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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>American Automobile Association</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ACN</td>
<td>Automated Collision Notification</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>ATA</td>
<td>American Trucking Association</td>
</tr>
<tr>
<td>ATIS</td>
<td>Advanced Traveler Information System</td>
</tr>
<tr>
<td>AVL</td>
<td>Automatic Vehicle Location</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Dispatch</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>CMAQ</td>
<td>Congestion Mitigation and Air Quality</td>
</tr>
<tr>
<td>COWS</td>
<td>Communication on Wheels</td>
</tr>
<tr>
<td>CTD</td>
<td>Coordinated Transit District</td>
</tr>
<tr>
<td>CVIEW</td>
<td>Commercial Vehicle Information Exchange Window</td>
</tr>
<tr>
<td>CVISN</td>
<td>Commercial Vehicle Information Systems and Networks</td>
</tr>
<tr>
<td>CVO</td>
<td>Commercial Vehicle Operations</td>
</tr>
<tr>
<td>DMS</td>
<td>Dynamic Message Sign</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>DSNWK</td>
<td>Developmental Services for Northwest Kansas</td>
</tr>
<tr>
<td>EIA</td>
<td>Electronics Industry Alliance</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency Medical Services</td>
</tr>
<tr>
<td>EVP</td>
<td>Emergency Vehicle Preemption</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FMCSA</td>
<td>Federal Motor Carriers Safety Administration</td>
</tr>
<tr>
<td>FTA</td>
<td>Federal Transit Administration</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HSIP</td>
<td>Highway Safety Improvement Program</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>IFTA</td>
<td>International Fuel Tax Association</td>
</tr>
<tr>
<td>IRP</td>
<td>International Registration Plan, Inc.</td>
</tr>
<tr>
<td>IRS</td>
<td>Internal Revenue Service</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>ISTEA</td>
<td>Intermodal Surface Transportation Efficiency Act of 1991</td>
</tr>
<tr>
<td>ITE</td>
<td>Institute of Transportation Engineers</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transportation Systems</td>
</tr>
<tr>
<td>KANG</td>
<td>Kansas Army National Guard</td>
</tr>
<tr>
<td>KARS</td>
<td>Kansas Accident Records System</td>
</tr>
<tr>
<td>KBI</td>
<td>Kansas Bureau of Investigation</td>
</tr>
<tr>
<td>KCC</td>
<td>Kansas Corporation Commission</td>
</tr>
<tr>
<td>KDEM</td>
<td>Kansas Division of Emergency Management</td>
</tr>
<tr>
<td>KDOR</td>
<td>Kansas Department of Revenue</td>
</tr>
<tr>
<td>KDOT</td>
<td>Kansas Department of Transportation</td>
</tr>
<tr>
<td>KHP</td>
<td>Kansas State Patrol</td>
</tr>
<tr>
<td>KMCA</td>
<td>Kansas Motor Carriers Association</td>
</tr>
<tr>
<td>KTA</td>
<td>Kansas Turnpike Authority</td>
</tr>
<tr>
<td>LRS</td>
<td>Location Referencing System</td>
</tr>
<tr>
<td>LRTP</td>
<td>Long Range Transportation Plan</td>
</tr>
<tr>
<td>MDSS</td>
<td>Maintenance Decision Support System</td>
</tr>
<tr>
<td>MDT</td>
<td>Mobile Data Terminal</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>MPO</td>
<td>Metropolitan Planning Organization</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
</tr>
<tr>
<td>NHS</td>
<td>National Highway System</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<td>--------------</td>
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</tr>
<tr>
<td>NTCIP</td>
<td>National Transportation Communications for ITS Protocol</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operations and Maintenance</td>
</tr>
<tr>
<td>PCS</td>
<td>Personal Communications Service</td>
</tr>
<tr>
<td>RCAT</td>
<td>Reno County Area Transportation</td>
</tr>
<tr>
<td>RFP</td>
<td>Request for Proposal</td>
</tr>
<tr>
<td>RWIS</td>
<td>Road Weather Information System</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
<tr>
<td>SAFETEA-LU</td>
<td>Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users</td>
</tr>
<tr>
<td>SDO</td>
<td>Standards Development Organization</td>
</tr>
<tr>
<td>STIP</td>
<td>Statewide Transportation Improvement Program</td>
</tr>
<tr>
<td>STP</td>
<td>Surface Transportation Program</td>
</tr>
<tr>
<td>TBD</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>TEA-21</td>
<td>Transportation Equity Act for the 21st Century</td>
</tr>
<tr>
<td>TIP</td>
<td>Transportation Improvement Program</td>
</tr>
<tr>
<td>TOC</td>
<td>Traffic Operations Center</td>
</tr>
<tr>
<td>TOMC</td>
<td>Transportation Operation and Management Center</td>
</tr>
<tr>
<td>TRCC</td>
<td>Traffic Records Coordinating Committee</td>
</tr>
<tr>
<td>TRIS</td>
<td>Truck Routing Information System</td>
</tr>
<tr>
<td>TSA</td>
<td>Transportation Security Administration</td>
</tr>
<tr>
<td>USDOT</td>
<td>United States Department of Transportation</td>
</tr>
<tr>
<td>WIM</td>
<td>Weigh in Motion</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

1.1 Background

This document is Volume II of the series reports that have been developed as part of the Development of a Kansas Statewide Intelligent Transportation System (ITS) Architecture Project. This document is intended to guide the Kansas Department of Transportation (KDOT) and participating stakeholders in effectively using the Kansas Statewide ITS Architecture in the planning, design, implementation, and operation stages of ITS systems and projects. This plan investigates and identifies opportunities to further integrate various ITS systems at local, regional and statewide levels.

Two other documents are also developed as part of this project:

- Volume I – Statewide ITS Architecture Plan. This document describes the “big picture” for ITS deployment in terms of individual ITS systems and devices that perform the functions necessary to deliver the desired services. It provides the who, what, when, and how of existing and desired ITS operations in Kansas.

- Volume III – Architecture Maintenance Plan. This plan describes a process for controlled updates to the Statewide ITS Architecture baseline so that the architecture continues to accurately reflect the existing ITS capabilities and future plans in the state.

An ITS Architecture provides a framework not only for defining, planning, and integrating ITS systems but also supporting ITS implementations in urban and rural environments. The Kansas Statewide ITS Architecture is developed to ensure institutional agreement and technical integration for ITS implementation in Kansas for the next 15 years. The Kansas Statewide ITS Architecture provides the ITS stakeholders with maximum understanding and amount of knowledge to steer the planning and deployment of regionally-integrated intelligent transportation systems throughout the state. As part of the Statewide ITS Architecture development effort, this Integration and Implementation Plan is developed to provide KDOT and participating agencies and stakeholders with a guidance to effectively implement the ITS projects that will accomplish the user needs identified in the Statewide ITS Architecture.

1.2 Purpose

This Integration and Implementation Plan examines the dependencies among existing and future ITS systems in Kansas and presents opportunities to further integrate the systems. It recommends the sequence and strategy for KDOT and other agencies to implement future ITS projects. This plan also identifies the approach for mainstreaming ITS into the transportation planning and project development process. It is a long range guidance that helps KDOT implementing ITS systems efficiently and cost-effectively. Specific ITS projects are defined and prioritized based on stakeholders’ input on transportation issues and needs. ITS initiatives are sequenced based on current and planned ITS deployments, costs and benefits, technical feasibility, institutional issues, and readiness of proposed projects.

1.3 Organization

This document is organized into eight sections:

- Section 1 provides an brief introduction to the plan.
- Section 2 describes the approach and key process for developing the plan.
- Section 3 identifies the important factors and issues that may affect project implementation and integration.
- Section 4 identifies a list of planned and potential ITS projects and provides details for each project.
- Section 5 illustrates the project sequencing and deployment schedule.
• Section 6 lists and describes the applicable ITS standards.
• Section 7 lists the involved stakeholders and describes the interagency agreements needed for the implementation and operation of identified ITS projects.
• Section 8 identifies the potential funding needs and resources.
2. APPROACH

2.1 Introduction

The process for developing this plan includes the identification of appropriate ITS concept and projects, analysis of project dependencies, identification of project sequencing, investigation of technology and ITS standards maturity and readiness, and consideration of agency agreements and project funding requirements. These planned projects will accomplish the user services and system functions defined in the Statewide ITS Architecture. Due to the complexity of the ITS systems and their dependencies, it is critical to develop a proper sequence to guide the deployment of all proposed ITS projects over time. Priority, desired timeframe and duration are examined and assigned to each ITS project, and an overall deployment schedule is compiled to ensure successful implementation.

The key in this planning process is to identify project definition and sequencing. The project definition outlines the project concepts and the associated details including project title, stakeholder, project scope, costs, benefits and the marketing packages defined in ITS architecture. The project sequencing gives an approximate timeframe in which an ITS project should be implemented based on the understanding of the projects and the dependencies of the project on other existing or planned ITS systems. The project dependencies show how successive ITS projects can build on one another. Typically, the first projects in the project sequence are already programmed and will simply be extracted from existing transportation plans. Successive projects will then be added to the sequence based on the project dependencies as well as technical, institutional and financial considerations.

2.2 Project Identification and Selection

The ITS projects included in this plan were identified based on the following sources:

- Kansas Statewide ITS Plan and accompanied project database
- Kansas Long Range Transportation Plan
- Kansas Commercial Vehicle Information Systems and Networks (CVISN) Program Plan
- Kansas Statewide Transportation Operation and Management Center (TOMC) Study
- Stakeholder surveys, inputs and feedback
- KDOT ITS Set-Aside projects

The Kansas Statewide ITS Plan and database provide a list of ITS projects that were identified during the plan development in 2002. The plan documents the transportation system characteristics, user services, and system architecture for the entire state. An ITS project database was developed to summarize all the ITS projects described in the ITS plan. The database served as a tool to facilitate KDOT to better manage and track the project deployment status.

The Kansas CVO/ITS Business Plan and the Kansas CVISN Program Plan were developed to create an information network using advanced technology. The program is intended to enhance efficiency, safety, compliance and enforcement for commercial vehicle operations. The CVISN Program Plan includes a list of CVISN related initiatives.

Kansas Statewide TOMC Study summarizes the feedback received from the regional stakeholders with regard to the transportation operations and functional requirements of the future Statewide TOMC. The report provides information on transportation needs and issues gathered from the stakeholder outreach, meetings.

A stakeholder survey was conducted to assist KDOT in developing statewide integrated ITS system over time. The survey was distributed to the key transportation or incident/emergency management stakeholders in Kansas. Information was collected with regard to data sharing, transportation needs and
issues, and ITS elements that have been implemented throughout the state. Prioritization of needs and issues was also done through the survey.

In addition, a stakeholder meeting was held in each of the 6 KDOT districts to obtain stakeholder inputs and feedback on transportation challenges and needs. The in depth discussions at the meetings helped with identifying project concept and ideas to address the challenges and needs.

### 2.3 Timeframe and Sequencing

Project timeframe represents the project status and defines the time window to implement the ITS project and associated services. Three timeframe categories are used and their definitions are described below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Time Frame</th>
<th>Year of Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Term</td>
<td>0 – 5 years</td>
<td>2007 – 2012</td>
</tr>
<tr>
<td>Medium Term</td>
<td>6 – 10 years</td>
<td>2013 – 2017</td>
</tr>
<tr>
<td>Long Term</td>
<td>Beyond 10 years</td>
<td>2018 and beyond</td>
</tr>
</tbody>
</table>

A project sequence defines the order in which ITS projects may be implemented. A good sequence is based on a combination of two factors:

- **Prioritization of projects based on existing conditions and stakeholder needs.** The ITS projects were prioritized to reflect a deployment path (sequence) on stakeholder needs. Although the information collected through stakeholder surveys and meetings was the basis of the ITS architecture; technology, funding opportunities and requirements continue to evolve. It is expected KDOT will reevaluate and reprioritize projects frequently.

- **Project dependencies, based on how successive ITS projects can build upon one another.** Project dependencies influence the project sequencing. It is beneficial to identify the information and functional dependencies between projects.

In most cases, the sequence of currently planned projects has already been programmed and can simply be extracted from existing transportation plans. Successive projects will then be added to the sequence based on the project dependencies and other planning factors.
3.  IMPLEMENTATION AND INTEGRATION CONSIDERATIONS

This section provides an overview of several critical issues that have to be considered in the planning process to ensure the success of ITS project implementation and integration. These issues include funding, staffing, ITS standard adoption, agency agreements, and mainstreaming ITS into planning process.

3.1  Funding

Funding is essential for project implementation. It is not feasible to initiate an ITS project without securing sufficient funding. Identifying available funding sources and securing adequate funding will assure a timely deployment of proposed ITS projects. The sources and types of funding for ITS projects are further discussed in Section 8.

3.2  Staffing

ITS deployment, operations and maintenance require adequate staff with specific knowledge and skill sets. Staff education and training, technical expertise, availability, and retention are critical aspects for a successful system deployment and effective system operations and maintenance after the system is deployed. The agencies involved in system deployment, operations and maintenance will have to identify a maintenance coordinator, key technical personnel, their required skills and responsibilities for future system operation and maintenance. Typically, training is necessary to keep the operation and maintenance staff current in their essential knowledge and skills. It is essential that individual agencies have to work closely and coordinate with each other for planning, design, implementation, operation and maintenance of ITS systems.

3.3  ITS Standard Adoption

ITS standards define how system components interconnect and interact with each other as well as with other systems. They allow information and data sharing between devices manufactured by different vendors, across different ITS applications, and among transportation agencies located in different jurisdictions. Standards are an important consideration when deploying ITS components. Standards specifically state the requirements of each ITS component when integrated with another. In addition, standards must be identified prior to implementing projects. Agencies should work together to determine what ITS standards be utilized to maximize interoperability. It is critical that the partner agencies monitor the standards development process so that the approved standards can be included as the Statewide ITS Architecture is updated.

3.4  Agency Agreements

The Statewide ITS Architecture provides both a technical and institutional framework for the deployment of ITS in Kansas. Institutional integration involves cooperation and coordination between various agencies and jurisdictions to achieve seamless operations and interoperability. The Statewide ITS Architecture identifies the stakeholder roles and responsibilities, ITS elements and their functions, and ITS deployment activities that would require establishment of an electronic link between and among organizations. From an institutional integration perspective, these electronic links or interfaces may require the establishment of some form of agreement to define roles and responsibilities of each party. Further details are discussed in Section 8.

3.5  Mainstreaming ITS into Planning Process

The Kansas Statewide ITS Architecture represents a blueprint or framework for integrating ITS systems operationally from a statewide perspective. The Architecture is an important tool for use in transportation planning, programming, and project implementation. It can identify opportunities for making ITS
investments in a more cost-effective manner. It supports transportation planning and ITS project implementation at state and regional levels with:

- Providing a statewide and regional context to project implementation
- Viewing individual project in the context of surrounding systems
- Prompting stakeholders to think about how a project fits within the overall transportation vision of Kansas
- Identifying integration opportunities that should be considered
- Providing head-start for the Systems Engineering Analysis that is required for ITS projects

The results of the transportation planning process – the plans and programs – are an important input to the architecture development. Traditional transportation plans and ITS plans discuss economic, social and transportation trends and needs and how infrastructure should be built to meet the needs. Many of these policies and goals are directly related to the needs and services that guide the development of the architecture. Conversely, the architecture can assist stakeholders in planning their ITS projects to support the goals. The architecture is a tool for use in the planning process to maximize appropriate integration of projects identified by the planning process. The planning process and related outputs also help refine the architecture over time by providing feedback. As such, the transportation planning process improves the architecture at the same time that the architecture informs and improves the transportation planning process. Once ITS projects are programmed, the architecture provides a starting point for project development. It provides inputs to support the systems engineering analysis including the development of the concept of operations, requirements, and high-level design and test planning of ITS projects. Figure 3-1 illustrates the relationships of an ITS architecture with transportation planning and project implementation.

Figure 3-1. ITS Architecture Can Support Transportation Planning and Project Implementation
3.5.1 Support Transportation Planning Process

The Statewide ITS Architecture can be used as a key reference in the transportation planning process. This will ensure all proposed ITS projects are consistent with the ITS architecture and additional integration opportunities are considered, leading to more efficient implementations.

Long Range Transportation Plan

One of the principal planning documents is the Kansas Long Range Transportation Plan. This plan provides the direction for planning and developing the transportation system needed to help move Kansas productively and prosperously into the future. The Kansas Long Range Transportation Plan is a long-range guide for major projects, systems, policies and strategies designed to maintain the existing multi-modal surface transportation system in the state and serve the state’s future travel needs.

The Statewide ITS Architecture can serve as an input to the Kansas Long Range Transportation Plan. The ITS services and projects identified in the Statewide ITS Architecture can support the development of long-range and short-range strategies/actions during the state transportation planning that lead to an integrated, efficient inter-modal transportation system. The descriptions of the goals and attributes of the systems and services included in the Statewide ITS Architecture can support measurement assessment during the state transportation planning. The Project Sequencing from the Integration and Implementation Plan can assist the development of prioritized projects and address the consistency of proposed transportation investments in the financial plan, which is typically a part of the Long Range Transportation Plan. In addition, the Statewide ITS Architecture provides a framework for analyzing how ITS elements are related and thereby to identify the areas for potential coordination and cooperation among agencies. This can promote both systems and inter-jurisdictional integration during the transportation planning.

