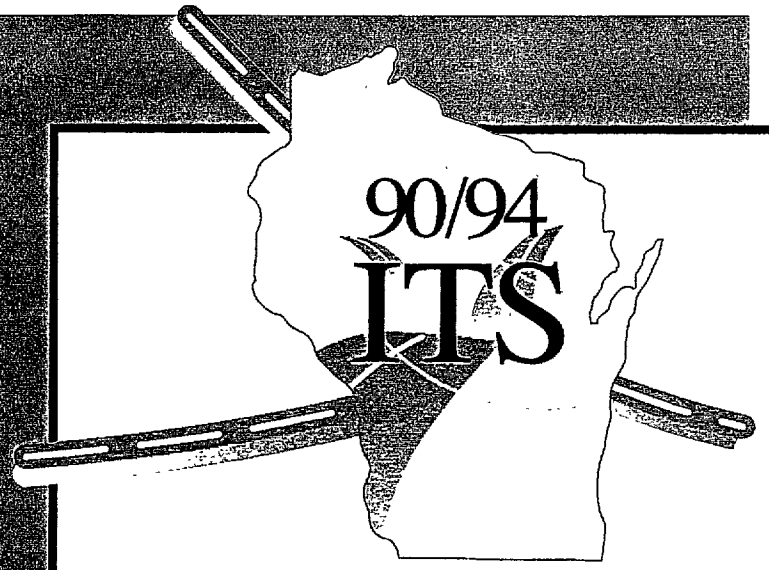
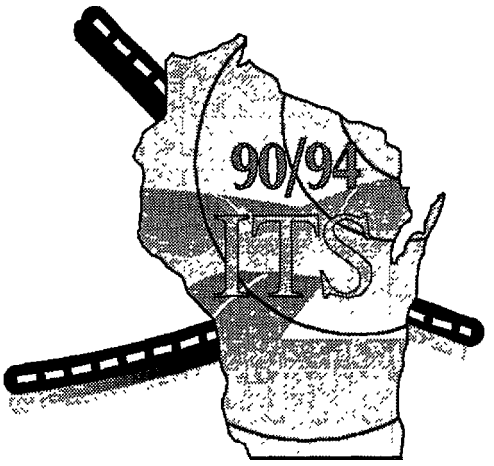


Intercity Corridor Study

Strategic Deployment Plan

December 1996



IH 90/94 Intercity Corridor Study
ITS Strategic Deployment Plan

Prepared By:

BRW, Inc.

In Association With:

JHK & Associates
KL Engineering, Inc.
JMS Communications

Prepared For:

Wisconsin Department of Transportation

December 1996

IH 90/94 Intercity Corridor Study ITS Strategic Deployment Plan Team

The IH 90/94 Intercity Corridor Study ITS Strategic Deployment Plan Team was led by the Wisconsin Department of Transportation and consisted of a Technical Team and a Consultant Team. The Technical Team set the strategic direction for and coordinated all the activities for the Corridor Study. The Consultant Team, under supervision of the Technical Team, prepared the Strategic Deployment Plan and all associated documents.

Technical Team Members

Marty Beekman, Chair
District 5 Wisconsin Department of Transportation

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State Patrol, Central Office
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Planning, District 6
Highway Division, District 2
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Division of Planning
Traffic - District 1
Division of Transit
Maintenance
District 5
ITS Program
Division of Motor Vehicles
Office of Transportation Safety
Office of Traffic

Other Federal and State Agencies

Wisconsin Division, FHWA
Tourism, State of Wisconsin
Wisconsin Department of Natural Resources

Local Government Representatives

Dane County Sheriff's Department
Dane County Emergency Government
Dane County Highway and Transportation Department
Jefferson County Highway Department
Eau Claire County Highway Department
St. Croix County Highway Department
Juneau County Sheriff's Department
City of Beloit Engineering Division

Universities and Associations

Civil Engineering, University of Wisconsin
Civil Engineering, Marquette University
Professional Firefighters Association

Consultant Team

BRW, Inc.
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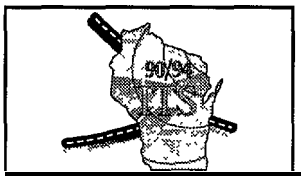

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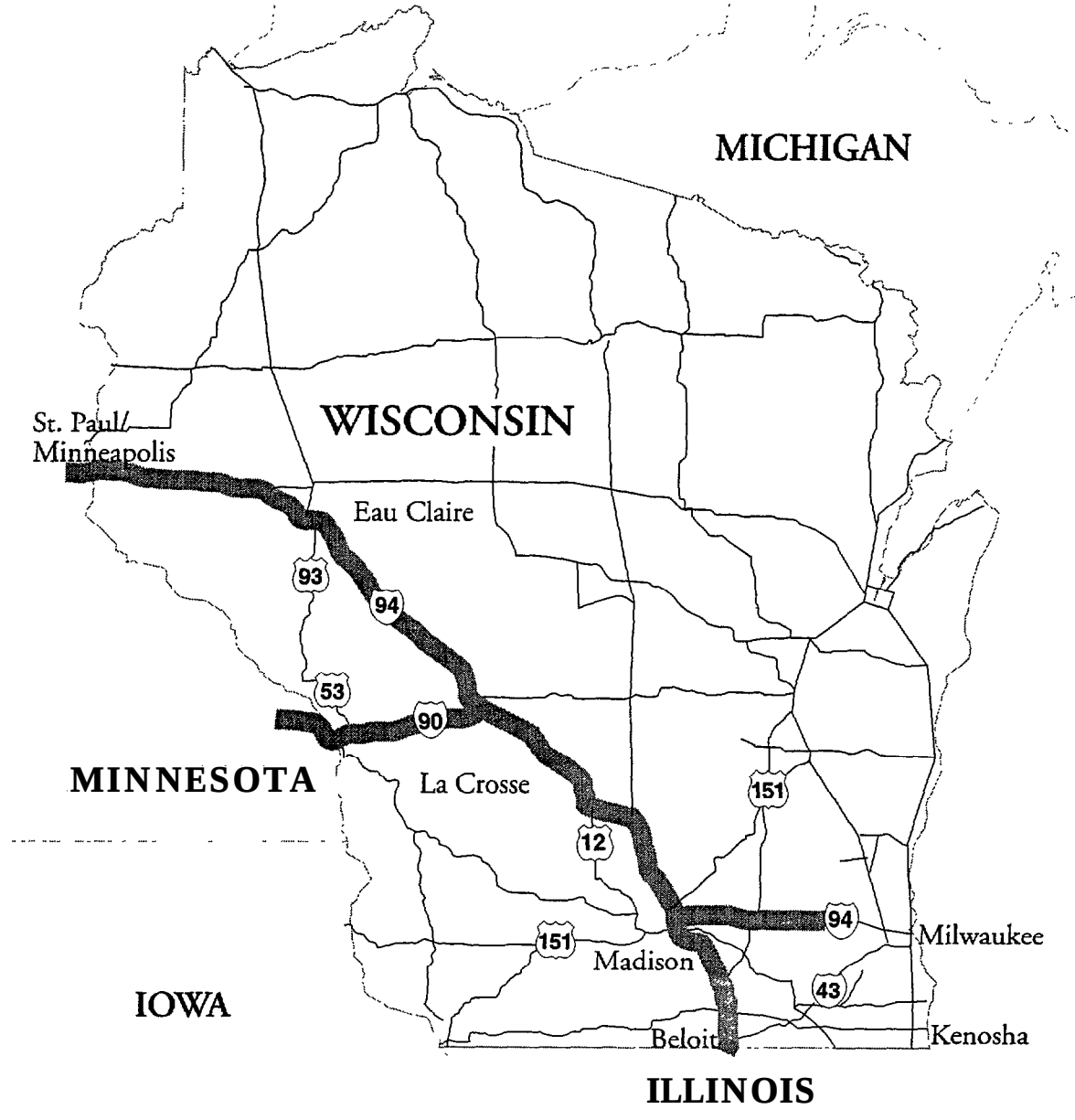
IH 90/94 EXECUTIVE SUMMARY

Overview

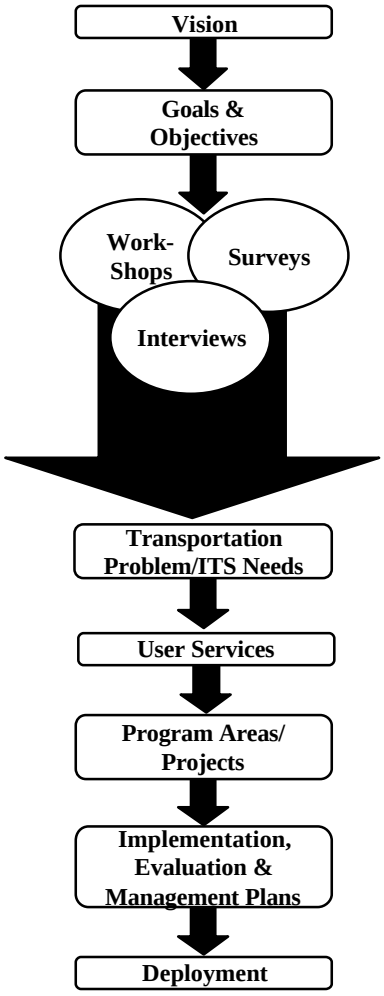
The IH 90/94 ITS Intercity Corridor Strategic Deployment Plan is an approach for implementing Intelligent Transportation Systems (ITS) in the IH 90/94 corridors that traverse the State of Wisconsin. Deployment of ITS in the IH 90/94 corridors is expected to improve the mobility, efficiency, productivity and safety of travelers within the IH 90/94 corridors. The plan includes specific projects along with estimated costs and staffing needs and encompasses a 20-year planning horizon with an emphasis on the first five years. The geographic area covered by the study is depicted below.



The plan was developed through a cooperative effort that included participation of stakeholders through written surveys, interviews, workshops, focus groups, and newsletters. A Technical Team was formed to guide the development of the plan and included representatives from the along with representatives from the Wisconsin Department of Transportation including personnel from the ITS program, Highway Districts, Traffic Transportation Safety, Transit State Patrol Motor Vehicle, Central Office, Planning and Maintenance.

Early in the planning process, the technical Team adopted a vision to guide the development of the plan. The vision for the IH 90/94 corridors is one of. *Enhanced transportation, mobility efficiency, productivity and safety within the corridors through the use of ITS technologies and systems. The vision begins with mutual cooperation between agencies within the IH 90/94 to plan and implement advanced ITS technologies. The vision in an integrated approach to solving transportation problems and seeks to improve the use of existing infrastructure and the choices of users and operators. The vision approaches problem that can be effectively addressed with the resources available within the corridors.*

The plan was developed through a systematic planning process that identified primary causes of transportation problems and user needs, then prioritized ITS user services for the IH 90/94 corridors. Nineteen (19) projects sorted into six program areas have been developed to provide the identified ITS user services. The plan identifies estimated funding and staffing needs, a structure to manage deployment of ITS in the IH 90/94 corridors along with performance criteria and a framework for evaluation. The process followed for developing the strategic deployment plan is presented below



IH 90/94 Program Areas

There are six (6) program areas that contain nineteen (19) ITS projects for the IH 90/94 corridors. Projects within each program area are inter-related and address a common set of objectives. The ITS projects and program areas are the result of the lo-step ITS planning process developed by the FHWA that identified transportation needs and problems of the IH 90/94 corridors, established priorities and developed ITS solutions for the top priorities. The plan identifies a specific operating or planning agency to manage each project along with a schedule, estimated budget and staffing needs, technology, proposed project location and administration. A summary of the six program areas follows.

Commercial Vehicle Operations

This program area consists of the development of procedures and systems that will allow commercial vehicle operators to operate more efficiently in the IH 90/94 corridors and WisDOT transportation officials to monitor and enforce motor carrier regulations more effectively. Specific projects are to develop automated roadside safety inspections at selected weigh stations along Interstates 90 and 94 and to increase the number of weigh-in-motion facilities. Also under this program area, a new data processing system for IFTA, IRP and oversize/overweight credentials will be established. This data processing system will use common data fields and will be designed to permit third party access for entities such as other states, the State Patrol and motor carriers.

Expected benefits under this program area are:

- More consistent safety inspections.
- Increase in number of vehicles inspected.
- Reduction of time vehicles spend in weigh stations.
- Increase in volume of vehicles weighed.
- Reduction of safety hazard involving vehicles at weigh stations.
- More accessible and consistent information on motor carriers.
- Fewer service disruptions for motor carriers.
- A streamlined application process for CVO credentials.

Incident Management

Under this program area, a coordinated incident management program capable of detecting and responding quickly and efficiently to a variety of incident types will be established. Development of a standard incident management plan that can be customized for each WisDOT Highway District is one of the first projects to be undertaken in this program area. This program **area also includes the development of a system to assist in detecting and responding to incidents** by installing Global Positioning Systems (GPS) on law enforcement, maintenance and other **selected vehicles. The use of cellular telephone service as a means to detect incidents will be promoted within this program area along with a system to locate the origin of cellular telephone calls.**

Expected benefits under this program area include:

- Quicker incident detection and response times.
- A reduction in incident related congestion.

- Improved service for 911 calls.
- A reduction in secondary accidents attributable to congestion.
- A coordinated approach with incident management agencies.

Emergency Management Services

Rural areas account for a disproportionate number of fatal accidents; 61% of all fatal accidents occur on rural roads while rescue time in urban areas is 12 minutes compared to 22 minutes for rural areas. Under this program area, a personal security system for motorists will be deployed in the Lacrosse area with the potential to implement the system throughout the IH 90/94 corridors. The Lacrosse area is recommended due to its proximity to the "Mayday Plus" initiative being undertaken in the Rochester, MN area by MnDOT's Minnesota Guidestar program. The "Mayday Plus" initiative is an automated accident location and severity notification system designed to operate within a sixty (60) mile radius of Rochester.

Expected benefits under this program area include:

- Quicker accident detection and response times.
- Improved comfort level for motorists.
- Identification of the structure, responsibilities and service levels for a Mayday dispatch facility.
- "Hands-on" experience with automated emergency response systems.

Regional Multimodal Traveler Information

Providing travelers with timely and accurate information leads to informed decisions on the mode of travel, the route and the time of travel. This program area offers three project areas that will provide pre-trip information, en-route information and transit schedule information. Under the project area of pre-trip information, the l-800 ROADWIS system will be expanded along with the development of an Internet home page that provides travel and weather information. The en-route project area will expand the use of changeable message signs, establish a statewide highway advisory radio system, provide traffic information to cellular telephone customers, install automated interactive kiosks and automated road condition warning signs, and establish a portable travel time reporting system. The transit schedule information project will provide an automated telephone system for travelers to call and obtain information on available public transit services.

Expected benefits under this program area include:

- Establishment of a central source of useful traveler information.
- Decrease in congestion.
- IH 90/94 travelers provided with information to select mode, route and time of travel.
- Increased use of public transit services.

Public -Private Partnerships

Introducing ITS services to the IH 90/94 corridors relies on private as well as public sector commitments. Under this program area, potential opportunities for participation by the private sector will be identified and pursued. In addition, potential legal and procurement barriers to private sector involvement will be researched and identified. Specific project opportunities involving the private sector that will be explored are; Outreach Initiatives, Cellular Telephone Origin and Promotion, Fiber-Optic Cable Installations, Changeable Message Signs, Interactive Kiosks and Home Page/Media Coordination. Education and outreach involving the private sector along with forums will also be pursued under this program area.

Expected benefits from this program area are:

- Additional funding for ITS services.
- Additional support for deploying ITS services in the IH 90/94 corridors.
- Acquisition of technology that may not otherwise be available.
- Additional information provided to IH 90/94 travelers.

Technical and Planning Support

Under this program area, support services will be provided for the deployment of ITS services in the IH 90/94 corridors. It is recommended that an ITS Deployment Committee be formed to coordinate and facilitate the implementation of the IH 90/94 ITS projects. The core group for the ITS Deployment Committee is the current IH 90/94 Technical Team. Technical services will support the ITS Deployment Committee as it develops projects, provides technical coordination, evaluation and management of the various projects. Initial efforts will focus on developing detailed project plans including reviews of relevant and existing plans, systems, standards, specifications, and guidelines. Technical services will also be provided to coordinate the IH 90/94 program with local, state and national efforts and plans. Additionally, outreach and public education programs on ITS services and systems will be developed.

Expected benefits under this program area include:

- A management structure for deploying ITS services in the IH 90/94 corridors.
- Active participation of IH 90/94 stakeholders.
- Technical assistance for deploying ITS services in the IH 90/94 corridors.
- Coordination with related local, state and national ITS initiatives.
- Establishment of outreach and public education programs for ITS services.

Short Term Implementation Costs

Staffing needs and implementation costs have been estimated for the first five years of deploying ITS services in the IH 90/94 corridors. The table below presents the estimated staffing requirements in person-years by program area for each of the first five years. This table reflects the estimated time required by lead agency personnel to manage projects and does not reflect staff time for preparing plans or designs. The staffing figures represent the total full-time equivalent positions estimated for each year and are not cumulative.

Estimated Staffing Requirements
(Listed as Full-Time Equivalent Positions)

Program Area	Year 1	Year 2	Year 3	Year 4	Year 5
1. Commercial Vehicle Operations	.50	1.00	1.00	1.00	1.00
2. Incident Management	1.31	3.40	3.25	3.25	3.25
3. Emergency Management Service	.33	.25	0.00	0.00	0.00
4. Regional Multimodal Traveler Information	1.43	1.45	1.20	1.20	1.20
5. Public-Private Partnerships	.10	.10	.10	.10	.10
6. Technical and Planning Support	.35	.35	.48	.48	.65
Totals	4.02	6.55	6.03	6.03	6.20

The estimated implementation costs for each program area during the first five years includes estimates of costs for planning and engineering studies, design, equipment, software development and system integration. Costs for an agency's project management and oversight are not included in the following table.

