Oklahoma Statewide Intelligent Transportation Systems (ITS) Implementation Plan

Oklahoma Department of Transportation

In Coordination With:

U.S. Department of Transportation

July 2004

Oklahoma Statewide Intelligent Transportation Systems (ITS) Implementation Plan

July 2004

Submitted to:

**Oklahoma Department of Transportation
200 N.E. 21st Street
Oklahoma City, OK 73105**

Submitted by:

**PB Farradyne, A District of PBQ&D
2777 Stemmons Freeway, Suite 1333
Dallas, Texas 75207**

THIS PAGE LEFT BLANK INTENTIONALLY.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

24/7	24 hours a day/7 days a week
AC	Advanced Construction
ACOG	Association of Central Oklahoma Governments
AVL	Automatic Vehicle Locator
CAD	Computer Aided Dispatch
CART	Cleveland Area Rapid Transit
CCTV	Closed Circuit Television
CDPD	Cellular Digital Packet Data
CMAQ	Congestion Mitigation and Air Quality
COTPA	Central Oklahoma Transportation and Parking Authority
CVO	Commercial Vehicle Operation
DDR	District Dedicated Revenue
DMS	Dynamic Message Sign
DPS	Department of Public Safety
DS	Dedicated State
DWDM	Dense Wave Division Multiplexing
EMSA	Emergency Medical Services Authority
ETC	Electronic Toll Collection
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GPS	Global Positioning System
HAR	Highway Advisory Radio
ISTEA	Intermodal Surface Transportation Efficiency Act
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
NOAA	National Oceanic and Atmospheric Administration
NCHRP	National Cooperative Highway Research program
NHS	National Highway System
OCARTS	Oklahoma City Area Regional Transportation Study
OCFD	Oklahoma City Fire Department
OCPD	Oklahoma City Police Department
ODOT	Oklahoma Department of Transportation
OTA	Oklahoma Transportation Authority
OU	Oklahoma University
PTZ	Pan/Tilt/Zoom
RTMC	Regional Traffic Management Center
RWIS	Roadway Weather Information System

SIB   State Infrastructure Bank
STP   Surface Transportation Program
TAFB   Tinker Air Force Base
TEA-21   Transportation Equity Act for the 21st Century
TIFIA   Transportation Infrastructure Finance and Innovation Act of 1998
TIP   Transportation Improvement Plan
TMA   Transportation Management Area
TMC   Transportation Management Center
UHF   Ultra High Frequency
USDOT   United States Department of Transportation
VMS   Variable Message Sign

1. INTRODUCTION

1.1 PURPOSE

The purpose of the Oklahoma Statewide Intelligent Transportation System (ITS) Implementation Plan is to guide state and local transportation officials and system implementers in the effective deployment and integration of ITS technologies across the state of Oklahoma. This is the third report in a three-part series on the Statewide ITS Plan. The two documents that precede this document are:

- The Statewide ITS Strategic Plan

- The Statewide ITS Architecture

The two major urban regions, Oklahoma City and Tulsa, have also developed their regional ITS Implementation plans. The Statewide ITS Implementation Plan supports those regional implementation plans and focuses on those elements of Oklahoma's ITS program needed for statewide functions as well. This Statewide Implementation Plan describes the short-range and long-range projects and policies that are proposed to be implemented over the next five years. The projects represent the priorities established by the Oklahoma stakeholders. The plan considers the statewide construction program and other opportunities to prioritize ITS projects.

The Implementation Plan also identifies high level ITS project initiatives that, when integrated with existing ITS elements, will lead to improved transportation network efficiency. ITS initiatives are phased for implementation based on current and planned ITS deployments, costs and benefits, technical feasibility, institutional issues, and readiness of proposed projects. In addition to these objectives, the plan accomplishes the following:

- Provides a background to the ITS planning effort and summarizes previously completed work applicable to ITS;

- Describes the regional ITS implementation plans;

- Identifies potential funding sources for initiatives/projects;

- Identifies statewide ITS initiatives and project costs; and

- Identifies an ITS evaluation plan.

The Statewide ITS Implementation Plan addresses statewide transportation needs and is intended to help foster the deployment of ITS in the near-term. The plan can be updated to include transportation needs as they arise.

1.2 INTENDED AUDIENCE AND REGION

This plan has been developed for the transportation agencies in Oklahoma, and their associated staff, with responsibility for statewide transportation management and operations. The intent is to identify and prioritize those ITS projects necessary for statewide operations. Individuals who will benefit from this document include system integrators, state and local

implementers wishing to integrate ITS systems, and other decision makers and transportation officials that are developing, or supporting the development of regional ITS systems.

1.3 APPROACH

The following section describes the general approach taken to develop the Oklahoma Statewide ITS Implementation Plan.

Development of the Implementation Plan is based on a nationally accepted approach and generally employs the following tasks:

- Build upon previously completed work. This work includes:
    - Oklahoma Statewide ITS Strategic Plan (including inventory of existing and planned ITS)
    - Oklahoma Statewide ITS Architecture
    - OCARTS ITS Implementation Plan
    - Tulsa Region ITS Implementation Plan
    - Oklahoma DOT Crash Inventory

- Identify Oklahoma Department of Transportation construction schedule (classification of corridors planned for construction in the next 5 years).

- Identification of ITS needed to complete the systems identified by stakeholders for regional and statewide operations.

1.4 ORGANIZATION

The Statewide ITS Implementation Plan consists of an Introduction (Chapter 1) and five additional chapters. An overview of Chapters 2 through 7 is provided below.

Chapter 2: Background – provides supplementary information that may help readers understand concepts expressed in this document. ITS is described, as is the relevant work leading to the completion of this document.

Chapter 3: Institutional Framework – identifies the statewide transportation stakeholders that disseminate/receive information from ITS sources. Agencies responsible for implementing ITS systems are described and their respective ITS technologies highlighted.

Chapter 4: Regional ITS Elements – describes the ITS implementation plans developed for the Oklahoma City and Tulsa Regions.

Chapter 5: Considerations for ITS Implementation – describes issues that may affect the success of ITS implementation. Recommendations with regard to these issues are provided in an effort to ensure success.

Chapter 6: Statewide ITS Implementation Plan – provides a series of regional ITS initiatives to foster effective deployment of ITS systems in Oklahoma. Each initiative is described and characteristics such as cost, desired outcomes, benefits, and specific projects are provided. The ITS initiatives provided in this section are based on existing and planned ITS deployments and are phased for implementation based on several factors, including need, costs, and expected benefits.

Chapter 7: ITS Evaluation Plan – provides a framework for evaluating the performance of ITS deployment. The plan identifies goals consistent with Oklahoma ITS Strategic Plan, FHWA Management and Operations policies, and stakeholder needs. The plan also outlines measures that can be recorded to monitor the change in performance from project implementation.

2. BACKGROUND

This chapter provides background information to the development of the Oklahoma Statewide ITS Implementation Plan. As previously stated, the primary objective of the plan is to provide guidance to transportation agencies so that future ITS systems in Oklahoma can be implemented in an efficient and cost-effective manner. The Oklahoma Statewide ITS Implementation Plan specifically identifies projects that meet statewide transportation needs.

2.1 STATEWIDE ITS THEMES

The Oklahoma Statewide ITS Strategic Planning effort spent considerable time conducting one-on-one interviews internally with ODOT staff and externally with Oklahoma stakeholders. From this effort, five themes emerged with consensus on the future direction of ITS in Oklahoma. These themes are:

- Incident Management. The application of surveillance, communication, and control technology to enhance regional, coordinated incident detection, verification, response, and clearance. Incidents are defined as both unplanned (e.g., crashes) and planned (e.g., special events).

- Work Zones traffic management and monitoring. Application of detection, surveillance, and communication technology to monitor and manage work zone traffic as well as support ODOT staff in construction management.

- Roadway Weather Information Systems. Application of detection, surveillance, and communication technology to monitor weather events effecting the roadway system and automation of treatment technologies to improve roadway conditions.

- Security and Preparedness. Application of surveillance and communication technology to monitor strategic infrastructure and link emergency response agencies via wireless and wireline technologies.

- Commercial Vehicle Operations. Application of automated registration, credentialing, and inspection systems to improve efficiency and competitiveness of Oklahoma CVO as well as detection and control technology to improve safety and mobility of commercial vehicles operating on the surface transportation system.

- Traveler Information Systems. Application of data collection, data fusion, and data dissemination to provide travelers with up-to-date roadway conditions, highway construction information, and travel choices.

2.2 STATEWIDE ITS ARCHITECTURE

The Oklahoma Statewide ITS Implementation Plan is a logical extension of the Oklahoma Statewide ITS Architecture. The Statewide ITS Architecture identifies the stakeholders' roles and responsibilities and includes all existing and planned ITS systems. The Architecture defines how those systems and subsystems are connected and what information will be

shared by participating agencies. The architecture details the ITS plans for the entire state. This allows integration and implementation to be a coordinated effort between transportation agencies rather than individual deployments.

2.3 STATEWIDE ITS STRATEGIC PLAN

An intelligent transportation system is a collection of technologies or systems (e.g., advanced sensors, computers, communication systems) that enable multiple agencies to work together to collectively manage the entire transportation network. Among other things, ITS increases roadway capacity without adding lanes and alerts drivers en-route and pre-trip to conditions (e.g., weather, construction, crashes) affecting travel. In the process of development the Strategic Plan, the stakeholders identified the transportation needs and the end results important to transportation in Oklahoma. Deployment of ITS in Oklahoma can:

- Enhance incident management operations,

- Improve traveler safety and mobility,

- Enhance information available to the public on travel conditions and choices,

- Enhance security of critical transportation investments (e.g., bridges and tunnels),

- Improve work-zone safety, and

- Improve commercial vehicle operations.

ITS elements improve the transportation system's efficiency and effectiveness for both providers and consumers of transportation services. By monitoring what is occurring on the system, making adjustments when needed, responding to unexpected traffic patterns or incidents, and providing real-time information, travelers may adjust their use of the system or adjust their routing based on prevailing conditions. Such actions lead to: improved traveler satisfaction through reduced traveler delay; reduction in secondary crashes through quick clearance of roadway incidents; faster treatment of injured persons through improved emergency response time; more efficient use of agency resources through coordinated management and response; efficient use of fixed assets (e.g., roadways); reduced operational costs through reduced fuel consumption; and environmental improvements through a reduction in vehicle emissions.

A key component of the Statewide ITS Strategic Plan is the establishment of a Statewide Transportation Information Center (STIC) and two Regional Transportation Management Centers (RTMCs). The STIC will be responsible for coordination of ITS information throughout the state of Oklahoma. The RTMCs will be located in and responsible for traffic management in the Oklahoma City and Tulsa Regions The STIC will be the central location for ODOT to share data and information collected by these regional centers, as well as other transportation management centers among the ITS stakeholders throughout the state. It will focus on collecting and disseminating transportation information critical to statewide safety, incident management, travel, security, and emergency management. These facilities include:

- Interstate highway system

- Oklahoma state highways on the National Highway System

- OTA Turnpike system

- Oklahoma airports

- Oklahoma Inland Waterway system

Space requirements for housing the STIC will be minimal because the primary operation and management of the ITS network will take place at the RTMCs. The STIC will be located in Oklahoma City, but may not be housed with the Oklahoma City Area Regional Transportation Study (OCARTS) RTMC. The STIC will likely consist of a few computer servers and monitors to access and view data; it will not need significant space for work stations or video displays. Operating staff requirements will also be minimal.

A key aspect of the STIC is to provide an independent network from other Oklahoma state networks for the sharing of video and data. The STIC will serve as central location to facilitate sharing of traffic management related information and control of ITS field devices between RTMCs and other transportation agencies mentioned above. Appropriate fire wall applications should be in place for sharing of data across the ITS network and other agency networks.

Functions of the STIC should include:

- Sharing of real-time video on Interstate, turnpike, and National Highway System (NHS)

- Sharing of camera control for CCTV on Interstates, turnpikes, and NHS

- Sharing of incident information on Interstate, state turnpikes, and NHS

- Statewide traffic data archive and data management / warehousing capability

- Sharing of statewide construction information dissemination

- Sharing of statewide maintenance activities

- Real-time communication to commercial vehicle operations (CVO) weigh stations

- Support data and video sharing through statewide communications system

- Facilitate center-to-center communications via software

- ITS maintenance and information tools

- Limited back-up operations for regional and local transportation management centers

The functions of the STIC should be integrated as the regional ITS systems mature. The initial functions should focus on video sharing, incident information sharing, and construction activity sharing. As the Statewide 511 system is developed, it will use the STIC to retrieve data for motorist information.

3. INSTITUTIONAL FRAMEWORK

3.1 TRAFFIC MANAGEMENT AGENCIES

The following section identifies and describes the transportation management agencies that own or operate ITS technologies in Oklahoma. Generally speaking these agencies are responsible for monitoring and managing traffic on regional roadways and provide data to the STIC. At times these agencies may communicate with each other to manage the transportation system more effectively, or within their region.

