Research Report
KTC-01-23/SPR188-98-1F

KENTUCKY TRANSPORTATION CENTER

College of Engineering

INTELLIGENT TRANSPORTATION SYSTEMS
BUSINESS PLAN FOR KENTUCKY
(Final Report)

UNIVERSITY OF KENTUCKY

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Research Report
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INTELLIGENT TRANSPORTATION SYSTEMS BUSINESS PLAN FOR KENTUCKY

(Final Report)

by

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

in cooperation with

Kentucky Transportation Cabinet
Commonwealth of Kentucky

and

Federal Highway Administration
U.S. Department of Transportation

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16. Abstract

This report presents a Business Plan for Intelligent Transportation Systems (ITS) in Kentucky. The purpose of the Business Plan is to define ITS projects that are planned for implementation from 2002 through 2007. The list of projects contained within this document was developed using Kentucky's ITS Strategic Plan, the ITS National Architecture, and stakeholder input.

There are 21 projects planned for implementation over the next 6 years at a total estimated cost of nearly $80 million. Another five projects will be considered when the Business Plan is updated in two years. These projects cover a wide range of topics including: traffic management, traveler information, public transportation management, commercial vehicle operations, emergency management, and information management. They will be implemented in all 12 highway districts across the state.

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TABLE OF CONTENTS

LIST OF ACRONYMS

AID	Automated Incident Detection
APTS	Advanced Public Transportation Systems
ARTIMIS	Advanced Regional Traffic Interactive Management and Information Systems
ARTS	Advanced Rural Transportation Systems
ATIS	Advanced Traveler Information Systems
ATMS	Advanced Traffic Management Systems
AVL	Automatic Vehicle Location
AVSS	Advanced Vehicle Safety Systems
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television cameras
CDPD	Cellular Digital Packet Data
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
DSRC	Dedicated Short-Range Communications
FCC	Federal Communications Commission
GIS	Geographic Information Systems
GPS	Global Positioning System
HAR	Highway Advisory Radio
IFTA	International Fuel Tax Agreement
IRIS	Infrared Inspection System
IRP	International Registration Plan
ISP	Information Service Provider
ITS	Intelligent Transportation Systems
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
MACS	Mainline Automated Clearance System
OKI	Ohio-Kentucky-Indiana Regional Council of Government
RF	Radio Frequency
RMS	Remote Monitoring System
RPU	Remote Processing Unit
RWIS	Road Weather Information Systems
SAC	Study Advisory Committee
STOC	Statewide Transportation Operations Center
TMC	Traffic Management Center
TRIMARC	Traffic Response and Incident Management Assisting the River Cities
WAN	Wide Area Network
WIM	Weigh-in-Motion

EXECUTIVE SUMMARY

This report presents a Business Plan for Intelligent Transportation Systems (ITS) in Kentucky. The purpose of the Business Plan is to identify and describe ITS projects that are recommended for implementation in Kentucky from 2002 through 2007. The list of projects contained within this document was developed using Kentucky's ITS Strategic Plan, the ITS National Architecture, and stakeholder input.

Deployment of ITS in Kentucky began nearly 20 years ago, and significant deployment has occurred throughout the State. Kentucky's ITS Strategic Plan[1] published in 2000, identified and described 21 separate ITS projects that had been deployed. This ITS Business Plan also contains a list of those projects, with abbreviated descriptions and a map of statewide ITS deployment.

The foundation for developing the ITS Business Plan was the ITS Strategic Plan and the National ITS Architecture. The Strategic Plan contained a mission statement, a vision, and a set of goals for each functional area of ITS. Those goals were the beginning point for developing the Business Plan. The National ITS Architecture contains 63 ITS market packages, and these market packages were mapped against the goals in the Strategic Plan to determine which market packages were most directly associated with accomplishing those goals. This process resulted in a reduced set of market packages that had direct applicability to Kentucky. This list was then further refined using stakeholder input. Finally, specific project recommendations were developed to implement the selected market packages. Stakeholder input was once again used to refine the list of specific projects.

There are 21 projects recommended for implementation over the next 6 years at a total estimated cost of nearly $80 million. Another five projects are recommended for consideration when the Business Plan is updated in two years. The recommended projects cover a wide range of topics, including: traffic management, traveler information, public transportation management, commercial vehicle operations, emergency management, and information management. They include deployments in all 12 highway districts across the state.

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1.0 INTRODUCTION

This report presents a Business Plan for deployment of Intelligent Transportation Systems (ITS) in Kentucky. This plan was developed using Kentucky's ITS Strategic Plan, the National ITS Architecture, and substantial stakeholder input. Kentucky's ITS Strategic Plan[1], published in June 2000, offered a vision for ITS in Kentucky and identified specific goals for each functional area of ITS. The purpose of the Business Plan is to identify specific projects for deployment over the next six years that will best accomplish the goals set forth in the Strategic Plan. The Business Plan looks at years 2002 through 2007 and defines each project in terms of its: objective, description, cost, location, and schedule. Some project descriptions also include a corresponding map that displays the location of the project.

The information contained within this report is based upon the best plans and estimates currently available. It is anticipated that this Business Plan will be reevaluated and updated every two years. The projects within this report will also be incorporated into Kentucky's Statewide ITS Architecture.

2.0 CURRENT ITS DEPLOYMENT IN KENTUCKY

The use of ITS in Kentucky began in 1982 with the implementation of a computerized traffic signal system, vehicle detection loops, and a closed circuit camera system in Lexington. Today, there are many ITS-related projects in operation or in development throughout the state involving traveler information, traffic management, public transportation, and commercial vehicle operations. A brief description of each project is provided below. (Refer to the *Intelligent Transportation Systems Strategic Plan* Final Report, KTC-00-5, for a more detailed description of the projects). Figure 1 shows the locations of the projects.

- **ADAPTIR***

  The purpose of the ADAPTIR system is to acquire traffic data and provide real-time information to motorists in a construction zone, and to accomplish these functions without the need for operator intervention. The motorist information is displayed on dynamic message signs (DMS) equipped with radar units. These DMS display the appropriate warning and advisory messages to motorists approaching a work zone when certain speed and delay thresholds are met. The messages warn the drivers that speeds are reduced ahead and that delays are "x" minutes. When delays become excessive, they advise motorists to use an alternate route. This system operates automatically, without the intervention of any personnel to prompt the messages. *(*This project was temporary and has since been removed.)*

- **Bridge Anti-Icing System**

  The anti-icing bridge deck system is used to dispense chemicals on the roadway to prevent the formation of a bond between the snow/ice and the bridge deck surface. By applying the chemical before this bonding occurs, the snow/ice removal process is accomplished more efficiently. The system uses a Road Weather Information System (RWIS) in conjunction with a camera for detecting and verifying surface and atmospheric conditions. Authorized personnel can activate the system remotely or at the bridge.

- **Commercial Vehicle Electronic Screening**

  As Lead State in the Advantage CVO Project, Kentucky was instrumental in deploying the Mainline Automated Clearance System (MACS) at 29 weigh stations from Florida to Ontario, including four sites in Kentucky. The latest version of MACS, called "Model MACS," is now deployed at six sites in Kentucky, seven in Georgia, and one in Connecticut. North Carolina, Missouri, and Alaska have also developed tentative plans to use Model MACS. MACS used Dedicated Short-Range Communications (DSRC) and optional weigh-in-motion (WIM) technologies to perform mainline electronic screening of commercial vehicles. The screening decisions are based on a screening database resident in a weigh station computer.

- **Coordinated Traffic Signal Systems**

  Coordinated traffic signal systems reduce travel times and vehicle operating costs by maximizing the efficiency of existing streets. This is accomplished by coordinating the cycles of traffic signals along a given route or within close proximity to one another. These systems improve traffic flow on a day-to-day basis as well as for special events and

emergencies. This in turn reduces emissions, thus improving air quality in these cities. The systems can continually measure traffic conditions and automatically adjust signal timing. The systems can also analyze traffic information, display traffic conditions, and report any problems with the signal equipment. The data collected allows the traffic engineering staff to continuously monitor the traffic conditions and make signal-timing adjustments to correct for incidents or special events.

- **Electronic Credentialing for Commercial Vehicles**

  As a Model Deployment State for the Commercial Vehicle Information Systems and Networks (CVISN) program, Kentucky has developed and implemented the capability for commercial motor carriers to apply for and receive their operating credentials and file their tax returns electronically.

- **Emergency Vehicle Signal Preemption**

  Several communities in Kentucky have implemented systems to provide preemption of traffic signals for emergency vehicles. When the signal is triggered, the emergency vehicle and all traffic flowing in the same direction are provided with a green light. Opposing lanes of traffic receive a red light.

- **Infrared Brake Testing Technology**

  Kentucky is participating, along with other states, in a test of a system that uses infrared sensing technology to evaluate the performance of truck brakes. This Infrared Inspection System (IRIS) can evaluate truck brakes while the vehicle is in motion and provide a reliable indication of brake deficiencies.

- **International Fuel Tax Agreement (IFTA) Clearinghouse**

  Kentucky participates in a partnership with other states to provide a clearinghouse for data related to state fuel taxes for commercial vehicles. Prior to IFTA, motor carriers operating in multiple states had to file a quarterly tax return (and remit taxes) to each state in which they operated. IFTA allows the carrier to file a single tax return (and single payment) to their base state and have the funds disbursed appropriately to the various states in which that carrier operated. The IFTA clearinghouse allows for electronic exchange of data as to what carriers are delinquent or paid-up on fuel taxes and the number of miles reported by each carrier in each jurisdiction.

- **International Registration Plan (IRP) Clearinghouse**

  Kentucky participates in a partnership with other jurisdictions to provide a clearinghouse for the transfer of data and fees (related to commercial vehicle registration) electronically through a single point. Each IRP jurisdiction is required to supply recap and transmittal reports, along with fees collected, to all other IRP jurisdictions within 45 days of collection. The clearinghouse eliminates the necessity to mail hardcopy documentation and checks to multiple jurisdictions. Data is sent electronically once a month to the clearinghouse database, fees are netted on the 15th of the month, and any fees due are transferred electronically. The true benefit of the system will be seen once all jurisdictions are participating.

- **ITS Applications in the Vicinity of the Cumberland Gap Tunnel**

  The purpose of adding ITS applications in the vicinity of the Cumberland Gap Tunnel is to improve the safety and efficiency of travel through the Tunnel and in the surrounding region. The applications include DMS, lane use signals, variable speed limit signs, closed circuit television cameras (CCTV), and loop detectors.

- **Laptops and Wireless Communications for Roadside Commercial Vehicle Safety Inspections**

  The Kentucky Transportation Cabinet's Division of Vehicle Enforcement is currently equipping their enforcement vehicles with laptop computers and mobile communications technology to assist officers in accessing accurate, timely data to identify high-risk motor carriers, vehicles, and drivers. The technology also expedites the process of conducting commercial vehicle inspections and uploading inspection results to appropriate state and national databases.

- **Lexington Traffic Management and Traveler Information**

  The ITS applications in the Lexington-Fayette County area help to provide the best possible transportation system through improved traffic management and traveler information. The technologies include: coordinated traffic signal control, CCTV, a reversible lane system, the Traffic Information Network, electronic total stations, RWIS, flip-down alternate route signs, detailed reference/ramp markers, video detection systems, geographic information systems (GIS), a website, a *311 cellular access phone number, detour routes, a cable television program, and DMS.

- **Louisville Traffic Management and Traveler Information**

  The Traffic Response and Incident Management Assisting the River Cities (TRIMARC) project provides improved management of incidents and traffic in the Louisville, Kentucky and southern Indiana area. The system includes an array of strategies to improve incident detection and verification, response time, site management, clearance time, and motorist information. TRIMARC has several technologies including: CCTV, DMS, a website, a highway advisory radio (HAR) system, RWIS, electronic total stations, electronic detection systems, freeway service patrol vans, and detailed reference/ramp markers.

- **Northern Kentucky Traffic Management and Traveler Information**

  The purpose of the Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) in the Cincinnati-Northern Kentucky area is to improve the overall safety of travelers and decrease travel time while improving air quality. ARTIMIS has several technologies including: CCTV, DMS, a website, a HAR system, RWIS, electronic total stations, a 511 traffic advisory telephone number, freeway service patrol vans, electronic detection systems, and detailed reference/ramp markers.

- **Remote Monitoring System**

  The Remote Monitoring System (RMS) is intended to improve commercial vehicle enforcement activities on US 25 in Walton, Kentucky, a potential bypass route of the southbound weigh station on I-75 in Kenton County. By utilizing an image capturing system, officers at the Kenton County weigh station are able to monitor truck traffic on US

25 just south of KY 14. The RMS concept addresses the problem of truckers avoiding fixed and mobile enforcement activities with the installation of permanent surveillance equipment that can be monitored remotely. The equipment is continuously present, so the truckers do not know when the site is being monitored.

- **Rest Area Traveler Information**

  The rest area traveler information project provides the public with travel information at 29 rest areas throughout the state. The information is available on monitors that display maps showing highway construction areas on the interstates, parkways, and other selected routes. The monitors also show the driving conditions for winter storm events and provide limited incident management information.

- **Road Weather Information Systems**

  The RWIS is designed to monitor weather-related parameters, including air and pavement temperatures, relative humidity, precipitation, ice formation, and wind speed/direction. Highway maintenance personnel use the data received from these stations to enable more timely treatments of roadways. The Transportation Cabinet can also use this information to notify the public of changing weather and roadway conditions.

- **Snow and Ice Removal Fleet Information System**

  This project is designed to enhance the ability of the Cabinet to manage winter storm operations and enable inter-jurisdictional coordination of the snow management efforts. It is a unique integration of automatic vehicle location (AVL) technology using global positioning systems (GPS), GIS, and cellular digital packet data (CDPD) communications. System software supports near real-time monitoring and management of snow and ice removal operations by storm managers.

- **Statewide Transportation Operations Center**

  The Statewide Transportation Operations Center (STOC) provides a centralized location to coordinate traffic operations and commercial vehicle enforcement activities throughout the entire state. It enables improved communications and data sharing among state agencies, improved management of incidents, and improved provision of travel-related information to the traveling public.

- **Truck Rollover Warning System**

  The purpose of the Truck Rollover Warning System is to reduce the number of truck rollovers on the Natcher Parkway exit ramp to the Owensboro Bypass. A "TRUCKS REDUCE SPEED" sign is illuminated when a truck is detected exceeding a specified speed.

- **Weigh Station Networking**

  All of Kentucky's weigh stations have been linked to a wide area network (WAN) to facilitate information sharing and accessibility of accurate and up-to-date data on the safety and credentials status of motor carriers, vehicles, and drivers.

