Introduction

This proposal describes a Pooled Fund Study to implement the initial objectives of the High Plains Coalition. The Nebraska Department of Roads (NDOR) will serve as the lead state for the Pooled Fund Study. The Pooled Fund Study will initially be open to the states of Colorado, Kansas, Missouri, Utah, and Wyoming. Subsequently, other contiguous states will be able to join.

Background

The High Plains Coalition is an evolving initiative between the states of Nebraska, Wyoming, Colorado, Kansas, Missouri, and Utah to identify, research, and assess appropriate technological solutions that support data and information sharing between a group of predominantly rural states with a variety of different legacy systems and user needs. The Coalition will focus its research on finding technological solutions that will exchange information between appropriate agencies that affect travel along the I-70, I-80, I-76, I-25, and I-15 corridors. The High Plains Coalition differs from other multi-state initiatives in many ways:

- The Coalition comprises states that are extremely rural and characterized by travel over very long distances in remote and often challenging conditions;
- While some Coalition members have invested in sophisticated and expensive transportation management systems for their principal metropolitan areas, there is, in general, very few existing systems in these states that can be linked to support the information sharing needs of the Coalition;
- It is impracticable for large rural states with constrained resources to invest in major new systems development and implementation. Instead they must seek creative and innovative solutions that can be developed and deployed in a cost-effective manner;
- The Coalition members have a willingness and motivation to collaborate in all aspects of operational response, including an openness to sharing operational responsibilities that is uncommon in other multi-state initiatives.
- This system will not simply link DOT websites for the purpose of providing traveler information. Instead, this system will need the ability to exchange information system to system seamlessly for the benefit of field personnel in specific regions. In this way we will be able to accomplish corridor incident management across state lines.
- This system seeks to increase benefits and lower costs by maximizing resources state to state and providing users of these corridors with alternatives to unplanned delays which increase costs to both public and private users.
- This system will connect district to district across state lines rather than merely connect Traffic Management Center to Traffic Management Center, to provide a real time tool for field personnel.

The Coalition has established the following as a mission:

"The High Plains Coalition will support safe and efficient travel through a cooperative program of multi-state data sharing and dissemination of information to travelers."

This mission encompasses two key components of the Coalition's research program:

- The ability to gather and share information that will help agency personnel in one state make operational decisions based on the conditions and actions taking place in another state; and
- The ability to disseminate information about those conditions and actions to the appropriate users of the highway system and in a manner that is best suited to their needs.

Recently the participating states voted to move forward with the efforts of the Coalition. They have begun the process to gather and document information on existing and planned infrastructure, operational procedures, and dissemination techniques that could support the Coalition's goals and objectives. This information can support the selection of a suitable set of technical solutions. The purpose of this proposal is to accelerate the research and assessment of that solution through a Pooled Fund approach.

Approach

This Pooled Fund Study will undertake the research and assessment of a web-based system that will provide a simple method for participating states to rapidly share information relevant to the mission of the Coalition, and will also research the ways in which the multiple participating states can present applicable information in a format that suits the needs of various users of the region's highway system.

For example, the research and assessment activities must provide answers to the following needs:

- The system must allow state agency users to access up-to-date emergency contact information for each of the participating states;
- The system must allow state agency users to access detailed information in other participating states, such as data from RWIS stations or currently displayed DMS messages;
- The system must allow state agency users to obtain detailed information on road closures and restrictions, including information that would not be accessible to the public;
- The system must allow state agency users to exchange information and requests, such as a request to display a particular message on a DMS;
- The system must provide regional highway maps displaying all alerts and hazards for the benefit of various highway users. These maps must be developed to support the specific needs of the different users of the highway system, such as motor carriers or automobile drivers.

A program of research and assessment is needed because development of this system will be technically challenging. There are significantly different levels of infrastructure deployment and sophistication of systems across the five states. The legacy systems in these states have been developed at different times and using different data formats and standards. The five states also have widely different plans for the future in terms of the types and scale of systems that will be deployed.