3.1.1 ODOT

ODOT's mission is to "provide a safe, economical, and effective transportation network for the people, commerce and communities of Oklahoma". ODOT Division 4 is responsible for much of the Statewide system. ODOT Division 4 operates regional DMS through a dial-up connection with a PC at the Division 4 – Oklahoma City Division Office.

ODOT, through a cooperative agreement with the University of Oklahoma (OU), has an ITS research lab on the north campus of OU at Max Westheimer airport in Norman. Software interfaces are being developed and tested in the lab to control Dynamic Message Signs (DMS) and Closed Circuit Television (CCTV) cameras.

ODOT owns an extensive fiber optic cable network that parallels I-35 from the Oklahoma/Texas border to the Oklahoma/Kansas border, and on I-44 from the Oklahoma/Texas border to the Oklahoma/Missouri Border, and on I-40 from the Missouri Turnpike to the Oklahoma/Arkansas border. This network interfaces with OTA's fiber network which is installed along the Turner, Cimarron, and Muskogee Turnpikes. At the writing of this report, neither the ODOT owned nor the OTA owned fiber was lit. There are contracts in place to light initial portions of the fiber network in Tulsa and Oklahoma in late 2003 and early 2004.

ODOT also has a 155.25 MHz statewide radio system. This system is a voice only system.

3.1.2 Oklahoma Transportation Authority

The Oklahoma Transportation Authority (OTA) is responsible for operating Oklahoma's Turnpike System and electronic toll collection (ETC) system (named Pike Pass). As part of the Pike Pass system, 65 cameras are used to enforce toll gate violations. Additionally, newer toll facilities are equipped with built-in automatic de-icing equipment, that are tied-in with pavement and roadway sensors.

As mentioned previously, OTA also owns an extensive fiber optic cable network that parallels the turnpike system.

3.1.3 Regional Transportation Management Centers (RTMCs)

Each RTMC will gather information about their region's transportation network and local operations centers. The RTMCs will process and fuse this information with other

operational and control data, and will provide information to partner agencies and local travelers. This information is used to monitor incidents and the operations of the transportation network and implement traveler information and real-time control strategies to improve safety and efficiency. All local transportation information will be collected by the RTMC and then passed on to the STIC. The agencies connected to the RTMCs include the following.

3.1.3.1 Emergency Management and Response Agencies

Emergency management agencies include those agencies responsible for responding to regional incidents and emergencies. As such it is critical that these agencies obtain timely information and respond as quickly as possible to mitigate the impacts of the situation. These agencies communicate with traffic management agencies primarily to obtain traffic-related information.

3.1.3.2 Department of Public Safety / Oklahoma Highway Patrol

The Department of Public Safety (DPS) is Oklahoma's statewide roadway enforcement authority. The DPS has 13 troops (or divisions) statewide. One troop is dedicated solely to the statewide turnpike system. The DPS currently operates an 800MHz radio system. Additionally, DPS provides the *55 call system statewide so motorists can report incidents and obtain necessary assistance. The DPS also maintains a website (http://www.dps.state.ok.us/cgi-bin/weathermap.cgi) for reporting near-real time weather conditions to statewide motorists. Troop S has installed satellite uplink capability used primarily for DPS applications in connection to commercial vehicle operations.

3.1.3.3 Fire Departments

Local Fire Departments provide fire suppression, fire prevention, rescue and other emergency services. The departments currently own a fleet of vehicles, some with on-board navigation capabilities and traffic signal pre-empt capabilities. Fire vehicles are dispatched through the Department's computer aided dispatch (CAD) system. Fire vehicles are also equipped with mobile data terminals, which will eventually be replaced by Mobile Computer Terminals. The terminals will allow firefighters to search databases, and access and store information locally.

3.1.3.4 Police Departments

Local Police Departments are responsible for ensuring the overall safety of residents within the local region. As part of this task, these Departments are responsible for operating the City's Emergency Management and 9-1-1 programs. The Departments currently operate a fleet of vehicles, many of which have the necessary equipment to be dispatched through the Department's CAD system. Similar to the local fire vehicles, mobile data terminals installed in police vehicles will be replaced with mobile computer terminals.

3.1.3.5 Emergency Medical Services

EMSA is the exclusive emergency medical service provider of several cities within Oklahoma, including several in the OCARTS region. EMSA has a state-of-the-art operating center which

features a satellite monitored CAD system. Each EMSA ambulance is equipped with an AVL system, so dispatchers can quickly locate and dispatch the vehicle closest to an incident.

3.1.3.6 Transit Management Agencies

Public transit agencies are responsible for providing downtown parking alternatives as well as safe, efficient, and convenient public transportation. The Central Oklahoma Transit and Parking Authority (COTPA) operates METRO Transit, Oklahoma City's main transit provider. METRO Transit buses and vans serve more than 20 fixed bus routes covering the main traffic areas of Oklahoma City. METRO Transit also provides transportation for mobility-impaired persons with Metro-Lift. METRO uses NextBus service to provide customers with real-time public transit information.

Metropolitan Tulsa Transit Authority (MTTA) & Broken Arrow Bus System (BABS) are the two transit agencies in the Tulsa region. At this time, MTTA has automatic passenger counters (APC) and an existing transit management center. The MTTA has plans to implement an automatic vehicle location (AVL) system for their buses as well as demand response transit. In addition, there are plans to install kiosks at bus stations to inform travelers when the next bus will be arriving. MTTA is also interested in an electronic payment system as well as using buses as probes in the traffic stream to give real-time traffic conditions along their routes.

3.1.3.7 Metropolitan Planning Organizations (MPOs)

The Association of Central Oklahoma Governments (ACOG) and the Indian Nations Council of Governments (InCOG) provide coordination, planning, technical and educational services and leadership for local governments in the Oklahoma metropolitan areas. Both agencies are taking an active role in planning and funding ITS projects that serve the regional needs, which in turn, greatly benefit the statewide ITS effort.

3.1.3.8 Military Bases

The military bases in Okalahoma represent strategic state infrastructure. During emergency events, traffic management on highways leading to and from military bases will be critical. Deployment of military resources will be affected by knowing the traffic conditions near military bases as well as statewide highway conditions. The military bases have their own on-base command that can benefit from the sharing of transportation data. In addition, many of the military bases receive their own weather information from National Oceanic and Atmospheric Administration (NOAA). This information may be valuable shared with the Regional TMCs.

3.1.3.9 Local Traffic Operations Centers

Local city public works departments will continue to operate and maintain surface street signal control in their jurisdictions. Coordination with the RTMC and other local traffic operations centers (TOCs) will be conducted by use of real-time surveillance and detection, data sharing, and sharing information on operating plans. The TOCs may have all management functions available in the regional transportation management center except for freeway control. A TOC may choose to implement only a few of the functions listed below and delay the implementation of some functions until later phases.

3.2 OTHER TRANSPORTATION AGENCIES

3.2.1 Airports

The major commercial airports in Oklahoma are Will Rodgers World Airport in Oklahoma City and the Tulsa International airport. In addition there are several other commercial and general aviation airports that impact transportation in Oklahoma. An airport will interface with the Regional TMCs in those urban areas. The data of interest to the airport is real-time traffic conditions and incident data as well as access to the video cameras, especially on the landside roadways leading to the airport. The airport should receive a Regional TMC remote workstation that will allow video display for any camera on the network and current roadway condition status.

The airports have information that would be of interest to state and regional travelers. This information consists of flight data from the airport's flight information display system (FIDS) and parking information for the on-airport parking garages and lots. In addition, if there is an incident at an airport that will delay flight operations, this information should be shared with the Regional TMC. This information will be in turn shared with the Statewide ITS system.

3.2.2 Ports and Waterways

The Oklahoma Inland Waterway system is considered strategic transportation infrastructure to the state. The users of the port facilities throughout the state would benefit from participation in the statewide ITS system and in turn receiving information on port operations will assist with commercial vehicle operations and rail operation with the ports. This information should be shared between the port authorities and the regional transportation management systems. Any port facility not associated with a Regional TMC should share data directly with the statewide ITS system. At the same time, traffic management and security will benefit from the ports sharing incident information with the Regional TMCs or Statewide ITS system. If an incident occurs at a port that affects port operations, that information can be disseminated to users (i.e., commercial vehicles and rail operators) and agencies responsible for traffic control. Travelers can be alerted to alternate routes, access closures, and/or delays associated with any waterway incident.

4. REGIONAL ITS IMPLEMENTATION

Statewide ITS Implementation in Oklahoma needs to proceed on two levels simultaneously: statewide and regionally. The Statewide ITS Strategic Plan outlines the operational concept for both the statewide ITS operations and regional ITS operations. Fundamentally, most of the traffic management and control is slated for the regional TMCs. The Statewide Transportation Information Center has primary functions of:

- Sharing information from the Regional TMCs

- Statewide Monitoring of highways, work zones, and incidents

- Providing back-up / off-hour operation when needed

Regional ITS Implementation plans were developed for the OCARTS and Tulsa Regions. As the two largest metropolitan areas, deployment of ITS in these regions will have some of the greatest benefits to transportation in Oklahoma.

The following two tables are taken from the OCARTS and Tulsa Regional Implementation Plans, respectively. These tables provide the ITS projects along with the short-term and long-term costs.

Table 1: Summary of OCARTS Region ITS Projects (Costs in $1000s)*

Initiative:	Short-term	Long-term	Total
Regional Transportation Management Center Implementation/ Enhancements	$3,500	$500	$4,000
Implement / Expand RTMC Field Devices	$10,200	$15,000	$25,200
Statewide Fiber Optic Cable Expansion	$800	$500	$1,300
Individual Agency Data Archives	N/A	$500	$500
Emergency Vehicle Signal Pre-emption Expansion	$60	$60	$120
Emergency / Transit AVL Implementation	$1,180	$250	$1,430
Coordinated Radio Communication System	N/A	$500	$500
Alternate Route Implementation for Incident Management	$100	TBD	TBD
Traffic and Transit Information Kiosk Implementation	N/A	$150	$150
Total	$14,560	$17,210	$31,770

* All costs provided in 2003 dollars.

Table 2: Summary of Tulsa Region ITS Projects (Costs in $1000s)*

Initiative:	Short-term	Long-term	Total
Regional Transportation Management Center Implementation/ Enhancements	$500	$3,000-5,000	$3,500-5,500
Implement Expand RTMC Field Devices	$7,500	$15,000	$22,500
Regional Agency Fiber Optic Cable Connections	$200	$200	$400
Road Weather Monitoring	$175-375	$350-750	$525-1,125
Individual Agency Data Archives	$100	$400	$500
Expansion of Regional Traveler Information Devices	$400	$125	$525
Safety Service patrol Implementation	$850	$850	$1700
Total	$9,725-9,925	$19,925-22,325	$29,650-32,250

* All costs provided in 2003 dollars.

5. CONSIDERATIONS FOR ITS IMPLEMENTATION

There are several issues that may indirectly affect the success of ITS implementations – including funding, staffing, standards, maintenance activities, and others. These issues, if not considered and addressed, may decrease the effectiveness of the STIC, regional systems, and the statewide ITS as a whole. The following chapter discusses these issues in detail.

5.1 FUNDING

The costs associated with designing, deploying and operating an ITS requires jurisdictions to be flexible in their use of federal, state and local revenues. Since the advent of the Intermodal Surface Transportation Efficiency Act in 1991, and its successor the Transportation Equity Act for the 21st Century (TEA-21) of 1998, the federal government has provided states with unprecedented flexibility and discretion in how Federal Highway Trust Fund money can be used to enhance the surface transportation system. However, this distributed responsibility results in more demands from all sectors of the transportation community. Furthermore, budgets are becoming more and more limited as local revenues are restrained due to economic shortfalls or other factors. ITS projects will encounter greater competition with other types of both traditional and non-traditional transportation projects. For instance, ITS projects often have to compete for funding with more traditional transportation, construction, and improvement projects. This often delays the funding of planned ITS projects, and subsequently shifts ITS systems implementation. During such delay, it is likely with ITS projects that newer technologies will emerge limiting the effectiveness of the planned project when it is implemented. The following paragraphs describe considerations like these as well as potential funding sources.

5.1.1 Funding Needs

Planning and Design

As with most capital projects, ITS projects require planning and design work to determine what will be built, how it will be built, and what level of mitigation (if any) is required. ITS projects, however, are not the same as typical roadway design projects. Because of the computers, software, and networks, a "systems engineering" approach is required by the Federal Highway Administration (FHWA) in planning and design ITS projects. Special attention needs to be paid to ensure that enough funds are allocated for the planning and design phase to accomplish the systems engineering process. The systems engineering process focuses on the end product. Issues such as "how will the system be used?", "how will the system be tested?", and "what other systems (existing or planned) are effected?" must be answered at the beginning of the project. This is crucial for adequately defining the project, so that true costs are reasonably accurate to budget for the construction, operations, and maintenance phases.