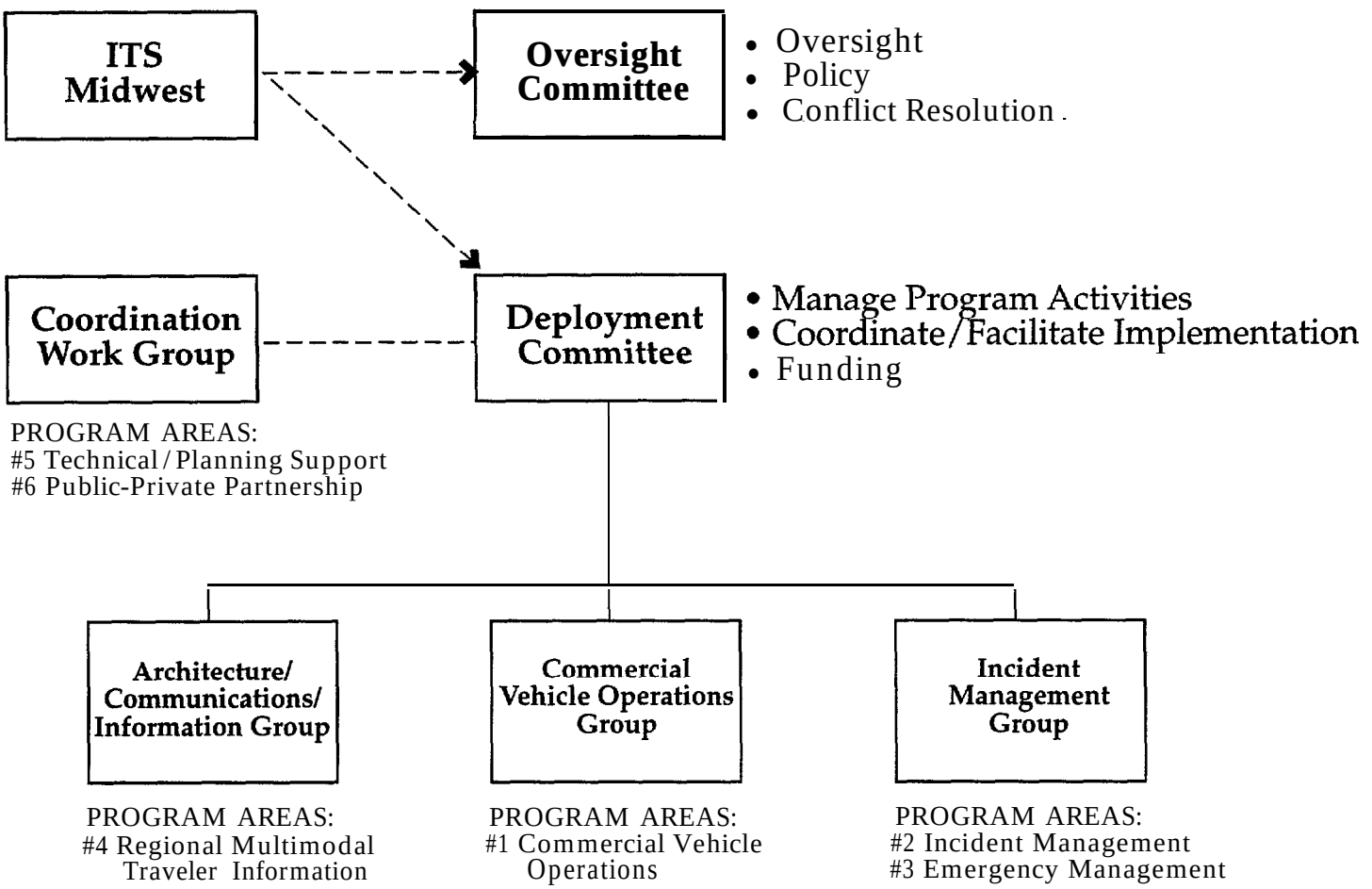
Estimated Implementation Costs

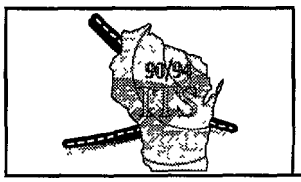
Program Area	Year 1	Year 2	Year 3	Year 4	Year 5	Totals
1. Commercial Vehicle Operations	$20,000	$490,000	$895,000	$395,000	$400,000	$2,200,000
2. Incident Management	$210,000	$483,750	$230,000	$235,000	$240,000	$1,398,750
3. Emergency Management Service	538,000	$125,000	$0	$0	$0	$163,000
4. Regional Multimodal Traveler Information	$707,000	$699,000	$874,500	$1,218,500	$1,247,500	$4,746,500
5. Public-Private Partnerships	$25,000	$25,000	$40,000	$50,000	$50,000	$190,000
6. Technical and Planning Support	$100,000	$200,000	$200,000	$200,000	$200,000	$900,000
Totals	$1,100,000	$2,022,750	$2,239,500	$2,098,500	$2,137,500	$9,598,250

Next Steps for Deployment

This plan was adopted in December 1996, and forwarded to Wisconsin's ITS Steering Committee. The Steering Committee will review and discuss this plan in early 1997 and forward its comments/recommendations to WisDOT's Executive Committee who will determine what resources will be allocated to ITS initiatives in the IH 90/94 corridors. The WisDOT Executive Committee is comprised of Division Administrators from Business Management, Wisconsin State Patrol, Motor Vehicles, Districts, Infrastructure and Development and the Investment Management Division. Deployment of ITS in the IH 90/94 corridors will occur within the direction provided by WisDOT's Executive Committee.

Managing the deployment of ITS services in the IH 90/94 corridors will be overseen by the ITS Deployment Committee that is described in greater detail under the Technical and Planning Support program area. The Deployment Committee is supported by Work Groups that will focus on specific programs and projects as depicted below.





1.0 INTRODUCTION

Overview

In September, 1995 the State of Wisconsin initiated an effort to create a strategic deployment plan for the implementation of cost-effective applications of ITS technologies to improve the mobility, efficiency, productivity and safety of travelers within the IH 90 and 94 corridors. The IH 90/94 ITS Intercity Corridor Study distinguishes itself from other ITS initiatives by focusing on deployment of ITS technologies in a rural environment and addressing unique rural problems and needs. The IH 90/94 ITS Intercity Corridor Study was facilitated by the Wisconsin Department of Transportation (WisDOT) in cooperation with the Federal Highway Administration (FHWA). BRW, Inc. was selected to lead the consultant team that assisted WisDOT with the development of this strategic deployment plan.

FHWA ITS Deployment Planning Process

Preparation of the IH 90/94 Corridors Strategic Deployment Plan followed the ten step ITS planning process developed by the Federal Highway Administration. This process is illustrated in Figure l-l.

The federal ITS planning and deployment process emphasizes a systematic approach that has a user-needs perspective and involves a strong institutional coalition. The deployment of ITS should be structured to protect against inefficient allocation of resources and to ensure that ITS potential can be fully realized. Deployment should be based upon solving local user needs rather than looking for opportunities to utilize new technologies. Finally, successful deployment depends on the development of an institutional framework and coalition of transportation agencies and other stakeholders. Such a coalition and the cooperation that develops helps ensure that each agency's needs, constraints, opportunities and responsibilities are addressed that results in a system that meets the needs and expectations of each agency and the public.

Development of the IH 90/94 Strategic Deployment Plan

Agency Coordination and Public Involvement

The approach to developing the IH 90/94 Strategic Deployment Plan emphasized participation of agencies and direct public involvement. Throughout the development of the plan, working meetings were held with a Technical Team that provided oversight for the development of the plan. Outreach workshops and focus group meetings were conducted to inform and solicit input from corridor stakeholders such as WisDOT staff, the tourism industry, motor carriers and local governments. Four (4) newsletters were published that provided an update on the progress of the plan. Agency coordination and public involvement also included written surveys and interviews with agencies to solicit input and to assist in identifying corridor problems, causes and potential solutions.

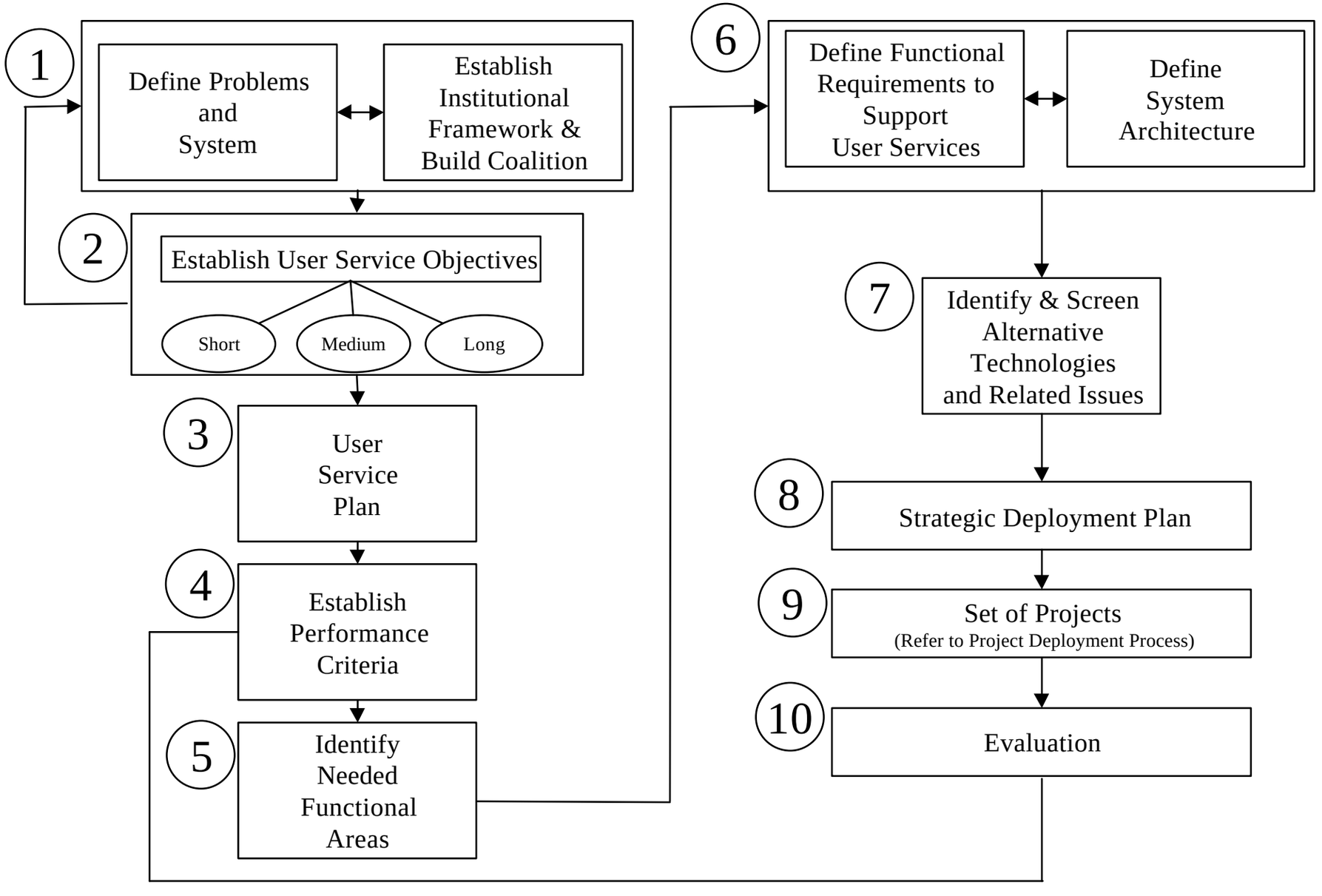


Figure 1-1
FHWA ITS Planning Process

Source: "IVHS Planning and Project Deployment Process", FHWA, April 1993

The IH 90/94 Technical Team

WisDOT's ITS Program led the development of the IH 90/94 Strategic Deployment Plan. A Technical Team was formed to provide oversight to the development of the plan. At the outset of the study, key stakeholders throughout the IH 90/94 Corridors were contacted and invited to participate in the development of the Strategic Deployment Plan for the IH 90/94 Corridors. The inaugural meeting of the Technical Team was held in Madison on September 22,1995 and was attended by approximately 30 individuals. The Technical Team was comprised of representatives from various WisDOT branches, county officials, law enforcement officials, FHWA, representatives from academia, city officials and other interested parties.

Marty Beekman of WisDOT Highway District 6 served as the Chair of the Technical Team and John Norwell from Dane County served as the Vice-Chair. Other agencies represented on the Technical Team are:

City of Beloit - Engineering Division
Dane County - Highways & Transportation
Eau Claire County - Highways
Jefferson County - Highways
City of Madison - Department of Transportation
St. Croix County - Highways
WisDOT - Central Office, Maintenance
WisDOT - Central Office, Planning
Wisconsin Department of Natural Resources
WisDOT - District 1, Traffic
WisDOT - District 4, Highways
WisDOT - District 6, Planning
WisDOT - Office of Transportation Safety
WisDOT - Office of Traffic
WisDOT - ITS Program
Wisconsin State Patrol - Central Office
Dane County - Sheriff's Department
Dane County - 911 Services
FHWA - Wisconsin Division
Juneau County - Sheriff's Department
Marquette University - Civil Engineering
University of Wisconsin - Civil Engineering
WisDOT - Central Office, Traffic
WisDOT - Central Office, Transit
Wisconsin Department of Tourism
WisDOT - District 2, Highways
WisDOT - District 5
WisDOT - Division of Motor Vehicles
Wisconsin Professional Fire Fighters Association
Wisconsin State Patrol - District 2

IH 90/94 Corridors' Working: Statement

One of the initial actions taken by the Technical Team was to establish a working statement for the IH 90/94 Corridors that described the future use of multimodal ITS technologies and institutional arrangements in the corridors. The working statement provided a framework that guided the development of the IH 90/94 Corridors Strategic Deployment Plan and included a *Statement of Need, Vision, Goals and Objectives.* The working statement for the study is presented below and on the following pages.

Statement of Need

The State of Wisconsin and U.S. DOT recognize that Wisconsin's IH 90/94 Intercity Corridors represent a unique opportunity for deployment of ITS application in an intercity/rural setting. The following characteristics create this unique opportunity:

- Travel in the corridors demonstrates significant seasonal and weekend peaks and congestion; tourist travel is a critical economic and transportation concern.

- Truck volumes are relatively high; trucking and intermodal/multimodal linkages are critical to the agriculture industry.

- Significant corridor travel occurs in inclement weather and under hazardous roadway conditions.

- Adjacent areas (Minnesota and Gary-Chicago-Milwaukee Corridor) lead the nation in rural and corridor ITS applications; WisDOT has a strong ITS commitment and numerous ITS initiatives.

As part of an integrated approach to addressing the transportation problems in the IH 90/94 Intercity Corridors, WisDOT has chosen to plan, design and implement ITS technologies within the corridor. This integrated approach will be done in consultation with the USDOT, local governments, planning organizations, private industry and special interest groups throughout the corridors.

Vision

The vision for the IH 90/94 Intercity Corridors is one of enhanced transportation, mobility, efficiency, productivity and safety within the corridors through the use of ITS technologies and systems. This vision begins with mutual cooperation between agencies within the IH 90/94 Corridors to plan and implement advanced ITS technologies. The vision is an integrated approach to solving transportation problems and seeks to improve the use of existing infrastructure and the choices of users and operators. The vision approaches problems that can be effectively addressed with the resources available within the Corridors.

All single and multimodal users who travel within and through the corridors are part of the vision for the IH 90/94 Intercity corridor. The vision is also for transportation operators and agencies, and the surrounding community.

The vision for the IH 90/94 Intercity Corridors includes the cost-effective application of the following elements:

- **Commercial Operations**

  In coordination with national and regional initiatives, commercial carriers will be able to traverse IH 90/94 with minimal delays at weigh and inspection stations if they stay in compliance. Systems will electronically weigh and inspect commercial vehicles. Other systems will enable the electronic issuance and monitoring of permits from regulatory agencies. Commercial carriers will have access to traveler information systems that can assist with routing, scheduling and dispatching.

- **Institutional Issues and Barriers**

  Barriers to deploying ITS technologies and arrangements will be researched and identified. Legislative initiatives will be developed and submitted where appropriate to reduce barriers (i.e., multi-state purchasing options), resolve privacy concerns and encourage arrangements such as public/private partnerships.

- **Cooperation**

  The future of the IH 90/94 Intercity Corridors starts with the mutual cooperation between transportation agencies within the corridor. All agencies, from WisDOT to tourist information centers, municipal traffic agencies, local fire, police and medical service providers will work together to promote and encourage the most productive and safest operation of the transportation network. These agencies will work together to plan, design, implement and operate ITS systems in a cooperative and mutual manner. In addition to mutual cooperation among agencies in the IH 90/94 corridors, initiatives such as the GCM ITS Priority Corridor Study will be monitored for opportunities to coordinate and link information.

- **Traveler/Tourist Information**

  Information regarding the transportation system within the IH 90/94 Intercity Corridors will be immediately available to users through a variety of devices such as television, radio, public kiosks, roadway signage and other interactive communication devices. Users will be able to inquire and receive information about current and expected traffic conditions, travel times, incidents and alternative routes.

  Users will also be able to inquire and receive information about intercity transit status, schedules and local transit services connecting to intercity services. Information available to users of the IH 90/94 corridors will include information from adjacent areas such as the GCM ITS Priority Corridor and Minnesota Guidestar programs. This linked information will allow users to make informed decisions about when to leave, how to travel, and what route to take.

- **Emergency Management**

  Devices will notify authorities to the need for dispatching emergency vehicles to the site of a collision or incident. Systems will coordinate the response from fire, police and medical agencies for fast response in the most appropriate manner. Other systems will coordinate the removal of incidents to promote the timely return of the travel network to peak performance.

- **Evolution**

  The implementation of ITS technologies within the IH 90/94 Intercity Corridors will occur in an evolutionary manner. Technologies will be introduced gradually as the costs and benefits are demonstrated and justified for the corridor.

- **Traffic Management**

  Traffic on selected portions of IH 90/94 Intercity Corridors, particularly in and around urban areas, will be monitored and controlled through an integrated system. Integrated systems will control arterial and freeway operations, monitor and make adjustments to lane usage, speed limits, ramp access and traffic signals. The goal of the system is to maximize the efficiency of the overall network based on actual conditions. In cooperation with travel information systems, traffic control operators can notify users of current or

changing conditions and thereby redirect traffic or set drivers' expectations for safer more efficient flow. Incident management systems will identify incidents, dispatch the appropriate response services, and remove and mitigate the effects of incidents throughout the area.

- **Vehicle Tracking**

  Systems will track commercial carriers, transit operators, emergency and service vehicle support services, and hazardous material carriers to track and monitor the status of their vehicles. These systems will allow these operators to efficiently schedule their services and quickly respond to user needs.

- **Navigation**

  Systems and on-board devices will assist drivers to plan and follow safe and efficient driving routes throughout the corridor. These devices will also provide local information such as services and attractions.

- **Transit Systems**

  Service will also be improved through the use of technology to provide smooth connections between local and intercity services, tracking of vehicles, accurately maintain schedules, predict demand and operate fleets more efficiently with a minimum of downtime and delay. Users of transit systems can be informed immediately of the status of their chosen route and connections to intercity services using a variety of devices such as telephones with services such as audiotext, public kiosks, personal computers and personal digital assistants. Users will be encouraged to use transit systems through improved information, easier access to information and improved transit connections.

Goals and Objectives

The following goals and objectives were developed to reflect the working vision statement developed by the Technical Team. This vision statement describes the desired future use of multimodal ITS technologies and institutional arrangements within the corridors. Through the development of the deployment plan, the Technical Team intends to make the vision a reality.

The goals of the IH 90/94 Intercity ITS Early Deployment plan are to:

- Enhance Mobility and Accessibility
- Enhance Productivity
- Improve Safety
- Increase Efficiency
- Develop an Intercity Transportation System that most Effectively Supports the Optimal Deployment of Appropriate Technologies

Through a cooperative process, the IH 90/94 Technical Team is establishing strong institutional arrangements to improve transportation systems within the IH 90/94 Intercity Corridors using ITS technologies and applications.

Goal: To Enhance Mobility and Accessibility

Objectives and Benefits:

To improve the accessibility and availability of travel information to tourists, commercial vehicle operators and other users of all transportation facilities.

To simplify scheduling and fee collection procedures for operators and users of intermodal facilities.

To reduce the variability and number of actions necessary to use public transportation facilities.

To improve the predictability of travel time for all transportation modes.

Goal: To Enhance Productivity

Objectives and Benefits:

To reduce travel delay and increase the reliability and predictability of moving people and goods for all transportation users.

To improve the ability of tourists, commercial vehicle operators and other users to perform travel planning using real-time travel information.

To reduce the operational costs to operators incurred from inefficient transportation facilities.

To reduce costs to users by improving the equity of fee collection.