Transportation Improvement Program

The Statewide Transportation Improvement Program (STIP) is another primary transportation planning output that can be supported by the Statewide ITS Architecture. The STIP is developed by incorporating into a single document the portions of the annual transportation improvement programs (TIPs) being funded by the FHWA and FTA within Kansas. The STIP is a three-year listing of projects within the state proposed for federal-aid funding under Title 23 (Federal Highway Funding) and Title 49 (Federal Transit Assistance) of the United States Code.

As part of the STIP preparation, a project prioritization and selection process is conducted, where the Statewide ITS Architecture can play a role. The Project Sequencing output from the Statewide ITS Architectures can be an input to prioritization. Integration opportunities and implementation strategies identified in the Integration and Implementation Plan can be used to better define the full benefits of ITS projects.

3.5.2 Support ITS Project Development

The Statewide ITS Architecture can be used for support in ITS project development cycle. A typical ITS project development cycle begins with project definition, followed by Request for Proposal (RFP)/work order generation, leading to project implementation. Information in the Statewide ITS Architecture can assist in all three of these areas of project development.

Project Definition

Project Definition may occur at several levels of detail. Early in the planning process a project may be defined only in terms of the transportation services it will provide, or by the major system pieces it contains. At some point prior to the beginning of implementation the details of the project must be developed. This could include further system definition and interface definition including exactly what systems or parts of systems will make up the project, what interconnections the project entails, or what information needs to flow across the system interconnections. Requirement definition may go through similar levels of detail, starting with very high-level description of project functions and moving toward system specifications. By identifying the portions of the Statewide ITS Architecture that define the project, the architecture outputs can be used to create aspects of the project definition.
The areas that an ITS architecture can assist in project definition are:

- The identification of agency roles and responsibilities (including any inter-agency cooperation) can come from the operational concept developed as part of the ITS architecture. This operational concept can either serve as a starting point for a more detailed definition, or possibly provide all the needed information.
- Requirements definition can be completely or partly defined by using the ITS architecture functional requirements applicable to the project.
- The ITS architecture includes a map to ITS standards, and the project mapping to the Statewide ITS Architecture can extract the applicable ITS standards for the project.

**RFP/Work Order Generation**

Once a project is defined, and funding is committed, the implementation process can commence with the generation of a RFP/Work Order, which is the common governmental practice for initiating a contract with the private sector to implement the project. Once a contract is in place, project implementation begins and moves through design, development, integration, and testing.

The Statewide ITS Architecture, and the products produced during its development, can support this RFP generation. First the project definition described above forms the basis for what is being procured. Mapping the project to the Statewide ITS Architecture allows bidders to have a clear understanding of the scope of the project and of the interfaces that need to be developed. The functional requirements created as part of the Statewide ITS Architecture can be used to describe the functional requirements for the project. In addition a subset of the ITS Standards identified as part of the Statewide ITS Architecture development can be specified in the RFP/Work Order.

**Project Implementation**

Because ITS projects involve systems and their interconnections, it is very important to follow a systems engineering approach to designing and implementing the project. While the exact process followed is at the discretion of the local agency, the FHWA and FTA ITS Architecture and Standards Final Rule/Policy lay out a set of required systems engineering analyses for ITS projects funded through the highway trust fund. It is a highly recommended that a systems engineering analysis should be performed for non-federally funded ITS projects as well. The required systems engineering analysis steps are:

- Identification of portions of the ITS architecture being implemented;
- Identification of participating agencies’ roles and responsibilities;
- Requirements definitions;
- Analysis of alternative system configurations and technology options to meet requirements;
- Procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Procedures and resources necessary for operations and management of the system.
4. PROJECT DEFINITION

4.1 Descriptions and Project List

This section details the ITS initiatives currently being implemented and will be implemented in Kansas over the next 15 years. ITS initiatives for Kansas were prepared by the project team, led by KDOT, and were reviewed by the Statewide ITS Architecture Steering Committee prior to inclusion in this document. A total of 52 ITS projects are identified for implementation. They are:

1. KDOT Statewide Transportation Operations and Management Center (TOMC)
2. KDOT Kansas Speedway Traffic Management System Enhancements
3. KDOT Condition-Based Variable Speed Limit Signs
4. KDOT Dynamic Message Signs (DMSs)
5. KDOT Cell Probe System
6. KDOT Closed-Circuit Television (CCTV) Cameras along Interstates
7. KDOT Video Feed via Satellite
8. KDOT Rest Area Kiosks
9. KDOT Rest Area Wi-Fi
10. KDOT KANROAD Reporting System Enhancements
11. KDOT Winter Maintenance Vehicle Automatic Vehicle Location (AVL) and Mobile Data Terminal (MDT)
12. KDOT Paint Trucks Automatic Vehicle Location (AVL)
13. KDOT Snowplows Infrared Radar
14. KDOT Integration of Weather Sensors on Maintenance Vehicles with Road Weather Information System (RWIS)
15. KDOT Snow Route Design Optimization Software
16. KDOT Vehicle Maintenance Management System
17. KDOT Work Zone Intrusion System
18. KDOT KGATE Enhancements
19. KDOT ITS Archive
20. KDOT Mayday/Automated Collision Notification (ACN) Response System
21. KDOT Mayday/ACN Service Provider Registration System
22. KDOT Truck Routing Information System (TRIS)
23. KDOT Remote Screening Weigh-in-Motion (WIM) System
24. KDOT Highway Railroad Intersections ITS Project
25. KDOT Rest Area Weather Radio Announcement
26. KDOT Maintenance Decision Support System (MDSS)
27. Kansas Commercial Vehicle Information Exchange Window (CVIEW)
28. Kansas Department of Revenue (KDOR) Electronic Heavy Vehicle Use Tax Reporting
29. Kansas Highway Patrol (KHP) Emergency Vehicles Mobile Data Units
30. KHP Total Stations Enhancement
31. KHP Photogrammetry Project
32. Kansas Bureau of Investigation (KBI) AMBER Alert System Enhancement
33. Kansas Turnpike Authority (KTA) Service Area Kiosks
34. Kansas Airport Security Monitoring Systems
35. Kansas Alternate Route Planning
36. Rural Transit Computer Aided Dispatch (CAD), Automatic Vehicle Location (AVL), and Mobile Data Terminal (MDT)
37. Rural Transit On-Board Cameras
38. Rural Transit Electronic Fare Payment System
39. Rural Transit Kiosks
40. Rural Transit Pre-Trip Planning
41. Rural Transit Vehicle Maintenance Management System
42. Rural Transit Security Monitoring System
43. Rural Transit On-Board Display/Audio System
44. County and City Traffic Data Collection
45. County and City Signal System Coordination and Operation
46. County and City Mobile Speed Monitoring Trailer
47. County and City Portable Dynamic Message Signs (DMSs)
48. County and City Maintenance Vehicle Computer Aided Dispatch (CAD)
49. County and City Communications Center Upgrade
50. County and City Emergency Vehicle Preemption (EVP)
51. County and City Emergency Vehicle Automatic Vehicle Location (AVL) and Mobile Data Terminal (MDT)
52. County and City Database and Geographic Information System (GIS) Support

A summary of the 52 projects is presented in Table 4-1. Details of each project are described in Section 4.2. In Section 4.2, each project is described with the following information:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Number</td>
<td>For reference purpose only and does not indicate any type of priority</td>
</tr>
<tr>
<td>Project Title</td>
<td>The title of the project</td>
</tr>
<tr>
<td>Service Area</td>
<td>Service area(s) related to the project. Each project may provide service to one or more of the following areas:</td>
</tr>
<tr>
<td></td>
<td>• Commercial Vehicle Operations</td>
</tr>
<tr>
<td></td>
<td>• Data Management</td>
</tr>
<tr>
<td></td>
<td>• Emergency Management</td>
</tr>
<tr>
<td></td>
<td>• Maintenance and Construction Management</td>
</tr>
<tr>
<td></td>
<td>• Public Transportation Management</td>
</tr>
<tr>
<td></td>
<td>• Traffic Management</td>
</tr>
<tr>
<td></td>
<td>• Traveler Information</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>Agency or agencies that will be responsible for the planning, design, implementation and operation of the project</td>
</tr>
<tr>
<td>Project Scope</td>
<td>Description of project goals, system functions and other details</td>
</tr>
<tr>
<td>Expected Benefit</td>
<td>Benefits expected from the deployment of the project</td>
</tr>
<tr>
<td>Time Frame</td>
<td>Time frame for the deployment in term of short, medium and long terms</td>
</tr>
<tr>
<td>Duration</td>
<td>Estimated length of time for project deployment</td>
</tr>
<tr>
<td>Priority</td>
<td>Level of stakeholder needs for the project (Low, Medium and High).</td>
</tr>
<tr>
<td>Project Cost</td>
<td>Estimated based on costs information from past ITS project experience and similar ITS studies. The costs are divided into overall capital costs and annual operations and maintenance (O&amp;M) costs. In some cases, the annual O&amp;M costs are estimated as 10% of the overall capital costs to date. Since the costs are estimated based upon numerous assumptions, it is highly recommended that the detailed costs be analyzed prior to project initiation. All costs are estimated in 2006 dollars.</td>
</tr>
<tr>
<td>Market Package</td>
<td>A list of market packages to be considered</td>
</tr>
<tr>
<td>Dependency</td>
<td>Information and technical dependencies of the project with other projects or systems</td>
</tr>
<tr>
<td>Architecture</td>
<td>An ITS architecture diagram for the project</td>
</tr>
</tbody>
</table>
Table 4-1. Summary of Proposed ITS Projects and Concepts

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder(^1)</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 1  | KDOT Statewide TOMC                                | Traffic Management, Traveler Information, Emergency Management, Data Management | KDOT\(^*\)        | Short      | High     | $2M          | $450K    | None. Could support deployment of ITS field devices in #4, and #6, and #10, and possibly #2, #3, and #5. | • Improved traffic operations and management  
• Improved traveler information collection and dissemination  
• Improved incident response and management |
| 2  | KDOT Kansas Speedway Traffic Management System Enhancements | Traffic Management                                | KDOT\(^*\), KHP, KTA | P-I: Short  
P-II: Short to Medium | P-I: High  
P-II: High | $12K/CCTV; $120K/DMS (permanent); $30-$45K/DMS (portable); Integration: $90K | $30K      | None                                                                 | • Improved traffic safety and operation efficiency in the Kansas Speedway Area  
• Improved incident detection, verification and response |
<p>| 3  | KDOT Condition-based Variable Speed Limit Signs     | Traffic Management                                | KDOT(^*)        | Medium     | Low      | $40K/location | $5K/location | None                                                                 | • Improved travel safety |</p>
<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 4  | KDOT Dynamic Message Signs              | Traffic Management, Traveler Information | KDOT* KTA   | Short to Long | High     | $120K/DMS (permanent); $30-$45K/DMS (portable) | $4.5K/DMS (permanent); $1.5K/DMS (portable) | None. Can be integrated into #1.                                       | • Improved travel information dissemination  
• Improved incident management  
• Improve work zone safety and management |
| 5  | KDOT Cell Probe System                  | Traffic Management                        | KDOT*       | Long       | Medium   | $125K        | $2K      | None                                                                         | • Cost-effective traffic data collection in rural areas  
• Expanded traffic monitoring and data collection coverage area  
• Improved traveler information dissemination |
| 6  | KDOT CCTV Cameras along Interstates     | Traffic Management, Traveler Information, Maintenance and Construction Management | KDOT* KHP Neighboring States | Short     | Medium   | $12K/location | $1.5K/location | None. Can be integrated into #1.                                       | • Improved roadway safety  
• Effective incident verification  
• Improved traveler information dissemination  
• Improved roadway conditions verification |
| 7  | KDOT Video Feed via Satellite           | Traffic Management, Emergency Management  | KDOT* KDEM  | Medium     | Medium   | $20K         | $5K      | None. Could be deployed in conjunction with #6.                           | • Improved emergency response and coordination |
Table 4-1. (Continued)

1 Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 8  | KDOT Rest Area Kiosks          | Traveler Information              | KDOT* Kansas  | Short      | High     | Software and Integration: $10K; Kiosks: $20K/unit                             | $2K/Kiosk | Could use the same communication infrastructure and be deployed in concert with the expansion of Wi-Fi service at rest areas (#9). | • Improved travel information dissemination  
    |                               |                                    | Travel and    |            |          |                                                                              |                        | • Increased traveler satisfaction  
    |                               |                                    | Tourism       |            |          |                                                                              |                        | • Improved travel safety                                                   |
| 9  | KDOT Rest Area Wi-Fi           | Traveler Information, Emergency   | KDOT* Kansas  | On-going   | High     | $0                                            | $0         | Wireless Comm. for the Wi-Fi service could be used for the connection of kiosks at rest areas (#8). | • Improved travel information dissemination  
    |                               | Management                        | Travel and    |            |          |                                                                              |                        | • Increased traveler satisfaction                                        |
|    |                               |                                    | Tourism       |            |          |                                                                              |                        | • Improved emergency response and communication                           |
| 10 | KDOT KANROAD Reporting System  | Traveler Information, Data        | KDOT* KTA     | Short      | High     | TBD                                           | TBD        | Support project #1 (KDOT Statewide TOMC),                                   | • More efficient data entry and reporting  
    | Enhancements                   | Management                        | Kansas        |            |          |                                                                              |                        | • Improved data sharing                                                  |
|    |                               |                                    | Travel and    |            |          |                                                                              |                        | • Improved travel information dissemination                               |
Table 4-1. (Continued)

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder(^1)</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>KDOT Winter Maintenance Vehicles AVL and MDT</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>P-I: On-going P-II: Short to Medium</td>
<td>P-I: High P-II: Medium</td>
<td>$10K/vehicle; Base Station: $200K</td>
<td>$100/vehicle; Base Station: $4K</td>
<td>Could follow the model for transit AVL in Hays and Hutchinson; could be implemented in conjunction with #12; could support project#16; Deployment model could be shared with #29, #36, and #51.</td>
<td>• Improved winter maintenance safety and operations efficiency • Reduced snow and ice control costs • Improved customer service</td>
</tr>
<tr>
<td>12</td>
<td>KDOT Paint Trucks AVL</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Short</td>
<td>Medium</td>
<td>$1.5K/vehicle; Base Station: $200K</td>
<td>$50/vehicle; Base Station: $4K</td>
<td>Could be implemented in conjunction with #11.</td>
<td>• Improved worker and vehicle safety and operations efficiency</td>
</tr>
<tr>
<td>13</td>
<td>KDOT Snowplows Infrared Radar</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Long</td>
<td>Low</td>
<td>$3K/unit</td>
<td>$200/unit</td>
<td>None</td>
<td>• Improved snowplow operations safety and efficiency</td>
</tr>
<tr>
<td>14</td>
<td>KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Long</td>
<td>Low</td>
<td>P-I: $20K P-II: TBD</td>
<td>P-I: $2K P-II: TBD</td>
<td>None</td>
<td>• Improved road weather information collection • Improved environmental conditions monitoring</td>
</tr>
<tr>
<td>15</td>
<td>KDOT Snow Route Design Optimization Software</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Medium</td>
<td>Medium</td>
<td>TBD</td>
<td>TBD</td>
<td>None</td>
<td>• Improved snow plow efficiency • Reduced snow and ice control costs</td>
</tr>
</tbody>
</table>

1 Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.
Table 4-1. (Continued)

1 Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>KDOT Vehicle Maintenance Management System</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Medium</td>
<td>Medium</td>
<td>TBD</td>
<td>TBD</td>
<td>Project #11 could provide information to support this project; could build upon system in Hays; could coordinate with #41</td>
<td>• Improved vehicle maintenance planning, scheduling and management</td>
</tr>
<tr>
<td>17</td>
<td>KDOT Work Zone Intrusion System</td>
<td>Maintenance and Construction Management</td>
<td>KDOT*</td>
<td>Short</td>
<td>High</td>
<td>$5K/system; $60K for pilot study</td>
<td>$500</td>
<td>None</td>
<td>• Improved work zone safety</td>
</tr>
<tr>
<td>18</td>
<td>KDOT KGATE Enhancements</td>
<td>Data Management</td>
<td>KDOT*</td>
<td>On-Going</td>
<td>High</td>
<td>TBD</td>
<td>TBD</td>
<td>Could support #19 and other existing KDOT data management systems</td>
<td>• Improved data sharing • Improved data archiving and management</td>
</tr>
<tr>
<td>19</td>
<td>KDOT ITS Archive</td>
<td>Data Management</td>
<td>KDOT*</td>
<td>Medium</td>
<td>Low</td>
<td>TBD</td>
<td>TBD</td>
<td>Should coordinate with KANSYS or KARS; could support project #18</td>
<td>• Efficient ITS data archiving and management • Effective data support for ITS planning</td>
</tr>
<tr>
<td>20</td>
<td>KDOT Mayday/ACN Response System</td>
<td>Emergency Management</td>
<td>KDOT*, KHP, Troop G, 911 centers, County Sheriff and City Police</td>
<td>Long</td>
<td>Low</td>
<td>TBD</td>
<td>TBD</td>
<td>Could be implemented in conjunction with #21.</td>
<td>• Improved emergency response • Improved roadway assistance • Improved personal security</td>
</tr>
</tbody>
</table>
Table 4-1. (Continued)

