APPLICATION FOR PARTICIPATION IN THE
FY01 ITS INTEGRATION COMPONENT
of the
ITS DEPLOYMENT PROGRAM

Project Identification Number and Name:
Traffic Signal Systems Integration and Deployment

Project Location: Moscow, Idaho

FY01 Congressionally Designated Funding Amount: $694,413

Submitted by
(Agency): University of Idaho
(Date): 20 September 2001

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EXECUTIVE SUMMARY

The City of Moscow, Idaho, is one of a number of small rural towns in the state that has a growing transportation problem. Based on the recently-completed statewide ITS plan, this proposal describes a project that will provide significant benefits to travelers in the city by reducing delay experienced along the city's main arterials. The project will provide a more efficient and manageable signal control system for the Idaho Transportation Department by providing real time information on the status of the system components. The project will test the use of NTCIP standards, the development of a project and regional ITS architecture, and the use of the Spec Wizard in a small-town setting.

The following objectives will guide this project:

- Provide a test for the implementation of NTCIP standards in a small-town traffic control system.
- Develop and implement a plan to improve traffic flow and safety in the City of Moscow by upgrading and integrating the city's traffic signal control system.
- Develop and apply a protocol for the design, implementation, and testing of traffic signal timing plans using real-time hardware-in-the-loop simulation.

The project will be conducted jointly by the Idaho Transportation Department, the City of Moscow, and the University of Idaho.

The project will integrate traffic control system elements using NTCIP standards. A project architecture will be developed using the Turbo Architecture tool.

Congressionally-designated funds of $694,413 are available for the project. Local matching funds of $418,277 will be provided, exceeding the 20 percent requirement. Other matching funds of $446,769 will also be provided. Total matching funds account for 55 percent of the total project costs of $1,559,459.

The project is scheduled to start on September 1, 2001. The project will conclude on February 28, 2004.

PROJECT PROPOSAL

TECHNICAL APPROACH

1. Background

Overview

The state of Idaho, located in the inland Pacific Northwest, is home to 1.2 million people spread over 86,000 square miles of farmland, wilderness, and several small to medium sized urban areas. The quality of life available in Idaho has attracted over 220,000 new residents during the past decade.

While providing the engine for significant economic development, this growth has stretched the capacity of the state's transportation system to function effectively. Traffic volumes on Idaho's major highways have increased by over 50 percent since 1990 while passenger car registration has grown by over 38 percent. In response to this growth, the Idaho Transportation Department (ITD), in cooperation with local governmental agencies, has developed an aggressive program to maintain its roadway infrastructure, ensure that its bridges are safe, and effectively manage the growing effects of congestion.

The City of Moscow lies in the Palouse region of north Idaho, eight miles to the east of Pullman, Washington and 90 miles to the south of Coeur d'Alene, Idaho. See Figure 1. Home to the University of Idaho and a growing number of high technology industries, Moscow has a population of nearly 20,000 people. Two major highways serve the city. U.S. 95, Idaho's major north-south route, carries between 15,000 and 23,000 vehicles a day along various segments through the city. State Highway 8, a major east-west route connects Moscow with Pullman on the west and the towns of Troy and Deary on the east. The highway carries between 11,000 and 24,000 vehicles per day along various segments in the city. Pullman, Washington, eight miles to the west of Moscow, has a population of 24,000 including 16,000 students at Washington State University. While 14,000 trips per day are made between the two cities on a typical weekday, volumes on State Highway 8/270 increases significantly during the special events that are common at both universities.

The City of Moscow is relatively compact with short distances between its signalized intersections. Downtown signal spacing is 300 feet. This close spacing increases the need for good coordination but reduces the cost of the communications network needed to connect the signal controllers.

Figure 1. Palouse region

Need For Proposed Project

Moscow is one of a number of small rural towns in Idaho that has a growing transportation problem. While two recent highway projects have significantly improved traffic flow in Moscow, important capacity and safety problems remain. Traffic congestion occurs regularly in the downtown area during peak periods and along routes serving the University of Idaho. There are several railroad intersections that cause traffic delays several times a week. Events at both universities generate significant traffic volumes that stretch the capability of the existing traffic control system. Traffic signal controller technology deployed in the city is outdated and is not capable of implementing advanced traffic control strategies that might more effectively reduce or manage congestion. Communications between some of the traffic controllers is inefficient or does not exist.

ITD has recognized that there is a wide range of transportation problems that must be addressed throughout the state, particularly in the state's small rural towns. A statewide planning effort was initiated in 1998 to provide ITS awareness and education, evaluate the potential of advanced technologies to help address transportation related needs, and to develop a statewide ITS master plan. The plan[1], and the process through which it was developed, has achieved the following goals:

[1] Meyer, Mohaddes Associates, *State of Idaho Intelligent Transportation Systems Strategic Plan*, December 2000.