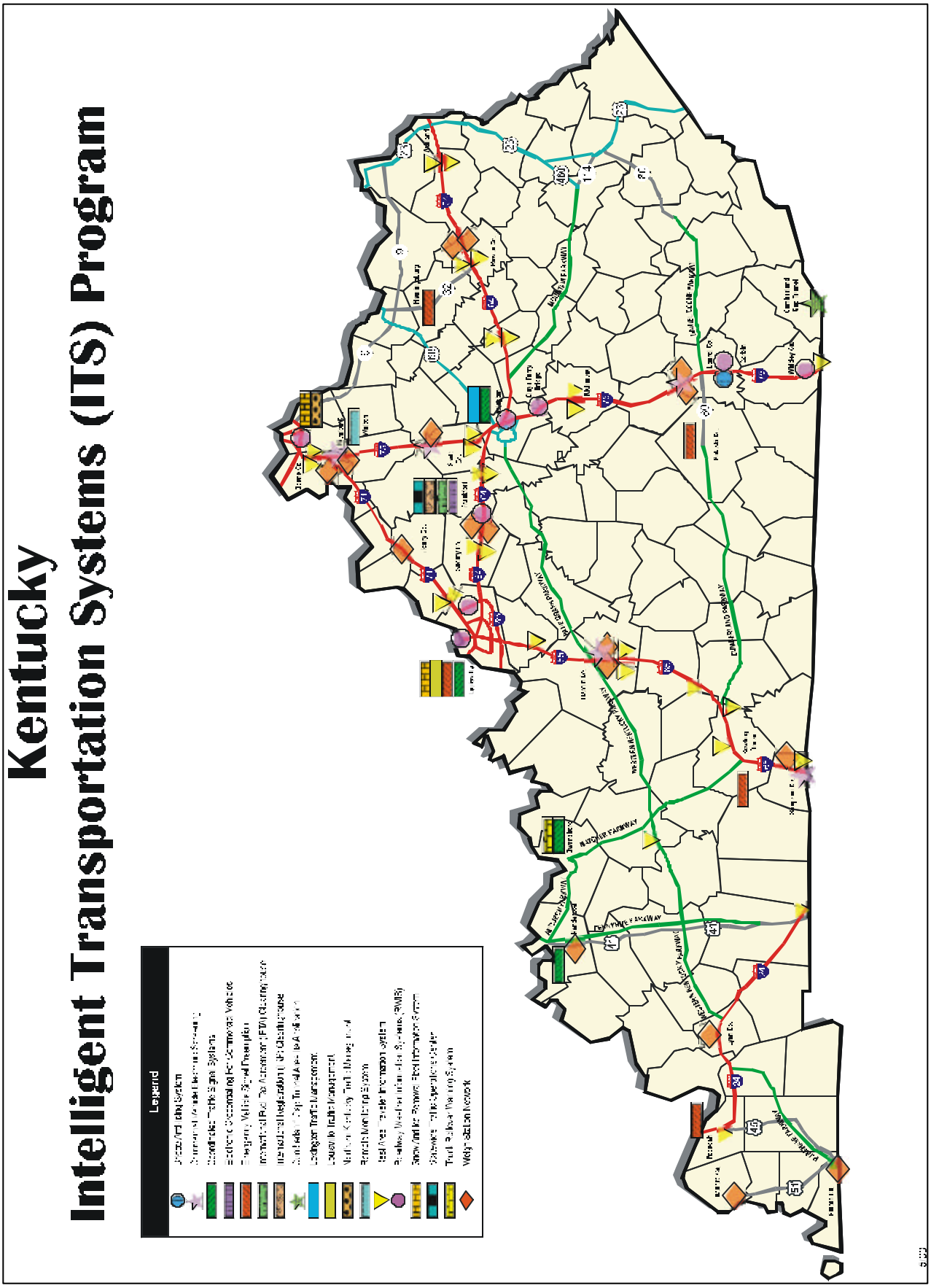


Figure 1. Current ITS Project Locations

3.0 DEVELOPMENT OF ITS BUSINESS PLAN

The process of developing the ITS Business Plan for Kentucky began with the ITS Strategic Plan, which was completed and published in June 2000. The Strategic Plan defines the twenty-year vision for ITS in Kentucky and identifies key goals for each of the six functional areas of ITS. These functional areas include: Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS), Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Advanced Vehicle Safety Systems (AVSS), and Commercial Vehicle Operations (CVO).

The ITS National Architecture was also used in the development of the Business Plan. The National Architecture describes ITS in terms of 31 user services, and these services are further broken down into 63 market packages. Market packages are services within the National Architecture that are designed to solve real transportation problems and meet specific needs. As a starting point toward developing a list of projects for the Business Plan, the goals defined in Kentucky's ITS Strategic Plan were "mapped against" the market packages in the National Architecture, to determine which market packages were applicable to meeting Kentucky's goals. This linked the goals to real transportation services for implementation. Appendix A contains the matrix that links all the Strategic Plan goals to market packages.

Through this process, fifty market packages were identified as necessary to implement all the goals within the Strategic Plan. The Kentucky Transportation Center (KTC) project staff first simplified this list by eliminating the market packages that would need to be implemented by the private sector, local agencies, or different divisions of the state government. An effort was also made to eliminate market packages that could not reasonably be implemented within a 6-year time frame. Once those market packages were eliminated, relative priorities were assigned to the remaining market packages, based on stakeholder input, engineering judgment, and the number of goals met by each market package.

As a result of this process, KTC project staff were able to present the Study Advisory Committee (SAC) with a list 13 primary market packages, 3 secondary market packages, and 3 additional user service areas for consideration. These items can be seen in Table 1. The 13 primary market packages are services that need to be implemented for Kentucky to meet the priority goals within the Strategic Plan. The three secondary market packages were also deemed important, but were of a lower priority (or less urgent) than the primary market packages. The three additional user service areas were included for consideration by the SAC, because they were not covered by any of the primary or secondary market packages. This provided an opportunity for the SAC to determine if an oversight had occurred or if these user service areas truly were lower priorities.

For their presentation to the SAC, KTC project staff reviewed what each ITS market package would provide, possible technologies for deployment, and other elements or systems that would be required as part of that implementation. The SAC discussed these market packages and decided on a list for the Business Plan. Finally, the three user service areas not covered by the proposed market packages were reviewed. The SAC agreed that an element of transit and archived data should be added to the Business Plan. From this, a final list of market

packages was developed for inclusion in the Business Plan. That list is shown on the following page in Table 2.

Primary ITS Market Packages	
ATIS 1	Broadcast Traveler Information
ATIS 2	Interactive Traveler Information
ATMS 1	Network Surveillance
ATMS 2	Probe Surveillance
ATMS 3	Surface Street Control
ATMS 6	Traffic Information Dissemination
ATMS 8	Incident Management System
ATMS 18	Road Weather Information System
EM 1	Emergency Response
CVO 3	Electronic Clearance
CVO 4	Commercial Vehicle Administrative Processes
CVO 7	Roadside Commercial Vehicle Operations Safety
CVO 10	Hazardous Material Management
Secondary ITS Market Packages	
ATIS 9	In-Vehicle Signing
ATMS 11	Emissions Monitoring and Management
ATMS 13	Standard Railroad Grade Crossing
Other ITS Service Areas (User Services)	
Public Transportation Management	
Advanced Vehicle Safety Systems	
Information Management	

Table 1. Market Packages and User Service Areas Presented to the SAC

Market Packages Approved for Inclusion in the Business Plan	
ATIS 1	Broadcast Traveler Information
ATIS 2	Interactive Traveler Information
ATMS 1	Network Surveillance
ATMS 2	Probe Surveillance
ATMS 3	Surface Street Control
ATMS 6	Traffic Information Dissemination
ATMS 8	Incident Management System
ATMS 13	Standard Railroad Grade Crossing
ATMS 18	Road Weather Information System
EM 1	Emergency Response
CVO 3	Electronic Clearance
CVO 4	Commercial Vehicle Administrative Processes
CVO 7	Roadside Commercial Vehicle Operations Safety
CVO 10	Hazardous Material Management
APTS 1	Transit Vehicle Tracking
AD 1	ITS Data Mart

Highlighted market packages would be included as part of the Business Plan, but only as projects to include when it is updated.

Table 2. Approved Market Packages

The SAC was also asked to provide information on any current or planned projects and suggest new projects for any of the market packages. The committee members also made suggestions as to locations where some of the new projects should be implemented.

KTC project staff used the approved list of market packages and the input from the SAC to develop a list of projects for the Business Plan. That list was reviewed with staff from the Transportation Cabinet's ITS Branch and was revised based on their input. The resulting list of projects, with project descriptions, is presented in Section 5.0 of this report.

4.0 INFRASTRUCTURE

Most ITS technologies require infrastructure to be in place in order for the system to function as intended. The most common infrastructure requirements are electrical power (to power the equipment itself) and a communications connection. The communications connection allows the on-site equipment to send information to other systems and/or receive information from other systems. Since the primary purpose of most ITS technologies is to gather, process, and disseminate information, the communications aspect of the infrastructure is a critical element of ITS deployment.

Typically, infrastructure components are deployed on a project-by-project basis, or even on a site-by-site basis. However, when regional or statewide deployments are envisioned, there may be value in assessing the corporate requirements of the various systems. There may be economies of scale or other benefits achievable when infrastructure requirements are considered as a whole rather than just piece by piece.

For electrical power, there may be no valid alternative to just providing power on a project-by-project basis. However, for some technologies with low power requirements, solar power is a valid option. Rather than investigating this option individually for each project, the feasibility, costs, advantages, and limitations of solar power should be investigated thoroughly and a set of recommended practices and specifications should be developed. These recommendations and specifications could then be used to make sound decisions for all ITS deployments.

With regard to communications infrastructure, many options exist, and choosing among those options can be difficult. Usually, this process represents a tradeoff between capabilities and cost. Currently, the Kentucky Transportation Cabinet (KYTC) does not have any plans to deploy a statewide network of wire-lines or fiber-optics. Instead, the Cabinet will select the best communications option for each project, based on an assessment of benefits versus costs. The Internet has been identified as an attractive communications option, particularly in rural areas. Using this approach, each location will require a phone line and an account with an Internet Service Provider.

A study is currently underway to identify the best option for statewide wireless service for Kentucky. Once selected, a system will be implemented to provide this service for KYTC and other state agencies. This system may have implications for the ITS infrastructure, but these cannot be explored until more is known about the system to be implemented.

5.0 FUTURE PROJECTS IN KENTUCKY

The following projects are recommended for implementation in Kentucky over the next six years. Costs for these projects are estimates. Money already spent and on-going maintenance costs have not been included as part of the estimate. The total cost shown for each project represents the capital start-up money required for the six years or the duration of the project (if less than six years). The source of funding for these projects has not been identified as part of this report. It is anticipated that some of these projects will be funded by local agencies. See Appendix B for a summary on cost for these projects by fiscal year and highway district.

Projects For the Update

511 Deployment

Objective

The objective of this project is to establish a single statewide telephone number (511) for the public to obtain traveler information.

Description

The Kentucky Transportation Cabinet has developed a plan for initiating the 511 traveler information system throughout the state. ARTIMIS, the traffic management center (TMC) in the Northern Kentucky/Cincinnati area, was the first in the state and the nation to implement the 511 traveler information system. Region-specific traveler information will also be available in Lexington, Louisville, and the Cumberland Gap Tunnel Region. KYTC will be initiating the statewide and Cumberland Gap systems, and they will assist and advise the traffic management / traveler information systems in Louisville and Lexington as they make this transition. The goal of this project will be statewide availability of traveler information through 511.

Cost

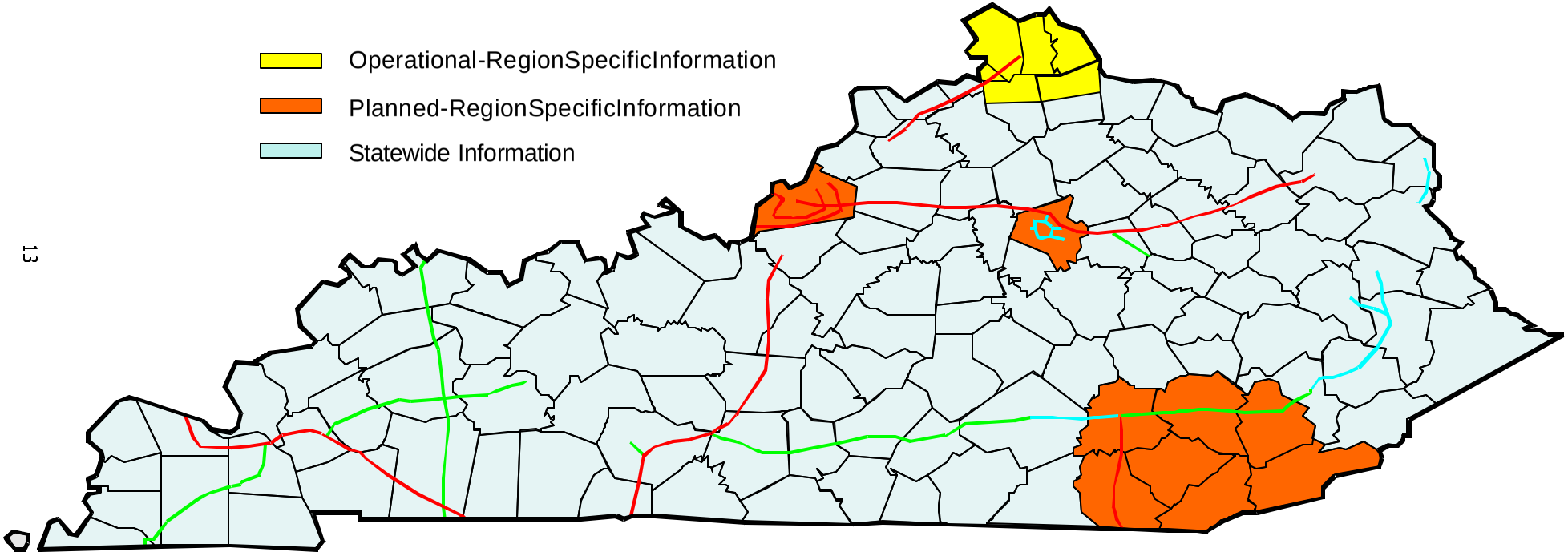
$500,000

The cities of Louisville and Lexington will each be eligible for a $100,000 federal grant to plan their transition to 511. Each grant will require a $25,000 local match.

Location/Schedule

Map Number	Task	County	District	FY Installation	Cost
1	Northern Kentucky (ARTIMIS)	Boone, Campbell, Kenton Portions of: Gallatin, Grant, Pendleton	6	Operational	0
N/A	Statewide	All	All	2002	$200,000
2	Cumberland Gap	Bell, Whitley, Laurel, Knox, Clay, Leslie, Harlan	11	2004	$50,000
3	Lexington	Fayette	7	To be determined	$125,000
4	Louisville	Jefferson	5	To be determined	$125,000

511 Deployment



ARTIMIS

Objective

The objective of this project is to optimize, integrate, and expand the ARTIMIS (Advanced Regional Traffic Interactive Management & Information System) project in Kentucky.

Description

ARTIMIS is the traffic management system in the Cincinnati/Northern Kentucky region. This system monitors 88 miles of interstate highways by vehicle detection and camera systems. The information is disseminated to the public through DMS, 511 telephone service, radio/television reports, and HAR. Incidents are managed better through the use of reference/ramp markers, total station surveying, service patrol vans, RWIS, and traffic signal systems.

The anticipated projects for the next six years are listed below. These projects were taken from the *OKI Regional Intelligent Transportation System Plan*[2]. (This Plan should be referred to when updating the Kentucky ITS Business Plan since projects are listed for ARTIMIS through the year 2011.)

