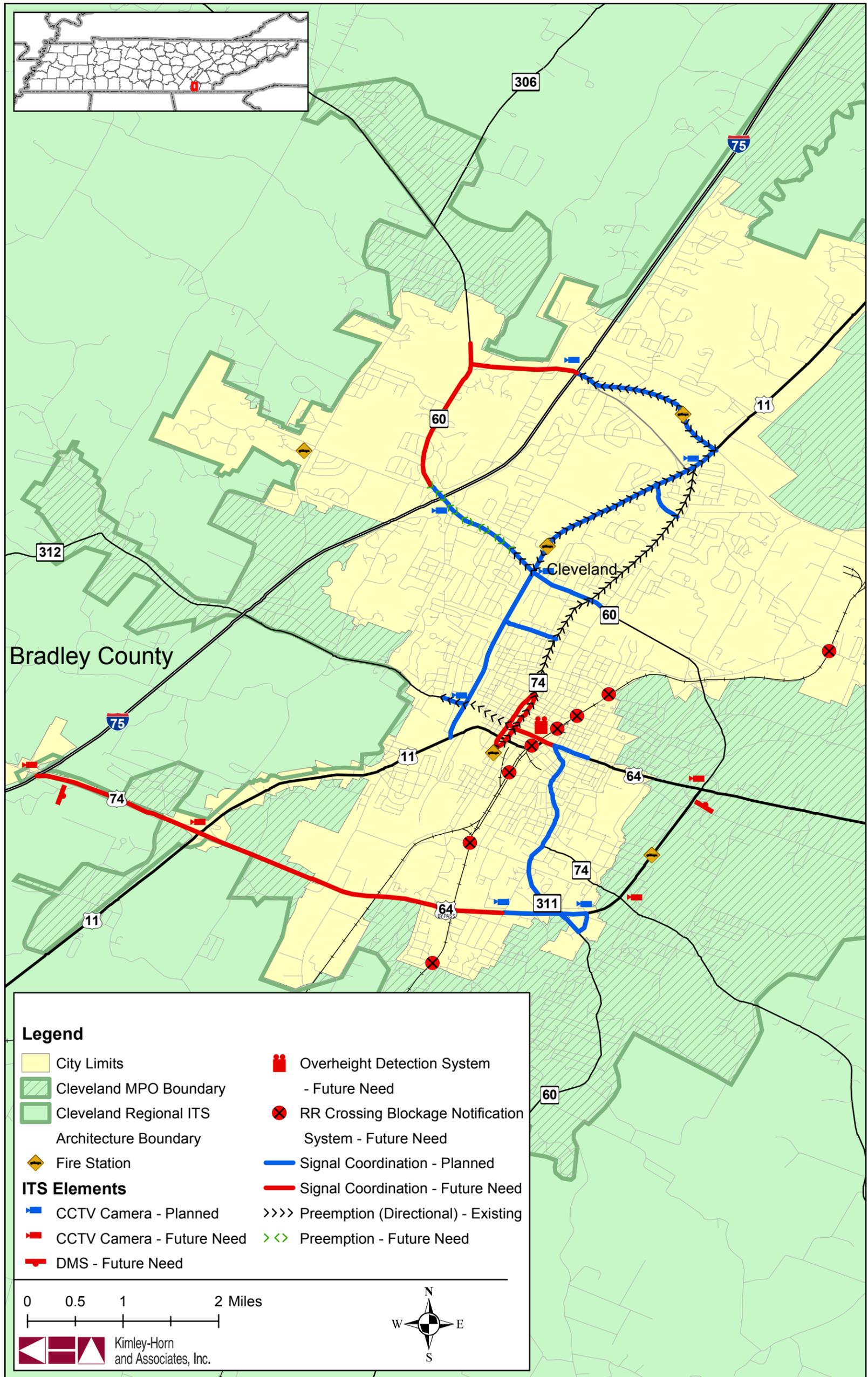


Figure 2 – Local Agency ITS Field Element Deployments

### 3.2 Regional Projects

Regional projects are identified in **Table 9** through **Table 15**. The tables are divided by primary responsible agency as follows:

- **Table 9** – Bradley County 911 Dispatch;
- **Table 10** – City of Cleveland;
- **Table 11** – Cleveland-Bradley County Emergency Management Agency;
- **Table 12** – Cleveland Urban Area MPO;
- **Table 13** – Southeast Tennessee Human Resource Agency;
- **Table 14** – TDOT; and
- **Table 15** – Cleveland Region.

