Kansas Statewide Intelligent Transportation System Architecture
KDOT Project No. 106 KA-0380-01

Volume II

KANSAS STATEWIDE ITS ARCHITECTURE INTEGRATION AND IMPLEMENTATION PLAN

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Prepared for:

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AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
ACN	Automated Collision Notification
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATA	American Trucking Association
ATIS	Advanced Traveler Information System
AVL	Automatic Vehicle Location
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CMAQ	Congestion Mitigation and Air Quality
COWS	Communication on Wheels
CTD	Coordinated Transit District
CVIEW	Commercial Vehicle Information Exchange Window
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
DOT	Department of Transportation
DSNWK	Developmental Services for Northwest Kansas
EIA	Electronics Industry Alliance
EMS	Emergency Medical Services
EVP	Emergency Vehicle Preemption
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carriers Safety Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
HSIP	Highway Safety Improvement Program
IEEE	Institute of Electrical and Electronics Engineers
IFTA	International Fuel Tax Association
IRP	International Registration Plan, Inc.
IRS	Internal Revenue Service
ISO	International Organization for Standardization
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
KANG	Kansas Army National Guard
KARS	Kansas Accident Records System
KBI	Kansas Bureau of Investigation
KCC	Kansas Corporation Commission
KDEM	Kansas Division of Emergency Management
KDOR	Kansas Department of Revenue
KDOT	Kansas Department of Transportation
KHP	Kansas State Patrol
KMCA	Kansas Motor Carriers Association
KTA	Kansas Turnpike Authority
LRS	Location Referencing System
LRTP	Long Range Transportation Plan
MDSS	Maintenance Decision Support System
MDT	Mobile Data Terminal
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
NEMA	National Electrical Manufactures Association
NHS	National Highway System
NOAA	National Oceanic and Atmospheric Administration

NTCIP	National Transportation Communications for ITS Protocol
O&M	Operations and Maintenance
PCS	Personal Communications Service
RCAT	Reno County Area Transportation
RFP	Request for Proposal
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SDO	Standards Development Organization
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
TBD	To Be Determined
TEA-21	Transportation Equity Act for the 21st Century
TIP	Transportation Improvement Program
TOC	Traffic Operations Center
TOMC	Transportation Operation and Management Center
TRCC	Traffic Records Coordinating Committee
TRIS	Truck Routing Information System
TSA	Transportation Security Administration
USDOT	United States Department of Transportation
WIM	Weigh in Motion

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 Business Plan for Commercial Vehicle Operations (CVO) Using ITS
- 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 2-1. Project Implementation Timeframes

Category	Time Frame	Year of Deployment
Short Term	0 – 5 years	2007 – 2012
Medium Term	6 – 10 years	2013 – 2017
Long Term	Beyond 10 years	2018 and beyond

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.

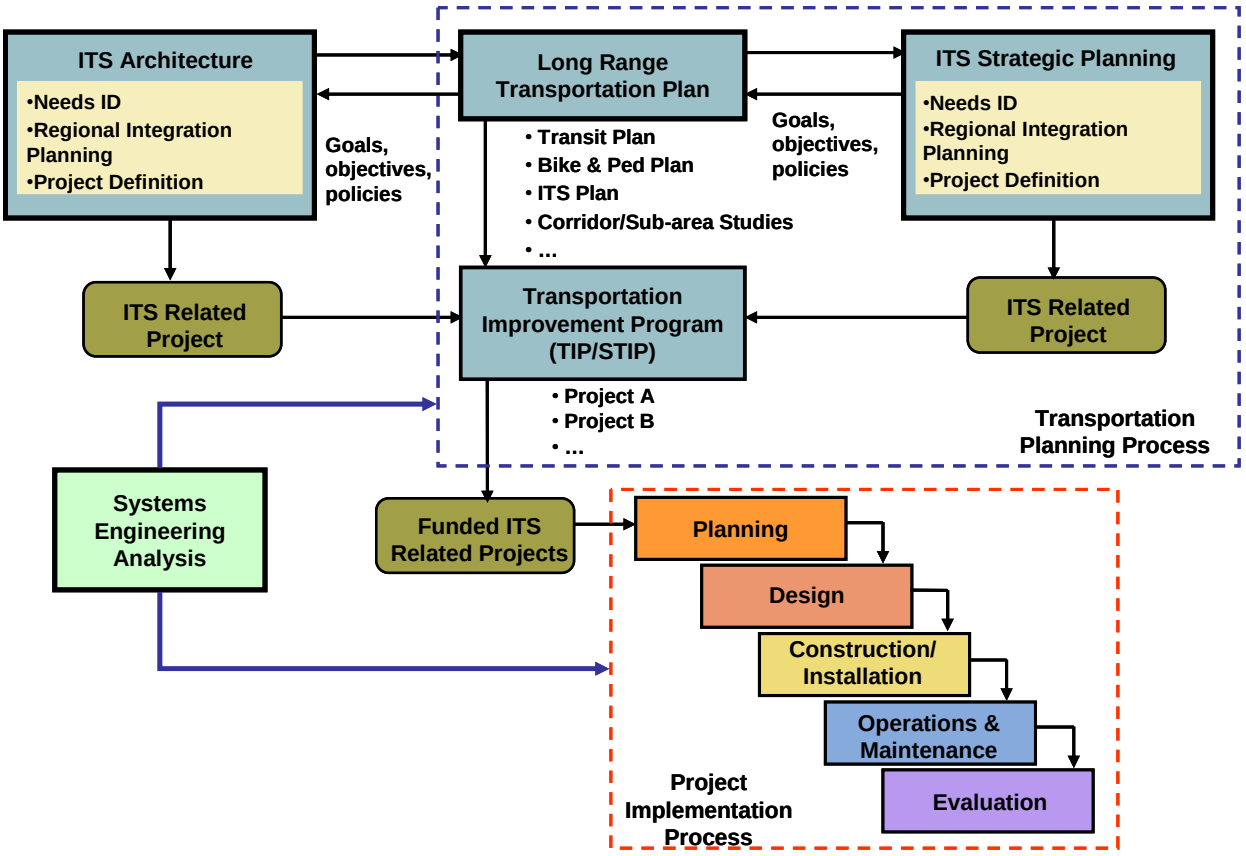


Figure 3-1. ITS Architecture Can Support Transportation Planning and Project Implementation

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:

Item	Description
Project Number	For reference purpose only and does not indicate any type of priority
Project Title	The title of the project
Service Area	Service area(s) related to the project. Each project may provide service to one or more of the following areas: • Commercial Vehicle Operations • Data Management • Emergency Management • Maintenance and Construction Management • Public Transportation Management • Traffic Management • Traveler Information
Stakeholder	Agency or agencies that will be responsible for the planning, design, implementation and operation of the project
Project Scope	Description of project goals, system functions and other details
Expected Benefit	Benefits expected from the deployment of the project
Time Frame	Time frame for the deployment in term of short, medium and long terms
Duration	Estimated length of time for project deployment
Priority	Level of stakeholder needs for the project (Low, Medium and High).
Project Cost	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&M) costs. In some cases, the annual O&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.
Market Package	A lists of market packages to be considered
Dependency	Information and technical dependencies of the project with other projects or systems
Architecture	An ITS architecture diagram for the project

Table 4-1. Summary of Proposed ITS Projects and Concepts

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
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
3	KDOT Condition-based Variable Speed Limit Signs	Traffic Management	KDOT*	Medium	Low	$40K/location	$5K/location	None	• Improved travel safety

Table 4-1. (Continued)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
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.

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
8	KDOT Rest Area Kiosks	Traveler Information	KDOT* Kansas Travel and Tourism	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 • Increased traveler satisfaction • Improved travel safety
9	KDOT Rest Area Wi-Fi	Traveler Information, Emergency Management	KDOT* Kansas Travel and Tourism KHP Counties and Cities	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 • Increased traveler satisfaction • Improved emergency response and communication
10	KDOT KANROAD Reporting System Enhancements	Traveler Information, Data Management	KDOT* KTA Kansas Travel and Tourism	Short	High	TBD	TBD	Support project #1 (KDOT Statewide TOMC),	• More efficient data entry and reporting • Improved data sharing • Improved travel information dissemination

Table 4-1. (Continued)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
11	KDOT Winter Maintenance Vehicles AVL and MDT	Maintenance and Construction Management	KDOT*	P-I: On-going P-II: Short to Medium	P-I: High P-II: Medium	$10K/vehicle; Base Station: $200K	$100/vehicle; Base Station: $4K	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.	• Improved winter maintenance safety and operations efficiency • Reduced snow and ice control costs • Improved customer service
12	KDOT Paint Trucks AVL	Maintenance and Construction Management	KDOT*	Short	Medium	$1.5K/vehicle; Base Station: $200K	$50/vehicle; Base Station: $4K	Could be implemented in conjunction with #11.	• Improved worker and vehicle safety and operations efficiency
13	KDOT Snowplows Infrared Radar	Maintenance and Construction Management	KDOT*	Long	Low	$3K/unit	$200/unit	None	• Improved snowplow operations safety and efficiency
14	KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS	Maintenance and Construction Management	KDOT*	Long	Low	P-I: $20K P-II: TBD	P-I: $2K P-II: TBD	None	• Improved road weather information collection • Improved environmental conditions monitoring
15	KDOT Snow Route Design Optimization Software	Maintenance and Construction Management	KDOT*	Medium	Medium	TBD	TBD	None	• Improved snow plow efficiency • Reduced snow and ice control costs

Table 4-1. (Continued)

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

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

Table 4-1. (Continued)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
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)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
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)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
30	KHP Total Stations Enhancement	Emergency Management	KHP*	On-going	High	TBD	TBD	None	• Improved roadway safety • Improved trooper safety • Improved incident investigation efficiency
31	KHP Photogrammetry Project	Emergency Management	KHP*	Short	High	TBD	TBD	None	• Improved roadway safety • Improved travel safety • Improved trooper safety • Improved incident investigation efficiency
32	KBI AMBER Alert System Enhancements	Emergency Management	KBI* KDOT KHP KC Scout County Sheriffs City Police Departments	On-going	High	$3K	Staff time	None	• Improved AMBER alert operational efficiency and communications
33	KTA Service Area Kiosks	Traveler Information	KTA* KDOT	Short	Medium	Software and Integration: $10K; Kiosks: $20K/unit	$2K/Kiosk	Could follow the model for kiosks at rest areas (#8); could link with KDOT KANROAD and 511 systems.	• Improved travel and service information dissemination • Increased traveler satisfaction • Improved travel safety

Table 4-1. (Continued)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
34	Kansas Airport Security Monitoring Systems	Emergency Management	KDOT* Airports	Medium	Low	$250K/system	$600/system plus staff labor for operation	None	• Improved airport security and infrastructure protection • Improved personal security
35	Kansas Alternate Route Planning	Traffic Management, Emergency Management, Traveler Information	KDOT* KDEM KHP KTA Counties Cities	Medium	Medium	$150K/study	TBD	None	• Reduced secondary incidents • Reduced fuel consumption and emissions • Reduced motorist stress levels • Improved response time to incidents • Improved travel information dissemination
36	Rural Transit CAD, AVL and MDT	Public Transportation	Rural Transit Service Providers, KDOT*	Short to Medium	Medium	CAD System for Dispatch Center: $120K; AVL & MDT: $5K/vehicle	CAD: $1K AVL & MDT: $100/vehicle	Support projects #39, #40, and #43.	• Improved transit services • Improved transit operation efficiency • Improved transit user satisfaction
37	Rural Transit On-board Cameras	Public Transportation, Emergency Management	Rural Transit Service Providers, KDOT*	Short	Medium	Camera: $8K/vehicle; Transit center hardware and software: $30K	Camera: $250/vehicle; Transit center hardware and software: $1K	None	• Improved passenger and transit operator security • Improved emergency response efficiency

Table 4-1. (Continued)

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

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

Table 4-1. (Continued)

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

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

Table 4-1. (Continued)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
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)

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

No	Project Title	Service Area	Stakeholder[1]	Time Frame	Priority	Capital Cost	O&M Cost	Dependency	Benefit
52	County and City Database and GIS Support	Data Management	Counties and Cities*	Short to Medium	Medium	TBD	TBD	Could share the system with other Counties and Cities, and KDOT	• Improved data management • Improved coordination and facilitation for transportation / ITS planning • Improved traveler information dissemination

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

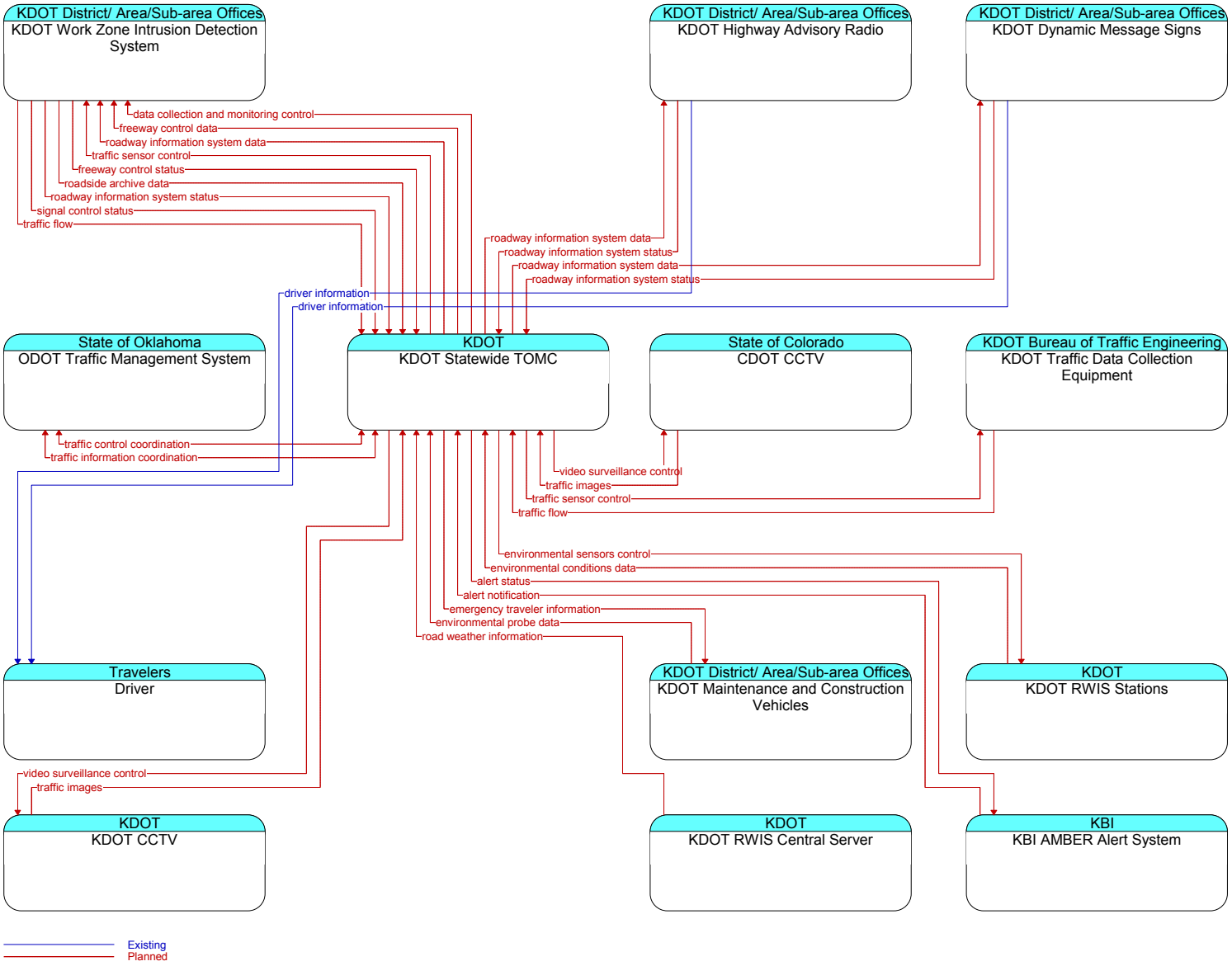
Market Package

- 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

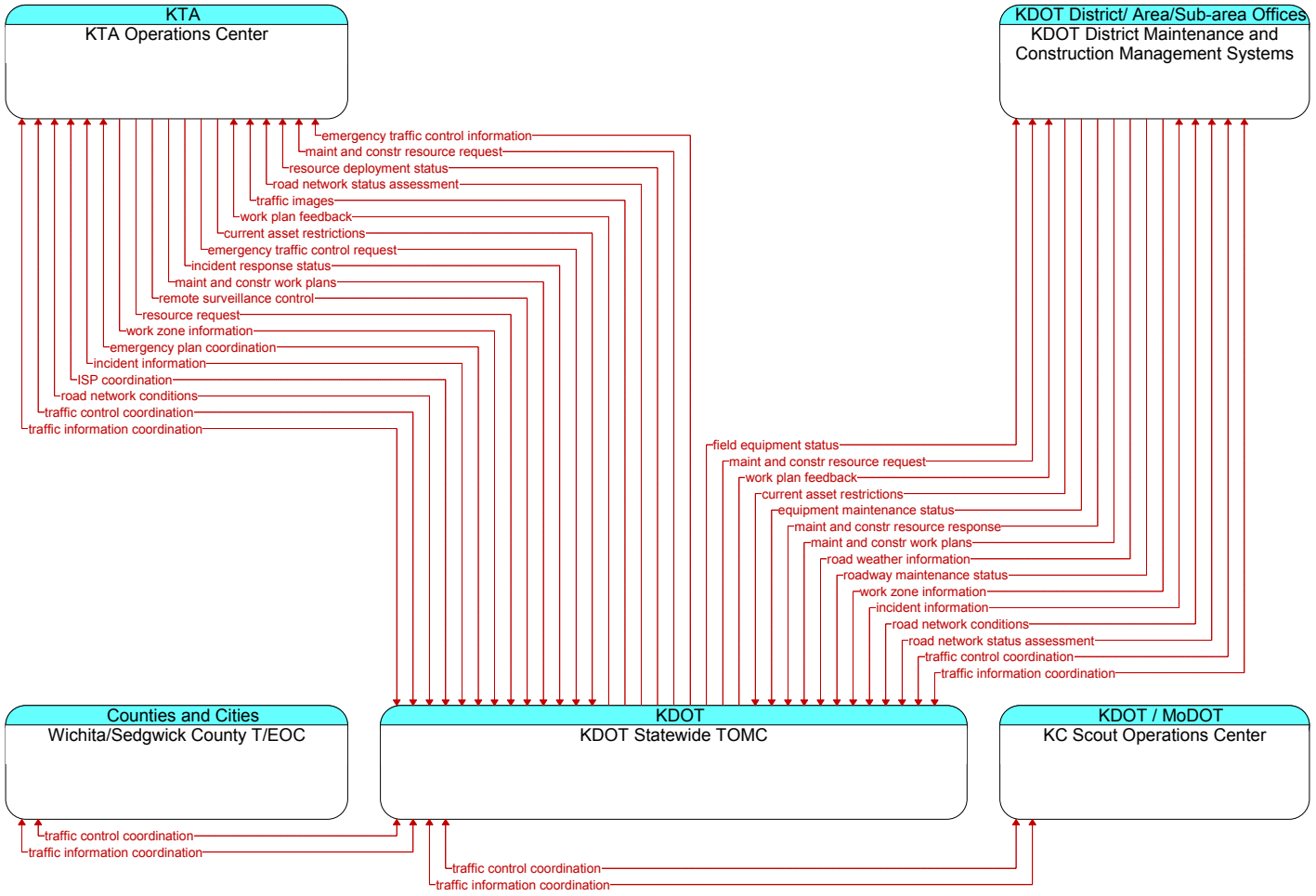
Dependency Support deployment of ITS field devices and infrastructure in projects #4 (KDOT Dynamic Message Signs). #6 (KDOT CCTV along Interstates), and #10 (KDOT KANROAD Reporting System Enhancements); and possibly #2 (KDOT Kansas Speedway Traffic Management System Enhancements), #3 (KDOT Condition-based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

Architecture See next 4 pages

KDOT Statewide TOMC Architecture Part 1



KDOT Statewide TOMC Architecture Part 2



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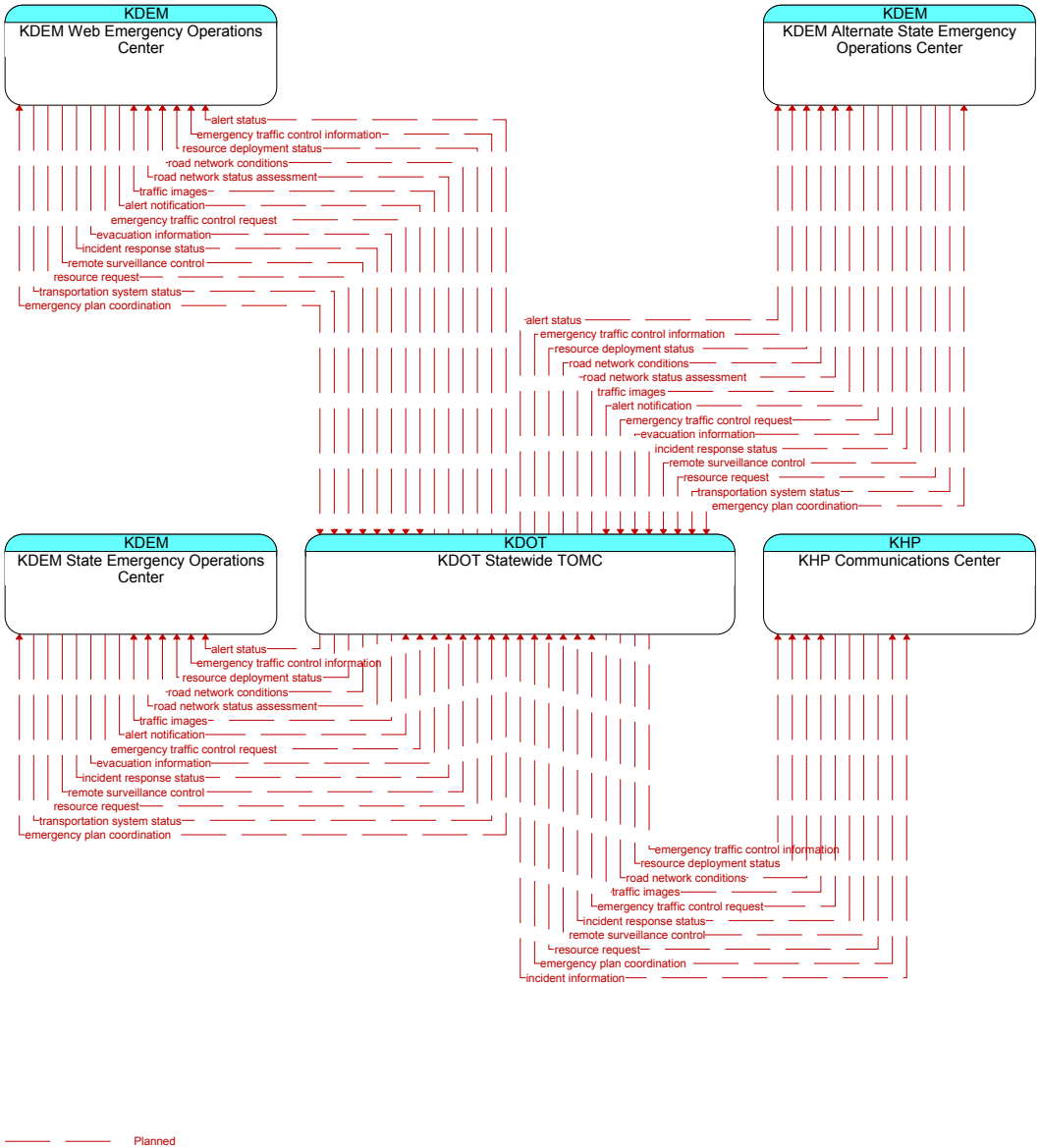