Institutional and "human" challenges also exist that must be researched and resolved. Foremost, the resulting High Plains system must be an easy-to-use tool for agency personnel if it is to become widely accepted and kept up-to-date. There must also be a commitment to support the continuing operations and enhancement of the system if the early investment in development is to be justified. While public-private partnerships sound appealing, existing experience suggests that these will have only modest impact on the overall deployment and operations effort. However, each of these issues must be addressed by the Coalition members through research and evaluation of alternatives.

Task 1 – Research User Needs and Requirements

The first activity to be undertaken by the Coalition is to develop a well-documented concept of operations. This provides a point of departure from which the detailed needs and requirements of the proposed future system can be discussed in a meaningful and consistent manner with the stakeholders, and allows a specific research agenda to be established for the Coalition. Completion of the concept of operations is followed by a period of data gathering to identify all of the user requirements. This step involves discussions with all agencies, groups, and individuals that have an input into the functionality of the system. These users will be encouraged to describe the ultimate functionality of the system without regard to cost or schedule considerations, so that an overall research program can be created. The third step involves the identification of the system requirements necessary to support a large majority of the user requirements. A fourth step will identify the individual research and assessment tasks that will need to be performed to develop the identified system. These tasks may include:

- Research into the availability of and assessment of information sharing systems;
- Review and assessment of data sharing standards;
- Research into interfaces and data formats of legacy and proposed systems;
- Assessment of institutional barriers to real-time information sharing in a multi-state environment;
- Assessment of low-cost infrastructure availability and deployment for rural transportation districts;
- Research into the experience of state transportation agencies sharing operational responsibilities;
- Research into legal and liability implications of sharing operational responsibilities;
- Assessment of procurement alternatives for multi-state system development, operations, and maintenance;
- Benefit-cost analysis of a rural multi-state information sharing system.

Work has already been undertaken to understand the overall concept of a system for the High Plains Coalition and the requirements of the transportation agencies in the participating states. This information will provide a solid foundation from which to develop a concept of operations and a set of user requirements. However, this work will need to be expanded, particularly to add the needs of additional stakeholders. For example, the requirements of public safety and homeland security agencies will need to be explored. Similarly, the needs of users outside the public sector will be examined, including those of motor carriers, trucking associations, and the individual driver. The needs of these users, both public and private, are anticipated to expand the list of research agenda topics identified above.

The concept of operations also provides the opportunity to assess and recommend approaches to the following for the High Plains Coalition:

- Program management;
- Organizational structure;
- Development of interagency memoranda of understanding;
- Funding amounts and mechanisms (described further in this document); and
- Commercial participation and partnerships.

Task 2 – Conduct Research and Assessment Tasks and Perform High-Level Design

The first activity in this phase of the Coalition's work is to conduct the various research and assessment tasks that have been identified and agreed upon by the Coalition members in Task 1. The final research agenda will depend on the nature of the issues identified during the concept definition work and the gathering of all user needs and requirements. The results of the individual research and assessment tasks will then influence the approach taken by the Coalition in the further development of a technological solution.

The next step of the process is to analyze the research and assessment results in the context of the identified user and system requirements developed during the earlier steps and develop a systems architecture. This step will also identify those elements of the existing state legacy systems,

including software, computers, and communications, that will require modification or replacement. The list of requirements is prioritized and then balanced against the available budget for an operational assessment system. Those requirements that can be reasonably implemented with this system, given the cost and schedule constraints, will be identified as part of an implementation phasing plan. These requirements then become the technical baseline for the proposed High Plains system.

The development of the architecture for an operational assessment system is a critical component of this effort. The architecture will be compliant with the current requirements of 23 CFR 940.09 promulgated by the FHWA. This work will not replicate or supersede any existing regional architectures developed by the participating states. Instead, this work will ensure that there is a viable mechanism by which the many disparate systems and infrastructure in the five states can communicate based on the results of the earlier research and assessment tasks.