- Establishment of an active ITS committee, with representation from both the southern and northern parts of the state.
- Enhanced ITS awareness among transportation agencies statewide.
- Development of statewide and regional ITS architectures which form the basis for future system design activities.
- Identification of ITS strategies within 12 separate categories to address the stated needs.
- Identification of 162 individual projects and provision of the information necessary to begin programming these ITS projects into Idaho's transportation plans.
- Establishment of specific recommendations to facilitate Idaho ITS implementation.

The statewide plan recognizes that, while important new traffic technologies are being applied to larger urban areas, there has been little effort to date to apply these technologies to improving traffic problems in Idaho's smaller towns. Further, there has historically been little technical expertise available in these small towns to provide basic traffic signal-timing analysis and operational improvements. Yet, traffic congestion and safety remain important problems in these areas.

The statewide ITS plan identified traffic signal control systems and highway-railroad intersections as two of the most important ITS categories applicable to Idaho's rural towns. The plan suggested the following strategies for consideration in future projects:

- Signal coordination
- Signal systems interconnection
- Actuation
- Signal hardware improvements
- Improved detection components
- Enhanced rail crossing integration
- Staff training and development

The statewide plan recommended a high priority project for short-term implementation to address traffic flow problems in the city of Moscow. Designated as project D2S2, Moscow Traffic Signal System Technology Development and Deployment, this project would

> . . . *develop traffic signal controller technology that will be applied to improve traffic signal operations in the City of Moscow. The technology will assist Idaho Transportation Department traffic engineers in reducing congestion along the Highway 8 and U.S. 95 corridors by optimizing signal timing plans and testing coordinated/actuated signal control timing plans using hardware-in-the-loop simulation before they are implemented in the field. The technology will also be implemented in other parts of District 2 and subsequently in other parts of the state.*[2]

[2] Meyer, Mohaddes Associates, *State of Idaho Intelligent Transportation Systems Strategic Plan*, December 2000, page 4-18.

The purpose of this project is to improve traffic flow and safety in the city. This project will deploy new traffic controllers and detection devices along the city's state highway system, integrate the operation of the controllers and detection devices, and develop new signal timing strategies. It will test the operation of the new controllers using NTCIP standard protocols and timing plans before they are implemented in the field using hardware-in-the-loop simulation. The project will evaluate the operation of the system once it is deployed.

Project Benefits

This project will provide significant benefits to the travelers in the city of Moscow by reducing delays experienced along signalized arterials of State Highway 8 and U.S. 95 and improving the safety at the city's railroad highway grade crossings. The project will provide a more efficient and manageable signal control system for ITD by providing real time information on the status of the system components. Modern malfunction management monitors will be used to archive faults and provide mechanisms for remotely diagnosing intersection malfunctions, prior to dispatching maintenance personnel. This remote diagnostic capability is important since ITD district maintenance staff is based 30 miles south of Moscow. It will also provide archived traffic flow data from loop and video detectors at the signalized intersections that can be used for medium and long term planning efforts. Through the lessons learned in the application of real-time hardware-in-the-loop simulation, traffic engineers and planners throughout the nation will be able to more effectively plan and deploy new traffic signal timing plans using the latest traffic control technologies. Finally, the project will test the use of NTCIP standards, the development of a project and regional ITS architecture, and the use of the Spec Wizard in a small-town setting.

2. Project Description

Overview of Project Activities

The two major highways that serve the City of Moscow are two to four lane arterials controlled at regular intervals by traffic signals. Thirteen of the signalized intersections are on the state highway system. The remaining two signalized intersections are on city streets and are operated and maintained by the City of Moscow with assistance from ITD.

Table 1 lists the signal controllers that are now in operation in the city. The table identifies the controller make and model, the system type, communications linkages, the type of controller operation, the detection devices, the cycle length, and the type of pre-empt, if any. Most of the controllers are older technology (e.g., TCT LMD 8000 series or the even older LC 8000 series) and are not capable of implementing state-of-the-practice traffic control strategies. While the seven intersections in the downtown area are interconnected, communications expansion is limited because the interconnect is provided via low bandwidth copper. The three intersections on the western portion of

State Highway 8 are interconnected by fiber optic cable. The two systems are not tied together. The remaining intersections operate in isolation with local vehicle actuation, but no coordination with the remainder of the system. Figure 2 shows the core area signal system in the City of Moscow showing ten of the city's fifteen signalized intersections.