1 Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder¹</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 21 | KDOT Mayday/ACN Service Provider Registration System | Emergency Management          | KDOT*        | Long       | Low      | TBD          | TBD      | Could be implemented in conjunction with #20                                              | • Improved emergency response  
    |                                                   |                               |              |            |          |              |          | • Improved roadway assistance                                                                    | • Improved personal security                                             |
| 22 | KDOT Truck Routing Information System (TRIS)        | Commercial Vehicle Operations | KDOT*        | On-going   | High     | TBD          | TBD      | None; could support project #27.                                                              | • Improved oversize/overweight vehicle routing  
    |                                                   |                               |              |            |          |              |          | • Improved travel safety                                                                        | • Improved roadway infrastructure protection                              |
| 23 | KDOT Remote Screening Weigh-in-Motion System       | Commercial Vehicle Operations | KDOT* KHP    | Short      | Medium   | $250K/unit  | $25K/unit | None                                                                                 | • Reduction in time of vehicles spent on inspection  
    |                                                   |                               |              |            |          |              |          | • Improved operations efficiency                                                                | • Reduced safety hazards                                                   |
| 24 | KDOT Highway-Railroad Intersections ITS Project     | Traffic Management            | KDOT* Railroad Companies Counties and Cities | Medium | Medium | TBD          | TBD      | None                                                                                     | • Improved roadway safety  
    |                                                   |                               |              |            |          |              |          | • Improved traveler information dissemination                                                  | • Improve railroad crossing safety                                      |
Table 4-1. (Continued)

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 25 | KDOT Rest Area Weather Radio Announcement              | Traveler Information                       | KDOT* NOAA                    | Medium     | Medium   | TBD          | TBD      | None       | • Improved travel information dissemination
|    |                                                         |                                            |                               |            |          |              |          |            | • Improved travel safety                     |
| 26 | KDOT Maintenance Decision Support System (MDSS)        | Maintenance and Construction Management   | KDOT* MDSS Pooled Fund Study* | On-going   | High     | $150K (KDOT’s contribution to the system development through the MDSS Pooled Fund Study) | TBD      | None       | • Improved winter maintenance safety and operations efficiency
|    |                                                         |                                            |                               |            |          |              |          |            | • Reduced snow and ice control costs
|    |                                                         |                                            |                               |            |          |              |          |            | • Improved customer service
|    |                                                         |                                            |                               |            |          |              |          |            | • Improved traveler information dissemination |
| 27 | Kansas Commercial Vehicle Information Exchange Window (CVIEW) | Commercial Vehicle Operations             | KDOT* KDOR* KCC KHP           | On-going   | High     | $650K       | $70K     | None; could support projects #22. | • Improved information exchange
|    |                                                         |                                            |                               |            |          |              |          |            | • Improved efficiency in vehicle and cargo clearance |
| 28 | KDOR Electronic Heavy Vehicle Use Tax Reporting        | Commercial Vehicle Management             | KDOR* IRS                     | Short      | Medium   | TBD          | TBD      | None       | • Improved vehicle tax reporting efficiency |
| 29 | KHP Emergency Vehicles Mobile Data Units              | Emergency Management                       | KHP*                          | On-going   | High     | MDT: $8K/unit Base Station: $200K | MDT: $50/unit Base Station: $4K | None       | • Improved communication and operations efficiency
|    |                                                         |                                            |                               |            |          |              |          |            | • Increased trooper safety                    |
Table 4-1. (Continued)

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>KHP Total Stations</td>
<td>Emergency Management</td>
<td>KHP*</td>
<td>On-going</td>
<td>High</td>
<td>TBD</td>
<td>TBD</td>
<td>None</td>
<td>Improved roadway safety • Improved trooper safety • Improved incident investigation efficiency</td>
</tr>
<tr>
<td></td>
<td>Enhancement</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>31</td>
<td>KHP Photogrammetry</td>
<td>Emergency Management</td>
<td>KHP*</td>
<td>Short</td>
<td>High</td>
<td>TBD</td>
<td>TBD</td>
<td>None</td>
<td>Improved roadway safety • Improved travel safety • Improved trooper safety • Improved incident investigation efficiency</td>
</tr>
<tr>
<td></td>
<td>Project</td>
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</tr>
<tr>
<td>32</td>
<td>KBI AMBER Alert System</td>
<td>Emergency Management</td>
<td>KBI* KDOT KHP KC Scout County Sheriffs City Police Departments</td>
<td>On-going</td>
<td>High</td>
<td>$3K</td>
<td>Staff time</td>
<td>None</td>
<td>Improved AMBER alert operational efficiency and communications</td>
</tr>
<tr>
<td></td>
<td>Enhancements</td>
<td></td>
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<tr>
<td>33</td>
<td>KTA Service Area</td>
<td>Traveler Information</td>
<td>KTA* KDOT</td>
<td>Short</td>
<td>Medium</td>
<td>Software and Integration: $10K; Kiosks: $20K/unit</td>
<td>$2K/Kiosk</td>
<td>Could follow the model for kiosks at rest areas (#8); could link with KDOT KANROAD and 511 systems.</td>
<td>Improved travel and service information dissemination • Increased traveler satisfaction • Improved travel safety</td>
</tr>
<tr>
<td>No</td>
<td>Project Title</td>
<td>Service Area</td>
<td>Stakeholder(s)</td>
<td>Time Frame</td>
<td>Priority</td>
<td>Capital Cost</td>
<td>O&amp;M Cost</td>
<td>Dependency</td>
<td>Benefit</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>34</td>
<td>Kansas Airport Security Monitoring Systems</td>
<td>Emergency Management</td>
<td>KDOT*</td>
<td>Medium</td>
<td>Low</td>
<td>$250K/system plus staff labor for operation</td>
<td>$600/system</td>
<td>None</td>
<td>• Improved airport security and infrastructure protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Airports</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>• Improved personal security</td>
</tr>
<tr>
<td>35</td>
<td>Kansas Alternate Route Planning</td>
<td>Traffic Management, Emergency Management, Traveler Information</td>
<td>KDOT* KDEM KHP KTA Counties Cities</td>
<td>Medium</td>
<td>Medium</td>
<td>$150K/study</td>
<td>TBD</td>
<td>None</td>
<td>• Reduced secondary incidents</td>
</tr>
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<td></td>
<td>• Reduced fuel consumption and emissions</td>
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<td>• Reduced motorist stress levels</td>
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<td>• Improved response time to incidents</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved travel information dissemination</td>
</tr>
<tr>
<td>36</td>
<td>Rural Transit CAD, AVL and MDT</td>
<td>Public Transportation</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Short to Medium</td>
<td>Medium</td>
<td>CAD System for Dispatch Center: $120K; AVL &amp; MDT: $5K/vehicle</td>
<td>CAD: $1K AVL &amp; MDT: $100/vehicle</td>
<td>Support projects #39, #40, and #43.</td>
<td>• Improved transit services</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>• Improved transit operation efficiency</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved transit user satisfaction</td>
</tr>
<tr>
<td>37</td>
<td>Rural Transit On-board Cameras</td>
<td>Public Transportation, Emergency Management</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Short</td>
<td>Medium</td>
<td>Camera: $8K/vehicle; Transit center hardware and software: $30K</td>
<td>Camera: $250/vehicle; Transit center hardware and software: $1K</td>
<td>None</td>
<td>• Improved passenger and transit operator security</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved emergency response efficiency</td>
</tr>
</tbody>
</table>
Table 4-1. (Continued)

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Rural Transit Electronic Fare Payment System</td>
<td>Public Transportation</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Medium</td>
<td>Medium</td>
<td>Electronic fare box: $1K/Bus Center hardware/software/integration: TBD</td>
<td>$100/Bus Center hardware/software: TBD</td>
<td>None</td>
<td>• Improved transit operations efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved fare and passenger data collection and management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved quality of transit services</td>
</tr>
<tr>
<td>39</td>
<td>Rural Transit Kiosks</td>
<td>Public Transportation, Traveler Information</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Medium</td>
<td>Low</td>
<td>Software/Integration: $10K; Kiosks: $20K/unit</td>
<td>$2K/unit</td>
<td>Could be supported by #36 and #40. Could follow model of Project #8</td>
<td>• Improved transit traveler information</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Increased customer satisfaction</td>
</tr>
<tr>
<td>40</td>
<td>Rural Transit Pre-trip Planning</td>
<td>Public Transportation, Traveler Information</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Medium</td>
<td>Low</td>
<td>TBD</td>
<td>TBD</td>
<td>Could support project #39.</td>
<td>• Improved transit traveler information</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Increased customer satisfaction</td>
</tr>
<tr>
<td>41</td>
<td>Rural Transit Vehicle Maintenance Management System</td>
<td>Public Transportation</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Short to Medium</td>
<td>Medium</td>
<td>TBD</td>
<td>TBD</td>
<td>Build upon the system in place in Hays</td>
<td>• Improved vehicle maintenance planning, scheduling and management</td>
</tr>
<tr>
<td>42</td>
<td>Rural Transit Security Monitoring System</td>
<td>Public Transportation</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Medium</td>
<td>Medium</td>
<td>$250K</td>
<td>$600 plus labor for operation</td>
<td>None</td>
<td>• Improved transit infrastructure security monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved personal security</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved emergency response</td>
</tr>
</tbody>
</table>
Table 4-1. (Continued)

Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder^1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Rural Transit On-board Display/Audio System</td>
<td>Public Transportation</td>
<td>Rural Transit Service Providers, KDOT*</td>
<td>Long</td>
<td>Medium</td>
<td>$5K/vehicle</td>
<td>$500/vehicle</td>
<td>Could be supported by Project #36</td>
<td>• Improved transit traveler information</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Increased customer satisfaction</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>County and City Traffic Data Collection</td>
<td>Traffic Management</td>
<td>Counties and Cities*</td>
<td>Short</td>
<td>High</td>
<td>Hardware/Software: $180K; Detector (loop): $2K/unit</td>
<td>Hardware/Software: $8K; Detector (loop): $180/unit</td>
<td>None</td>
<td>• Improved data collection traffic monitoring capability</td>
</tr>
<tr>
<td>45</td>
<td>County and City Signal System Coordination and Operation</td>
<td>Traffic Management</td>
<td>Counties and Cities*</td>
<td>Short</td>
<td>High</td>
<td>TBD</td>
<td>TBD</td>
<td>None</td>
<td>• Improved efficiency in traffic operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Reduction in travel time and delay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Reduction in fuel consumption and air pollution</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>County and City Mobile Speed Monitoring Trailer</td>
<td>Traffic Management</td>
<td>Counties and Cities*</td>
<td>Short</td>
<td>High</td>
<td>$12K/trailer</td>
<td>$1K/trailer</td>
<td>None</td>
<td>• Improved travel safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Reduced enforcement cost</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>County and City Portable Dynamic Message Signs</td>
<td>Traffic Management, Traveler Information</td>
<td>Counties and Cities*</td>
<td>Short</td>
<td>High</td>
<td>$30K-$45K/DMS</td>
<td>$1.5K/DMS</td>
<td>None</td>
<td>• Improved traveler information dissemination</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved incident management</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved work zone safety and management</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-1. (Continued)

1 Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder1</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| 48 | County and City Maintenance Vehicle CAD | Maintenance and Construction Management | Counties and Cities | Short      | High     | $120K        | $1K      | Could be done in conjunction with Project #49 | • Improved efficiency in maintenance vehicle operation  
• Improved response to roadway maintenance and incident assistance request |
| 49 | County and City Communications Center Upgrade | Emergency Management            | Counties and Cities* | Short      | High     | TBD          | TBD      | Could be deployed in conjunction with #48. | • Improved emergency response  
• Improved inter-agency communication and coordination |
| 50 | County and City Emergency Vehicle Preemption | Emergency Management            | Counties and Cities* | Short      | High     | $10K/intersection; $2K/vehicle (costs vary by technologies and locations) | $800/intersection; $200/vehicle | None                                      | • Improved emergency response |
| 51 | County and City Emergency Vehicle AVL and MDT | Emergency Management            | Counties and Cities* | Short      | High     | $10K/vehicle; Base Station: $200K | $100/vehicle; Base Station: $4K | Could be deployed in conjunction with #49.; could follow model of Project #11 | • Improved emergency operation efficiency  
• Improved emergency response |
Table 4-1. (Continued)

Stakeholders marked with an asterisk (*) are identified as the lead stakeholder responsible for securing project funding.

<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Service Area</th>
<th>Stakeholder$^1$</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Capital Cost</th>
<th>O&amp;M Cost</th>
<th>Dependency</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>County and City Database and GIS Support</td>
<td>Data Management</td>
<td>Counties and Cities*</td>
<td>Short to Medium</td>
<td>Medium</td>
<td>TBD</td>
<td>TBD</td>
<td>Could share the system with other Counties and Cities, and KDOT</td>
<td>• Improved data management</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>• Improved coordination and facilitation for transportation / ITS planning</td>
<td>• Improved traveler information dissemination</td>
</tr>
</tbody>
</table>
4.2 Project Definition

**Project No.** ITS-01

**Title**
KDOT Statewide Transportation Operation and Management Center (TOMC)

**Service Area**
Traffic Management, Traveler Information, Emergency Management, Data Management

**Stakeholder**
KDOT

**Scope**
The purpose of the Statewide TOMC is to create an environment that will allow for immediate and real-time transportation system operation from both local and statewide levels. This environment will enable faster response to emergencies and weather related incidents and provide better quality and timelier traveler information to the users of the transportation network in Kansas. The TOMC will use PC-based software applications to independently control multiple ITS devices and have reporting capabilities based on gathered data. Users will have access to the application through any networked computer with the appropriate software capability or through a central server with the software application.

**Expected Benefit**
- Improved traffic operations and management
- Improved traveler information collection and dissemination
- Improved incident response and management

**Timeframe**
Short term

**Duration**
3 Years

**Priority**
High

**Capital Cost**
$2M

**O&M Cost**
$450K/Year

**Market Package**
- ATMS01 – Network Surveillance
- ATMS06 – Traffic Information Dissemination
- ATMS07 – Regional Traffic Control
- ATMS08 – Traffic Incident Management
- MC03 – Road Weather Data Collection
- MC06 – Winter Maintenance
- MC07 – Roadway Maintenance and Construction
- MC08 – Work Zone Management
- ATIS1 – Broadcast Traveler Information
- ATIS2 – Interactive Traveler Information
- EM01 – Emergency Call-Taking and Dispatch
- EM02 – Emergency Routing
- EM04 – Roadway Service Patrols
- EM06 – Wide-Area Alert
- EM07 – Early Warning System
- EM08 – Disaster Response and Recovery
- EM09 – Evacuation and Reentry Management
- AD2 – ITS Data Warehouse

**Dependency**
Support deployment of ITS field devices and infrastructure in projects #4 (KDOT Dynamic Message Signs), #6 (KDOT CCTV along Interstates), and #10 (KDOT KANROAD Reporting System Enhancements); and possibly #2 (KDOT Kansas Speedway Traffic Management System Enhancements), #3 (KDOT Condition-based Variable Speed Limit Signs), and #5 (KDOT Cell Probe System)

**Architecture**
See next 4 pages
KDOT Statewide TOMC Architecture Part 2

- Emergency traffic control information
- Maintenance and construction resource request
- Resource deployment status
- Road network status assessment
- Traffic images
- Work plan feedback
- Current asset restrictions
- Emergency traffic control request
- Incident response status
- Maintenance and construction work plans
- Remote surveillance control
- Resource request
- Work zone information
- Emergency plan coordination
- Incident information
- ISP coordination
- Road network conditions
- Traffic control coordination
- Traffic information coordination

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ITS-02</td>
</tr>
</tbody>
</table>

**Title**
KDOT Kansas Speedway Traffic Management System Enhancements

**Service Area**
Traffic Management

**Stakeholder**
KDOT, KHP, KTA

**Scope**
KDOT has installed five CCTV cameras on roadways adjacent to the Kansas Speedway to monitor traffic conditions. The cameras are also used for incident identification and verification. The cameras are linked with an area office in Bonner Springs. Information about incidents and traffic is relayed to the traveling public via portable DMS on the roadways. Currently the system is mainly used for racing events and is controlled by KHP on race days. The system will be integrated with the Scout system in Kansas City and will be utilized for day-to-day operations (Phase I). Phase II will expand the system by adding devices including permanent and portable DMS and additional CCTV cameras. Ultimately, the system will be integrated with KDOT Statewide TOMC.

**Expected Benefit**
- Improved traffic safety and operation efficiency in the Kansas Speedway area
- Improved incident detection, verification and response

**Timeframe**
Phase I: Short Term; Phase II: Short to Medium Term

**Duration**
3 years

**Priority**
High

**Capital Cost**
- $12K/CCTV
- $120K/DMS (permanent)
- $30K-$45K/DMS (portable)
- System Integration: $90K

**O&M Cost**
$30K/ year

**Market Package**
- ATMS01 – Network Surveillance
- ATMS06 – Traffic Information Dissemination
- ATMS08 – Traffic Incident Management

**Dependency**
None

**Architecture**
See next page. Detailed project architecture and integration with other ITS components in the Kansas City area will be included in the Regional ITS Architecture for the Kansas City Metropolitan Area.
KDOT Kansas Speedway Traffic Management System Architecture

KDOT District/Area/Sub-area Offices
KDOT Kansas Speedway Traffic Management System Field Equipment

KDOT / MoDOT
KC Scout Operations Center

Special Event Promoters

Existing

Planned

roadway information system data
video surveillance control
roadway information system status
traffic images
traffic control coordination
traffic information coordination
roadway information system data
video surveillance control
event confirmation
event plans
event confirmation
event plans

KDOT District/Area/Sub-area Offices
KDOT Kansas Speedway Traffic Management System

KTA
KTA Operations Center
Project No. ITS-03

Title KDOT Condition-based Variable Speed Limit Signs

Service Area Traffic Management

Stakeholder KDOT

Scope KDOT plans to deploy condition-based variable speed limit signs to regulate traffic flow speed as needed. The project will enhance traffic flow management by changing the pre-defined speed limits in accordance with the traffic level. The system will include CCTVs, car separation sensors, information processing software, variable speed limit signs, and an interconnection scheme, including satellite, cellular, PCS, leased telephone lines, 6 GHz microwave, or optical fiber. The locations for this deployment will be further investigated.