Cost

$38,890,000

Location/Schedule

Task	Description	Route / Location	Cost
Enhance Existing Field Devices	Ensure previously installed field devices are the proper type and in the proper location through new installations, device change-out or device relocation. Upgrade communications as needed.	To be determined	$200,000
Arterial Signal Operations Upgrades	Study corridor for potential improvements in signal progression, detection, and DMS and CCTV placement. Implement recommended improvements. Includes consideration of integrating signals across jurisdictional boundaries, responsive and adaptive signal control, and other (non-ITS) approaches.	Dixie Highway (US 25/42/127): I-71/75 to river	$2,880,000*
		US 27: I-275 to river	$2,160,000*
Traveler Information Kiosk	Implement 1 multi-modal traveler information kiosk connected to ARTIMIS at airport	Cincinnati / Northern Kentucky Airport	$125,000
Coordinated Emergency Responder Radio System	Public safety and emergency response operate at a number of different radio frequencies. This project provides funding to evaluate which functions served by which communications links should be integrated across jurisdictions. Budget is included to implement	Emergency response vehicles	$2,200,000*

Task	Description	Route / Location	Cost
	the upgraded, integrated communications systems to enable interagency communications in the field.		
Establish Regional Incident Management Forum	Fund activities related to regional incident management forum. The suggested charter of the forum is standardizing, unifying, and improving response to crashes and other incidents on the roadways. Expands on current Incident Management Task Force at OKI.	N/A	$150,000 ($25,000 per year)
Public Information Program	Publicize ARTIMIS services, educate public on how to use the services, inform public of what to do when there is a crash.	N/A	$600,000 ($100,000 per year)
Increase Freeway Service Patrols	Increase frequency on existing routes, and expand geographic coverage. Purchase 2 additional service patrol vehicles.	To be determined	$1,500,000 ($250,000 per year)
Freeway Incident Response Teams	Implement 1 incident response team to attend to and remove disabled vehicles from interstates.	To be determined	$1,200,000 ($200,000 per year)
Expand Traveler Information Delivery Methods	Implement additional traveler information dissemination methods, which may include cable TV station; personalized traveler information on a subscription basis delivered to cell phones, pagers, personal computing devices, etc.; connections to private sector service providers that provide content for in-vehicle computing devices; and other means that may emerge in the future. This should be implemented via a public-private partnership. The key public sector cost element will be in infrastructure to enable providing enhanced content to the private sector.	To be determined	$1,000,000*
Upgrade ARTIMIS to Support Integrated Architecture	Implement ARTIMIS software and systems upgrades to enable "membership" model. Project includes member software for member workstations.	Member workstations	$1,500,000*
Connect 911 Computer Aided Dispatch Systems to ARTIMIS	Develop software to export traffic incidents input to CAD systems, and import the information to ARTIMIS. Project assumes 3 different CAD vendors.	Early candidates include Boone County, City of Erlanger, and City of Covington.	$250,000*
Freeway Field Device and Communications Expansion	Extend field devices and communications on freeway system.	I-471: River to I-275 I-275: River to River I-71/75: US 42 interchange south to I-71/75 split	$21,250,000
1/10th Mile Reference Markers	Complete freeway system reference marker coverage.	I-75, I-275	$150,000
Highway-Rail Intersection Advanced Safety Systems	Install advanced highway-rail safety systems at key crossings. A study must be conducted to identify the crossings and the preferred system.	To be determined	$500,000*

Task	Description	Route / Location	Cost
Develop METRO/TANK Transit Schedule and Itinerary Planning System	Install a system that enables phone-based, operator assisted, or on-line transit itinerary planning in real time, and schedule browsing. Project assumes TANK would serve as project manager.	N/A	$1,500,000*
Bus Traffic Signal Priority	Study key transit corridors for applicability of bus traffic signal priority to improve transit travel time. Implement transit signal priority on traffic signals on identified corridors.	To be determined	$75,000
Truck-Oriented Traveler Information	Implement specialized trucker-oriented traveler information via ARTIMIS and at weigh stations approaching the region. Information on weight restrictions, transit routes, truck stops, construction, and incidents specific to the trucking community would be implemented via telephone numbers, DMS, and/or kiosks.	Weigh stations and other locations to be determined	$750,000*
Freeway Bridge Snow and Ice Detection	Install up to 10 snow and ice detection sensors (RWIS) on key interstate bridges.	To be determined	$300,000
Research Program	Establish a research program, in conjunction with universities, to test new implementation concepts.	Suggested project is NB I-71/75 downhill crash mitigation system in Covington	$450,000 ($150,000 per year)
Install Snow and Ice Detection Management and Advanced Snow Plow Systems	Pilot project to assess use of RWIS integrated with advanced technology snowplows. These systems provide early warning of icing and snow, and meter the amount of chemical and/or sand applied based on surface conditions, including amount of chemical already applied. Savings in chemical and sand, and reduction of ice and snow-related incidents are anticipated. A lead agency must be selected for this project, or the project can be implemented through the Research Program.	To be determined	$150,000

*Indicate that the costs are highly uncertain. Further study is needed to better establish cost.

ARTIMIS

ExistingFullCoverage-
OptimizeFieldDevices

Study andImplement
Arterial SignalOperations

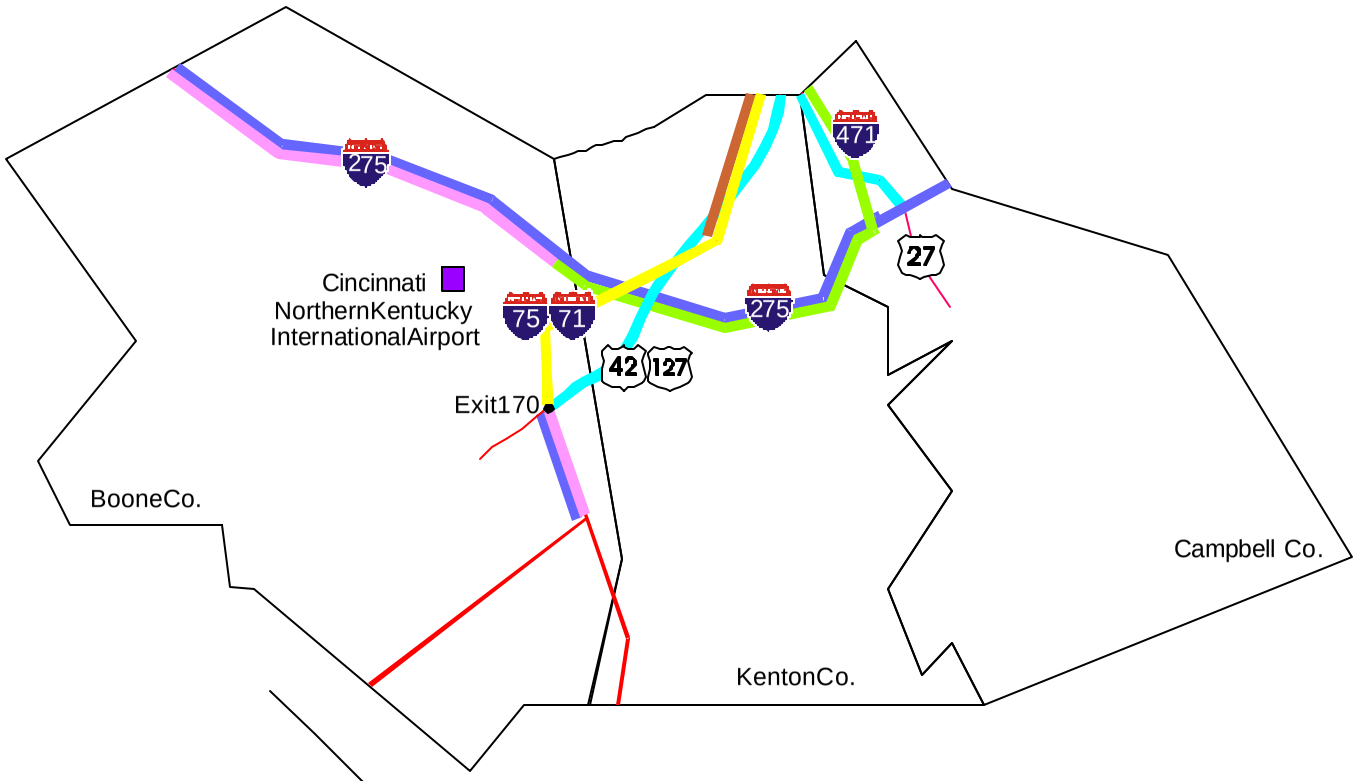
ExistingPartialCoverage-
InstallFieldDevices
and Communications
for FullCoverage

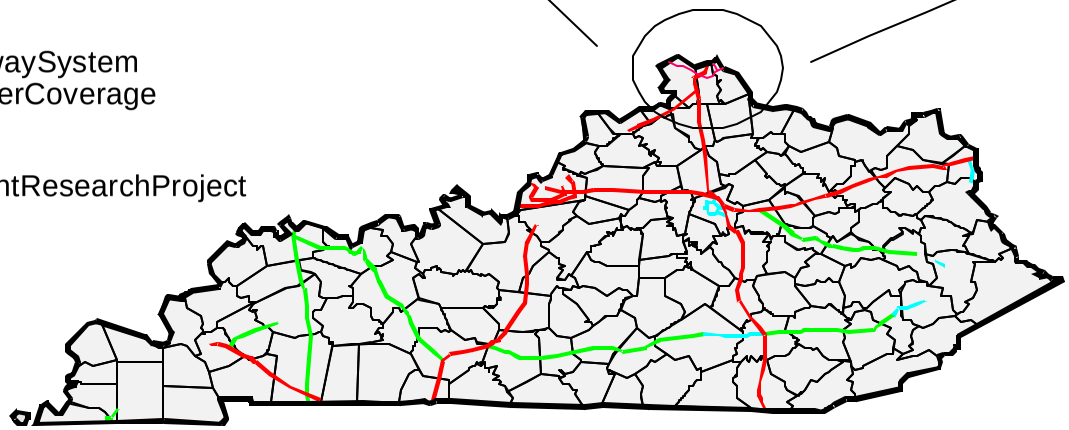
ImplementTraveler
InformationKiosk

Implement Freeway
FieldDeviceand
Communications
Expansion

CompleteFreewaySystem
ReferenceMarkerCoverage

SpeedAbatementResearchProject





Commercial Vehicle Electronic Credentials (Administrative Processes)

Objective

The objective of this project is to allow commercial motor carriers to apply for and receive necessary operating credentials and pay necessary taxes using electronic means, thus improving the efficiency, timeliness, and cost-effectiveness of commercial vehicle administrative processes.

Description

As a Model Deployment State for the Commercial Vehicle Information Systems and Networks (CVISN) Program, Kentucky has been implementing technologies to allow motor carriers to accomplish necessary administrative functions (i.e., registration, tax filing, etc.) electronically, thus providing an alternative to traditional paper-intensive and labor-intensive processes. These technologies allow motor carriers to access web pages where the necessary information can be entered and submitted. Interfaces to legacy registration and tax systems allow the information to be transferred and processed with minimal human intervention.

Cost

$1,025,000

Because much of the development of these systems is being accomplished with in-house resources, exact costs are difficult to establish.

Location/Schedule

These technologies are installed in central offices of the Transportation Cabinet and the Governor's Office of Technology. They are accessible to motor carriers from any location with a computer and a web browser.

Development of these systems has been underway since 1997, and several systems are currently operational. Additional capabilities will be added, according to the following schedule:

- IFTA tax filing via web – Operational
- KYU tax filing via web – Operational
- Vehicle registration (IRP) via web – Operational
- KIT Tax Filing via web – 2002
- Oversize/Overweight Permitting via web – 2003

Commercial Vehicle Electronic Screening

Objective

The objective of this project is to electronically screen enrolled, transponder-equipped trucks on the mainline at fixed weigh/inspection stations.

Description

Commercial vehicle electronic screening uses vehicle-mounted transponders, roadside readers, and specialized computer software to perform mainline screening of enrolled vehicles. When an enrolled vehicle approaches a weigh station equipped with screening technology, the truck's transponder is identified, the truck's credentials are verified, and the trucking company's safety record is checked. If the station has mainline WIM technology, the truck's weight is also checked. If everything checks out satisfactorily, a "bypass" signal is sent to the truck's transponder, and the transponder displays a green light for the driver, indicating that the truck can proceed on the mainline. If a problem is detected, or if the vehicle is selected based on random sampling, a red light signal is sent, indicating that the truck must pull through the weigh station.

Cost

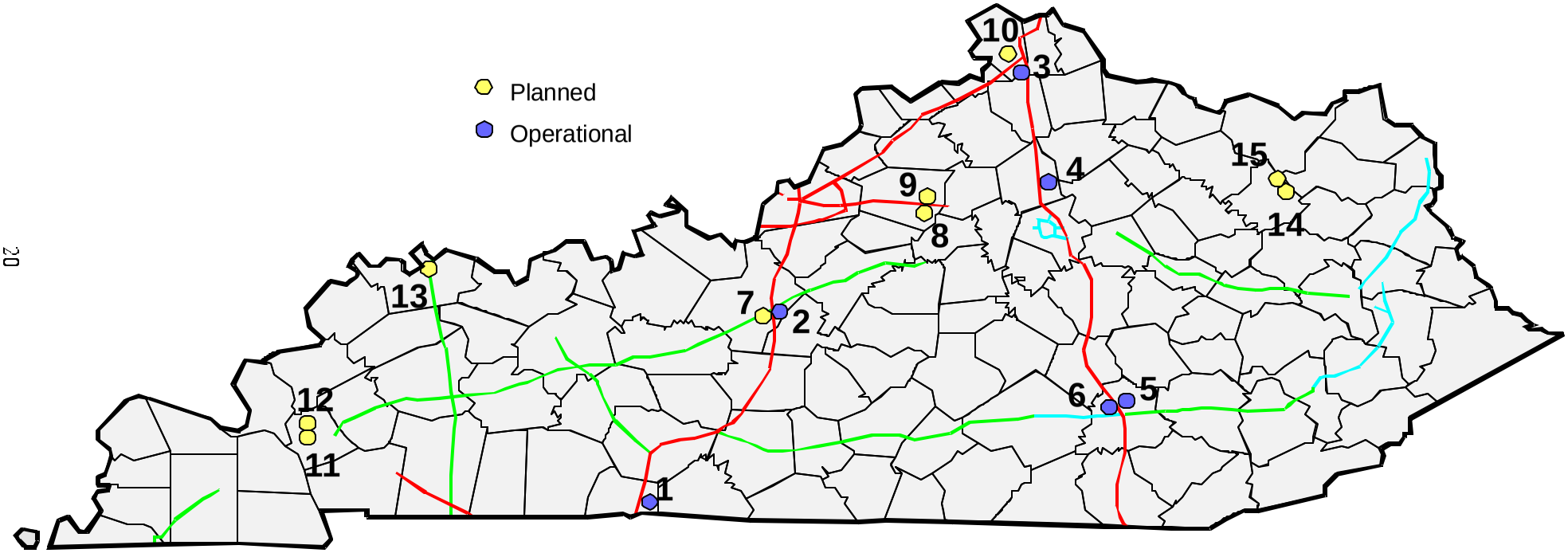
$1,350,000

The cost to equip an existing weigh station with an electronic screening system, without mainline WIM technology, is approximately $150,000. Adding WIM technology to the system can add from $50,000 to $150,000 to the cost, depending on the type of WIM technology selected. Kentucky does not currently plan to include WIM with these installations.

Location/Schedule

Map Number	Route / Location	Milepost	Direction	County	District	FY Installation
1	I-65	3	NB	Simpson	3	Operational
2	I-65	90	NB	Hardin	4	Operational
3	I-75	168	SB	Kenton	6	Operational
4	I-75	130	NB	Scott	7	Operational
5	I-75	30	NB	Laurel	11	Operational
6	I-75	30	SB	Laurel	11	Operational
7	I-65	90	SB	Hardin	4	2002
8	I-64	38	EB	Shelby	5	2002
9	I-64	38	WB	Shelby	5	2002
10	I-71	77	SB	Boone	6	2002
11	I-24	36	EB	Lyon	1	2002
12	I-24	36	WB	Lyon	1	2002
13	US41	18	SB	Henderson	2	2002
14	I-64	148	EB	Rowan	9	2003
15	I-64	148	WB	Rowan	9	2003

Commercial Vehicle Electronic Screening



Cumberland Gap Tunnel Enhancements

Objective

The objective of this project is to expand the network surveillance and traffic control capabilities in the area surrounding the Cumberland Gap Tunnel. This will include additional surveillance and tracking of hazardous material carriers in the area.

Description

The Cumberland Gap Tunnel is a critical link along the US 25E corridor which intersects with I-75 near Corbin, Kentucky and I-81 near Morristown, Tennessee. Areas of interest and focus for the US 25E corridor and surrounding area are traffic management and advanced traveler information related to operation of the Tunnel, congestion and incident management for HAZMAT trucks passing through the Tunnel, other incidents and crashes in the region, weather-related problems as they relate to the regional transportation system, and dissemination of tourist information related to travel conditions and/or attractions. A critical part of the overall project will be to provide an appropriate level of integration of system components to insure operational efficiency and effectiveness. Among the traditional ITS applications proposed for the corridor and region are CCTV, DMS, HAR, and RWIS.

Cost

$6,800,000

Total cost includes the cost of installed technologies, a regional ITS deployment plan, system integration, and a project evaluation.

