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Executive Summary

This Strategic Deployment Plan summarizes the results of the Intelligent Transportation System (ITS) Early Deployment Study for the bi-state Kansas City metropolitan area. This plan was prepared by the HNTB Corporation, AlliedSignal Technical Services Corporation, and Edwards and Associates, Inc. study team under contract with the Kansas Department of Transportation (KDOT) and the Missouri Highway and Transportation Department (MHTD). A project Steering Committee, which includes representatives from KDOT and MHTD, as well as the Federal Highway Administration (FHWA) and the Mid-America Regional Council (MARC), provided suggestions and feedback throughout the study.

Intelligent transportation systems (ITS) are systems that utilize advanced technologies, including computer, communications and process control technologies, to improve the efficiency and safety of the transportation system. These systems encompass a variety of components that may be deployed by public and private agencies. The fact that these systems are often deployed incrementally by a number of agencies makes it especially important that they be coordinated. This Strategic Deployment Plan was developed to facilitate coordination of ITS activities in the Kansas City area, and to provide a common framework for deployment.

This Strategic Deployment Plan documents the transportation system characteristics in the Kansas City metropolitan area, the ITS user services appropriate for application, a system architecture for the intelligent transportation system to be deployed, the alternative technologies available, and a deployment plan.

The study focused on the freeway system, and considered the arterial and transit systems to the extent that they affect the operation of the freeway system and contribute to overall mobility in the metropolitan area. Kansas City has an extensive freeway system, and there are locations that experience recurring congestion, particularly I-70 east of downtown, I-35 south of and immediately north of downtown, and the south leg of I-435. Unless some action is taken, recurring congestion may be expected to increase as traffic volumes increase. Currently, much of the congestion in the urban area is related to incidents, and many issues that were identified as priorities are related to incidents. These issues include both technical issues, such as rapid identification and verification of incident location, as well as institutional issues, such as agency coordination and recognition of the goals and objectives of all the agencies at the incident site.

The highest priority user services, based on agency rankings and the results of a survey conducted at two public meetings, are Incident Management, Traffic Control, Emergency Notification and Personal Security, and Emergency Vehicle Management. These user services address both recurring and incident related congestion, and contribute to the prompt identification and removal of incidents.

Development of the system architecture was based on an examination of three different architecture alternatives. The recommended architecture includes two central servers with an information server. This control logic will provide autonomy for the two states, yet will facilitate coordination and provide redundancy. Coordination will also be enhanced by specification of a single traffic operations center (TOC). With respect to data processing, the recommended

architecture utilizes centralized data processing, which is the standard and proven system used in most applications across the country. The communications network is a dual ring fiber optic backbone in a star/ring configuration, which will provide redundancy as well as capacity adequate for all anticipated components. Emergency management coordination will be based on the existing 911 dispatch system, TOC operators will contact emergency responders directly using the 911 system. The recommended architecture takes a hybrid approach to arterial signal control. Some arterial signal systems will be controlled from the TOC, while others will be controlled outside the TOC, for example by cities. The final characteristic identified by the architecture is coordination with public transit. Public transit functions will be maintained outside the TOC, although this does not preclude coordination of activities, particularly for the dissemination of information.

An examination of costs and benefits is provided for both the development of a freeway management system and selected transit ITS applications. The proposed freeway management system addresses roadway monitoring and incident detection, verification, and response, and includes vehicle detectors, closed circuit television cameras, highway advisory radio, variable message signs and a traffic operations center. The costs and benefits associated with the development of a freeway management system were calculated for four stages of deployment, as shown in Figure ES-1. The estimated annualized costs, annual benefits, and benefit cost ratio are shown in Table ES-1 for each stage. The values shown in Table ES-1 reflect each state paying a percentage of the shared costs (for the traffic operations center, hardware and software) proportional to the system roadway mileage in the state. The total capital cost for the deployment of Phase 1 is $29.1 million.