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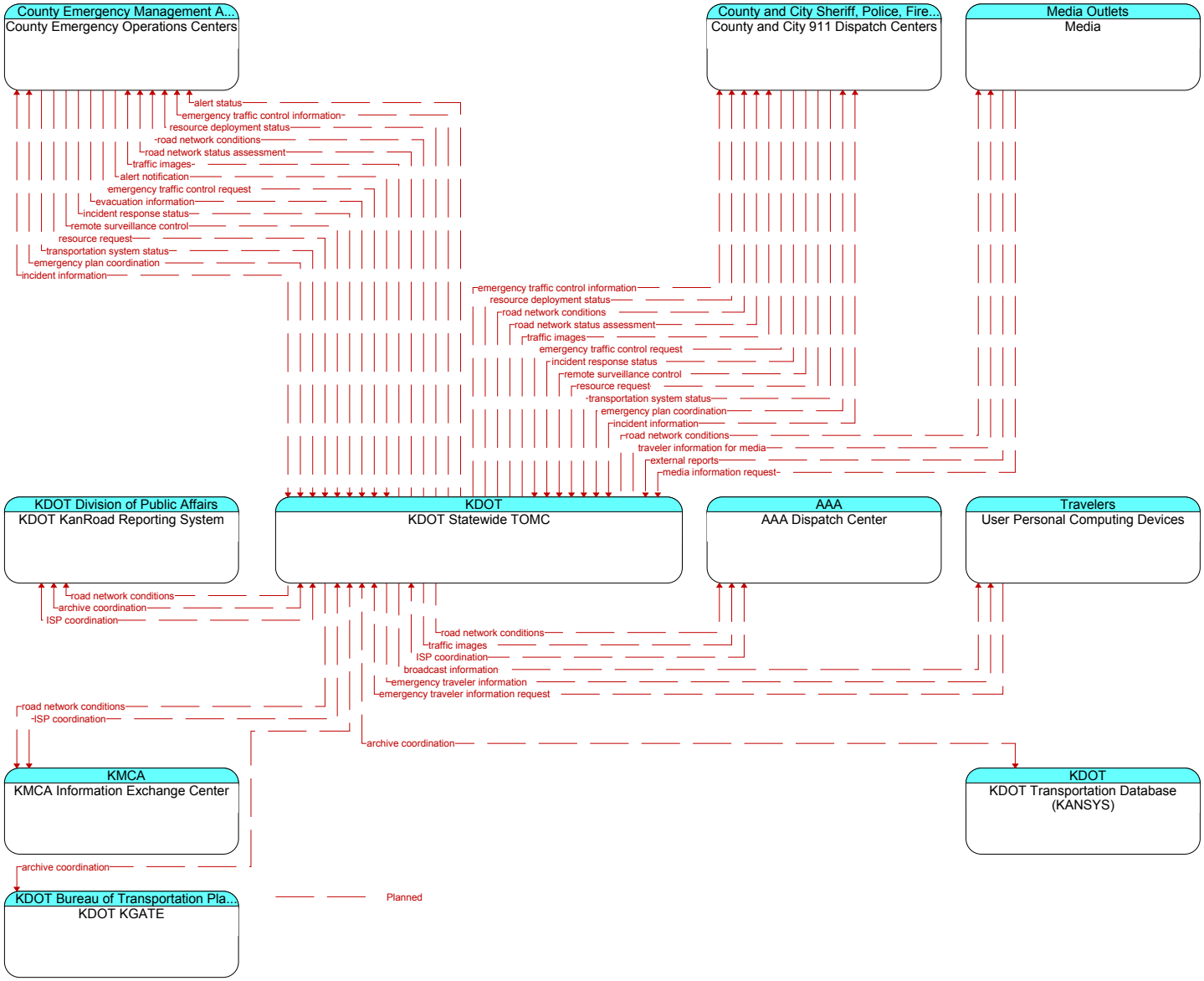
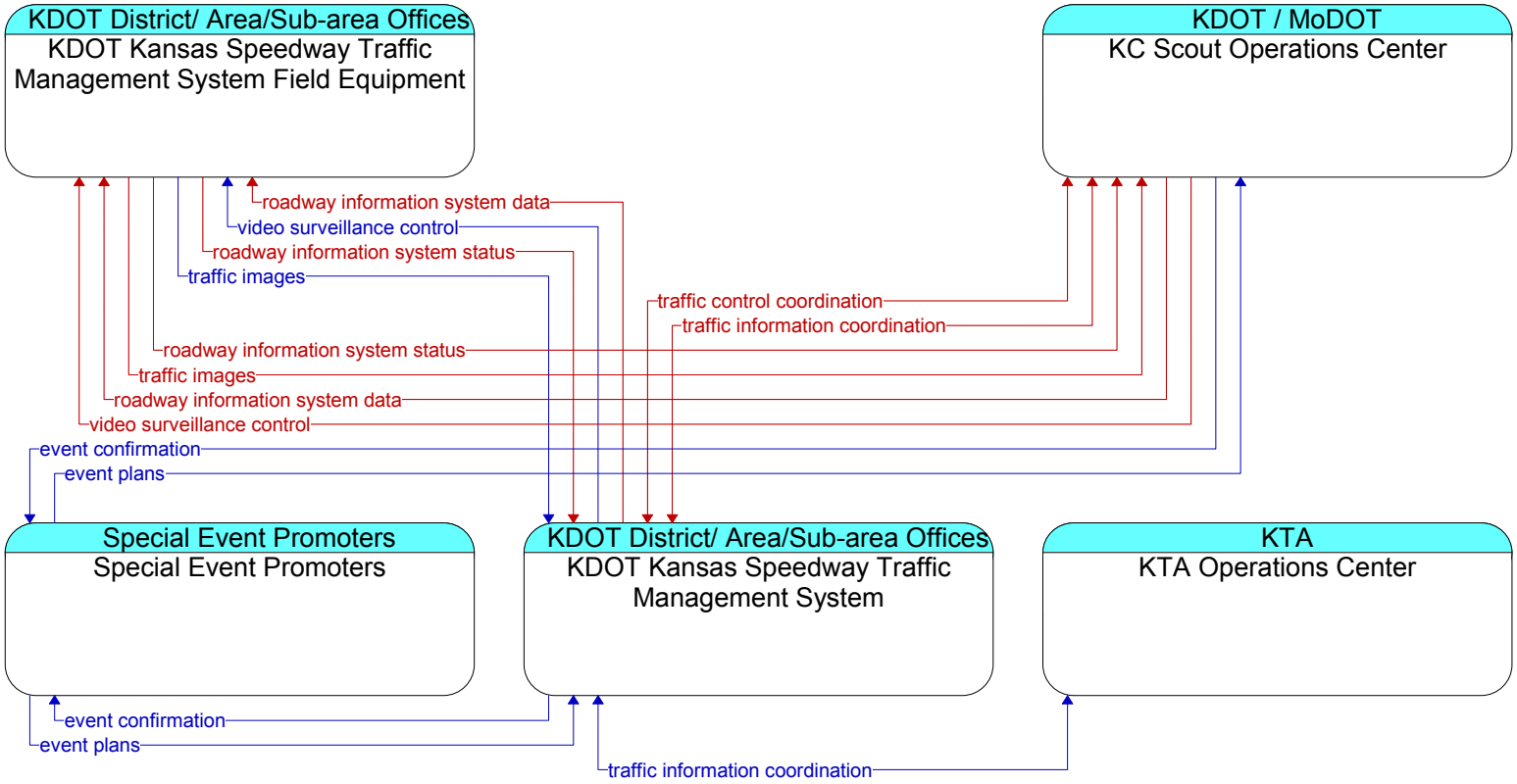


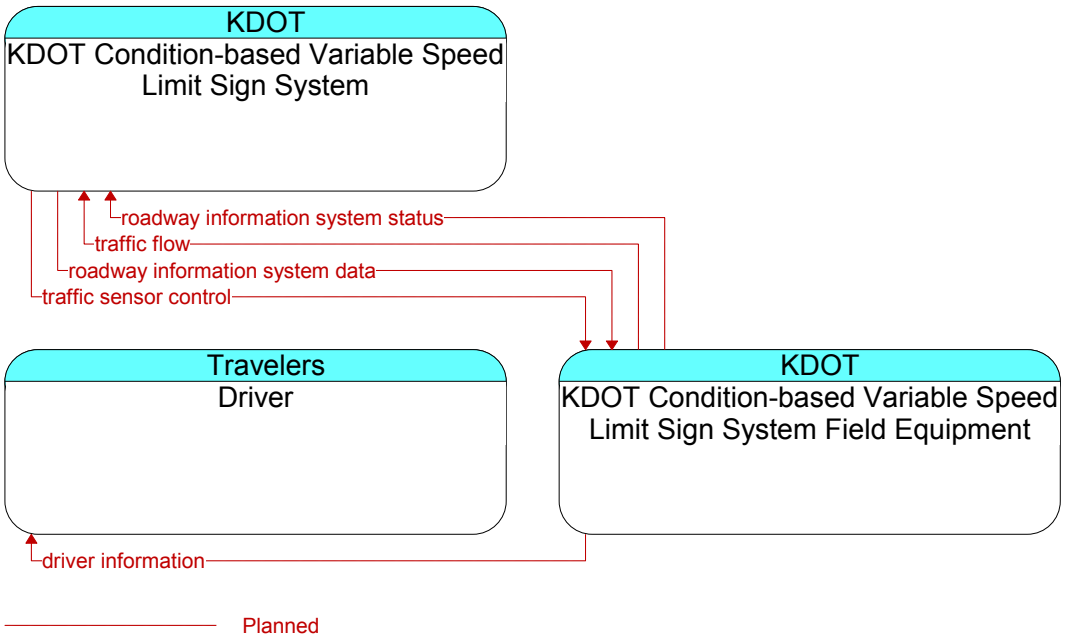
Project No.	**ITS-02**
Title	KDOT Kansas Speedway Traffic Management System Enhancements
Service Area	Traffic Management
Stakeholder	KDOT, KHP, KTA
Scope	KDOT has installed five CCTV cameras on roadways adjacent to the Kansas Speedway to monitor traffic conditions. The cameras are also used for incident 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



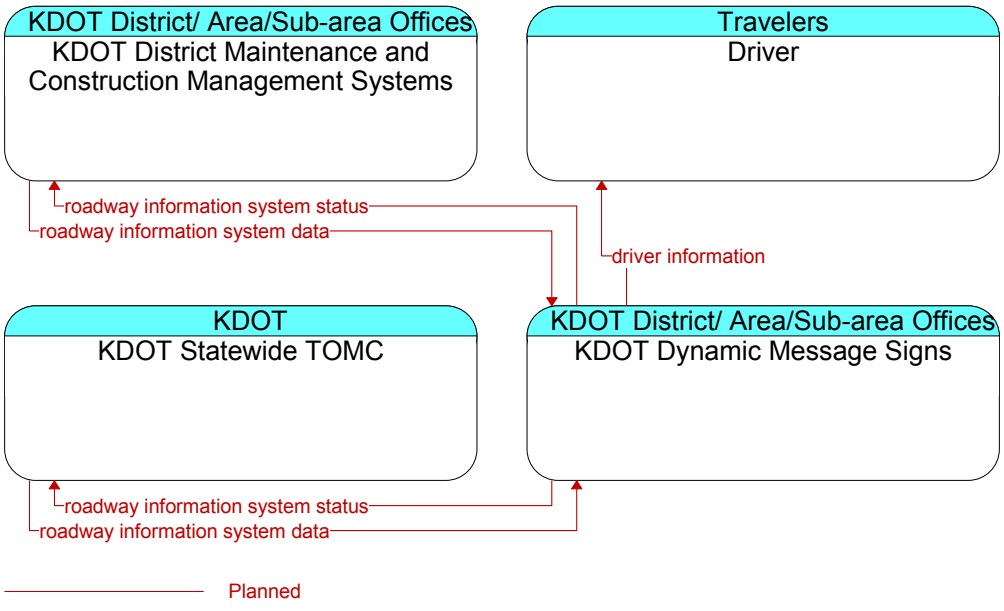
Project No.	**ITS-03**
Title	KDOT Condition-based Variable Speed Limit Signs
Service Area	Traffic Management
Stakeholder	KDOT
Scope	KDOT plans to deploy condition-based variable speed limit signs to regulate traffic flow speed as needed. The project will enhance traffic flow management by changing the 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

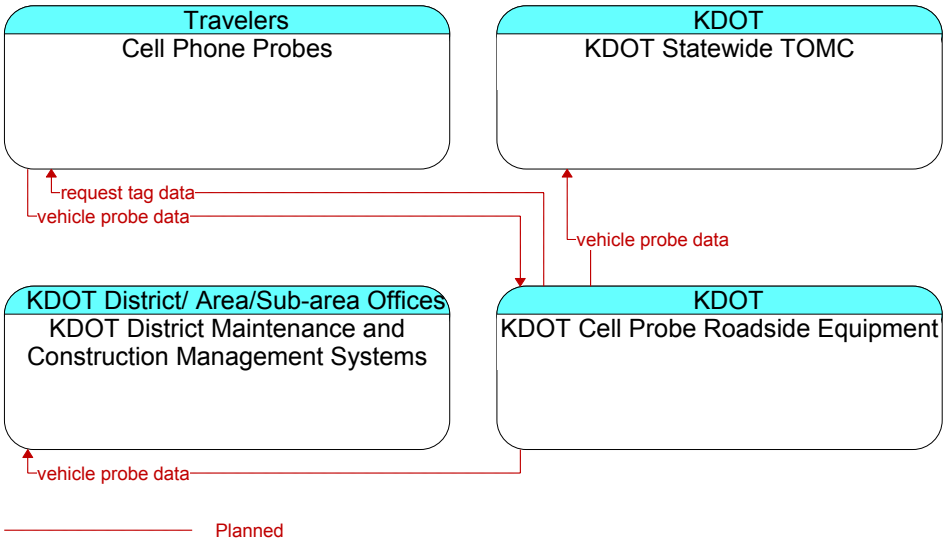


Project No.	**ITS-04**
Title	KDOT Dynamic Message Signs
Service Area	Traffic Management, Traveler Information
Stakeholder	KDOT, KTA
Scope	KDOT plans to deploy additional permanent and portable dynamic message signs (DMSs) along the major freeways statewide. A total of 25 portable and permanent DMSs are 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

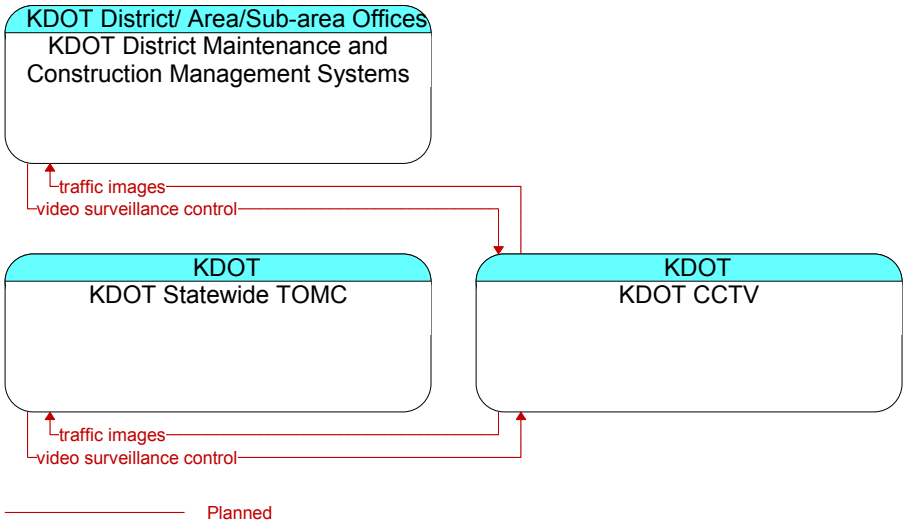


Project No.	**ITS-05**
Title	KDOT Cell Probe System
Service Area	Traffic Management
Stakeholder	KDOT
Scope	Missouri DOT has tested cell probe technology for the purpose of obtaining travel time and speed data for Missouri state highways, including all KC Scout routes. KDOT recently completed a cell probe 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	



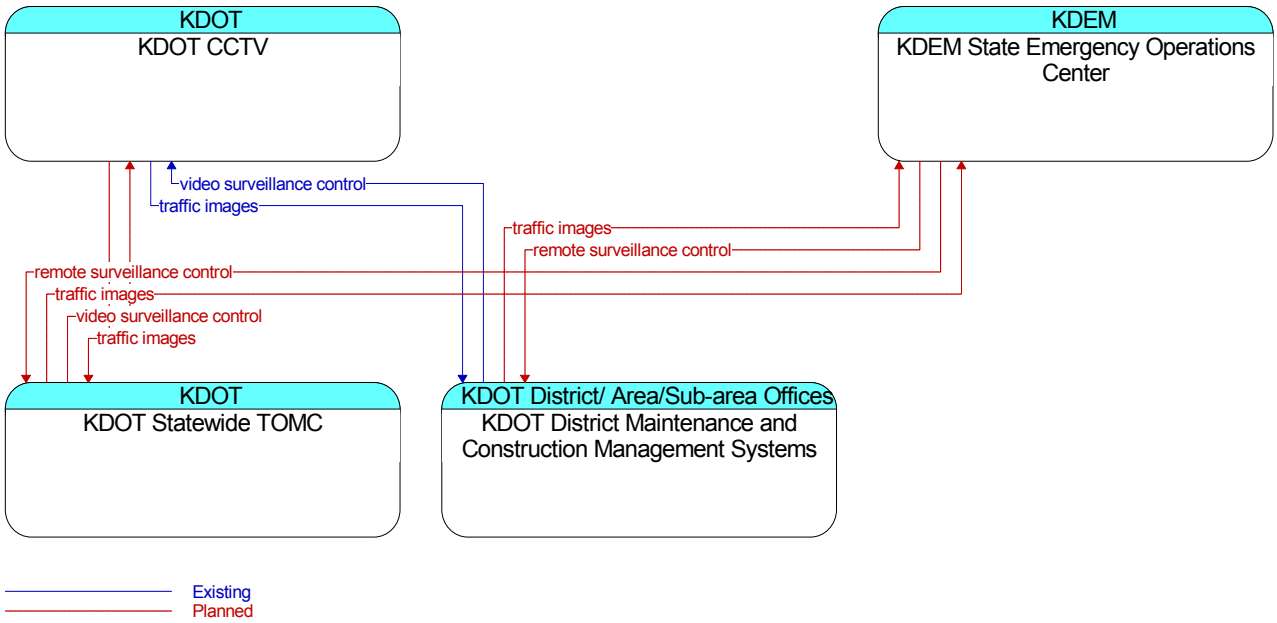
Project No.	**ITS-06**
Title	KDOT CCTV along Interstates
Service Area	Traffic Management, Traveler Information, Maintenance and Construction Management
Stakeholder	KDOT, KHP, Neighboring States
Scope	This project will deploy CCTV cameras at critical locations along interstate highways throughout Kansas. 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



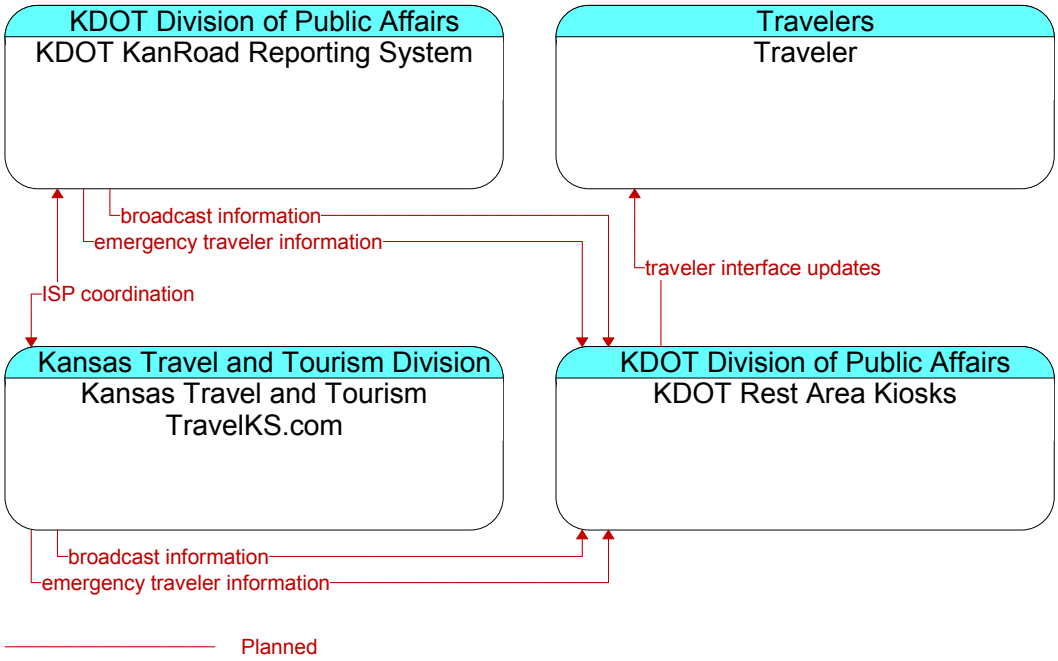
Project No.	**ITS-07**
Title	KDOT Video Feed via Satellite
Service Area	Traffic Management, Emergency Management
Stakeholder	KDOT, KDEM
Scope	KDOT has two Communication on Wheels (COWs) units to assist public safety agencies with interoperability communications for both natural and manmade statewide 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.
Expected Benefit	Improved emergency response and coordination
Timeframe	Medium Term
Duration	1 Year
Priority	Medium
Capital Cost	$20K
O&M Cost	$5K/year
Market Package	EM08 – Disaster Response and Recovery
Dependency	None but could be deployed in conjunction with Project #6 (KDOT CCTV Cameras along Interstates)