Project Capital

Capital expenditures for ITS will include, but are not limited to:

- Infrastructure, including roadside devices, communications media (e.g., fiber optic cable), and the infrastructure required for the RTMC
- Software
- Other materials directly tied to the project implementation (e.g., marketing, training materials, etc.). These are generally one-time charges.

Operations and Maintenance

Adequate operations and maintenance funding is needed for effective system development and operation. The level of sophisticated technical and software systems inherent in most ITS projects is substantial. Funding is necessary not only at project implementation but is also needed to maintain these systems, communication networks, and devices. ITS often requires additional funding for operations and maintenance of ITS devices as compared to traditional transportation projects such as road maintenance. The agencies within the Oklahoma Statewide region need to account for routine maintenance and the additional costs that may apply to ensure a full design lifecycle for each system. These investments need to be protected to avoid premature system(s) replacement.

One positive attribute of ITS standards adoption will be the development of more interoperable equipment and common system platforms, which will encourage more choices among vendors, thus helping to reduce replacement costs.

Training

As the ITS elements are deployed in the Oklahoma Statewide region, it will be increasingly important to ensure that the staff responsible for operating and maintaining these devices receive adequate training. Training will be required for all existing and new employees who will be responsible for operating and maintaining ITS. Providing proper and adequate training will help ensure that maximum benefits are derived and that system life is maximized.

5.1.2 Funding Opportunities

Funding is a vital element of any transportation program. The purpose of this section is to provide the information necessary for ODOT to consider the funding alternatives (and their requirements) that are available for the ITS projects. Innovative funding sources are included.

Federal Sources

The enabling legislation allocating federal funds is Title 23 of U.S. Code as modified by the Transportation Equity Act for the 21st Century (TEA-21). TEA-21 is a six year funding package signed into law in 1998 and is due to expire at the end of this year. TEA-21 authorizes $217 million in funds for deploying multimodal transportation projects, including ITS, over a six-year period. For ITS, TEA-21 allocates funding primarily for ITS Integration, ITS Standards, Operational Tests, Research, and ITS Deployment Incentives. ODOT has been successful in obtaining earmarked funds for deployment of ITS projects in the Oklahoma Statewide region. TEA-21 legislation is expected to be replaced by the congressionally approved Safe, Accountable, Flexible and Efficient Transportation Equity Act of 2003 (SAFETEA).

If approved in its current form, the SAFETEA package will establish a categorical program (the ITS performance Incentive Program) for ITS. For the State of Oklahoma the six year aggregate summary of SAFETA apportionments for the ITS Performance Incentive Program is expected to be $15,230,015. This differed from TEA-21 where funding for ITS was set-aside form other programs like the NTS. In addition to this categorical program, there is also a CVISN portion that directs $25 million per year to states so they can complete the CVISN program, which would bring funding to Oklahoma for commercial vehicle operation (CVO) applications.

Applications for ITS funds must submit 1) an analysis of the life cycle costs for operations and maintenance (if capital costs exceed $3 million), and 2) a multi-year financing and operations plan.

Under TEA-21, several changes were made to mainstream the ITS program into the well-funded traditional federal-aid highway categories. As a result, ITS projects are explicitly eligible for NHS, STP, CMAQ funding. Further, ITS "capital and operating costs for traffic monitoring, management, and control facilities and programs" are eligible. Use of CMAQ funds for operations is limited to a three-year period. The other traditional funds do not have a time limit.

This national package includes the following funding programs that may be tapped to support ITS deployment:

- National Highway System (NHS)
- Surface Transportation Program (STP)
- Congestion Mitigation Air Quality (CMAQ)

National Highway System (NHS)

This program provides funds to improve rural and urban roadways that are part of the NHS. Under the NHS Designation ACT of 1995, over 160,995 miles of roads, which are most critical to interstate travel and national defense, those that connect with other transportation modes, and those essential for international trade are eligible for funding. Until 1991, the NHS funding program limited the period in which funding could be used for traffic management and control to two years. However, TEA-21 and its predecessor (ISTEA) eliminated this limitation. This is inclusive of start-up and operating costs. TEA-21 also includes "infrastructure-based intelligent transportation system capital improvements" as eligible projects for NHS funding. Additionally, as defined in 23 USC 103(b)(6), the term "operating costs for traffic monitoring, management, and control" now includes a much broader range of eligible expenditures, including the following:

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

Operating expenses are now defined to include hardware and software upgrades, as well as major systems maintenance activities (i.e., those undertaken to ensure peak performance).

The replacement of defective or damaged computer components and other traffic management system hardware, including street-side hardware, is also eligible. However, restrictions still preclude the use of these funds for the routine maintenance of computer components and system hardware.

Surface Transportation Program

The Surface Transportation Program (STP) is a block-grant type program that can be used by state and local governments on any road (including NHS) that is functionally classified as a local or rural minor collector or higher. Infrastructure-based intelligent transportation system capital improvements are eligible for STP funding. STP funds can be used for capital and operating costs for traffic monitoring, management, and control facilities. However, as with NHS funding, they cannot be used for maintenance.

Congestion Mitigation and Air Quality Program

As part of the federal Clean Air Act, the Congestion Mitigation and Air Quality Program (CMAQ) channels air quality improvement resources to non-attainment areas for ozone, carbon monoxide, and particulate matter. Traffic and congestion management strategies are eligible for CMAQ funding, provided that the sponsor can demonstrate that these strategies will improve air quality.

Operating expenses for traffic monitoring, management, and controls are eligible for CMAQ funding under the following conditions:

- The project produces demonstrable air quality benefits
- Project expenses are incurred as the result of new or additional service levels
- Previous funding mechanisms, such as fees for services, are not replaced

Use of CMAQ funds for operations is limited to a three-year period. The other traditional funds do not have a time limit. In addition to the funds authorized specifically for ITS, ITS activities are eligible for funding from other programs. Both NHS and STP funds may be used for infrastructure-based ITS capital improvements and CMAQ funding may be used for implementing ITS strategies to improve traffic flow, which contributes to air quality improvement. Transit-related ITS projects are defined to be capital projects and are therefore eligible for funding under specific transit capital programs, such as the Urbanized Area Formula Grant Program and the formula grant program for non-urbanized areas. This is in addition to the STP, NHS and CMAQ programs.

State Sources

Another consideration in funding eligibility is the role of the Metropolitan Planning Organization (MPO). In Transportation Management Areas (TMAs), NHS and Interstate Maintenance projects are selected by the State, in consultation with the MPOs, and consistent with the Transportation Improvement Program (TIP). With all other federally funded projects, the MPOs select the projects in consultation with the State, consistent with the TIP. In reality, ODOT and the MPOs strive for consensus on all of the projects in the TIP, whether or not federally funded.

Dedicated State (DS)

Dedicated State (DS) funds are the primary source of state transportation funding for state highways. DS funds may be used for ITS purposes on any state highway, any bus system or rail system without any program restrictions on eligibility.

District Dedicated Revenues (DDR)

Derived from the State Comprehensive Enhanced Transportation System Tax, these funds must only be used for state transportation projects in the specific counties where the revenues were collected to the maximum extent feasible.

ITS Earmarks

ITS earmarks will continue to be another source for ITS project funding. Although the predictability of this funding is somewhat limited, this source can provide supplemental resources for various ITS projects in the pipeline for implementation, or help start ITS projects that haven't faired well through other more established TEA-21 funding programs. After the State receives ITS earmark monies, the Oklahoma Statewide region may apply to the State to receive funding. The ODOT ITS Policy Committee decides how the Earmark money is allocated.

Innovative Funding Mechanisms and Special Programs

"Innovative financing" refers to changing the traditional FHWA financing process from a single strategy of funding on a "grants reimbursement" basis, to a diversified approach that provides new options. Innovative funding has been advocated for ITS for some time perhaps due to the unique, relatively new nature of ITS projects. Many of these ideas come from the most innovative financing concepts developed in the public and private sectors. A prime objective of innovative financing is to maximize the states' ability to leverage federal capital for needed investment in transportation systems and to foster the efficient use of funds.

Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA)

TEA-21 established a new innovative financing program called the "Transportation Infrastructure Finance and Innovation Act of 1998" (TIFIA). Eligibility for TIFIA extends to projects that are of critical national importance such as intermodal facilities, border crossing infrastructure, multi-state highway trade corridor expansion, and other investments that have regional and national benefits. The TIFIA credit program is designed to fill market gaps and leverage substantial private co-investment, through supplemental and subordinate capital.

TIFIA permits the USDOT to provide financial assistance to projects in the form of direct loans, loan guarantees, and lines of credit. Almost any project that costs over $100 million is eligible for this program. ITS projects are specifically included for costs of $30 million or more. Federal credit assistance may not exceed 33% of the total project cost.

ITS Deployment Program

Under this program, eligible projects must demonstrate integration of multi-modal ITS components in metropolitan areas, rural areas, statewide, for multi-state city settings to improve mobility, promote safety, increase traffic flow, etc. including building on existing ITS projects. The Federal share is 50%. Proposals are submitted to FHWA Washington Headquarters. Traditionally, however, these funds have been earmarked by Congress. This fact requires sponsors of projects to gain local congressional support for candidate projects.

Partnerships

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

State Infrastructure Bank (SIB)

The SIB is an investment fund that offers loans, credit enhancements and other forms of financial assistance to surface transportation projects that meet federal standards and are eligible for assistance under Title 23 and capital projects defined by Title 49. The loans are capitalized with federal funds.

Advanced Construction (AC)

This approach involves using state funds for a project eligible for eventual reimbursement with federal funds. Advanced Construction funds can be used in Interstate Maintenance, National Highway System, and Congestion Mitigation / Air Quality programs. This approach is characterized as an excellent tool to ensure that no available Federal funds are lost in a Federal fiscal year.

State Match

State Match involves credit for the non-federal share of funding on a project. Toll revenue expenditures are used as a credit toward the non-federal matching share of all programs authorized, with certain exceptions. A different form of state match involves use of the value of in-kind services for the soft match, under certain rules.

5.2 STAFFING

The STIC will likely consist of a few computer servers and monitors to access and view data; it will not need significant space for work stations or video displays. Operating staff requirements will be minimal. Anticipated needs include a data manager/analyst and or a communication specialist. Job descriptions for each position are listed below. The

majority of staffing needs will be in the RTMCs. The OCARTS Implementation Plan and the Tulsa Regional Implementation plan detail the staffing requirements for the RTMCs.

Data manager/ analyst
- Help define data standards to enable cross agency data sharing; help define and support data sharing across agencies
- Design, maintain and manage relational databases for decision making
- Turn rata data into usable information
- Design report formats and run queries (SQL) and reports; perform analysis as requested, generate useful and timely reports, coordinate data sharing with other agencies and monitor data security and storage
- Analyze data for patterns and trends; interpret data and use it for problem solving and decision making
- Report and disseminate data throughout organization; disseminate data results to other agencies
- Responsible for overall quality and integrity of data generated and used by the system
- Keep project management well-informed of potential uses of data for planning, project evaluation and other purposes
- Assist with studies: for example in highway agencies, speed and volume studies; in transit agencies, performance reports that support the scheduling, fleet management, and service planning staff functions
- Ensure databases comply with standard communications protocols.

Communications specialist
- Must be knowledgeable in the operations of a variety of wireline, wireless technologies, and radio communications (AM and FM) systems supporting video, data and voice transmissions.
- Must support field device implementation
- Must support implementation of devices with TMC control facility

5.3 MAINTENANCE

The majority of ITS maintenance efforts are towards field devices. The field devices will primarily be the responsibility of the RTMCs. The OCARTS Implementation Plan and the Tulsa Regional Implementation plan detail the maintenance responsibilities of the RTMCs. For the STIC, the maintenance responsibilities would primarily involve network administration. The Data manager/ analyst and communications specialist would handle network administration. This type of work would include ensuring the network is operational and functioning at peak performance, ensuring routers and firewalls are configured properly, and connections to the STIC are operational and data is being transferred to the appropriate entities. Duties may also include the maintenance of a statewide web server which would display traveler information from the various RTMCs from a statewide perspective.

5.4 PROCUREMENT

One critically important aspect of deploying ITS is the use of the proper procurement method. It is well documented and accepted by the FHWA that the use of low bid methods for the delivery of ITS is not appropriate.

Among all of the candidate procurement methods for ITS as described in the Procurement Issue Paper (See Appendix at the end of this document), those considered viable have one common characteristic - the contracted party to ODOT is a single entity. Further, this entity is selected for their capabilities, not on the basis of a low bid. The system manager contract type has been found to perform well for implementing agencies and should be considered for use by ODOT. This firm referred to as the system manager is responsible for the system planning and design, and ultimately responsible for providing the system platform, integrating this with the field hardware and communications, and delivering the working system to ODOT. This single point of responsibility reduces the risks associated with implementing ITS.   The approach specifically provides the following additional benefits:

- Unlike with low bid, where the software is designed to do the absolute minimum required to meet the specifications, the system manager can take advantage of the latest thinking and processes in a rapidly evolving technological market.

- The system manager provides the owner access to the system development and integration process. If the field hardware installation is let with the software the bid will be won by an electrical contractor who does not provide software platforms. The electrical company will subcontract the software to another company.