To reduce the scheduling and processing delays and costs to users and operators associated with the regulation of vehicles.

To reduce the costs and improve the quality of data collection for transportation system planning, use, operations, maintenance and installations.

Goal: To Improve Safety

Objectives and Benefits: To improve the tracking of hazardous material movements, the response to and mitigation of the effects due to loss of containment incidents.

To reduce the number of motor vehicle collisions, associated injuries and fatalities.

To improve the average response time of emergency services.

To improve the ability to identify, respond, remove and/or mitigate the effects of incidents.

To enhance personal security on all modes of transportation.

Goal: To Increase Efficiency

Objectives and Benefits: To reduce time delay and costs associated with congestion.

To optimize the operational efficiency of goods and people movement on existing facilities.

To increase average vehicle occupancy.

To reduce the rate of growth of vehicle miles traveled.

To reduce time lost in inter-modal interchange.

Goal: To Develop an Intercity Transportation System that most Effectively Supports the Optimal Deployment of Appropriate Technologies

Objectives and Benefits: To establish intercity corridors that:

- Advances the National ITS Program.
- Advances the deployment and integration of technology.
- Receive federal funding support for development and deployment.

To establish an ITS architecture that:

- Is open and adoptable to meet future architecture needs.
- Is consistent with developing national standards.

User Needs and Travel Conditions

In April 1996, a Traveler User Needs Report was produced as part of the development of this plan. This report defined the 370 miles of Interstate Highways comprising the IH 90/94 corridors along with backbone and connector routes that influence travel in the IH 90/94 corridors. The report identified transportation infrastructure components such as locations of weigh stations, rest areas, information centers, intermodal facilities, State Patrol radio tower sites, automated traffic recorders, winter weather reporting facilities and intercity bus routes. The report also identified selected traffic conditions facing users of the IH 90/94 corridors such as congestion and crash data.

Technology Alternatives

In June 1996, a Technology Report was completed as part of the IH 90/94 Strategic Deployment Plan. This report identifies various technologies to support the selected ITS user services within the IH 90/94 corridors. The report presents detailed descriptions of technologies applicable to a particular functional area and then describes features, characteristics and associated issues related to the IH 90/94 corridors.

A copy of both these reports can be obtained by contacting WisDOT's ITS Program.

Chronology of IH 90/94 ITS Strategic Deployment Plan

As noted earlier, the development of the IH 90/94 Strategic Deployment Plan followed the 10 step ITS planning process developed by the Federal Highway Administration. The Technical Team developed the Strategic Deployment Plan in a systematic, coordinated manner that included full public disclosure and involvement.

The Technical Team met 10 times to develop goals and objectives, identify and review needs in the IH 90/94 Corridors, discuss proposed projects and program areas and approve the final plan. The public was kept informed of and involved in the development of the Strategic Deployment Plan through written surveys, agency interviews, workshops, focus groups, meeting notices and newsletters.

As noted earlier, one of the first steps in the study was to establish a working statement that provided guidance to the Technical Team throughout the development of the Strategic Deployment Plan. One of the next steps in the study was to conduct written surveys and agency interviews with stakeholders in the IH 90/94 Corridors in an effort to identify transportation problems, user needs and potential ITS solutions. As the data from the surveys and interviews were reviewed and analyzed, the consulting team prepared a *Traveler User Needs Report* that defined the IH 90/94 corridors and summarized travel conditions facing travelers in the IH 90/94 corridors.

Focus groups and workshops were held at critical points in the development of the plan to inform and solicit input from a wide range of IH 90/94 transportation stakeholders. In February 1996, a *Prioritization Workshop* that involved hands on participation by Technical Team members in prioritizing IH 90/94 transportation problems and user services, matching user services with problems and identifying potential projects for the IH 90/94 corridors. In April 1996, *focus group meetings* were conducted in Madison and Eau Claire to solicit input on the transportation problems and potential ITS projects that were identified through the Prioritization Workshop.

Based on the input from the Technical Team and results from the Prioritization Workshop and focus group meetings an initial list of recommended ITS user services and projects was established and presented in the *User Service Plan* produced in May, 1996. In August 1996, workshops were conducted in Madison and Lacrosse at which the potential ITS projects for the IH 90/94 Corridors were presented and discussed. Results from the Prioritization Workshop, April focus group meetings, and August workshops are discussed in greater detail **in Chapter 2.**

As potential ITS projects in the IH 90/94 corridors evolved, the consulting team conducted an initial assessment of technology, identified functional areas/requirements, developed initial performance criteria and developed a preliminary system architecture. Details on the specific projects and preliminary system architecture are found in **Chapter 3.**

During the development of the IH 90/94 Strategic Deployment Plan, four newsletters were published and distributed to over 250 individuals and agencies on the III 90/94 mailing list. The newsletters informed readers of the progress of the study, upcoming milestones, how people could get more involved in the study and an overview of local and national ITS initiatives.

Accompanying Documents

Throughout the course of this study, several documents were produced including the following:

- Vision, Goals and Objectives for Study, January 1996
- Written Survey Results, *January 1996*
- Agency Survey Results, *February 1996*
- User Needs and Travel Conditions Report, *February 1996*
- Prioritization Workshop Summary, *March 1996*
- Summary of Focus Group Meetings, *April 1996*
- Alternative Technologies, *April 1996*
- User Service Plan, *May 1996*
- Functional Areas/Requirements, *June 1996*
- Initial Listing of Potential ITS Projects, *August 1996*
- ITS Project Detail and System Architecture, *September 1996*
- Draft Strategic Deployment Plan, *September 1996*
- Adopted Strategic Deployment Plan, *December 1996*
- Minutes from each of the Technical Team Meetings

Copies of these documents may be obtained by contacting WisDOT's ITS Program.

Organization of the Strategic Deployment Plan

This document provides the reader with a summary of the process followed, the data gathered, analysis performed and conclusions reached during the development of the Strategic Deployment Plan for ITS in the IH 90/94 Corridors. The remainder of this document is divided into the following Chapters:

Chapter 2: Selection of ITS User Services

This chapter summarizes the process and presents the results of the effort to identify and prioritize transportation problems and ITS user services for the III 90/94 Corridors. The

Prioritization Workshop, April focus group meetings and August workshops are discussed in this chapter.

Chapter 3: Project Detail and System Architecture

This chapter presents the proposed program areas and individual ITS projects for deployment in the IH 90/94 corridors. Each of the program areas includes detailed information on the related projects including objectives, scope, current conditions, location, technology, time frame, budget, staffing, administration and sponsor. Additionally, for each proposed project there is a section that describes the recommended infrastructure including functional requirements, preliminary system architecture and data flow.

Chapter 4: Performance Criteria

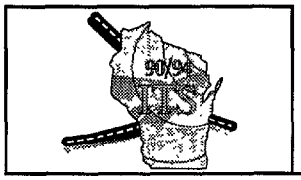
Performance measures, data/information needs and data/information sources for each project are presented in this chapter.

Chapter 5: Procurement and Funding

This chapter describes the procurement methods commonly used by States across the country and reviews WisDOT's procurement and contract policies along with the potential impact they may have on deploying ITS projects in the IH 90/94 Corridors.

Chapter 6: Implementation Plan

This chapter was prepared in conformance with 23CFR655d and FAP Guide Transmittal 12 and discusses program management, institutional issues, monitoring and review of the Strategic Deployment Plan, the system design, construction management procedures, personnel and budget resources associated with the deployment of ITS in the IH 90/94 corridors.



2.0 SELECTION OF ITS USER SERVICES

2.1 Overview

Identification of appropriate ITS user services that are based on local transportation needs was a crucial step in the development of the Strategic Deployment Plan for ITS in the IH 90/94 Corridors. The IH 90/94 study followed the lo-step ITS planning process developed by the Federal Highway Administration. This process is illustrated in Figure l-l found in Chapter 1 and includes establishing user service objectives that lead to a strategic deployment plan with a specific set of projects.

The National ITS Program is focused on the development and deployment of a collection of inter-related user services. User services have been defined to date as part of the national program planning process and serve as a starting point to identify appropriate ITS user services for the IH 90/94 Corridors. To identify the ITS user services for the IH 90/94 Corridors, members of the Technical Team participated in a prioritization workshop in January, 1996; held focus group meetings in April, 1996; and, conducted workshops in August, 1996. Each of these activities are summarized below and on the following pages. More detail on each of these activities is available in separate reports available from WisDOT's ITS Program.

2.2 Prioritization Workshop Summary

On February 21 and 22 1996, the IH 90/94 ITS Intercity Corridor Study conducted a prioritization workshop in Madison, Wisconsin. The workshop involved hands on participation in prioritizing IH 90/94 transportation problems and user services, matching user services with problems and identifying potential projects for the IH 90/94 corridors. The purpose of the workshop was to:

1. *Define the highest priority travel problem areas of the IH 90/94 corridor; and,*
2. *Select and describe the components of a focused plan that addresses these problems and accomplishes the IH 90/94 ITS vision.*

Workshop participants were chosen from the Technical Team to represent a variety of interests, agencies and functional areas. A list of the individuals who participated in the Prioritization Workshop is found in Appendix A.

The workshop began with an overview of the objectives of the workshop and the process that would be followed. The vision statement, elements, goals and objectives for the IH 90/94 ITS Intercity Corridor study were reviewed along with a brief review of relevant information from WisDOT's Translink 21 Report. This was followed by reviewing a list of problems and causes compiled from the written survey distributed in December 1995, agency interviews conducted in January 1996 and contributions throughout the study from participants at Technical Team meetings.

Selection of Top Problem Areas/Problem Causes

Early in the first day of the workshop, participants discussed the transportation problems and causes identified to date in the study. Workshop participants added, modified and deleted problems and causes that resulted in an updated listing of problems. At this point, participants voted on problems and causes within five areas: **Traveler Services,** *Highway, Omtercoty/Local Bus Systems, Commercial Vehicles and Institutional.*

At the beginning of the second day, workshop participants reviewed the rankings that showed the top problems and causes for each area. The discussion resulted in consolidating selected problems/causes then conducting a vote to rank the top problems/causes. Two rounds of hand votes were held and the rankings from each round of voting are summarized below:

TOP PROBLEMS

	RANK	
	First Round	Second Round
Highway		
Construction Projects	**7**	**7**
Congestion/Seasonal Congestion	**4**	**5**
Incident Mitigation/Emergency Response/Help	**1**	**1**
, Traveler Services		
Notification of Incidents	**4**	**4**
Current Road Conditions Information	**3**	**2**
Information on Congestion, Constr., Weather, Special Events	**2**	**2**
	11	*No Votes*
Intercity & Local Bus Systems		
Information on Available Services (Intercity)	**13**	*No Votes*
Schedule and Routes	**9**	*No Votes*
Lack of Real Time Schedule Information	**11**	*No Votes*
Commercial Vehicles		
Effectiveness of Regulation/Enforcement/Weigh Time	**6**	**5**
Lack of Parking/Rest Areas for Trucks	**17**	*No Votes*
Institutional		
Coordination at Accident Scenes	**10**	*No Votes*
Level of Enforcement	**8**	**7**
Coordination for Freeway Closures	**13**	*No Votes*
Uniformity in Messages for CMS	**13**	*No Votes*
Uniformity in Design Standards	**13**	*No Votes*

Selection of Top ITS User Services

This portion of the workshop began with an overview of ITS user services as defined by the ITS National Program Plan. As part of the user survey conducted in December 1995, respondents were asked to consider the needs of all users in the IH 90/94 corridors and rank the ITS user services. The results of the ranking from the user survey were reviewed, then workshop participants voted on the 29 ITS user services. A second round of voting was held to give participants an opportunity to make certain their voting was consistent with their intent. The results from the voting and the rankings from a November 17,1995 Technical Team informal vote are summarized below.

ITS User Services

	First Round		Second Round		11/17/95
	Score	Rank	Score	Rank	Ranking
En-Route Driver Information	**31**	**2**	9	**1**	**2**
Pre-Trip Travel Information	**26**	**4**	**8**	**2**	**7**
Incident Management	**36**	1	**8**	**2**	1
Commercial Vehicle Electronic Clearance	**29**	**3**	**5**	**4**	11
Traveler Services Information	**23**	**5**	**3**	**5**	**6**
Emergency Notification & Personal Security	**20**	**6**	**2**	**6**	**3**
Commercial Vehicle Admin. Processes	**11**	**10**	1	**7**	**19**
Automated Roadside Safety Inspection	**19**	**7**	0	**8**	**13**
Traffic Control	**15**	**8**	0	**9**	**10**
Route Guidance	13	**9**	0	**10**	**8**
Emergency Vehicle Management	11	**10**	0	**11**	**4**
En-Route Transit Information	10	**12**	0	**12**	**20**
Public Transportation Management	8	**13**	0	**13**	**12**
On-Board Safety Monitoring	**7**	**14**	0	**14**	**15**
Public Travel Security	**5**	**15**	0	**15**	**24**
Hazardous Materials Incident Response	**5**	**15**	0	**15**	**5**
Electronic Payment Services	**5**	**15**	0	**15**	**15**
Longitudinal Collision Avoidance	**4**	**18**	0	**18**	**8**
Lateral Collision Avoidance	**4**	**18**	0	18	**14**
Vision Enhancement for Crash Avoidance	**3**	**20**	0	**20**	**23**
Intersection Collision Avoidance	**3**	**20**	0	**20**	**22**
Automated Highway System	**3**	**20**	0	**20**	**27**
Personalized Public Transit	**2**	**23**	0	**23**	**27**
Emissions Testing & **Mitigation**	**2**	**23**	0	**23**	**21**
Freight Mobility	**1**	**25**	0	**25**	**24**
Safety Readiness	**0**	**26**	0	**26**	**24**
Ride Matching & Reservation	**0**	**26**	0	**26**	18
Pre-Crash Restraint Deployment	**0**	**26**	0	**26**	**27**
Demand Management & Operations	**0**	**26**	0	**26**	**17**

IH 90/94 Market Services/Project Ideas

Both the user survey and the agency interviews asked participants to describe services they felt should be established, improved or coordinated to meet the needs of travelers in the IH 90/94 corridors and to identify technologies they felt were most appropriate to provide the identified services. Workshop participants discussed project ideas from the user survey and agency interviews and developed a list of potential ITS projects to meet the identified transportation needs in the IH 90/94 Corridors.

Workshop participants discussed at length how the potential ideas/solutions related to the problems and causes discussed earlier in the workshop. The workshop participants then reviewed the potential ideas/solutions individually to determine how they related to top problem areas.

Establishment of Overriding: Factors

Overriding factors are locally developed criteria to help guide the development of projects and to aid in prioritizing transportation problems and user services in the IH 90/94 Corridor. Overriding factors help ensure that the results of the study adequately address critical underlying issues in the IH 90/94 Corridors.

Workshop participants discussed critical issues in the IH 90/94 Corridors and compiled a list of overriding factors to be used as a guide throughout the development of the Strategic Deployment Plan. The overriding factors were then discussed at a later meeting of the Technical Team and the following list was established:

- Corridor-Wide Perspective
- Consistent with Translink 21
- Regional Consistency
- Regional Impact
- Integration w/Existing System
- Social/Economic Awareness
- An Early Winner
- Ease of Deployment
- Measures Performance/Benefits
- Risk/Benefits
- Maintenance/Operation
- Building Block Approach/Incremental
- Meets User Expectations
- Meets User Needs
- Meets User Perceptions
- Meets Agency Expectations
- Meets Agency Needs
- Meets Agency Perceptions
- Opportunity for Private Partner
- Cost/Benefit: Life Cycle Cost
- User Acceptance
- Serves Many
- High Visibility
- National Consistency
- National Impact

2.3 Focus Group Meetings

On April 15 and 16 1996, focus group meetings were held in Madison and Eau Claire to solicit input from a wide range of corridor users and operations agencies on transportation problems and potential ITS projects identified through the Prioritization Workshop. A list of the participants in the focus groups is found in Appendix B.

At the focus group meetings, WisDOT staff and members of the BRW consulting team gave an overview of ITS, provided a summary of the IH 90/94 ITS Intercity Corridor Study, discussed the direction of the study and the transportation problems and potential ITS solutions identified to date in the study. Focus group participants then separated into one of six small groups based on their area of interest, (Commercial Vehicles, Institutional, Traveler Information, Traffic Control, Incident Management and Public Transportation. *In both Madison and Eau Claire, participants formed three small groups* with *each group discussing two topics.*

Focus group participants were asked to identify obstacles they felt could hinder the study from achieving its vision. Participants also reviewed and discussed transportation problems and possible ITS projects from the prioritization workshop and compiled their own list of top problems and possible ITS projects for the IH 90/94 corridors. After the small group discussions, each group reported back to the full group. Summarized below are the obstacles that focus group participants felt could hinder the IH 90/94 ITS Intercity Corridor Study from achieving its vision:

Funding *(4 Mentions)*
Competing Priorities Between and Within Agencies (2 *Mentions)*
Need for Leadership (2 *Mentions)*
Process (2 *Mentions)*

The Following Obstacles Were Each Mentioned Once:

Deciding Where to Start
Infrastructure
Interagency Relationships
Interstate Cooperation
Lack of Standard Vehicle-to-Roadside Communication
Public Acceptance
Maintaining the Integrity of the Existing System
Uniqueness of Incidents
Establishing Private/Public Partnerships
Changing Technology

The top problems and possible ITS solutions identified through the focus group meetings are presented on Tables 2-1 and 2-2, and compared with those also identified through the prioritization workshop process.

Table 2-l
Top Problems from Focus Group Meetings

Problems	*Identified Through:* Prioritization Workshop	Focus Grout,
Problems from Workshop & Focus Group:		
Congestion	X	X
Construction Projects	X	X
Coordination at Accident Scenes	X	X
Coordination for Freeway Closures	X	X
Current Travel/Road Condition Information	X	X
Effectiveness of Law Enforcement	X	X
Emergency Service Response Time	X	X
Information on Available Transit Services	X	X
Lack of Layover Facilities	X	X
Lack of Alternate Route Information	X	X
Limited Incident Information to Users in Advance	X	X
Time Delays at Weigh Stations	X	X
Uniformity in Design Standards	X	X
Uniformity of CMS Messages	X	X
Problems from Focus Group *Only:*		
Lack of Consistency in Planned Responses		X
Sharing of Information Between Agencies		X
Cumbersome Payment System for Transit		X
Inability to Regulate Traffic Flow		X
Integration of Different Information Systems		X
Lack of Alternate Routes		X
Enforcement/Travelers Have Different Incident Management Needs		X
Minnesota Scales Require All Buses to Stop		X
Security at Incident Sites		X
Underutilized Transit Vehicles		X

Table 2-2
Project Ideas from Focus Group Meetings

	Identified Through:	
Project Ideas	**Prioritization Workshop**	**Focus Group**
Ideas from Workshop & Focus Group:		
Active Warning Sign	X	X
Alternate Route Signage	X	X
Automate Safety Inspections	X	X
Automatic Road Condition Warning	X	X
Commercial Vehicle Pre-Clearance	X	X
Develop Incident Management Plan	X	X
Expand Use of Cell Phones	X	X
Guidelines for Institutional Coordination	X	X
Information Kiosks for Travelers	X	X
Locate Origin of Cell Calls	X	X
Permanent HAR Statewide	X	X
Portable CMS	X	X
Private Sponsorship of CMS	X	X
Ramp Meters	X	X
Uniform Standards for CMS Messages	X	X
Weigh-in-Motion Scales	X	X
Ideas from Focus Group Meetings Only:		
Coordinate Multiple Use of All Transit Vehicles		X
Electronic Toll Collection at Beloit		X
Mail Commercial Violations		X
More Coordination Between All Transit Sectors		X
Provide Plastic "Debit Card" for Transit Fare Payment		X
Uniformity in Enforcement		X

2.4 Recommended ITS User Services and Project Ideas

The results from the prioritization workshop, focus groups and input from the Technical Team produced an updated list of ITS user services and potential projects to address the identified needs found in the IH 90/94 Corridors. Two matrices were then developed and used to help identify the potential projects/ITS user services with the greatest likelihood of adequately addressing the critical, underlying transportation issues facing the IH 90/94 Corridors. The first matrix compared each potential project with the overriding factors identified in the prioritization workshop. A second matrix compared each potential project with the problems identified in both the prioritization workshop and focus group meetings.