Expected Benefit Improved travel safety

Timeframe Medium Term

Duration 1 year

Priority Low

Capital Cost $40K/location

O&M Cost $5K/location

Market Package ATMS04 – Freeway Control

Dependency None

Architecture

```
KDOT
KDOT Condition-based Variable Speed Limit Sign System

roadway information system status
traffic flow
roadway information system data
traffic sensor control

Travelers
Driver

driver information

KDOT
KDOT Condition-based Variable Speed Limit Sign System Field Equipment

Planned
```
Project No. ITS-04
Title KDOT Dynamic Message Signs
Service Area Traffic Management, Traveler Information
Stakeholder KDOT, KTA
Scope KDOT plans to deploy additional permanent and portable dynamic message signs (DMSs) along the major freeways statewide. A total of 25 portable and permanent DMSs are currently planned statewide. The majority of these signs will be placed near major decision points to provide travel information and advance warnings.

Expected Benefit
- Improved travel information dissemination
- Improved incident management
- Improved work zone safety and management

Timeframe Short to Long Term
Duration 12 years
Priority High
Capital Cost $120K/DMS (permanent); $30K-45K/DMS (portable)
O&M Cost $4.5K/DMS (permanent); $1.5K/DMS (portable)
Market Package
- ATMS06 – Traffic Information Dissemination
- MC08 – Work Zone Management
- EM06 – Wide-Area Alert

Dependency None but can be integrated into Statewide TOMC operation.

Architecture

![Architecture Diagram](attachment:architecture_diagram.png)
Project No. | ITS-05
---|---
Title | KDOT Cell Probe System
Service Area | Traffic Management
Stakeholder | KDOT
Scope | Missouri DOT has tested cell probe technology for the purpose of obtaining travel time and speed data for Missouri state highways, including all KC Scout routes. KDOT recently completed a cell probe technology pilot for six miles along I-435 in Kansas. The purpose of the pilot is to test the process of obtaining travel time and speed data and its accuracy and reliability. This project will take the experience and lessons learned from the above projects and conduct an additional pilot study in rural Kansas to investigate the feasibility of using cell technology for obtaining speed and possibly travel time information in a rural environment.

Expected Benefit | • Cost-effective traffic data collection in rural areas
• Expanded traffic monitoring and data collection coverage area
• Improved traveler information dissemination

Timeframe | Long Term
Duration | 2 Years
Priority | Medium
Capital Cost | $125K
O&M Cost | $2K/year
Market Package | ATMS02 – Probe Surveillance
Dependency | None
Architecture

![Architecture Diagram]

Planned
Project No. ITS-06

Title KDOT CCTV along Interstates

Service Area Traffic Management, Traveler Information, Maintenance and Construction Management

Stakeholder KDOT, KHP, Neighboring States

Scope This project will deploy CCTV cameras at critical locations along interstate highways throughout Kansas. These CCTVs will be used to monitor traffic flows and verify incident severity and will be installed at selected locations where are prone to freezing, snow, curves, fog, high wind, flooding, and/or smoke. The KDOT districts and Statewide TOMC will be the primary operators of the CCTV. KDOT will be able to share camera images and control in real time with KHP and local transportation and public safety agencies. These CCTV will be part of the ITS field device deployment for the Statewide TOMC.

Expected Benefit
- Improved roadway safety
- Effective incident verification
- Improved travel information dissemination
- Improved roadway conditions verification

Timeframe Short Term

Duration 2 Years

Priority Medium

Capital Cost $12K/location

O&M Cost $1.5K/location/year

Market Package ATMS01 – Network Surveillance

Dependency None but can be integrated into Statewide TOMC operation

Architecture

![Architecture Diagram](image-url)
<table>
<thead>
<tr>
<th>Project No.</th>
<th>ITS-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>KDOT Video Feed via Satellite</td>
</tr>
<tr>
<td>Service Area</td>
<td>Traffic Management, Emergency Management</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>KDOT, KDEM</td>
</tr>
<tr>
<td>Scope</td>
<td>KDOT has two Communication on Wheels (COWs) units to assist public safety agencies with interoperability communications for both natural and manmade statewide emergencies. These units have various types of interagency and interoperability radio gear on-board. This project will equip COWs units with hardware and software to allow transmitting CCTV camera images via satellite communications. The video feed could be transmitted back to KDOT and KDEM to assist in emergency responses.</td>
</tr>
<tr>
<td>Expected Benefit</td>
<td>Improved emergency response and coordination</td>
</tr>
<tr>
<td>Timeframe</td>
<td>Medium Term</td>
</tr>
<tr>
<td>Duration</td>
<td>1 Year</td>
</tr>
<tr>
<td>Priority</td>
<td>Medium</td>
</tr>
<tr>
<td>Capital Cost</td>
<td>$20K</td>
</tr>
<tr>
<td>O&amp;M Cost</td>
<td>$5K/year</td>
</tr>
<tr>
<td>Market Package</td>
<td>EM08 – Disaster Response and Recovery</td>
</tr>
<tr>
<td>Dependency</td>
<td>None but could be deployed in conjunction with Project #6 (KDOT CCTV Cameras along Interstates)</td>
</tr>
</tbody>
</table>

**Architecture**

![Architecture Diagram](image-url)
Project No. | ITS-08
---|---
Title | KDOT Rest Area Kiosks
Service Area | Traveler Information
Stakeholder | KDOT, Kansas Travel and Tourism
Scope | This project will install kiosks at rest areas to provide travel information as an alternative to internet access. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, detours, weather information, and travel and tourism information. Ideally both a real-time interactive request/response system and an information system that "push" a tailored stream of information to the traveler will be supported. However, the detailed functions of the system will be determined based on traveler needs and funding availability on a later date.
Expected Benefit | • Improved travel information dissemination
• Increased traveler satisfaction
• Improved travel safety
Timeframe | Short Term
Duration | 3 years
Priority | High
Capital Cost | Software and Integration: $10K; Kiosk: $20K/unit
O&M Cost | $2K/Kiosk/year
Market Package | • ATIS01 – Broadcast Traveler Information
• EM06 – Wide-Area Alert
Dependency | • Could possibly use the same communication infrastructure and be deployed in concert with the expansion of Wi-Fi service at rest areas (Project #9)
• Coordinated with KDOT Rest Area Weather Radio Announcement (Project #25)
Architecture | See next page
<table>
<thead>
<tr>
<th>Project No.</th>
<th>ITS-09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>KDOT Rest Areas Wi-Fi</td>
</tr>
<tr>
<td>Service Area</td>
<td>Traveler Information, Emergency Management</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>KDOT, Kansas Travel and Tourism, KHP, Counties and Cities</td>
</tr>
<tr>
<td>Scope</td>
<td>KDOT is conducting a one-year pilot project to evaluate wireless access points at four rest areas that allow travelers to connect Internet and obtain traveler information such as weather, road conditions and construction/maintenance work zones and detours in Kansas and surrounding states. These locations are: the Greenwood County rest stop on US-400 (near Beaumont); the Williamsburg rest stop on I-35; the Goodland rest area on I-70 near Colorado; and the Paxico rest area off I-70 west of Topeka. This pilot project provides generic Internet access for a fee, but travelers have free access to a Kansas traveler information portal. Upon successful completion and evaluation of the pilot project, the Wi-Fi service could be extended to all 42 rest areas of Kansas. KDOT would have access to the wireless bandwidth for the connection of kiosks at rest areas. Planned kiosks (Project #8) will provide non-interactive travel information as an alternative to internet access.</td>
</tr>
</tbody>
</table>
| Expected Benefit | • Improved travel information dissemination  
• Increased traveler satisfaction  
• Improved emergency response and communication |
| Timeframe        | On-going |
| Duration         | 3 years |
| Priority         | High |
| Capital Cost     | $0 |
| O&M Cost         | $0 |
| Market Package   | • ATIS01 – Broadcast Traveler Information  
• ATIS02 – Interactive Traveler Information  
• EM06 – Wide-Area Alert |
| Dependency       | Wireless communications for the Wi-Fi service could be used for the connection of kiosks at rest areas (Project #8) |
| Architecture     | See next page |
KDOT Rest Area Wi-Fi

KDOT Division of Public Affairs
KDOT KanRoad/511 Traveler Information Website

Travelers
Traveler

User Personal Computing Devices

KDOT Division of Public Affairs
KDOT Rest Area WiFi

Planned
**Project No.** ITS-10  
**Title** KDOT KANROAD Reporting System Enhancements  
**Service Area** Traveler Information, Data Management  
**Stakeholder** KDOT, KTA, Kansas Travel and Tourism  
**Scope** KANROAD is an internet-based software system that allows multiple users, primarily KDOT and KTA personnel, to enter information about construction work zones, maintenance work zones, detours, weather-related road conditions and other hazards into a reporting system. Data gathered by the KANROAD is then provided to KDOT Internet website and the 511 system for public use. Road condition data is fully automated to 511. Construction and maintenance data is only partially automated at the current time but will be fully automated in the future. TravelKS.com will also be integrated with KanRoad in the future.  

**Expected Benefit**  
- More efficient data entry and reporting  
- Improved data sharing  
- Improved traveler information dissemination  

**Timeframe** Short Term  
**Duration** 2 Year  
**Priority** High  
**Capital Cost** TBD  
**O&M Cost** TBD  
**Market Package**  
- MC04 – Weather Information Processing and Distribution  
- ATIS1 – Broadcast Traveler Information  
- ATIS2 – Interactive Traveler Information  
- AD2 – ITS Data Warehouse  

**Dependency** Support Project #1 (KDOT Statewide TOMC), Project #8 (KDOT Rest Area Kiosks), and Project #9 (KDOT Rest Area Wi-Fi)  

**Architecture** See next page
Project No. | ITS-11
---|---
Title | KDOT Winter Maintenance Vehicles Automatic Vehicle Location and Mobile Data Terminal
Service Area | Maintenance and Construction Management
Stakeholder | KDOT
Scope | This project will equip automatic vehicle location (AVL) systems and mobile data terminals (MDTs) on KDOT winter maintenance vehicles. This project will be implemented in 2 phases. Phase 1 will install AVL and MDT equipment on 6 maintenance vehicles in KDOT District 6. The benefit of using AVL and MDT in KDOT winter maintenance operations will be evaluated. Cellular communications are currently used, and it is likely the 800 MHz system will be used for communications in the future. Based on the results of Phase 1, Phase 2 will expand AVL and MDT installation statewide to additional maintenance vehicles.
Expected Benefit | • Improved winter maintenance safety and operations efficiency  
• Reduced snow and ice control costs  
• Improved customer service
Timeframe | Phase I: On-going; Phase II: Short to Medium Term
Duration | Phase I: 2 Years; Phase II: 3 Years
Priority | Phase I: High; Phase II: Medium
Capital Cost | $10K/vehicle; Base Station: $200K
O&M Cost | $100/vehicle/year; Base Station: $4K/year
Market Package | • MC01 – Maintenance and Construction Vehicle and Equipment Tracking  
• MC06 – Winter Maintenance
Dependency | • Could follow the model for transit AVL system implemented in Hays and Hutchinson  
• Could be implemented in conjunction with Project #12 (KDOT Paint Trucks AVL)  
• Could support Project #16 (KDOT Vehicle Maintenance Management System)  
• Deployment model and system could be shared with Projects #29 (KHP Emergency Vehicles Mobile Data Units), #36 (Rural Transit CAD, AVL and MDT), and #51 (County and City Emergency Vehicle AVL and MDT).
Architecture | See next page
KDOT Winter Maintenance Vehicles Automatic Vehicle Location and Mobile Data Terminal

KDOT District/ Area/Sub-area Offices
KDOT District Maintenance and Construction Management Systems

- maint and constr dispatch status
- maint and constr vehicle location data
- maint and constr vehicle operational data
- maint and constr dispatch information
- maint and constr vehicle system control

Travelers
Vehicle

KDOT District/ Area/Sub-area Offices
KDOT Maintenance and Construction Vehicles

vehicle location

Existing
Project No.  ITS-12
Title  KDOT Paint Trucks Automatic Vehicle Location
Service Area  Maintenance and Construction Management
Stakeholder  KDOT
Scope  This project will test an AVL (Automatic Vehicle Location) system on a paint truck. If successful, full deployment will be to a total of 1 truck per district. The AVL system will use GPS receivers integrated with the 800 MHz radio system, satellite or cellular communications.
Expected Benefit  Improved worker and vehicle safety and operations efficiency
Timeframe  Short Term
Duration  6 months
Priority  Medium
Capital Cost  $1.5K/vehicle; Base Station: $200K
O&M Cost  $50/vehicle/year; Base Station: $4K/year
Market Package  MC01 – Maintenance and Construction Vehicle and Equipment Tracking
Dependency  Could be deployed in conjunction with Project #11 (KDOT Winter Maintenance Vehicles AVL and MDT)

Architecture

```
KDOT District/ Area/Sub-area Offices
  KDOT District Maintenance and Construction Management Systems

Travelers
  Vehicle

KDOT District/ Area/Sub-area Offices
  KDOT Maintenance and Construction Vehicles
```

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KDOT Snowplows Infrared Radar</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Maintenance and Construction Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>This project will install Infrared Radar (NightVision) on a couple of snowplow trucks in a district for testing.</td>
</tr>
<tr>
<td><strong>Expected Benefit</strong></td>
<td>Improved snowplow operations safety and efficiency</td>
</tr>
<tr>
<td><strong>Timeframe</strong></td>
<td>Long Term</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>1 year</td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Capital Cost</strong></td>
<td>$3K/unit</td>
</tr>
<tr>
<td><strong>O&amp;M Cost</strong></td>
<td>$200/unit/year</td>
</tr>
<tr>
<td><strong>Market Package</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Dependency</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td>None</td>
</tr>
</tbody>
</table>
Project No.  ITS-14
Title  KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS
Service Area  Maintenance and Construction Management
Stakeholder  KDOT
Scope  Currently, KDOT maintenance vehicles are equipped with air and pavement temperature sensors. However, the environmental data collected is stored on board and is not sending to any receiving site in real time or near real time. This project will equip maintenance vehicles with communication capabilities to transmit the data in real time. This project will be implemented in two phases. Phase 1 of this project will install communications on three maintenance trucks in a district. The data collected by the vehicles will be transmitted in real time to a receiving site where the data is integrated with RWIS data. The benefits of the system will be evaluated. Phase 2 of this project will expand the system to each maintenance area within the district for a number of trucks to be determined.

Expected Benefit

• Improved road weather information collection
• Improved environmental conditions monitoring

Timeframe  Long Term
Duration  4 Years
Priority  Low
Capital Cost  Phase 1: $20K; Phase 2: TBD
O&M Cost  Phase 1: $2K/year; Phase 2: TBD
Market Package  MC03 – Road Weather Data Collection
Dependency  None
Architecture  See next page
KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS

KDOT
KDOT RWIS Central Server

KDOT RWIS Stations

KDOT District/ Area/Sub-area Offices
KDOT Maintenance and Construction Vehicles

KDOT District/ Area/Sub-area Offices
KDOT District Maintenance and Construction Management Systems

road weather information
environmental conditions data
environmental probe data

evironmental sensors control
environmental probe data

Existing
Planned
**Project No.**  ITS-15

**Title**  KDOT Snow Route Design Optimization Software

**Service Area**  Maintenance and Construction Management

**Stakeholder**  KDOT

**Scope**  This project will develop the Snow Route Design Optimization Software to assist KDOT District Offices in re-designing network snow service routes to optimize the plowing process. The software can be enhanced to a master system enabling the planning, management, and scheduling of other road maintenance activities such as striping.

**Expected Benefit**
- Improved snow plow efficiency
- Reduced snow and ice control costs

**Timeframe**  Medium Term

**Duration**  2 years

**Priority**  Medium

**Capital Cost**  TBD

**O&M Cost**  TBD

**Market Package**
- MC06 – Winter Maintenance
- MC07 – Roadway Maintenance and Construction

**Dependency**  None

**Architecture**

![Architecture Diagram]

Existing

Planned
Project No. ITS-16

Title KDOT Vehicle Maintenance Management System

Service Area Maintenance and Construction Management

Stakeholder KDOT

Scope This project will deploy a system to assist KDOT in managing fleet and other maintenance and construction equipment management. This system will automate vehicle maintenance scheduling and manage routine and corrective maintenance activities based on vehicle and equipment usage and conditions and maintenance facility/personnel availability.