Architecture



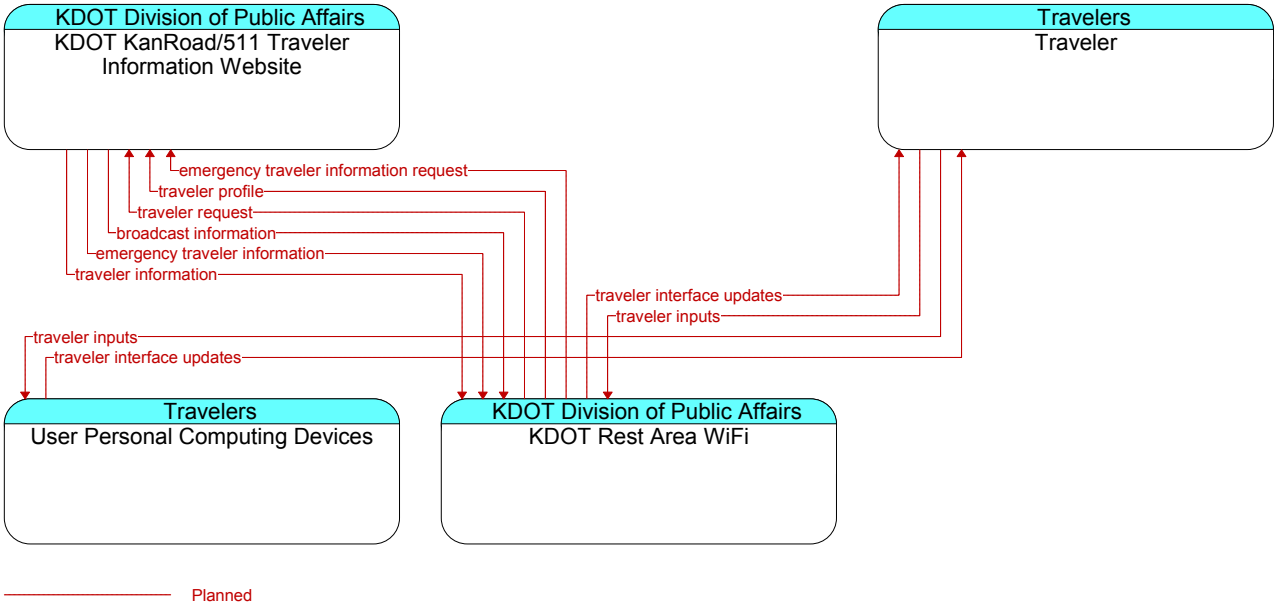
Project No.	**ITS-08**
Title	KDOT Rest Area Kiosks
Service Area	Traveler Information
Stakeholder	KDOT, Kansas Travel and Tourism
Scope	This project will install kiosks at rest areas to provide travel information as an alternative to internet access. The traveler can obtain current information regarding 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

KDOT Rest Area Kiosks



Project No.	**ITS-09**
Title	KDOT Rest Areas Wi-Fi
Service Area	Traveler Information, Emergency Management
Stakeholder	KDOT, Kansas Travel and Tourism, KHP, Counties and Cities
Scope	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.
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

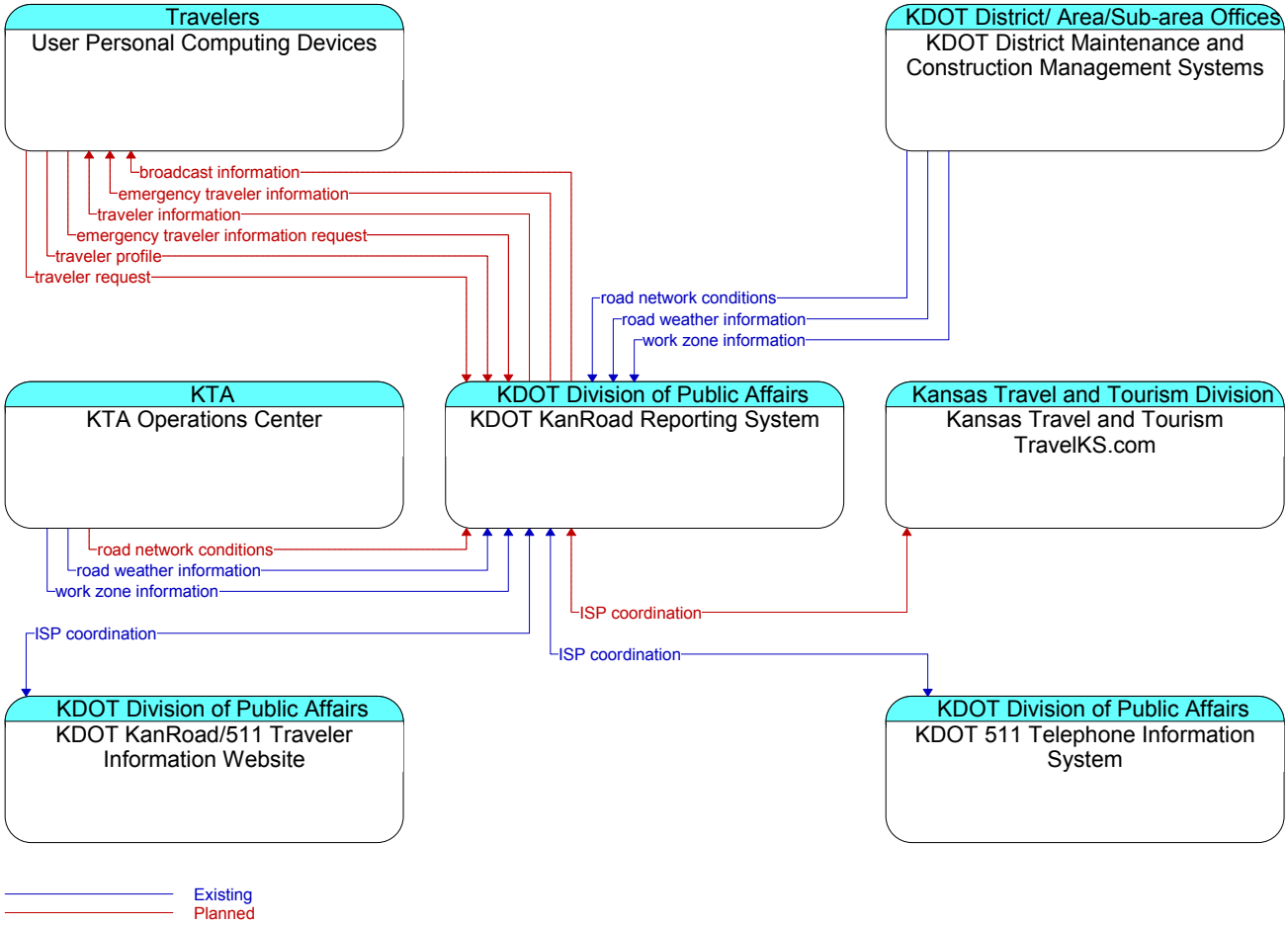
KDOT Rest Area Wi-Fi



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

KDOT KANROAD Reporting System Enhancements



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

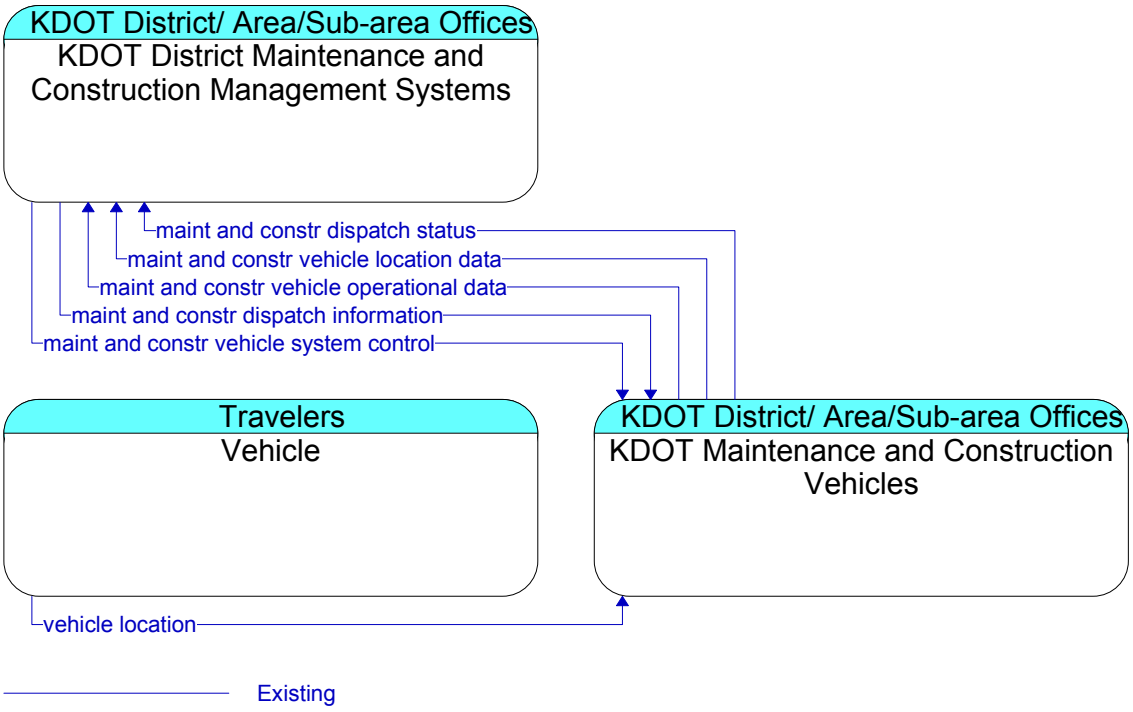
O&M Cost $100/vehicle/year; Base Station: $4K/year

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).

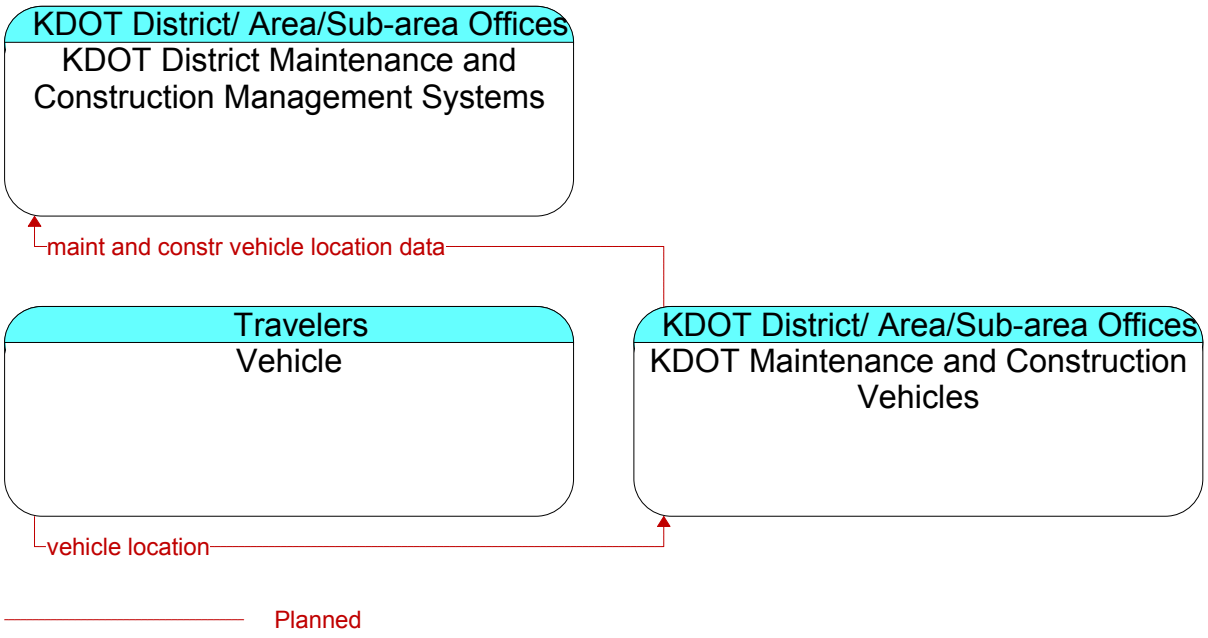
Architecture See next page

KDOT Winter Maintenance Vehicles Automatic Vehicle Location and Mobile Data Terminal



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)

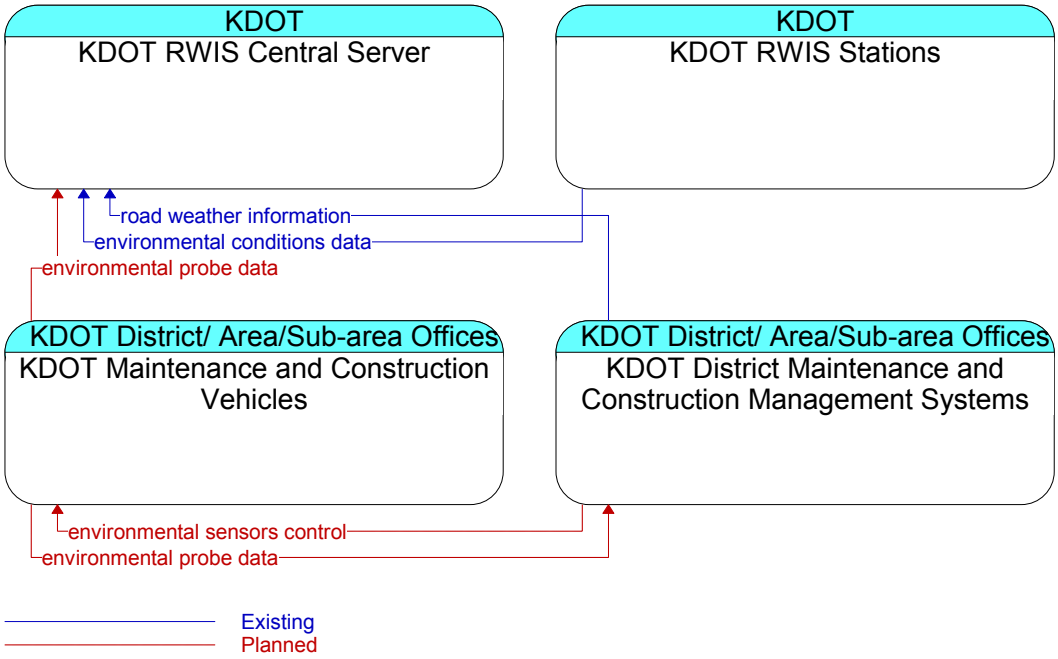
Architecture



Project No.	**ITS-13**
Title	KDOT Snowplows Infrared Radar
Service Area	Maintenance and Construction Management
Stakeholder	KDOT
Scope	This project will install Infrared Radar (NightVision) on a couple of snowplow trucks in a district for testing.
Expected Benefit	Improved snowplow operations safety and efficiency
Timeframe	Long Term
Duration	1 year
Priority	Low
Capital Cost	$3K/unit
O&M Cost	$200/unit/year
Market Package	None
Dependency	None
Architecture	None

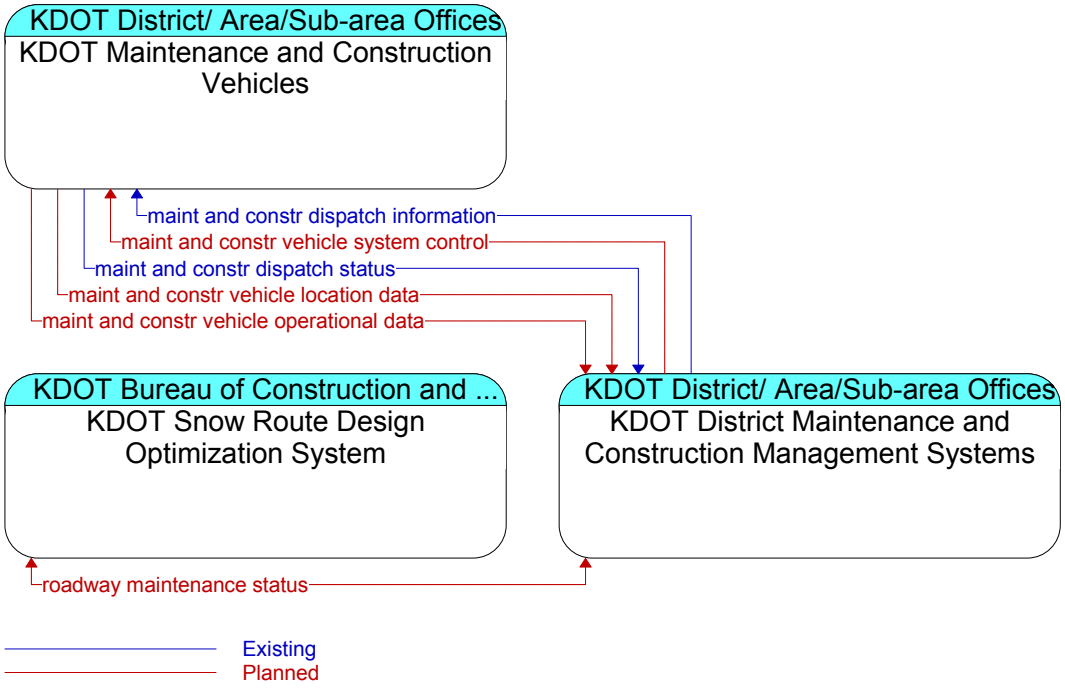
Project No.	**ITS-14**
Title	KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS
Service Area	Maintenance and Construction Management
Stakeholder	KDOT
Scope	Currently, KDOT maintenance vehicles are equipped with air and pavement temperature sensors. However, the environmental data collected 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



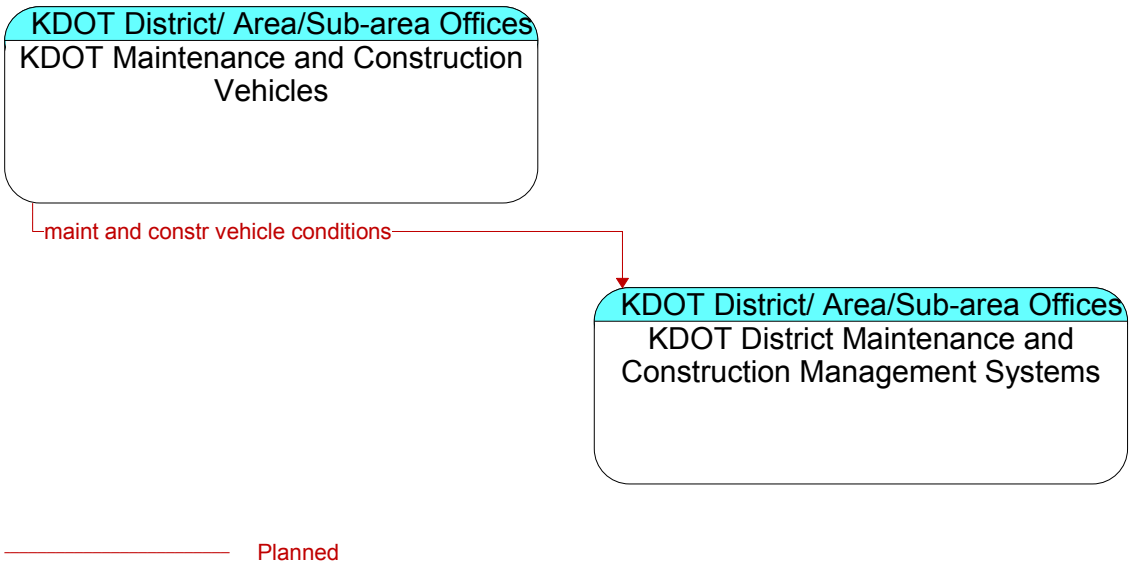
Project No.	**ITS-15**
Title	KDOT Snow Route Design Optimization Software
Service Area	Maintenance and Construction Management
Stakeholder	KDOT
Scope	This project will develop the Snow Route Design Optimization Software to assist KDOT District Offices in re-designing network snow service routes to optimize 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



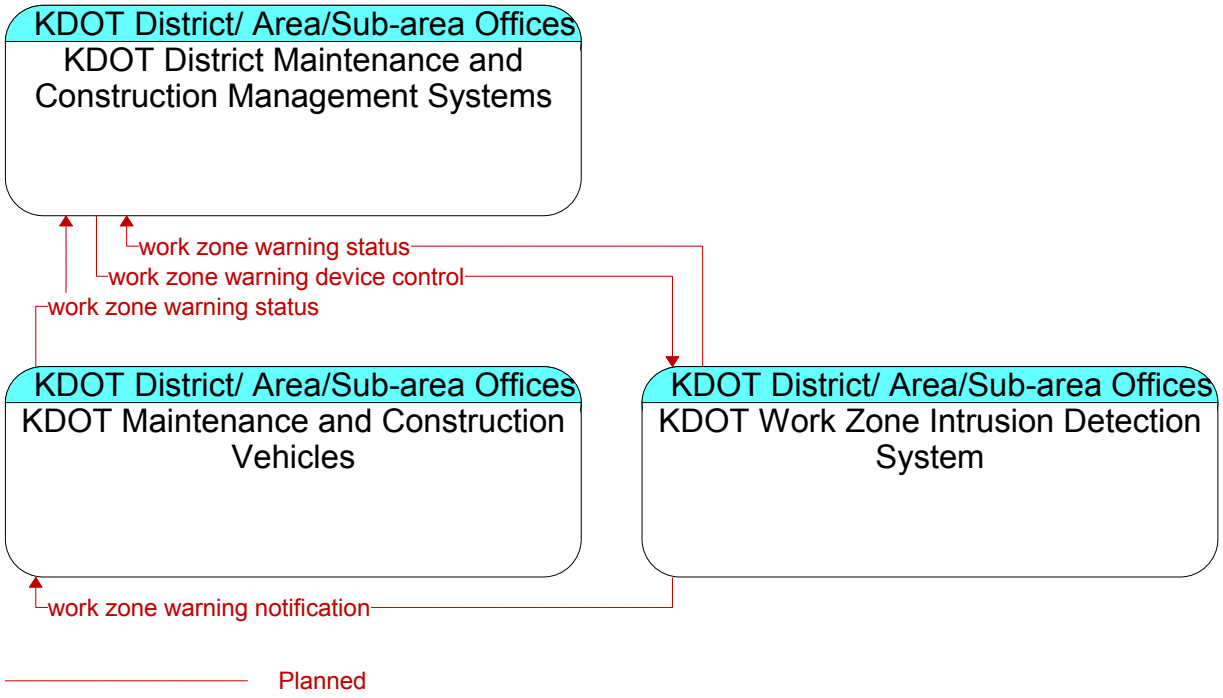
Project No.	**ITS-16**
Title	KDOT Vehicle Maintenance Management System
Service Area	Maintenance and Construction Management
Stakeholder	KDOT
Scope	This project will deploy a system to assist KDOT in managing fleet and other maintenance and construction equipment management. This system will automate 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