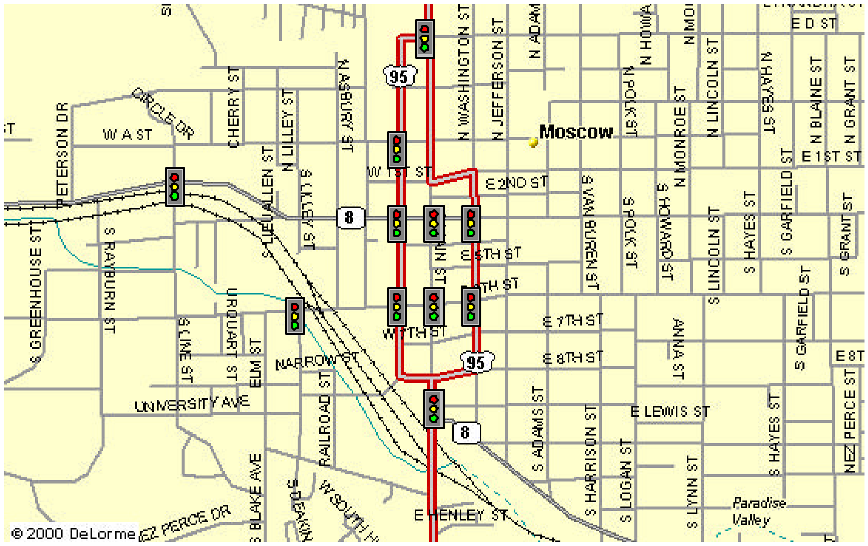

Figure 2. City of Moscow core area signal system

The following objectives will guide this project:

- Provide a test for the implementation of NTCIP standards in a small-town traffic control system.
- Develop and implement a plan to improve traffic flow and safety in the City of Moscow by upgrading and integrating the city's traffic signal control system.
- Develop and apply a protocol for the design, implementation, and testing of traffic signal timing plans using real-time hardware-in-the-loop simulation.

This project will deploy new traffic controller cabinets at ten of the intersections in the city that now use outdated cabinets and will upgrade the controllers and conflict monitors in the other cabinets. Coordination will be provided by a master controller system using emerging ITS standards for on-street masters. All signal timing plans and controller operations will be tested in the National Institute for Advanced Transportation Technology's (NIATT) Traffic Controller Laboratory using hardware-in-the-loop simulation and NIATT's newly developed controller interface device (CID).

	Intersection Cross Streets		Owner[1]	Controller		System Type[2]	Comm to Master[3]	Master Controller			Comm to Control	Actuation[4]	Detection[5]	Cycle Length (sec)	Pre-empt
	N-S	E-W		Make	Model			Make	Model	Location					
1	Warbonnet	3rd (SH 8)	S	TCT	LMD 8000	Int		TCT	MDM 100	Line St	FO	Full	L	105	
2	Farm	3rd (SH 8)	S	TCT	LMD 8000	Int		TCT	MDM 100	Line St	FO	Full	V	105	Railroad
3	Line	3rd (SH 8)	S	TCT	LMD 8000	Int	Dialup	TCT	MDM 100	Line St	FO	Full	L	105	Railroad
4	Jackson (US 95)	3rd (SH 8)	S	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA		70	
5	Main (US 95)	3rd (SH 8)	S	TCT	LC 8000	Int	Dialup	TCT	LM 100	Main/3rd	TP	NA		70	
6	Washington (US 95)	3rd (SH 8)	S	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA		70	
7	Jackson (US 95)	A	S	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA		70	
8	Deakin	6th	C	TCT	LC 8000							Full	L		
9	Jackson (US 95)	6th	S	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA		70	Railroad
10	Main	6th	C	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA			
11	Washington (US 95)	6th	S	TCT	LC 8000	Int			LM 100	Main/3rd	TP	NA			
12	Washington (US 95)	Troy Hwy (SH 8)	S	Peek	LMD 8000							Full	L	70	Railroad
13	Main (US 95)	D	S	TCT	LMD 8000	TBC						Full	L		
14	Blaine	Troy Hwy (SH 8)	S	TCT	LMD 8000							Full	L		
15	Main (US 95)	Sweet	S	Peek	LMD 8000	TBC						Full	V		Railroad

Table 1. City of Moscow signal controller inventory

(1) Owner: S = state; C = city.
(2) System type: TBC = time based coordination; Int = interconnected; SA = stand alone
(3) Communication to master controller: DLL = dedicated leased line; DIALUP = dial-up connection over existing phone lines; TP = twisted pair; FO = fibre optic; SS = spread sprectrum; MW = microwave
(4) Actuation: F = full (all lanes on all legs have detection); S = semi-actuated; NA = not actuated.
(5) Detection: L = loops cut into pavement; V = video detection; C = combination of L and V