Location/Schedule

Task	Route / Location	FY Installation	Cost
CCTV (6 or more)	Approaches to Tunnel	2002	$500,000
RWIS (2 or more)	Around Tunnel and on I-75 near Jellico, Tennessee	2002	$200,000
DMS –permanent (6 or more)	Tunnel approaches and interchanges on I-75 and I-81	2002	$1,300,000
HAR (6)	US 25E corridor	2002	$600,000
Radio Rebroadcast System	Tunnel Control Center (with speakers in Tunnel)	2003	$200,000
Expansion of Tunnel Control Center	Tunnel Control Center	2003	$700,000
Multiple Communication Devices (prototype)	To be determined by stakeholders	2003	$500,000
HAZMAT Truck Identification / Monitoring System (prototype)	Tunnel approaches and other locations to be determined by stakeholders	2003	$500,000
Automatic Vehicle Location (AVL) and Computerized Dispatching	On public transit vehicles in the region	2003	$600,000

Detailed Reference Marker Expansion

Objective

The objective of this project is to provide closely spaced reference markers along all Kentucky interstates to increase the effectiveness of emergency response and incident management processes. Increased frequency of spacing of reference markers is expected to provide more definitive reference information to locate an incident.

Description

The reference marker signs are generally in the median and spaced at either 0.1 or 0.2-mile intervals, depending on roadway geometry. Existing signs have either a blue or green background with white letters. (With the exception of some signs in the ARTIMIS project (which are blue and spaced at 0.1-mile intervals), future implementation will use blue signs spaced at 0.2-mile intervals.) Mainline sign dimensions are typically 48 inches in height and 12 inches in width. The sign information consists of direction, route, mile number, and mile tenth. These signs will also be located on interstate ramps. Ramp sign dimensions are typically 30 inches by 30 inches and include the ramp designation with information indicating which routes are being connected.

Cost

$718,750

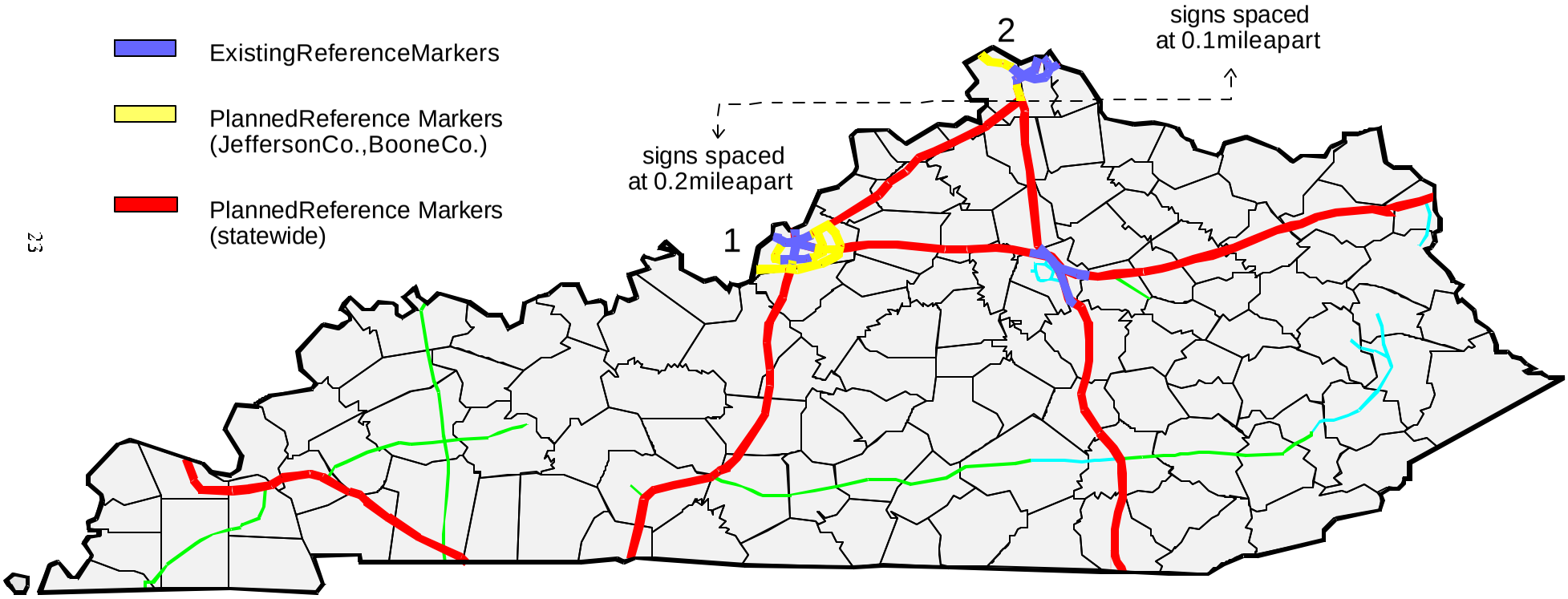
The average cost of reference marker signs (including materials and installation) is approximately $150 per sign. The cost to install these signs every 0.2 of a mile on 660 miles of interstate would be $495,000. An additional 25% will cover the cost of ramp signs, bringing the total cost of the project to $618,750. Estimated costs for additional installations to complete coverage for the ARTIMIS project is $150,000 (included with the ARTIMIS project) and for the TRIMARC project is $100,000.

Location/Schedule

Map Number	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
1	I-64	9.0 – 19.0	EB, WB	Jefferson	5	2002	N/A
	I-65	125.0 – 128.0	NB, SB	Jefferson	5	2003	N/A
	I-71	3.0 – 9.0	NB, SB	Jefferson	5	2002	N/A
	I-264	18.0 – 23.0 0.0 – 9.0	EB, WB	Jefferson	5	2003	N/A
	I-265	0.0 – 37.0	NB, SB	Jefferson	5	2004	N/A
2	I-75	173.0 – 179.0	NB, SB	Boone	6	2002	N/A
	I-275	2.0 – 12.0	NB, SB	Boone	6	2002	N/A
3	All other interstates sections	All sections	All	Various	1,2,3,4, 5,7,8,9, 11	2005-2006	4-19.01 (on I-65 Hardin Co.)

Refer to the Rural Incident Management Systems and ARTIMIS projects for information on detailed reference markers implemented in the Bowling Green and Northern Kentucky areas.

Detailed Reference Marker Expansion



Detour Route Development

Objective

The objective of this project is to develop and implement a system of detour routes for interstates, parkways, and other controlled-access roadways that will provide efficient and effective alternatives when an incident occurs.

Description

The detour routes will be identified and documented, and the documentation will be distributed to agencies responsible for incident response throughout the state. These routes will be marked with flip-down signs, to be utilized when a detour is necessary.

Cost

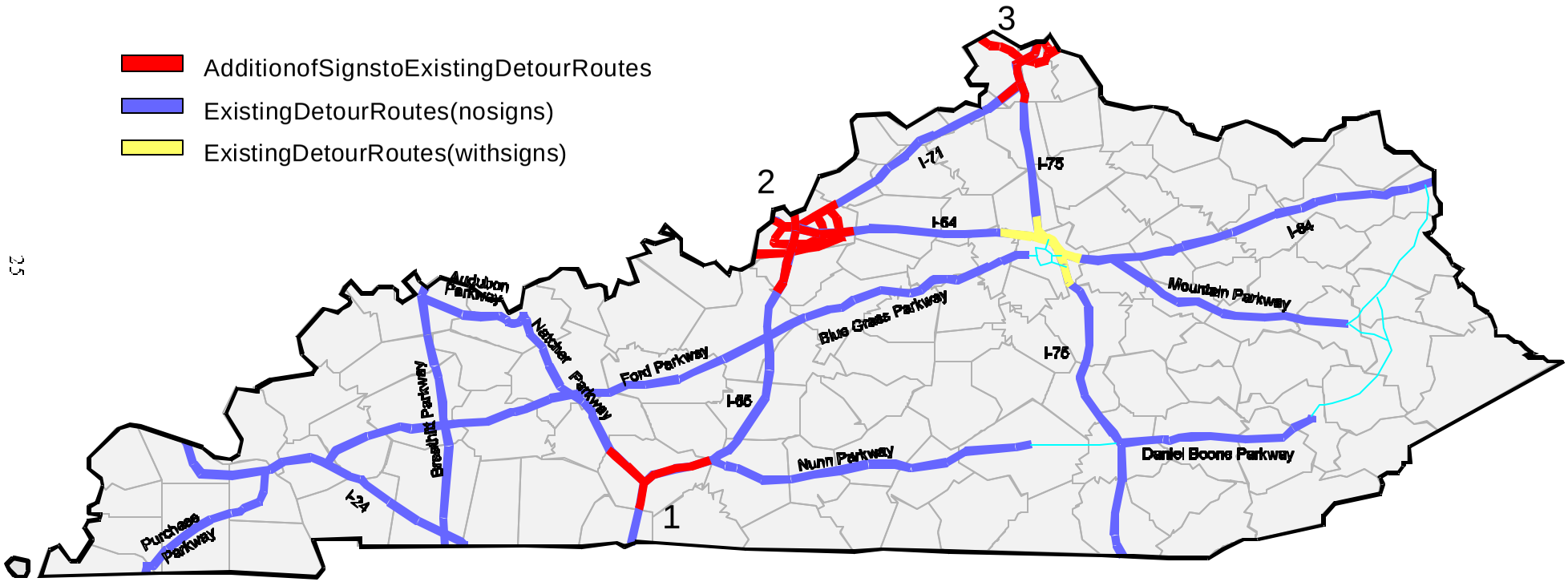
$400,000

The cost of a flip-down sign including materials and installation is approximately $500 per sign. The signs should be strategically located to reduce the number of enforcement personnel needed when traffic is being detoured. The development of a plan to designate appropriate locations of detour signs is estimated to cost approximately $100,000.

Location/Schedule

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Cost
N/A	Develop plan for locating signs	N/A	N/A	N/A	Various	Various	2003	$100,000
1	100 signs	I-65, Natcher Parkway	All sections	All directions	Warren	3	2004	$50,000
2	300 signs	I-64, I-65, I-71, I-264, I-265	All sections	All directions	Jefferson	5	2005	$150,000
3	200 signs	I-71, I-75, I-275, I-471	All sections	All directions	Boone, Kenton, Campbell	6	2007	$100,000

Detour Route Development



Dynamic Message Sign Deployment

Objective

The objective of this project is to establish a statewide network of DMS in order to provide traveler information to motorists at the roadside.

Description

This project will include the development of standard specifications for DMS and the deployment of semi-permanent (side mounted) and permanent (overhead mounted) signs on major roadways in Kentucky. Initially, these signs will be controlled and maintained by the district offices. Eventually they will be programmed remotely and controlled by the staff at the STOC. The DMS will be used to notify the public of maintenance and construction activities, highway crashes, potential adverse weather conditions, road closures, possible detour routes, and other incidents.

Cost

$8,550,000

Semi-permanent DMS – 34 @ $25,000 = $ 850,000
Permanent DMS – 26 signs @ $200,000 = $5,200,000
Development of specifications - $2,500,000

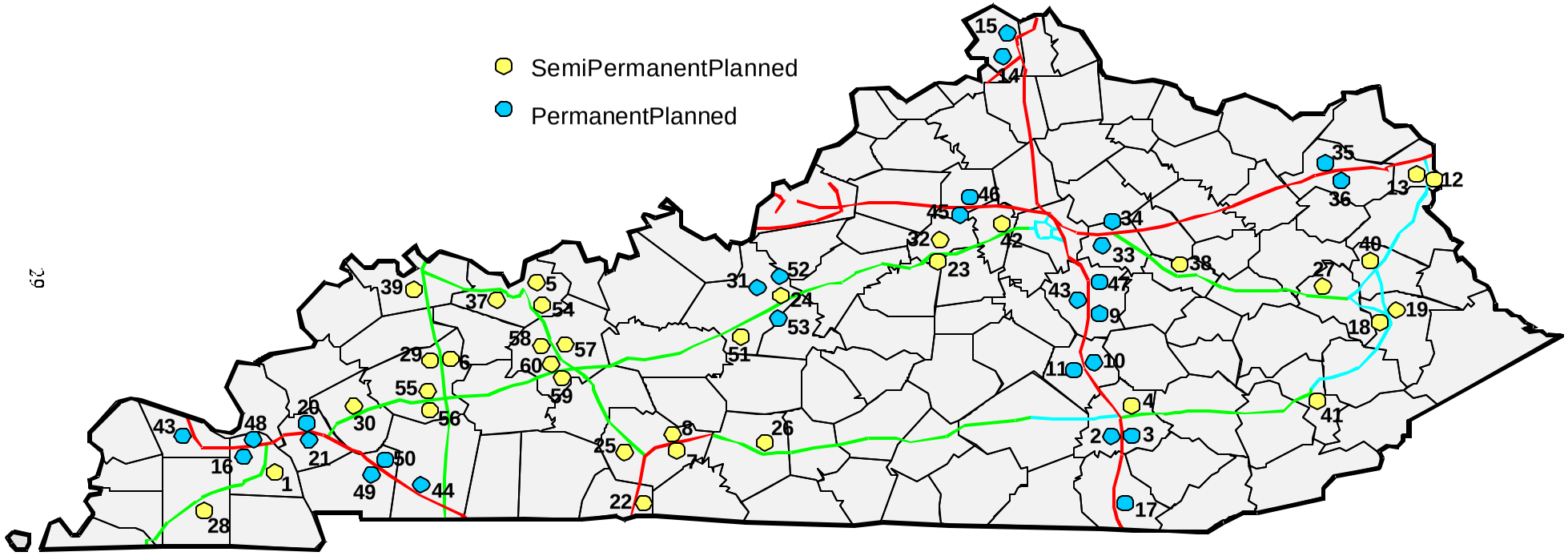
Location/Schedule

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
1	Install semi-permanent	US 68	To be determined	NB	Marshall	1	2002	1-1121.00
2	Install permanent	I-75	To be determined	SB	Laurel	11	2002	11-2004.00
3	Install permanent	I-75	To be determined	NB	Laurel	11	2002	11-2004.00
4	Install semi - permanent	DB-9006 Boone	0-4	WB	Laurel	11	2002	11-2004.00
5	Install semi - permanent	US 231	To be determined	SB	Daviess	2	2002	2-116.05
6	Install semi - permanent	PE-9004 Breathitt	33-40	NB	Hopkins	2	2002	2-2007.00
7	Install semi - permanent	I-65	29-40	NB	Warren	3	2002	3-6.00
8	Install semi - permanent	I-65	29-40	SB	Warren	3	2002	3-6.00
9	Install permanent	I-75	82	NB	Madison	7	2002	7-7.00
10	Install permanent	I-75	55-65	NB	Rockcastle	8	2002	8-2000.00
11	Install permanent	I-75	71-75	SB	Rockcastle	8	2002	8-6.45

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
12	Install semi – permanent	US 23	14	NB	Boyd	9	2002	9-176.00
13	Install semi - permanent	US 23	4	SB	Boyd	9	2002	9-182.00
N/A	Develop standard specifications	N/A	N/A	N/A	Various	Various	2003	N/A
14	Install permanent	I-71	To be determined	SB	Boone	6	2003	N/A
15	Install permanent	I-75	To be determined	SB	Boone	6	2003	N/A
16	Install permanent	I-24	To be determined	EB	Marshall	1	2003	N/A
17	Install permanent	I-75	To be determined	NB	Whitley	11	2003	N/A
18	Install semi - permanent	US 23	13	WB	Floyd	12	2003	12-904.00
19	Install semi - permanent	US 23	13	NB	Floyd	12	2003	12-904.00
20	Install permanent	I-24	To be determined	WB	Lyon	1	2003	1-7.00
21	Install permanent	I-24	To be determined	EB	Lyon	1	2003	1-7.00
22	Install semi - permanent	I-65	4	NB	Simpson	3	2003	3-15.00
23	Install semi - permanent	BG-9002 Bluegrass	52-56	EB	Anderson / Mercer	7	2003	7-2008.00
24	Install semi - permanent	BG-9002 Bluegrass	To be determined	WB	Hardin	4	2004	N/A
25	Install semi - permanent	WN-9007 Natcher	To be determined	SB/EB	Warren	3	2004	N/A
26	Install semi - permanent	CU-9008 Nunn	To be determined	WB	Barren	3	2004	N/A
27	Install semi - permanent	KY-9009 Combs	To be determined	WB	Magoffin	10	2004	N/A
28	Install semi - permanent	PU-9003 Purchase	To be determined	NB	Graves	1	2004	1-181.40
29	Install semi - permanent	PE-9004 Breathitt	46-53	SB	Hopkins	2	2004	2-2010.00
30	Install semi - permanent	WK-9001 Ford	18-26	WB	Caldwell	2	2004	2-2011.00
31	Install permanent	I-65	To be determined	SB	Hardin	4	2004	4-286.10
32	Install semi - permanent	US 127	2	SB	Anderson	7	2004	7-304.01
33	Install permanent	I-64	To be determined	EB	Clark	7	2004	7-32.00
34	Install permanent	I-64	To be determined	WB	Clark	7	2004	7-32.00
35	Install permanent	I-64	172-181	WB	Carter	9	2004	9-2010.00