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. A majority 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.
- **Description** – Provides a description of the project including notes on deployment locations and costs. 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. **Figures 1 and 2** support the project descriptions by showing the location of many of the existing, planned, and future field components.
- **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. For each project it is also noted whether funding has been identified or is still needed.
- **Deployment Timeframe** – 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.
- **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.

### 3.2.1 Bradley County 911 Dispatch

**Table 9 – Bradley County 911 Dispatch Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Bradley County 911 Dispatch CCTV Camera Image Sharing	Establish a connection to share TDOT and City of Cleveland CCTV camera images with the Bradley County 911 Dispatch. Connecting to the City of Cleveland Public Works Department would allow the Bradley County 911 Dispatch access to TDOT video once the Public Works Department was connected to TDOT. Additional Responsible Agencies: City of Cleveland, TDOT	To Be Determined Funding Identified: No	Mid-term	ATMS08
Bradley County 911 Dispatch CAD Connection to City of Cleveland Public Works	Implement a connection from the Bradley County 911 Dispatch to the City of Cleveland Public Works Department to allow automated sharing of incident and road closure information between traffic and public safety. Additional Responsible Agency: City of Cleveland	To Be Determined Funding Identified: No	Mid-term	ATMS08 EM02 MC10
Bradley County 911 Dispatch Railroad Crossing Blockage Notification System	Provide automated warning to Bradley County 911 Dispatch of railroad crossing blockages by trains at signalized intersections to facilitate emergency vehicle dispatch. Eight crossings have been identified. The cost will vary based on the type of crossing and whether or not advance notification is desired for the public as well as emergency dispatchers. Additional Responsible Agency: City of Cleveland	To Be Determined Funding Identified: No	Mid-term	ATMS13 EM02

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.2 *City of Cleveland*

**Table 10 – City of Cleveland Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Cleveland Signal System Upgrade, CCTV Camera Implementation, and Traffic Management Enhancements	<p>Expand the traffic management capabilities of the City of Cleveland Public Works Department to include the ability to monitor closed circuit television (CCTV) cameras and vehicle detection and to control dynamic message signs (DMS). Currently the department only operates the closed loop signal system. Cost includes equipment costs and those costs associated with modifying space in an existing facility to support the increased traffic management capabilities.</p> <p>Upgrade and expand the City of Cleveland traffic signal system.</p> <p>Implement CCTV cameras at key sections of roadway within the City of Cleveland. 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. Seven locations have been identified for this initial deployment phase.</p> <p>This project also includes fiber deployments to support the ITS implementations.</p>	<p>\$1.5M Funding Identified: Yes</p>	<p>Short-term</p>	<p>ATMS01 ATMS03 ATMS08</p>
City of Cleveland Overheight Detection and Warning System on SR 40/US 64	<p>Implement an overheight detection and warning system on SR 40/US 64 at the railroad overpass in downtown Cleveland. Current static signage is not effective since most drivers of recreational vehicles are not aware that their vehicle is over height. The system would include detection to determine whether or not a vehicle was too tall for the underpass and a lighted blank out sign or a static sign with beacons to indicate to the driver that they need to detour to avoid striking the overpass.</p>	<p>\$30,000 Funding Identified: No</p>	<p>Short-term</p>	<p>ATMS01</p>
City of Cleveland School Zone Flasher Control System	<p>Implement a system that would allow school zone flashers to be remotely programmed by the City of Cleveland Public Works Department.</p>	<p>\$5,000/site Funding Identified: No</p>	<p>Short-term</p>	<p>ATMS19</p>