Expected Benefit Improved vehicle maintenance planning, scheduling and management

Timeframe Medium Term

Duration 1 Year

Priority Medium

Capital Cost TBD

O&M Cost TBD

Market Package MC02 – Maintenance and Construction Vehicle Maintenance

Dependency
- Project #11 (KDOT Maintenance Vehicle AVL and MDT) could provide vehicle usage information to support this project
- Could build upon the system in place for DSNWK in Hays
- Could be deployed in concert with Project #41 (Rural Transit Vehicle Maintenance Management System)

Architecture

```mermaid
graph LR

KDOT District/Area/Sub-area Offices --> KDOT Maintenance and Construction Vehicles

KDOT Maintenance and Construction Vehicles

KDOT District/Area/Sub-area Offices

KDOT District Maintenance and Construction Management Systems

maint and constr vehicle conditions

Planned
```
Project No. ITS-17
Title KDOT Work Zone Intrusion System
Service Area Maintenance and Construction Management
Stakeholder KDOT
Scope The work zone intrusion system will detect errant vehicles entering the work zones and provide warning to crew workers of imminent encroachment or other potential safety hazards. This will be a pilot project to test and evaluate a work zone intrusion system. Based on the results of the pilot study, KDOT will investigate the possibility to procure additional systems for future use.
Expected Benefit Improved work zone safety
Timeframe Short Term
Duration 1 Year
Priority High
Capital Cost $5K/system; $60K for pilot study
O&M Cost $500/year
Market Package MC09 – Work Zone Safety Monitoring
Dependency None
Architecture

KDOT District/ Area/Sub-area Offices
KDOT District Maintenance and Construction Management Systems

→ work zone warning status
→ work zone warning device control
→ work zone warning status

KDOT District/ Area/Sub-area Offices
KDOT Maintenance and Construction Vehicles

→ work zone warning notification

KDOT District/ Area/Sub-area Offices
KDOT Work Zone Intrusion Detection System

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th><strong>ITS-18</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KDOT KGATE Enhancements</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Data Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>KGATE is a GIS-based web portal designed to reduce road blocks to data sharing. The web portal connects to numerous KDOT geo-referenced databases or other data including digital images, multiple databases, and scanned documents. The data are linked by latitude/longitude, KDOT Location Referencing System (LRS) plus county or state log-mile start and end points, and centroid. The internal web-site provides capabilities to share KDOT data across the agency with a GIS interface. This project will enhance KGATE by incorporating more data types into the system. KGATE is currently for KDOT internal use only. KDOT plans to allow other agencies to access KDOT data through KGATE. A pilot test for allowing external access will be conducted with KHP.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | • Improved data sharing  
 | • Improved data archiving and management |
| **Timeframe**   | On-going |
| **Duration**    | 1 Year |
| **Priority**    | High |
| **Capital Cost**| TBD |
| **O&M Cost**    | TBD |
| **Market Package** | AD2 – ITS Data Warehouse |
| **Dependency**  | Support and interface with Project #19 (KDOT ITS Archive) and other existing KDOT data management systems |
| **Architecture** | See next page |
KDOT KGATE Enhancements

KDOT
- KDOT Telecommunications Infrastructure GIS Database
  - archive coordination

KDOT Bureau of Transportation Planning
- KDOT ITS Archive
  - archive coordination

KDOT
- KDOT Accident Database (KARS)
- KDOT Bureau of Transportation Planning
  - KDOT KGATE
  - archive coordination
  - archive coordination

KDOT
- KDOT Transportation Database (KANSYS)
  - archive coordination

Planned
Project No.  ITS-19
Title  KDOT ITS Archive
Service Area  Data Management
Stakeholder  KDOT
Scope  This project will develop an archiving system for KDOT Bureau of Transportation Planning that collects, stores, analyzes and reports traffic counts and classifications, geometric and accident data, mapping and GIS information, public transportation, rail, bicycle, pedestrian, and ITS.
Expected Benefit  ●  Efficient ITS data archiving and management
  ●  Effective data support for ITS planning
Timeframe  Medium Term
Duration  2 Years
Priority  Low
Capital Cost  TBD
O&M Cost  TBD
Market Package  AD1 – ITS Data Mart
Dependency  ●  Should coordinate with KANSYS and KARS on data collection and data format/presentation consistency
  ●  Could support Project #18 (KDOT KGATE Enhancements)
Architecture

KDOT District/ Area/Sub-area Offices
  KDOT District Maintenance and Construction Management Systems
  KDOT Accident Database (KARS)

KDOT
  KDOT Transportation Database (KANSYS)
  KDOT Bureau of Transportation Planning
  KDOT ITS Archive

archive status
archive coordination
archive status
archive coordination
archive status
archive coordination
Planned
Project No.: ITS-20
Title: KDOT Mayday/Automated Collision Notification Response System
Service Area: Emergency Management
Stakeholder: KDOT, KHP, KTA/KHP Troop G, 911 centers, County Sheriff's Offices, City Police Departments
Scope: This project will develop a Mayday system to receive Automated Collision Notification (ACN) calls. The system may consist of a single center or multiple centers and provide statewide service coverage. The system will require an ACN Gateway to allow calls originating in Kansas to be routed directly to the appropriate center while other calls are routed to a national responder. The project may require coordination with cellular providers and national Mayday service providers.
Expected Benefit:
- Improved emergency response
- Improved roadway assistance
- Improved personal security
Timeframe: Long Term
Duration: 2 Years
Priority: Low
Capital Cost: TBD
O&M Cost: TBD
Market Package: EM03 – Mayday and Alarms Support
Dependency: Could be implemented in conjunction with Project #21 (KDOT Mayday/ACN Service Provider Registration System)
Architecture: See next page
KDOT Mayday/ACN Response System

Travelers
Vehicle

County and City Sheriff, Police, Fire...
County and City 911 Dispatch Centers

KHP
KHP Communications Center

KDOT Bureau of Transportation Pla...
KDOT Mayday/ACN Response System

KTA
KTA Operations Center

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KDOT Mayday/Automated Collision Notification Service Provider Registration System</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Emergency Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>This project will develop a registration system for the following purposes: 1) establishing criteria for service provider registration, 2) developing necessary administrative tools and procedures, and 3) developing and executing an action plan for disseminating the registration information to the public and to service providers.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | • Improved emergency response  
  • Improved roadway assistance  
  • Improved personal security |
<p>| <strong>Timeframe</strong> | Long Term |
| <strong>Duration</strong> | 2 Years |
| <strong>Priority</strong> | Low |
| <strong>Capital Cost</strong> | TBD |
| <strong>O&amp;M Cost</strong> | TBD |
| <strong>Market Package</strong> | EM03 – Mayday and Alarms Support |
| <strong>Dependency</strong> | Could be implemented in conjunction with Project #20 (KDOT Mayday/ACN Response System) |
| <strong>Architecture</strong> | None |</p>
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th><strong>ITS-22</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KDOT Truck Routing Information System (TRIS)</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Commercial Vehicle Operations</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>TRIS is a GIS-based routing and bridge analysis system to assist KDOT and KDOR personnel to augment clearance or provide routing information for oversize and overweight trucks. The routes will be selected by analyzing the bridges, trusses, and construction or detour events along truck itinerary. TRIS is deployed in phases and the initial phases of system deployment provided the necessary information electronically to the permit clerk for routing any permit load. TRIS replaced paper maps used to verify routes and eventually will have the permit route completely selected by the computer software. TRIS will also be integrated with the similar systems developed by the neighboring states to further include border to border bridge analysis and better share the truck routing information between the states.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | • Improved oversize/overweight vehicle routing  
• Improved travel safety  
• Improved roadway infrastructure protection |
| **Timeframe** | On-going |
| **Duration** | 2 Years |
| **Priority** | High |
| **Capital Cost** | TBD |
| **O&M Cost** | TBD |
| **Market Package** | CVO04 – CV Administrative Process |
| **Dependency** | • Support Project #27 (Kansas Commercial Vehicle Information Exchange Window (CVIEW))  
• Could benefit from real-time information on road conditions and restricts provided by KANROAD |
| **Architecture** | See next page |
KDOT Truck Routing Information System (TRIS)

CVIEW Group
Kansas Commercial Vehicle Administration Legacy Systems
- credentials information
- credentials status information
- route restrictions
- safety status information

Private Trucking Companies
Private Trucking Companies
- route restrictions

CVIEW Group
Kansas CVIEW
- credentials information
- credentials status information
- route restrictions
- safety status information

KDOT
KDOT Truck Routing Information System

Planned
Project No. ITS-23
Title KDOT Remote Screening Weigh-in-Motion System
Service Area Commercial Vehicle Operations
Stakeholder KDOT, KHP
Scope A mainline weigh-in-motion system is planned on US 69. This system will allow KHP to remotely monitor commercial vehicle compliance. When an overweight truck is detected by the system, an alarm will be sent to the nearby KHP dispatch or trooper to alert them of the violation.
Expected Benefit
- Reduction of time vehicles spend on inspection
- Improved operations efficiency
- Reduced safety hazard caused by slow moving vehicles re-entering roadways
Timeframe Short Term
Duration 1 Year
Priority Medium
Capital Cost $250K/unit
O&M Cost $25K/unit/year
Market Package CVO06 – Weigh-in-Motion
Dependency None
Architecture

Private Trucking Companies
- Private Trucking Companies
- Commercial Vehicles

KHP Interstate Troops
- KHP Interstate Troops

KHP
- KHP Motor Carrier Inspectors

KDOT
- KDOT Weigh-in-Motion Stations

- Electronic screening request
- Pass/pull-in request
- Tag data
- Screening event record
- Alarm
- CVO inspector information
- CVC override mode
- CVO inspector input

Planned
Project No. ITS-24

Title KDOT Highway-Railroad Intersection ITS Project

Service Area Traffic Management

Stakeholder KDOT, Railroad Companies, Counties and Cities

Scope This project will deploy ITS technologies at or near highway-railroad intersections (HRIs). This project will consider a combination of ITS technologies for HRIs, including detectors, digital data communications, railway transponders, train location systems, electronic warning signs, radio, and wireless transmitters to improve safety, efficiency, productivity, control, and communication. The locations and technologies to be deployed will be studied and determined in the future.

Expected Benefit
- Improved roadway safety
- Improved travel information dissemination
- Improved railroad crossing safety

Timeframe Medium Term

Duration 3 Years

Priority Medium

Capital Cost TBD

O&M Cost TBD

Market Package
- ATMS06 – Traffic Information Dissemination
- ATMS13 – Standard Railroad Grade Crossing
- ATMS14 – Advanced Railroad Grade Crossing
- ATMS15 – Railroad Operations Coordination

Dependency None

Architecture See next page
<table>
<thead>
<tr>
<th>Project No.</th>
<th>ITS-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>KDOT Rest Area Weather Radio Announcement</td>
</tr>
<tr>
<td>Service Area</td>
<td>Traveler Information</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>KDOT, NOAA</td>
</tr>
<tr>
<td>Scope</td>
<td>KDOT currently has radio announcement equipment at rest areas in District 3 that broadcasts continuous weather information from the NOAA Weather Radio to travelers. KDOT plans to expand the service to other rest areas in Kansas.</td>
</tr>
</tbody>
</table>
| Expected Benefit| ● Improved traveler information dissemination  
                          ● Improved travel safety |
| Timeframe       | Medium Term             |
| Duration        | 1 Year                  |
| Priority        | Medium                  |
| Capital Cost    | TBD                     |
| O&M Cost        | TBD                     |
| Market Package  | ATIS01 – Broadcast Traveler Information |
| Dependency      | None                    |
| Architecture    |                         |

![Architecture Diagram](attachment:image)

- **KDOT**
  - KDOT Rest Area Weather Radio Equipment
  - Broadcast information

- **NOAA**
  - NOAA Weather Radio

Planned
# Project No. ITS-26

**Title**
KDOT Maintenance Decision Support System (MDSS)

**Service Area**
Maintenance and Construction Management

**Stakeholder**
KDOT, MDSS Pooled Fund Study

**Scope**
MDSS is a server- and client-side hardware and software package that provides winter maintenance support. MDSS offers visualizations of the real time maintenance data integrated from many sources (weather forecasts, RWIS, plow positions, materials, spread rates, etc.) and reports actual road conditions to establish appropriate maintenance treatments. It enables weather and roadway conditions predictions and identifies an optimal maintenance plan given user-configurable resources. MDSS also communicates recommendations to the maintenance personnel. KDOT is currently testing the MDSS in Topeka and Dodge City.

**Expected Benefit**
- Improved winter maintenance safety and operations efficiency
- Reduced snow and ice control costs
- Improved customer service
- Improved traveler information dissemination

**Timeframe**
On-going

**Duration**
3 Years

**Priority**
High

**Capital Cost**
$150K (KDOT contribution to the system development through the MDSS Pooled Fund Study)

**O&M Cost**
TBD

**Market Package**
- MC03 – Road Weather Data Collection
- MC04 – Weather Information Processing and Distribution
- MC06 – Winter Maintenance

**Dependency**
None

**Architecture**
See next page
KDOT Maintenance Decision Support System (MDSS)

KDOT District/Area/Sub-area Offices
- KDOT Maintenance and Construction Vehicles
  - Maintain and constr dispatch information
  - Maintain and constr vehicle system control
  - Maintain and constr dispatch status
  - Maintain and constr vehicle operational data

Private Information Service Providers
- Surface Transportation Weather Services
  - Transportation weather information request
  - Environmental conditions data
  - Transportation weather information
  - Environmental conditions data

NOAA
- National Weather Service
  - Weather information
  - Roadway maintenance status

KDOT Bureau of Construction and...
- KDOT Maintenance Decision Support System (MDSS)
  - Road weather information
  - Environmental conditions data
  - Environmental sensors control

KDOT
- KDOT RWIS Central Server
  - Environmental conditions data
  - Environmental sensors control

KDOT
- KDOT RWIS Stations
  - Environmental conditions data
  - Environmental sensors control

KDOT District/Area/Sub-area Offices
- KDOT District Maintenance and Construction Management Systems
  - Maintain and constr dispatch information
  - Maintain and constr vehicle system control
  - Maintain and constr dispatch status
  - Maintain and constr vehicle operational data

Existing
Project No. ITS-27

Title Kansas Commercial Vehicle Information Exchange Window (CVIEW)

Service Area Commercial Vehicle Operations

Stakeholder KDOT, KDOR, KCC, KHP

Scope CVIEW is an electronic data exchange system that will enhance efficiency, safety, compliance and enforcement for commercial vehicle operations. The Kansas CVIEW will provide carrier, vehicle, safety and credential information to fixed and mobile roadside inspection stations, state agencies, and other third party users. It will permit state agencies to perform safety checks before issuing certain types of credentials and will support the business needs of third party users such as insurers obtaining safety data to support their underwriting processes. CVIEW is a cooperative project among the KCC, KDOR, KDOT, and KHP. KHP will be the lead agency for implementing and hosting the CVIEW solution.

Expected Benefit

- Improved information exchange
- Improved efficiency in vehicle and cargo clearance

Timeframe On-going

Duration 2 Years

Priority High

Capital Cost $650K

O&M Cost $70K/year

Market Package

- CVO03 – Electronic Clearance
- CVO04 – CV Administrative Processes
- CVO07 – Roadside CVO Safety

Dependency None but could support Project #22 (KDOT Truck Routing Information System (TRIS))

Architecture See next page
Kansas Commercial Vehicle Information Exchange Window (CVIEW)
Project No. **ITS-28**

**Title**
KDOR Electronic Heavy Vehicle Use Tax Reporting

**Service Area**
Commercial Vehicle Operations

**Stakeholder**
KDOR, IRS

**Scope**
This project will provide electronic data transfer interface with the Internal Revenue Service (IRS) to electronically submit records of tax payments for IRS verification.

**Benefit**
Improved vehicle tax reporting efficiency

**Timeframe**
Short Term

**Duration**
1 Year

**Priority**
Medium

**Capital Cost**
TBD

**O&M Cost**
TBD

**Market Package**
CVO04 - Commercial vehicle administrative processes

**Dependency**
None

**Architecture**

![Architecture Diagram]

- **Private Trucking Companies**
  - Private Trucking Companies
  - audit data
  - credential application
  - tax filing

- **IRS**
  - IRS

- **KDOR**
  - KDOR Online Trucking System
  - credentials information
  - credentials status information

Existing
Planned
Project No.  ITS-29
Title  KHP Emergency Vehicles Mobile Data Units
Service Area  Emergency Management
Stakeholder  KHP
Scope  KHP is currently deploying mobile data units on 215 KHP emergency vehicles across the state. Roadside network connectivity is provided via KDOT 800 MHz radio communication network. The Mobile Data Units will allow Troopers computer access from their vehicles to request information from the Communications Center.
Expected Benefit  ● Improved communication and operation efficiency
                 ● Improved trooper safety
Timeframe  On-going
Duration  1 year
Priority  High
Capital Cost  MDT: $8K/unit; Base Station: $200K
O&M Cost  MDT: $50/unit; Base Station: $4K
Market Package  ● ATMS08 – Traffic Incident Management System
                 ● EM01 – Emergency Call Taking and Dispatch
Dependency  None
Architecture
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KHP Total Stations Enhancement</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Emergency Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KHP</td>
</tr>
</tbody>
</table>

**Scope**  
KHP desires to purchase reflector-less electronic total station equipment and upgrades for existing electronic total stationing equipment owned and operated by the KHP. The use of total stations not only decreases time and expense of accident scene investigations, but also increases the safety for the troopers and motoring public. KHP plans to purchase at least eight (8) of these packages. Additional packages may be purchased in the future as desired.