The potential projects and user services were then reviewed by the consulting team and Technical Team to identify those with the strongest relationship to the overriding factors and identified problems. The results of this process are contained in the IH 90/94 *User Service Plan* prepared for the Technical Team in May, 1996.

The recommended list of projects and ITS user services is based on the following:

- *All potential projects address at least one identified problem in the IH 90/94 Corridor;*
- *All potential projects relate to at least one overriding factor established through the prioritization workshop;*
- *All potential projects address a combination of 11 or more problems/overriding factors;*
- *All potential projects require current, new or emerging technology for deployment;*
- *All potential projects are based within the State of Wisconsin; and,*
- *All ITS user services contain at least one recommended project idea.*

The recommended ITS User Services for the IH 90/94 Corridors from the prioritization workshop and April, 1996 focus groups are:

En-Route Driver Information
Travel Services Information
Traffic Control
Incident Management
Pre-Trip Travel Information
Public Transportation Management
Commercial Vehicle Electronic Clearance
Automated Roadside Safety Inspections
Emergency Notification and Personal Security

Table 2-3 includes a listing of recommended project ideas sorted by ITS User Service and Infrastructure Component.

Table 2-3
Recommended Project Ideas
sorted by
ITS User Service and Infrastructure Component

Freeway Management
- Traffic Control
  - *Expand use of changeable message signs.*
  - *Active warning signs.*

Commercial Vehicle Operations
- Automated Roadside Safety Inspections
  - *Automate safety inspections.*
- Commercial Vehicle Electronic Clearance
  - *Add weigh-in-motion scales.*
  - *Purchase credentials in advance.*

Incident Management
- Incident Management
  - *Incident clearance plan.*
  - *Develop incident management plan.*
  - *Locate origin of cell calls.*
  - *Expand use of cell phones.*
  - *Install GPS on vehicles.*

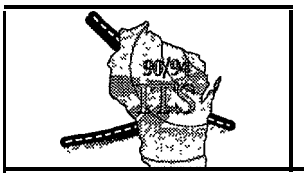
Emergency Management Services
- Emergency Notification and Personal Security
  - *Mayday system for motorists in need.*

Regional Multimodal Traveler Information
- En-Route Driver Information
  - *Expand use of changeable message signs.*
  - *Statewide highway advisory radio.*
  - *Cellular call to motorists.*
  - *Automated interactive kiosks.*
  - *Automatic road condition warning.*
  - *Weather & incident information to motorists.*
  - *Portable travel time report system.*
  - *Active warning signs.*
- Travel Services Information
  - *Automated interactive kiosks.*
- Pre-Trip Travel Information
  - *Add to l-800 ROADWIS system.*
  - *Travel information on a home page.*
  - *Weather & incident information to motorists.*
- Public Transportation Management
  - *Automated schedule information.*

2.5 August 1996 Workshop

On August 6 and 7, 1996 workshops were conducted Madison and Lacrosse at which the potential ITS projects for the IH 90/94 Corridors were presented and discussed. Stakeholders from throughout the IH 90/94 Corridors were invited to attend and comment on the proposed projects. At the workshops, participants separated into smaller groups based on their area of interest and were asked to comment on the projects in general, the proposed priority/phasing of the projects, proposed locations and to identify any issues/roadblocks to deploying the projects. At the conclusion of the small group meetings, a representative from each group gave a brief presentation to the entire group. The comments from the August, 1996 workshops are incorporated into the recommended Program Areas and projects presented in Chapter 4.0.

A summary of the comments from August, 1996 workshops are available in a separate report from the WisDOT section. A listing of the participants in the August, 1996 workshops can be found in Appendix C.



3.0 PROJECT DETAIL AND SYSTEM ARCHITECTURE

3.1 Introduction

This chapter presents the proposed program areas and individual ITS projects for deployment in the IH 90/94 Corridors. Each program area, project, and project phase on the succeeding pages are described in the following format:

1. Program Area

   A. Program Area Overview

      I. Description
      II. Rationale
      III. Expected Results
      IV. Projects Not Selected
      V. Implementation Timetable

   B. Individual Project Overview (Project 1.1, 1.2, etc.)

      I. Objective
      II. Current Conditions
      III. Scope/Phases
      IV. Location
      V. Technology
      VI. Administration
      VII. Time Frame
      VIII. Budget
      IX. Staffing
      X. Sponsor

   C. Individual Project Infrastructure (Project 1.1, 1.2, etc.)

      I. Functional Requirements
      II. Preliminary System Architecture
      III. Data Flow Diagram

Six program areas, each containing **a** set of projects, have been developed and are detailed below and on the following pages:

1. Commercial Vehicle Operations

1.1. Automated Safety Inspections/Weigh-in-Motion Scales

1.1.1 Implement "Smart" Scale Facilities
1.1.2 Expansion of Ramp Weigh-in-Motion Scales

1.2 Purchase Credentials In Advance

1.2.1 Design and Develop Electronic System
1.2.2 Upgrade WisDOT Motor Carrier Record Keeping

2. **Incident Management**

2.1 Develop an Incident Management Plan

2.1.1 Establish an Incident Management Committee
2.1.2 Establish Incident Management Test Sites

2.2 Determine Origin of Cellular Telephone Calls
2.2.1 Establish Test Sites

2.3 Expand Use of Cellular Telephones

2.3.1 Cellular Hotline and Operations / Dispatch Center
2.3.2 Cellular Telephone Hotline Promotion

2.4 Install GPS on Vehicles

2.4.1 Establish Test Site in Dane County

3. **Emergency Management Services**

3.1 Establish "Mayday" System for Motorists in Need

3.1.1 Develop Functional Requirements and Specifications
3.1.2 Establish Test Site in Lacrosse

4. **Regional Multimodal Traveler Information**

4.1 Provide Pre-Trip Traveler Information

4.1.1 Expand l-800 ROADWIS Automated Telephone Information Service
4.1.2 Expand Home Page Information on the Internet

4.2 Provide Multimodal Traveler Information

4.2.1 Expand Use of Changeable Message Signs
4.2.2 Establish Corridor-Wide Highway Advisory Radio
4.2.3 Provide Information via Cellular Telephone
4.2.4 Install Automated Interactive Kiosks
4.2.5 Install Automated Road Condition Warning Signs
4.2.6 Establish Portable Travel Time Reporting System

4.3 Provide Transit Schedule via Automated Service

4.3.1 Develop Functional Requirements and Specifications
4.3.2 Automated Transit Schedule Test

5. **Public - Private Partnerships**

5.1 Outreach Initiatives

5.2 Cellular Telephone Origin and Promotion

5.3 Fiber Optic Cable Installations

5.4 Changeable Message Signs

5.5 Interactive Kiosks

5.6 Home Page/Media Coordination

6. **Technical and Planning Support**

6.1 ITS Deployment Committee

6.1.1 Initial Committee Development
6.1.2 Administrative and Coordination Support
6.1.3 Decision Support

6.2 Technical Support

6.2.1 Develop Project Plans, Solicitations and Evaluations
6.2.2 Lead Projects
6.2.3 Coordinate and Update Deployment Plan

6.3 Outreach/Education
6.3.1 Program Information Center
6.3.2 Public Outreach and Education
6.3.3 Internal Education and Interagency Involvement Program

PROGRAM AREA 1: COMMERCIAL VEHICLE OPERATIONS

PROGRAM AREA OVERVIEW

Description: This program area consists of procedures and systems that will allow; (1) *commercial vehicle operators to operate more efficiently in the IH 90/94 Corridors,* and; (2) *WisDOT transportation officials to monitor and enforce motor carrier regulations more* effectively. It is expected that efforts under this program area will lead to improvements in the operating efficiency and safety of intermodal operations through incorporation of advanced technologies associated with commercial vehicle operations (CVO) automation and integration. Technologies such as weigh-in-motion have been successfully used in the IH 90/94 corridor and this program area will support similar initiatives. This program area includes projects that support automated roadside safety inspections, commercial vehicle electronic preclearance, and the electronic purchase of credentials in advance.

Rationale: This program area addresses two of the top 14 problems identified during the development of the IH 90/94 Strategic Deployment Plan as follows:

- *Effectiveness of law enforcement*
- *Time delays at weigh stations*

This program area also relates to 17 of the 25 overriding factors established by the IH 90/94 Technical Team as follows:

- *Corridor- Wide Perspective*
- *Consistent with Translink 21*
- *Regional Consistency*
- *Regional Impact*
- *Integration w/Existing System*
- *Cost/Benefit: Life Cycle Cost*
- *National Consistency*
- *Meets User Expectations*
- *Meets User Needs*
- *Meets User Perceptions*
- *Meets Agency Expectations*
- *Meets Agency Needs*
- *Meefs Agency Perceptions*
- *User Acceptance*
- *Measures Perfromance/Benefits*
- *Risks/Benefits*
- *Building Block Approach/Incremental*

Expected Results:

Initiatives under this program area are expected to result in a reduction in operating costs for commercial vehicle operators through an improvement in service efficiency - (fewer delays due to weigh-in-motion scales and advance purchase of credentials); an increase in the productivity of WisDOT's CVO regulatory efforts; improvement in service to vehicle owners, and; improvement in safety for all IH 90/94 users through more comprehensive enforcement of safety regulations (with automated safety inspections) and subsequent removal of violators from the road.

Automated Roadside Safety Inspections and ***Commercial Vehicle Electronic Clearance*** are the ITS user services that will be provided under this program area.

Project Ideas Discussed But Not Selected:

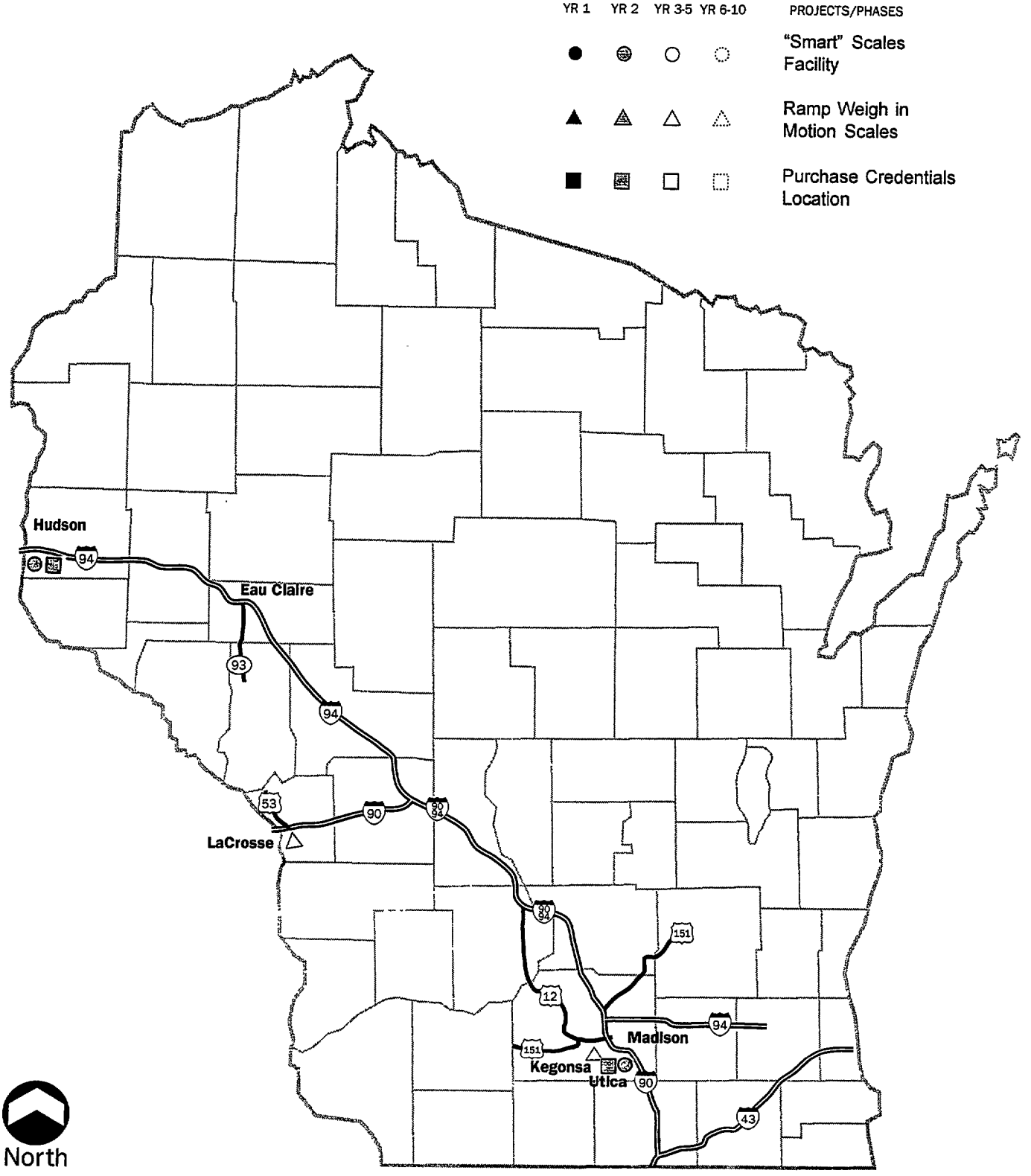
During the development of the strategic deployment plan, other project ideas were considered, but are not included in the final plan. These project ideas are not part of the strategic deployment plan since they did not address a minimum level of IH 90/94 problems and/or overriding factors or did not incorporate ITS Technology. These project ideas are listed below: .

- Construct New Facilities, *(without ITS)* .
- WisDOT Staff Become Active in the Development of Standards
- Establish Uniformity in Enforcement .
- Send CVO Violations via U.S. Mail

Following is the proposed timetable for each of the projects under Program Area 1.

	Implementation Timeframe			
Program Area 1: Commercial Vehicle Operations	**Year 1**	**Year 2**	**Years 3-5**	**Years 6-10**
1.1 Automated Safety Inspections/Weigh-in-Motion Scales				
1.1.1 Implement "Smart" Scales Facility		X		
1.1.2 Expansion of Ramp Weigh-in-Motion Scales		X	X	
1.2 Purchase Credentials in Advance				
1.2.1 Design and Develop Electronic System		X		
1.2.2 Upgrade WisDOT Motor Carrier Record Keeping			X	

Commercial Vehicle Operations



PROJECT 1.1 OVERVIEW

Project 1.1: Automated Safety Inspections/Weigh-In-Motion Scales

Objective:

This project will develop an automated roadside safety inspection for commercial vehicles at selected weigh stations along Interstates 90 and 94. This project will allow weight, credentials, and safety history to be checked in one location during a single stop.

Automated safety inspections will collect and store data, provide historical safety data by vehicle and provide quick information updates to other inspection facilities, the WisDOT Office of Motor Carriers and the State Patrol. Automated safety inspections are expected to provide more consistent inspections, to decrease the time of inspections and increase the number of vehicles that can be inspected in a given period of time.

Weigh-in-motion scales allow commercial vehicles to be weighed without coming to a complete stop. Vehicles that pass the initial weighing are permitted to continue through the weigh station without stopping, while vehicles failing the initial weighing are routed into the station to be weighed a second time. Weigh-in-motion scales reduce the amount of time vehicles spend in a weigh station, reduces the back-up of vehicles onto the Interstate and increases the volume of vehicles that one station can process. Another expected benefit is reducing the safety hazard caused by slow moving vehicles re-entering the interstate.

Also, under this project one FTE position will be established for the purpose of providing maintenance on weigh-in-motion scales. The addition of this **FTE** is expected to result in quicker repairs and less down-time for weigh-in-motion scales. The potential impacts from this project are:

- More consistent inspections.
- Decrease in time of inspections.
- Increase in number of vehicles that can be inspected within a given period of time.
- Reduction of time vehicles spend in weigh stations.
- Reduction in back-up of vehicles onto the Interstate.
- Increase in volume of vehicles that one weigh station can process.
- Reduced safety hazard caused by slow moving vehicles re-entering the interstate.

Current Conditions:

Truck weigh stations within the study corridor are located at the following locations: Utica, Kegonsa, Cottage Grove, Tomah, Oakdale, Hudson, and West Salem and a prescreening system is in place at Rusk. The Hudson weigh station is currently equipped with ramp weigh-in-motion scales. Maintenance costs for ramp weigh-in-motion scales are

higher when compared to static scales. This is mostly due to the limited availability of trained technicians, that results in repairs taking a longer time to complete. The weigh stations at Tomah and Oakdale are scheduled to be removed in 1996. The weigh station at Cottage Grove may be eliminated by 2006.

The State of Wisconsin participated in the Automated Mileage and Stateline Crossing Operational Test (AMASCOT) that was conducted from January, 1994 through April, 1996. This test demonstrated and evaluated the feasibility of automatically collecting a vehicle's mileage data by jurisdiction and electronically transmitting data to meet International Fuel Tax Agreement (ETA) and International Registration Plan (IRP) reporting requirements.

Under AMASCOT, 30 interstate commercial vehicles with prototype electronic mileage collection devices gathered mileage from the vehicles as they operated throughout the United States and Canada, then integrated the mileage data with fuel purchase data to generate the information to meet the prescribed reporting requirements. AMASCOT was managed by the Iowa Transportation Center with the states of Iowa, Minnesota, and Wisconsin participating.

Scope: This project is divided into the following phases:

Phase 1 - 1.1.1 Implement a "Smart" Scales Facility

This phase will consist of combining automated safety inspections with weigh-in-motion scales to develop a "smart" scales facility. Weight, credentials and safety history will all be electronically checked at one location at one time. The Utica weigh station site is proposed as the location for deployment of the first IH 90/94 "smart" scales facility with the Hudson facility proposed as a site to add automated safety inspections. The Utica site is identified for Year 2, however, the presence of bedrock at the site may require a longer time frame.

Phase 2 - 1.1.2 Expansion of Ramp Weigh-in-Motion Scales

This phase consists of installing ramp weigh-in-motion scales at the Lacrosse/West Salem and Kegonsa weigh stations.

Location: Preliminary Project Locations

In Year 2, Automated Safety Inspections and Weigh-in-Motion Scales will be implemented along I-90 at the current Utica facility site (southeast of Madison) and Automated Safety Inspections will be implemented along I-94 at the Hudson facility. These two locations are proposed due to heavy truck traffic between Minneapolis/St. Paul and Chicago.

In Years 3-5, addition of ramp weigh-in-motion scales is proposed for the Lacrosse / West Salem site on I-90 and the Kegonsa site on I-90.

Technology: The technology for this project will include an automatic vehicle classification system, a detection system, on-scale detectors, a traveler interface, a control system and a communications network.