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
36	Install permanent	I-64	172-181	EB	Carter	9	2004	9-2010.00
37	Install semi - permanent	AU-9005 Audubon	To be determined	EB	Daviess	2	2005	N/A
38	Install semi - permanent	KY-9009 Combs	To be determined	NB	Powell	10	2005	N/A
39	Install semi - permanent	US 41A	To be determined	SB	Henderson	2	2005	N/A
40	Install semi - permanent	US 23	To be determined	SB	Johnson	12	2005	N/A
41	Install semi - permanent	KY 80	To be determined	WB/NB	Perry	10	2005	N/A
42	Install semi - permanent	US 60	To be determined	WB	Woodford	7	2005	N/A
43	Install permanent	I-24	To be determined	SB	McCracken	1	2005	1-2.00
44	Install permanent	I-24	85	WB	Christian	2	2005	2-213.00
45	Install permanent	I-64	48-53	EB	Franklin	5	2005	5-2028.00
46	Install permanent	I-64	48-53	WB	Franklin	5	2005	5-2028.00
47	Install permanent	I-75	To be determined	NB	Madison	7	2006	N/A
48	Install permanent	I-24	To be determined	WB	Marshall	1	2006	N/A
49	Install permanent	I-24	To be determined	EB	Trigg	2	2006	N/A
50	Install permanent	I-24	To be determined	WB	Trigg	2	2006	N/A
51	Install semi - permanent	WK-9001 Ford	To be determined	EB	Hardin	4	2006	4-19.00
52	Install permanent	I-65	To be determined	NB	Hardin	4	2006	4-19.00
53	Install permanent	I-65	To be determined	NB	Hardin	4	2006	4-19.00
54	Install semi - permanent	WN-9007 Natcher	To be determined	NB	Daviess	2	2007	N/A
55	Install semi - permanent	WK-9001 Ford	To be determined	WB	Hopkins	2	2007	N/A
56	Install semi - permanent	WK-9001 Ford	To be determined	EB	Hopkins	2	2007	N/A
57	Install semi - permanent	WN-9007 Natcher	To be determined	NB	Ohio	2	2007	N/A
58	Install semi - permanent	WN-9007 Natcher	To be determined	SB	Ohio	2	2007	N/A
59	Install semi - permanent	WK-9001 Ford	To be determined	EB	Ohio	2	2007	N/A
60	Install semi - permanent	WK-9001 Ford	To be determined	WB	Ohio	2	2007	N/A

Dynamic Message Sign Deployment



I-75 Corridor Incident Detection and Probe Surveillance

Objective

The objective of this project is to enhance existing capabilities for incident detection on the I-75 corridor through the use of transponder-equipped vehicles and strategically located roadside readers.

Description

Significant numbers of vehicles traveling I-75 through Kentucky are equipped with radio frequency (RF) transponders, which are used for electronic toll collection in some regions of the country as well as for commercial vehicle electronic screening. Through strategic deployment of roadside readers, these transponder-equipped vehicles will become anonymous probes, providing virtually continuous measurement of travel times along selected roadway segments. This travel-time information can be provided to travelers via DMS or other mechanisms. In addition, the probe-measured data will augment information from other sources to allow authorities to quickly identify and respond to delay-producing incidents.

Cost

$750,000

The cost of deploying roadside readers to measure probe travel times is anticipated to be approximately $20,000 per reader. Deploying a reader every 5 miles for the 180 miles of I-75 would require 36 readers, for a total cost of $720,000. This assumes that each reader would be configured with antennas to read both northbound and southbound traffic. Assuming an additional $30,000 for processing software, the total project cost will be approximately $750,000. Communications would be accomplished via the Internet, so each reader would require local phone line service and an account with an information service provider (ISP). Thus, it could be assumed that the monthly operational cost would be about $50 per month per reader.

Obviously, this project could be accomplished in segments. A portion of I-75 could be selected for initial deployment and the system could be evaluated before expanding deployment to the entire corridor. For example, if a 50-mile segment were selected (e.g., milepost 80 to milepost 130) 10 readers and processing software would be required, at an approximate cost of $230,000.

Location/Schedule

The recommended project, if funding allows, is to equip all of I-75 in Kentucky with roadside readers, spaced approximately 5 miles apart. The recommended time frame for implementation is fiscal year 2005.

Informational Course on ITS for Law Enforcement Agencies

Objective

The objective of this project is to familiarize local and county law enforcement agencies with intelligent transportation systems (ITS).

Description

This course will teach local and county law enforcement agencies about ITS. As technologies continue to develop and become more sophisticated, use of ITS increases. Law enforcement agencies may have opportunities to use these technologies on the job. Such technologies include GPS units for pinpointing crash locations, total station surveying for crash reconstruction, and infrared brake testing and virtual weigh stations for commercial vehicles.

Cost

The cost of developing this course and presenting three workshops will be approximately $75,000.

Location/Schedule

The exact location and schedule of the courses will be determined with the guidance of the KYTC.

Informational Kiosks

Objective

The objective of this project is to provide traveler information to the public via kiosks.

Description

Informational kiosks will provide traveler information to the public. These kiosks will be located at rest areas, welcome centers, and possibly truck stops, malls, or other desired locations. This information will be interconnected with the statewide transportation operations center and provide traveler information about roadways in the entire state, as well as some information about other states.

A range of two-way wireless and wire line communications systems may be used to support the required digital communications between the kiosk and the information service provider (ISP). Future enhancements of this system, including automatic updates from the road report, may eliminate the need for an independent ISP.

Cost

$35,250

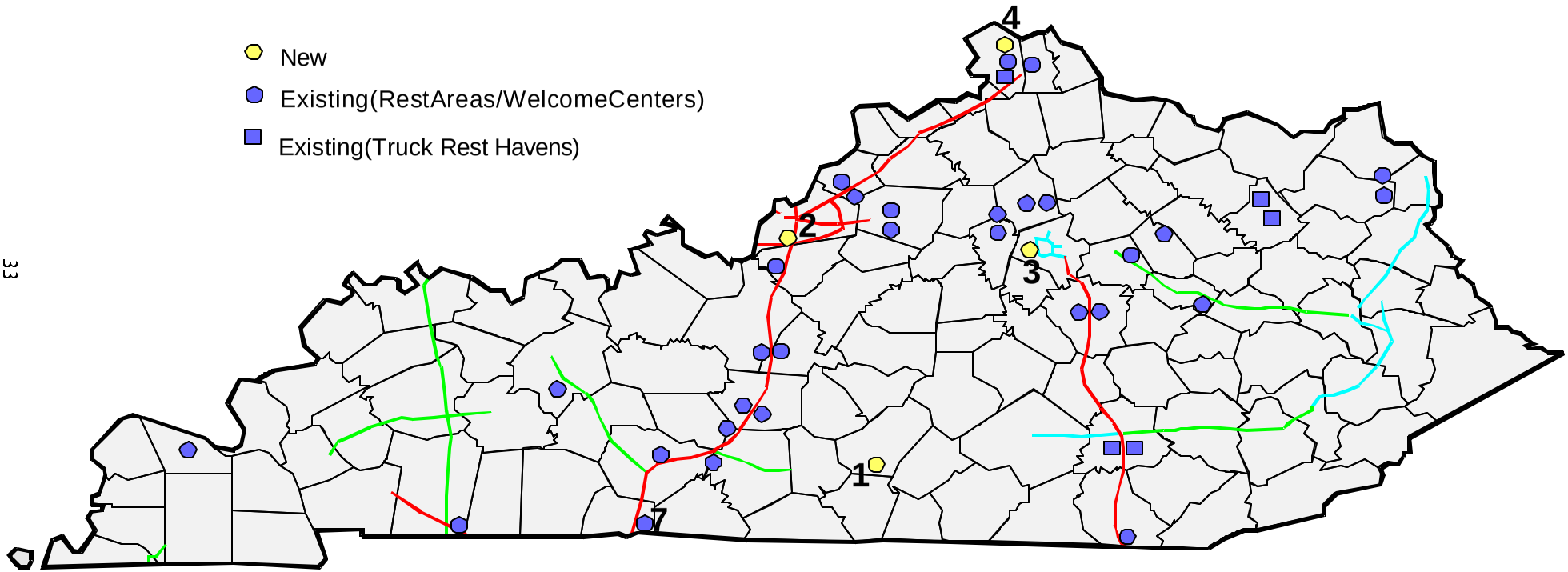
The approximate cost to install and integrate an informational kiosk is $11,750. The cost for installing 1 unit at the Cincinnati/Northern Kentucky Airport is estimated at $125,000 (this cost is included as part of the ARTIMIS project.)

Location/Schedule

Map Number	Route / Location	Milepost	Direction	County	District	FY Installation
1	Nunn Pkwy	50	EB	Adair	8	2004
2	Louisville Intl. Airport	N/A	N/A	Jefferson	5	2005
3	Bluegrass Airport	N/A	N/A	Fayette	7	2005
4	Cincinnati/Northern Kentucky Airport	N/A	N/A	Boone	6	To be determined

Refer to the ARTIMIS project for more information on the kiosk being implemented at the Cincinnati/Northern Kentucky Airport.

Informational Kiosks



Lexington Traffic Management and Traveler Information Systems

Objective

The objective of this project is to both functionally and geographically expand the traffic management and traveler information systems in the Lexington-Fayette Urban County area.

Description

Lexington's traffic management and traveler information systems will grow in a number of ways over the next six years. The Division of Traffic Engineering will expand and improve its communications infrastructure by installing fiber optic cable along the arterials. Radio communication with traffic signals will be used where there has been a loss of communication and in remote locations. Wireless video transmission may also be used in the future.

To monitor traffic, the Division of Traffic Engineering will begin to rely more on video detection and less on in-pavement inductive loops. Video detection provides a method of vehicle detection that is less invasive to the pavement and adds more flexibility to the signal system. The TMC will be moved and expanded to provide adequate space for group tours of the facility and several pieces of new equipment. The TMC will have an overhead projection unit with video wall, traffic control system server and workstations, and fully integrated video and graphics. This move will allow for a closer working relationship with Lexington's Emergency Operations Center. As a result of this move, the Traffic Information Network will have access to additional technologies to provide for enhanced reporting of incidents and congestion levels throughout the city and region.

The Divisions of Traffic Engineering, Police, and Fire are working together to improve incident detection and emergency response in the Lexington area through the use of video, acoustic, and radar/microwave detection technologies, also known as Automated Incident Detection (AID) systems. Each of these devices will be installed at a minimum of 10 sites in Lexington and will be evaluated for accuracy and timeliness of data collection and transmission.

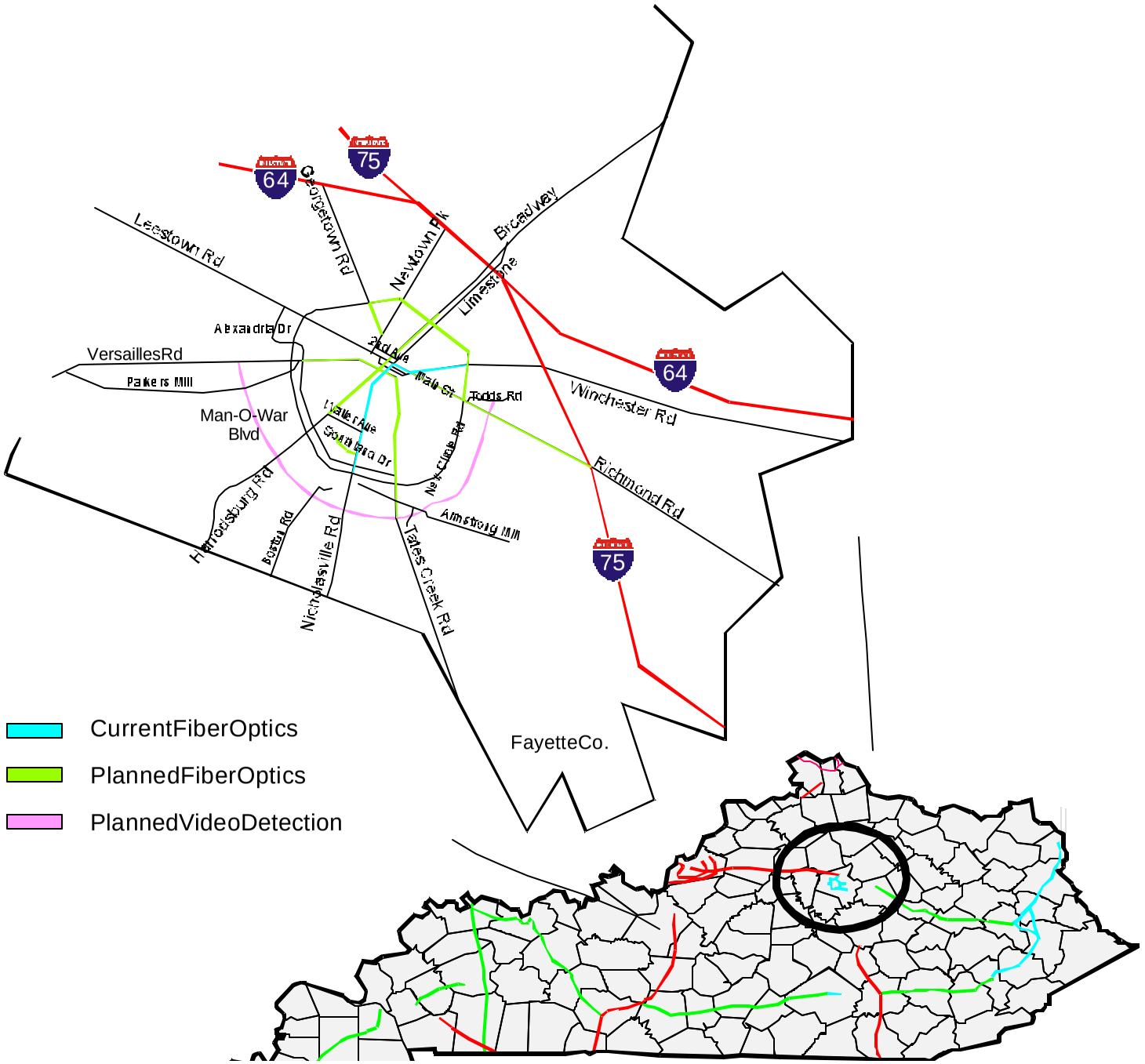
Cost

$6,060,000

Location/Schedule

Task	Route / Location	FY Installation	Cost
Fiber Optic	Nicholasville Road (New Circle to Limestone/Vine)	Installed	$3,150,000
	Water Street and Limestone (Vine to Main)		
	Winchester Road (Limestone/Second to New Circle)		
	South side of Main Street (Limestone to Main/Midland intersection)		
	Harrodsburg Road (Limestone/Vine to Waller)	2002	
	Richmond Road (Main/Midland to New Circle)		
	Tates Creek Road (downtown to Man-O-War)	2002	
	Versailles Road (downtown to Alexandria drive)		
	Georgetown Road (downtown to New Circle Road)	2003	
	North Broadway (downtown to Fire Station #8)	2004	
	New Circle Road (Georgetown Road to Winchester Road)	2005	
	New Circle Road (Winchester Road to Richmond Road)	2006	
	Southland Drive (Harrodsburg Road to Nicholasville Road)		
	Richmond Road (New Circle Road to I-75)	2007	
Video Detection	22 units on Man-O-War (Todds Road to Armstrong Mill Road)	2002	$385,000
	Man-O-War (Armstrong Mill Road to Crosby Drive)	2002	
	Man-O-War (Crosby Drive to Nicholasville Road)	2003	
	Man-O-War (Nicholasville Road to Boston Road)	2004	
	Man-O-War (Boston Road to Harrodsburg Road)	2005	
	Man-O-War (Harrodsburg Road to Parkers Mill Road)	2006	
	Man-O-War (Parkers Mill Road to Versailles Road)	2007	
Initial Improvements to the TMC	TMC	2002	$200,000
Enhancements to the TMC	TMC	2003-2007	$375,000 ($75,000 per year)
Automated Incident Detection Systems	10 locations to be determined by Division of Traffic Engineering and other stakeholders	2002	$200,000
	Additional sites and locations to be determined upon evaluation of initial installation	2003-2007	$1,250,000 ($250,000 per year)
Radio or wireless video communication	To be determined	2003-2007	$500,000 ($100,000 per year)

Lexington Traffic Management and Traveler Information Systems



Road Weather Information System Expansion

Objective

The objective of this project is to establish a statewide network of RWIS in order to collect information on changing weather and roadway conditions.