Work Scope

Fourteen work tasks will be conducted to achieve the project objectives:

- Establish project management and technical oversight teams
- Review and document relevant ITS standards
- Prepare concept of operations report
- Prepare and document integration strategy
- Conduct system inventory
- Develop project architecture using Turbo Architecture tool
- Develop specifications for traffic controllers and other support equipment using the Spec Wizard tool
- Develop, test, and analyze signal timing plans and control strategies using hardware-in-the-loop simulation techniques
- Develop training materials and application guides for ITD traffic engineers for implementing new signal timings and control strategies using hardware-in-the-loop simulation techniques
- Deploy standards-based traffic signal controller system
- Install and test signal timings in the field
- Assess and evaluate system performance
- Collect and archive traffic flow data
- Complete system evaluation and report

Task 1. Establish project management and technical oversight teams

A project management team consisting of personnel from the City of Moscow, ITD, and NIATT will be responsible for management and oversight of all project tasks. The project team will be responsible for developing and managing all cooperative agreements needed for this project. The management team members are listed in Table 2.

Organization	Management Team Members
City of Moscow	Gary Reidner
Idaho Transportation Department	Dave Couch
University of Idaho (NIATT)	Michael Kyte

Table 2. Project management team members

A project technical team will be responsible for conducting all project work tasks. The project technical team will consist of personnel from the City of Moscow, ITD, NIATT, FHWA, and Purdue University. Members of the project technical team are listed in Table 3. The technical team will consider the operation of the city's existing controllers, the deficiencies of these controllers, the timing problems that currently exist in the operation of the controllers, and the resulting traffic flow and safety problems. The technical team will identify and specify the new controller equipment that is needed to improve traffic flow on the State Highway 8 and 95 corridors. The technical team will also develop the signal timing plans, develop the testing methodology for these new timing plans, conduct and review the laboratory tests, field deploy the new timing plans, and evaluate and assess the operational performance of the new timing plans. One of the key issues to be considered by the technical team is the method of integrating real-time hardware-in-the-loop simulation methods into signal timing, testing, and planning.

Organization	Technical Team Members
City of Moscow	City Engineer (to be determined)
Idaho Transportation Department	Dave Couch Terry McAdams Dale Moore
University of Idaho (NIATT)	Michael Kyte Ahmed Abdel-Rahim Michael Dixon
Federal Highway Administration	Paul Olson
Purdue University	Darcy Bullock

Table 3. Project technical team members

Task 2. Review and document relevant ITS standards

The project team will review ITS standards (NTCIP and others) that are relevant to this project and to determine which standards will be used during the design, integration, and deployment activities to be conducted later in the project. The project team will prepare a technical memorandum summarizing the findings of this task. Table 4 lists candidate standards that will be considered for use in this project.

Task 3. Prepare concept of operations report

The project team will prepare a concept of operations report. The purpose of this report is to provide documentation on how the intended system will be operated. The report will define project stakeholders, optimization objectives, and protocols for developing timing plans, procedures for submitting those plans to ITD for review, implementation of the timing plans, and for verification that the timing plans are implemented as proposed. It will serve as a guidance document to assess how well the system is operated after construction. It will also serve as documentation of operational agreements between agencies.

Task 4. Prepare and document integration strategy

The project team will prepare an integration strategy describing how all systems and components will be integrated. This document will focus on applicable ITS standards, the topology of the fiber optic interconnect, and various roadside equipment that must be integrated into a functioning traffic control system.

Task 5. Conduct system inventory

The project team will conduct a complete inventory of the operation and performance of the existing city signal system. The inventory will be used to provide the information necessary to evaluate the system needs as well as provide a baseline for an evaluation of the effectiveness of the project. The following data will be collected:

- Traffic volume profiles for each key roadway segment.
- Travel time profiles for each segment along the U.S. 95 and Highway 8 corridors.
- Average delay data at selected key intersections.

The inventory will include a review of existing signal timings for each signalized intersection and an identification of existing deficiencies at the railroad grade crossings. The inventory will also include an operational analysis of all signalized intersections using current traffic flow and control data and an assessment of the operations of each of the traffic controllers and cabinets now installed in the field. In addition, the project team will prepare a model network that can be used as input for one or more standard traffic analysis models. The project team will prepare a technical memorandum summarizing the results of this inventory.

Based on the inventory and analysis, cabinet size and load bay size requirements will be documented for each intersection. Intersections where existing cabinet facilities are appropriate for current and near future needs will only have the controller, conflict monitor, and telemetry programmed for upgrading. Other intersections will have new cabinets programmed.