Administration: The WisDOT Division that sponsors this project will either provide staff or hire a third party to manage the development. It is expected that WisDOT will hire contractors to complete certain portions of this project.

It is proposed that interested parties such as local jurisdictions, county highway representatives, motor carriers and other WisDOT divisions participate in the development of this project by serving on a committee that oversees the project development.

Time Frame: During the first year, lead WisDOT staff will be identified, the oversight committee will be formed and a plan will be developed for implementation. In the latter half of year 1, it is expected that the FTE weigh-in-motion maintenance position will be established.

In year 2, installation of automated safety inspections and weigh-in-motion scales will begin on I-90 at the Utica site and installation of automated safety inspections will commence on I-94 at the east Hudson site. In years 3 - 5 installation of weigh-m-motion scales will begin at the Lacrosse / West Salem and the Kegonsa sites.

Budget:

Year 1:	$20,000
Year 2:	$415,000
Year 3:	$395,000
Year 4:	$395,000
Year 5:	$400,000

Staffing: For project development & oversight only (in full-time equivalent person-years by year):

Year 1:	.50 FTE
Year 2:	1.00 FTE
Year 3:	1.00 FTE
Year 4:	1.00 FTE
Year 5:	1.00 FTE

Sponsor: WisDOT State Patrol or Division of Motor Vehicles is recommended to sponsor this project.

PROJECT 1.1 INFRASTRUCTURE

Functional Requirements:

In order to develop effective automated safety inspections and weigh in motion scales, a number of actions/activities need to be undertaken and are presented here *in* four categories; *General Applications, Data Collection, Information Dissemination* and *Database System*.

General Applications

The Weigh-in-Motion/Automatic Vehicle Classification. (WIM/AVC) system will be comprised of the following components at a minimum:

- High-speed WIM (mainline), or
- Low-speed WIM (Weigh Station/Point-of-Entry (POE))
- AVC equipment
- Detection system
- On-scale detectors
- Traveler interface .
- Weigh Station/POE control system
- Credentials database system

The above components will permit data/information, commands, and queries to be transmitted internally within the WIM/AVC system and messages to be transmitted externally to the commercial vehicles. These components and the communication system that links them together will result in the following functionality at a minimum:

- Obtain and record weight data
- Obtain and record vehicle classification data
- Process and compare data by vehicle
- Monitor and control components of the WIM/AVC system
- Transmit compliance messages to vehicles
- Access by third parties

It is anticipated that the WIM/AVC system will be capable of operating 24-hours-a-day, 7-days-a-week in all types of weather.

Data Collection

- Vehicle weight per axle
- Tandem axle weights
- Gross vehicle weight
- Vehicle speed
- Number of axles
- Axle spacings
- Vehicle classification/type
- Date and time stamp
- Lane number
- Vehicle height

On-scale detectors will ensure that vehicles passing over the WIM/AVC equipment are completely within the "active" weighing zone of the system (i.e., not lane-straddling, off-the-road or in a position where the vehicle cannot be properly weighed.) It is envisioned that the detector station(s) will collect vehicle speeds, "trigger" the start of the WIM/AVC sensors, and "trigger" the start of CMS units. It is anticipated that WIM/AVC system equipment may be placed in a mainline roadway lane or along weigh station access ramps.

All WIM/AVC installation locations are envisioned to take into account the following factors at a minimum:

- Vehicle acceleration/deceleration
- Vehicle speed
- Temperature variation
- Roadway grade
- Roadway geometry
- Traffic volume
- Pavement smoothness

Information Dissemination

It is envisioned that the WIM/AVC system will be capable of transmitting compliance messages to commercial vehicles either through a message on a changeable message sign or through a message transmitted to a unit installed inside the commercial vehicle.

Database System

WisDOT will establish and maintain a database system that will at a minimum include all Wisconsin based motor carriers and potentially include a listing of motor carriers nationwide. Information contained in the database will include data on Wisconsin safety inspections and other state inspections, FHWA records, accident history, driver information/hours of service, fuel permits, overweight/oversize permits, operating authority, enforcement history, etc.)

It is envisioned that WisDOT officials at the central office and at the individual weigh stations will have access to the database system.

Preliminary System Architecture:

This section discusses the overall preliminary system architecture for Project 1.1. It is envisioned that the WIM/AVC system will require the following components in order to achieve full operationality:

Field Sensor System

The field sensor system is responsible for accurate and timely collection of all of the data necessary for proper operation of the WIM/AVC system. The field sensor system is comprised of WIM sensors (both low

speed and high speed), AVC sensors, a detection system and on-scale detectors.

Traveler Interface

The traveler interface system is responsible for communicating the compliance message from the central control system to the motor carrier through the communications network. The traveler interface envisioned for the WIM/AVC system consists of a CMS unit and/or an in-vehicle unit.

Weigh Station/Point-of-Entry (POE) Control System

The central processing point for the entire operation is the Weigh Station/POE control system with associated workstation terminals. This system is responsible for obtaining all data from the field sensor system, for processing the data, for comparing the data to credentials stored on the database and for issuing a compliant or non-compliant status message to the traveler interface system. This control system will also have monitoring/controlling capabilities over all components of the local WIM/AVC system along with textual/graphical display capabilities at the workstation terminal. A control system will be located at each Weigh Station/POE and will be linked to WisDOT's central location that maintains the motor carrier database system.

Network Communication

A communications network is necessary to interconnect the entire WIM/AVC system. The communications network envisioned for project 1.1 consists of the following communications links:

Field Sensors to POE Control System. This link is for the transmission of the field sensor data (i.e. vehicle weight, speed, height, type, axles, etc.), to the central control system. Potential communications include fiber-optic, leased lines, cellular, spread spectrum radio, twisted pair and coaxial cable.

POE Control Systen to CMS Units. This link transmits compliance messages from the central control system to a changeable message sign for viewing by the motor carrier. Potential communications include fiber-optics, leased lines, twisted pair and coaxial cable.

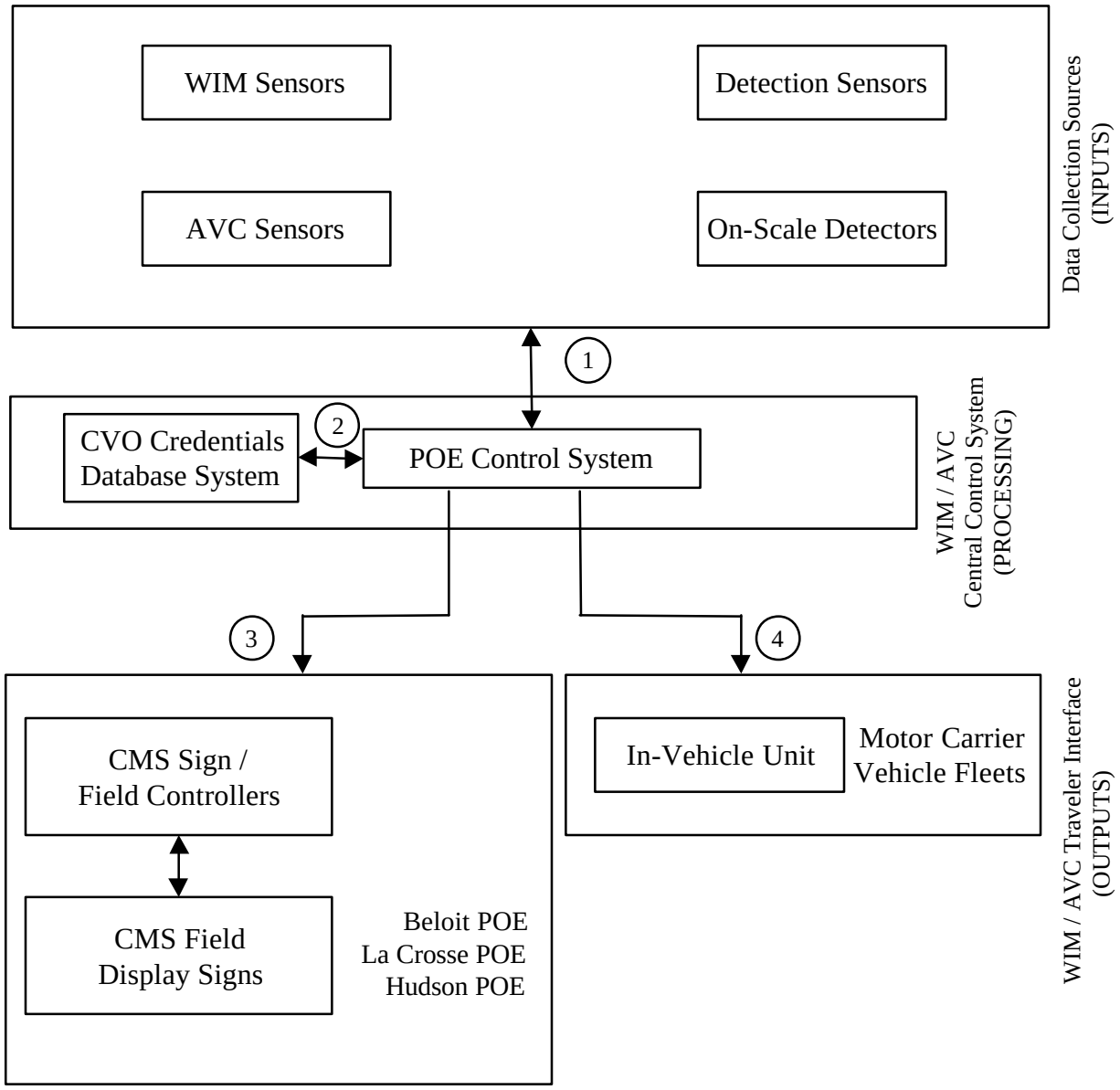
POE Control System to In-Vehicle Unit. This link transmits compliance messages from the central control system to an in-vehicle device for viewing by the motor carrier. Potential communications include radio frequency, microwave, infrared and spread spectrum radio.

Credentials Database System to POE Control System. This link will transmit information between WisDOT's central motor carrier database and each POE control system. Potential communications include the Wisconsin

State Patrol's microwave system, fiber-optics, leased lines and cellular telephones.

Data Flow: The following diagram illustrates the potential flow of data between the various components of the WIM/AVC system.

WIM / AVC SYSTEM
Data Flow Diagram



1. Fiber-Optic, Leased Line, Cellular, Spread Spectrum Radio, Twisted Pair, Coaxial Cable
2. Microwave, Fiber-Optic, Leased Line, Cellular
3. Leased Line, Fiber-Optic, Twisted Pair, Coaxial Cable
4. RF, Microwave, Infrared, Spread Spectrum Radio

PROJECT 1.2 OVERVIEW

Project 1.2: Purchase Credentials in Advance

Objective:

Operating a commercial vehicle requires credentials to be purchased such as oversize/overweight permits, an International Fuel Tax Agreement (ETA) license and decals, and an International Registration Plan (IRP) registration. A separate set of records is often maintained for each of these credentials and the data processing system is not easily accessible by third parties such as the State Patrol, other states, or motor carriers. Under this initiative, an electronic system will be established to allow motor carriers to purchase IFTA, IRP and oversize/overweight credentials in advance. This electronic system will use common data fields and information for all permits that are a part of the system and will permit third party access for entities such as other states, the State Patrol and inquiries from officials at weigh stations.

This system will result in more accessible and consistent information on motor carriers operating on Wisconsin roadways and will permit properly licensed commercial vehicle operators to have fewer service disruptions due to checks for credentials. Other potential benefits are an enhancement to WisDOT's information systems, a reduction in government costs and a reduction in time and cost to motor carriers.

Current Conditions:

Wisconsin is participating in a one-stop electronic purchase of credentials initiative, which allows operators to purchase oversize/overweight permits electronically. This initiative is being led by the Minnesota Department of Transportation and includes the following states: Wisconsin, Minnesota, Illinois, Missouri, Nebraska, North Dakota, South Dakota, and Kansas.

The current IRP data processing system used for Interstate commercial vehicles was established in 1978/79 and cannot be integrated with other data processing systems (either within Wisconsin or with other states). The Division of Motor Vehicles is presently seeking proposals to develop a new data processing system for IFTA and IRP credentials. One of the characteristics envisioned for the new data processing system for IFTA and IRP credentials is that information on IFTA and IRP credentials will be accessible by third parties (i.e., other WisDOT Divisions) and that common data fields will be used.

Scope:

This project is divided into the following phases:

Phase 1 - 1.2.1 Design and Develop Electronic System

This phase will consist of developing a plan to integrate an electronic data processing system for overweight and oversize permits that is

compatible with WisDOT's IFTA and IRP system currently under development.

Under this phase, WisDOT officials will also assess the possibility of coordinating the electronic pre-clearance initiatives in Wisconsin with the Advantage I-75 weigh station by-pass program.

Phase 2 - 1.2.2 Upgrade WisDOT Motor Carrier Record Keeping

Under this phase the plan developed in Phase 1 will be implemented.

Location: Preliminary Project Locations

As the IFTA, IRP and oversize/overweight automated systems are put in place and third party access is available, carrier access and deployment in facilities and Wisconsin State Offices will proceed as deemed appropriate.

Technology: The technology for this project will include a communications network, user interface, customized software that includes common data fields and a credentials database.

Administration: WisDOT Division of Motor Vehicles will oversee the development of projects in this program area with active participation by the Divisions of Business Management, Transportation Infrastructure/Development, Transportation Districts and State Patrol. It is expected that WisDOT staff will hire the services of an individual or firm with expertise in the area of electronic communications and software development.

It is proposed that other parties such as Wisconsin based motor carriers and other WisDOT divisions participate in the development of these projects by serving on a committee that oversees project development.

Time Frame: During the first year it is expected the WisDOT Division of Motor Vehicles will designate a lead staff person to oversee the development of these projects, that an oversight committee will be formed and that an initial plan will be developed. In the latter half of year 1, individuals or firms with expertise in the area of electronic communications and software development may be retained.

In years 2 and 3, work will begin on developing and implementing an electronic system for carriers to purchase oversize and overweight permits that is compatible with WisDOT's IFTA and IRP processing system.

It is expected that by the end of year 3 WisDOT will have in place a fully integrated electronic data processing system for IFTA, IRP and oversize/overweight permits that is also accessible to third parties.

Budget:

Year 1:	$0
Year 2:	$75,000
Year 3:	$500,000
Year 4:	$0
Year 5:	$0

Staffing: For project development & oversight only (in full-time equivalent person-years by year):

Year 1:	.25 FTE
Year 2:	.50 FTE
Year 3:	.50 FTE
Year 4:	.50 FTE
Year 5:	.50 FTE

Sponsor: WisDOT Division of Motor Vehicles is recommended to sponsor this project.

PROJECT 1.2 INFRASTRUCTURE

Functional Requirements:

In order to develop an effective system for electronically purchasing credentials, a number of actions / activities need to be undertaken. The functional requirements for this project will be based on those established for IFTA / IRP electronic system that WisDOT is currently seeking proposals on.

Preliminary System Architecture:

The system architecture developed for WisDOT's IFTA / lRP electronic system will be utilized for this project.

PROGRAM AREA 2: INCIDENT MANAGEMENT

PROGRAM AREA OVERVIEW

Description:

An important function to support throughout the I-90/94 Corridors is a coordinated incident management (IM) program that is capable of detecting and responding quickly and efficiently to a variety of incident types (e.g., accidents, stalled vehicles, spilled loads, HazMat spills, etc.).

A critical component of an IM program is a coordination center, where data from various locations can be gathered and reviewed by trained personnel to form an area-wide picture of events as they occur. This coordination center then becomes a support system for the incident response and clearance activities and a focal point for detection/verification and traveler information dissemination. Combining these functions in the same location also has the potential to improve the efficiency and consistency of incident response actions. Another component of the IM program proposed for the IH 90/94 corridors is the development of a standard IM Plan that will serve as an outline/template for each WisDOT District to develop a more detailed/customized IM Plan custom-made for their respective jurisdiction.

Development of each District IM Plan will be a multi-jurisdictional effort in order to capture the various views, insights, and steps necessary to minimize/mitigate an incident's impact on the Corridor. Paramount to developing an effective IM Plan is the formation of an I-90/94 Corridor IM Committee, responsible for establishing the standard for IM Plans and for their integration into existing day-to-day operations.

This program area also includes the development of a system to assist in detecting incidents and responding to incidents. Global Positioning Systems (GPS) could be installed on law enforcement, maintenance, and other selected vehicles to provide precise location information for responding to incidents. The use of cellular telephone service as a means to detect incidents will be promoted within this program area along with a system to locate the origin of cellular telephone calls. The capability developed under this program area will be greatly enhanced by the presence of the Wisconsin State Patrol's existing microwave communications system, the initiation of a cellular call-in and call origin locating system, the installation of GPS for location tracking of certain agency vehicles, and the use of a regional digital map system. These endeavors will allow IM Teams to better locate a reported incident, to move quickly and notify the appropriate agencies of real-time conditions within their jurisdiction, and facilitate greater coordination among the agencies involved.

Rationale: This program area addresses three of the top 14 problems identified during the development of the IH 90/94 Strategic Deployment Plan as follows:

- *Emergency service response time*
- *Congestion*
- *Delays related to construction projects*

This program area also relates to 18 of the 25 overriding factors established by the IH 90/94 Technical Team as follows:

- *Corridor-Wide Perspective*
- *Consistent with Translink 21*
- *Regional Consistency*
- *Regional Impact*
- *Integration w/Existing System*
- *Social/Economic Awareness*
- *Opportunity for Private Partner*
- *Meets Agency Expectations*
- *Meets Agency Perceptions*
- *Meets Agency Needs*
- *Serves Many*
- *User Acceptance*
- *An Early Winner*
- *Ease of Deployment*
- *Measures Performance/Benefits*
- *Risk/Benefits*
- *Maintenance/Operation*
- *Building Block Approach/Incremental*

Expected Results: The expected results of this program area include a more comprehensive and coordinated approach to detecting incidents and dispatching emergency response services. Incident management plans will be prepared that can be applied throughout the IH 90/94 Corridors. The IM system will be augmented by the use of communications and detection equipment, such as cellular telephones and Global Positioning Systems (GPS). The results of developing these systems is expected to reduce incident-related travel delays and improve emergency response times.