- The system manager approach provides a product that not only incorporates consistent leading edge technologies; it can also enable integration with any traffic control systems of the adjacent network or elsewhere in the state.

- In the current environment of TEA 21 funding using a system manager allows the State to readily modify the implementation to take advantage of new funding sources, such as demonstration projects and other sources of funds.

- The design of the telecommunications network can be prepared to include future requirements that can be designated later by the owner. Often systems that are low bid have limited expansion capabilities. These limitations are often not discovered until control elements are expanded or modified later.

- As upgrades to the system hardware and software are needed in later years, they can be designed and deployed uniformly and with minimum expense.

Design build is an increasingly popular approach to project delivery in the areas of buildings, roadway and bridge. Its weakness, when used for ITS, is ODOT's loss of control or choice over the final product. This final product is only defined in terms of functional requirements with this method, leaving the outcome uncertain, except for the cost. However, ITS at the lowest price is often unsatisfactory. Weighing price with technical submissions mitigates this disadvantage, but technical submittals prepared over a short period of time within a fixed number of pages leaves much to be determined later by the contractor, adding risk to the owner. Perhaps the most important distinction of design build over the system manager methods above is that an electrical installation contractor is typically the prime contractor, removing ODOT from a direct relationship with the system provider/integrator.

5.5 TECHNICAL RESOURCE STANDARDIZATION

Agencies within the Oklahoma Statewide region should standardize their technical resources as much as possible in an effort to reduce costs and increase ITS efficiency. Agencies operating different software platforms may wish to adopt a common or open platform to reduce the cost and time needed to train staff. Common or open software platforms will also ensure that files can be easily exchanged between agencies, thus reducing the need to reproduce similar data in different formats. For example, the exchange of geographic information system (GIS) data between agencies will be more easily accomplished through a common software program. Similarly, standardizing field equipment is likely to produce significant benefits. Similar to software platforms, standardization of field equipment will reduce the burden of having to train staff on varying pieces of equipment. In addition, standardization of field equipment will reduce maintenance costs, by reducing the number of parts that need to be ordered and kept in stock. Last but not least, inter-agency communications can be improved if similar systems are used. This will allow an individual agency to listen to communications of other agencies so as to implement the most appropriate response when regional emergencies occur.

6. STATEWIDE ITS IMPLEMENTATION PLAN

The Oklahoma Statewide ITS Implementation Plan provides a framework for deploying ITS systems within Oklahoma. The Implementation Plan is founded on a fundamental principle that the true benefits of an ITS are not achieved until a significant portion of the system in deployed. For example, if only certain segments of a corridor are instrumented for surveillance, data collection, and dynamic message signs to communicate to the motorists, the full traffic management / incident management benefits cannot be realized when incidents occur in the non-instrumented sections.

A number of statewide ITS initiatives recommended for implementation in the next five years are provided and described in following sets of tables. Within each table, the recommended ITS initiatives are described in terms of their key functions, desired outcomes, potential benefits, planned or programmed projects, implementation phase (short- or long-term) and costs.

Statewide ITS initiatives represent key infrastructure investment (e.g., expand fiber optic cable network) that promote system interoperability and efficiency, and lead to improved transportation system safety and mobility. The statewide ITS initiatives presented in this chapter were derived from the statewide ITS functions outlined in the Statewide ITS Strategic Plan and through examination of functions not being addressed by regional ITS deployments. ITS initiatives are provided, as opposed to specific projects, to give system implementers flexibility when defining projects in the future given funding constraints or other impedances to ITS implementation. However, specific projects currently planned or programmed are identified under their corresponding ITS initiative.

The difference between the Statewide and the regional implementation plans is simply that the statewide plan focuses on statewide initiatives, while each region will have an implementation plan of its own. All of the implementation plans will be developed considering the full range of needs across the state, so they are completely inter-related. This section provides a complete list of projects and includes implementation costs.

6.1 ITS INITIATIVE SEQUENCING

The goal of the ITS sequencing is to deploy those ITS projects needed to serve statewide needs and those projects needed to support the regional ITS needs. The relationship between the Statewide Transportation Information Center and the Regional TMCs is shown in Figure 1. As stated before, the Regional TMCs will conduct a majority of the traffic management functions and the statewide center will collect, share, and store data from these regional centers.
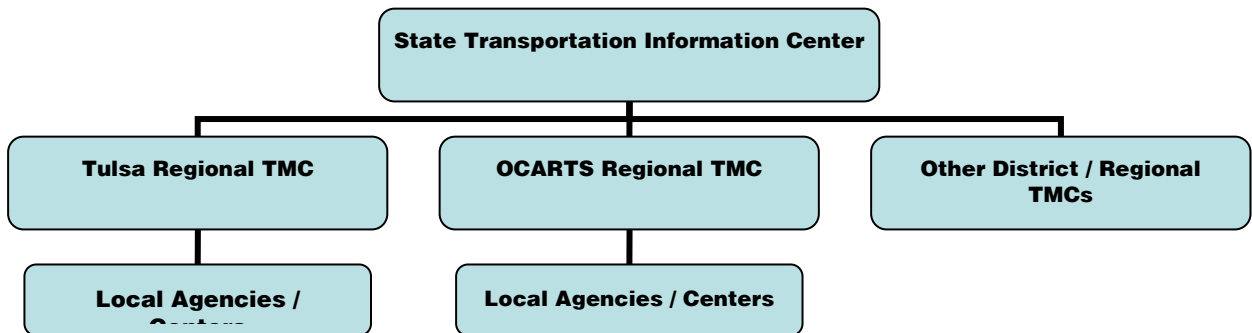
Figure 1. Statewide / Regional ITS Centers Relationships

Due to the dynamic nature of ITS and likely shift in regional needs, a specific deployment sequence is not prescribed. Instead, projects are recommended for deployment in either the short- or long-term (0-5 and 5-15 years respectively), with project deployment occurring at anytime within the proposed term. In a few cases, project deployment may occur in the short-term with additional project development occurring in the long-term. Project deployment phases are described in greater detail below.

Short-term – present to five years into the future. Short-term initiatives focus heavily on the provision of 1) infrastructure, including communications needed to physically connect ITS elements and to manage the transportation network, 2) regional traveler information, and 3) network surveillance. Short-term initiatives build on existing ITS deployments, while providing the necessary infrastructure needed to support long-term initiatives.

Long-term – five to fifteen years into the future. Initiatives that fall into the long-term build upon projects phased in the short-term and are intended to expand, maintain or complete portions of the regional ITS system.

Short and long-term ITS initiatives for the Oklahoma Statewide region are described in greater detail in the following tables.

Table 3: Statewide Fiber Optic Cable Expansion

Initiative:	Statewide Fiber Optic Cable Expansion	
Description:	The statewide fiber optic cable network will be expanded to provide connections with the Regional TMCs, and other transportation management and emergency management agencies in Oklahoma. Currently over 900 miles of fiber exist within the state, with fiber running the entire length of I-35 and I-44. To date the fiber has not been lit, therefore this project will include the installation of fiber optic multiplexers and switches to light the fiber and enable the exchange of data. This project will complete some of the links in the OCARTS region in the short-term and expand coverage into the I-40, US 69, and US 412 corridors in the short-term.	
Specific Projects:	• I-240 from I-44 to I-40, and • I-35 from SH 9 West to I-40 • I-40 from the Texas border to Webber's Falls, • US 69 from I-44 to the Texas border, • US 412 from I-35 to Enid	
Key Functions:	• Data Exchange • Communications	
Desired Outcomes:	• Improved electronic data exchange (i.e., upload/download times) • Exchange of CCTV video and images among multiple agencies	
Benefits:	• Improved Communications • Improved Agency Operations	
Plan:	Short-term: Install fiber along I-240 (20 miles) to complete the loop to the south of Oklahoma City. Install fiber along I-35 south of I-40 (15 miles) to connect to Norman. Long-term: complete coverage of I-40, US-69 and US412	
Considerations:	Expand fiber optic network to existing centers and field devices first. Expand fiber optic cable network outward to provide connections to planned field devices and other centers.	
Cost Basis:	Fiber Optic Cable = $20,000 per mile	
Estimated Cost*:	Short-term	Long-term
	$700,000 (assumed 35 miles)	$12,500,000 (assumed 625miles)

* All costs provided in 2004 dollars.

Table 4: Deploy ITS Field Devices

Initiative:	Implement/Expand RTMC Field Devices	
Description:	This project will expand existing DMS and implement CCTV cameras at locations where devices have not been deployed and the need for such devices exist. It is expected that additional CCTV cameras with full Pan/Tilt/Zoom (PTZ) capabilities and web cameras will be deployed. DMS will be permanently installed at the roadside.	
Specific Projects:	• No specific projects have been identified.	
Key Functions:	• Traffic Monitoring • Incident Detection, Verification, and Response • En-route Traveler Information Dissemination • Security	
Desired Outcomes:	• Improved Emergency Response • Improved Incident Response	
Benefits:	• Reduced Delays, Improved Safety and Traffic Flow	
Plan:	Implement programmed projects in the short-term. Implement additional devices in the long term	
Considerations:	• Policies are needed to establish how CCTV cameras are operated and resulting video and images are to be distributed.	
Cost Basis:	CCTV Camera Unit = $17,000 (includes unit and installation) Camera Pole = $7,000 (includes foundation, conduit, and installation) DMS = $120,000 IP-Based Web Cameras = $1,000 Expansion of System $400,000 per mile (includes CCTV cameras, vehicle detectors, DMS, and Fiber Installation)	
Estimated Cost*:	Short-term	Long-term
	Individual projects: $1,400,000 plus integration costs. (Assumed 25 Cameras = $600,000, 5 DMS = $600,000, 200 IP-based web cameras = 200,000) System Expansion: $12,000,000	System Expansion $20,000,000 (50 mi)

* All costs provided in 2004 dollars.

Table 5: Statewide Transportation Information Center

Initiative:	Statewide Transportation Information Ctr Implementation
Description:	The Regional Traffic Management Center will serve as the focal point for collection and dissemination of traffic and traveler information for the OCARTS region. The RTMC will gather information about the transportation network, process and fuse this information with other operational and control data, and provide near real-time information to partner agencies and travelers. Specifically, RTMC operators will use ITS infrastructure installed along freeways to monitor and verify freeway operations and conditions. RTMC operators will detect and verify the status of incidents on regional freeways and will coordinate with other regional transportation and emergency response agencies to clear incidents in a timely manner. Additionally, any information collected on the regional level will be shared with the Statewide Transportation Information Center, in an effort to better manage statewide transportation.
Specific Projects:	• Regional Traffic Management Center
Key Functions:	• Freeway incident detection and verification • Provide transportation network operating data including video imagery to participating agencies, the public, and the media for wide dissemination • Coordinate incident management activities with other agencies
Desired Outcomes:	• Coordinated traffic operations • Coordinated incident management
Potential Benefits:	• Improved incident response • Enhanced traffic monitoring and incident verification • Improved data collection and dissemination
Plan:	• Build facility in short-term.
Considerations:	Seven acres of land at the ODOT Division 4 annex has been reserved for the RTMC. This site is located close to the I-35/I-235/I-40 interchange within Oklahoma City.
Cost Basis:	$3,500,000 for purchase of basic facility, $500,000 for hardware, software and integration for regional control
Estimated Cost*:	Short-term	Long-term
	$3,500,000	$500,000 (upgrades)

* All costs provided in 2004 dollars.

Table 6: Statewide ITS Central Software

Initiative:	ITS Central Software	
Description:	The interim ITS Software for data sharing and field device control was developed by the University of Oklahoma. ODOT and OU recognize this software in its current configuration will not serve the long-term needs of ODOT and the other stakeholders.	
Specific Projects:	• Development of Concept of Operations and System Requirements Specification. • Development of Phase I software (basic incident logging and control of cameras and DMS). • Develop remainder of software.	
Key Functions:	• Provide integrated control of field devices and incident data collection and storage.	
Desired Outcomes:	• Integration of all field devices into one software package.	
Benefits:	• Easier to maintain and support the various regional TMCs. • Operations staff from various locations will be familiar with the common software. • Data will be collected and stored in a common format.	
Plan:	Short Term: Concept of Operations and System Requirements Specification. Develop Phase I software. Long Term: Develop remainder of software.	
Considerations:	Consensus will be needed on what requirements are needed around the state, and in what priority.	
Cost Basis:		
Estimated Cost*:	Short-term	Long-term
	$750,000	$3,000,000-$5,000,000

* All costs provided in 2004 dollars.