Task 6. Develop project architecture using Turbo Architecture tool

The project team will develop the project architecture using the Turbo Architecture tool. The project architecture will be based on the regional architecture developed as part of the ITS statewide plan. The project team will prepare a technical memorandum describing the completed architecture. This technical memorandum will include the following elements:

- Control strategies and their application
- Field devices to be considered and deployed
- Data to be collected and how it will be used
- A communications plan
- Stakeholders
- Agencies involved in system operation
- Relationship of proposed system to the regional architecture

Task 7. Develop specifications for traffic controllers and other support equipment using the Spec Wizard tool

The project team will review the current traffic controller specification now used by ITD and, based on this review, recommend a specification for the traffic controllers to be used in the project. Other needed support equipment required for field deployment and integration will be identified and specified. The Spec Wizard tool will be used as part of this task to assist in the review and modification of the ITD standard controller specification and defining requisite NTCIP objects. The resulting specification will also serve as a model for other organizations in Idaho that want to implement an NTCIP-based system using the ITD standard specification.

Task 8. Develop, test, and analyze signal-timing plans and control strategies using hardware-in-the-loop simulation techniques

The project team will develop, test, and analyze signal-timing plans. Standard intersection drawings will be prepared that include detector locations, signal phasing, a numbering scheme for detectors, and a number scheme for phases. The team will analyze the existing available traffic controllers meeting ITD signal controller specifications, specify the set of new traffic controllers to be deployed, develop alternative signal timing strategies, and use the CID to test and modify timing plans. NIATT's Traffic Controller Laboratory will be used for this task using a complete replication of the field signal controller system. The project team will develop supporting software to automate controller-testing procedures. The project team will consider design protocols for the development of traffic responsive systems for small cities with particular consideration given to the problems identified in the city of Moscow. The project team will consider how to improve the safety and efficiency of preemption procedures used at Moscow's at grade railroad crossings.

Task 9. Develop training materials and application guides for ITD traffic engineers for implementing new signal timings and control strategies using hardware-in-the-loop simulation techniques

The project team will develop training materials and conduct training for engineers and technicians who will be using and deploying traffic controllers. The training material will be based on those developed through NIATT's Traffic Signal Summer Camps. This material will be sufficiently general so that it can be used for training and evaluation of traffic control systems provided by other vendors. It is anticipated that other vendors will be interested in applying their traffic control equipment to the same hardware-in-the-loop simulation techniques developed for this project.

Task 10. Deploy standards-based traffic signal controller system

The project team will specify, procure, test, and deploy new traffic controllers and other supporting equipment. Normal ITD bid procedures will be used to acquire this equipment. This task will include acceptance testing of new controllers using the CID. Since new standards will likely be used, the hardware-in-the-loop testing with the CID will provide a very rigorous testing environment to ensure that the standards provide good operational performance, prior to deploying them in the field.

The drawings developed in task 8 will serve as the base maps for the closed loop monitoring software. These drawings will be linked to the dynamic display features of the closed loop system. Prior to deployment, this closed loop monitoring software will also be tested using the CIDs.

Task 11. Install and test signal timings in the field

The project team will install and test new signal timings in the field. Once the timings have been installed, the project team will review the operation of each intersection within the system to insure the equipment and timings are operating as planned. The signal timings will be refined as needed in the field for each timing plan and control strategy.

Task 12. Assess and evaluate system performance

The project team will assess and evaluate the signal timings that have been implemented in the field. The team will assess how well the forecasts made using the hardware-in-the-loop simulation compare with actual field performance and the benefits achieved by the project. The system performance will be evaluated using the following data:

- Identification of malfunctioning loop detectors
- Comparison between turning movements used in the hardware-in-the-loop simulation and detector counts obtained from intersection detectors
- Before and after travel times through each corridor
- Average delay at selected key intersections within the corridor
- Queue spillback at key intersections during peak period operation

Task 13. Collect and archive traffic flow data

The project team will collect traffic flow data generated by the detector devices at each of Moscow's fifteen signalized intersection. The team will develop and document methods for automatically archiving this data for future planning use and for evaluating system performance.

Task 14. Complete system evaluation and report

The project team will conduct an evaluation of the project and prepare a report describing the results of the evaluation. The report will include the following elements:

- The performance of the traffic control elements deployed as part of this project.
- The performance of the integrated traffic control elements deployed as part of this project.
- The performance of the communications systems.
- The performance of the testing protocol based on the CID.
- A self-assessment by all project team members, including documentation and assessment of lessons learned during the project.

An external peer panel will be assembled to review the evaluation process and findings.