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

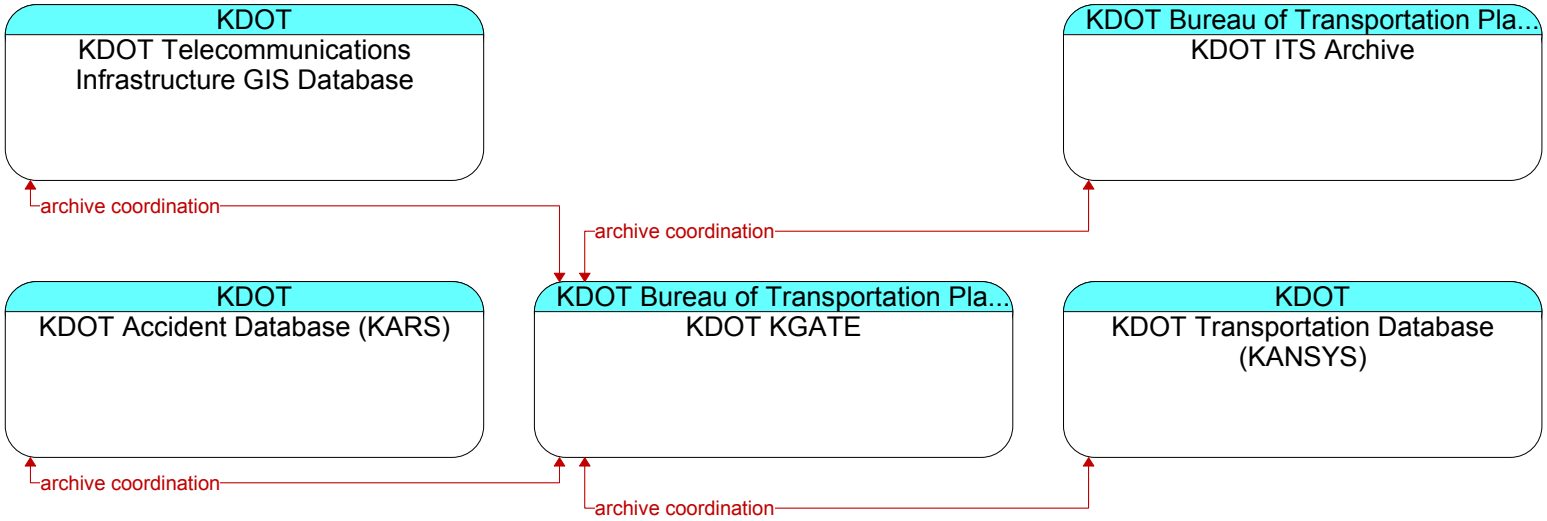
Architecture



Project No. ITS-18

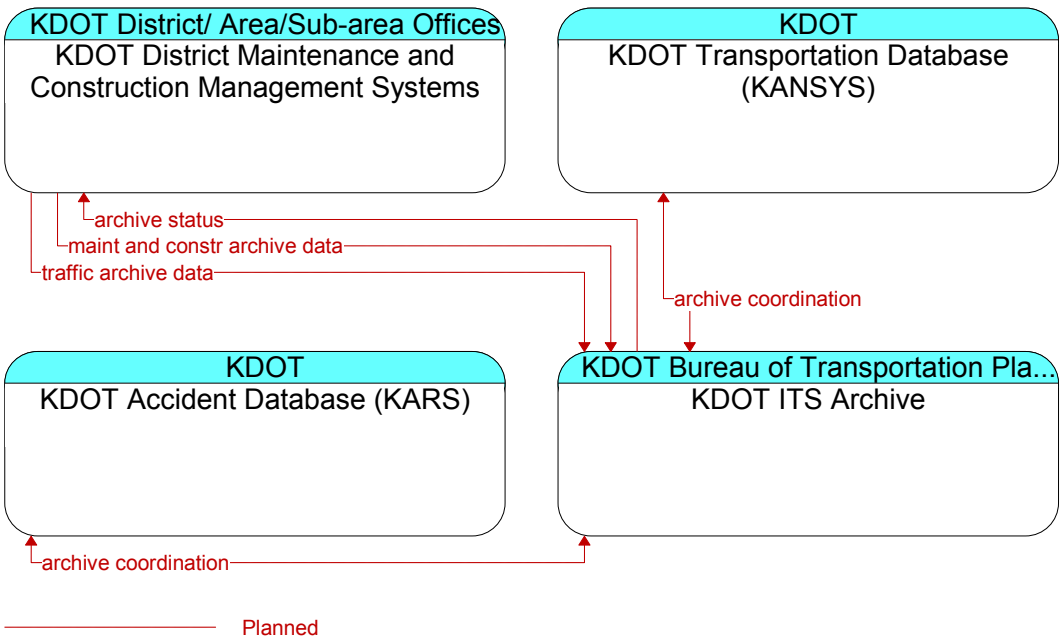
Title	KDOT KGATE Enhancements
Service Area	Data Management
Stakeholder	KDOT
Scope	KGATE is a GIS-based web portal designed to reduce road blocks to data sharing. The web portal connects to numerous KDOT geo-referenced databases or other data including digital images, multiple databases, and scanned documents. 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.
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



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)

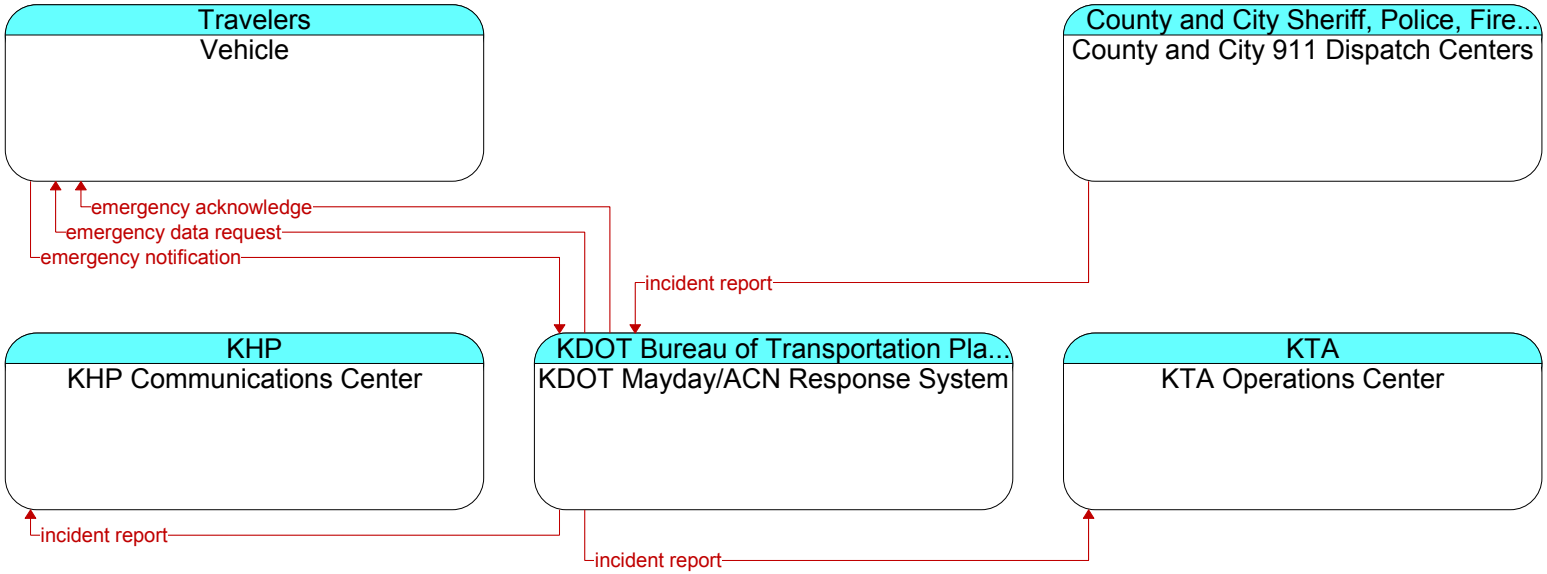
Architecture



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

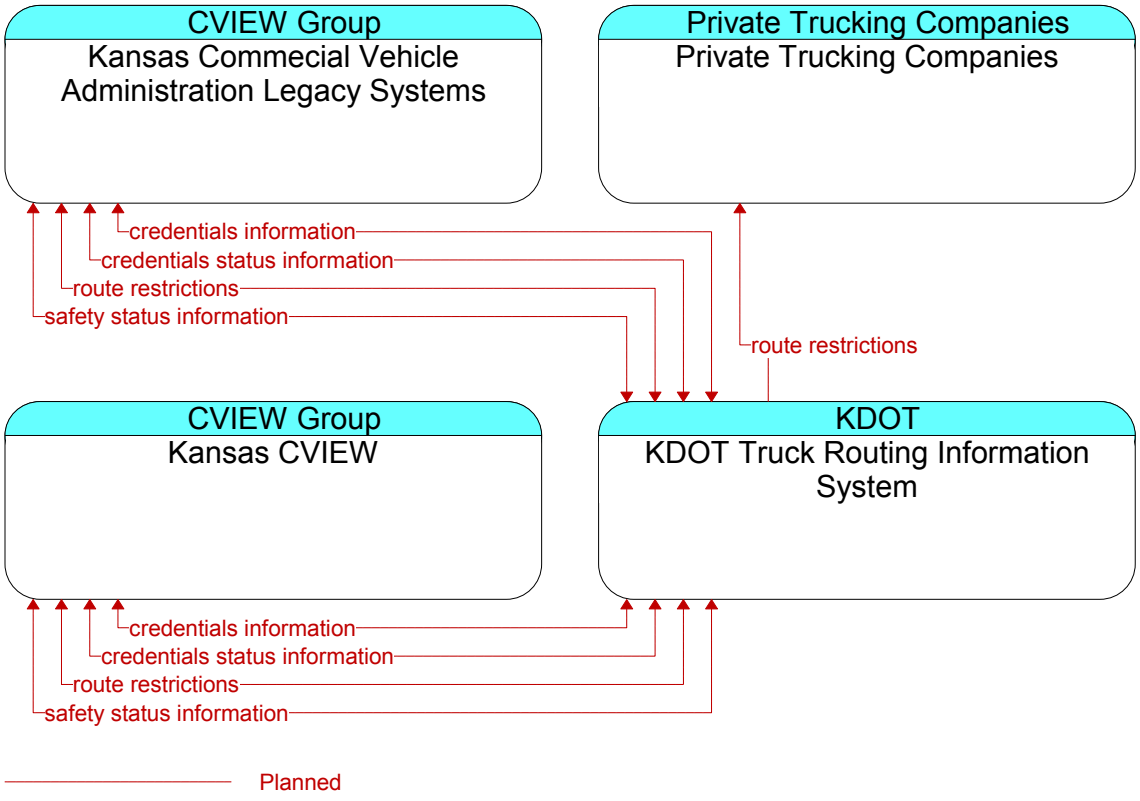


Project No. ITS-21

Title	KDOT Mayday/Automated Collision Notification Service Provider Registration System
Service Area	Emergency Management
Stakeholder	KDOT
Scope	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.
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 #20 (KDOT Mayday/ACN Response System)
Architecture	None

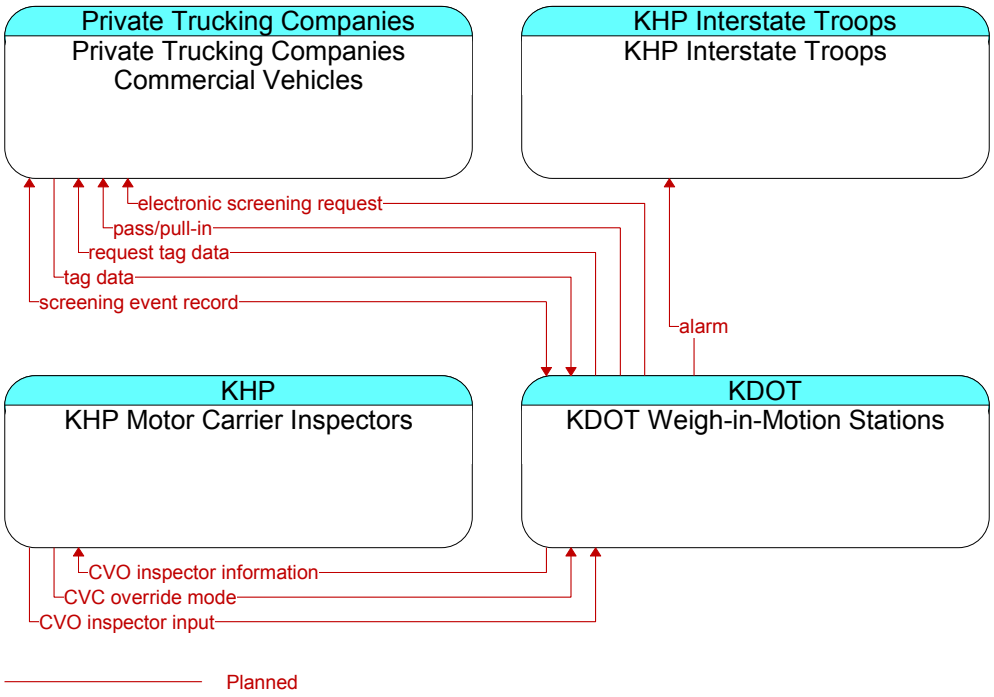
Project No.	**ITS-22**
Title	KDOT Truck Routing Information System (TRIS)
Service Area	Commercial Vehicle Operations
Stakeholder	KDOT
Scope	TRIS is a GIS-based routing and bridge analysis system to assist KDOT and KDOR personnel to augment clearance or provide routing information for oversize and overweight 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.
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)



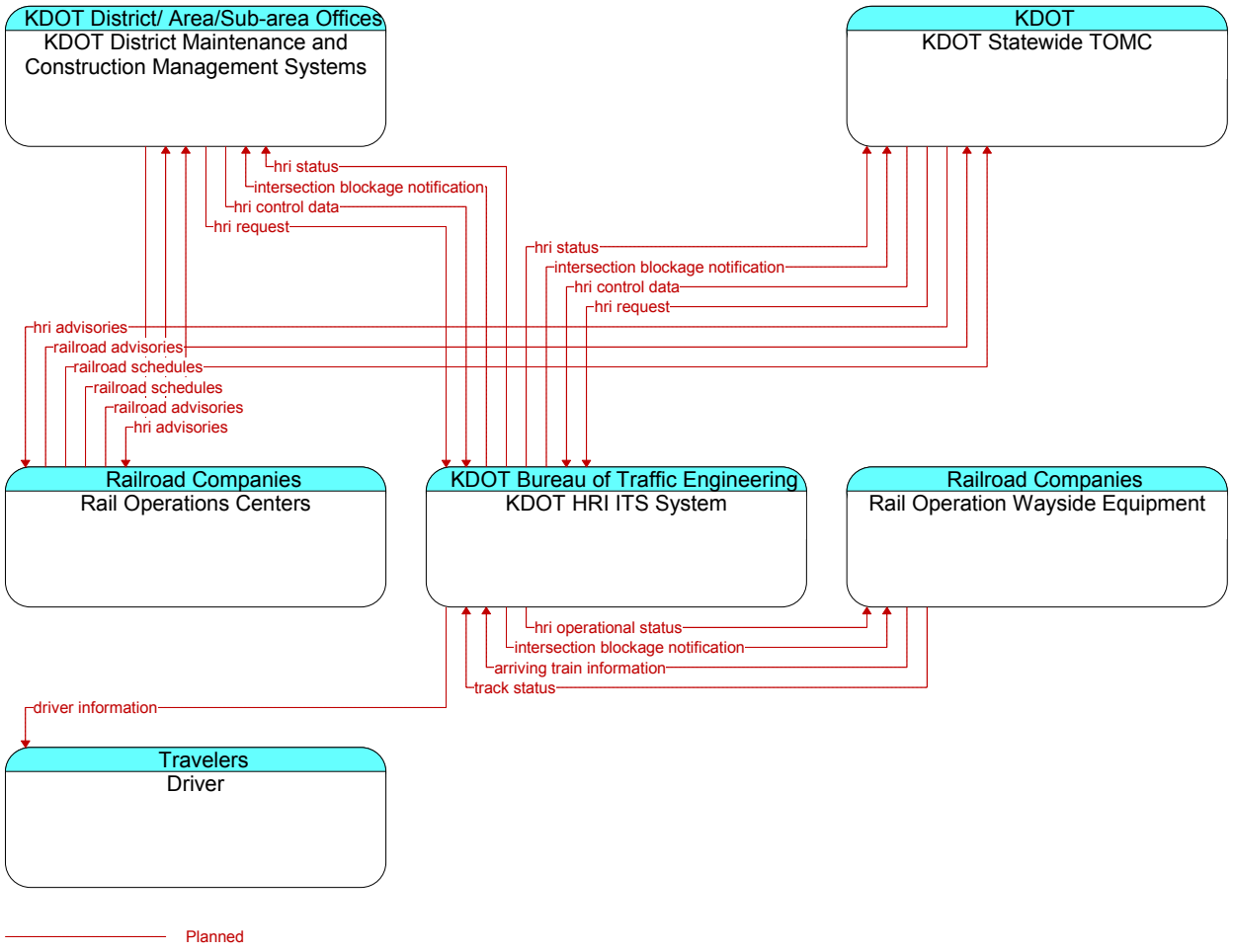
Project No.	**ITS-23**
Title	KDOT Remote Screening Weigh-in-Motion System
Service Area	Commercial Vehicle Operations
Stakeholder	KDOT, KHP
Scope	A mainline weigh-in-motion system is planned on US 69. This system will allow KHP to remotely monitor commercial vehicle compliance. When an overweight truck 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



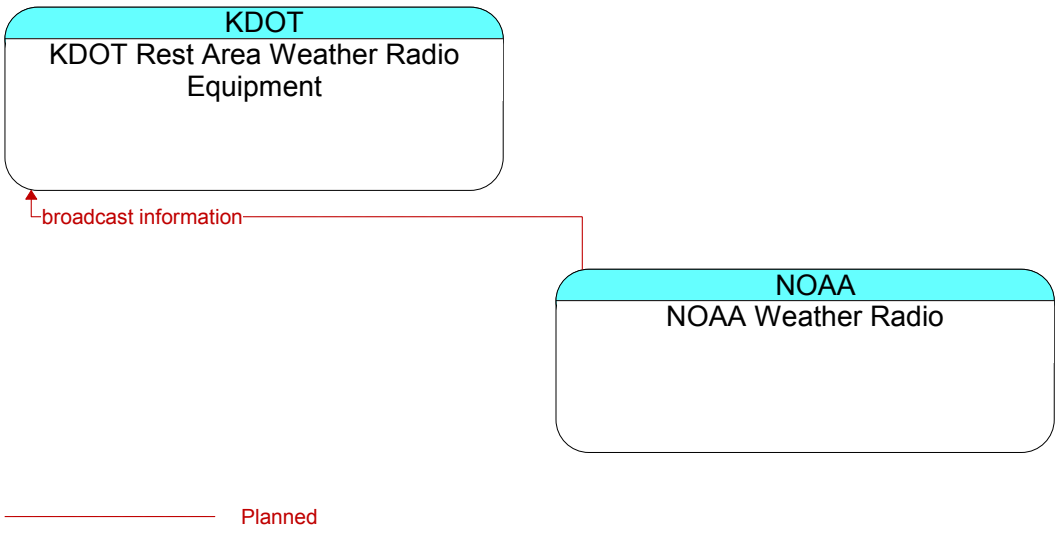
Project No.	**ITS-24**
Title	KDOT Highway-Railroad Intersection ITS Project
Service Area	Traffic Management
Stakeholder	KDOT, Railroad Companies, Counties and Cities
Scope	This project will deploy ITS technologies at or near highway-railroad intersections (HRIs). This project will consider a combination 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

KDOT Highway-Railroad Intersection ITS Project



Project No.	**ITS-25**
Title	KDOT Rest Area Weather Radio Announcement
Service Area	Traveler Information
Stakeholder	KDOT, NOAA
Scope	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.
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

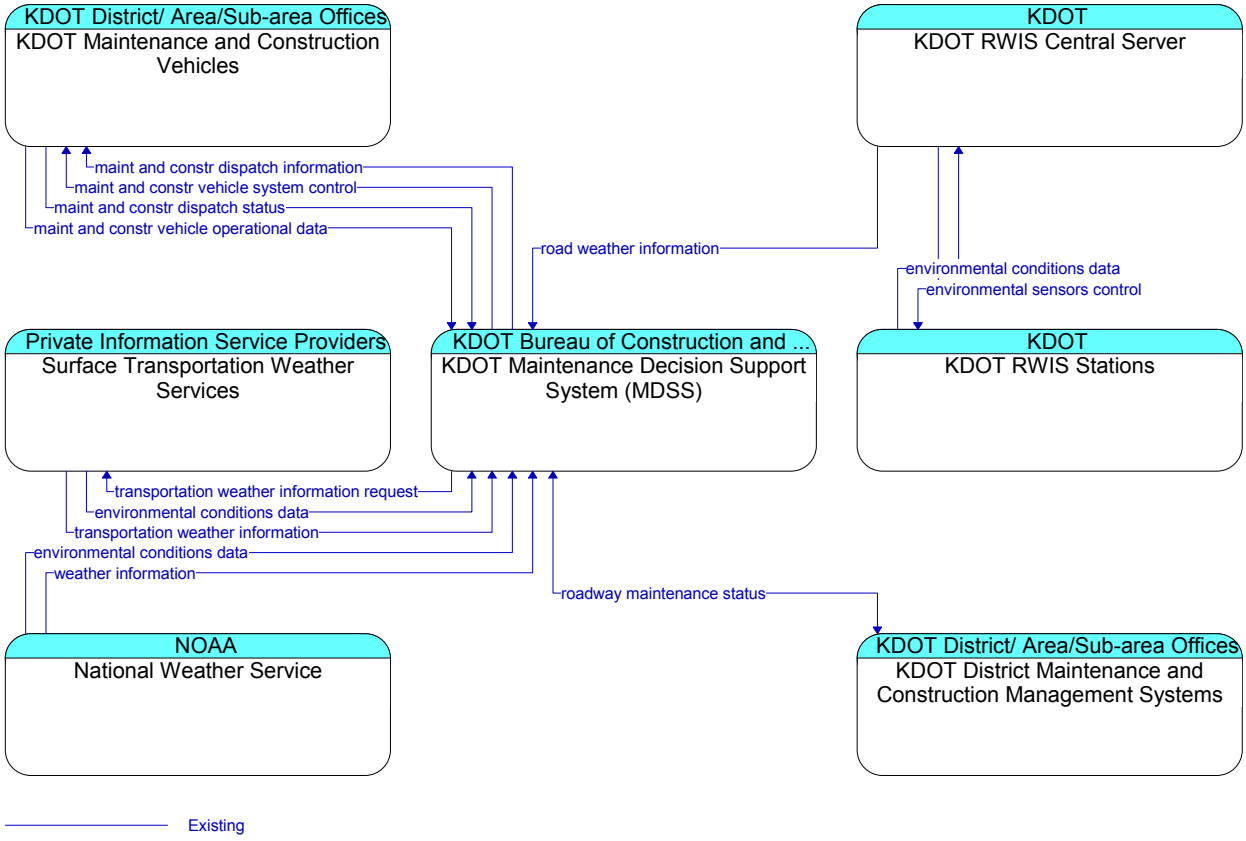
Architecture



Project No. ITS-26

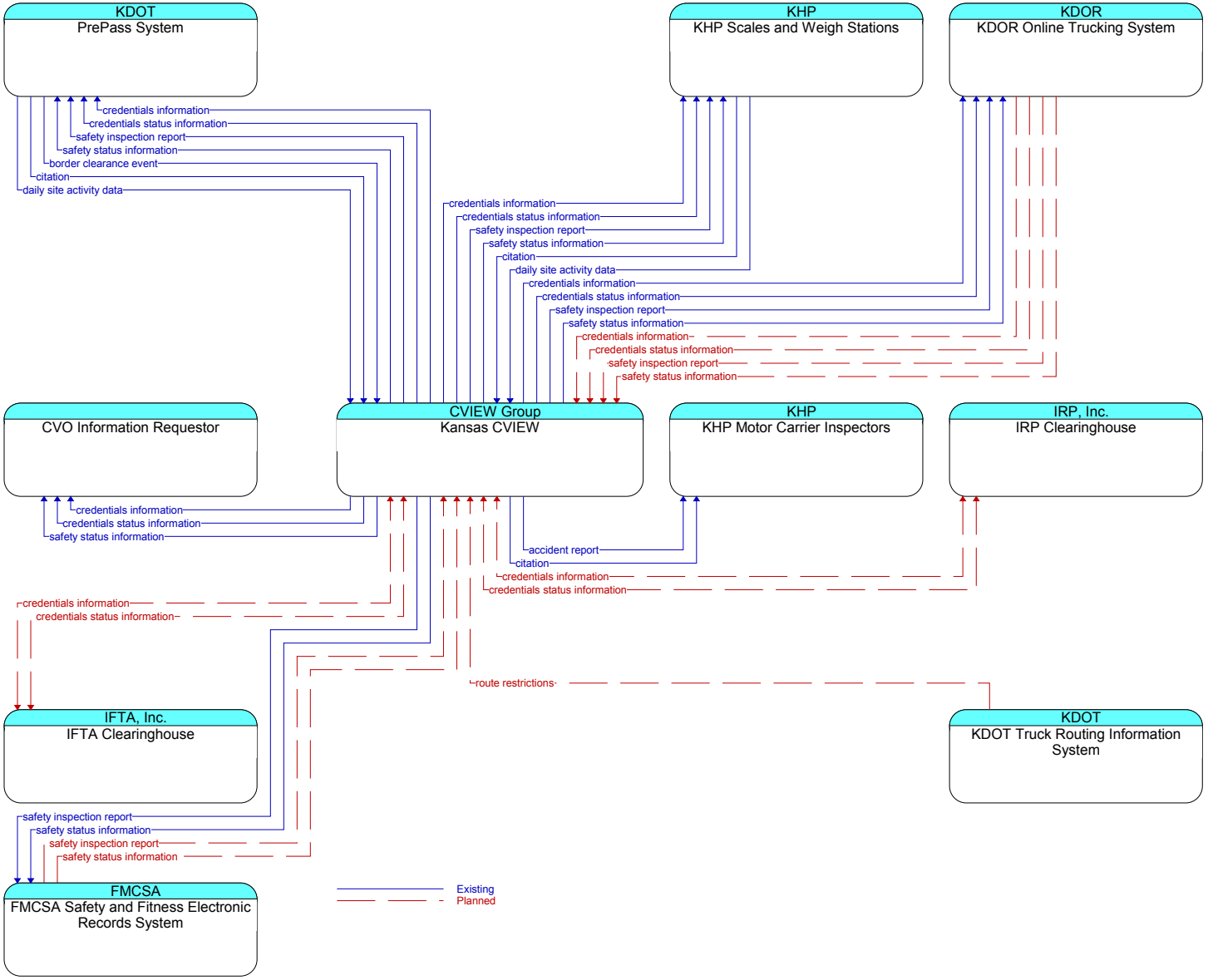
Title	KDOT Maintenance Decision Support System (MDSS)
Service Area	Maintenance and Construction Management
Stakeholder	KDOT, MDSS Pooled Fund Study
Scope	MDSS is a server- and client-side hardware and software package that provides winter maintenance support. MDSS offers visualizations of the real time 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)