**Expected Benefit**  
- Improved roadway safety  
- Improved trooper safety  
- Improved incident investigation efficiency

**Timeframe**  
On-going

**Duration**  
2 Years

**Priority**  
High

**Capital Cost**  
TBD

**O&M Cost**  
TBD

**Market Package**  
ATMS08 – Traffic Incident Management System

**Dependency**  
None

**Architecture**  
None
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KHP Photogrammetry Project</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Emergency Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KHP</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>KHP plans to purchase a close-range photogrammetry system to assist in crash scene reconstruction and documentation. The project will equip and train KHP troopers in the operation of the photogrammetry system. The use of the system will keep traffic disruption at and near the crash scene to a minimum and enhance the safety of the troopers, emergency services personnel, and motorists.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | ● Improved roadway safety  
● Improved travel safety  
● Improved trooper safety  
● Improved incident investigation efficiency |
<p>| <strong>Timeframe</strong> | Short |
| <strong>Duration</strong> | 1 Year |
| <strong>Priority</strong> | High |
| <strong>Capital Cost</strong> | TBD |
| <strong>O&amp;M Cost</strong> | TBD |
| <strong>Market Package</strong> | ATMS08 – Traffic Incident Management System |
| <strong>Dependency</strong> | None |
| <strong>Architecture</strong> | None |</p>
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-32</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>KBI AMBER Alert System Enhancements</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Emergency Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT, KBI, KHP, KC Scout, County Sheriffs, City Police Departments</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>KDOT participates in the Kansas AMBER Alert program by using its traveler information systems to assist the Kansas Bureau of Investigation (KBI) in the dissemination of child abduction information. The Kanroad/511 website has a link to the Kansas AMBER Alert website, and Kansas 511 features an alert system that enables it to broadcast AMBER Alert information as needed. AMBER Alert messages are also placed on Dynamic Message Signs (DMS) across the state and disseminated to traffic operations centers (TOCs) such as Kansas City Scout. KDOT’s future plans call for improving the efficiency of information dissemination by automating the communication of AMBER Alerts to 511, websites, and TOCs.</td>
</tr>
<tr>
<td><strong>Expected Benefit</strong></td>
<td>Improved AMBER alert operation efficiency and communications</td>
</tr>
<tr>
<td><strong>Timeframe</strong></td>
<td>On-going</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>2 Years</td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td>High</td>
</tr>
<tr>
<td><strong>Capital Cost</strong></td>
<td>$3K</td>
</tr>
<tr>
<td><strong>O&amp;M Cost</strong></td>
<td>Staff Time (TBD)</td>
</tr>
<tr>
<td><strong>Market Package</strong></td>
<td>EM06 – Wide-Area Alert</td>
</tr>
<tr>
<td><strong>Dependency</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td>See next 2 pages</td>
</tr>
</tbody>
</table>
### Project No. **ITS-33**

**Title**  
KTA Service Area Kiosks

**Service Area**  
Traveler Information

**Stakeholder**  
KTA, KDOT

**Scope**  
This project will deploy kiosks in KTA service areas to provide travel information to motorists traveling along the Kansas Turnpike. The information provided by the kiosks will include maps, traffic conditions, maintenance and construction information, road and weather conditions, and general turnpike service information, as well as food, lodging, scenic attractions and other travel related information.

**Expected Benefit**
- Improved travel and service information dissemination
- Increased traveler satisfaction
- Improved travel safety

**Timeframe**  
Short Term

**Duration**  
2 Years

**Priority**  
Medium

**Capital Cost**  
Software and Integration: $10K; Kiosk: $20K/unit

**O&M Cost**  
$2K/unit/year

**Market Package**  
ATIS01 – Broadcast Traveler Information

**Dependency**
- Could follow the KDOT system/model for kiosks at rest areas (Project #8)
- Could be linked with KDOT KANROAD and 511 systems

### Architecture

```
Travelers
  Traveler
    ➜ traveler interface updates

KTA
  KTA Operations Center

KTA
  KTA Service Area Kiosks
    ➜ broadcast information
```

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-34</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Kansas Airport Security Monitoring Systems</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Emergency Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>KDOT, Airports</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>This project will install security cameras to monitor airport infrastructures for security. The video images collected from the cameras will be transmitted to the airport operations center for incident and threat identification and verification. Upon confirmation, threat information will be communicated with homeland security, emergency management, and law enforcement agencies for immediate assistance and support.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | • Improved airport security and infrastructure protection  
• Improved personal security |
| **Timeframe**  | Medium Term |
| **Duration**   | 1 Year |
| **Priority**   | Low |
| **Capital Cost** | $250K/system |
| **O&M Cost**   | $600/system plus staff labor for operation |
| **Market Package** | EM05 – Transportation Infrastructure Protection |
| **Dependency** | None |
| **Architecture** | See next page |
Kansas Airport Security Monitoring Systems

Airports
- Airports Security Monitoring Field Equipment
  - Secure area surveillance control
  - Secure area surveillance data

County and City Sheriff, Police, Fire...
- County and City 911 Dispatch Centers
  - Incident report
  - Threat information coordination

Airports
- Incident report
- Threat information coordination

County Emergency Management A...
- County Emergency Operations Centers
  - Incident report
  - Threat information coordination

KDEM
- KDEM State Emergency Operations Center
  - Incident report
  - Threat information coordination

Existing
Planned
Project No. ITS-35
Title Kansas Alternate Route Planning
Service Area Traffic Management, Emergency Management, Traveler Information
Stakeholder KDOT, KDEM, KHP, KTA, Counties, Cities
Scope This will be a series of projects that develop alternate route plans for emergency and incident situation in various areas/regions. The projects will identify and evaluate alternate routes and develop strategies and procedures to implement alternate routes. These projects will be cooperative efforts among multiple agencies, including planning, traffic management, traffic engineering, emergency management, law enforcement, and roadway maintenance and construction.
Expected Benefit
- Reduced secondary incidents
- Reduced vehicle fuel consumption and emissions
- Improved response time to traffic incidents and other emergencies
- Reduced motorist stress levels
- Improved travel information dissemination
Timeframe Medium Term
Duration 1 Year
Priority Medium
Capital Cost $150K/study
O&M Cost TBD
Market Package ATMS08 – Traffic Incident Management System
Dependency None
Architecture None
Project No. ITS-36

Title Rural Transit Computer Aided Dispatch, Automatic Vehicle Location and Mobile Data Terminal

Service Area Public Transportation

Stakeholder Rural Transit Service Providers, KDOT

Scope DSNWK (Developmental Services for Northwest Kansas) in Hays and RCAT (Reno County Area Transportation) in Hutchinson have installed computer aided dispatch (CAD), Automatic Vehicle Location (AVL) and Mobile Data Terminal (MDT) on their transit fleets. The project will install similar systems to other rural transit systems. In the near term, the transit systems in Garden City will be outfitted with such a system. Other transit agencies, including the Sunflower Diversified Services, will have a similar system installed in the future. Implementation of the system will be a joint effort by rural transit agencies and KDOT.

Expected Benefit
- Improved transit services
- Improved transit operation efficiency
- Improved transit users satisfaction

Timeframe Short to Medium Term

Duration TBD

Priority Medium

Capital Cost
- CAD System for Dispatch Center: $120K
- AVL and MDT: $5K/vehicle

O&M Cost
- CAD: $1K/year
- AVL/MDT: $100/vehicle/year

Market Package
- APTS1 – Transit Vehicle Tracking
- APTS2 – Transit Fixed-Route Operations
- APTS3 – Demand Response Transit Operations

Dependency Support provision of transit traveler information for Projects #39 (Rural Transit Kiosks), #40 (Rural Transit Pre-trip Planning), and #43 (Rural Transit On-board Display/Audio)

Architecture See next page
Rural Transit Computer Aided Dispatch, Automatic Vehicle Location and Mobile Data Terminal

Diagram:
- Rural Transit Providers
  - Rural Transit Systems Operations Centers
  - transit vehicle location data
  - transit vehicle passenger and use data
  - transit vehicle schedule performance
  - transit schedule information
  - transit vehicle operator information

- Travelers
  - Vehicle

- Planned

Rural Transit Systems Transit Vehicles
**Project No.**    ITS-37  
**Title**    Rural Transit On-board Cameras  
**Service Area**    Public Transportation, Emergency Management  
**Stakeholder**    Rural Transit Service Providers, KDOT  

**Scope**    This project will install a security system on board of transit vehicles to provide physical security for transit passengers and vehicle operators. The system will include surveillance cameras, audio systems, and/or event recorders. The cameras will provide in-vehicle surveillance to warn of potentially hazardous situations. Transit operators or passengers can activate alarms that are installed on-board. This project will evaluate an initial deployment on a small number of vehicles.

**Expected Benefit**    
- Improved passenger and transit operator security  
- Improved emergency response efficiency  

**Timeframe**    Short Term  
**Duration**    1.5 Years  
**Priority**    Medium  
**Capital Cost**    Security camera: $8K/vehicle; Transit center hardware and software: $30K  
**O&M Cost**    Camera: $250/vehicle/year; Hardware/software: $1K/year  
**Market Package**    APTS5 – Transit Security  
**Dependency**    None  

**Architecture**

![Architecture Diagram]

*Planned*
Project No. ITS-38

Title Rural Transit Electronic Fare Payment System

Service Area Public Transportation

Stakeholder Rural Transit Service Providers, KDOT

Scope This project will implement an electronic fare payment system for fare collection in transit vehicles. Installation of automatic passenger counting equipment will also be considered. DSNWK and Finney County Committee on Aging are interested in deploying such systems.

Expected Benefit
- Improved transit operation efficiency
- Improved fare and passenger data collection and management
- Improved quality of transit services

Timeframe Medium Term

Duration 1 Year

Priority Medium

Capital Cost
- Electronic fare box: $1K/vehicle; Center software/hardware/integration: TBD

O&M Cost $100/vehicle/year; Center software/hardware: TBD

Market Package APTS4 – Transit Passenger and Fare Management

Dependency None

Architecture

[Diagram showing the interaction between Rural Transit Providers, Rural Transit Systems Operations Centers, Traveler Card, and Transit Vehicles, highlighting fare and payment status, request for bad tag list, transit vehicle passenger and use data, bad tag list, fare management information, and request for payment.]

Planned
**Project No.**  ITS-39  
**Title**  Rural Transit Kiosks  
**Service Area**  Public Transportation, Traveler Information  
**Stakeholder**  Rural Transit Service Providers, KDOT  
**Scope**  This project will install kiosks at major transit stations and stops to disseminate transit related information. Finney County Committee on Aging is interested in such a project. Other rural transit systems may also deploy similar systems.  
**Expected Benefit**  
- Improved transit traveler information  
- Increased customer satisfaction  
**Timeframe**  Medium Term  
**Duration**  2 Years  
**Priority**  Low  
**Capital Cost**  Software and integration: $10K; Kiosks: $20K/unit  
**O&M Cost**  $2K/unit/year  
**Market Package**  APTS8 – Transit Traveler Information  
**Dependency**  
- Project #36 (Rural Transit CAD, AVL and MTD) could support this project with providing real-time transit vehicle location and travel information  
- Project #40 (Rural Transit Pre-trip Planning) could provide added functionality to the system  
- Deployment could follow the KDOT system/model for Project #8 (KDOT Rest Area Kiosks)  
**Architecture**
Project No.  ITS-40
Title  Rural Transit Pre-trip Planning
Service Area  Public Transportation, Traveler Information
Stakeholder  Rural Transit Service Providers, KDOT
Scope  This project will develop a pre-trip planning system for rural transit systems. This system will provide pre-trip planning capability via the Internet and/or kiosks. The Finney County Committee on Aging is considering the development of a pre-trip planning system. Other rural transit systems may also consider a similar system.
Expected Benefit  ● Improved transit traveler information  
                   ● Increased customer satisfaction
Timeframe  Medium Term
Duration  2 Years
Priority  Low
Capital Cost  TBD
O&M Cost  TBD
Market Package  APTS8 – Transit Traveler Information
Dependency  Could support or be integrated with Project #39 (Rural Transit Kiosks)
Architecture  See next page
Rural Transit Pre-trip Planning

Rural Transit Providers
- Rural Transit Systems Operations Centers
- Rural Transit Systems Websites

Travelers
- Traveler

User Personal Computing Devices
- traveler inputs
- traveler interface updates
- transit and fare schedules
- transit information request

Rural Transit Providers
- Rural Transit Systems Kiosks

Urban Transit Providers
- Urban Transit Systems Operations Centers

Existing
- personal transit information
- transit information user request

Planned
- traveler interface updates
- traveler inputs
Project No. ITS-41
Title Rural Transit Vehicle Maintenance Management System
Service Area Public Transportation
Stakeholder Rural Transit Service Providers, KDOT
Scope This project will deploy a system to assist rural transit systems in managing the maintenance activities for their fleets. This system will automate vehicle maintenance scheduling and manage routine and corrective maintenance activities based on vehicle usage and conditions and maintenance staff availability. A system will be implemented in Salina. Finney County Committee on Aging is also interested in implementing such a system.
Expected Benefit Improved vehicle maintenance planning, scheduling and management
Timeframe Short to Medium Term
Duration 2 Years
Priority Medium
Capital Cost TBD
O&M Cost TBD
Market Package APTS6 – Transit Maintenance
Dependency Build upon the system in place for DSNWK in Hays
Architecture

```
Rural Transit Providers
| Rural Transit Systems Transit Vehicles

request for vehicle measures
transit vehicle conditions

Rural Transit Providers
| Rural Transit Systems Maintenance Facilities

Planned
```
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th>ITS-42</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Rural Transit Security Monitoring System</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Public Transportation</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>Rural Transit Service Providers, KDOT</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>This project will deploy security systems to monitor transit stops, stations, garages, and transit yards. The system includes surveillance cameras and security alarms. Transit center dispatches can monitor the surveillance cameras remotely, and transit system personnel and passengers can activate alarms. Finney County Committee on Aging is interested in deploying the system to monitor transit yards and bus stops.</td>
</tr>
</tbody>
</table>
| **Expected Benefit** | - Improved transit infrastructure security monitoring  
  - Improved personal security  
  - Improved emergency response |
| **Timeframe**   | Medium Term |
| **Duration**    | 1 Year |
| **Priority**    | Medium |
| **Capital Cost**| $250K |
| **O&M Cost**    | $600/year plus labor for operation |
| **Market Package** | APTS5 – Transit Security |
| **Dependency**  | None |

**Architecture**

```
Rural Transit Providers
Rural Transit Systems Operations Centers

| secure area surveillance data |
| secure area surveillance control |

Rural Transit Providers
Rural Transit Systems Security Monitoring System
```

Planned
Project No.  ITS-43
Title                  Rural Transit On-board Display/Audio System
Service Area          Public Transportation
Stakeholder           Rural Transit Service Providers, KDOT
Scope                  This project will install displays and/or audio equipment on board of transit vehicles to disseminate transit information to passengers. The information provided will include transit stop announcement, real-time transit schedule, fare rates, routes, and other transit services information that are of general interest to transit users. Finney County Committee on Aging plans to install such a system.
Expected Benefit       • Improved transit traveler information
                        • Increased customer satisfaction
Timeframe             Long Term
Duration               1.5 years
Priority              Medium
Capital Cost           $5K/vehicle
O&M Cost              $500/vehicle
Market Package        APTS8 – Transit Traveler Information
Dependency            Project #36 (Rural Transit CAD, AVL and MDT) could support this project with providing real-time transit vehicle location information

Architecture

```
Rural Transit Providers
Rural Transit Systems Operations Centers

Travelers
Traveler

Rural Transit Providers
Rural Transit Systems Transit Vehicles

↑ transit traveler request
↑ transit traveler information
↓ traveler interface updates
```

Planned
<table>
<thead>
<tr>
<th><strong>Project No.</strong></th>
<th><strong>ITS-44</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>County and City Traffic Data Collection</td>
</tr>
<tr>
<td><strong>Service Area</strong></td>
<td>Traffic Management</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>County and City</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>This project will install detectors to collect traffic flow data (volume, speed, and/or occupancy). City of Junction City plans to install traffic sensors on the city street network.</td>
</tr>
<tr>
<td><strong>Expected Benefit</strong></td>
<td>Improved data collection and traffic monitoring capability</td>
</tr>
<tr>
<td><strong>Timeframe</strong></td>
<td>Short Term</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>1 Year</td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td>High</td>
</tr>
<tr>
<td><strong>Capital Cost</strong></td>
<td>Hardware/software: $180K; Detector (loop): $2K/unit</td>
</tr>
<tr>
<td><strong>O&amp;M Cost</strong></td>
<td>Hardware/software: $8K/year; Detector: $180/site</td>
</tr>
<tr>
<td><strong>Market Package</strong></td>
<td>ATMS01 – Network Surveillance</td>
</tr>
<tr>
<td><strong>Dependency</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td></td>
</tr>
</tbody>
</table>

![Architecture Diagram](planned.png)
Project No. ITS-45

Title County and City Signal System Coordination and Operation

Service Area Traffic Management

Stakeholder County and City

Scope This project will implement signal timing coordination to facilitate more efficient movement of traffic, particularly during peak hours. The project will include designing or updating and implementing signal timing plans, installing interconnects, and upgrading controller hardware and/or software. Several cities, including Great Bend and Manhattan, will implement signal coordination and operation.

Expected Benefit
- Improved efficiency in traffic operations
- Reduction in travel time and delay
- Reduction in fuel consumption and air pollution

Timeframe Short Term

Duration 2 Years

Priority High

Capital Cost TBD

O&M Cost TBD

Market Package
- ATMS03 – Surface Street Control
- ATMS07 – Regional Traffic Control

Dependency None

Architecture

Counts and Cities
County Engineering and City Public Works Offices

Counts and Cities
County and City Traffic Signal Systems

Planned
**Project No.**  ITS-46  
**Title**  County and City Mobile Speed Monitoring Trailer  
**Service Area**  Traffic Management  
**Stakeholder**  County and City  
**Scope**  Garden City will procure a mobile speed monitoring trailer in promoting speed limit compliance. This system will provide suggested safe driving speed to the vehicles if an excessive speed is detected. The system provides flexibility to place the trailer at locations where the speeding problem is identified. The system can also be used for speed data collection to support traffic analysis and safety studies.