Description

There are currently eight RWIS operational around the state. These systems monitor weather-related parameters, including air and pavement temperatures, relative humidity, precipitation, ice formation, and wind speed/direction. Highway maintenance personnel use the date received from these stations to enable more timely treatments of roadways. The Transportation Cabinet can also use this information to notify the public of changing weather and roadway conditions. Further systems will be installed in order to achieve statewide coverage. The Transportation Cabinet intends to have 40 RWIS operational by 2003.

Each system includes a remote processing unit (RPU), wind speed and direction sensor, air temperature/relative humidity sensor, subsurface temperature sensor, surface temperature sensor, solar radiation sensor, rain gage, and snapshot video camera.

Cost

$384,000

The equipment cost per site is $6,000. The total cost per site, including installation, is $12,000. KYTC plans to install 40 systems, 8 of which are currently operational. Thirty-two sites remain to be installed at a cost of $12,000 per site.

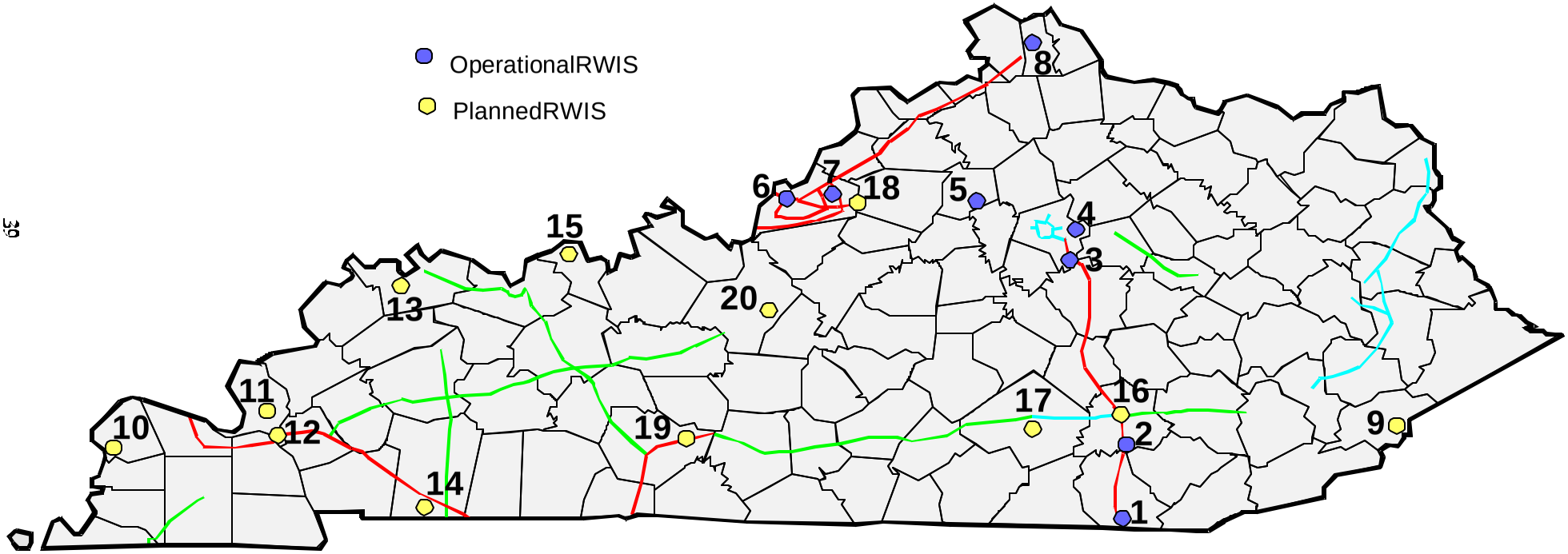
Location/Schedule

Map Number	Route / Location	Milepost	Direction	County	District	FY Installation
1	I-75	0	N/A	Whitley	11	Operational
2	I-75	28.9	N/A	Laurel	11	Operational
3	I-75	97.5	N/A	Fayette / Madison	7	Operational
4	I-64	81.4	N/A	Fayette	7	Operational
5	I-64	55.4	N/A	Franklin	5	Operational
6	I-64	5.0	N/A	Jefferson	5	Operational
7	KY 1447 (Westport Road)	6.7	N/A	Jefferson	5	Operational
8	KY 17	18.6	N/A	Kenton	6	Operational
9	US 119	12.5	N/A	Letcher	12	2002
10	US 51	8.3	N/A	Ballard	1	2002
11	US 60	12.4	N/A	Livingston	1	2002
12	I-24	33.7	N/A	Livingston	1	2002
13	US 60	10.4	N/A	Henderson	2	2002
14	I-24	88.8	N/A	Christian	2	2002

15	US 60	13.9	N/A	Hancock	2	2002
16	I-75	40.7	N/A	Laurel	11	2002
17	US 27	9.8	N/A	Pulaski	8	2002
18	I-64	24.0	N/A	Jefferson / Shelby	5	2002
19	I-65	37.6	N/A	Warren	3	2002
20	I-65	91.9	N/A	Hardin	4	2002

The location and installation schedule for the remaining 20 sites will be determined by the ITS Team with input from the District Offices. The Rural Incident Management Systems project recommends that at least one of these systems be implemented in the Bowling Green/Warren County area. The ARTIMIS project recommends that some of these systems be implemented in the Northern Kentucky area.

Road Weather Information System Expansion



Rural Incident Management Systems

Objective

The objective of this project is to better manage incidents on rural roadways by using ITS technologies.

Description

Predicted and unpredicted incidents can impact the transportation network in many ways, so managing these incidents becomes a major concern for transportation agencies. By managing incidents better, delay time is reduced and safety for the driving public is increased. This project makes use of the following technologies or techniques to better monitor and manage incidents: detailed reference/ramp markers, pre-emption of traffic signals for emergency vehicles, freeway service patrols, CAD, coordinated traffic signals, RWIS, AVL, radar detection units, flip-down detour signs, CCTV, and traffic detectors.

Cost

$1,681,000

Owensboro Signal Pre-emption for Emergency Vehicles - $115,000

Bowling Green Incident Management System - $566,000
- Reference markers – (cost is included in the Detailed Reference Marker project)
- Signal pre-emption (expand system – 20 signals) - $130,000
- CAD - $250,000
- Coordinated traffic signals (expand system – 20 signals) - $80,000
- RWIS – (cost is included in the RWIS project)
- AVL - $100,000
- Radar detection units (3) - $6,000
- Flip-down detour signs – (cost is included with the Detour Route Development project)

Fayette County Freeway Service Patrols - $500,000
- Freeway service patrols - $125,000 per unit per year for 2 years

Statewide Road Monitoring System - $500,000
- CCTV - $250,000
- Detectors - $250,000

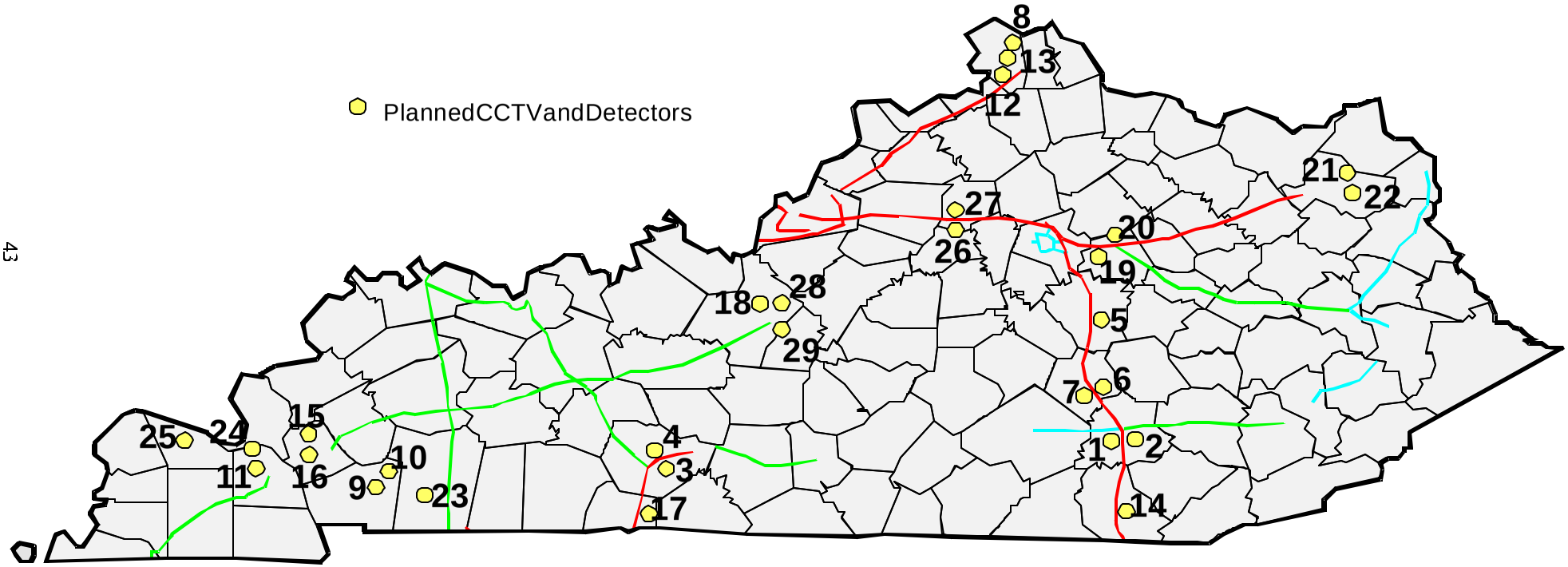
Location/Schedule

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
N/A	Owensboro Signal Pre-emption	To be determined	To be determined	N/A	Daviess	2	2002	N/A

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
N/A	Bowling Green Incident Management System	Bowling Green Region	To be determined	To be determined	Warren	3	2004	N/A
N/A	Fayette County Service Patrols	I-75 and I-64	N/A	N/A	Fayette	7	2006	N/A
1	Statewide Road Monitoring System-CCTV and Detectors	I-75	To be determined	SB	Laurel	11	2002	11-2004
2		I-75	To be determined	NB	Laurel	11	2002	11-2004
3		I-65	29-40	NB	Warren	3	2002	3-6.00
4		I-65	29-40	SB	Warren	3	2002	3-6.00
5		I-75	82	NB	Madison	7	2002	7-7.00
6		I-75	55-65	NB	Rockcastle	8	2002	8-2000.00
7		I-75	71-75	SB	Rockcastle	8	2002	8-6.45
8		I-75	To be determined	SB	Boone	6	2003	N/A
9		I-24	To be determined	EB	Trigg	2	2003	N/A
10		I-24	To be determined	WB	Trigg	2	2003	N/A
11		I-24	To be determined	EB	Marshall	1	2003	N/A
12		I-71	To be determined	SB	Boone	6	2003	N/A
13		I-75	To be determined	SB	Boone	6	2003	N/A
14		I-75	To be determined	NB	Whitley	11	2003	N/A
15		I-24	To be determined	WB	Lyon	1	2003	1-7.00
16		I-24	To be determined	EB	Lyon	1	2003	1-7.00
17		I-65	To be determined	NB	Simpson	3	2003	3-15.00
18		I-65	To be determined	SB	Hardin	4	2004	4-286.10
19		I-64	To be determined	EB	Clark	7	2004	7-32.00
20		I-64	To be determined	WB	Clark	7	2004	7-32.00
21		I-64	172-181	WB	Carter	9	2004	9-2010.00
22		I-64	172-181	EB	Carter	9	2004	9-2010.00
23		I-24	To be determined	WB	Christian	2	2005	N/A
24		I-24	To be determined	WB	Marshall	1	2005	N/A
25		I-24	To be determined	SB	McCracken	1	2005	1-2.00
26		I-64	48-53	EB	Franklin	5	2005	5-2028.00

Map Number	Task	Route / Location	Milepost	Direction	County	District	FY Installation	Six-Year Plan Job No.
27	Statewide Road Monitoring System- CCTV and Detectors	I-64	48-53	WB	Franklin	5	2005	5-2028.00
28		I-65	To be determined	NB	Hardin	4	2006	4-19.00
29		I-65	To be determined	NB	Hardin	4	2006	4-19.00

Rural Incident Management Systems



Signal Coordination

Objective

The objective of this project is to improve and expand signal coordination across the state and thereby improve the flow of traffic for all motorists in Kentucky.

Description

Coordinated traffic signal systems reduce travel times and vehicle operating costs by maximizing the efficiency of existing streets. These systems improve traffic flow on a day-to-day basis, as well as for special events and emergencies. Currently, most of these systems are synchronized with an internal clock. Timing is verified and updated as needed using radio frequency communication.

Cost

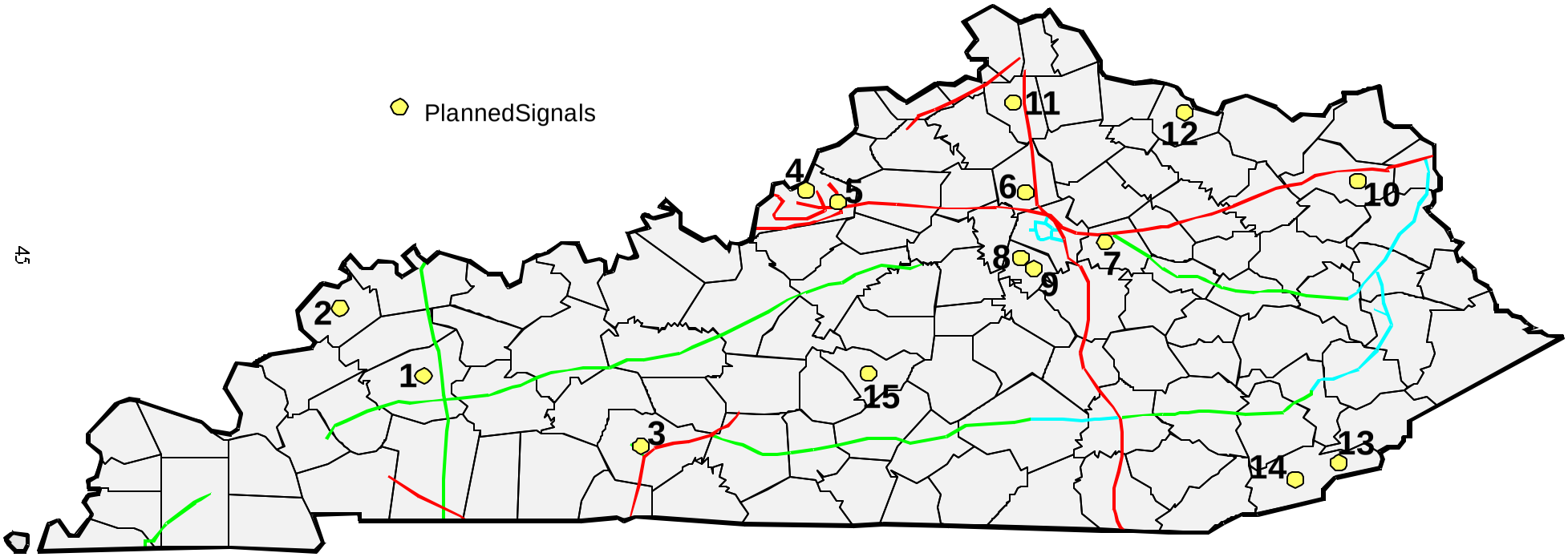
$1,189,500

Location/Schedule

Map Number	Task	Route / Location	County	District	FY Installation*	Cost
1	14 signals	Madisonville	Hopkins	2	2002	$205,000
2	5 signals	Morganfield	Union	2	2002	$60,000
3	8 signals	Bowling Green	Warren	3	2002	$12,000
4	8 signals	Poplar Level Rd	Jefferson	5	2002	$76,000
5	11 signals	Middletown	Jefferson	5	2002	$52,500
6	7 signals	Georgetown	Scott	7	2002	$10,000
7	9 signals	Winchester	Clark	7	2002	$13,000
8	4 signals	Nicholasville	Jessamine	7	2002	$6,000
9	3 signals	Nicholasville	Jessamine	7	2002	$5,000
10	9 signals	Grayson	Carter	9	2002	$200,000
11	7 signals	Dry Ridge	Grant	6	2003	$70,000
12	4 signals	Maysville	Mason	9	2003	$180,000
13	3 signals	Harlan County and railroad	Harlan	11	2003	$30,000
14	3 signals	Harlan County and US 119	Harlan	11	2003	$70,000
15	3 signals	Campbellsville	Taylor	4	2004	$200,000

**More systems will be installed based upon district input. The Rural Incident Management Systems project recommends additional signal systems be coordinated in the Bowling Green/Warren County area.*

Signal Coordination



Statewide Road Reporting System

Objective

The objective of this project is to provide the public with a variety of travel-related information on road conditions, road closures, construction/maintenance activities, crashes, and reduced speed areas, and special events that may affect traffic.