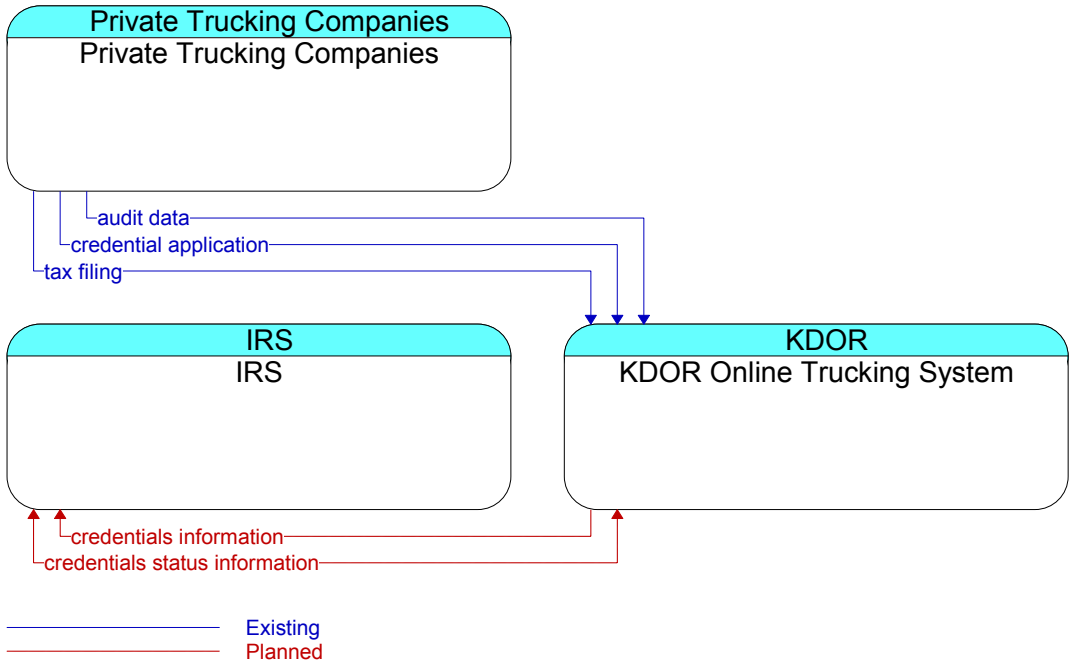
Project No.	**ITS-27**
Title	Kansas Commercial Vehicle Information Exchange Window (CVIEW)
Service Area	Commercial Vehicle Operations
Stakeholder	KDOT, KDOR, KCC, KHP
Scope	CVIEW is an electronic data exchange system that will enhance efficiency, safety, compliance and enforcement for commercial vehicle 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)



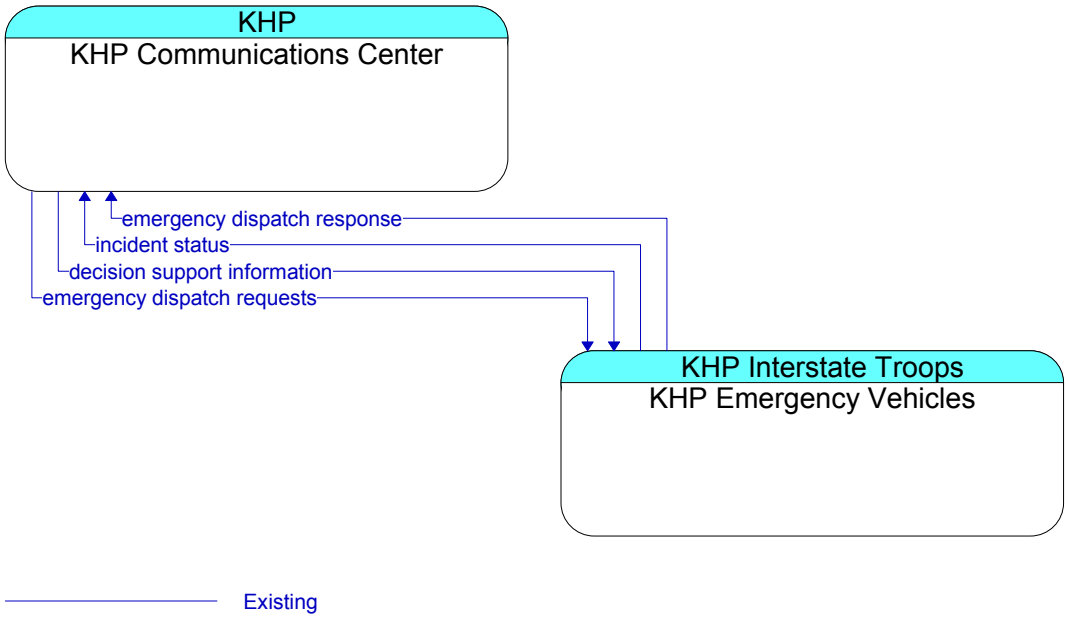
Project No.	**ITS-28**
Title	KDOR Electronic Heavy Vehicle Use Tax Reporting
Service Area	Commercial Vehicle Operations
Stakeholder	KDOR, IRS
Scope	This project will provide electronic data transfer interface with the Internal Revenue Service (IRS) to electronically submit records of tax payments for 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



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

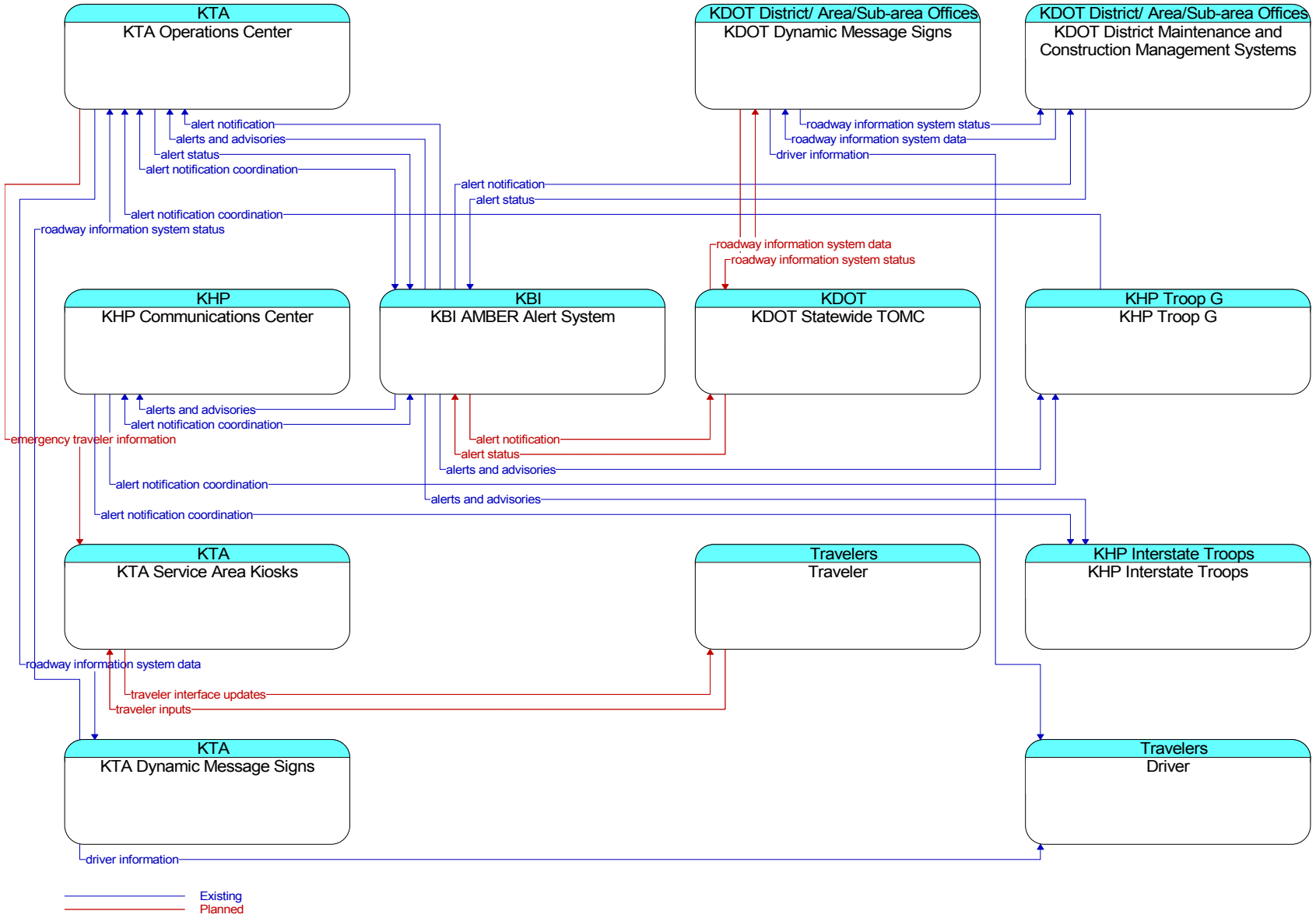


Project No.	**ITS-30**
Title	KHP Total Stations Enhancement
Service Area	Emergency Management
Stakeholder	KHP
Scope	KHP desires to purchase reflector-less electronic total station equipment and upgrades for existing electronic total stationing equipment owned and operated by the KHP. The use of total 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

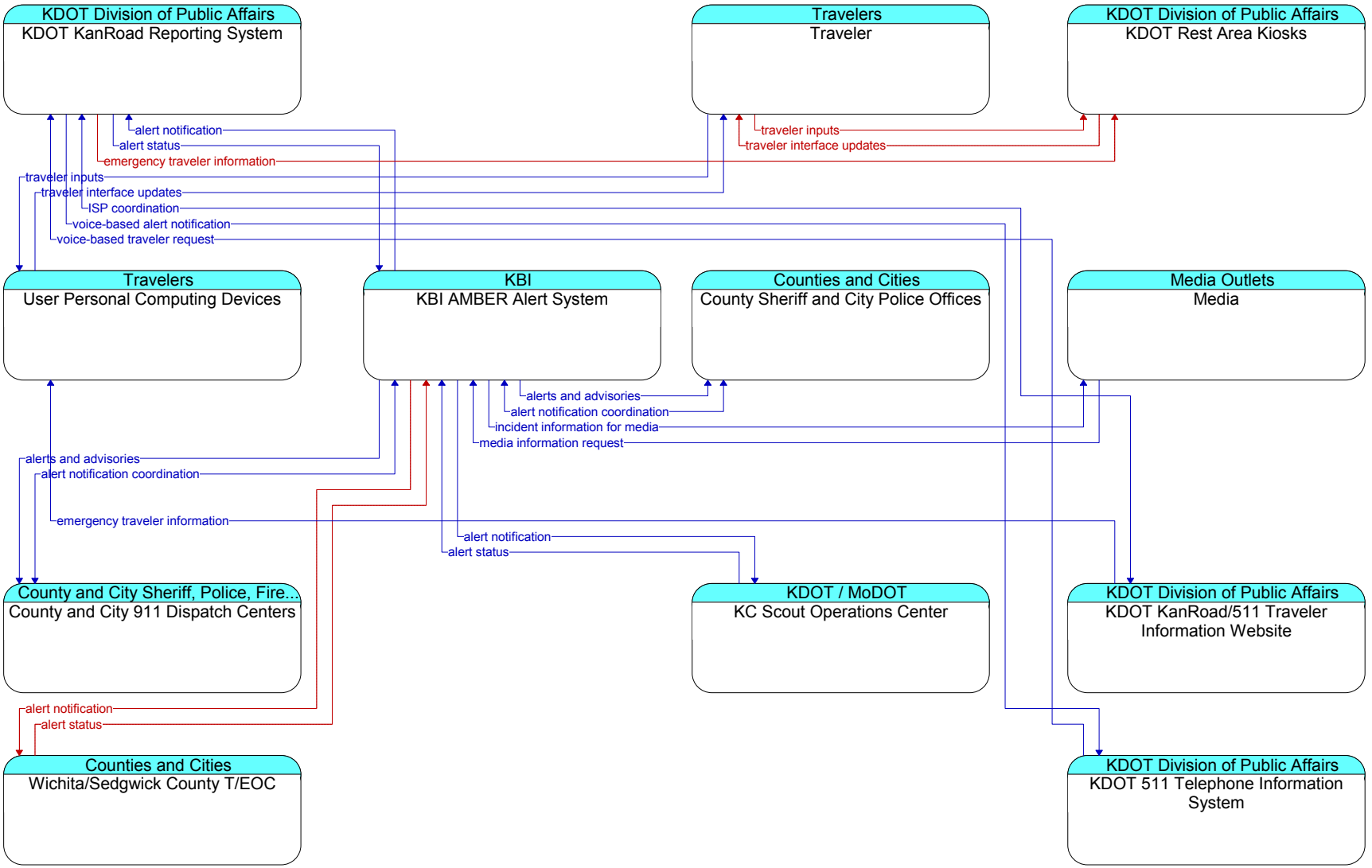
Project No.	**ITS-31**
Title	KHP Photogrammetry Project
Service Area	Emergency Management
Stakeholder	KHP
Scope	KHP plans to purchase a close-range photogrammetry system to assist in crash scene reconstruction and documentation. The project will equip and train KHP troopers in the operation of the photogrammetry 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.
Expected Benefit	• Improved roadway safety • Improved travel safety • Improved trooper safety • Improved incident investigation efficiency
Timeframe	Short
Duration	1 Year
Priority	High
Capital Cost	TBD
O&M Cost	TBD
Market Package	ATMS08 – Traffic Incident Management System
Dependency	None
Architecture	None

Project No.	**ITS-32**
Title	KBI AMBER Alert System Enhancements
Service Area	Emergency Management
Stakeholder	KDOT, KBI, KHP, KC Scout, County Sheriffs, City Police Departments
Scope	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.
Expected Benefit	Improved AMBER alert operation efficiency and communications
Timeframe	On-going
Duration	2 Years
Priority	High
Capital Cost	$3K
O&M Cost	Staff Time (TBD)
Market Package	EM06 – Wide-Area Alert
Dependency	None
Architecture	See next 2 pages

KBI AMBER Alert System Enhancements (Part 1 of 2)

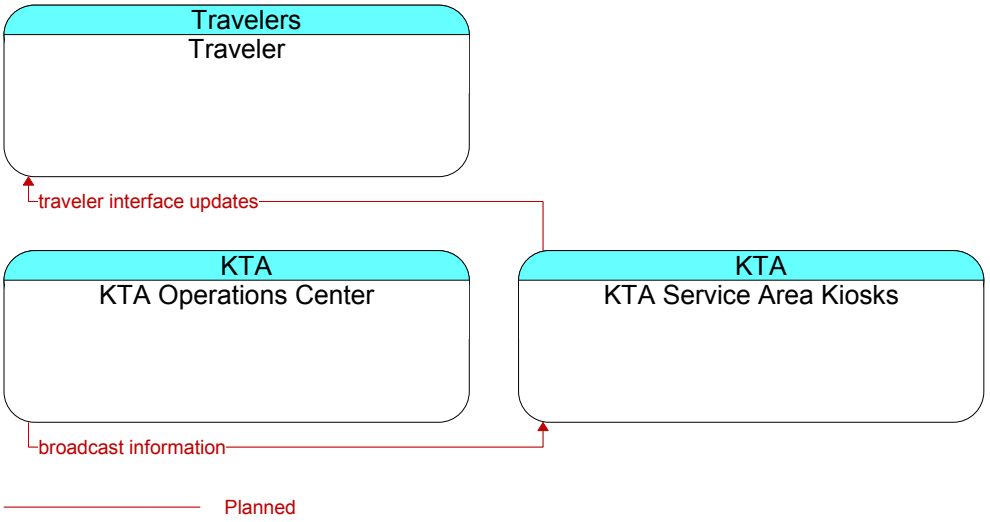


KBI AMBER Alert System Enhancements (Part 2 of 2)



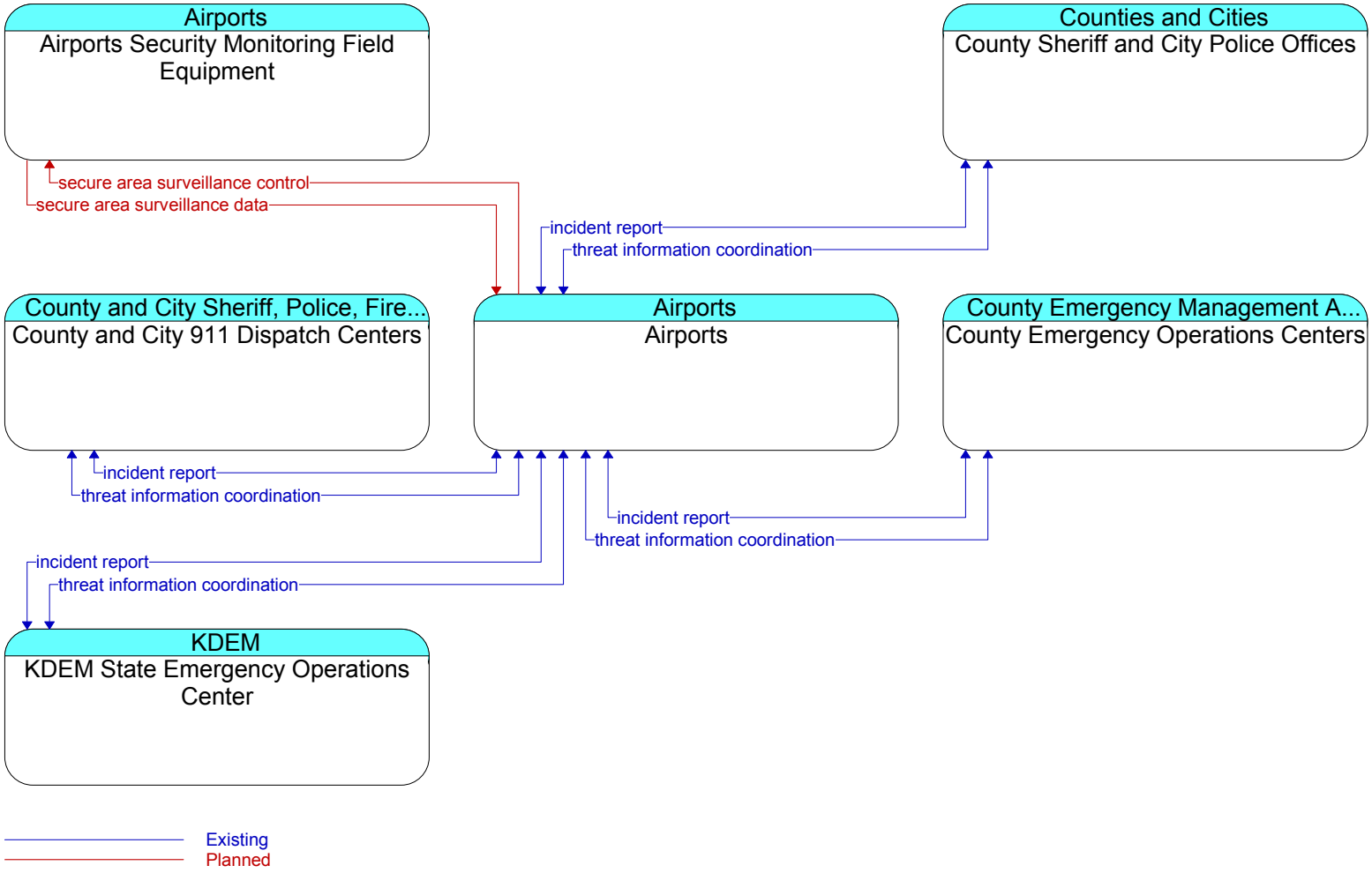
Project No.	**ITS-33**
Title	KTA Service Area Kiosks
Service Area	Traveler Information
Stakeholder	KTA, KDOT
Scope	This project will deploy kiosks in KTA service areas to provide travel information to motorists traveling along the Kansas Turnpike. The information provided by the kiosks will include maps, 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