3. Rural Projects

The following ITS infrastructure components (market packages) will be deployed and integrated during this project:

- Archived Data (AD)
  - ITS data warehouse (AD2)
- Advanced Traffic Management Systems (ATMS)
  - Surface street control (ATMS 3)
  - Standard railroad grade crossings (ATMS 13)

4. Infrastructure Components to be Integrated

A. Traffic Signal Control
   i. Idaho Transportation Department
   ii. City of Moscow
B. Highway-Rail Intersection Control
   i. Idaho Transportation Department
   ii. Palouse and Coalee City Railroad

- Traffic Signal Control systems (A) will be integrated with other Traffic Signal Control Systems (A)
- Traffic Signal Control systems (A) will be integrated with Highway/Rail Intersection Control (B)

5. Integration Approach

The regional architecture developed as part of the statewide ITS plan will be the basis for the integration activities undertaken during this project. As part of Task 6 of this project, a project architecture will be developed. This project architecture will guide the deployment and integration activities of this project.

A major goal of this project is to integrate the various traffic control systems now in operation in the City of Moscow to improve the flow of traffic and safety within the city. This project will also develop the means by which data gathered by the loop detectors and traffic controllers can be archived for use in future planning activities. In addition, the integration of the traffic controllers and the rail/highway grade crossing operations will be reviewed and assessed.

The project will consider the integration of the university special event managers, public safety organizations, and ITD so that the additional traffic generated during special events can be more effectively managed using the new traffic control system.

While the traffic controllers that will be affected by this project all reside in one community (the city of Moscow), significant coordination will be required between all project team members, including ITD, the city, and the university. This coordination will be ensured through the project management team, in which each team member will be actively involved. Much of the integration that will be achieved through this project is a technical integration of the various traffic control elements that currently operate independently.

6. Architecture

This project agrees to follow the Architecture approach included in Section 3.2 of the Guidance. This project meets the criteria indicated with an "X" below:

___ A. A regional ITS architecture exists or is being developed.
In the discussion section below, the project proposal identifies the region, the organization (with contact) responsible for developing or maintaining the regional ITS architecture, the parts of the regional ITS architecture that will be reflected in the project design and implementation, and any updates to the regional ITS architecture that are necessary to reflect the specifics of the proposed project.

_X_ B. A regional ITS architecture does not exist (and is not currently under development) and the project is to receive more than $300K in funding (after takedowns) from this program in FY01.
In the discussion section below, the project description explicitly states that (1) a project level ITS architecture will be developed, using a systems engineering analysis, and the project will be designed in accordance with the project level ITS architecture and (2) the development of a regional ITS architecture will be initiated, using a systems engineering analysis, within a year of obligation of funds. Also in the discussion section, the project description identifies the region to be included in the regional ITS architecture, the agencies/systems to be included in the project level ITS architecture, the agencies to be (initially) included in the regional ITS architecture, and the funding source(s) and schedule for both the project level and regional ITS architecture development.

___ C. A regional ITS architecture does not exist (and is not currently under development) and the project is to receive less than $300K in funding (after takedowns) from this program in FY01.
In the discussion section below, the project description explicitly states that a project level ITS architecture will be developed, using a systems

engineering analysis, and the project will be designed in accordance with the project level ITS architecture. Also in the discussion section below, the project description identifies the agencies/systems to be included in the project level ITS architecture, as well as the funding source(s) and schedule for this development.

Discussion

The statewide ITS plan includes both a statewide architecture and a regional architecture, each reviewed and approved by the statewide ITS committee. The statewide architecture is comprised of the regional architectures, the statewide communications networks, and other elements managed by ITD headquarters. The regional architecture includes regional communications networks, city communications networks, and regional wireless communications networks. These elements are all connected to the statewide communications network. The scenario approved by the statewide ITS committee includes two primary data management elements:

- Data management activities occur at the local level so that the primary stakeholders manage data and information of significance only to local users.
- Data pertinent to the entire state is pushed to the state system where stakeholders with a statewide perspective manage that data and information.

The Turbo Architecture tool will be used to develop both a regional architecture and a project architecture. The regional architecture developed as part of the statewide ITS planning effort will be used as the starting point for this work. The region to be included in this work will be the City of Moscow. The agencies to be included in the development of the architecture include the City of Moscow, ITD, and the University of Idaho.

The following market packages will be considered:

- Archived Data (AD)
    - ITS data warehouse (AD2)
- Advanced Traffic Management Systems (ATMS)
    - Surface street control (ATMS 3)
    - Standard railroad grade crossings (ATMS 13)

7. ITS Standards and Standards Testing

This project agrees to follow the ITS Standards and Standards Testing approach included in Section 3.3 of this Guidance.

This project agrees to cooperate with the analysis of the project as a potential test site for the US DOT sponsored ITS Standards Testing Program.

This project agrees to serve as an ITS standards testing site if selected to participate in the testing program.