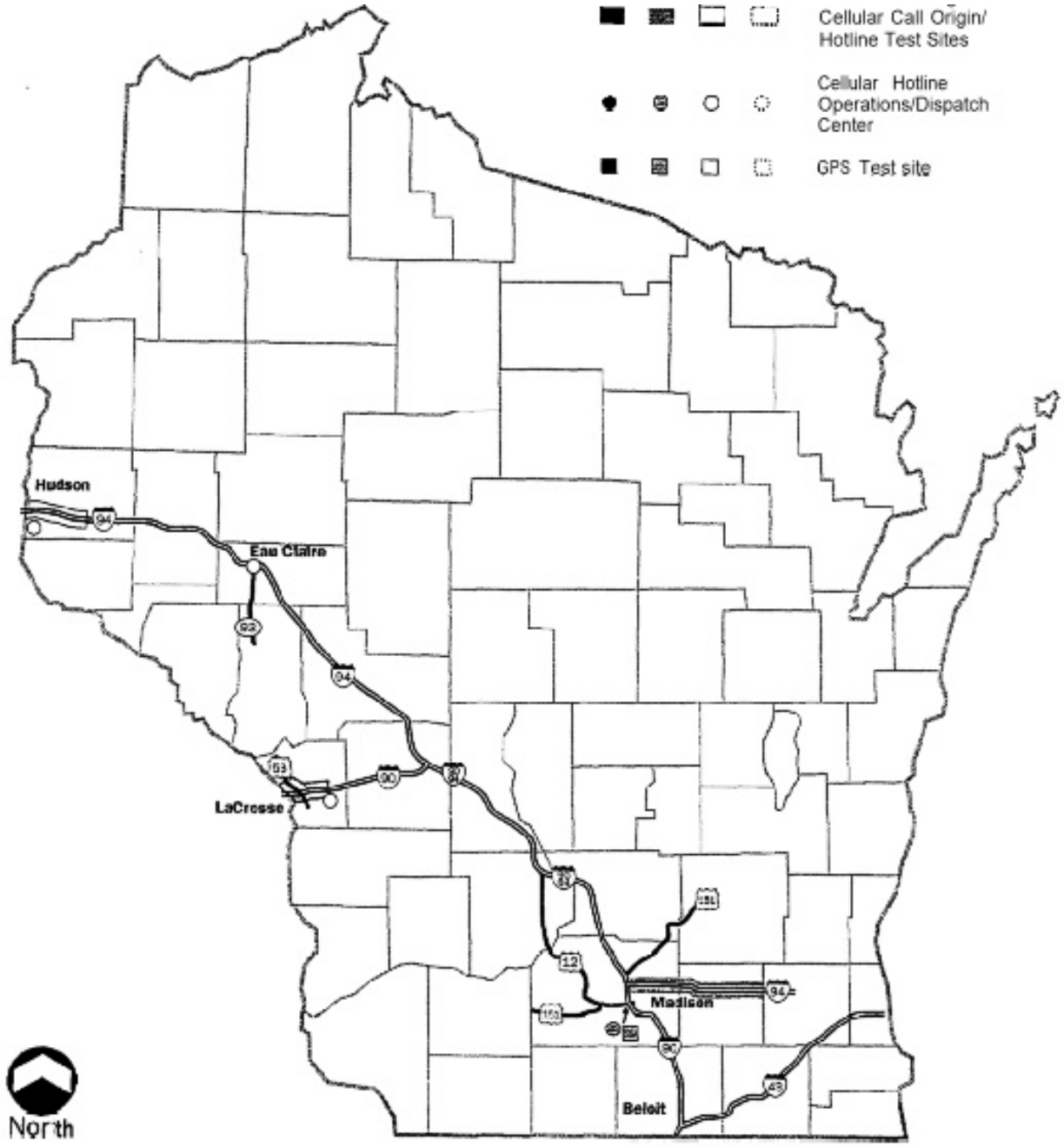
Incident Management is the ITS user service that will be provided under this program area.

Project Ideas Discussed But Not Selected:

All project ideas generated from the Technical Team's prioritization workshop and the Focus Group meetings are included in this program area.

Following is the proposed timetable for each of the projects under Program Area 2.

Program Area 2: Incident Management	Implementation Timeframe			
	Year 1	Year 2	Years 3 - 5	Years 6 -10
2.1 Develop an Incident Management Plan				
2.1.1 Establish an Incident Management Committee	X			
2.1.2 Establish Incident Management Test Sites		X	X	
2.2 Determine Origin of Cellular Telephone Calls				
2.2.1 Establish Test Sites		X	X	
2.3 Expand Use of Cellular Telephones				
2.3.1 Cellular Hotline & Operations/Dispatch Center		X	X	
2.3.2 Cellular Telephone Hotline Promotion		X	X	
2.4 Install GPS on Vehicles				
2.4.1 Establish Test Site in Dane County		X		


YR 1 YR 2 YR 3-5 YR 6-10 PROJECTS/PHASES
Cellular Call Origin/ Hotline Test Sites
Cellular Hotline Operations/Dispatch Center
GPS Test site
Hudson
Eau Claire
LaCrosse
Madison
Beloit
North

PROJECT 2.1 OVERVIEW

Project 2.1: Develop an Incident Management Plan

Objective:

Development of incident management plans focus on reducing the time to detect, verify and clear incidents. By reducing response and clearance times, victims of accidents will receive medical treatment more quickly, congestion duration will be reduced and the number of secondary accidents is expected to decrease.

Under this project a standard incident management plan will be developed that will serve as an outline to develop a detailed, customized incident management plan for their jurisdiction. Development of the individual incident management plans will be a multi-jurisdictional effort, include available alternate routes and focus on detecting, verifying and clearing incidents in the most efficient manner. The incident management plans will include an incident clearance plan. The potential benefits from this project are:

- Reduction in time to detect, verify and clear incidents and improve emergency service accessibility.
- Coordinated approach with incident management agencies.
- Integration in communications and detection equipment (cellular and GPS).

Current Conditions:

Since the late 1970's, agency officials in SE Wisconsin have recognized Incident Management activities as a key component of their freeway traffic management system. More recently, the advancement of such initiatives as Milwaukee's MONITOR Freeway Traffic Management System, the Gary-Chicago-Milwaukee ITS Priority Corridor, and the 1993 Regional Incident Management Conference, has led to the establishment of the Southeastern Wisconsin Incident Management (SWIM) program. SWIM is a formal, comprehensive, on-going incident management program for Southeastern Wisconsin which addresses urban and rural areas.

SWIM is an 18-month project that began in August, 1995 (and is scheduled to be completed in March, 1997) that focuses on developing a freeway Incident Management Plan that identifies both short and long-range implementation strategies to enhance evolving Incident Management structures and activities within the seven (7) county region of SE Wisconsin. At this time, SWIM is comprised of two (2) primary components: a Policy Group and a Technical Team. The Policy Group is comprised of several policy makers (e.g., WisDOT District and HQ managers, County/City engineers, Public Works commissioners, Sheriffs, etc.) that meet bi-monthly (quarterly after program's end) to provide direction and support for the permanent and on-going development,

implementation, and administration of a regional freeway Incident Management program for SE Wisconsin.

The Technical Team is comprised of day-to-day operations staff (e.g., operations engineers, technical staff, officers-in-the-field, EMS providers, towing firms, etc.) that meet monthly to provide "real-world" technical expertise and guidance on freeway Incident Management activities in order to ensure successful development and implementation of the Incident Management plan so that it achieves SWIM's objectives. Currently, these groups are working toward soliciting stakeholders needs and identifying problems and associated causes related to freeway Incident Management practices.

In addition to the SWIM project, the Wisconsin Interagency Incident Command System, (WIICS), has established an incident command system under which autonomous agencies operate together when responding to fires, floods, tornados or hazardous materials spills. WIICS was established in 1993 and includes the Badger State Sheriff's Association, Wisconsin Chiefs of Police Association, Wisconsin State Fire Chiefs' Association, Wisconsin DNR, Wisconsin Department of Military Affairs, U.S. Department of the Interior, and U.S. Department of Agriculture.

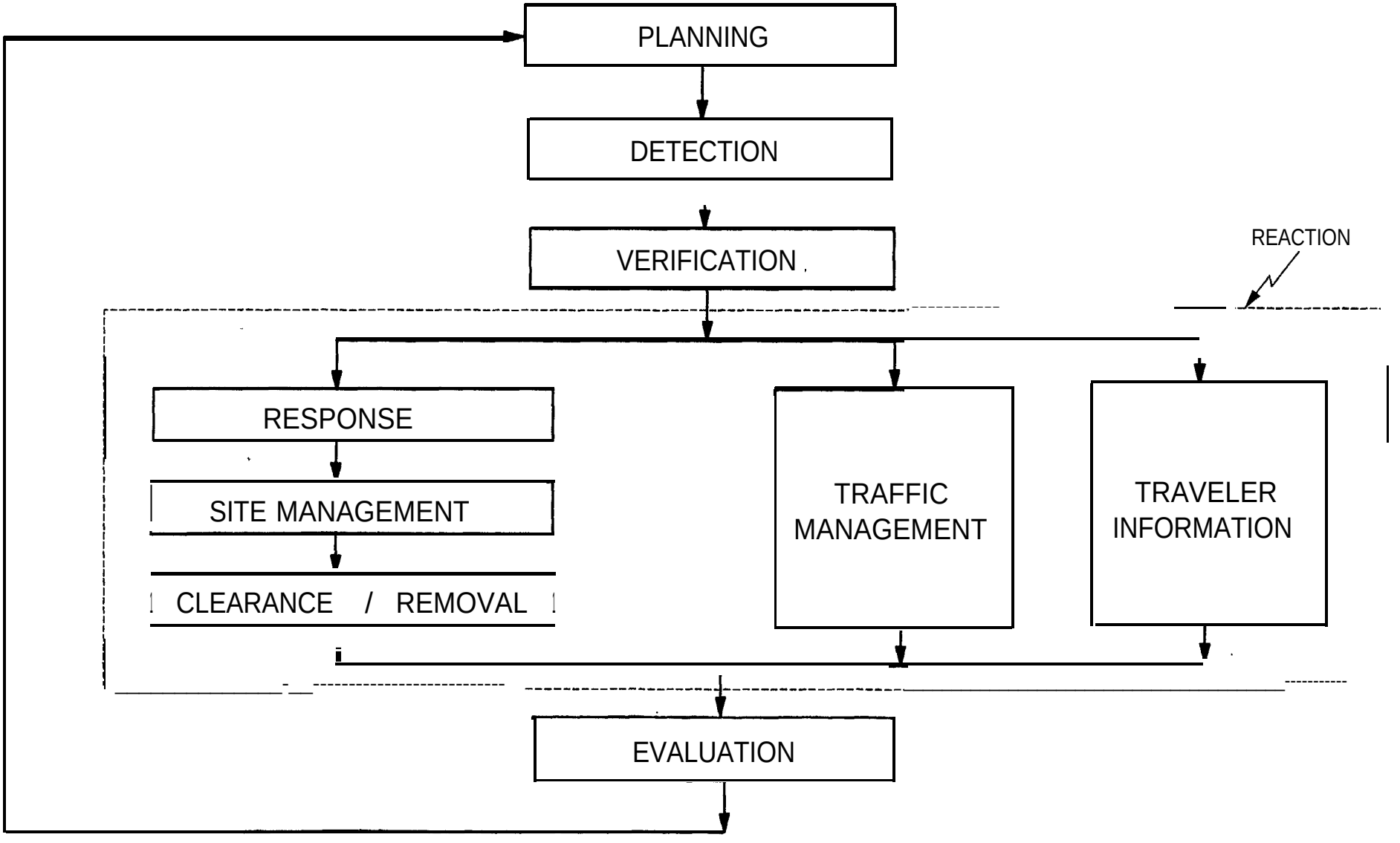
Scope:

A Corridor Incident Management Committee will be established to develop the policies, procedures, and strategies necessary for establishing operating protocols and agreements between WisDOT and the other involved agencies. *This initiative will be coordinated with the work underway and individuals involved in the SWIM program and the WIICS program.* A one year program will be undertaken by the Corridor Incident Management Committee in order to develop a strategic Incident Management Plan outline/template, operating agreements, and technology integration strategies. Each WisDOT Highway District will then have an opportunity to customize the "Master" Incident Management Plan, integrating the plan into their daily operations, and developing the capabilities needed to support the Incident Management Plan. The Corridor Incident Management Committee will meet on a regular basis after the initial, overall Incident Management Plan outline/template is developed in order to review and revise the plan as new information becomes available.

The graphic on the following page illustrates the SWIM program.

Southeastern Wisconsin Incident Management Program

THE INCIDENT MANAGEMENT PROCESS



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Scope: (continued)

This project is divided into the following phases:

Phase 1 - 2.1.1 Establish an Incident Management Committee

The Corridor Incident Management Committee will be responsible for establishing the "master" incident management plan. This committee will develop procedures, policies, and strategies for operating protocols and agreements between the WisDOT Districts and the other incident management agencies. Over a period of one year, the committee will develop a plan for each WisDOT District to develop their own customized plan, operating agreements, and technology integration. Each WisDOT Highway District would then be responsible for implementing those plans and developing the capabilities needed to support the overall plan.

The Committee will meet on a regular basis after the initial plan is developed to review and revise the plan as new information becomes available through the coordination efforts.

Phase 2 - 2.1.2 Establish Incident Management Test Sites

Incident management test sites within the affected WisDOT Districts will be established in a phased approach. Test sites will be used to assess the effectiveness of the incident management plans and to serve as a database to collect test site information so that improvements/ modifications to the plans can be recommended.

Location:

The first recommended Incident Management Test site is along I-94, between Madison and Milwaukee. Future test sites are recommended for I-SO/Highway 53 in the Lacrosse area and along I-94 near Hudson.

Technology:

Depending on the type and extent of incident management systems deployed, a variety of applications could be utilized such as technology for detection, verification, response, traveler information and communications.

Administration:

The WisDOT Division that leads this project will provide staff and may hire a third party to manage the committee, provide technical support and produce a written Incident Management plan.

The committee that is established should include representatives from the SWIM program, the WIICS program, law enforcement, towing services, emergency services, planning commissions, WisDOT Central Office, Wisconsin State Patrol, WisDOT Districts along with County, City and local officials.

Time Frame: A "master" Incident Management plan that can be customized for each of the WisDOT Districts will developed within one year. During the second year, individual districts will prepare customized incident management plans for their respective districts. Also, during the second year, an Incident Management Program will be implemented along I-94, between Madison and Milwaukee.

Budget:

Year 1:	$40,000
Year 2:	$120,000
Year 3:	$140,000
Year 4:	$140,000
Year 5:	$140,000

Staffing: For committee development & oversight only (in full-time equivalent person-years by year):

Year 1:	.33 FTE
Year 2:	1.75 FTE
Year 3:	1.75 FTE
Year 4:	1.75 FTE
Year 5:	1.75 FTE

Sponsor: WisDOT Highway Central Office or WisDOT District 1.

PROJECT 2.1 INFRASTRUCTURE

Functional Requirements:

In order to develop an effective Incident Management plan, a number of actions/activities need to be undertaken and are presented here in three categories; *Institutional, Procedural* and *Operational.*

Institutional

- Establish interagency structures and relationships to maintain close coordination, cooperation, and communication through the formation of the following groups:

  - Corridor Incident Management Steering Committee
  - Policy Groups
  - Technical Teams
  - Corridor Response Groups
  - Traffic Management Teams

- Agency and personnel contact lists should be established within the above groups.

- The following agencies should be active participants in the development of the IH 90/94 Corridor Incident Management Plan:

  - Representatives from the SWIM program
  - WisDOT (Central Office and Districts)
  - Wisconsin State Patrol
  - County Public Works Departments
  - County Sheriff Departments
  - Fire Fighting Agencies
  - Local Transportation Agencies
  - Local Law Enforcement Agencies
  - Regional Planning Commission
  - EMS Providers
  - Towing Firms
  - Transit Agencies
  - Media (e.g., TV, radio, Shadow/Metro Traffic, etc.)
  - Representatives from the WIICS program

- Develop policies, procedures, and guidelines necessary for establishing operating protocols, institutional agreements, a "master" Incident Management Plan outline/template, and technology integration strategies for all involved agencies.

- The development of the Incident Management program and all of its institutional, procedural, and operational Incident **Management** practices should be coordinated with those of SWIM and WIICS.

Procedural

- Develop a "master" Incident Management Plan that will serve as an outline/template for each WisDOT District to develop a more detailed/customized plan tailor-made for their respective jurisdiction.

- Individual WisDOT District Incident Management Plans shall be a multi-jurisdictional/agency effort in order to capture the various views, insights, and steps necessary to minimize/mitigate an incident's impact on the Corridor.

- Available alternate routes should be incorporated into the Incident Management Plans.

- The Corridor's Incident Management Program shall address the following incident types at a minimum:

  - Stalled Vehicles
  - Accidents
  - Spilled Loads
  - HazMat Spills
  - Disabled Vehicles
  - Adverse Weather Conditions
  - Maintenance/Construction Activities
  - Special Events

- Develop an Incident Management Plan that successfully manages the following incident stages at a minimum:

  - Planning
  - Detection
  - Verification
  - Response
  - Site/Scene Management
  - Traffic Management/Control
  - Clearance/Removal
  - Recovery
  - Dissemination of Traveler Information
  - Evaluation

Operational

- Solicit stakeholders' needs, identify problems and associated causes, along with potential solutions as they relate to freeway Incident Management practices.

- Utilize the following steps as a minimum when identifying key problems and defining user needs:

  - Needs Assessment Workshop
  - Stakeholder Survey
  - Follow-up Contact Meetings
  - Agency Interviews
  - Focus Group Meetings
  - Data Collection Efforts
  - Incident Management Group / Team Input

- Investigate and assess the effects of the following during the Incident Management problem identification phase:

  - Lack of freeway Incident Management evaluation data.
  - Inefficiencies related to reporting incidents (e.g., lack of public education / awareness program / campaign, lack of incident call-in / report system for public use, etc.).
  - Unclear jurisdictional responsibilities.
  - Lack of common communication system / frequency for involved agencies.
  - Inefficiencies related to agency coordination, cooperation, and communication.
  - Lack of consistent and "easy-to-use" freeway location identification signing and markings.
  - Lack of vehicle "quick-removal" legislation.
  - Lack of technical solutions to automatically detect and verify incidents in real-time.
  - Alternate routes not clearly defined.
  - Lack of timely, accurate, and relevant information.

- Identify additional problems that are more specific and representative of the Corridor.

- Investigate and determine the usefulness of the following during the Incident Management solution identification phase:

  - Establish common communication systems / procedures.
  - Prioritized potential solutions within the Incident Management Plan to obtain most cost-effective impact.
  - Conduct freeway modeling tasks in order to evaluate alternative Incident Management solutions.
  - Install additional CMS units at key, strategic locations.
  - Adopt vehicle quick-removal legislation.
  - Establish region-specific towing contract.

- Considerations during solution identification phase:

  - Provide pre-trip traveler information (e.g., enhanced l-800 ROADWIS, kiosks, etc.).
  - Establish cellular call-in system and promote usage/education of motoring public.
  - Increase "static" freeway location signing/markings.
  - Establish location-tracking system as part of cellular call-in program.
  - Implement freeway accident investigation sites (AIS).
  - Develop pre-planned (and mutually agreed upon) incident diversion routes.
  - Improve freeway/arterial coordination through integrated traffic signal operations.
  - Improve incident detection/verification through implementation of automatic incident detection algorithms.
  - Improve distribution of incident information to media outlets.

- Identify additional solutions that are more specific and representative of the Corridor (as necessary).

Preliminary System Architecture:

Institutional

As noted within the Functional Requirements section, various interagency structures/relationships within the IH 90/94 Corridor need to be established in order to maintain close coordination, cooperation, and communication between all of the involved Incident Management agencies. The oversight group for this effort will be the Corridor Incident Management Steering Committee. From this Committee, it is envisioned that a number of more "focused" Incident Management groups will be established such as Policy Groups, Technical Teams, Corridor Response Groups, and Traffic Management Teams. The hierarchical structure for these Corridor Incident Management groups will need to be established upon program start-up.

In addition, it is expected that various agencies will want to be involved within the Corridor's Incident Management operations in order to ensure comprehensive and successful Incident Management practices. These groups may include active participation from WisDOT (Central Office and Districts), Wisconsin State Patrol, County Public Works Departments, County Sheriff Departments, local transportation agencies, local law enforcement agencies, firefighting agencies, Regional Planning Commissions, EMS providers, fire fighting agencies, towing firms, transit agencies, and media interests (e.g., TV, radio, Shadow/Metro Traffic, etc.).