Project No.	**ITS-34**
Title	Kansas Airport Security Monitoring Systems
Service Area	Emergency Management
Stakeholder	KDOT, Airports
Scope	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.
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

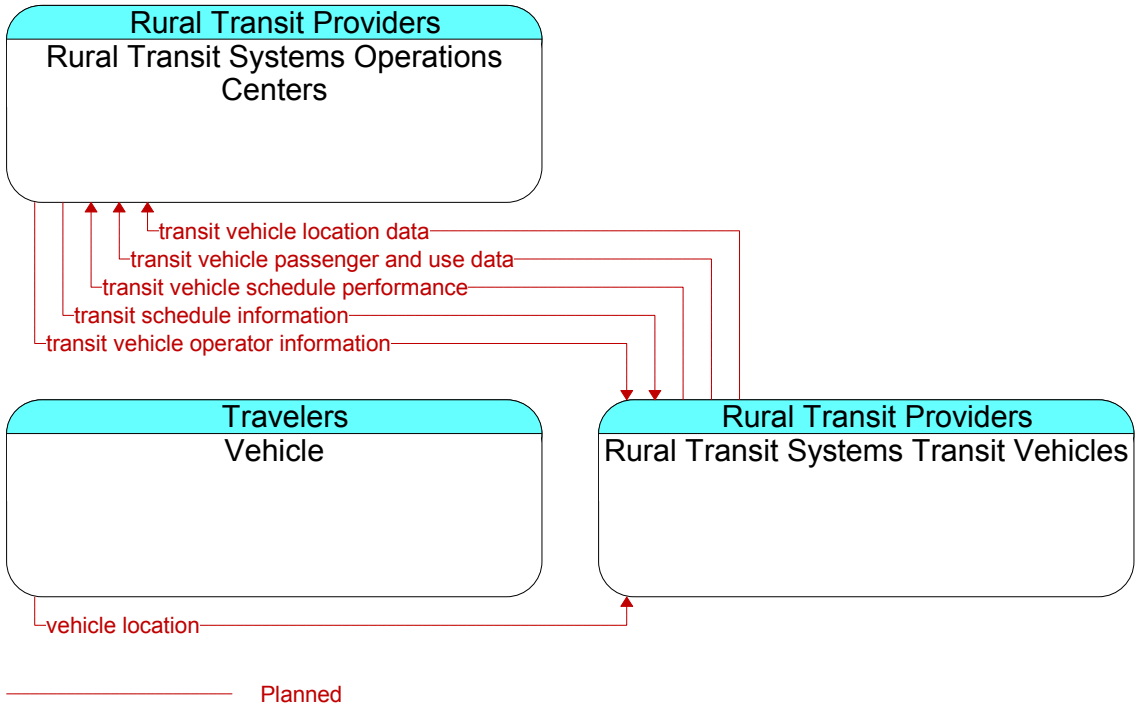


Project No.	**ITS-35**
Title	Kansas Alternate Route Planning
Service Area	Traffic Management, Emergency Management, Traveler Information
Stakeholder	KDOT, KDEM, KHP, KTA, Counties, Cities
Scope	This will be a series of projects that develop alternate route plans for emergency and incident situation in 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

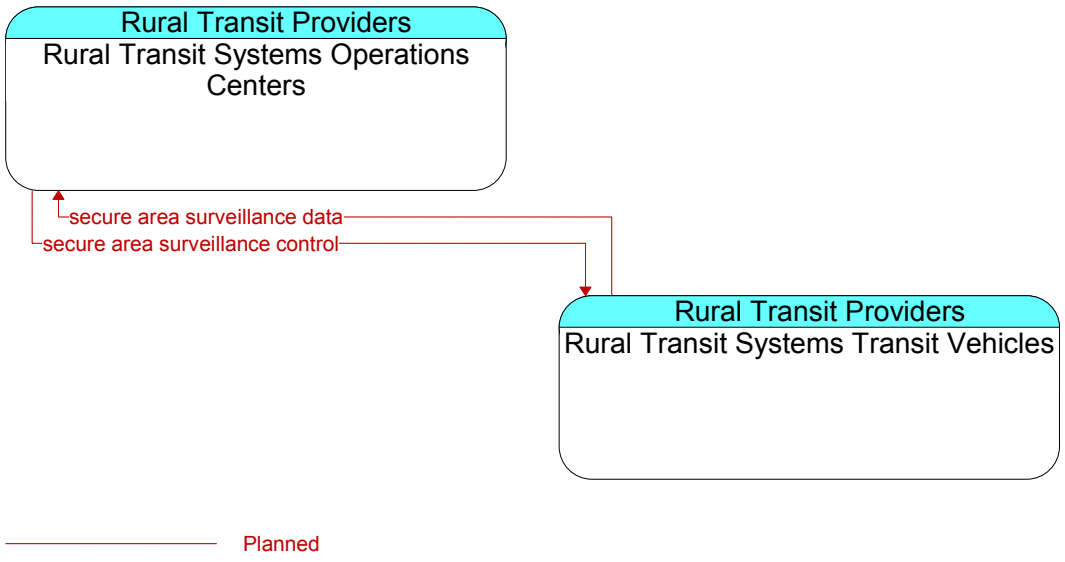
Title	Rural Transit Computer Aided Dispatch, Automatic Vehicle Location and Mobile Data Terminal
Service Area	Public Transportation
Stakeholder	Rural Transit Service Providers, KDOT
Scope	DSNWK (Developmental Services for Northwest Kansas) in Hays and RCAT (Reno County Area Transportation) in Hutchinson 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



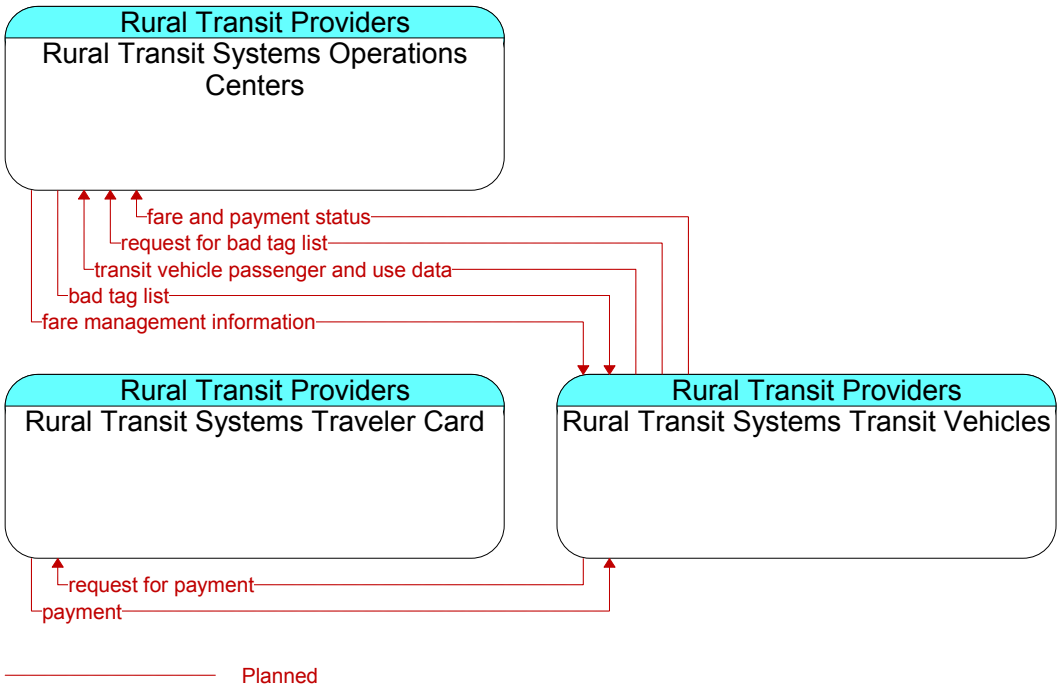
Project No.	**ITS-37**
Title	Rural Transit On-board Cameras
Service Area	Public Transportation, Emergency Management
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will install a security system on board of transit vehicles to provide physical security for transit passengers and 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



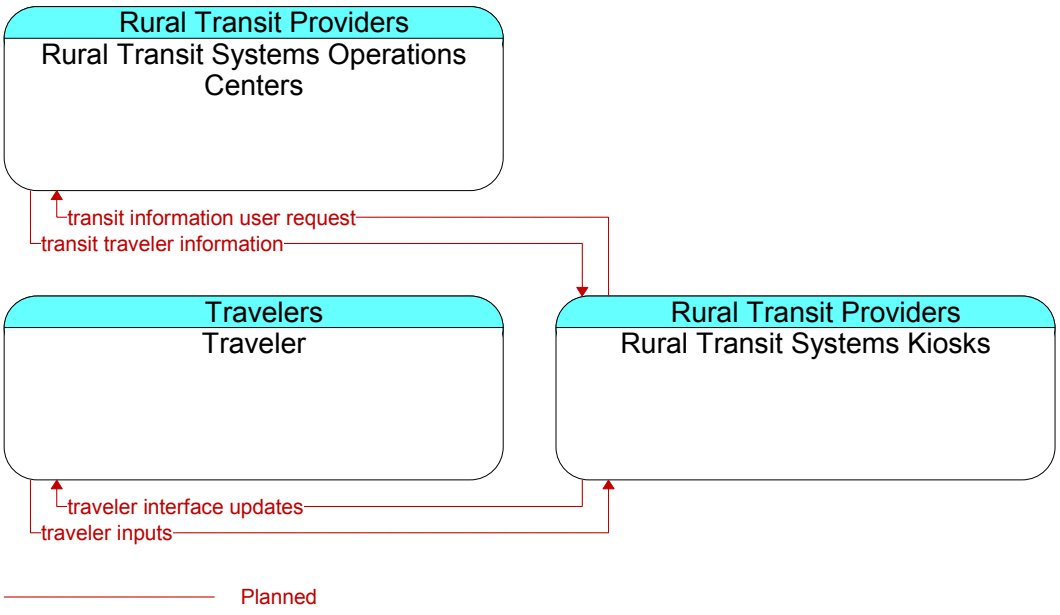
Project No.	**ITS-38**
Title	Rural Transit Electronic Fare Payment System
Service Area	Public Transportation
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will implement an electronic fare payment system for fare collection in transit vehicles. Installation of automatic passenger 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



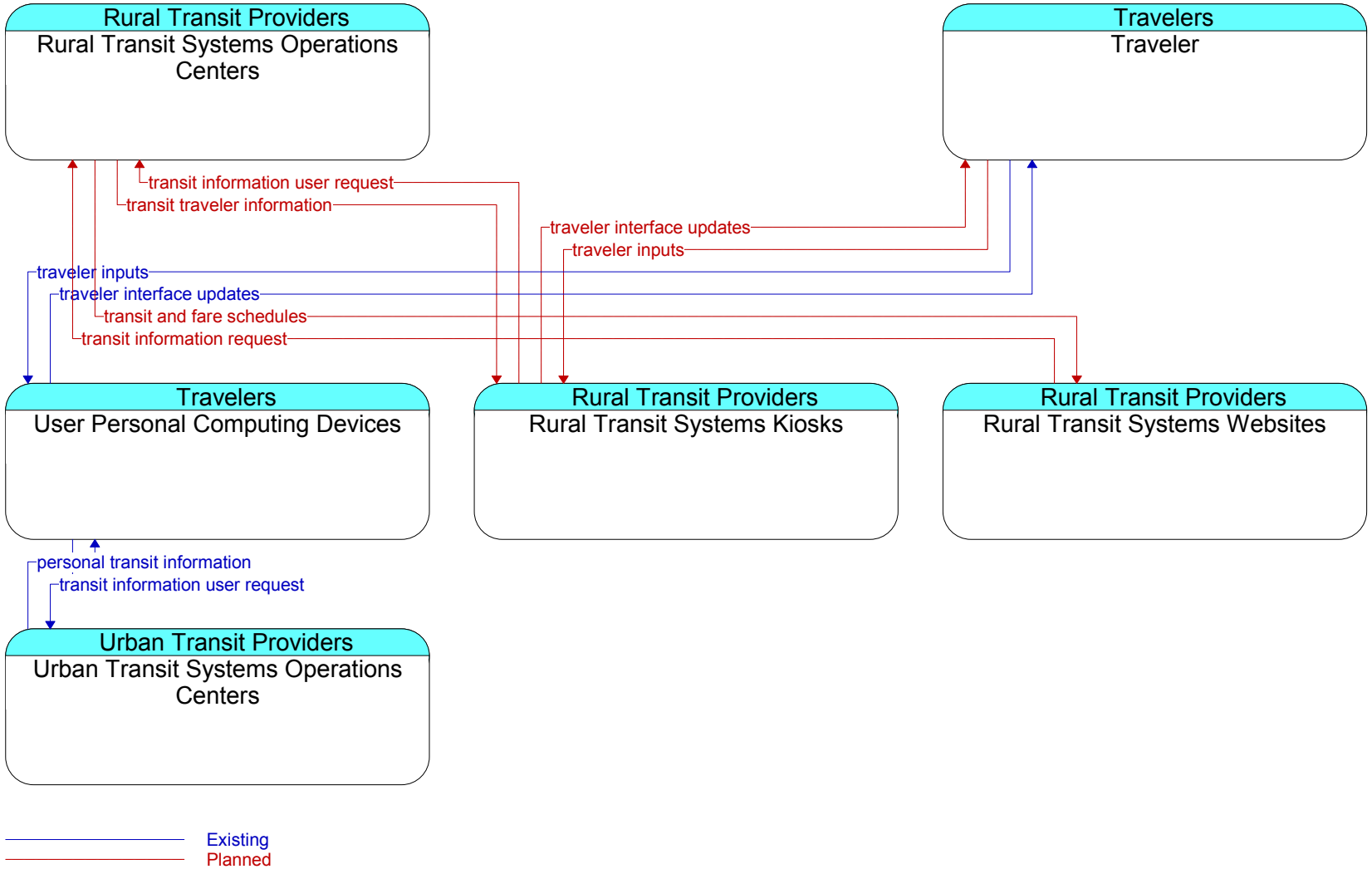
Project No.	**ITS-39**
Title	Rural Transit Kiosks
Service Area	Public Transportation, Traveler Information
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will install kiosks at major transit stations and stops to disseminate transit related information. Finney County Committee on 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



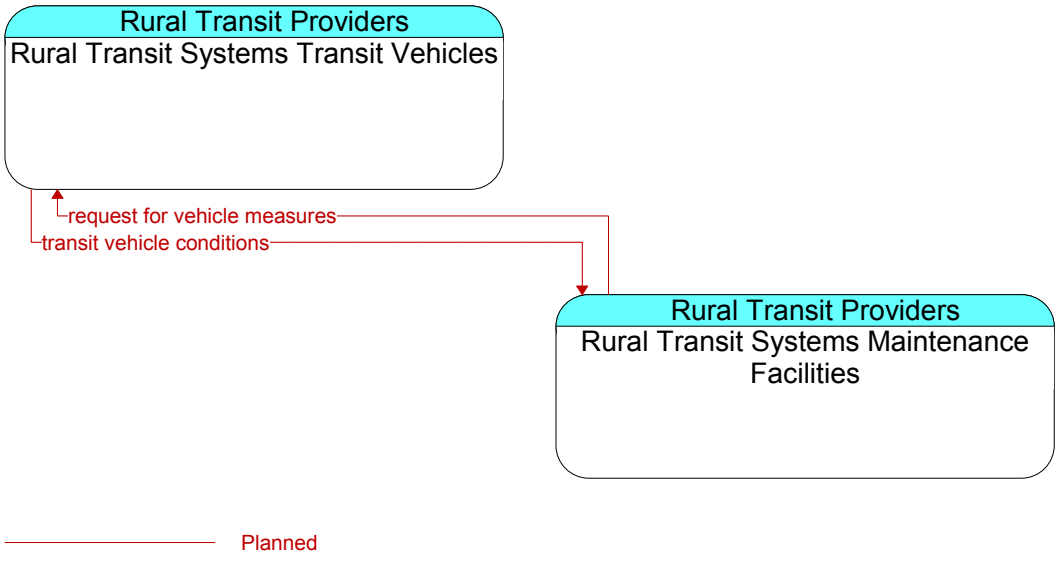
Project No.	**ITS-40**
Title	Rural Transit Pre-trip Planning
Service Area	Public Transportation, Traveler Information
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will develop a pre-trip planning system for rural transit systems. This system will provide pre-trip planning capability 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



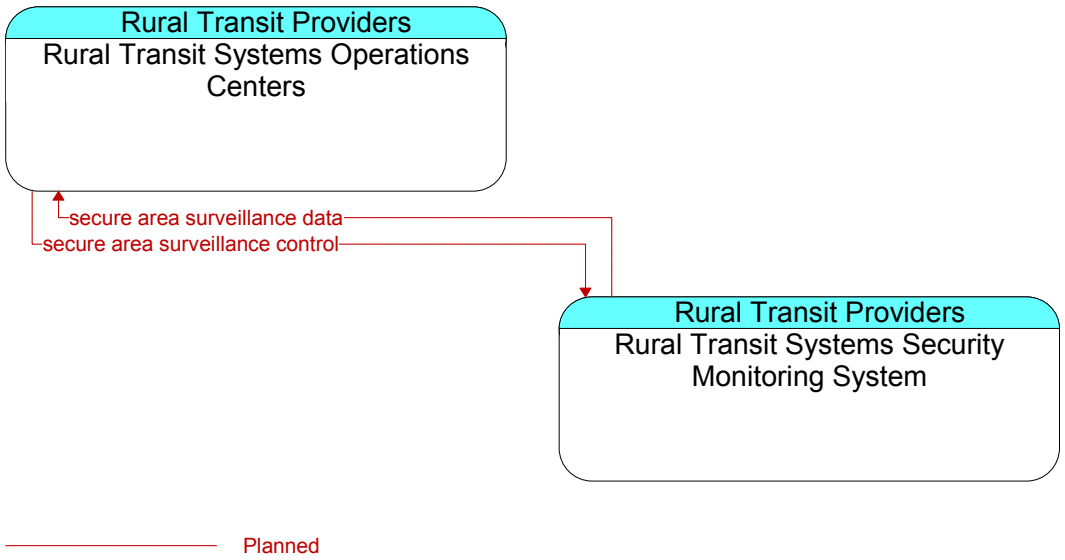
Project No.	**ITS-41**
Title	Rural Transit Vehicle Maintenance Management System
Service Area	Public Transportation
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will deploy a system to assist rural transit systems in managing the maintenance activities for their fleets. This system 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



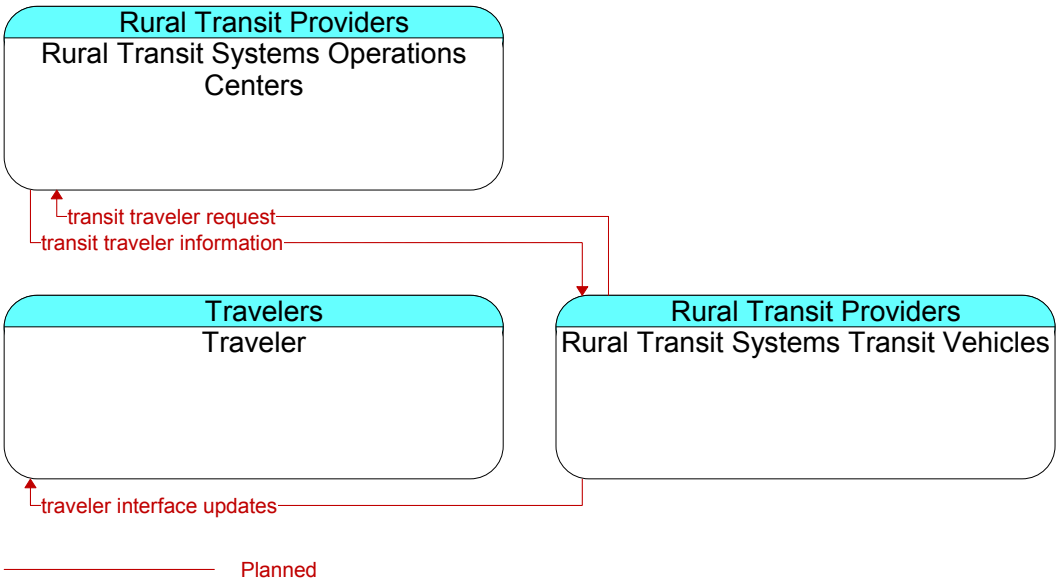
Project No.	**ITS-42**
Title	Rural Transit Security Monitoring System
Service Area	Public Transportation
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will deploy security systems to monitor transit stops, stations, garages, and transit yards. The system includes surveillance cameras 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.
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



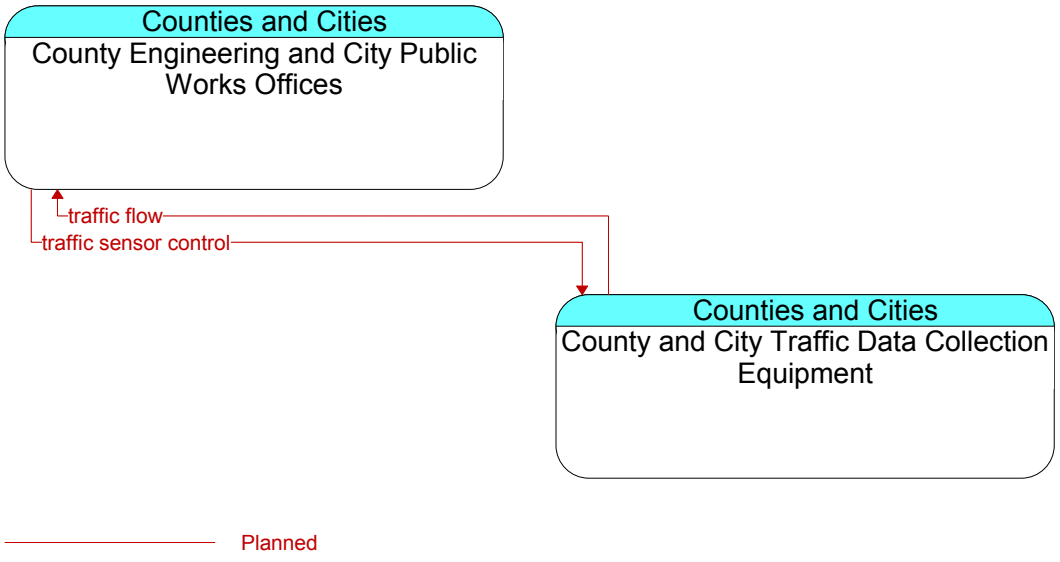
Project No.	**ITS-43**
Title	Rural Transit On-board Display/Audio System
Service Area	Public Transportation
Stakeholder	Rural Transit Service Providers, KDOT
Scope	This project will install displays and/or audio equipment on board of transit vehicles to disseminate transit information to passengers. 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