**Table 10 – City of Cleveland Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Cleveland Emergency Vehicle Signal Preemption Expansion	Expand emergency vehicle signal preemption system by adding signal preemption capabilities to additional traffic signals in the City of Cleveland to improve incident response times and emergency responder safety. Preemption capability is currently for the Fire Department only, but should be considered for EMS as part of the expansion.	\$6,000/intersection \$1,500/vehicle Funding Identified: No	Short-term	ATMS03 EM02
City of Cleveland Public Works Department Vehicle AVL	Implement automated vehicle location (AVL) on City of Cleveland Public Works Department vehicles. Cost represents in-vehicle equipment as well as supporting software to tie vehicle locations to the City's geographic information system (GIS) software. The City should consider deploying this project in coordination with a project to implement AVL on emergency vehicles.	\$3,000/vehicle Funding Identified: No	Short-term	MC01
City of Cleveland Public Works Department Coordination with TDOT SmartWay Center	Establish a communications connection between the City of Cleveland Public Works Department and the Chattanooga SmartWay Center for the coordination of traffic information. This sharing will facilitate the inclusion of regional information in the Tennessee 511 System as well the sharing of weather information and video feeds. With the fog system upgrades coming on line, this project should occur within the next year.  Additional Responsible Agency: TDOT	Cost To Be Determined Funding Identified: No	Short-term	ATMS07 ATMS08
City of Cleveland Signal System Upgrades	Continue to upgrade and expand the City of Cleveland traffic signal system. Cost represents an average cost per intersection for upgrading and adding to the closed loop signal system. Cost will vary based on the level of upgrade required to integrate the signals.	\$20,000/intersection Funding Identified: No	Mid-term	ATMS03
City of Cleveland CCTV Cameras	Implement additional CCTV cameras on key sections of roadway within the City of Cleveland. 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. Preliminary planning has identified four locations for this phase.	\$30,000/site Funding Identified: No	Mid-term	ATMS01

**Table 10 – City of Cleveland Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Cleveland DMS	Implement two DMS on the US 64 Bypass to provide traveler information for detours from I-75 onto US 411. One sign would be eastbound just after I-75 and the second before US 64.	\$75,000/site Funding Identified: No	Mid-term	ATMS06
City of Cleveland Vehicle Detection	Implement vehicle detection technologies on roadways in the City of Cleveland so that traffic management staff can monitor speeds and volumes. The information can be used in the management of the transportation system or to detect incidents. The costs and capabilities will depend on the technology chosen. Cost range represents a variety of technologies from in-pavement loop detectors to non-intrusive detectors that would be mounted on an existing or new pole. In addition to use for real time traffic condition monitoring, in some locations the count data will be archived for use in signal timing and transportation planning.	\$5,000 to \$20,000/site Funding Identified: No	Mid-term	ATMS01
City of Cleveland Speed Monitoring System	Implement additional vehicle detection locations or add capabilities to vehicle detection implemented as part of other projects 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.	\$5,000/portable system \$5,000 to \$10,000/permanent site Funding Identified: No	Mid-term	ATMS01 ATMS19
City of Cleveland Public Works Department Real-Time Traveler Information Website	Add real-time traveler information, such as incident locations, speed, and CCTV camera images to the City of Cleveland Public Works Department website.	\$50,000 Funding Identified: No	Mid-term	ATIS01 ATIS02

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

### 3.2.3 Cleveland-Bradley County Emergency Management Agency

**Table 11 – Cleveland-Bradley County Emergency Management Agency Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Cleveland-Bradley County EMA Back-up Operations for City of Cleveland Public Works Department	Implement a workstation and appropriate software at the Cleveland-Bradley County EMA to allow a representative from the Public Works Department or the EMA the ability to access and control all of the City of Cleveland Public Works Department traffic capabilities. Additional Responsible Agencies: City of Cleveland, TDOT	To Be Determined Funding Identified: No	Mid-term	EM08 EM09
Cleveland-Bradley County EMA CCTV Camera Image Sharing	Establish a connection to share TDOT and City of Cleveland CCTV camera images with the Cleveland-Bradley County EMA. Connecting to the City of Cleveland Public Works Department would allow the Cleveland-Bradley County EMA access to TDOT video once the Public Works Department was connected to TDOT. Additional Responsible Agencies: City of Cleveland, TDOT	To Be Determined Funding Identified: No	Mid-term	EM08 EM09