Table 7: ITS Data Archives

Initiative:	ITS Data Archives	
Description:	Project provides participating agencies with hardware and software to establish individual data archives. The intent of the project is to establish a regionally distributed data archive, as a means to efficiently manage and exchange various types of data. The project lays the framework for a regional data archive if desired in the future.	
Specific Projects:	None Proposed	
Key Functions:	• Data Collection • Data Analysis • Data Exchange	
Desired Outcomes:	• Effective storage and exchange of data • Limit Data Redundancy	
Benefits:	• Improved Operations • Enhanced Data Analysis	
Plan:	Establish individual data archives within each agency. Develop common standards and protocols. Long-term integrate this into a regional database where all ITS agencies can access data.	
Considerations:	• Need to identify common data standards and protocols that will enable the merging of data from individual agency archives • Need to identify a common approach for accessing data • Need to identify means to avoid sharing sensitive data and information	
Cost Basis:		
Estimated Cost*:	Short-term	Long-term
	TBD	$500,000

* All costs provided in 2004 dollars.

Table 8: Statewide Roadway Weather Information System Deployment

Initiative:	Statewide RWIS Deployment
Description:	Project will implement Road Weather Information Stations, to measure pavement temperatures, and provide ambient weather conditions near the road surface (i.e., relative humidity, air temperature, precipitation, and wind speed).
Specific Projects:	No specific projects have been identified
Key Functions:	• Collect weather and pavement data • Validation of reported roadway conditions
Desired Outcomes:	• Improved roadway treatment and use of available materials (i.e, salt and sand)
Benefits:	• Improved Safety • Reduced insurance costs and property damage
Plan:	• Implement is short-term, expand coverage in long-term
Considerations:	Need to determine appropriate locations for RWIS implementation. Possible locations could include points along a freeway where a high numbers of crashes are caused by weather events, or points along a freeway where certain weather events are likely to first occur (e.g., low lying areas may be first areas where fog or ice forms).
Cost Basis:	• $35,000-$75,000 per RWIS

Estimated Cost*:	Short –term	Long-term
	$175,000-$375,000 (5 RWIS Assumed)	$350,000 - $750,000 (10 RWIS assumed)

* All costs provided in 2004 dollars.

Table 9: 5-1-1 Traveler Information System

Initiative:	5-1-1 Traveler Information System	
Description:	5-1-1 systems have the potential to be the primary interface for travelers with ITS. The key to developing a useful 5-1-1 system is having timely, accurate content for travelers when they need it. A 5-1-1 system consists of data collection, data fusion, and data dissemination.	
Specific Projects:	No specific projects have been identified	
Key Functions:	• Integrate traveler information into a common system that the public can call.	
Desired Outcomes:	• Provide a common telephone number and automated system for the public to call to get real-time travel information.	
Benefits:	• Common number provides public easy access to traveler information. • Reduce personnel needed to provide telephone assistance to public for traveler information.	
Plan:	Evaluate plan in short-term. Implement Statewide system in long-term.	
Considerations:	• Must be able to integrate information from most or all available TMCs to provide complete information. • Must be automated in order to prevent necessity of large scale Call Center staff.	
Estimated Cost*:	Short-term	Long-term
	5-1-1 Plan Underway by Universities	$3,000,000

* All costs provided in 2004 dollars.

7. ITS EVALUATION PLAN

This ITS Evaluation Plan is a proposed methodology for evaluating ITS projects implemented in the State of Oklahoma. The plan will allow ODOT and its partners to measure the benefits of the ITS Program and to continually report to external stakeholders on the progress of the state's ITS Program. To make better use of resources, evaluation is necessary to monitor how projects are meeting the state's goals of improving safety and mobility, enhancing security, and increasing agency efficiency.

7.1 PURPOSE

The purpose of the ITS Evaluation Plan is to establish a framework for evaluating ITS projects against the goals of the Oklahoma Department of Transportation. The foundation of the evaluation plan framework is the identification of performance measures. These measures consist of a set of objective, measurable criteria used to evaluate the performance of the transportation system and to gauge if, and to what degree, the vision and goals of ODOT are being achieved.

This evaluation plan will assist ODOT in:

- Planning future ITS implementation

- Prioritizing ITS funding

- Improving state-level decision/policy making

- Meeting Federal requirements for project evaluation

- Provide information to the general public about the program

The ultimate goal of evaluation should be to confirm if the ITS program supports the mission statement of ODOT:

> *"The mission of the Oklahoma Department of Transportation is to provide a safe, economical and effective transportation network for the people, commerce and communities of Oklahoma."*

To accomplish this, the ITS Evaluation Plan must also provide a consistent basis for evaluating projects to be implemented in the state. The plan identifies specific performance measures to gauge project performance. These performance measures are identified in Section 3. For each measure, the data needed to calculate the measure is identified along with the frequency of data collection. In the future, the existing ITS system should be able to collect a significant amount of the data for the evaluation process. In the early years, it may be necessary to supplement data from the system with additional data collection to generate and calculate performance measures.

The evaluation plan was developed in concert with the Statewide ITS Strategic Plan. The measures used in the evaluation plan reflect what was identified as important to stakeholders interviewed. The plan also incorporates the recommended (or required) ITS benefit reporting practices from the Federal Highway Administration (FHWA).

7.2 EVALUATION PROCESS

7.2.1 Step 1: Appoint an Evaluation Team

The first step of an evaluation program is to determine what goals the projects are attempting to achieve. As mentioned in Section 1, ODOT has an established mission statement. This serves well as the high-level goal, but more specific goals are needed for each region and each project. In order for the goals not to be biased, it is recommended that the key stakeholders affected by the project be involved in the development of the goals. Experience has demonstrated that formation of this team early in the project is essential to facilitating planning and avoiding surprises later on in the project time line.

The team should identify the key factors that will significantly affect the achievement of higher level goals. An example goal would be to maximize the carrying capacity of the existing transportation facilities. This goal would help achieve the mission statement, "effective transportation network", and it is measurable by collecting traffic throughput data.

The formation of a team of stakeholders will also assist ODOT in aligning activities and resources to help collect data. For example, if the project is in a city, and the city is included on the team, the city might reschedule activities that would hinder the evaluation of the project.

7.2.2 Step 2: Develop an Evaluation Strategy

The evaluation strategy is the methodology to be used to measure the agreed upon goals of the project. The strategy should include the selected goals from the overall list in Section 3 that are appropriate for the project and the measures for each goal. Also, a ranking system is needed to reflect how well the project measures were reached. A developed set of performance measures should be limited to procedures that demonstrate results, are limited to the vital few indicators for each goal, and are not too costly.

Project evaluation resources can then be assigned to determine who is responsible for conducting the evaluation and collecting data. Having an agreed upon strategy before the project is implemented can assists the partners in reconciling differences, building a sense of teamwork and trust, and also creating expectations about exactly what will be evaluated and the relative importance the evaluators will place in each goal area.

While each project partnership will establish its own unique evaluation goals, the measures serve to maintain the focus of goal-setting on the overall objectives of the project. In addition, these few good measures are useful not only at the conclusion of the project, but also during the life of the deployed system. As data is collected, these results can be used

to adjust various aspects of the ITS system or systems being tested or deployed so as to improve overall system performance.

7.2.3 Step 3: Develop an Data Collection Plan

A clear data collection plan helps streamline the data collection process. In this step, it is important to have cooperation between stakeholders and evaluators. Duplicating efforts or collecting inadequate data can be eliminated and in turn can save time and money. If possible, automated data collection should be used to simplify the process.

Before data collection begins the following points should be identified:
- How much data needs to be collected
- Location from which the data will come
- Length of time over which to collect the data
- How to document data
- Frequency of data collection
- Any calculation methodology that will be used
- If the performance measure is new, try to identify existing data sources or create new sources.
- That data sources need to be credible and cost effective.

It is imperative in this step to plan ahead to insure that the effort collects complete, accurate, and consistent data and that performance information is reported in a way that is useful.

7.2.4 Step 4: Collect Data and Calculate Performance Measures

This step includes the data collection effort for evaluating projects. After completion of the project and the evaluation, the partners can continue to use data provided by automated data collection for continual refinement of the system.

Once data collection is complete, the agreed upon performance measures can be calculated and reviewed.

7.2.5 Step 5: Summarize Evaluation

Once data is collected, performance measures calculated, and reviewed, the final product of the evaluation process should be a report demonstrating the evaluation strategy, the data collected, the conclusions from the collected data and recommendations. The report should clearly communicate performance information to stakeholders and the public, and support future decision making and resource allocation.   The FHWA recommends developing an executive summary for top-level decision makers.

This report should be reviewed by the evaluation team once it has been finalized and published. In addition, in order to have the results from ITS project evaluations contribute to the growing body of knowledge on ITS costs and benefits, a copy of the Final Report should be sent to the JPO Program Assessment Coordinator.

7.3 GOALS AND MEASURES

Performance measurement is the use of statistical evidence to determine progress toward specific defined organizational objectives. In a service industry such as transportation, the performance measurement process starts by defining precisely the services that the organization promises to provide, including the quality or level of service (e.g. timeliness, reliability, etc.) that is to be delivered. The performance measurement process starts by defining the services that the organization promises to provide.

In general, a good measure:

- Is accepted by and meaningful to stakeholders
- Demonstrates how well goals and objectives are/not being met
- Is simple, understandable, logical, and repeatable
- Shows a trend
- Allows for economical data collection
- Is timely
- Is sensitive
- Supports the organization's values and the relationship the organization has with customers, suppliers, and stakeholders

7.3.1 Challenges to Measuring Performance

Many benefits of ITS projects cannot be measured, or are difficult to measure, in standard quantitative measures alone. Qualitative, such as safety and information flow, as well as quantitative measures will have to be considered. Another challenge to consistent evaluation is the fact that it is rare for one improvement to make an overwhelming change. Transportation facilities are dynamic environments characterized and influenced by numerous variables beyond the control of transportation professionals.

7.3.2 Goals and Measures

The US DOT has established the following ITS Goals: Safety, Mobility, Efficiency, Productivity, Energy and the Environment, and Customer Satisfaction. US DOT has also identified measures for each of these goals for monitoring the performance in each of the goal areas. Oklahoma should adopt the goals defined by US DOT with one addition. A seventh goal of Infrastructure Security is recommended. Oklahoma has established security as one of the ITS themes in the Statewide ITS Strategic Plan. The ITS system will support the state's security initiative by providing high bandwidth communication and CCTV surveillance along the critical transportation infrastructure in Oklahoma.

Goal: Safety – Safety is the absence of hazards or reduction of dangers. This is typically measured by the number of incidents that occur.

Measures:
- Change in overall crash rate (crashes/year)
- Change in fatality crash rate (fatal crashes/year)

- Change in injury crash rate (injury crashes/year or injury crashes/million vehicles miles of travel)
- Change in secondary crash rate resulting from incidents
- Change in weather related crash rate

Goal: Efficiency – Efficiency identifies the difference between transportation facilities capacity and the number of vehicles it is serving. The closer the facility is to carrying maximum throughput, the more efficient it is.

Measures:
- Increase freeway throughput as a result of improved incident clearance and traffic management
- To maintain a predictable travel time for length of trip so that customer expectations are met
- Increase travel speeds

Goal: Mobility - Mobility indicates the variability in overall travel time from an origin to a destination in the transportation network, including any modal transfers or en-route stops. This measure can readily be applied to intermodal freight (goods) movement, as well as personal travel.

Measures:
- Maximize carrying capacity and operating performance of existing transportation facilities and services
- Decrease the response time to highway incidents
- Decrease the clearance time for highway incidents
- Decrease in the number of Level 3 (i.e., incidents with lane closures exceeding 2 hours) and Level 2 incidents (i.e., incident with lane closures exceeding 30 minutes)
- Number of freeway miles congested in peak hours by direction daily
- Reduce travel times

Goal: Productivity - Productivity is the ability to reduce the operating cost of an agency to conduct its business operation. This can be measured in dollars saved or in reduction in the persons required to accomplish tasks or duties.

Measures:
- Increase in job performance of existing personnel
- Reduction in cost (could be time or resources measured in dollars)
- Reduction in required staff time (person hours saved)

Goal: Energy and Environment - The air quality and energy impacts of ITS services are very important considerations, particularly for metropolitan areas that have not attained air quality standards established by the Clean Air Act Amendments of 1990 ("non-attainment areas").

Measures:
- Change in emissions levels (tons of CO, NOx, and HC)
- Change in fuel consumption (gallons)

Goal: Support Security – Real-time communications between emergency response agencies are important to security and natural disaster issues.

Measures:
- Miles of transportation network with fiber optic communications system operating for transportation operations
- Number of response agencies that can communicate with each other
- Miles of the transportation network under surveillance and monitoring

Goal: Customer Satisfaction - Customer Satisfaction is the difference between users' expectations and experience in relation to a service or product.

Measures:
- Percentage of Oklahoma travelers surveyed that were satisfied with travel information
- Percentage of Oklahoma travelers surveyed that were satisfied with the performance of ODOT and local transportation agencies.

7.4 METHODS OF MONITORING

Evaluation framework should recommend that each region collect the data necessary to calculate the measures for each of the goals in its region. Each region should "roll-up" its data to formulate a statewide monitoring of the appropriate measures. If not in a region, a specific district may want to keep track of the measures applicable to their ITS systems.