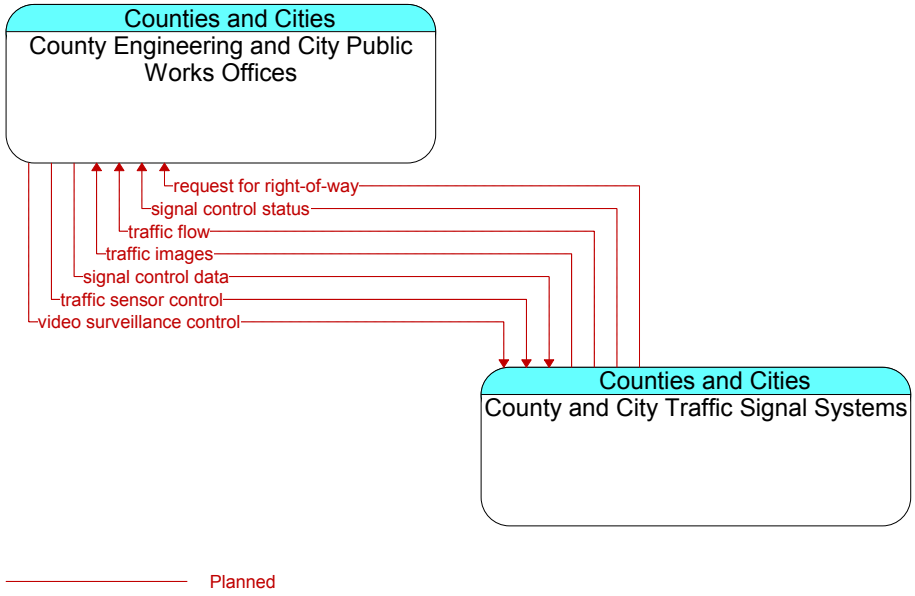
Project No.	**ITS-44**
Title	County and City Traffic Data Collection
Service Area	Traffic Management
Stakeholder	County and City
Scope	This project will install detectors to collect traffic flow data (volume, speed, and/or occupancy). City of Junction City plans to install traffic sensors on the city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

Architecture



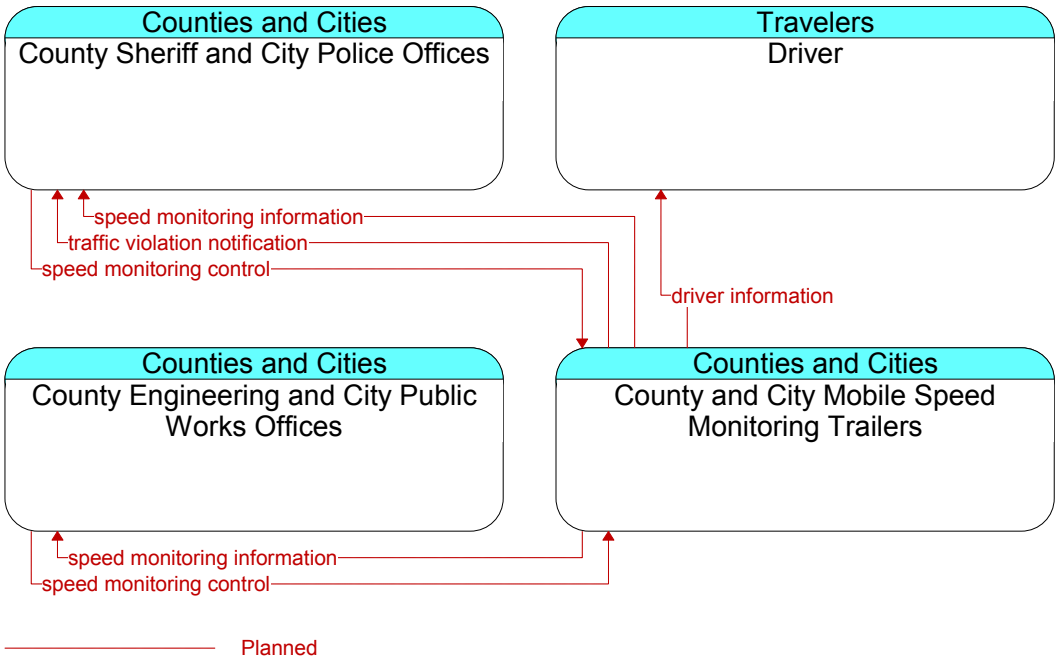
Project No.	**ITS-45**
Title	County and City Signal System Coordination and Operation
Service Area	Traffic Management
Stakeholder	County and City
Scope	This project will implement signal timing coordination to facilitate more efficient movement of traffic, particularly during peak hours. The project 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



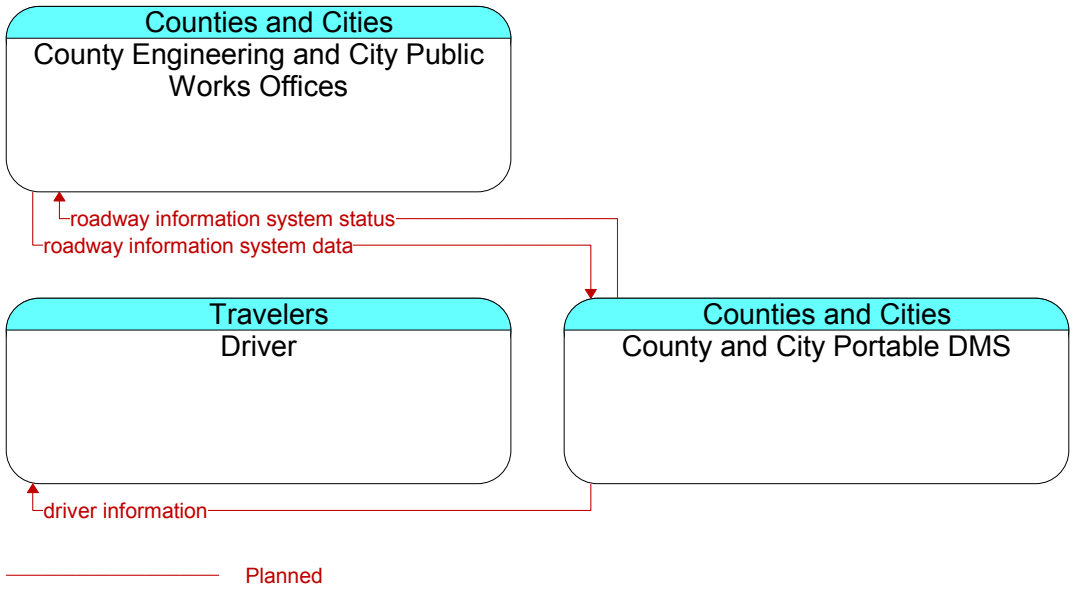
Project No.	**ITS-46**
Title	County and City Mobile Speed Monitoring Trailer
Service Area	Traffic Management
Stakeholder	County and City
Scope	Garden City will procure a mobile speed monitoring trailer in promoting speed limit compliance. This system will provide suggested safe driving speed to the vehicles 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



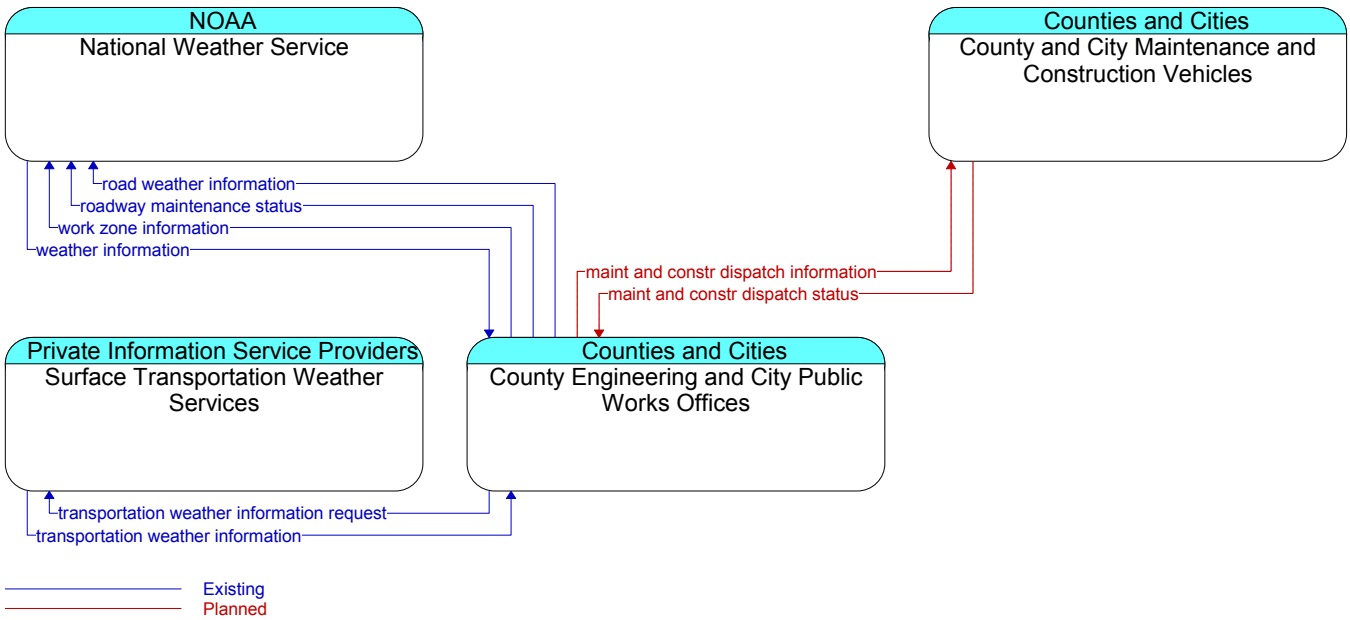
Project No.	**ITS-47**
Title	County and City Portable Dynamic Message Signs
Service Area	Traffic Management, Traveler Information
Stakeholder	County and City
Scope	Several cities and counties, including Dodge City, will procure portable dynamic message signs (DMSs) for directing traffic during special 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



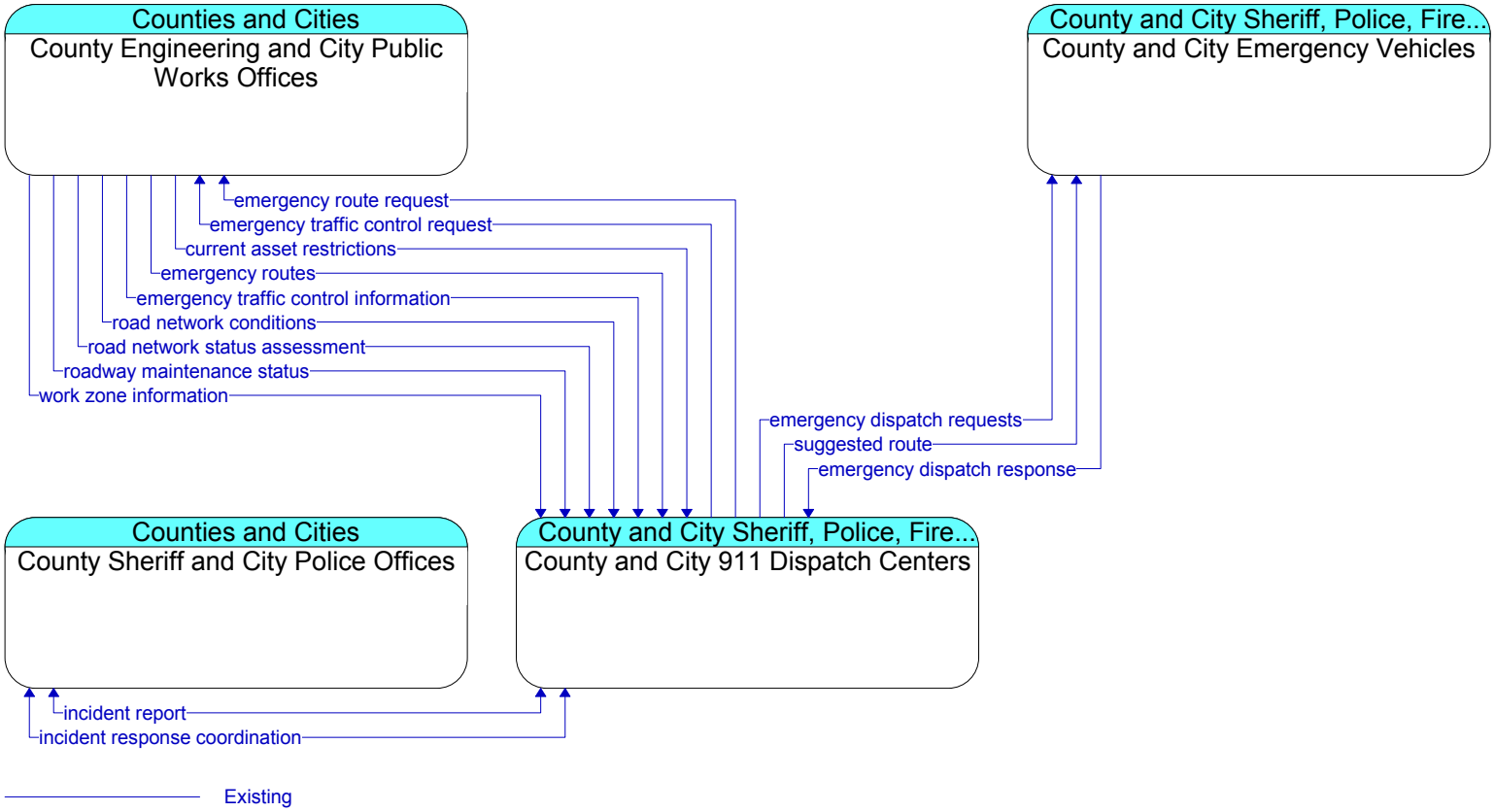
Project No.	**ITS-48**
Title	County and City Maintenance Vehicle Computer Aided Dispatch
Service Area	Maintenance and Construction Management
Stakeholder	County and City
Scope	This project will install computer aided dispatch (CAD) system to dispatch maintenance vehicles for planned activities (road 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



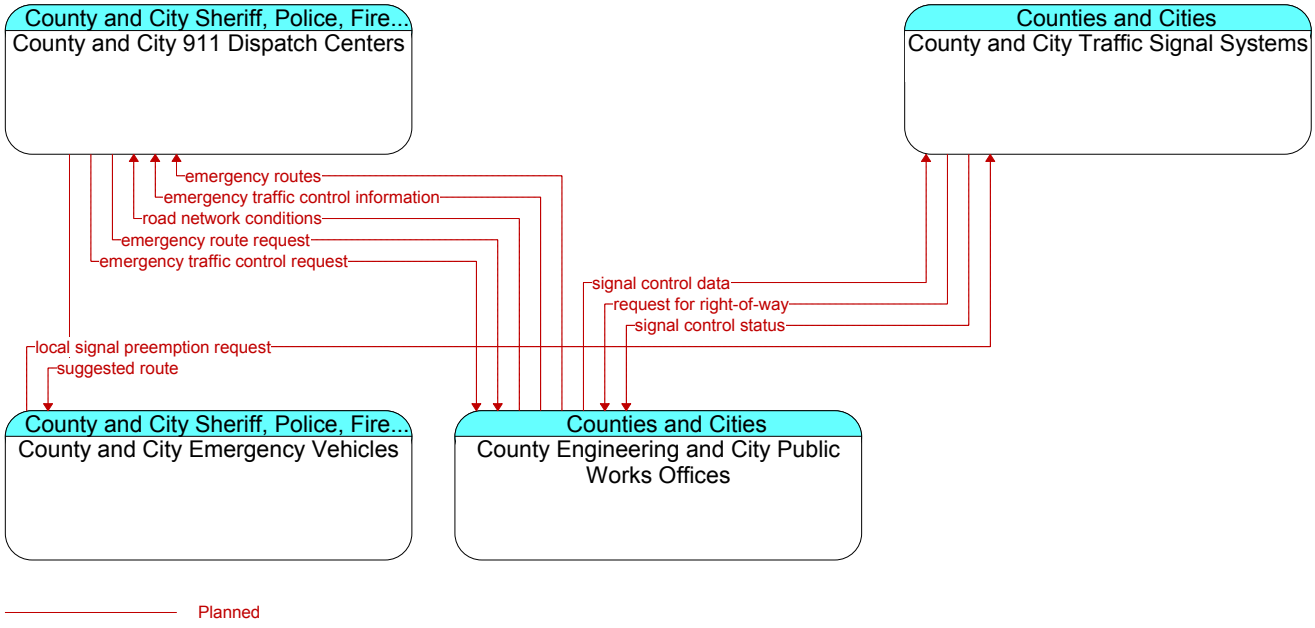
Project No.	**ITS-49**
Title	County and City Communications Center Upgrade
Service Area	Emergency Management
Stakeholder	County and City
Scope	This project will deploy center-related improvements, including installing or upgrading computer aided dispatch (CAD) systems, consolidating different communication 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

County and City Communications Center Upgrade



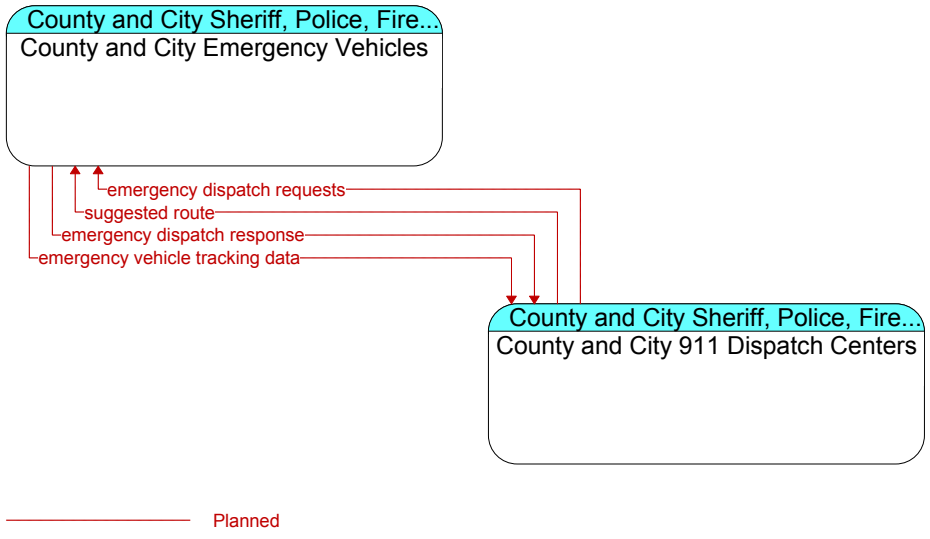
Project No.	**ITS-50**
Title	County and City Emergency Vehicle Preemption
Service Area	Emergency Management
Stakeholder	County and City
Scope	This project will install emergency vehicle preemption (EVP) systems at signalized intersections as well as on emergency vehicles for emergency vehicle signal 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



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)

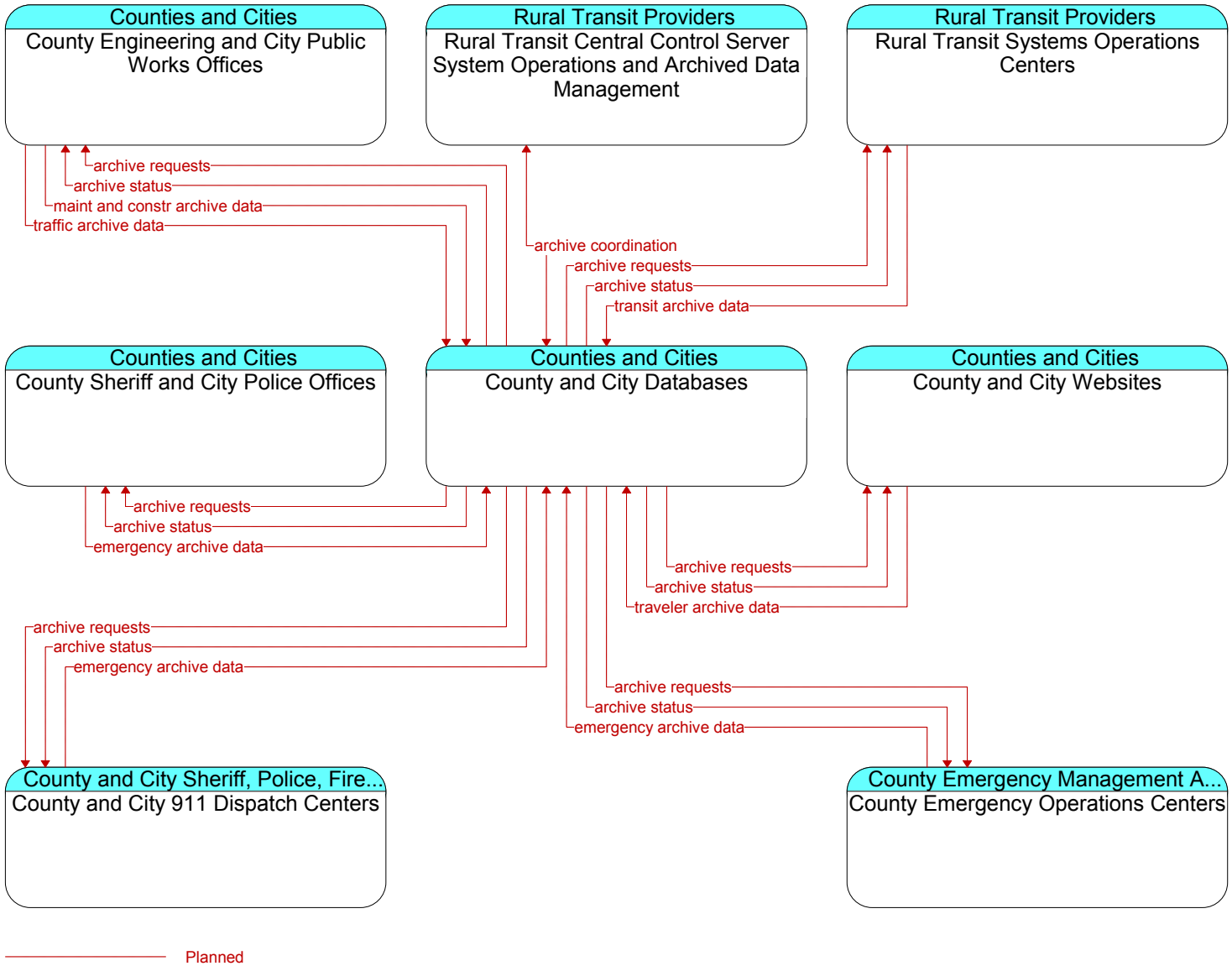
Architecture



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

County and City Database and GIS Support



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 5-1. Project Implementation Schedule

No	Project Title	Time Frame	Priority	Short Term			Medium Term					Long Term				
				Year												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9	KDOT Rest Areas Wi-Fi	On-Going	High															
11	KDOT Winter Maintenance Vehicles AVL and MDT	On-Going	High															
18	KDOT KGATE Enhancements	On-Going	High															
22	KDOT Truck Routing Information System (TRIS)	On-Going	High															
26	KDOT Maintenance Decision Support System (MDSS)	On-Going	High															
27	Kansas Commercial Vehicle Information Exchange Window (CVIEW)	On-Going	High															
29	KHP Emergency Vehicles Mobile Data Units	On-Going	High															
30	KHP Totoal Stations Enhancement	On-Going	High															
32	KBI AMBER Alert System Enhancements	On-Going	High															
1	KDOT Statewide TOMC	Short	High															
4	KDOT Dynamic Message Signs	Short to Long	High															
31	KHP Photogrammetry Project	Short	High															
47	County and City Portable DMS	Short	High															
48	County and City Maintenance Vehicle CAD Dispatch	Short	High															
46	County and City Mobile Speed Monitoring Trailer	Short	High															
2	KDOT Speedway Traffic Management System Enhancements	Short to Medium	High															
8	KDOT Rest Area Kiosks	Short	High															
10	KDOT KANROAD Reporting System Enhancements	Short	High															
17	KDOT Work Zone Intrusion System	Short	High															
44	County and City Traffic Data Collection	Short	High															
45	County and City Signal System Coordination and Operation	Short	High															
49	County and City Communications Center Upgrade	Short	High															
51	County and City Emergency Vehicle AVL and MDT	Short	High															
50	County and City Emergency Vehicle Preemption	Short	High															
12	KDOT Paint Trucks AVL	Short	Medium															
6	KDOT CCTV Along Interstate	Short	Medium															

Table 5-1. (continued)

No	Project Title	Time Frame	Priority	Short Term					Medium Term					Long Term				
				Year														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
33	KTA Service Area Kiosks	Short	Medium															
36	Rural Transit CAD, AVL and MDT	Short to Medium	Medium															
23	KDOT Remote Screening Weigh-in-Motion System	Short	Medium															
37	Rural Transit On-board Cameras	Short	Medium															
41	Rural Transit Vehicle Maintenance Management System	Short to Medium	Medium															
28	KDOR Electronic Heavy Vehicle Use Tax Reporting	Short	Medium															
52	County and City Database and GIS Support	Short to Medium	Medium															
7	KDOT Video Feed via Satellite	Medium	Medium															
15	KDOT Snow Route Design Optimization Software	Medium	Medium															
16	KDOT Vehicle Maintenance Management System	Medium	Medium															
24	KDOT Highway-Railroad Intersection ITS Project	Medium	Medium															
25	KDOT Rest Area Weather Radio Announcement	Medium	Medium															
35	Kansas Alternate Route Planning	Medium	Medium															
38	Rural Transit Electronic Fare Payment System	Medium	Medium															
42	Rural Transit Security Monitoring System	Medium	Medium															
19	KDOT ITS Archive	Medium	Low															
34	Kansas Airport Security Monitoring Systems	Medium	Low															
39	Rural Transit Kiosks	Medium	Low															
40	Rural Transit Pre-trip Planning	Medium	Low															
3	KDOT Condition-based Variable Speed Limit Signs	Medium	Low															
43	Rural Transit On-board Display/Audio System	Long	Medium															
5	KDOT Cell Probe System	Long	Medium															
14	KDOT Integration of Weather Sensors on Maintenance Vehicles with RWIS	Long	Low															
20	KDOT Mayday/ACN Response System	Long	Low															
21	KDOT Mayday/ACN Service Provider Registration System	Long	Low															
13	KDOT Snowplows Infrared Radar	Long	Low															

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/.