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.4 *Cleveland Urban Area MPO*

**Table 12 – Cleveland Urban Area MPO Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Cleveland Urban Area MPO Archive Data Warehouse	Establish a data warehouse to archive data from cities and transit agencies in the MPO service area 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 Cleveland Urban Area MPO.	\$50,000 to \$100,000 Funding Identified: No	Long-term	AD2

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.5 Southeast Tennessee Human Resource Agency

**Table 13 – Southeast Tennessee Human Resource Agency Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Cleveland Urban Area Transit System AVL, MDTs, and Mayday Alarms	Install automated vehicle location (AVL) for real-time vehicle location of the Cleveland Urban Area Transit System fleet. The system will include a global positioning system (GPS) unit and a communication link between vehicle and dispatcher. Also included in the implementation are mobile data terminals (MDTs) and mayday alarms. This project is being implemented as part of a statewide AVL deployment.	\$1.5M for the combined deployments on the Cleveland Urban Area Transit System and SETHRA Transportation Funding Identified: Yes	Short-term	APTS01 APTS02 APTS05
SETHRA Transportation AVL, MDTs, and Mayday Alarms	Install AVL for real-time vehicle location of the Southeast Tennessee Human Resource Agency (SETHRA) fleet. The system will include GPS and a communication link between vehicle and dispatcher. Also included in the implementation are MDTs and mayday alarms. This project is being implemented as part of a statewide AVL deployment.		Short-term	APTS01 APTS03 APTS05
Cleveland Urban Area Transit System On-Board Security Monitoring	Implement video surveillance on Cleveland Urban Area Transit System vehicles to improve patron and driver safety. Cameras would be for local recording only. New buses purchased will include security monitoring at the time of purchase.	\$3,000/vehicle Funding Identified: No	Short-term	APTS05
Cleveland Urban Area Transit System Stop Annunciation	Implement stop annunciation technology to improve traveler information and accessibility by the sight impaired. Stop annunciation uses GPS to determine what the next stop is and makes an announcement to travelers. This information is also frequently displayed on a dynamic sign within the vehicle so that hearing impaired patrons can also benefit from the information.	To Be Determined Funding Identified: No	Mid-term	APTS08
SETHRA Transportation On-Board Security Monitoring	Implement video surveillance on SETHRA vehicles to improve patron and driver safety. Cameras would be for local recording only. New buses purchased will include security monitoring at the time of purchase.	\$3,000/vehicle Funding Identified: No	Mid-term	APTS05

**Table 13 – Southeast Tennessee Human Resource Agency Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Cleveland Urban Area Transit System Electronic Fare Collection	Implement electronic fare collection capabilities on Cleveland Urban Area Transit System buses.	\$12,000/vehicle \$75,000 for hardware and software Funding Identified: No	Long-term	APTS04

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

### 3.2.6 Tennessee Department of Transportation

**Table 14 – TDOT Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
TDOT SmartWay Deployment on I-75 – CCTV Cameras	Implement closed circuit television (CCTV) cameras on I-75 in the Cleveland Region to create continuous coverage from Chattanooga through the fog zone. 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. Communications costs are not included and can vary widely depending on available options for communication and the quality of video that is required.	\$30,000/site Funding Identified: No	Short-term	ATMS01
TDOT SmartWay Deployment on I-75 – DMS Southbound before Exit 20	Implement dynamic message signs (DMS) on I-75 southbound before exit 20 to disseminate incident, weather, construction, and general traffic information. This location would allow travelers to detour onto US 411 if a major incident caused an extended closure on I-75.	\$175,000/sign Funding Identified: Yes, planned for Fall 2008 letting	Short-term	ATMS06
TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 20	Implement DMS on I-75 northbound before exit 20 to disseminate incident, weather, construction, and general traffic information.	\$175,000/sign Funding Identified: No	Short-term	ATMS06
TDOT HELP Vehicle Service Area Expansion	Expand the TDOT Region 2 HELP service area to include the Cleveland Region. HELP vehicles stationed in the area would facilitate incident management as well as special event management.	To Be Determined Funding Identified: No	Short-term	EM04
TDOT SmartWay Deployment on I-75 – Vehicle Detection	Implement vehicle detection technologies on I-75 to monitor speeds and volumes. The cost and capabilities will depend on the technology chosen. Cost range represents a variety of technologies from in-pavement loop detectors to non-intrusive detectors that would be mounted on an existing or new pole. Spacing in rural areas will typically be greater than spacing in urban areas.	\$5,000 to \$20,000 per site Funding Identified: No	Mid-term	ATMS01
I-75 Detour Route DMS	Implement a DMS on US 64 in advance of US 411 that could be used to support detours during long-term closures on I-75, such as a full scale activation of the fog system.	\$75,000/sign Funding Identified: No	Mid-term	ATMS06