Description

The system will serve as a source of statewide information for travelers on road conditions throughout the interstate and parkway systems, along with selected other main roads in the state. Travelers will be able to receive information via kiosks, a statewide 511 system, the Internet, fax, email, and DMS. The current "Road Report" system will be updated to provide for more frequent and easier updates of the information and to include more detailed and timely information for the public.

Cost

$325,000

Software - $300,000
Dissemination methods:
Internet/fax/email - $25,000
Kiosks – (cost included with Information Kiosks project)
511 – (cost included with 511 Deployment project)
DMS – (cost included with DMS Deployment project)

Location/Schedule

Task	Route / Location	Milepost	Direction	County	District	FY Installation
Reporting Software	N/A	N/A	N/A	Various	Various	2002
Internet/Fax/Email Systems	N/A	N/A	N/A	Various	Various	2003

Strategic Planning and Implementation in Rural Kentucky

Objective

The objective of this project is to evaluate the needs in the Bowling Green/I-65 area and identify technology improvements to meet those needs.

Description

This project will entail the development of an ITS strategic plan in the Bowling Green/I-65 area. Needs will be defined by stakeholders in the area, and a strategic plan to meet those needs will be developed. Other projects throughout the state already plan to implement technologies and systems in this area, but this planning process will serve to identify special needs in the area. Technology already planned for the area includes: DMS, RWIS, CCTV, and detectors.

Cost

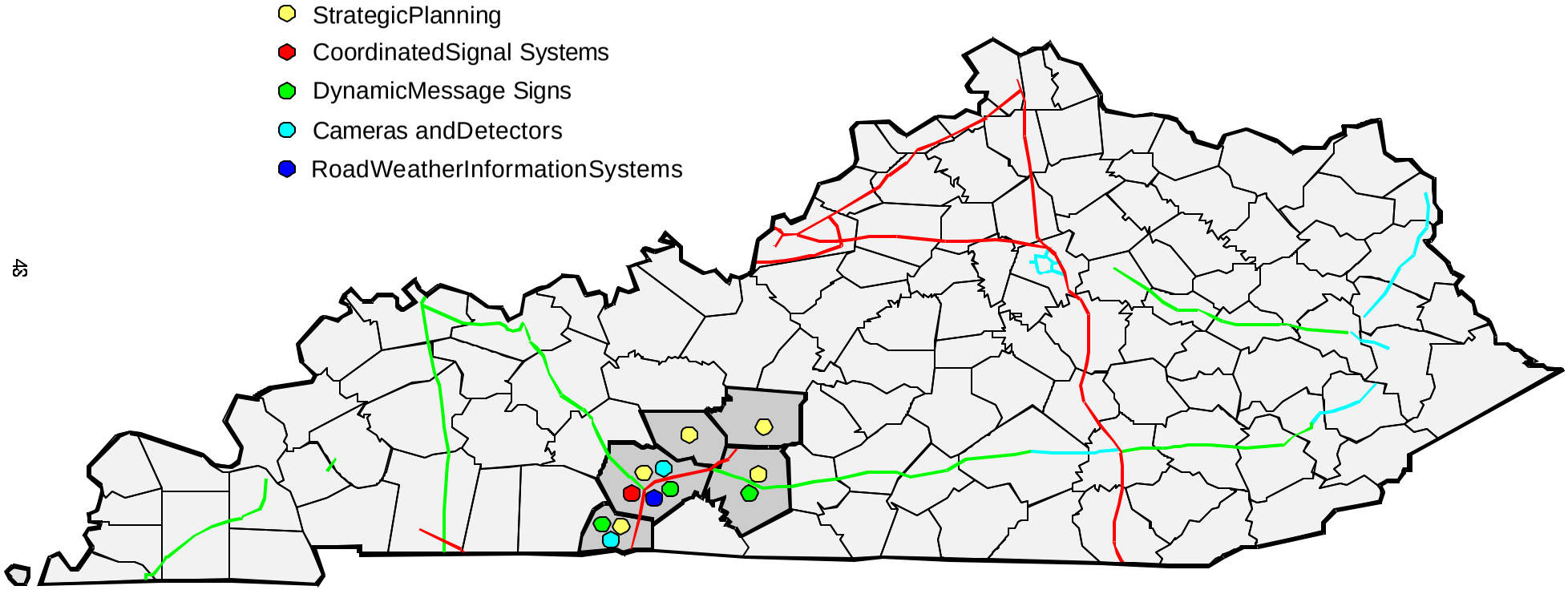
$560,000

The cost to develop the strategic plan is estimated at $60,000. Additional technologies added to the system are anticipated to cost approximately $500,000.

Location/Schedule

Task	Route / Location	County	District	FY Installation	Cost
Strategic Planning		Warren, Barren, Edmonson, Hart, and Simpson	3, 4	2003	$60,000
Coordinated Signal Systems (7)		Warren	3	2002	Refer to Signal Coordination project
Dynamic Message Signs (5)	I-65	Warren	3	2002 (3-6.00)	Refer to DMS project
		Simpson	3	2003 (3-15.00)	
	WN-9007 Natcher	Warren	3	2004	
	CU-9008 Nunn	Barren	3	2004	
Cameras and Detectors (3)	I-65	Warren	3	2002 (3-6.00)	Refer to Rural Incident Management Systems project
		Simpson	3	2003 (3-15.00)	
RWIS (1)	I-65	Warren	3	2002	Refer to RWIS project
Rural Incident Management System	Bowling Green area	Warren	3	2004	Refer to Rural Incident Management Systems project
Implement additional technologies	Bowling Green area	Warren, Barren, Edmonson, Hart, and Simpson	3, 4	To be determined	$500,000

Strategic Planning and Implementation in Rural Kentucky



Transit System Improvements

Objective

The objective of this project is to improve transit service through transit vehicle tracking systems, CAD, and passenger information systems. Data from this project will also be used to enhance the traffic management system by providing important traffic flow information.

Description

This project includes the implementation of AVL and CAD systems for transit vehicles in the Louisville and Northern Kentucky areas. These systems will improve overall dispatching and operating efficiency and provide more reliable service to the public. This technology can also serve as a valuable source of data for the state and local TMCs, providing pertinent information on the flow of traffic. Pre-trip transit information, including routes, maps, schedules, fares, park-and-ride locations, and vehicle arrival times, will be provided to the public using an automated telephone system, the Internet, cable television, kiosks, and personal information sources (such as a pager or personal data assistant).

Cost

$3,750,000

The cost to implement the Louisville system is estimated at $3,750,000. The cost to implement the Northern Kentucky system is estimated at $1,500,000 (this cost is included with the ARTIMIS project).

Location/Schedule

Task	Route / Location	County	District	FY Installation
Equip 340 vehicles with GPS/AVL, implement information systems	Louisville area	Jefferson	5	2004
TANK Transit Itinerary Planning System	Northern Kentucky	Kenton, Boone, Campbell	11	2004

Refer to the ARTIMIS project for more information on the transit system being implemented at the Cincinnati/Northern Kentucky Airport.

TRIMARC
(Traffic Response and Incident Management Assisting the River Cities)

Objective

The objective of the TRIMARC project, in the Louisville and Southern Indiana region, is to provide rapid detection of incidents, assist in notifying appropriate public safety agencies, and provide accurate and timely traffic information to motorists. By reducing traffic delays and congestion, TRIMARC also improves air quality, improves safety, and reduces travel times.

Description

TRIMARC makes use of video cameras and radar traffic detectors to monitor traffic flow and detect incidents. Data from all cameras and detectors flows into the TRIMARC Operations Center, where the video images are displayed and the detector data is processed. When the traffic detector data indicates a possible incident, operators can use the video cameras to verify the incident.

Through the use of DMS and HAR, TRIMARC operators can communicate up-do-date information to drivers, including information on incidents, detours, and potential hazards. An Internet web site (www.trimarc.org) and a public access television program also provide traffic information, color-coded traffic maps, and video images to the public.

During morning and evening rush hour, TRIMARC, in cooperation with AAA Kentucky, operates freeway assistance vans throughout the Louisville area. Indiana operates similar freeway assistance vans through their "Hoosier Helper" program. The Kentucky vans are equipped with GPS, thus allowing for AVL.

Blue reference markers, located every 0.2 miles, assist in determining the exact location of an incident.

An automated "Wizard" warning system, using citizens band radio, has been deployed to warn truckers of upcoming curves where loads may shift, creating a rollover hazard.

In the next several years, it is anticipated that TRIMARC will expand geographically. This will include adding radar and/or video monitoring to additional routes, adding additional DMS and/or HAR sites, expanding the number and coverage area of the highway helper vans, and installing detailed reference markers on additional routes.

It is also anticipated that TRIMARC will expand functionally. Specifically, the system will incorporate capabilities for probe surveillance, surface street control, GPS tracking of enforcement vehicles, and highway-rail intersection. The TRIMARC Operations Center will be connected to the STOC in Frankfort to enable two-way sharing of information. The web page will be made interactive, with a link to the web site for the STOC.

Cost

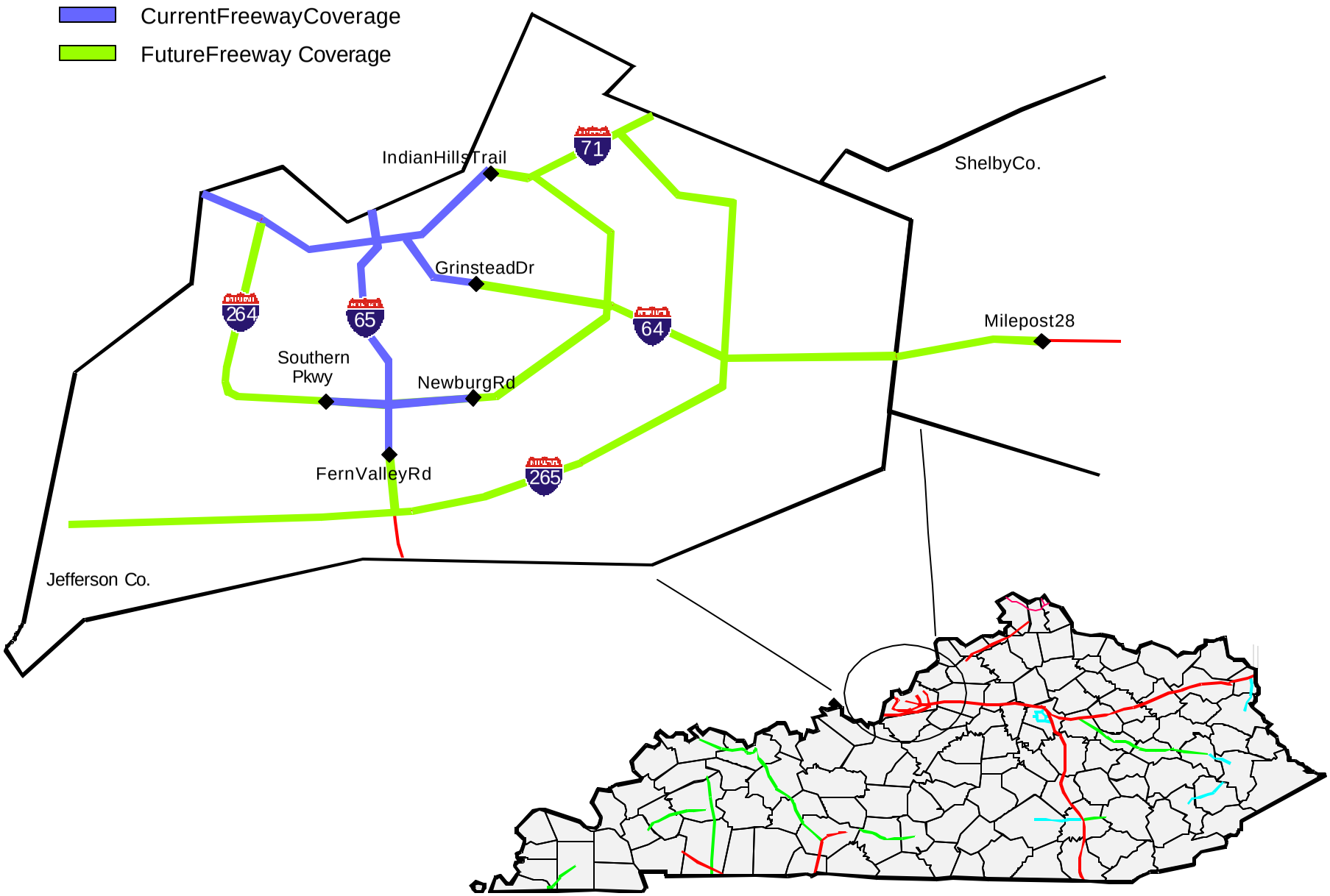
$6,000,000

The cost for this project is anticipated to be $1,000,000 per year for six years.

Location/Schedule

Task	Route / Location	FY Installation
Extending coverage – cameras and detectors	I-64 from milepost 8 (Grinstead Drive to milepost 19 (Gene Snyder Freeway)	2002 (in progress)
Extending coverage – cameras and detectors	I-65 from milepost 125 (Gene Snyder Freeway to milepost 128 (Fern Valley Road)	2002 (in progress)
Extending coverage – cameras and detectors	I-71 from Indian Hills Trail to milepost 5 (Watterson Expressway)	2002 (in progress)
Extending coverage: adding 2 DMS, 8 cameras, and detectors to I-64 in conjunction with rehabilitation project	I-64 from milepost 19 (Gene Snyder Freeway) to milepost 28 (in Shelby County)	2002
Probe surveillance	N/A	2003
GPS tracking of enforcement vehicles	N/A	2003
Connecting TRIMARC Operations Center to STOC	N/A	2003
Interactive web site with link to STOC	N/A	2003
Surface Street Control	Not yet identified	2004
Highway-rail intersection technologies	Not yet identified	2004
Extending coverage – cameras and detectors	All of I-264	2004-2005
Extending coverage – cameras and detectors	I-71 from milepost 5 to Jefferson-Oldham County line	2006
Extending coverage – cameras and detectors	All of I-265	2006-2007

TRIMARC


CurrentFreewayCoverage
FutureFreeway Coverage
IndianHillsTrail
71
ShelbyCo.
GrinsteadDr
264
65
64
Milepost28
Southern
Pkwy
NewburgRd
FernValleyRd
265
Jefferson Co.