**Expected Benefit**  
- Improved travel safety  
- Reduced enforcement cost

**Timeframe**  Short Term  
**Duration**  6 Months  
**Priority**  High  
**Capital Cost**  $12K/trailer  
**O&M Cost**  $1K/trailer/year  
**Market Package**  ATMS19 – Speed Monitoring  
**Dependency**  None

**Architecture**

![Architecture Diagram]

Planned
Project No. ITS-47

Title County and City Portable Dynamic Message Signs

Service Area Traffic Management, Traveler Information

Stakeholder County and City

Scope Several cities and counties, including Dodge City, will procure portable dynamic message signs (DMSs) for directing traffic during special events, maintenance and construction activities, and incident management.

Expected Benefit
- Improved travel information dissemination
- Improved incident management
- Improved work zone safety and management

Timeframe Short Term

Duration 1 Year

Priority High

Capital Cost $30K-$45K/DMS

O&M Cost $1.5K/DMS

Market Package
- ATMS06 – Traffic Information Dissemination
- MC08 – Work Zone Management

Dependency None

Architecture

Counties and Cities
County Engineering and City Public Works Offices

Roadway information system status
Roadway information system data

Travelers
Driver

Counts and Cities
County and City Portable DMS

driver information

Planned
Project No.  ITS-48  
Title  County and City Maintenance Vehicle Computer Aided Dispatch  
Service Area  Maintenance and Construction Management  
Stakeholder  County and City  
Scope  This project will install computer aided dispatch (CAD) system to dispatch maintenance vehicles for planned activities (road maintenance, snow plowing, etc.) and unplanned incidents. The project will enhance the response to the planned and unplanned roadway maintenance and incident assistance requests.  
Expected Benefit  
• Improved efficiency in maintenance vehicle operation  
• Improved response to roadway maintenance and incident assistance request  
Timeframe  Short Term  
Duration  2 Years  
Priority  High  
Capital Cost  $120K  
O&M Cost  $1K/year  
Market Package  
• MC06 – Winter Maintenance  
• MC07 – Roadway Maintenance and Construction  
Dependency  Could be implemented in conjunction with Project #49 (County and City Communications Center Upgrade)  

Architecture
**Project No.**  ITS-49  
**Title**  County and City Communications Center Upgrade  
**Service Area**  Emergency Management  
**Stakeholder**  County and City  
**Scope**  This project will deploy center-related improvements, including installing or upgrading computer aided dispatch (CAD) systems, consolidating different communication centers, supporting and improving emergency routing, and/or other measures. Several counties, including Cheyenne County and Ellis County, are looking into installing CAD systems.  
**Expected Benefit**  
- Improved emergency response  
- Improved inter-agency communication and coordination  
**Timeframe**  Short Term  
**Duration**  2 Year  
**Priority**  High  
**Capital Cost**  TBD  
**O&M Cost/Year**  TBD  
**Market Package**  
- EM01 – Emergency Call-Taking and Dispatch  
- EM02 – Emergency Routing  
**Dependency**  CAD could be implemented in conjunction with Project #48 (County and City Maintenance Vehicle CAD)  
**Architecture**  See next page
**Project No.**  ITS-50

**Title**  County and City Emergency Vehicle Preemption

**Service Area**  Emergency Management

**Stakeholder**  County and City

**Scope**  This project will install emergency vehicle preemption (EVP) systems at signalized intersections as well as on emergency vehicles for emergency vehicle signal preemption. A number of counties and cities, including Dodge City, Hutchinson, Junction City, and Hamilton County, will deploy such systems.

**Expected Benefit**  Improved emergency response

**Timeframe**  Short Term

**Duration**  2 Years

**Priority**  High

**Capital Cost**  $10K/intersection; $2K/vehicle

**O&M Cost**  $800/intersection/year; $200/vehicle/year

**Market Package**  EM02 – Emergency Routing

**Dependency**  None

**Architecture**

```
County and City Sheriff, Police, Fire,...
County and City 911 Dispatch Centers

County and City Traffic Signal Systems

Counties and Cities

emergency routes
emergency traffic control information
road network conditions
emergency route request
emergency traffic control request

local signal preemption request
suggested route

signal control data
request for right-of-way
signal control status

County and City Sheriff, Police, Fire,...
County and City Emergency Vehicles

County Engineering and City Public Works Offices
```

Planned
Project No. ITS-51

Title County and City Emergency Vehicle Automatic Vehicle Location and Mobile Data Terminal

Service Area Emergency Management

Stakeholder County and City

Scope This project will install AVL and MDT on emergency vehicle fleet to track vehicles locations and improve communications. City of Hays has received funding approval for such deployment. Several counties, including Riley County, Russell County, Saline County, and Neosho County, also plan to install AVL systems. Butler County is also interested in installing MDT to receive dispatch information, mapping, etc.

Expected Benefit
- Improved emergency response
- Improved emergency operation efficiency

Timeframe Short Term

Duration 2 Years

Priority High

Capital Cost $10K/vehicle; Base station: $200K

O&M Cost/Year $100/vehicle/year; Base station: $4K/year

Market Package
- EM01 – Emergency Call-Taking and Dispatch
- EM02 – Emergency Routing

Dependency
- Could be implemented and integrated with Project #49 (County and City Communications Center Upgrade)
- Could model the KDOT system in Project #11 (KDOT Winter Maintenance Vehicles AVL and MDT)

Architecture

County and City Sheriff, Police, Fire...
County and City Emergency Vehicles

County and City Sheriff, Police, Fire...
County and City 911 Dispatch Centers

Planned
Project No. ITS-52

Title County and City Database and GIS Support

Service Area Data Management

Stakeholder County and City

Scope This project will implement data management systems to assist counties and cities in archiving and managing data for a variety of uses. Data may include traffic volumes, crash data and history, types of roadway and surface, construction history, field device inventory and locations, road construction and detour information, infrastructure inventory, locations and diagrams, etc. The systems will function similarly to a data clearinghouse and use Geographic Information System (GIS) to support data management. Junction City, Newton, Hays, Hutchinson, Ellis County, Russell County, and Marion County are interested in implementing such systems.

Expected Benefit
- Improved data management
- Improved coordination and facilitation for transportation/ITS planning
- Improved traveler information dissemination

Timeframe Short to Medium Term

Duration 3 Years

Priority Medium

Capital Cost TBD

O&M Cost TBD

Market Package AD2 – ITS Data Warehouse

Dependency Systems could be shared with other counties, cities and KDOT

Architecture See next page
5. IMPLEMENTATION SEQUENCING

This section identifies the overall vision and approach for ITS system deployments over the next 15 years throughout Kansas. Detailed project descriptions are provided in Section 4. These project descriptions depict the project concept, expected benefits, a cost estimate for deployment, operations and maintenance, and potential functions of the system in terms of market packages. It should be noted that the cost estimates are based on current technologies that are most likely to be deployed, along with many assumptions. Final costs may vary based on site-specific circumstances and are more accurately determined during the design/preliminary engineering phase.

Table 5-1 illustrates the implementation sequencing and schedule for the 52 planned and potential ITS projects identified in Section 4. These projects are organized based on their implementation timeframes (i.e. short, medium, and long terms). This implementation schedule is subject to change over time as projects are deployed or priorities change. Factors such as funding, impact of previous deployments, and unforeseen circumstances may require alternations of some projects, especially those scheduled for deployment in later years. As such, it is recommended that this implementation sequence and schedule is evaluated on an annual basis.
<table>
<thead>
<tr>
<th>No</th>
<th>Project Title</th>
<th>Time Frame</th>
<th>Priority</th>
<th>Short Term</th>
<th>Medium Term</th>
<th>Long Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>KDOT Rest Areas Wi-Fi</td>
<td>On-Going</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>KDOT Winter Maintenance Vehicles AVL and MDT</td>
<td>On-Going</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>KDOT KGATE Enhancements</td>
<td>On-Going</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>KDOT Truck Routing Information System (TRIS)</td>
<td>On-Going</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>KDOT Maintenance Decision Support System (MDSS)</td>
<td>On-Going</td>
<td>High</td>
<td></td>
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</tr>
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<td>27</td>
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6. ITS STANDARDS

ITS Standards are fundamental to the establishment of an open ITS environment that achieves the goals originally envisioned by the U.S. Department of Transportation. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Standards can be thought of as the glue that holds the various pieces of architecture together. The logical architecture presents a functional view of the ITS user services. It defines the functions or processes that are required to perform the selected ITS user services, and the information or data flows that need to be exchanged between these functions. The physical architecture partitions the functions defined by the logical architecture into systems and subsystems. To accomplish the functions outlined in the logical architecture, communication must take place between the elements of the physical architecture. Standards define how these communications take place.

6.1 Standards Benefits

Many of the benefits the public receives from the National ITS Architecture are a direct result of the development and implementation of standards. Primarily, standards provide benefits in the following areas:

- **National Compatibility** – National compatibility is represented by the ability to use the same equipment and services, regardless of the geographical location. The architecture identifies specific interfaces requiring nationwide compatibility. Examples include the delivery of real-time traveler information to in-vehicle devices and the dedicated short-range interface between the vehicle and the roadside. Nationwide standards for these types of interfaces will allow travelers and commercial vehicles to use their compliant equipment anywhere within the United States.

- **Multiple Suppliers** – The architecture can encourage competition in the delivery of ITS services through the implementation of standards in areas where a standard is not necessarily required to provide a traveler with seamless operation of his ITS service. These interfaces will benefit from standards in allowing multiple suppliers of equipment and software that will directly connect to other ITS systems.

- **Ranges of Functionality** – The standard packages contain data flows that support several levels of service. For example, the *trip plan* data flow contains a large number of optional data fields. The standards developer is encouraged to maintain the flexibility in the data flow specifications to allow for multiple implementations.

- **Synergy** – As discussed above, the architecture began with a logical architecture that satisfied the identified user services. As a result, there are functions and data flows common to several of the services. These “processes” appear in several higher-level data flows, and because they come from a single source they support synergy and consistency.

- **Risk Reduction** – The architecture reduces risk to public providers, private providers and consumers. For public providers, existence of standards means that equipment purchased one year will be likely to operate with new equipment purchased several years from now. This also means that agencies will not be locked into specific vendors since all vendors will be able to build to the same standard. For private providers, existence of standards means that they can gather information from multiple sources using well-defined message sets and thereby increase the level of service to their customers. For consumers, products built to a particular standard will allow a user to select their service provider from a number of companies, not just the company with which their equipment happens to be compatible.

Defined standards are fundamental to the establishment of nationally compatible and interoperable ITS deployments. Standards will enable deployment of consistent, non-interfering, reliable systems on local, regional and national levels. Open standards will further benefit the consumer by enhancing competition for the range of products necessary to implement the ITS user services. Larger markets for specific products will reduce production costs through economy of scale. Producers benefit from standards
because they assure a wide market over which the product can be sold. As deployment occurs, diverse systems will be developed to address the special needs of urban, suburban and rural environments. Standards will ensure interoperability across these implementations without impeding innovation as technology advances and new approaches evolve.

Well-chosen, well-timed, and broadly accepted standards can provide the following frequently referenced benefits:

- **Interoperability between diverse systems** – This benefit facilitates cost-effective area-wide implementations that ultimately provide enhanced service to the consumer.
- **Preservation of investment** – Timely standards can reduce investments in multiple incompatible approaches, some of which will become casualties of natural selection in the market place.
- **Technology insertion** – Systems can be incrementally improved to take advantage of new technologies.
- **Creation of broader markets** – Interoperability standards set the stage for national and/or international markets. The lack of a standard may ultimately limit the size of the market.
- **Interchangeability** – Interchangeable equipment reduces capital costs through increased competition and reduces maintenance costs through smaller spares inventories of less expensive replacement parts.

Note that the adopted standards must be comprehensive to support interoperability. There are several examples in which hastily developed and adopted standards have not included sufficient specification to guarantee interoperability between standard-compliant systems.

### 6.2 Using Standards

Over 100 standards have been identified as part of the National ITS Architecture standard development activities. The task of working with public and private sector ITS community to develop these standards has been tasked to seven different standards development organizations (SDOs). These SDOs include:

- American Association of State Highway and Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Organization for Standardization (ISO)
- Institute of Transportation Engineers (ITE)
- National Electrical Manufactures Association (NEMA)
- Society of Automotive Engineers (SAE)

Information on the complete list of ITS Standards can be found on the ITS Standards webpage at [http://www.standards.its.dot.gov/](http://www.standards.its.dot.gov/).

While the Kansas Statewide ITS Architecture is a comprehensive plan which includes various ITS applications, it does not cover every conceivable ITS technology. As such, not all ITS standards will be applicable to the existing and proposed projects. Table 6-1 summarizes the appropriate ITS standards for all existing and proposed projects in Kansas.

It should be noted that the ITS standards presented in Table 6-1 may represent a superset of options, and in some cases, provide redundant capabilities. In addition, these ITS standards are at different levels of maturity as noted in the status column in the table. Care should be taken to select the standards that best meet the needs of the regional or project.
Table 6-1. Key Standards Supporting the ITS Projects in Kansas

*Status (as of May 2007):
P – Published: Standards that are available for purchase.
A – Approved: Standards that have passed all necessary ballots and have been approved by a standards
development organization, but not yet published.
B – In Ballot: Standards that are being voted upon by a committee or working group, or are undergoing other
SDO procedures.
U – Under Development: Standards that are being written, but are not yet ready for a formal ballot.
S – Standard Development Work has been suspended; or standards have been withdrawn.

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6.3 Mapping of Standards to Application Areas

Table 6-2 provides a guide to ITS standards that could be considered for use in different types of ITS projects in Kansas. Each row in the table represents an ITS standard and each column represents one of nineteen application areas. The standards included in the table are those that relate to the subsystems and information flows between them that are likely to be included in the ITS projects in Kansas. The application areas are deployment-oriented categories that focus on specific ITS services or systems. Each application area consists of one or more interfaces in the National ITS Architecture. They were chosen so that agencies and service providers can easily find the application area within which a particular ITS project fits. Most ITS projects will relate to only one application area, although larger projects may relate to more than one application area.

Note that not all interfaces in the Kansas Statewide ITS Architecture are represented by an application area. This is because not all interfaces are currently represented by approved or published ITS standards. Additional application areas may be added in the future as additional ITS standards become available. The inclusion of a standard in an application area indicates that standard may apply—not that it must apply. On the other hand, the exclusion of a standard from an application area does not mean that the standard may not be used in a project for that application area. For example, traffic management standards do not include traveler information standards; however, traffic management centers may benefit from knowing what traveler information systems do with the information.

The following key standards that support ITS projects in Kansas are not included in the Application Area Matrix. These standards are mapped to the National ITS Architecture and are not assigned to specific application areas.

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<tr>
<td>SAE</td>
<td>J2540/2</td>
<td>ITIS (International Traveler Information Systems) Phrase Lists</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>SAE</td>
<td>J2540/3</td>
<td>National Names Phrase List</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>
7. AGENCY AGREEMENTS

The Kansas Statewide ITS Architecture provides both a technical and institutional framework for the deployment of ITS in Kansas. Institutional integration involves cooperation and coordination between various agencies and jurisdictions to achieve seamless operations and interoperability.

There are several types of arrangements associated with the interfaces identified in the Kansas Statewide ITS Architecture. Information sharing and exchanges between systems require knowledge of the transmission protocol and data formats to ensure compatibility. Coordinating field device operations owned by different agencies requires defined procedures for submitting message requests and rules governing when such requests can be honored. Such coordination may be done with informal arrangements such as a Memorandum of Understanding (MOU). Sharing control of field devices operated by different agencies could involve more liability issues, which may require more formal agreements. Coordinated incident response may also require formal agreements, but also requires group training of personnel from various agencies. Agreements may be obtained for data sharing, procedure, operation, maintenance, and training.

Some common types of agreements are listed in Table 7-1. The agreement process may begin with something as simple as a handshake agreement. However, once interconnections and integration of systems begin, agencies may want to have something more substantial in place. A documented agreement will aid agencies in planning their operational costs, understanding their respective roles and responsibilities, and build trust for future projects. Formal agreements may be necessary where funding or financial arrangements are defined or participation in large regionally significant projects is required.

Table 7-2 presents a list of existing and potential agreements that would be required for the implementation and operation of an integrated ITS system in Kansas.