Procedural

The Corridor Incident Management Program shall develop a "master" Incident Management Plan that will serve as an outline/template for each WisDOT District to develop a customized Incident Management Plan for their respective jurisdiction. Development of each individual District Incident Management Plan shall be a multi-jurisdictional/agency effort in order to capture the various views, insights, and steps necessary to minimize/mitigate an incident's impact on the Corridor.

Operational

The Corridor Incident Management Program will solicit stakeholders' needs and identifying problems, associated causes, and potential solutions as they relate to freeway Incident Management practices. It is anticipated that these problems and causes will be identified through techniques similar to those listed in the "Functional Requirements" section. In addition, the list of problems and the list of solutions described within the "Functional Requirements" section shall be reviewed for their potential inclusion within the "master" Incident Management Plan. Additional Incident Management identification techniques, problems and causes, and solutions shall be identified upon program start-up.

PROJECT 2.2 OVERVIEW

Project 2.2: Determine Origin of Cellular Telephone Calls

Objective:

Many incidents on Interstates 90 and 94 are reported by motorists using cellular telephones. Properly identifying the location of an incident relies on the caller's familiarity with the area and ability to note landmarks, location of nearby roads and milemarkers. Unlike land-line telephone systems, the location of a call from a cellular telephone cannot be established in Wisconsin or most other States. Once a call is received procedures will be established for proper dispatching. The potential benefits from this project are:

- Improved ability to detect remote caller locations.
- Increase in efficiency of incident management dispatch/response.

Current Conditions:

At this time, the location of a call from a cellular telephone cannot be established in Wisconsin (or in most other States) like they can be for land-line telephone systems. However, recent technological and legislative advances imply that this situation is changing rapidly. On the technical front, the "Washington D.C. Area Traffic Flow Measurement Test" along the I-495/Capital Beltway is using cross-triangulation techniques between multiple cell sites/relay stations to locate/track cellular calls in an attempt to use these vehicles as traffic probes. This system for determining the location of cellular phones requires essentially simultaneous reception of cellular signals at three (3) or more receiving sites. Overall, most triangulation techniques either use cell stations or satellites as their reference points and some systems can even obtain a location/tracking accuracy within 10 ft.

Recent action by the Federal Communications Commission (FCC) also impacts this project. In July 1996, the FCC issued rules that require cellular providers and others to implement systems to locate wireless 911 callers. The FCC has specified a time period of five years for implementation.

Scope:

The initial step in this project is to conduct an inventory of cellular telephone service providers and services in the IH 90/94 corridors that will include plans that cellular providers have for introducing this technology. The next step will involve reviewing alternative technologies and then determining the role that WisDOT can play in accelerating the deployment of this technology. As this technology is made available procedures will be developed for dispatch centers to follow.

This project will culminate in the establishment of a test site(s) as follows:

Phase 1 - 2.2.1 Establish Test Sites for Determining Origin of Calls

Call origin test site(s) will be established within the affected WisDOT Districts. This test site(s) will be used to correctly identify the location of a cellular telephone call to an emergency communications center.

Location: The initial test site will be dependent on the area in which cellular telephone service providers first introduce technology to locate the origin of cellular telephone calls. It is recommended that every effort be made to develop an initial test site on I-94 between Madison and Milwaukee in conjunction with Project 2.1, Establish a "Mayday" System for Motorists in Need.

Technology: The project will include sensor stations equipped with directionally sensitive antennas and receivers that operate passively in the cellular radio frequency transmissions; inbound wireless communications from the cellular telephone to the sensor stations; and a control station to serve as the command center where directional information is combined with collateral environmental information.

Administration: Staff from the Wisconsin State Patrol or a third party supervised by staff from the Wisconsin State Patrol will conduct the initial work on this project. It is expected that the same staff overseeing project 2.3 will oversee this project and participate in the development of projects 2.1 and 2.4. An oversight committee will be established to direct the work and to coordinate this initiative with other projects in this program area.

Time Frame: During the first year an inventory of cellular telephone service providers and services in the IH 90/94 corridor will be conducted along with a review of alternative technologies and determining the role that WisDOT can play in accelerating the deployment of this technology. The second year will mark the initiation of a test to demonstrate this technology.

Budget:

Year 1:	$5,000
Year 2:	$20,000
Year 3:	$0
Year 4:	$0
Year 5:	$0

Staffing: For project development and oversight only (in full-time equivalent person-years by year):

Year **1:**	**.05 FTE**
Year 2:	**.05** FTE
Year 3:	**.05** FTE
Year 4:	**.05** FTE
Year 5:	**.05 FTE**

Sponsor: Wisconsin State Patrol - Central Office.

PROJECT 2.2 INFRASTRUCTURE

Functional Requirements:

A number of actions / activities need to be undertaken to establish a successful project to test and demonstrate a system to locate the origin of cellular telephone calls, and are presented here.

General Requirements

1) The cellular call locating / tracking system (a.k.a. location system) developed for the I-90 / 94 Corridor shall not require modifications or enhancements to the user's cellular telephone, PCS, or personal digital assistant (PDA) transmitting over a wireless system. There are two (2) primary methods to determine the location and calling number of cellular transmissions:

   - Multiple Sight Lines-of-Bearing (LOB) "Cross-Fixing" Systems; and
   - Single Site LOB Systems.

2) No additional spectrum shall need to be allocated for the location system.

3) The cellular stations shall be equipped with directionally sensitive antennas and receivers [i.e., Sensor Stations (SS)] that operate passively in the wireless phone frequency [i.e., radio frequency (RR)] bands.

4) The location system shall process the RF directional data through triangulation techniques, multi-dimensional parametric correlation, or some other proven algorithm to obtain the location of the calling vehicle.

5) The location system shall evaluate and display the identification and positional data for monitoring, analysis, and response.

6) The location system shall be capable of determining the cellular call location without the transmission of voice signals (i.e., it is only necessary that the cellular phone be turned on for control signals).

7) Procedures shall be developed for dispatchers to follow when they receive a cellular call they can identify.

Multiple Sight LOB "Cross-Fixing" System Operations

1) This system shall simultaneously obtain LOBs to the cellular phone (i.e., vehicle) from multiple cell sites / relay stations.

2) These LOBS shall be entered into computer algorithms containing triangulation techniques in order to compute a "cross-fix" of the cellular call location.

3) This system shall require a minimum of two (2) simultaneous LOBs in order to operate effectively.

4) Since obtaining multiple LOBs requires a relatively dense network of cellular stations, this system shall only be considered for more urban applications.

Single Site LOB System Operations

1) This system shall utilize a single LOB, roadway mapping system, and operator regional familiarity to determine the location and calling number of cellular transmissions.

2) In order to determine the cellular transmission location, this system shall assume that the calling vehicle is actually located on the roadway. Then, where the LOB and roadway intersect shall identify the position of the vehicle.

Coverage Area

1) Initially, the location system's test site(s) shall be established in those locations where cellular, and broadband PCS first establish their systems. (It is recommended that the initial test site be established along I-94 between Madison and Milwaukee in conjunction with Project #'s 2.1 and 2.3).

2) Ultimately, the location system shall be extended throughout the Corridor.

Preliminary System Architecture:

This section discusses the overall preliminary system architecture for the I-90/94 Corridor's cellular call locating/tracking system. The Corridor location system shall require, at a minimum, the following components in order to achieve full operationality.

Call-In Participants

The underlying assumption within the program is that "Project 2.3: Expand the Use of Cellular Telephones" will be undertaken. In this manner, call-ins to the Corridor's cellular call-in system shall be capable of being located per the location system.

Sensor Stations

The Sensor Stations (SS) shall be equipped with directionally sensitive antennas and receivers that operate passively in the cellular RF transmissions. The SS processes the RF directional data in order to obtain the location of the calling vehicle.

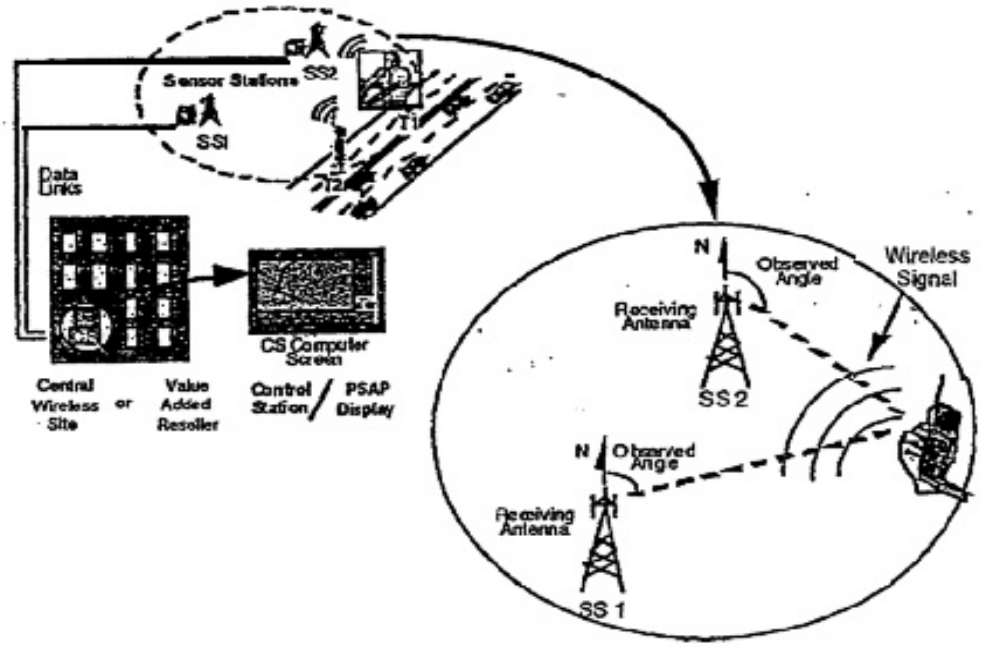
Communications

Inbound wireless communications from the cellular phone to the SS shall utilize cellular RF transmissions. Upon detection at the SS antenna sites, the calculated directional information is relayed via data link (e.g., fiber-optic, twisted pair, leased line, etc.) to the Control Station.

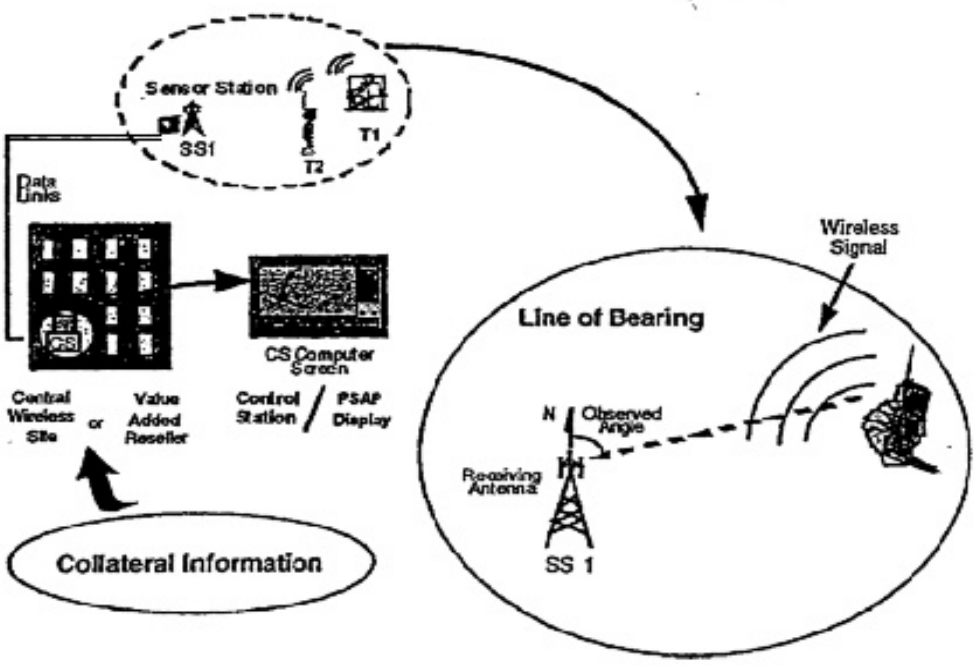
Control Station

The Control Station (CS) serves as the command center where the directional information is combined with collateral environmental information. The CS then evaluates the identification and positional data for monitoring, analysis, and response as well as displays the vehicle locations in tabular form and on a computer-based map.

Data Flow: The following page illustrates project data flow for Project 2.2.



Determination of Location with Multiple Sire LOB "Cross-Fixing" System



Determination of Location with Single Site LOB System

PROJECT 2.3 OVERVIEW

Project 2.3: Expand use of Cellular Telephones

Objective:

Cellular telephones are an important source of traffic and incident information from motorists using Interstates 90 and 94. Initiatives under this project will focus; (1) on encouraging motorists to call the appropriate officials with helpful information on interstate conditions and incidents; and, (2) establishing a separate number for non-emergency 911 calls. A plan to promote the use of cellular telephones will be developed and the present system for receiving, evaluating and passing the information on to the appropriate agency(s) will be reviewed. The potential benefits from this project are:

- Increased role of cellular telephone technology in the III 90/94 Corridors.
- Education of users on the distinction between emergency (911) and non-emergency (incident detection).
- Improved incident data collection and information dissemination by directing the efforts of cellular users in a coordinated approach.

Current Conditions:

Motorist cellular telephone call-ins are already an important source of traffic/congestion and incident/accident information along the I-90/94 Corridor. Presently, motorists are able to use a state-wide cellular 911 service or call the Public Safety agency (e.g., WSP, County Sheriff Dept., Local Police Dept. City Eng. Dept., County Public Works Dept., etc.) which they believe to be the appropriate/responsible party for the situation-at-hand. These agencies are then charged with either responding to the problem (if they are indeed the responsible party), receiving the information and relaying it to the true, responsible agency, or providing the number of the appropriate party to contact and directing the motorist to call them instead.

911 calls are handled and dispatched in different ways throughout the III 90/94 Corridors. For example, some 911 centers will dispatch fire fighters directly while other 911 centers will pass on the call to the local fire department.

Scope:

This project is divided into the following phases:

Phase 1 - 2.3.1 Cellular Hotline and Operations/Dispatch Center

A cellular telephone hotline system and dispatch center will be established to give motorists with cellular telephones the ability to report non-emergency 911 calls and other traffic related information. The dispatch center would be accessed by a three digit number and would be similar to the *999 cellular call-in system currently in operation in the Chicago area. As dispatch centers are established throughout the

IH 90/94 Corridors, a standard system will be established for receiving and dispatching calls.

A key element of the cellular hotline system is the ability to separate emergency calls (which would still be handled by the 911 emergency call system) from non-emergency calls. The hotline system would receive traffic data related to congestion, incidents (accidents, stalled vehicles), bad weather/road conditions, drunken drivers, malfunctioning roadway equipment or roadway surface failures, downed signs, etc. Callers would be able to relay the locations of these problems via the technology discussed in Project 2.2 that pinpoints caller locations to within one-tenth of a mile. In the future, this technology may also be able inform the caller if an accident site that he/she is attempting to report is already known, but to remain on the line if reporting another emergency.

Phase 2 - 2.3.2 Cellular Telephone Hotline Promotion

The aforementioned cellular telephone hotline and dispatching system will be promoted and "advertised" by a variety of methods, including billboards, "AAA" travel information and similar travel publications/brochures, and rest area kiosks. The objective of the advertising is to inform motorists of this service, to educate them as to its intended purpose, and to alleviate the number of non-emergency 911 calls.

Test segments of the cellular telephone hotline technology will be established in affected WisDOT Districts within the IH 90/94 Corridor. The first test site is recommended for I-94 between Madison and Milwaukee.

Location: The test sites for Project 2.1.2 (Incident Management), Project 2.2.1 (Cellular Call Origin), and Project 2.3.1 (Cellular Hotline) are proposed for the same location. In Year 2, the recommended test site is along I-94 between Madison and the eastern Jefferson County line. The Year 3 test site is recommended for the Lacrosse area along Hwy. 53 and part of I-90 east of Lacrosse. In Year 4, the test site is recommended for a 20-mile stretch in St. Croix County along I-94. Cellular hotline dispatch centers will be located near the test corridors in the appropriate years.

Technology: A dispatch/customer service center will be equipped with cellular communications capabilities, using the technologies described in Project 2.2.

Administration: Staff from the Wisconsin State Patrol or a third party supervised by staff from the Wisconsin State Patrol will conduct the initial work on this project. It is expected that the same staff overseeing project 2.2 will oversee this project and participate in the development of projects 2.1 and *2.4.* An oversight committee will be established to direct the work and to coordinate this initiative with other projects in this program area.

Time Frame: During the first year, the actions necessary to implement a successful cellular hotline and operations / dispatch center will be established and coordinated with the initiatives undertaken in projects, 2.1 and 2.2. In Year 2 a test site will be established along I-94 between Madison and the Jefferson County line and in Year 3 a test site will be established along Hwy. 53 and a portion of I-90 east of Lacrosse. In Year 4, a test site will be established along a 20 mile stretch in St. Croix County along I-94. For each test site, an initial and on-going promotion will be undertaken to inform travelers of the cellular call-in service.

Budget:

Year 1:	$65,000
Year 2:	$165,000
Year 3:	$90,000
Year 4:	$95,000
Year 5:	$100,000

Staffing: Staffing for this project will be coordinated with the staffing needs of other projects in Program Area 2 and is expected to require the following (in full-time equivalent person-years by year):

Year 1:	.43 FTE
Year 2:	1.35 FTE
Year 3:	1.35 FTE
Year 4:	1.35 FTE
Year 5:	1.35 FTE

Sponsor: Wisconsin State Patrol - Central Office.

PROJECT 2.3 INFRASTRUCTURE

Functional Requirements:

A number of actions/activities need to be undertaken to establish a successful project to establish and promote a cellular telephone call-in service, and are presented here.

System Operations

1) The I-90/94 Corridor cellular call-in system (a.k.a. Corridor call-in system) shall provide a central clearinghouse from which to perform its functions as a "voice-relay dispatch center" within the Corridor incident management scheme. The program shall contain the following functionality at a minimum:

- Call-taking responsibilities wherein the Corridor call-in service is responsible for receiving all types of cellular call-ins and informational requests, not just those related to roadways. The trained dispatch operators are responsible for securing the necessary information from each caller through a series of logical, insightful questions. In addition, dispatch operators need to be prepared for every type of variable even though the focus of the Corridor call-in operations are transportation-related.

- Call-in information evaluation will allow the dispatcher to compare/contrast the call-in report with those received previously, thereby establishing a high-level of information credibility, a succinctly detailed incident report, and a list of agencies to contact.

- Agency dispatching efforts will then see the dispatch operators relaying the pertinent details of the reported incident to the appropriate agency(s). The Corridor call-in system shall only contact various levels of government/public safety organizations (e.g., WisDOT, WSP, local law enforcement, traffic, and fire depts., EMS, transit authorities, etc.): no private companies shall be directly contacted (e.g., towing firms, AAA-type organizations, etc.).

- Dispatching training sessions are required in order to properly prepare the dispatchers for the program's call-taking, information evaluation, and agency dispatching operations. Formal training sessions (which utilize a phased approach) will be conducted since their important lessons form the heart of the program's information/system processing approach.