Task 3 – Perform Detailed Design of a System for Operational Assessment

With the full set of implementation requirements identified, the Coalition will proceed with the detailed design of a High Plains system that will be the subject of an operational assessment. The intent of this activity is not necessarily to deploy a fully-functioning system across the entire geographic area of the High Plains Coalition. However, it is critical to implement sufficient system capabilities and on a large enough scale to be able to validate that the issues identified during the individual research tasks have been addressed and that the system is able to perform its desired functions in the unique rural multi-state environment of the High Plains Coalition.

During this step, the specific elements of the designs for the operational assessment system are developed. Here, a number of key activities will be performed. These will include:

- Hardware design (for any required terminals, servers, routers, etc.);
- Software design to support data gathering, sharing, display, and archiving, and including development of the web-based environment;
- Interface design to existing systems, field devices, databases, etc.; and
- Development of procurement specifications to obtain necessary hardware and software.

Task 4 – Implementation of Operational Assessment System

Implementation of the proposed operational assessment system will include the development of an installation plan. This plan will address the deployment of the operational assessment system in each participating state, including the responsibilities of the personnel in each state to support the operational assessment. On completion of the installation plan, emphasis will then be placed on implementing software interfaces required to collect data and information from each of the states.

System implementation also includes the development of all user manuals and training materials. This will ensure that agency users are able to use the system effectively for their information gathering and sharing needs. Most importantly, documentation will be developed to support the operational assessment. This will also include all assessment plans, data collection sheets, data

collection procedures and protocols, reporting requirements, analysis tools and techniques, and expected assessment outcomes, including research objectives and hypotheses. At this stage of development, a Configuration Management plan will also be created. Configuration Management provides the mechanisms and processes by which changes that affect the system are monitored and controlled. This ensures that a change made to the operational assessment system in one state does not adversely affect the operation or use of the system in another.

Task 5 – Conduct Integration and Operational Assessment

This task provides for integration of the operational assessment system with existing legacy systems and current operational processes and procedures across the five state region and allows the system to become operational for the purpose of assessing its utility and functionality in a real operational environment. The system will undergo a variety of testing before starting the operational assessment that is designed to validate that the original user and system requirements have been satisfied. The purpose of this testing is to ensure that a correctly functioning system is available for the operational assessment, and that no shortcomings in the performance of the system will affect the results of the operational assessment. Testing will include:

- Subsystem testing;
- Integration testing; and
- System acceptance testing.

Once the system is integrated and tested it is ready for the operational assessment. The operational assessment itself will be conducted according to the plans and procedures developed in Task 4.

Certain follow-up actions may then be required as a result of the operational assessment. For example, system parameters may need to be adjusted and refined to ensure the most efficient operation. System elements will need to be monitored and maintained to retain reliability.

Task 6 – Data Analysis, Reporting, and Future Research Agenda

Data gathered during the operational assessment will be analyzed according to the plan developed in Task 4. The results of the operational assessment will be presented in a final report that will describe all the findings of the project and will draw conclusions on the utility and functionality of the High Plains system. The final report will also present recommendations for the future of the High Plains system, including the full scale deployment if the operational assessment found the system to be effective in meeting the Coalition's goals.

It is anticipated that additional areas of research and assessment will emerge as a result of the operational assessment. These will be documented and defined as part of an updated High Plains research agenda for consideration by the members.

Program Management and Funding

A Pooled Fund will be established for the research and operational assessment of this proposed system. The transportation agencies from the six identified states will be the initial members of the Pooled Fund Study and will provide the funding according to the following funding schedule:

Research into needs and implement operational assessment system:

Year 1	$100,000 per state
Year 2	$100,000 per state

Operational assessment and reporting:

Years 3-5	$50,000 per state per year