<table>
<thead>
<tr>
<th>Type of Agreement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handshake Agreement</td>
<td>• Early agreement between one or more partners</td>
</tr>
<tr>
<td></td>
<td>• Not recommended for long term operations</td>
</tr>
<tr>
<td>Memorandum of Understanding (MOU)</td>
<td>• Initial agreement used to provide minimal detail and usually demonstrating a general consensus</td>
</tr>
<tr>
<td></td>
<td>• Used to expand a more detailed agreement like a Interagency Agreement which may be broad in scope but contains all of the standard contract clauses required by a specific agency</td>
</tr>
<tr>
<td></td>
<td>• May serve as a means to modify a much broader Master Funding Agreement, allowing the master agreement to cover various ITS projects throughout the region and the MOUs to specify the scope and differences between the projects</td>
</tr>
<tr>
<td>Interagency Agreement</td>
<td>• Between local public agencies (e.g., transit authorities, cities, counties, etc.) for operations, services, or funding</td>
</tr>
<tr>
<td></td>
<td>• Documents responsibility, functions and liability, at a minimum</td>
</tr>
<tr>
<td>Intergovernmental Agreement</td>
<td>• Between governmental agencies (e.g., agreements between State DOTs, MPOs, etc.)</td>
</tr>
<tr>
<td>Operational Agreement</td>
<td>• Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency</td>
</tr>
<tr>
<td></td>
<td>• Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained</td>
</tr>
</tbody>
</table>
Table 7-1. (continued)

<table>
<thead>
<tr>
<th>Type of Agreement</th>
<th>Description</th>
</tr>
</thead>
</table>
| Funding Agreement | • Documents the funding arrangements for ITS projects (and other projects)  
                    • Includes at a minimum standard funding clauses, detailed scope,  
                      services to be performed, detailed project budgets, etc. |
| Master Agreements | • Standard contract and/or legal verbiage for a specific agency and  
                      serving as a master agreement by which all business is done and  
                      can be found in the legal department of many public agencies  
                      • Allows states, cities, transit agencies, and other public agencies that  
                        do business with the same agencies over and over (e.g., cities and  
                        counties) to have one Master Agreement that uses smaller  
                        agreements (e.g., MOUs, Scope-of-Work and Budget Modifications,  
                        Funding Agreements, Project Agreements, etc.) to modify or expand  
                        the boundaries of the larger agreement to include more specific  
                        language |

Table 7-2. Kansas Statewide ITS Architecture Existing/Potential Agreements

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Description</th>
<th>Associated Stakeholder</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-State AMBER Alert Agreement</td>
<td>Address AMBER Alert plan operational issues across state borders</td>
<td>KBI, KDOT, KHP, Neighboring State DOTs/DOR</td>
<td>Existing/Potential</td>
</tr>
</tbody>
</table>
| Inter-State Data Sharing Agreement | Address the exchange of information between state DOTs/DOR. The data may include 511 traveler  
                                         information, road conditions, traffic flow, etc.                                       | KDOT, Neighboring State DOTs/DOR                                                          | Existing/Potential |
| Inter-State Operations Agreement   | Address system integration, equipment operation coordination, equipment maintenance, operational  
                                         information exchanging and other issues across state borders. Equipment may include CCTV,  
                                         DMS, etc.                                                                                 | KDOT, Neighboring State DOTs/DOR                                                          | Existing/Potential |
| Inter-State Incident Response      | Support incident information notification, incident response coordination, resource               | KDOT, KHP, Neighboring State DOTs/DOR, Neighboring State Patrols, County and City Public  
Coordination Agreement | coordination, etc. among multiple agencies across state borders.                             | Safety Agencies, County and City Traffic Management and Maintenance Agencies, other      | Existing/Potential |
<pre><code>                                     |                                                                                               | agencies                                                               |
</code></pre>
<table>
<thead>
<tr>
<th>Agreement</th>
<th>Description</th>
<th>Associated Stakeholder</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-Agency Data Sharing Agreement</td>
<td>Address the exchange of data between different agencies in different regions. However, informally, the exchange of information may occur on an as-needed basis. Data may include traffic flow, video images, road weather, road conditions, etc.</td>
<td>KDOT, KDEM, KDOR, KHP, KCC, County and City Traffic Management Agencies, County and City Public Safety Agencies, Media Outlets, Private Information Service Providers</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Inter-Agency Operations Agreement</td>
<td>Address equipment operation coordination, equipment maintenance, operational information exchange and other issues. Equipment may include traffic signal systems, DMS, CCTV, etc.</td>
<td>KDOT, KHP, KDEM, County and City Traffic Management Agencies, County and City Public Safety Agencies</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Multi-Agency Communication Infrastructure Sharing Agreement</td>
<td>There are multiple examples and opportunities for the sharing of communications infrastructure throughout the regions. A regional plan and subsequent agreements that define responsibilities could result in the communications network required to link the various ITS applications together.</td>
<td>KDOT, KHP, County and City</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Inter-Agency Road Maintenance/ Snow Removal Agreement</td>
<td>Define roles and responsibilities for roadway maintenance as well as snow removal.</td>
<td>KDOT, County and City Maintenance Agencies</td>
<td>Existing</td>
</tr>
<tr>
<td>Multi-Agency EMS Communications Integration Agreement</td>
<td>Integrated EMS communications allows for quickly sharing of current incident response status between allied response agencies and creates a flow of information that reduces or eliminates delay due to a lag in communications.</td>
<td>KHP, County and City Public Safety Agencies</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Multi-Agency Incident Response Coordination Agreement</td>
<td>Support incident information exchange, incident response coordination, resource coordination, etc. among multiple agencies in different regions.</td>
<td>KDOT, KHP, County and City Public Safety Agencies, County and City Traffic Management and Maintenance Agencies, other agencies</td>
<td>Existing</td>
</tr>
<tr>
<td>Agreement</td>
<td>Description</td>
<td>Associated Stakeholder</td>
<td>Status</td>
</tr>
<tr>
<td>-----------</td>
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<td>------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Multi-Agency Disaster Response Coordination Agreement</td>
<td>Define roles, responsibilities, and functions for disaster response, recovery and evacuation and reentry management.</td>
<td>KDEM, KDOT, KBI, KHP, County and City Public Safety Agencies, County and City Traffic Management Agencies, Transit Agencies, Public School Transportation Departments</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Multi-Agency Disaster Information Coordination Agreement</td>
<td>Define roles, responsibilities and functions for accessing and disseminating disaster information.</td>
<td>KDEM, KDOT, KBI, KHP, County and City Public Safety Agencies</td>
<td>Existing</td>
</tr>
<tr>
<td>Multi-Agency Limited Liability Agreements</td>
<td>Address the varying levels of liability limitation associated with the various agencies that would need to work together to enable coordinated, multi-agency transportation and emergency management strategies.</td>
<td>Agencies involved into transportation and emergency management.</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Transit Electronic Payment Agreement</td>
<td>Support transit electronic payment systems. Agreements may define roles and responsibilities of transit agencies and financial institution to share information such as revenue from smart cards, etc.</td>
<td>Transit Agencies, Financial Institutions</td>
<td>Potential</td>
</tr>
<tr>
<td>Emergency Vehicle Signal Preemption Agreement</td>
<td>Define roles, responsibilities and functions for emergency vehicle preemption at signalized intersections</td>
<td>County and City Public Safety Agencies, KDOT, County and City Traffic Management Agencies</td>
<td>Existing/Potential</td>
</tr>
<tr>
<td>Railroad Crossing Management Agreement</td>
<td>Define roles, responsibilities and functions for rail grade crossing coordination and optimization at signalize intersections.</td>
<td>Railroad Companies, KDOT, County and City Traffic Management Agencies</td>
<td>Existing</td>
</tr>
</tbody>
</table>
8. **FUNDING NEEDS AND SOURCES**

8.1 **Introduction**

Funding availability is the backbone for successful ITS project integration and implementation in addition to the facts of staffing, standard adoption, and technical resources. Adequate funding ensures that proposed projects are deployed effectively and in a timely fashion which will make this plan remain useful in the future.

8.2 **Funding Needs**

The ITS funding will be needed in the following activities in order to successfully implement, operate, maintain, and integrate ITS elements in Kansas:

- Planning and design of new ITS elements
- Capital investment for ITS infrastructure
- System operations and maintenance
- Staff training

8.2.1 **Planning and Design**

Planning and design are critical phases to determine what ITS systems will be built, how they will be built, and what levels of mitigations are required. Planning and design process includes extensive and detailed works such as the development of system concept of operations, system requirements, high level and detailed level design plans and specifications. Adequate funding for planning and design works will ensure a successful system design and accurate cost estimates to budget for the construction, operations, and maintenance phases.

8.2.2 **Project Capital**

Capital expenditures for ITS projects will include but not limited to the following:

- ITS infrastructure including roadside devices, computer hardware and ITS application software
- Communication infrastructure (fiber optic and radio networks)
- Other materials (marketing and training)

8.2.3 **Operations and Maintenance**

With the development and deployment of ITS elements, the ITS systems become more and more complex in terms of infrastructure, functionalities, technologies, and operations. As a result, keeping good system operations and maintenance becomes increasingly important. Adequate operations and maintenance funding ensures effective system operations and increases system life span by supporting sufficient maintenance manpower and routine preventative maintenance activities. These investments need to be secured to avoid premature system replacement and short system and component life cycle.

8.2.4 **Training**

The technical and management requirements for the operational and maintenance staff have also been increased due to the technology advancement and system complexity. Proper and adequate staff training assures that the required operations and maintenance needs are met. It is critical to secure the training budget to provide necessary trainings to the operation and maintenance staff to keep their skills current and update. This will help them confidently perform the system maintenance in house or support the manufactures for advanced maintenance work.
8.3 Funding Sources

8.3.1 Federal

Transportation funding at the federal level is authorized as a massive nation-wide package every five to six years. The current package, which was signed into law in 2005, is the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). With guaranteed funding for highways, highway safety, and public transportation totaling $244.1 billion, SAFETEA-LU represents the largest surface transportation investment in Nation’s history. Building on the foundation of two landmark transportation bills that brought surface transportation into the 21st century, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21), SAFETEA-LU supplies the funds and refines the programmatic framework for investments needed to maintain and grow national vital transportation infrastructure.

Under SAFETEA-LU, ITS is no longer a special niche program; rather it is part of the “mainstream” of transportation funding. There were changes in the bill regarding the use of funding for ITS projects. One of the significant changes is the discontinuation of dedicated funds for ITS deployment. There was no money set aside for deploying ITS projects after Fiscal Year 2005. However, funding for highway construction or enhancements, such as from the National Highway System (NHS) Program, can now be used to deploy ITS equipment as long as it addresses the goals of the funding program, such as reducing congestion or improving operations. Although the bill eliminates the funding specifically set aside for ITS deployment, it creates the opportunity to access a greater amount of funding, can help tie ITS to other projects the state is pursuing, and helps mainstream ITS with other state and agency initiatives.

In addition to the expanded eligibility for ITS deployment, the bill contains a new real-time system management information program that directs the U.S. DOT to establish a program to provide, in all states, the capability to monitor in real time the traffic and travel conditions of the major highways in the U.S. Throughout the list of 5,700 high priority projects many include ITS either as their main focus or as a secondary component. Beyond that, there are numerous programs that include expanded eligibility for ITS projects, and there remains a healthy ITS research and development program. CVISN and Road Weather Management also received special recognition.

SAFETEA-LU includes the following funding programs that may be tapped to support the ITS deployment:

**National Highway System (NHS) Program**

The NHS program focuses federal resources on significant rural and urban roads serving major population centers, international border crossings, intermodal transportation facilities, and major travel destinations. It includes the Interstate System, other urban and rural principal arterials, highways that provide motor vehicle access between the NHS and major intermodal transportation facilities, the defense strategic highway network, and strategic highway network connectors.

The NHS funding could be used for traffic management and control, including infrastructure-based ITS capital improvements. Additionally, as defined in 23 USC 103(b)(6), operating costs for traffic monitoring, management, and control include a much broader range of eligible expenditures, including the following:

- Labor costs
- Administrative costs
- Utilities and rent
- Other costs associated with the continuous operation of traffic control, such as integrated traffic control systems, incident management programs, and traffic control centers

Operating expenses include hardware and software upgrades, as well as major systems maintenance activities. The replacement of defective or damaged computer components and other traffic management system hardware, including street-side hardware, is also eligible.
**Congestion Mitigation and Air Quality Improvement (CMAQ)**
The CMAQ program provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. A total of $8.6 billion is provided through 2009. Funding is available for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas) as well as former nonattainment areas that are now in compliance (maintenance areas).

Eligible activities include transit improvements, ITS or traffic flow improvements, and public fleet conversions to cleaner fuels, among others. Traffic and congestion management strategies are eligible for CMAQ funding, provided that the sponsor can demonstrate that these strategies will improve air quality. The federal share for most CMAQ-eligible projects is 80 percent. The CMAQ program operates on a reimbursable basis, so funds are not provided until work is completed.

**Surface Transportation Program (STP)**
The STP provides flexible funding that may be used by States and local governments for projects on any Federal-aid highway, including the NHS, transit capital projects, and public bus terminals and facilities. In addition, carpool, pedestrian, bicycle, and safety projects may also be implemented with STP funding on roads of any functional classification.

A total of $32.5 billion in STP funds is authorized through 2009. Each State must set aside a portion of their STP funds (10 percent or the amount set aside in 2005, whichever is greater) for transportation enhancements activities. The set-aside of 10 percent previously required for safety construction activities is eliminated beginning in 2006, as these activities are funded separately under the new Highway Safety Improvement Program.

**Real-Time System Management Information Program**
Under this new program, a real-time system management information program will be established to provide, in all States, the capability to monitor, in real-time, the traffic and travel conditions of the major highways of the U.S. and to share that information to improve the security of the transportation system, address congestion problems, support improved response to weather events and surface transportation incidents, and facilitate national and regional highway traveler information. Data exchange formats will be established by the U.S. DOT within 2 years to ensure that data may readily be exchanged with State and local governments and the traveling public. States may use NHS, STP, and CMAQ funds for planning and deployment of real-time monitoring elements. States may also use State Planning and Research funds for planning of real-time monitoring elements.

**Highway Safety Improvement Program (HSIP)**
The HSIP is established as a core program with flexibility provided to allow States to target funds to their most critical safety needs. A total of $5.1 billion is provided for 2006-2009. Of this amount, $880 million is set aside for the Railway-Highway Crossing program; $90 million is set aside annually for construction and operational improvements on high-risk rural roads. The HSIP requires States to develop and implement a strategic highway safety plan and submit annual reports to the U.S. DOT Secretary that describe at least 5% of their most hazardous locations, progress in implementing highway safety improvement projects, and their effectiveness in reducing fatalities and injuries.

**Safe Routes to School**
This new program enables and encourages primary and secondary school children to walk and bicycle to school. Both infrastructure-related and behavioral projects will be geared toward providing a safe, appealing environment for walking and biking that will improve the quality of our children's lives and support national health objectives by reducing traffic, fuel consumption, and air pollution in the vicinity of schools. Funding may be used for the planning, design, and construction of infrastructure-related ITS projects that will substantially improve the ability of students to walk and bicycle to school, such as traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, secure bicycle parking facilities, and traffic diversion improvements in the vicinity of schools. In addition, funding is available for noninfrastructure-related activities to encourage walking and bicycling to school, including
public awareness campaigns and outreach, traffic education and enforcement in the vicinity of schools, student sessions on bicycle and pedestrian safety, health, and environment, and funding for training, volunteers, and managers of safe routes to school programs.

**ITS Earmarks**

ITS earmarks will continue to be another source for Kansas ITS project funding. Federal earmarks are attached each year by the U.S. Congress for specific projects to various appropriations bills or in the conference or committee reports accompanying the bill. Earmarking is the allocation of a lump sum appropriated for a specific purpose, usually a purpose within the general authority of the entity or program being funded. Under the new transportation act, money from these earmarks can be used to deploy ITS projects.

8.3.2 **State Funds**

**KDOT ITS Set-Aside Program**

The goal of this program is to further promote ITS within the state by funding studies, research, technology developments, and technology applications. This program was established in 2000 as part of the 10-year comprehensive transportation plan to facilitate the deployment of rural and urban ITS programs. Funding may be authorized on an annual basis beyond the initial ten-year period. Cities, counties, other state agencies and KDOT can submit applications to fund ITS projects.

**Other State Funds**

The State of Kansas may utilize collected taxes from gasoline, property, and/or sales taxes to fund and/or provide local match to the implementation of the transportation program. This income may be combined into a general use fund to be used for various purposes. Kansas may also impose a number of user charges, fees, and taxes to generate revenue for implementing, operating, and maintaining ITS. User charges, fees, and taxes are collected from those who directly benefit from, or are associated with, using a specific publicly provided service. One example of this is the gas tax: drivers on public roadways pay for them through a tax on fuel. The amount paid is proportional to the amount of product or service consumed. Included below is a partial list of user charges, fees, and taxes that may be applied to state transportation systems:

- Motor vehicle registration fee
- Vehicle sales tax
- Certificate of title fee
- Weight-distance tax for commercial vehicles
- Vehicle inspection charge
- Motor oil tax and tire tax, etc.

The use of these taxes or fees may require that enabling legislation to be approved by the State Legislature.

8.3.3 **Local Funds**

Local jurisdictions may also utilize taxes collected from property, sales, and/or other financial mechanisms (e.g. tax increment financing or TIF) to fund and/or provide local match to the implementation of the transportation program. Similar to state funds, this income may be combined into a general use fund to be used for various purposes.

8.3.4 **Partnerships**

A public/private partnership is a business relationship between the public and private sectors. Both entities, to a specific degree, share responsibilities and the costs, risks, and rewards associated with delivering goods and/or services. From a transportation standpoint, a public/private partnership is a form of service delivery with a collaborative approach based on reallocating traditional responsibilities, costs, risks, and rewards between the public agency and private entities.
8.3.5 Homeland Security Grants

The U.S. Department of Homeland Security administers grant funds to enhance the ability of states, local and tribal jurisdictions, and other regional authorities in the preparation, prevention, and response to terrorist attacks and other disasters. These grants include, but are not limited to areas of

- Port Security
- Critical Infrastructure Protection
- Regional and Local Transit Systems
- Equipment and Training for First Responders
- Homeland Security Grants

These grants can be used to fund projects with security applications, such as surveillance cameras, security/threat sensors and detectors, communications devices, and training for supporting emergency and threat response activities.