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In the discussion section below, the project proposal identifies the ITS Standards that will be considered in the project design; if an applicable listed standard will not be considered, the project provides justification as to why the standard will not be considered; and describes the process that will be used to ensure that the considered standards will be incorporated in the project design.

Discussion

Table 4 lists ITS standards will be considered for inclusion in this project.

Number	NTCIP/ITS Standard
1103	NTCIP - Transportation Management Protocol
2001	NTCIP - Class B Profile
8003	NTCIP - Framework and Classification of Profiles
8004	NTCIP - Structure and Identification of Management Information
1201	NTCIP - Global Object Definitions
1202	NTCIP - Object Definitions for Actuated Traffic Signal Controller Units
1206	NTCIP - Data Collection & Monitoring Devices
1209	NTCIP - Transportation System Sensor Objects
1210	NTCIP - Objects for Field Management Stations
1211	NTCIP - Objects for Signal Control Priority
2501	NTCIP - Information Profile for DATEX
1302	NTCIP - Message Set for DATEX-ASN Management
1101	NTCIP - Simple Transportation Management Framework (STMF)
2301	NTCIP - Application Profile for Simple Transportation Management Framework
2302	NTCIP - Application Profile for Trivial File Transfer Protocol
2303	NTCIP - Application Profile for File Transfer Protocol (FTP)
2304	NTCIP - Applications Profile for Data Exchange ASN.1 (DATEX)
2305	NTCIP - Applications Profile for Common Object Request Broker Architecture
2201	NTCIP - TP-Transportation Transport Profile
2202	NTCIP - Internet (TCP/IP and UDP/IP) Transport Profile
2101	NTCIP - Point to Multi-Point Protocol Using RS-232 Subnetwork Profile
2102	NTCIP - Subnet Profile for PMPP over FSK modems
2103	NTCIP - Subnet Profile for PPP over RS 232 (Dial-up)
2104	NTCIP - Subnet Profile for Ethernet
	IEEE Incident Management
	Traffic Management Data Dictionary

Table 4. Potential NTCIP/ITS standards for project

Evaluation of Benefits

This project agrees to participate in Evaluation of Benefits as described under Section 3.4 of the Guidance.

If this project is selected for independent evaluations, the project will cooperate with the independent evaluators and participate in evaluation planning and progress review meetings to ensure a mutually acceptable, successful implementation of the independent evaluation.

This project agrees to collect, document, and annually report cost accounting data.

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This project agrees to perform a local evaluation funded from Project resources and submit a Local Evaluation Report documenting the lessons learned in meeting project goals and objectives. The Local Evaluation Report will address the following issues identified with an "X" (identify at least two):

__X__ Evaluate the institutional issues associated with achieving cooperation among public sector agencies, and document how they were overcome.
__X__ Provide a brief lessons learned report on the technical and institutional issues encountered in integrating ITS components.
____ Provide an evaluation report on the lessons learned in employing innovative financing or procurement and/or public-private partnering techniques.
__X__ Produce a lessons learned report on the experiences, challenges and approaches used in achieving consistency with the National ITS Architecture and/or implementation of ITS standards.
____ Produce a case study on the planning process used to achieve integration into an approved plan and program developed under an area-wide (statewide and/or metropolitan) planning process which also complies with applicable state air quality implementation plans.
____ Provide the appropriate metropolitan planning process with data generated by ITS technologies and services, and provide a report on plans or intentions for archiving the data and using it.

In the discussion section below, the project proposal identifies the steps that will be taken to meet the evaluation requirements.

Discussion

The project team will conduct a thorough evaluation of the project. This evaluation will be based on the project objectives that have been established and will consider the following elements:

- The performance of the traffic control elements deployed as part of this project.
- The performance of the integrated traffic control elements deployed as part of this project.
- The performance of the testing protocol based on the CID.
- A self-assessment by all project team members, including documentation and assessment of lessons learned during the project.
- An external peer review conducted by a peer review panel.

SCHEDULE

8. Start Date: September 1, 2001.

9. Expected Completion Date: February 29, 2004.

10. Milestones and Expected Completion Dates

Table 5 lists the key project milestones and the expected completion date for each milestone.