**Table 14 – TDOT Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Project Recommendations Outside the Cleveland Regional Boundaries				
TDOT SmartWay Deployment on I-75 – CCTV Camera at MP 14	Implement a CCTV camera at milepost 14 on White Oak Mountain to monitor traffic conditions and aid in incident management. The camera will be constructed as part of Phase 2 of the Chattanooga ITS Deployments and be monitored and controlled from the Chattanooga SmartWay Center.	\$30,000 Funding Identified: Yes, funded as part of Chattanooga Phase 2 Deployments	Short-term	ATMS01
TDOT SmartWay Deployment on I-75 – DMS Northbound before Exit 11	Implement DMS on I-75 northbound before Exit 11 to disseminate incident, weather, construction, and general traffic information. Exit 11 is the last exit before White Oak Mountain and a sign in this location would provide a valuable opportunity to warn travelers of an incident on the roadway before the 8 mile mountainous stretch without exits.	\$175,000/sign Funding Identified: No	Mid-term	ATMS06

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.7 *Cleveland Region*

**Table 15 – Cleveland Regional Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Regional Media Liaison and Coordination	<p>Develop agreements and enhanced coordination with local media to improve information sharing and dissemination. There is no cost associated with this project. If the media desires to gather data, such as closed circuit television (CCTV) camera video feeds, from the transportation agencies in the Region, then it is expected that the media would be responsible for any costs.</p> <p>Responsible Agencies: City of Cleveland, TDOT</p>	<p>No Associated Cost Note: Funding not applicable</p>	<p>Mid-term</p>	<p>ATIS01</p>

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

#### **4. MAINTAINING THE REGIONAL ITS DEPLOYMENT PLAN**

Just as the ITS Architecture developed for the Cleveland Region documents the Region's goals for ITS implementation at the time it was developed, the ITS Deployment Plan addresses the projects that stakeholders agreed were necessary to implement at the time the plan was developed in order to reach their ITS deployment goals. As the Region grows, needs will change and as technology progresses new ITS opportunities will arise. Shifts in regional focus as well as changes in the National ITS Architecture will necessitate that the Cleveland Regional ITS Architecture be updated to remain a useful resource for the Region. These same changes will create new project opportunities and revisions to the projects in this ITS Deployment Plan.

Stakeholders agreed upon a procedure for updating the Regional ITS Architecture and Deployment Plan. The procedure, documented in detail in the Cleveland Regional ITS Architecture, outlines how to document ITS Architecture changes that may be needed for inclusion in the next plan update. While complete plan updates are scheduled to occur approximately every five years prior to the Long Range Transportation Plan update, stakeholders agreed that it would be beneficial to review the projects identified in the ITS Deployment Plan once a year. The Cleveland Urban Area MPO will lead the annual project reviews. The purpose of the reviews will be to update project status, remove projects that are completed, add project detail when available, and add any new projects into the ITS Deployment Plan. Any corresponding changes to the Cleveland Regional ITS Architecture will be documented and retained by the Cleveland Urban Area MPO for inclusion during the next complete update as outlined in the Cleveland Regional ITS Architecture document.