Table ES-1. Benefit Cost Ratio for Each Phase

Phase		1	2	3	4	All
Annual Benefits (in Millions)[1]		$13.5	$4.7	$5.6	$1.3	$25.2
Kansas		$4.7	$1.3	$1.3	$0.7	$7.9
Missouri		$8.9	$3.5	$4.4	$0.6	$17.3
Annualized Cost (in Millions)		$4.7	$2.5	$4.4	$5.7	$17.4
Kansas	Capital	$1.2	$0.6	$0.5	$1.7	$3.9
	Operating and Maintenance	$0.7	$0.4	$0.4	$1.1	$2.6
	Total	$1.9	$1.0	$0.9	$2.7	$6.5
Missouri	Capital	$1.8	$0.9	$2.0	$1.8	$6.5
	Operating and Maintenance	$1.0	$0.6	$1.5	$1.2	$4.3
	Total	$2.8	$1.5	$3.6	$2.9	$10.9
Benefit Cost Ratio		2.9	1.9	1.3	0.2	1.4

[1] Total values may not be the sum of the values shown for Kansas and Missouri due to rounding.

The primary focus of the deployment plan is a freeway management system. System components have been identified for a freeway management system that provides coverage of the entire metropolitan area. Based on the estimated benefit cost ratios, a freeway management system is recommended on Phase 1 in the short term (within 5 years), Phase 2 in the medium term (in 5 to 10 years), and Phases 3 and 4 in the long term (10 or more years), when the benefit cost ratios will presumably be more favorable due to increased volumes and reduced technology costs. Figure ES-2 illustrates the recommendations for the freeway management system for Phase 1.

Other activities identified in the deployment plan, but not reflected in the costs shown in Table ES-1, include integration of weather information into the TOC (short term), ramp metering (short to medium term), coordination with transit for the provision of information (medium term), coordination with the provision of in-vehicle information (long term), and the deployment of technologies to encourage alternatives to the single occupancy vehicle and enhance compliance with clean air mandates (long term). Ramp metering is recommended as a demonstration project on I-35 in Kansas in the short term, and for evaluation elsewhere in the medium term.

A number of ongoing activities have also been identified. These activities include coordination of arterial signal systems on freeway diversion routes, coordination with the Kansas Turnpike Authority, and coordination with emergency responders and local public works agencies. The deployment plan also includes transit applications such as video monitoring, automated scheduling and transit information, expansion of the automatic vehicle location system and personalized public transportation.

A number of priority activities for early deployment were identified for implementation within two years. These include "early winners", projects that have a relatively low cost, require a short development time, are relatively high priority, contribute to the Intelligent Transportation Infrastructure, and are expected to be successful and enhance the public image of ITS. Priority activities also include activities which set the stage for future ITS activities. Projects representing priority activities include:

- Implement closed circuit television cameras in selected priority locations in Kansas and Missouri.
- Pursue activities to procure fiber optics on Kansas interstates and freeways.
- Procure additional portable variable message signs.
- Expand motorist assistance patrol.
- Install freeway reference markers and overpass signing on priority facilities.
- Coordinate arterial signals for freeway diversion .
- Procure total station accident investigation equipment to facilitate accident investigation and speed up incident removal.
- Develop standards for construction to include ITS elements.
- Develop a policy for the provision of traveler information.
- Develop legislation and regulations to allow immediate removal of disabled vehicles.
- Consider a partnership with a private entity for the provision of traveler information in the short term.
- Coordinate with planning agencies to assure inclusion of ITS projects in local and regional plans.
- Consider facility needs for the traffic operations center during the planning and design of MHTD's new District 4 facility.
- Incorporate of ITS elements into the segment of Bruce Watkins Drive currently planned for construction.

ITS Early Deployment Study
Strategic Deployment Plan

NORTH

Legend

- Phase 1
- Phase 2
- Phase 3
- Phase 4

FIGURE ES-1
Deployment Phases

ITS Early Deployment Study
Strategic Deployment Plan

Legend

- Existing HAR Transmitter
- Existing HAR Sign
- Proposed HAR Transmitter
- Proposed HAR Sign
- CCTV Camera Locations
- Variable Message Sign Locations (Freeway)
- Variable Message Sign Locations (Arterial)
- Ramp Metering Demonstration Project

FIGURE ES-2
Short Term Priorities