An interim method of comparison could be monitoring two corridors in a "with and with-out study." This has been done effectively in the HOV community. This might be applicable where one corridor is having a freeway or arterial management system deployed and another corridor is not slated for deployment until a future time. The measures can be collected and calculated for both corridors and compared against each other.

7.5 PERFORMANCE REPORTING

As more systems are deployed across the state, monthly reports should be generated. These reports will highlight the ITS operation across the state. Each region with ITS equipment should produce a regional report. These reports will roll up to a statewide report that highlights both RTMCs as well as the statewide system and other smaller systems deployed in other divisions.

APPENDIX: PROCUREMENT ISSUE PAPER

1. INTRODUCTION

Successful ITS implementation, operation and maintenance requires effective procurement processes to acquire the services, hardware and software necessary for these systems. But many conventional procurement processes are not well suited to buying these systems, and new approaches present their own unique challenges. This issue paper presents brief descriptions of various contracting methods. It is important to recognize that this paper is merely intended to serve as an initial survey. It is not a detailed analysis and considerably more effort would be needed to further investigate and implement the alternatives and recommendations described here. The purpose of this issue paper is to summarize the state of the practice for procuring ITS and other advanced technology implementations.

2. TYPES OF CONTRACTS

This section summarizes a wide range of contracting vehicles available for the procurement of ITS.

2.1 ENGINEER / CONTRACTOR

Traditional highway construction projects have been procured using a process in which the project design is developed by a public agency or a consultant (the "Engineer"). A bid solicitation is issued which includes forms and design specifications and an award is made (to the "Contractor") on the basis of the lowest bid received. While this process is highly competitive, it is not well suited to the development of complex, high-tech information and communications systems which are the core of ITS.

If a consultant is to be used to design the project, the consulting engineer is selected based on qualifications and experience to perform the work. The engineer typically prepares the contract documents (plans and specifications). Construction contractors are invited to submit bids in accordance with the contract documents. Award is based on the lowest responsive bid. Once awarded, the contractor builds the project according to the bid documents. The engineer (or another CE&I consultant) inspects the construction, certifies completion and may interpret the bid documents. Most highway construction and smaller closed-loop type traffic control system projects nationally have been procured successfully utilizing this approach.

Advantages:

- The public agency is the responsible entity
- This approach has a long history of use, with roles clearly defined

- Its history provides well-established legal precedent to handle disputes arising from this approach
- The end product is well defined at an early stage in the project
- The contractor manages the subcontractors
- This approach is well-suited to highway construction

Disadvantages:

- Artificial dividing line between design and construction
- Not well-suited to software development in that software projects are difficult to specify and the buyer may not know his needs
- Software/systems integration is not usually performed by the prime contractor
- The contractor has financial incentive to find deficiencies in the bid documents and "changed" site conditions to seek change orders

2.2 DESIGN/BUILD

This type of contract combines both the design function and the construction/installation function into a single contracting vehicle. Also known as a turnkey or public turnkey, the procurement is for the design prepared by the procuring agency. Design/build contracts are usually most successful when they are structured around a preliminary design completed to the 20 to 60 percent level. The agency's role is to monitor the design/build work. Partnering is generally involved. This contracting alternative can allow for rapid completion of the project and can provide for streamlined procurement. Engineering and construction work can be done cooperatively with a single entity to resolve problems that are common in traditional contracting, where the engineering and construction functions are handled by separate firms. These contracts may also include warranty or operations management tasks. Under this arrangement, the agency assumes greater responsibility for inspections and approvals, and requires a significant quality control effort on the part of the public agency. Selection is often based on low bid, and bids may be somewhat higher than with a traditional approach because of the increased risks to the contractor.

Advantages:

- The time to deliver the project can be reduced significantly
- Used extensively in private sector (legal precedent)
- Reduced involvement of agency staff in production and construction inspection stages
- Single point of responsibility for project design and implementation
- This approach is well-suited to complex systems procurement and integration

Disadvantages:

- Many agencies lack experience in this approach
- Reduced level of control over system components and construction methods
- Final product may not be clearly understood until proposal time
- Requires contract clauses / incentives to assure quality materials and construction

2.3 SYSTEM MANAGER

Under this contracting approach, the system manager is selected using conventional consultant procurement processes. The system manager is responsible for the design (plans and specifications), software development, hardware procurement, integration, training, and overall quality control. Equipment and electrical contracting services are usually procured on a low bid basis. System managers are often used for technology-based projects. Large traffic control and freeway traffic management systems have been procured nationally using this approach.

Advantages:

- Overall system design, software development, and testing are controlled by a single entity
- The software developer is usually the prime contractor
- This approach minimizes the shifting of fault
- Its flexibility allows for more changes than traditional contracting approaches
- It is well suited to ITS projects
- There is relatively strong competition available

Disadvantages:

- Requires careful examination of firm qualifications to assure requisite blend of skills
- This approach is somewhat unfamiliar to local engineers and procurement officials
- This approach relies heavily on the successful performance of the system manager
- The end product tends to be less well defined than under the engineer/contractor approach and it is difficult to manage "expectancies"
- Low bid services (such as equipment and electrical contracting) are the responsibility of the public agency. This may include inspection and acceptance.

2.4   SYSTEM INTEGRATOR

This approach is virtually the same as the system manager, except that the system integrator can bid on equipment and electrical contracting services. This approach was used in Georgia for the Atlanta area ATMS project.

Advantages:
- Single point of responsibility
- Contracting is simplified

Disadvantages:
- This approach is not well known to public agencies
- Allowing contractors to directly bid to the system integrator may violate the public agency's procurement processes

2.5 COMMERCIAL OFF THE SHELF (COTS) SOFTWARE ACQUISITION

This approach is new to ITS, but it used for the majority of software acquisitions in both the public and private sectors. The local agency develops a functional specification or needs statement, along with an evaluation procedure. It then evaluates all commercially available systems and selects the system that most closely suits its needs, using a predefined evaluation procedure.

Advantages:

- Essentials of competitive procurement are maintained
- Proven effective throughout the computer industry
- Increases that probability of receiving mature relatively bug-free software
- Costs are reduced
- Implementation problems and schedule slippage are minimized
- Encourages the use of standard communications protocols

Disadvantages:

- Agencies cannot readily tailor software to their specific requirements
- Only a limited number of COTS currently exist
- This approach will not work for new applications
- It is difficult for an agency to assume ownership of compute source code

2.6 BUILD TO BUDGET

This approach is different from Design/Build in that functional requirements are used in place of a detailed design. Proposers, then, develop designs based on their best solutions to meeting the functional requirements identified, using existing elements where practical. This approach has been used frequently in toll projects.

Advantages:

- Similar to design/build
- Allows maximum flexibility to proposers to use their most cost-efficient designs
- Reduces the risk based on previous developments and applications
- May allow added functionality for a given budget

Disadvantages:

- Similar to design/build
- Very unusual practice for public agencies
- Increased risk because of a lack of detailed designs
- Detailed design documents may prove contentious and delay the project
- This is a very expensive approach for proposers

2.7 BUILD-OWN-OPERATE-TRANSFER AND FRANCHISE/LEASE

This approach involves long-term contracts with a consortium to finance, design, build, operate and collect revenue. From the system implementation phase, it is equivalent to either the design/build or build to budget alternatives. The differences occur during the system operations and maintenance phases. These alternatives are typically considered because they do not involve an up-front capital cost for the owner.

The most recent example of this approach is Kentucky DOT's use of a "Tax Exempt Master Lease" to finance the construction and operation of an ITS project in Louisville. The contractor receives construction funds (and later operational funds) through a private leasing arrangement. Once the system is operational, the DOT makes periodic payments to the leaseholder. Because private investors are assuming much of the risk, the return is considered tax-free.

Advantages:

- Contractor financing reduces the up-front capital requirements of agency
- O&M the responsibility of the contractor
- Allows maximum flexibility to proposers to use their most cost-efficient designs
- Reduces the risk by tying payment to delivery of service (i.e., system operations)

Disadvantages:

- Similar to design/build
- Very unusual practice for public agencies
- Requires long-term (10-15 year) commitment to assure contractor's return on investment
- This is a very expensive approach for proposers

2.8 DESIGN TO COST AND SCHEDULE

Under this approach, the public agency develops a prioritized list of requirements. The contractor then supplies all of the mandatory items and as many of the optional items as is feasible under the given cost and schedule constraints.

Advantages:

- This approach reduces scope creep
- It reduces cost and schedule risks

Disadvantages:

- Bidders, in an effort to win the job, may be unwilling to propose not meeting all the optional features
- Overly optimistic proposals, therefore, will win

2.9 SHARED RESOURCES

A shared resource project is any agreement between one or more public sector agencies and one or more private sector organizations with the objective of providing services using the combined resources of both -- often trading a grant of a right to a public resource for the addition of a private entity to achieve a service or facility of mutual benefit to both partners. Its most common form in the ITS context is a partnership for sharing highway rights-of-way in exchange for private telecommunications expertise and capacity to further both public sector and private sector objectives.

A shared resource project in this context has four specific features:

- Public-private partnering
- Private longitudinal access to public roadway right-of-way
- Installation of telecommunications hardware
- Compensation granted to the right-of-way owner over and above administrative costs

Advantages:

- Contractor financing reduces the up-front capital requirements of agency
- O&M the responsibility of the contractor
- Agency receives state of the art equipment, built to industry standards
- Potential revenue generator for agency for valuable right-of-way access

Disadvantages:

- Dependant on private market forces to create financial incentives
- Very unusual practice for public agencies
- Requires long-term (15-20 year) commitment to assure contractor's return on investment
- Agency requirements may not match those of private sector, resulting in few to no bidders or increased costs to agency

There are a number of examples of shared resource arrangements, discussed below:

Florida Fiber Net: FDOT and DMS are preparing to issue an RFP for a shared resource project to provide the state with a fiber optic network using approximately 2000 miles of limited access right of way throughout the state. In exchange for providing the fiber, the successful proposer will get use of the right-of-way for up to 99 years for the construction of a commercial fiber network. In addition to supporting ITS applications, the network also will be used as the principal backbone communications link for various traffic operations centers, data centers and administration buildings. DMS will also offer the opportunity for the successful proposer to provide it with a SONET-based, point to point backbone bandwidth for the state's SUNCOM network. The successful contractor also will be given the opportunity to compete for other communications contracts to provide other state services.

City of Leesburg, Florida: The City's Communications Utility and two private partners (Knight Enterprises and Alternative Communications Networks (ACN)) developed a fiber optics system to deliver telecommunications services in the city. In exchange for the city's grant of right-of-way access to the above ground utility poles and it's construction funding, ACN has designed and contracted the network and is leasing the capacity to public or private customers under a five-year contract with the city.

The city, in return, owns the dark fiber on its right-of-way. Customers own the fiber from the ROW line to their own facilities, pay ACN a fee for access to the city-owned backbone, and can either use their own equipment or pay ACN for the use of its equipment to light the fiber. A total of about 40 miles of fiber will be installed. Leesburg is receiving cash compensation based on lease payments in addition to the fiber capacity. After capital costs are repaid, the revenues will be split evenly between the city and its telecommunications partner.

Maryland: The state has allowed MCI access to 75 miles of ROW for 40 years, in which MCI may lay as many conduits as feasible and desired, and pull fiber as needed afterward. MCI is providing the state with 24 dark fibers for its use. MCI also will serve as the lead contractor for building and maintaining the system. Another partner, Teleport Communications Group (TCG), entered the agreement as a subcontractor to MCI. TCG is paying MCI to install and maintain fiber in privately held conduits. TCG is giving the state equipment needed to light the fibers, and additional fiber capacity for public sector use. Each party retains ownership of the fiber dedicated to its use. Maryland set up the project strictly as a procurement to purchase telecommunications capacity through ROW access.

Minnesota: Mn/DOT has issued a Communications Infrastructure Request for Proposal offering one time communications access to its freeway ROW in exchange for communications infrastructure, consisting of both fiber optics and wireless towers. In August, 1996, the state selected International Communications Systems (ICS) and Stone and Webster to install 96 fibers on the state's 1000 miles of freeway and on enough trunk highway mileage statewide to connect all of Mn/DOT's district offices and the Department of Administration's 13 Mnet HUB sites. Under the agreement, Mn/DOT will grant ICS and Stone and Webster the right to install the cable in the ROW. In return, the state will receive access to a 1500 mile high speed communications network at no cost. In addition, the private partners agreed to develop the network not only in the metropolitan areas, but also in the less populated areas of the state. The project has received opposition from two groups: long distance and other providers who object to the fact that only one provider will be using freeway ROW, and independent phone companies throughout the state who feel threatened by the competition likely to result from the partnership.

In addition, the state has filed a petition with the Federal Communications Commission for a ruling that the grant of exclusive longitudinal use of freeway rights-of-way do not violate Section 253(a) of the Telecommunications Act. Section 253(a) prohibits state and local governments from enforcing statutes, regulations or other requirements that prohibit or have the effect of prohibiting the ability to provide telecommunications service. Section 253(c) of the Act preserves the authority of state and local governments to manage public ROW and to require fair and reasonable compensation from telecommunications providers on a competitively neutral and nondiscriminatory basis for use of public ROW. Mn/DOT is arguing that the partnership is consistent with section 253(c) of the Telecommunications Act.