Virtual Weigh Station

Objective

The objective of this project is to combine the capabilities of a remote monitoring system (RMS) with WIM technology to produce a remotely monitored, "virtual" weigh station. This will allow commercial vehicle monitoring and enforcement activities to be extended to additional routes that cannot currently be effectively monitored.

Description

The virtual weigh station consists of a video camera system, with appropriate triggers to capture images of commercial vehicles that pass the site, along with a WIM system to capture the truck's weight. The weight data and images of the truck are transmitted to a selected location, where they can be reviewed by enforcement personnel. When a problem is apparent with regard to credentials, safety, or weight, an enforcement officer can be dispatched to intercept the truck and perform appropriate checks.

The virtual weigh station can extend enforcement coverage to additional routes at a fraction of the cost of additional fixed weigh stations. Because the virtual weigh station is always in place, truckers cannot tell when it is being monitored. Thus, it becomes increasingly difficult for truckers to avoid being monitored. This allows illegal or high-risk motor carriers to be detected and removed from operation.

Cost

$195,000

The total cost to design, procure, implement, and evaluate the first system is estimated at $195,000. The cost to implement additional systems should be less than $100,000 per site.

Location/Schedule

Plans are to implement one virtual weigh station in the summer of 2002, at a site to be selected by the project team. That first implementation will be evaluated for six months, and recommendations for further implementation will be published in June 2003.

Work Zone Safety Systems

Objective

The objective of this project is to use work zone safety systems to reduce travel time, improve safety, and keep drivers informed about the work zone area.

Description

Work zone safety systems are designed to provide information to the driving public that relates to the work zone area. This information should reduce the time to pass through the work zone and improve safety for the driver. The information can take different forms. For example, a dynamic message sign with information about the time it will take to proceed through the work zone or a flashing beacon sign indicating when the driver should merge. These systems can be self-sufficient, with no wiring needs, or can be monitored and updated from an off-site location. Based on Kentucky's experience, these systems work well on higher volume roads. Certain systems require that a detour route be available in the vicinity.

Cost

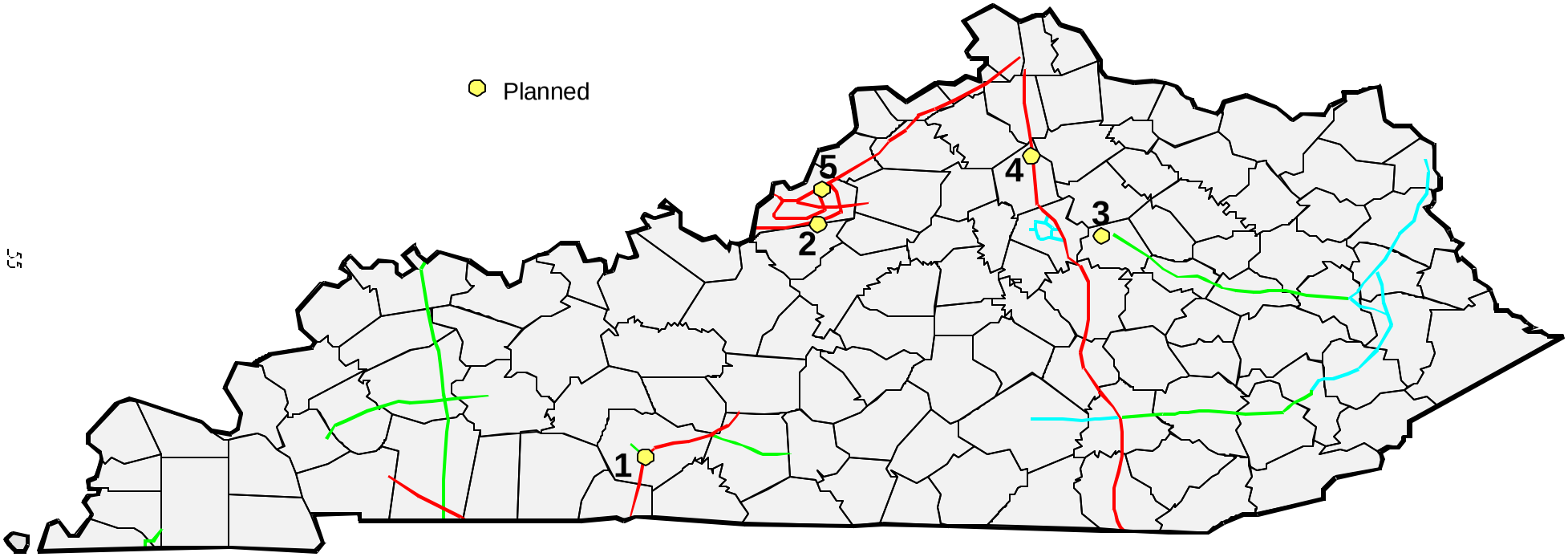
$500,000

The cost of installing a work zone safety system varies from $180,000 to $500,000 depending on the system capabilities. However, these systems are portable and can be moved to various locations around the state as necessary.

Location/Schedule

Map Number	Route / Location	Milepost	County	District	FY Installation	Six-Year Plan Job No.
1	I-65	19.1 – 26.5	Warren	3	2003	03-9.00
2	I-265	15.6 – 18.8	Jefferson	5	2003	05-2002.00
3	I-64	89.5 – 94.2	Clark	7	2004	07-32.00
4	I-75	138.7 – 143.2	Scott	7	2006	06-72.20
5	I-71	0 – 9.0	Jefferson	5	2007	N/A

Work Zone Safety Systems



Projects for the Update

Kentucky's ITS Business Plan will be updated every two years to reflect changes in needs and priorities that may occur. The following projects should be considered for inclusion in the Business Plan when it is updated in two years.

Archived Data System

This project would serve two purposes. First, it would provide standards for data collection, processing, and dissemination from ITS systems in Kentucky. Second, it would establish a central data processing system such as a virtual data warehouse or other central data repository. An archived data system would provide many services including: data content definition and coverage; data quality control and error checking; data visualization; and data management and storage. This project will be considered after the successful completion of the Pilot Mobility Monitoring Study currently being undertaken by ARTIMIS, KYTC, the Ohio Department of Transportation, and the Ohio-Kentucky-Indiana Regional Council of Governments (OKI).

Cellular-Phone-Based Tracking

The objective of this project would be to enable every vehicle containing a cellular phone (with the phone turned on) to become an anonymous "probe vehicle," capable of being precisely located and continuously tracked. This would provide for continuous and accurate measurement of travel times and rapid detection of incidents. The Federal Communications Commission (FCC) has mandated that all cellular phone providers implement the capability to pinpoint the location of emergency 911 calls originated from cellular phones. As cellular providers throughout Kentucky implement the ability to locate 911 calls, and possibly to locate and track all cell phones, the Transportation Cabinet needs to stay abreast of developments and determine the best way to leverage this capability for traffic management and incident response.

Highway-Rail Grade Crossings

Highway-rail grade crossings are a major concern for transportation officials. By using ITS highway-rail technologies, driver safety is increased and information can be provided to the driver about oncoming trains. Currently, Kentucky has about 55 railroad preemption traffic signals being used, but no future projects are anticipated for installing more signals or other technologies relating to highway-rail grade crossings. A study is currently being completed for the KYTC to update the compliance of the existing signals.

A future study has been recommended for the ARTIMIS area to identify crossings and preferred systems for installation. This study should be completed within 6 years and cost $500,000. (Refer to *OKI Regional Intelligent Transportation System Plan*[2] for more information about this study.) It is also anticipated that highway-rail intersection technology may be implemented as part of the TRIMARC project.

Pedestrian ITS

The objective of this project would be to improve the safety of pedestrians by implementing technology for enhancing a pedestrian crosswalk. The project may include the deployment of infrared pedestrian detectors, in-pavement lighting, or countdown pedestrian signals. This project will be considered once the needs are identified throughout the state.

Statewide Deployment of HAR

The objective of this project would be to establish a statewide network of HAR in order to provide site-specific, detailed traveler information to the driving public. The HAR would be used in conjunction with DMS to provide maximum information to drivers at strategic points and interchanges throughout the state. Sets of flashing warning lights mounted on the HAR signs would be activated, when necessary, to indicate the need for travelers to check the HAR frequency for incident-related traffic information. This project will be considered after an evaluation of the use and effectiveness of HAR is completed.

6.0 REFERENCES

[1]"Intelligent Transportation Systems Strategic Plan." Final Report. KTC-00-5. Kentucky Transportation Center, College of Engineering, University of Kentucky. June 2000.

[2]"OKI Regional Intelligent Transportation System Plan." Final Draft. PB Farradyne. June 22, 2001.

7.0 APPENDICES

Appendix A. Matrix of Strategic Plan Goals and Market Packages

Appendix B. Cost Summary for Projects

7.1 Appendix A – Matrix of Strategic Plan Goals and Market Packages

(Refer to the Strategic Plan for a description of the goals and the ITS National Architecture for a description of the market packages.)

Market Packages ↓ / Goals →	APTS					ATIS						ATMS							ARTS						AVSS								CVO					
	I	II	III	IV	V	I	II	III	IV	V	VI	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	I	II	III	IV	V	VI	VII	VIII	I	II	III	IV	V	VI
APTS 1			X		X				X																													
APTS 2			X																																		
APTS 3		X	X																																		
APTS 4			X																																		
APTS 5				X																																	
APTS 6			X																																		
APTS 7		X	X																	X		X															
APTS 8			X		X				X																													
ATIS 1					X	X			X	X	X												X														
ATIS 2			X		X	X			X	X	X										X		X														
ATIS 3																			X		X																
ATIS 4						X					X										X	X	X														
ATIS 5						X					X										X		X														
ATIS 6						X					X											X	X														
ATIS 7										X													X														
ATIS 8			X						X																												
ATIS 9				X		X					X							X			X		X	X					X		X						
ATMS 1						X	X				X										X																
ATMS 2						X	X				X										X																
ATMS 3																																					
ATMS 4						X					X					X					X																
ATMS 5																																					
ATMS 6						X		X			X					X					X	X	X														
ATMS 7								X													X	X															
ATMS 8							X									X					X																
ATMS 9																																					
ATMS 10																																					
ATMS 11																																					
ATMS 12						X		X		X													X														
ATMS 13																		X																			
ATMS 14																																					
ATMS 15						X					X												X														
ATMS 16																																					
ATMS 17																													X								
ATMS 18						X																	X														
ATMS 19																																					
AVSS 1				X																				X					X								
AVSS 2				X																				X					X		X						
AVSS 3				X																				X					X		X						
AVSS 4				X																				X					X		X						
AVSS 5				X														X						X					X		X						
AVSS 6				X																				X													
AVSS 7				X																				X					X		X						
AVSS 8				X																				X					X		X						
AVSS 9				X																				X					X		X						
AVSS 10				X																				X					X		X						
AVSS 11				X		X																		X					X	X	X						
EM 1							X									X			X			X															
EM 2							X									X			X			X															
EM 3							X									X			X																		
CVO 1																																					
CVO 2																																					
CVO 3																																	X	X	X	X	X	X
CVO 4																						X											X	X	X	X	X	X
CVO 5																																					
CVO 6																																	X			X	X	
CVO 7																													X				X	X	X	X	X	X
CVO 8																								X					X				X		X	X	X	
CVO 9																																					
CVO 10																X																				X		
AD 1																																					
AD 2																						X															
AD 3																						X															

7.2 Appendix B – Cost Summary for Projects

Cost by Fiscal Year

		Cost per FY						
Project	**Total Cost**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**TBD**
511 Deployment	$ 500,000	200,000		50,000				250,000
ARTIMIS	$ 38,890,000	575,000	575,000	575,000	575,000	575,000	575,000	35,440,000
Commercial Vehicle Electronic Credentials	$ 1,025,000	512,500	512,500					
Commercial Vehicle Electronic Screening	$ 1,350,000	1,050,000	300,000					
Cumberland Gap Tunnel Enhancements	$ 6,800,000	3,450,000	3,350,000					
Detailed Reference Marker Expansion	$ 718,750	25,000	25,000	50,000	309,375	309,375		
Detour Route Development	$ 400,000		100,000	50,000	150,000		100,000	
Dynamic Message Sign Deployment	$ 8,550,000	1,200,000	3,800,000	1,200,000	950,000	1,225,000	175,000	
I-75 Corridor Incident Detection and Probe Surveillance	$ 750,000				750,000			
Informational Course on ITS for Law Enforcement Agencies	$ 75,000							75,000
Informational Kiosks	$ 35,250			23,500	11,750			
Lexington Traffic management and Traveler Information Systems	$ 6,060,000	1,770,000	795,000	795,000	795,000	1,110,000	795,000	
Road Weather Information System Expansion	$ 384,000	144,000						240,000
Rural Incident Management Systems	$ 1,681,000	235,690	172,414	652,207	336,207	284,483		
Signal Coordination	$ 1,189,500	639,500	350,000	200,000				
Statewide Road Reporting System	$ 325,000	300,000	25,000					
Strategic Planning and Implementation in Rural Kentucky	$ 560,000		60,000					500,000
Transit System Improvements	$ 3,750,000			3,750,000				
TRIMARC	$ 6,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	
Virtual Weigh Station	$ 195,000	195,000						
Work Zone Safety Systems	$ 500,000		500,000					
Totals	**$ 79,738,500**	**$ 11,296,690**	**$ 11,564,914**	**$ 8,345,707**	**$ 4,877,332**	**$ 4,503,858**	**$ 2,645,000**	**$ 36,505,000**

Cost by District

	Cost per District												
Project	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TBD**
511 Deployment	16,667	16,667	16,667	16,667	141,667	16,667	141,667	16,667	16,667	16,667	66,667	16,667	
ARTIMIS						38,890,000							
Commercial Vehicle Electronic Credentials	85,417	85,417	85,417	85,417	85,417	85,417	85,417	85,417	85,417	85,417	85,417	85,417	
Commercial Vehicle Electronic Screening	300,000	150,000		150,000	300,000	150,000			300,000				
Cumberland Gap Tunnel Enhancements											6,800,000		
Detailed Reference Marker Expansion	68,750	68,750	68,750	68,750	168,750		68,750	68,750	68,750		68,750		
Detour Route Development	8,333	8,333	58,333	8,333	158,333	108,333	8,333	8,333	8,333	8,333	8,333	8,333	
Dynamic Message Sign Deployment	1,258,333	1,133,333	333,333	858,333	608,333	608,333	1,083,333	608,333	658,333	283,333	833,333	283,333	
I-75 Corridor Incident Detection and Probe Surveillance						151,500	279,500	115,500			203,500		
Informational Course on ITS for Law Enforcement Agencies													75,000
Informational Kiosks					11,750		11,750	11,750					
Lexington Traffic management and Traveler Information Systems							6,060,000						
Road Weather Information System Expansion	36,000	36,000	12,000	12,000	12,000			12,000			12,000	12,000	240,000
Rural Incident Management Systems	86,207	166,724	617,724	51,724	34,483	51,724	551,724	34,483	34,483		51,724		
Signal Coordination		265,000	12,000	200,000	128,500	70,000	34,000		380,000		100,000		
Statewide Road Reporting System	27,083	27,083	27,083	27,083	27,083	27,083	27,083	27,083	27,083	27,083	27,083	27,083	
Strategic Planning and Implementation in Rural Kentucky			448,000	112,000									
Transit System Improvements					3,750,000								
TRIMARC					6,000,000								
Virtual Weigh Station													195,000
Work Zone Safety Systems			100,000		200,000		200,000						
Totals	**$ 1,886,790**	**$ 1,957,307**	**$ 1,779,307**	**$ 1,590,307**	**$ 11,626,316**	**$ 40,159,057**	**$ 8,551,557**	**$ 988,316**	**$ 1,579,066**	**$ 420,833**	**$ 8,256,807**	**$ 432,833**	**$ 510,000**