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.

Standard Name	SDO	Document ID	Status*
Simple Transportation Management Framework (STMF)	AASHTO/ITE/NEMA	NTCIP 1101	P
Octet Encoding Rules (OER) Base Protocol	AASHTO/ITE/NEMA	NTCIP 1102	P
Transportation Management Protocols (TMP)	AASHTO/ITE/NEMA	NTCIP 1103	A
Center-to-Center Naming Convention Specification	AASHTO/ITE/NEMA	NTCIP 1104	A
CORBA Security Service Specification	AASHTO/ITE/NEMA	NTCIP 1105	S
CORBA Near-Real Time Data Service Specification	AASHTO/ITE/NEMA	NTCIP 1106	S
Global Object Definitions	AASHTO/ITE/NEMA	NTCIP 1201	P
Object Definitions for Actuated Traffic Signal Controller Units	AASHTO/ITE/NEMA	NTCIP 1202	P
Object Definitions for Dynamic Message Signs (DMS)	AASHTO/ITE/NEMA	NTCIP 1203	P
Object Definitions for Environmental Sensor Stations (ESS)	AASHTO/ITE/NEMA	NTCIP 1204	P
Object Definitions for Closed-Circuit Television (CCTV) Camera Control	AASHTO/ITE/NEMA	NTCIP 1205	P
Object Definitions for Data Collection and Monitoring (DCM) Devices	AASHTO/ITE/NEMA	NTCIP 1206	P
Object Definitions for Closed-Circuit Television (CCTV) Switching	AASHTO/ITE/NEMA	NTCIP 1208	P
Data Element Definitions for Transportation Sensor Systems (TSS)	AASHTO/ITE/NEMA	NTCIP 1209	P
Field Management Stations - Part 1: Object Definitions for Signal System Masters	AASHTO/ITE/NEMA	NTCIP 1210	U
Object Definitions for Signal Control and Prioritization	AASHTO/ITE/NEMA	NTCIP 1211	A
Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO/ITE/NEMA	NTCIP 2101	P
Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	AASHTO/ITE/NEMA	NTCIP 2102	P
Point-to-Point Protocol Over RS-232 Subnetwork Profile	AASHTO/ITE/NEMA	NTCIP 2103	P
Ethernet Subnetwork Profile	AASHTO/ITE/NEMA	NTCIP 2104	P
Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO/ITE/NEMA	NTCIP 2202	P
File Transfer Protocol (FTP) Application Profile	AASHTO/ITE/NEMA	NTCIP 2303	P
Application Profile for DATEX-ASN (AP-DATEX)	AASHTO/ITE/NEMA	NTCIP 2304	P
Application Profile for CORBA (AP-CORBA)	AASHTO/ITE/NEMA	NTCIP 2305	S

Table 6-1. (continued)

Standard Name	SDO	Document ID	Status
Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML)	AASHTO/ITE/NEMA	NTCIP 2306	B
Information Profile for DATEX	AASHTO/ITE/NEMA	NTCIP 2501	S
Information Profile for CORBA	AASHTO/ITE/NEMA	NTCIP 2502	S
Standard for Transit Communications Interface Profiles	APTA	TCIP-S-001 3.0.0	P
TCIP Common Public Transportation (CPT) Objects	APTA	NTCIP 1401	P
TCIP Incident Management (IM) Objects	APTA	NTCIP 1402	P
TCIP Passenger Information (PI) Objects	APTA	NTCIP 1403	P
TCIP Scheduling/Runcutting (SCH) Objects	APTA	NTCIP 1404	P
TCIP Spatial Representation (SP) Objects	APTA	NTCIP 1405	P
TCIP On-Board (OB) Objects	APTA	NTCIP 1406	P
TCIP Control Center (CC) Objects	APTA	NTCIP 1407	P
TCIP Fare Collection (FC) Business Area Objects	APTA	NTCIP 1408	P
Commercial Vehicle Safety Reports	ANSI	ANSI TS284	P
Commercial Vehicle Safety and Credentials Information Exchange	ANSI	ANSI TS285	P
Commercial Vehicle Credentials	ANSI	ANSI TS286	P
Electronic Filing of Tax Return Data	ANSI	ANSI TS813	P
Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications	ASTM	ASTM E2213-03	P
Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band	ASTM	ASTM E2158-01	P
Standard Practice for Metadata to Support Archived Data Management Systems	ASTM	ASTM E2468-05	P
Standard Specification for Archiving and Retrieving ITS-Generated Data	ASTM	ASTM E2259-03	P
Standard Provisional Specification for Dedicated Short Range Communication (DSRC) Data Link Layer	ASTM	ASTM PS 105-99	S
Logical Link (Layer 2) for DSRC 5.9 GHz	IEEE	IEEE 802.2	P
Standard for Message Sets for Vehicle/Roadside Communications	IEEE	IEEE 1455-1999	P
Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	IEEE	IEEE 1570-2002	P
Standard for Wireless Access in Vehicular Environments (WAVE) – Resource Manager	IEEE	IEEE 1609.1-2006	P
Standard for Wireless Access in Vehicular Environments (WAVE) – Security Services for Applications and Management Messages	IEEE	IEEE 1609.2-2006	P
Standard for Wireless Access in Vehicular Environments (WAVE) – Networking Services	IEEE	IEEE P1609.3	P
Standard for Wireless Access in Vehicular Environments (WAVE) – Multi-Channel Operation	IEEE	IEEE 1609.4-2006	P
Networking Services (Layer 3) for DSRC 5.9 GHz	ISO	ISO 21210	U
Standard for Common Incident Management Message Sets for use by Emergency Management Centers	IEEE	IEEE 1512-2006	P
Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE	IEEE 1512.1-2006	P
Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE	IEEE 1512.2-2004	P
Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	IEEE	IEEE 1512.3-2006	P

Table 6-1. (continued)

Standard Name	SDO	Document ID	Status
Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers	IEEE	IEEE P1512.4	B
Standard for Functional Level Traffic Management Data Dictionary (TMDD)	ITE	ITE TM 1.03	A
Message Sets for External TMC Communication (MS/ETMCC)	ITE	ITE TM 2.01	A
Location Referencing Message Specification (LRMS)	SAE	SAE J2266	P
On-Board Land Vehicle Mayday Reporting Interface	SAE	SAE J2313	P
Message Set for Advanced Traveler Information System (ATIS)	SAE	SAE J2354	P
Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media	SAE	SAE J2369	P
Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE	SAE J2540	P
RDS (Radio Data System) Phrase Lists	SAE	SAE J2540/1	P
ITIS (International Traveler Information Systems) Phrase Lists	SAE	SAE J2540/2	P
National Names Phrase List	SAE	SAE J2540/3	P

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.

SDO	Doc ID	Standard Name
AASHTO	1101	Simple Transportation Management Framework (STMF)
ANSI	TS284	Commercial Vehicle Safety Reports
ANSI	TS285	Commercial Vehicle Safety and Credentials Information Exchange
ANSI	TS286	Commercial Vehicle Credentials
ANSI	TS813	Electronic Filing of Tax Return Data
APTA	TCIP-S-001 3.0.0	Standard for Transit Communications Interface Profiles

Table 6-2. Key ITS Standards Application Area Matrix for Kansas

			Application Area																						
			Center to Center						Center to Field							Center to Vehicle/Traveler			Field to Field	Field to Vehicle		
SDO	Doc ID	Standard Name	Data Archival	Incident Management	Rail Coordination	Traffic Management	Transit Management	Traveler Information	Data Collection/Monitoring	Dynamic Message Signs	Environmental Monitoring	Ramp Metering	Traffic Signals	Vehicle Sensors	Video Surveillance	Mayday	Transit Vehicle Communications	Traveler Information	Highway Rail Intersection (HRI)	Probe Surveillance	Signal Priority	Toll/Fee Collection
AASHTO	1102	Octet Encoding Rules (OER) Base Protocol	•	•	•	•	•	•	•	•	•	•	•	•	•							
AASHTO	1103	Transportation Management Protocols (TMP)							•	•	•	•	•	•	•							
AASHTO	1104	Center-to-Center Naming Convention Specification	•	•	•	•	•	•														
AASHTO	1105	CORBA Security Service Specification	•	•	•	•	•	•														
AASHTO	1106	CORBA Near-Real Time Data Service Specification	•	•	•	•	•	•														
AASHTO	1201	Global Object Definitions		•					•	•	•	•	•	•	•						•	
AASHTO	1202	Object Definitions for Actuated Traffic Signal Controller Units											•									
AASHTO	1203	Object Definitions for Dynamic Message Signs (DMS)								•												
AASHTO	1204	Environmental Sensor Station (ESS) Interface Standard							•		•											
AASHTO	1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control													•							
AASHTO	1206	Object Definitions for Data Collection and Monitoring (DCM) Devices							•													
AASHTO	1208	Object Definitions for Closed Circuit Television (CCTV) Switching													•							
AASHTO	1209	Data Element Definitions for Transportation Sensor Systems (TSS)							•			•	•	•								

Table 6-2. (continued)

			Application Area																			
			Center to Center						Center to Field							Center to Vehicle/Traveler			Field to Field	Field to Vehicle		
SDO	Doc ID	Standard Name	Data Archival	Incident Management	Rail Coordination	Traffic Management	Transit Management	Traveler Information	Data Collection/Monitoring	Dynamic Message Signs	Environmental Monitoring	Ramp Metering	Traffic Signals	Vehicle Sensors	Video Surveillance	Mayday	Transit Vehicle Communications	Traveler Information	Highway Rail Intersection (HRI)	Probe Surveillance	Signal Priority	Toll/Fee Collection
AASHTO	1210	Field Management Stations - Part 1: Object Definitions for Signal System Masters											•									
AASHTO	1211	Object Definitions for Signal Control and Prioritization		•									•									
APTA	1401	TCIP Common Public Transportation (CPT) Objects	•				•										•					
APTA	1402	TCIP Incident Management (IM) Objects	•	•			•									•	•					
APTA	1403	TCIP Passenger Information (PI) Objects	•				•										•	•				
APTA	1404	TCIP Scheduling/Runcutting (SCH) Objects	•				•										•					
APTA	1405	TCIP Spatial Representation (SP) Objects	•																			
APTA	1406	TCIP On-Board (OB) Objects	•													•	•					
APTA	1407	TCIP Control Center (CC) Objects	•				•									•	•					
APTA	1408	TCIP Fare Collection (FC) Business Area Objects	•				•										•	•				
AASHTO	2101	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile							•	•	•	•	•	•	•							
AASHTO	2102	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile							•	•	•	•	•	•	•							
AASHTO	2103	Point-to-Point Protocol Over RS-232 Subnetwork Profile							•	•	•	•	•	•	•							

Table 6-2. (continued)

			Application Area																			
			Center to Center						Center to Field							Center to Vehicle/Traveler			Field to Field	Field to Vehicle		
SDO	Doc ID	Standard Name	Data Archival	Incident Management	Rail Coordination	Traffic Management	Transit Management	Traveler Information	Data Collection/Monitoring	Dynamic Message Signs	Environmental Monitoring	Ramp Metering	Traffic Signals	Vehicle Sensors	Video Surveillance	Mayday	Transit Vehicle Communications	Traveler Information	Highway Rail Intersection (HRI)	Probe Surveillance	Signal Priority	Toll/Fee Collection
AASHTO	2104	Ethernet Subnetwork Profile	•	•	•	•	•	•	•	•	•	•	•	•	•							
AASHTO	2202	Internet (TCP/IP and UDP/IP) Transport Profile	•	•	•	•	•	•	•	•	•	•	•	•	•							
AASHTO	2303	File Transfer Protocol (FTP) Application Profile	•	•	•	•	•	•	•	•	•	•	•	•	•							
AASHTO	2304	Application Profile for DATEX-ASN (AP-DATEX)	•	•	•	•	•	•														
AASHTO	2305	Application Profile for CORBA (AP-CORBA)	•	•	•	•	•	•														
AASHTO	2306	Application Profile for XML Message Encoding and Transport in ITS C2C Communications	•	•	•	•	•	•														
AASHTO	2501	Information Profile for DATEX	•	•	•	•	•	•														
AASHTO	2502	Information Profile for CORBA	•	•	•	•	•	•														
ASTM	E2158-01	Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band																		•	•	•
ASTM	E2213-03	Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications																		•	•	•

Table 6-2. (continued)

SDO	Doc ID	Standard Name	Application Area: Center to Center – Data Archival	Center to Center – Incident Management	Center to Center – Rail Coordination	Center to Center – Traffic Management	Center to Center – Transit Management	Center to Center – Traveler Information	Center to Field – Data Collection/Monitoring	Center to Field – Dynamic Message Signs	Center to Field – Environmental Monitoring	Center to Field – Ramp Metering	Center to Field – Traffic Signals	Center to Field – Vehicle Sensors	Center to Field – Video Surveillance	Center to Vehicle/Traveler – Mayday	Center to Vehicle/Traveler – Transit Vehicle Communications	Center to Vehicle/Traveler – Traveler Information	Field to Field – Highway Rail Intersection (HRI)	Field to Vehicle – Probe Surveillance	Field to Vehicle – Signal Priority	Field to Vehicle – Toll/Fee Collection
ASTM	E2468-05	Standard Practice for Metadata to Support Archived Data Management Systems	•																			
ASTM	E2259-03	Standard Specification for Archiving and Retrieving ITS-Generated Data	•						•													
ASTM	PS 105-99	Standard Provisional Specification for Dedicated Short Range Communication (DSRC) Data Link Layer																			•	
IEEE	802.2	Logical Link (Layer 2) for DSRC 5.9 GHz																			•	•
IEEE	1455-1999	Standard for Message Sets for Vehicle/Roadside Communications																		•		•
IEEE	1512-2006	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	•	•																		
IEEE	1512.1-2006	Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers	•	•																		
IEEE	1512.2-2004	Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	•	•																		
IEEE	1512.3-2006	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	•	•																		

Table 6-2. (continued)

			Application Area																			
			Center to Center						Center to Field							Center to Vehicle/Traveler			Field to Field	Field to Vehicle		
SDO	Doc ID	Standard Name	Data Archival	Incident Management	Rail Coordination	Traffic Management	Transit Management	Traveler Information	Data Collection/Monitoring	Dynamic Message Signs	Environmental Monitoring	Ramp Metering	Traffic Signals	Vehicle Sensors	Video Surveillance	Mayday	Transit Vehicle Communications	Traveler Information	Highway Rail Intersection (HRI)	Probe Surveillance	Signal Priority	Toll/Fee Collection
IEEE	P1512.4	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers	•	•																		
IEEE	1570-2002	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection																	•			
IEEE	1609.1-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager																		•	•	•
IEEE	1609.2-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages																		•	•	•
IEEE	P1609.3	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services																		•	•	•
IEEE	1609.4-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation																		•	•	•
ISO	21210	Networking Services (Layer 3) for DSRC 5.9 GHz																			•	•
ITE	TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)				•																
ITE	TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)				•																

Table 6-2. (continued)

SDO	Doc ID	Standard Name	Application Area: Center to Center – Data Archival	Center to Center – Incident Management	Center to Center – Rail Coordination	Center to Center – Traffic Management	Center to Center – Transit Management	Center to Center – Traveler Information	Center to Field – Data Collection/Monitoring	Center to Field – Dynamic Message Signs	Center to Field – Environmental Monitoring	Center to Field – Ramp Metering	Center to Field – Traffic Signals	Center to Field – Vehicle Sensors	Center to Field – Video Surveillance	Center to Vehicle/Traveler – Mayday	Center to Vehicle/Traveler – Transit Vehicle Communications	Center to Vehicle/Traveler – Traveler Information	Field to Field – Highway Rail Intersection (HRI)	Field to Vehicle – Probe Surveillance	Field to Vehicle – Signal Priority	Field to Vehicle – Toll/Fee Collection
SAE	J2266	Location Referencing Message Specification (LRMS)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
SAE	J2313	On-Board Land Vehicle Mayday Reporting Interface														•						
SAE	J2354	Message Set for Advanced Traveler Information System (ATIS)	•	•		•	•	•								•	•	•				
SAE	J2369	Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media																•				
SAE	J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	•	•		•	•	•								•	•	•				
SAE	J2540/1	RDS (Radio Data System) Phrase Lists	•	•		•	•	•								•	•	•				
SAE	J2540/2	ITIS (International Traveler Information Systems) Phrase Lists	•	•		•	•	•								•	•	•				
SAE	J2540/3	National Names Phrase List	•	•		•	•	•								•	•	•				

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 7-1. Summary of Agreement Types

Type of Agreement	Description
Handshake Agreement	• Early agreement between one or more partners • Not recommended for long term operations
Memorandum of Understanding (MOU)	• Initial agreement used to provide minimal detail and usually demonstrating a general consensus • 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 • 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
Interagency Agreement	• Between local public agencies (e.g., transit authorities, cities, counties, etc.) for operations, services, or funding • Documents responsibility, functions and liability, at a minimum
Intergovernmental Agreement	• Between governmental agencies (e.g., agreements between State DOTs, MPOs, etc.)
Operational Agreement	• Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency • Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained

Table 7-1. (continued)

Type of Agreement	Description
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

Agreement	Description	Associated Stakeholder	Status
Inter-State AMBER Alert Agreement	Address AMBER Alert plan operational issues across state borders	KBI, KDOT, KHP, Neighboring State DOTs/DOR	Existing/ Potential
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 Coordination Agreement	Support incident information notification, incident response coordination, resource coordination, etc. among multiple agencies across state borders.	KDOT, KHP, Neighboring State DOTs/DOR, Neighboring State Patrols, County and City Public Safety Agencies, County and City Traffic Management and Maintenance Agencies, other agencies	Existing/ Potential

Table 7-2. (continued)

Agreement	Description	Associated Stakeholder	Status
Inter-Agency Data Sharing Agreement	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.	KDOT, KDEM, KDOR, KHP, KCC, County and City Traffic Management Agencies, County and City Public Safety Agencies, Media Outlets, Private Information Service Providers	Existing/ Potential
Inter-Agency Operations Agreement	Address equipment operation coordination, equipment maintenance, operational information exchange and other issues. Equipment may include traffic signal systems, DMS, CCTV, etc.	KDOT, KHP, KDEM, County and City Traffic Management Agencies, County and City Public Safety Agencies	Existing/ Potential
Multi-Agency Communication Infrastructure Sharing Agreement	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.	KDOT, KHP, County and City	Existing/ Potential
Inter-Agency Road Maintenance/ Snow Removal Agreement	Define roles and responsibilities for roadway maintenance as well as snow removal.	KDOT, County and City Maintenance Agencies	Existing
Multi-Agency EMS Communications Integration Agreement	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.	KHP, County and City Public Safety Agencies	Existing/ Potential
Multi-Agency Incident Response Coordination Agreement	Support incident information exchange, incident response coordination, resource coordination, etc. among multiple agencies in different regions.	KDOT, KHP, County and City Public Safety Agencies, County and City Traffic Management and Maintenance Agencies, other agencies	Existing

Table 7-2. (continued)

Agreement	Description	Associated Stakeholder	Status
Multi-Agency Disaster Response Coordination Agreement	Define roles, responsibilities, and functions for disaster response, recovery and evacuation and reentry management.	KDEM, KDOT, KBI, KHP, County and City Public Safety Agencies, County and City Traffic Management Agencies, Transit Agencies, Public School Transportation Departments	Existing/ Potential
Multi-Agency Disaster Information Coordination Agreement	Define roles, responsibilities and functions for accessing and disseminating disaster information.	KDEM, KDOT, KBI, KHP, County and City Public Safety Agencies	Existing
Multi-Agency Limited Liability Agreements	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.	Agencies involved into transportation and emergency management.	Existing/ Potential
Transit Electronic Payment Agreement	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.	Transit Agencies, Financial Institutions	Potential
Emergency Vehicle Signal Preemption Agreement	Define roles, responsibilities and functions for emergency vehicle preemption at signalized intersections	County and City Public Safety Agencies, KDOT, County and City Traffic Management Agencies	Existing/ Potential
Railroad Crossing Management Agreement	Define roles, responsibilities and functions for rail grade crossing coordination and optimization at signalize intersections.	Railroad Companies, KDOT, County and City Traffic Management Agencies	Existing

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 ion 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.