Missouri: Missouri selected Digital Teleport Inc. (DTI) to install 1300 miles of fiber optic cable to create a statewide communications backbone system. In return for allowing access to the ROW, Missouri received six lighted fibers for state highway use and DTI's maintenance services for the system. The arrangement provides the state with two strong advantages. First, there is limited competition from ROW alternatives, such as railroads, in the areas of greatest interest to bidders (particularly the St. Louis metropolitan area). Second, it grants exclusivity to one telecommunications firm, although that firm can lease access to other telecommunications firms on its lines and is, in fact, doing so.

Missouri also structured the deal strictly as a procurement, purchasing telecommunications capacity through highway ROW, and DTI's access to the ROW is considered a procurement contract awarded to a single contractor, in a competitive process, rather than a special privilege.

2.10 STATE CONTRACT

Purchases of goods and services that are ongoing and are common to several state agencies generally are consolidated under standard specifications and are developed into state contracts or joint institutional purchases. Under the state contract approach, the state issues a Request for Bids for various (and usually indefinite quantities of) commodities and services. Vendors then provide prices for those products and services based on the terms and conditions of the RFB. The vendor providing the lowest bid is selected. The prices are good for some specified period of time. State agencies can then order the products and services they need from a list of providers. While this approach allows agencies to plan for and procure goods and services more easily (prices are known and fixed, ordering process is relatively quick and easy, etc.), it is not well-suited to complex procurement, such as ITS systems and equipment. This approach has both advantages and disadvantages.

Advantages:

- Latest technology can be procured through State contract
- Eliminates submittal review process when equipment in known to the Department
- State is in complete control over the schedule of equipment and software delivery
- State contracts directly with equipment and software suppliers, giving State greater leverage to insure products supplied are as promoted
- State can quickly procure alternate products when equipment or technology becomes obsolete or unavailable
- State contract equipment has already been product tested and approved
- Allows State to contract and deal directly with suppliers on all testing, giving State more power over suppliers meeting product schedules and adhering to test requirements
- Time required to negotiate and process supplemental agreements due to vendor equipment reduced or eliminated
- State is able to take greater responsibility and control over the success and outcome of the project
- Cost to operate equipment is reduced when the State procures equipment with known, quantifiable operating requirements

Disadvantages:

- Potential for delays getting new products approved and bid to new State contract list
- Contractors' ability to provide innovative approaches restricted or eliminated
- Introduces fourth party (vendors) as a major player in deciding on what and how system functions will be delivered
- Greatly increases Department involvement and liability in system procurement and acceptance
- Transfers some of the responsibility for ultimate system operation from Systems Manager and contractor to the State

3. METHODS OF AWARD

In addition to considering the type of contract vehicle most appropriate to a particular ITS project, the public agency must also consider which method of awarding the contract is most appropriate to ensure adequate competition for the award. A variety of options are described below.

3.1 SEALED BIDS

This approach is perhaps the most common method of award for both Federal and state contracting. This approach requires that contracts be awarded only on a lowest cost, responsible and responsive bidder basis. This approach tends to maximize the number of private firms competing against each other solely on the basis of price, and gives the procuring agency the "best buy."

The sealed bid process is easy to defend in protests because of its objectivity. However, sealed bidding works best when the agency can develop a complete, adequate, and realistic set of specifications, there are two or more responsible bidders willing to compete, the procurement lends itself to a firm, fixed price contract, and the selection itself can be made on price.

In the ITS context, however, sealed bidding presents some significant disadvantages. Detailed specifications may not be available for emerging technology, sealed bidding inhibits innovation, it precludes the public sector from considering anything but price in its selection, and it limits opportunities for the public and private sector to engage in meaningful dialogue to find the most appropriate solution to the agency's needs.

To mitigate some of these disadvantages, many public agencies have adopted pre-qualification procedures to ensure that low bidders have the requisite skills and competencies to successfully execute the work. This is particularly important in the ITS environment.

Lifecycle contracting is another approach agencies have employed to ensure that they receive both low cost and good value in their procurements. Lifecycle contracting is a competitive procurement process that results in the selection of the bid with the lowest lifecycle costs or that increases the weight given to lifecycle cost considerations.

3.2 2-STEP BID PROCESS

This approach allows the procuring agency to gain the advantages of a sealed bid approach when it lacks adequate specifications for a project. The process starts with a solicitation from the public agency that sets forth its technical needs and requirements. Proposers make technical proposals based on the solicitation, without discussing price. Those firms submitting technically acceptable proposals in step one would be invited to submit sealed fixed price bids based on their proposals.

3.3 COMPETITIVE PROPOSALS

This approach uses Requests for Proposals (RFPs) and Requests for Qualifications (RFQs) to select contractors when price and other considerations must be weighed. In general, the more design and professional services that are bundled into a solicitation, the more appropriate the use of competitive proposals. This approach is usually employed when there is more than one source capable of providing the services. While there is some subjectivity involved in selecting a contractor under this method, the process is sufficiently objective to allow for courts to review decisions, if a proposer issues a protest. Competitive proposals encourage innovation, but if the solicitation is too loosely defined, proposers may submit bids that the public agency does not consider to be responsive. The process also does not allow for bidders to clarify their bids in such circumstances. This approach may also invite political problems if the low bid contractor is not selected.

3.4 COMPETITIVE NEGOTIATIONS

Competitive Negotiation uses an RFP/RFQ process to identify one or more firm with which to conduct negotiations. This allows the agency to negotiate different contract terms than those used as the basis for the bid. Among the criteria to be considered in determining whether competitive negotiations are appropriate are whether there are significant variations in how the services to be procured can be provided, whether attributes other than price are to be considered, and whether there is a need for bidders to revise their work plans after the initial evaluation of the proposals.

3.5 SOLE SOURCE

Sole source contracting is allowed in only very limited circumstances. This approach involves the selection of a contractor for negotiations based on the firm's reputation or its prior relationship with the owner. It should be used only when the supplies or services to be procured are available from only one source.

3.6 UNSOLICITED PROPOSALS

Unsolicited proposals allow public agencies to obtain innovative or unique methods for meeting agency needs. Contracts can generally only be awarded when the unsolicited proposal does not resemble a pending competitive acquisition

4. LAWS/REGULATIONS GOVERNING FEDERAL PROCUREMENT

ITS deployment occurs largely in the realm of state and local agencies. But Federal law considerations play a role in determining what types of contracting vehicles and award methods can be used. This section describes some of the most significant Federal legal requirements to be considered in procurement.

4.1 FEDERAL LAW CONSIDERATIONS

Common Rule

Under the Common Rule, if a public agency is receiving Federal-aid funds, it is required to use the established state or local procurement procedures, but must also ensure that the contracts issued include relevant clauses required by Federal statute, executive order or regulation.

Title 23 Requirements

Title 23 states that highway construction contracts must use bidding methods that are effective in securing competition. In other words, competitive bidding methods are required, unless the state demonstrates that another method is more cost effective or an emergency requires the use of an alternative method.

The definition of construction includes traffic control systems. Currently, there is little guidance as to whether Title 23 requirements apply to specific ITS projects. But in general, if a contract involves installation, then it is considered construction and competitive bidding applies.

Other sections of Title 23 require that contracts for engineering, architectural, and design services must be awarded in the same manner as architecture and engineering services procured under the qualifications-based selection process prescribed in the Brooks Act (or some equivalent qualifications based requirement). Thus, since construction (or installation) projects require the use of competitive low bid methods for procurement, and architectural/ engineer/ design services require a qualifications-based selection process, a number of ITS projects could result in the need for two separate contracts (one for the engineering services and one for the installation services) and two separate contractors.

SEP-14 Innovative Contracting Methods

Within the context of the Common Rule and Title 23, FHWA has been promoting the evaluation of innovative contracting methods known as Special Experimental Project number 14 (SEP-14) for ITS projects. For eligible projects, SEP-14 allows the use of innovative contracting methods, such as design-build, for procurement of construction related items. ITS projects that receive federal aid funds and that have any elements that may be classified as construction items are required to follow the SEP-14 process if using the design-build contracting method. The SEP-14 process requires prior approval of the concept before proceeding with design-build contract.

There are no required selection criteria for design-build projects under the SEP-14 process, however it is the policy of FHWA that cost must be one of the factors. Other factors usually included in award criteria include quality and construction time considerations. The SEP-14 process has been used in North Carolina to award a design-build contract for construction of the Congestion Avoidance and Reduction for Automobiles and Trucks (CARAT) project near Charlotte. Utah DOT used "best value" award criteria for a design-build procurement for reconstruction of I-15 through Salt Lake City, including an area-wide ATMS, in time for the 2002 Winter Olympics.

The exemption allows the state or political subdivision to effectively and efficiently administer a government program and the administration of the program is significantly impaired without the exemption.

5. PROCUREMENT ALTERNATIVES & RECOMMENDATIONS

While there is still much confusion and consternation relative to ITS procurement, one thing is certain -- there are steps agencies can take to improve the acquisition of the hardware, software and services required. It also is true that there are no silver bullets, no magic solutions. A procurement process which worked successfully for one type of ITS procurement may not be appropriate for another one. This section discusses some general guidelines ODOT should employ in preparing for ITS procurements and provides some recommendations for which contracting vehicles should be considered for specific procurements. It concludes with a few additional recommendations for ODOT to consider in easing current procurement processes.

5.1 STEPS TO SUCCESSFUL ITS PROCUREMENT

There are six basic steps to be considered in preparing to purchase ITS. While these generally apply to system and software acquisitions, many of these steps can and should be applied to acquiring consultant services, as well. Each step is discussed briefly below:

Step 1 -- Build a Team

As many transportation professionals, long accustomed to traditional highway contracting procedures, have discovered, procuring ITS is different. It requires the involvement of a myriad of disciplines and specialties, some of which may be outside the Department of Transportation. The team may serve a number of functions: developing the plan and requirements for the procurement, evaluating the proposals, and ensuring that the goods or services procured are meeting the needs identified in the plan. The team can also serve to cement existing interagency relationships or build new relationships which will be critical not only to procuring the ITS system, but also to deploying and maintaining it.

Who should be on the team? Several people, including:

- Software technical expertise
- End users
- Maintainer and administrators of the system
- Domain experts
- Contracting and purchasing officials
- Software, information systems, and intellectual property legal expertise
- "Translators" who can explain technical jargon, concepts, etc across disciplines.

Step 2 -- Plan the Project

Good procurements are ones that are well-planned. Project plans need not be long and detailed, but should concisely present the goals and objectives of the project and highlight high-level strategic decisions about the procurement. The project plan will help to define the boundaries of the project, identify who needs to be on the project team, and provide a communications tool for all those involved in the project procurement. Importantly, the plan helps to explain "why" the project is being pursued - justifying the purchase and ensuring the procurement is focused on meeting these needs. Some things to include in the plan:

- Description of the project
- Rationale for the project
- Project Schedule
- Roles and responsibilities of team members
- Funding estimates and sources
- Facilities
- How the system will be acquired (the build or buy decision) (note: early in the project, this section may be in the form of alternatives)
- How the project fits in with other "legacy" or planned ITS systems
- Standards
- Risk Management
- Contracting Strategy (the extent to which consultants and outside support will be used for the project)
- Contracting Vehicles
- Contract Management
- System Operation and Use (who will use the system, who will administer and manage the system, etc.)
- Acceptance Strategy (how will the system, once acquired, be accepted?)
- Training Plans (how will users be trained in using the system?)
- Maintenance Plans (who will be responsible for maintaining the system?)
- Reality Check (what constraints and conditions must be considered in relation to the procurement?)

A key thing to remember is that the plan should be a living document and be a tool to guide the procurement. It should not become an overwhelming task that inhibits, rather than facilitates

the procurement. Items within the document are likely to (and should) change as the project evolves and team members contribute their various perspectives to the project. In addition, externalities affecting the project (budget, schedule, etc.) may force a reevaluation of certain parts of the plan.

Step 3 -- Develop Requirements (Software and Systems Projects)

A good set of requirements is perhaps one of the most important things you can do in a software or systems acquisition. This is where your project team can play an invaluable role. Requirements should be well documented in a configuration control document. The requirements should focus on the functional and performance requirements the system must meet. It should not get into design and technical requirements. Doing so confuses the issue and unnecessarily limits the options available to the agency.

It is important to thoroughly review and revise the requirements. Do not ask for too much. Unnecessary or superfluous requirements can greatly increase cost and complexity, without adding much in the way of functionality. Also consider quality factors in the requirements analysis. Ensure that the system will be able to accommodate anticipated changes.

Step 4 -- Make the "Build or Buy" Decision

Over the last several years, a variety of software and system applications and field devices have been developed and enhanced. Many of these existing systems and devices provide extensive functionality and can be integrated with other existing systems. Too often, however, public agencies have failed to consider "off-the-shelf" products for their systems. It is when systems are customized that bugs and costs explode. Off-the-shelf products can provide agencies with cost-effective systems that are well integrated and meet most, if not all, of their requirements. One approach to determining whether to build or buy a system is to develop a matrix for evaluating off the shelf products. An example is shown below in Table 1.