Milestone	Expected completion date
Establish project management and technical oversight teams (task 1)	Month 1
Review and document relevant ITS standards (task 2)	Month 3
Prepare concept of operations report (task 3)	Month 4
Prepare and document integration strategy (task 4)	Month 5
Conduct system inventory (task 5)	Month 8
Develop project architecture using Turbo Architecture tool (task 6)	Month 8
Develop specifications for traffic controllers and other support equipment using the Spec Wizard tool (task 7)	Month 10
Develop, test, and analyze signal timing plans and control strategies using hardware-in-the-loop simulation techniques (task 8)	Month 18
Develop training materials and application guides for ITD traffic engineers for implementing new signal timings and control strategies using hardware-in-the-loop simulation techniques (task 9)	Month 18
Deploy standards-based traffic signal controller system (task 10)	Month 24
Install and test signal timings in the field (task 11)	Month 26
Assess and evaluate system performance (task 12)	Month 28
Collect and archive traffic flow data (task 13)	Month 28
Complete system evaluation and report (task 14)	Month 30

Table 5. Milestones and completion dates

FINANCIAL PLAN

11. Non-Federally Derived Funding Sources

Congressionally Designated Amount: $694,413

Amount Used for Integration Activities: $469,413

Amount Used for Rural Infrastructure Deployment: $225,000

20% Minimum Match Amount: $277,765

Actual Match Amount: $418,277

A minimum 20% of the total cost of the project must be from non-Federally derived funding sources, as statutorily required, and must consist of either cash, substantial equipment or facilities contributions that are wholly utilized as an integral part of the project, or personnel services dedicated full-time to the proposed integrated deployment for a substantial period, as long as such personnel are not otherwise supported with Federal funds.

Identify Non-Federal Funding Source	**Identify Type of Funds** (cash, equipment or facilities, or full-time personnel services)	**Identify Major: (1) Integration Activities or (2) Rural Infrastructure Deployment Supported with These Funds**	**Specify Amount of Funding** ($)
University of Idaho(1)	Cash	Integration activities	$37,412
University of Idaho(2)	Waived indirect costs	Integration activities	$165,553
University of Idaho(3)	Personnel	Integration activities	$80,313
Northwest Signal Supply(3)	Equipment	Integration activities	$45,000
McCain Traffic Supply(4)	Equipment	Integration activities	$90,000

Notes:

(1) The University of Idaho has committed $37,412 for salary for staff who will be assigned to this project.

(2) The University of Idaho's federally-audited indirect cost rate for projects starting in FY02 or later is 48 percent. For projects under contract to ITD, the indirect cost rate is 20 percent. The difference between the two rates, 28 percent, or $165,553 for this project, is the cost waived by the University of Idaho. The university commonly uses these waived costs as local match on a variety of federal transportation projects.

(3) Michael Kyte, project manager, will spend 25 percent of his time providing project management and technical support for this project. This time commitment is fully documented and auditable through the University of Idaho accounting system. This amount includes 28.5 percent in fringe benefit costs.

(4) Northwest Signal Supply, a supplier of traffic control hardware and software products based in Lake Oswego, Oregon, has committed $45,000 in traffic control equipment and software to this project.

(5) McCain Traffic Supply, a supplier of traffic control hardware and software products based in Vista, California, has committed $90,000 in traffic control equipment and software to this project.

12. Other Funding Sources

Remaining 30% Match Amount: $446,769

A minimum of 30% of the total cost of the Project may come from a variety of funding sources and may include the value of Federally supported projects directly associated with the proposed integration project.

Identify Funding Source	**Identify Type of Funds** (cash, equipment or facilities, or personnel services)	**Identify Major: (1) Integration Activities, (2) Rural Infrastructure Deployment, or (3) Infrastructure Deployment Supporting Integration Supported with These Funds**	**Specify Amount of Funding** ($)
University Transportation Centers Program	Cash	Integration activities	$151,935
Idaho Transportation Department funds	Cash	Integration activities	$294,834

PARTICIPATING AGENCIES AND ORGANIZATIONS

13. Project Participants and Roles and Responsibilities

Lead Agency	University of Idaho
Roles and Responsibilities	Project management Conduct technical activities
Contact	Michael Kyte, Director National Institute for Advanced Transportation Technology University of Idaho PO Box 440901 Moscow, ID 83844-0901 208-885-6002 (voice) 208-885-2877 (fax) mkyte@uidaho.edu

Agency Responsible for Long-term O&M	Idaho Transportation Department
Roles and Responsibilities	Conduct technical activities Deploy traffic control elements
Contact	Dave Couch Traffic Engineer, District 2 Idaho Transportation Department PO Box 837 Lewiston, ID 83501-0837 208-799-5090 (voice) 208-799-4301 (fax) dcouch@itd.state.id.us
Participating Agency	City of Moscow
Roles and Responsibilities	Participate in technical activities
Contact	To be determined
Participating Agency	Purdue University
Roles and	Conduct technical activities

Responsibilities	
Contact	Darcy Bullock Professor of Civil Engineering Purdue University West Lafayette, Indiana 765-494-2226 (voice) 765-496-1105 (fax) darcy@purdue.edu