Table 1. Example Table for Evaluating and Comparing Product Features

	Product 1	Product 2	Product 3
Mandatory Requirements			
Requirement A			
Requirement B			
Requirement C			
Other Criteria			
Security			
Data Rights			
Life Cycle Costs			

Using the matrix, weed out products that do not meet your mandatory criteria. It is important to ensure that your mandatory requirements are, in fact, that. Carefully evaluate the remaining products, either through hands on use, or through a rigorous demonstration under conditions as close to yours as possible. Contact the vendor's other customers to determine the product's quality and reliability, the extent and quality of the vendor's support for the product, maintenance issues, etc. If you chose to use off-the-shelf products, be sure the contract includes provisions to accommodate changes in requirements, functionality, costs, etc. Also be sure that you get a flexible licensing agreement for the system. If you choose to customize off-the-shelf products, recognize that there are intellectual property rights issues to be considered, as the "commercialized" portions of your system will be subject to certain restrictions.

Step 5 -- Select a Contracting Vehicle

The next step in the procurement process is to select an appropriate contracting vehicle. This paper has presented a number of contracting types and issues to consider for each type. In addition, the Table 2 provides more guidance on how to select the right contracting vehicle for specific procurements.

In addition to the details presented in Table 2, the following are other general observations about procurement methods:

- There is no "one-size-fits-all" for ITS procurements. Contracting vehicles appropriate for some simple field devices will not likely be appropriate for other more complex acquisitions.
- The engineer/contractor approach is not appropriate for software.
- Consider the full range of options before selecting one. Selecting a contracting vehicle because it is familiar may seem easy and convenient initially, but it is likely that the approach's deficiencies for the procurement will become readily apparent, causing significant problems, creating delay and increasing the costs associated with the procurement.
- The requirements definition stage for system and software applications is critical and will play a key role in determining which contracting vehicle is most appropriate.

Table 3 presents a summary of the types of procurement that are appropriate for each type of ITS project or product. These recommendations are based on past experience, in other states.

Step 6 -- Understand Intellectual Property and Other Contractual Terms and Conditions

Traditional infrastructure design and construction does not present issues relating to rights in intellectual property. Software and system design can and do. It is important that these issues and other contractual terms and conditions (warranties, royalties, etc.) be fully understood by the project team when embarking on an ITS procurement. The active involvement of legal

experts in these areas is critical to ensure the maximum response from the private sector and to fully protect the interests of the public agency.

Table 2. Contracting Approaches[1]

Contract Approach	Description of Alternative	Advantages	Disadvantages	Example Applications
Engineer/ Contractor	Engineer is selected using a conventional consultant procurement process that is based on qualifications and experience to perform the work. The engineer typically prepares the contract documents are invited to submit bids in requirements of the contract documents. Once the bid has been awarded, the contractor builds the project per bid documents The engineer may inspect construction and interpret bid documents. The agency is the responsible entity.	Long history of use Well-defined roles Legal precedent for handling disputes End product well-defined at early stage Contractor manages subcontractors Well-suited to highway construction	Artificial dividing line between design and construction Not well-suited to software development work (difficult to specify, buyer may not know needs) Software/systems integration not usually performed by prime contractor Contractor has financial incentive to find deficiencies in bid documents and "changed" site conditions to seek change orders Limits communications between customer and software developer when software is developed by a subcontractor	Several agencies surveyed have used this approach, including: Colorado, the Gary-Chicago-Milwaukee Corridor, Houston, I-95 Corridor, Maryland, Missouri, Virginia, Washington and Wisconsin. Most have used for furnishing and installing field devices One ITS software contractor found itself third tier down on a construction contract, effectively shut off from all contact with the customer. Result was very bad software experience for all involved, because of the lack of communication and interaction with the client.

---

[1] Sources: Salwin, *The Road to Successful ITS Software Acquisition* and Tarnoff, *Procurement of Professional Services in a High Tech Era*

Contract Approach	Description of Alternative	Advantages	Disadvantages	Example Applications
Systems Manager	The systems manager is selected using conventional consultant procurement process (i.e., qualifications-based followed by competitive negotiation). The systems manager is responsible for design (plans and specifications), software development, hardware procurement, integration, training, and overall quality control. Equipment and electrical contracting services procured on low bid basis. System managers are often used for technology-based projects.	• Overall system design, software development, system integration, and testing controlled by a single entity. • Software developer is usually prime contractor • Minimizes shifting of fault • More flexibility to allow changes than in traditional approach • Well-suited to ITS projects • Avoids use of low-bid selection • Gives customer access to systems manager	• Fewer firms in marketplace with requisite blend of skills • Somewhat unfamiliar to local engineers/procurement officials • Heavy reliance on successful performance of system manager • End product less well-defined than engineer/contractor approach; difficult to manage "expectancies." • Low bid services (equipment and electrical contracting) responsibility of public agency; may include inspection and acceptance	• Used by both the Houston and I-95 Corridors in furnishing and installing field devices and software, ITS operations and ITS maintenance. • Dade County, Florida is using this approach for a signal system upgrade. Proposers were requested to propose based on capabilities of existing system and improvements identified at functional level. Allowed proposers to use base package.
System Integrator	Same as system manager, except the system integrator can bid on equipment and electrical contracting services.	• Single point of responsibility • Simplified contracting	• Not well-known by agencies • Direct bidding to system integrator may violate agency procurement process	• Used by Colorado, GCM corridor, Maryland, Missouri and Washington for furnishing and installing software. • Used by GCM, Missouri, Virginia and Wisconsin for ITS Operations.

Contract Approach	Description of Alternative	Advantages	Disadvantages	Example Applications
Design/ Build	The agency must commission the concept plans. The concept plan is normally 15 to 30 percent complete at the design level before the contractor is selected. this approach relies on a single entity to be responsible for the design and construction of a project. The agency's role is to monitor the design/build work. The design/build approach is frequently used for federal procurements involving structures. Partnering is generally involved.	• Full transfer of responsibility to design/build team • Eliminates imperfect transfer of design knowledge from designer to contractor • Rapid completion possible; significant time-savings • Streamlined procurement possible • Engineer and construction work done cooperatively with a single entity to resolve problems. • Financial incentive to rapidly complete work • May include warranty of operations management	• Agency assumes greater responsibility for inspection and approval process • May be indistinguishable from engineer/contractor approach when plans developed by engineer and design/build • May increase costs because of contractor risk and high proposal costs (design not complete) • May violate statutes (17 states) • Significant agency commitment to quality control	• Detroit used this approach for a freeway management system upgrade. Primary objective of the procurement was to provide field infrastructure, but did include TMC remodeling, new central control hardware, and operating software enhancements.
Design to Cost and Schedule	A prioritized requirements list is generated. The contractor supplies all the mandatory items and as many of the optional items within cost and schedule constraints.	• Reduces requirements creep • Reduces costs and schedule risks	• Bidders may be unwilling to propose not meeting all the optional features • Overly optimistic proposals will win	• Utah used this approach for their initial I-15 freeway management system procurement. Limited response led to selection of design/build approach for ultimate system

Contract Approach	Description of Alternative	Advantages	Disadvantages	Example Applications
Build to Budget	Different from design/build in that functional requirements used in place of detailed design. Proposers develop designs based on their best solution to meeting functional requirements using existing elements where practical..	• Similar to design build • Allows maximum flexibility to propospers to use their most cost-efficient designs • Reduced risk based on previous developments and applications • May allow added functionality for given budget	• Similar to design/build • Very unusual practice for agencies • Risk based on lack of detailed designs • Detailed design document may prove contentious point and delay project • Very expensive for proposers	• Sometimes used by commercial builders. • For transportation projects, this approach has been used mostly in toll projects and major bridges.
Shared Resource	Any agreement between one or more public sector agencies and one or more private sector organizations with the objective of providing services using the combined resources of both -- often trading a grant of a right to a public resource for the addition of a private entity to achieve a service or facility of mutual benefit to both partners. sector objectives.	• Allows public agency to obtain goods/services with little or no up-front costs	• Complex and numerous legal issues (some of which are in limbo, including interpretation of key provisions of Telecommunications Act) • Somewhat limited application	• Several state and local agencies have used this approach to provide a telecommunications backbone, including Maryland, Ohio Turnpike, Missouri, Bay Area Rapid Transit, City of Leesburg.

Contract Approach	Description of Alternative	Advantages	Disadvantages	Example Applications
State Contract	Purchases of goods and services that are ongoing and are common to several state agencies consolidated under standard specifications and developed into state contracts or joint institutional purchases.	• Quick and easy method of procuring standard equipment and supplies • All state agencies buy the same type of equipment • Standard equipment may ease maintenance and operation • Easier planning and budgeting	• Constrains system to only those products on the state contract, thereby limiting flexibility in system design • Long term contracts limit ability to buy latest versions	• Caltrans pioneered this method for traffic signal controllers and VMS • Utah currently using state contract prices for major components on the I-15 Salt Lake City ATMS. This is good approach for purchase of COTS software.
Build, Own, Operate, Transfer (BOOT) **Franchise or Lease**	Long-term contracts with a firm or consortium to finance, design, build, operate and collect revenue. Equivalent to design/build or the build-to-budget for implementation, but requires seller financing and adds the own-operate phase. These alternatives are typically considered because they do not involve an up-front capital cost for the owner.	• Similar to design build • Bidders provide financing, reducing up-front capital costs for the agency. • Allows maximum flexibility to prospers to use their most cost-efficient designs • Reduced risk of operations and maintenance costs, since this is bidder's responsibility.	• New approach - often requires statutory authority • Reduces agency control over project • Finance requirement may limit competition • Interest costs ultimately add to total for the project	• Dulles Greenway Toll Road Extension, No. Virginia (BOOT) • Calif. SR 91 HOV / Toll Lanes (Franchise/Lease)

Table 3. Recommended Procurement Method by Type of System and/or Product

Work Type	Contract Type						
	Engineer/ Contractor "Low-Bid"	System Manager	System Integrator	Design-Build	BOOT	Shared Resources	State Contract
Traffic Signal Installation	X						X
Time-Based Signal System	X						X
Closed Loop Signal System	X			X			X
Traffic Adaptive / Hybrid Signal System		X	X	X	X		
Ramp Metering System	X	X		X			
Communications System			X	X	X	X	
Dynamic Message Signs		X	X	X	X		
Highway Advisory Radio	X			X			X
Motorist Aid System (Call Boxes, etc.)	X						X
CCTV Monitoring System			X	X		X	
Electronic Toll Collection System		X	X	X	X		
Multi-modal Systems (transit, ridesharing, etc.)		X	X	X			
ISP (website, travel planning center, etc.)	X	X		X	X	X	

Note: For complex ITS projects, such as an integrated system combining communications, field equipment and software development, the project may be broken up into multiple procurements, with each using the method most appropriate to the items being specified.

5.2 STATEWIDE CONSIDERATIONS

This paper is intended to provide an overview of ITS procurement alternatives and issues as they relate to Oklahoma. Time and budget constraints do not allow for a significant and in-depth analysis of this very complex issue. In addition to the comments and recommendations above, Oklahoma DOT should consider the following:

Present hypothetical scenarios to the Attorney General to obtain clearer guidance on issues related to Public Records Laws and ITS procurements. While there are some AGOs available on the application of the public records law and agency rights in agency-produced software, copyrighted software, and trade secrets, there is little in these opinions which illuminates the issues presented by ITS procurements. There are presumably instances in which procurements have not gone forward, or private firms have been reluctant to bid on projects because of the Public Records Law. These scenarios should be presented to the Attorney General to clarify the law's application to these instances.

Develop clear guidelines on the Public Records Law and its application to ITS procurement. Once these AGOs are obtained, the ODOT should develop clear and concise guidelines on how Public Records Laws are applied and how proposers can effectively comply with its mandates.

Consider developing new contracting vehicles for ITS procurements. There has been interest and some effort in some states to develop new contracting vehicles for ITS procurement (or to adopt existing procurement methods from other state agencies to buy ITS). In Virginia, after frustrations with the low-bid contracting approach, DOT officials used a procurement category called "non-professional services" to obtain ATMS software. Originally the state had included software development as a part of a freeway construction project. The construction portion of the project was completed late, leaving very little money left for software development. VDOT terminated the contract and is now procuring the software through an "administrative services" RFP, giving the state greater flexibility in selecting an appropriate vendor. It has developed its requirements and scope of work and has adopted a design and process approach. Under the first phase of the project, a detailed design of the software will be developed and "frozen." The software will be built and additional features and functionality will be added later, as necessary. Other states have toyed with the idea of creating new contracting approaches, building on past procurement successes, and incorporating lessons learned from past failures. Oklahoma should consider (perhaps in conjunction with other states and/or with the Federal government) developing these new vehicle.