- Public relations efforts will see the undertaking of a PR campaign designed to inform the motoring public of the Corridor call-in system's existence, educate them as to its intended purpose and type(s) of calls that it is most properly-equipped to handle, and alleviate the number of non-emergency 911 calls. For safety reasons, the PR campaign shall also promote the use of cellular telephones equipped with speakers. (At this time, State law does not prohibit cellular calls while driving: need to monitor Wisconsin legislation for any changes). The Corridor call-in system shall be promoted/advertised through a number of methods including roadway-based signs, billboards, AAA travel information (and similar travel publications/brochures), local media outlets (e.g., TV, radio, newspaper, etc.), and rest area kiosks.

2) The Corridor call-in system shall establish an emergency dispatch and customer service center from which to perform this functionality.

Coverage Area

1) Initially, the Corridor call-in system shall establish test segment(s) in affected WisDOT Districts (1,2,5, and 6) in order to assess the program's performance. At this time, test site locations are as follows:

- Year 1–> I-94 between Madison and Milwaukee;
- Year 2 --> I-94 between Madison and Jefferson County line;
- Year 3 --> Lacrosse area along Hwy. 53 and part of I-90 east of Lacrosse; and
- Year 4 --> I-94 in St. Croix County (20-mile segment).

2) Ultimately, the Corridor call-in system shall cover the entire I-90/94 Corridor. (This will most likely be undertaken through a phased implementation approach.)

Hours-of-Operation

1) The Corridor call-in system shall operate 24-hours-a-day, 7-days-a-week.

Types of Call Received

1) The Corridor call-in system shall receive all types of cellular call-ins and informational requests, not just transportation-/roadway-related ones. The primary type of calls which the program will be equipped to receive/handle are as follows:

- Incidents (e.g., accidents, stalled vehicles);
- Traffic / congestion;
- Roadway conditions;
- Weather conditions;
- Drunk driving reports;
- Roadway surface failures;
- Downed signs, poles, etc.; and
- Malfunctioning traffic equipment.

2) Although not the focus of the program's operations, the Corridor call-in system shall be capable of receiving / handling emergency-type calls (e.g., conventional / typical emergency 911 calls, crimes-in-progress reports, requests for medical assistance, etc.).

Call-In Location Tracking

1) The Corridor call-in system shall utilize the systems, technologies, and approach identified in "Project 2.2: Determine Origin of Cellular Telephone Calls" to assist dispatchers in tracking the location of the incident call-ins.

2) The Corridor call-in system shall utilize a GIS mapping / database tool to assist dispatchers in tracking the location of the incident call-ins (as necessary with #l above).

3) The Corridor call-in system will be operated consistent with existing local, state and national privacy regulations.

General Requirements

1) The Corridor call-in system shall obtain the following information at a minimum from each received call (as appropriate):

- Type of incident (e.g., accident, spilled load, HazMat, stall, spin-out, etc.);
- Number of lanes blocked;
- Location (e.g., roadway name / number, incident direction of travel, mile marker, exit name / number, etc.);
- Number of vehicles involved;
- Vehicle description (e.g., license plate number, color, make, etc.);
- Injuries (Yes / No); and
- Agency on the scene (Yes / No).

2) The Corridor call-in system shall establish a specific dial-in number that is easily identifiable to the motoring public (i.e., like Chicago's "999).

Preliminary System Architecture:

This section discusses the overall preliminary system architecture for the I-90/94 Corridor cellular call-in system. The Corridor call-in system shall require, at a minimum, the following components in order to achieve full operationality:

Call-In Participants

The underlying assumption within this program is that, once established, the motoring public will actually use their cellular phones to call-in to the Corridor's system. Therefore, these call-in participants are a crucial source of information and critical to the overall success of the program.

Communications

Inbound communications between a call-in participant and the dispatch/customer service center shall be via cellular communications. If more than one center is desired, a communications network shall be required. Outbound communications between the dispatch/customer service center and the respective public safety organizations to contact shall be via regular telephone lines and cellular communications.

Dispatch/Customer Service Center

The dispatch/customer service center shall be the heart of the Corridor call-in system operations. It shall receive the motoring public's cellular call-ins, house the necessary dispatch operator workstations, support the dispatchers' information evaluation tasks, and allow for agency dispatching efforts. The dispatcher workstation shall provide a log to track usage, location of incident call-ins, type of incident, action taken, and response status.

Public Safety Organizations

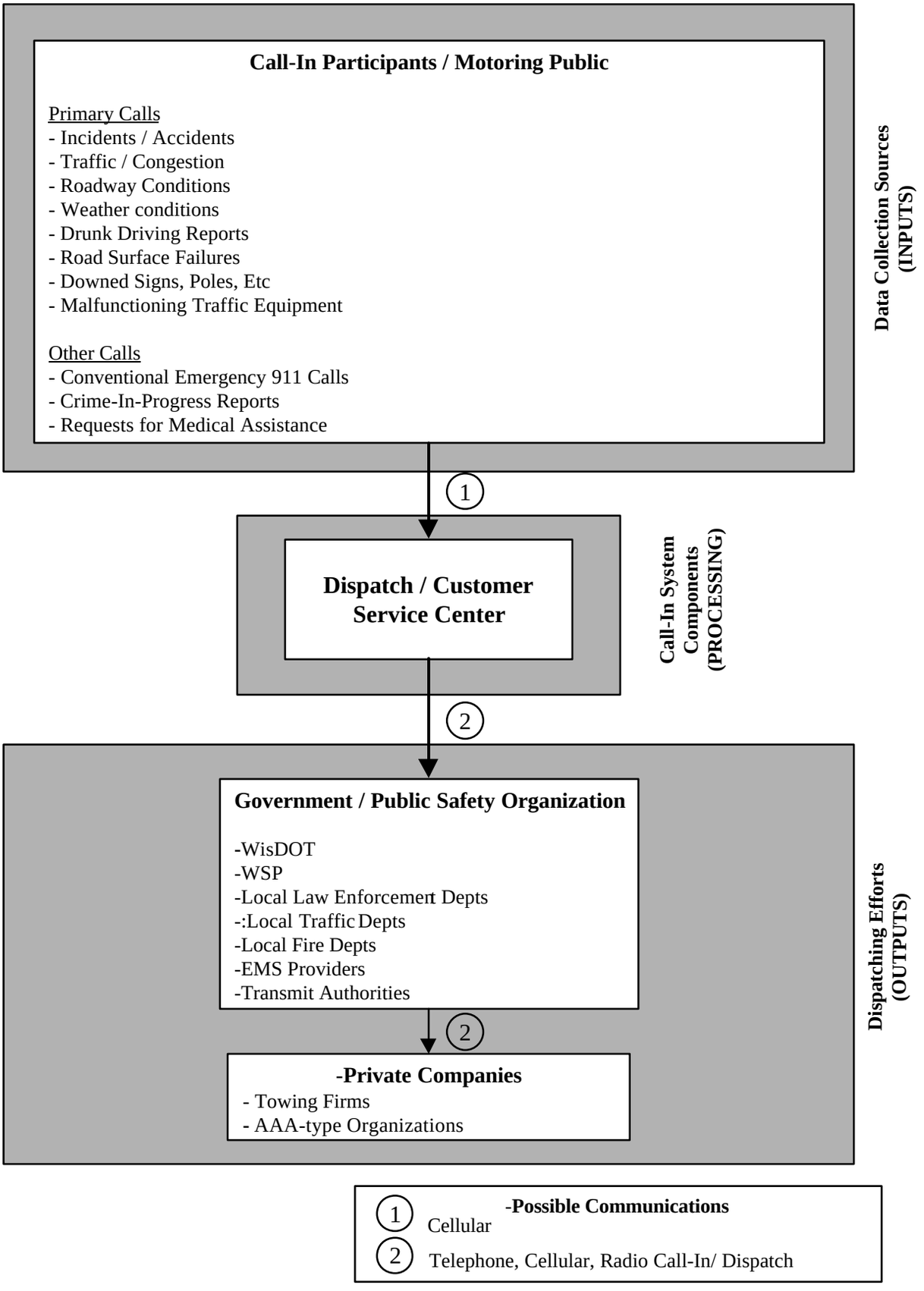
The various public safety organizations within the Corridor are responsible for responding to roadway incidents as soon as possible. Dispatchers will notify individual agencies of an incident and its pertinent characteristics (e.g., location, type, severity, etc.). These agencies in turn will be responsible for coordinating their incident response/clearance efforts via the policies and procedures developed in "Project 2.1: Establish an Incident Management Committee". In addition, the dispatchers will not contact any private companies with incident information: that is the responsibility of the public safety organizations.

Data Flow:

A data flow diagram appears on the following page for Project 2.3.

CELLULAR CALL-IN SYSTEM

Data Flow Diagram



PROJECT 2.4 OVERVIEW

Project 2.4: Install GPS on Vehicles

Objective:

Global Positioning System (GPS) equipment installed on vehicles can provide accurate information on a vehicle's location. With this information, dispatchers can quickly identify the vehicles that are best positioned to respond to an incident. A faster response time can reduce the duration of an incident and its associated congestion.

This project will demonstrate GPS technology and how it can decrease response times in the Dane County area near Madison. Within Dane County, a GPS test site and a specific fleet of vehicles will be targeted and equipped with GPS. Initially, it is envisioned that only those vehicles which are "in-the-field" a majority of the time (e.g., Wisconsin State Patrol, Dane County Sheriff, etc.) will participate. The potential benefits from this project are:

- Reduction in incident response times.
- Improved roadway traffic safety by immediate location detection and incident site dispatch.
- Reduced duration of an incident and traffic congestion.

Current Conditions:

Presently, there is no use of GPS on incident management fleet vehicles within the IH 90/94 Corridor Study area.

Scope:

This project will include the following phase:

Phase 1 - 2.4.1 Establish Test Site in Dane County

A demonstration of GPS technology will be conducted and an assessment will be made of its effectiveness in decreasing response times within the Dane County area near Madison. A GPS test site will be determined and specific incident management fleet vehicles will be targeted and equipped with GPS.

Location:

Within Dane County, a GPS test site and specific incident management fleet of vehicles will be targeted for the first year and equipped with GPS (those that are "in-the-field" the majority of the time, e.g., Wisconsin State Patrol, Dane County Sheriff, highway helper, etc.).

Technology: GPS utilizes a system of 24 earth-orbiting satellites to determine a vehicle's position. The accuracy of that location decreases when the vehicle is in an area with physical obstructions (e.g., tunnels, heavy tree cover, tall buildings, etc.) which obscure satellite line-of-sight. A GPS-based system requires that the vehicle be equipped with a receiver so that the vehicle can pick-up the satellite signals and calculate the vehicle location. This system would also require a transmitter in order to convey the vehicle's location to a central dispatch/monitoring facility.

Administration: Dane County Highway Department is recommended to provide administrative support services for this project.

Time Frame: This project is expected to be implemented by Year 2.

Budget:

Year 1:	$100,000
Year 2:	$178,750
Year 3:	$0
Year 4:	$0
Year 5:	$0

Staffing: For project development and oversight only (in full-time equivalent person-years by year):

Year 1:	**.50** FTE
Year 2:	.25 FTE
Year 3:	.10 FTE
Year 4:	.10 FTE
Year 5:	.10 FTE

Sponsor: Dane County Highway Department

PROJECT 2.4 INFRASTRUCTURE

Functional Requirements:

A number of actions / activities need to be undertaken to establish a successful GPS tracking and dispatching system and are presented here.

- **The GPS receiver shall be a self-contained unit.**
- **The** GPS receiver shall be a fully-automated device that requires minimal manual inputs.
- The GPS receiver shall be capable of receiving satellite(s) and ground station(s) GPS signals.
- The GPS receiver shall be capable of identifying its location with only two (2) GPS signal sources.
- The GPS receiver shall have an accuracy of position fixes within 100 meters.
- The GPS receiver shall have a self-diagnostic algorithm.
- The GPS receiver shall provide a means to indicate whether the receiver is working properly through the self-diagnostic algorithm.

Field Devices

Devices used in vehicles at a minimum should be capable of the following:

- The GPS receiver shall be designed for installation on the exterior of a vehicle and connected to a cellular phone (or other mobile communications terminal) through a twisted pair cable.
- The GPS receiver shall provide a means to transmit GPS signals through existing cellular communication technology.

Dispatch Workstations

The terminals used by the Dane County dispatchers should be configured at a minimum to perform the following functions:

- When the dispatch center receives the GPS data, the dispatch workstation monitor shall display the vehicle location on a digitized map along with request type (emergency or non-emergency) and identification of the vehicle.

- The dispatch workstation should be capable of sending a help call acknowledgment message to the vehicle's equipment.

- The dispatch workstation shall identify the closest appropriate response agency or vehicle.

Preliminary System Architecture:

This section discusses the overall preliminary system architecture for the GPS system. At a minimum, the GPS system shall require the following components in order to achieve full operationality:

GPS Receiver

The GPS receiver provides accurate vehicle location information to the dispatch center. It shall be a small component which is installed on the exterior of the vehicle. The GPS receiver shall have an aesthetically-pleasing appearance and work reliably in extreme weather conditions.

Communications

Communications between the vehicle and the dispatch center will most likely be through a communication network using cellular technology.

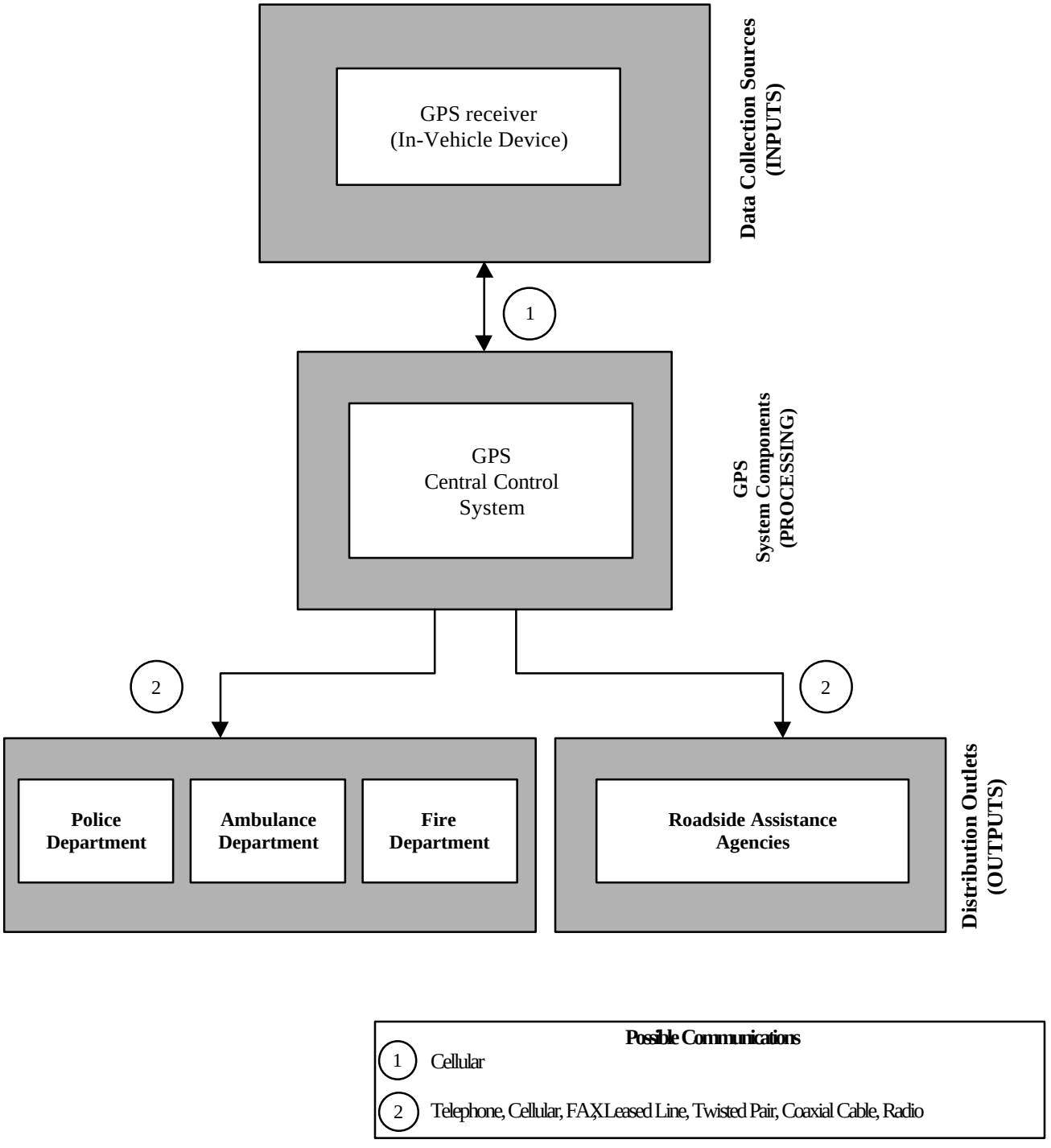
Dispatch Center

The dispatch center shall have a dispatch workstation that will utilize a Graphical User Interface operating system. A Geographical Information System application software package should be utilized for the dispatch workstation to be capable of inputting, analyzing, managing, and displaying all forms of spatial data on a digitized map. In addition, the digitized map shall support several zooming levels and display detailed information.

Data Flow:

The diagram on the following page illustrates the data flow for Project 2.4.

GPS SYSTEM
Data Flow Diagram



PROGRAM AREA 3: EMERGENCY MANAGEMENT SERVICES

PROGRAM AREA OVERVIEW

Description:

Efficient management and use of emergency equipment is an important contributor to a safe transportation system. Assignments of response vehicles to cover reported incidents at the incident scene can be accomplished more effectively based upon accurate knowledge of current vehicle location and traffic condition.

This program area will support the development of automated Mayday capabilities. Two capabilities would be offered with this service: driver and personal security and automatic collision notification. Driver and personal security capabilities will provide for user safety by activating distress signals indicating a need for emergency services for incidents like mechanical failures. The second capability is activated by an incident, and automatically transmits collision information regarding location, nature **and severity** of the crash to emergency personnel.

Rationale:

The top problems in the IH 90/94 Corridors that are addressed under this program area are:

- *Emergency Services Response Times*

This program area also supports 16 of the 25 overriding factors established by the IH 90/94 Technical Team, as follows:

- *Corridor-Wide Perspective*
- *Regional Consistency*
- *Regional Impact*
- *Social/Economic Awareness*
- *Opportunity for Private Partner*
- *National Impact*
- *Meets User Expectations*
- *Meets User Perceptions*
- *Meets User Needs*
- *Meets Agency Expectations*
- *Meets Agency Perceptions*
- *Meets Agency Needs*
- *High Visibility*
- *User Acceptance*
- *Measures Performance/Benefits*
- *Risk/Benefits*

Expected Results:

This project will initiate an emergency notification and personal security management system that will decrease response times. The resulting time savings is expected to improve the ability to save lives and to expediently contain hazardous material spills. ***Emergency Notification and Personal*** Security is the ITS user service that will be provided under this program area.

Project Ideas Discussed But Not Selected:

During the development of the strategic deployment plan, other project ideas were considered, but are not included in the final plan. These project ideas are not part of the strategic deployment plan since they did not address a minimum level of IH 90/94 problems and/or overriding factors or did not incorporate ITS Technology. These project ideas are listed below:

- Additional Training for Emergency Responders

Following is the proposed timetable for each of the projects under Program Area 3.

Program Area 3: Emergency Management Services	**Implementation Timeframe**			
	Year 1	**Year 2**	**Years 3 - 5**	**Years 6 - 10**
3.1 Establish a "Mayday" System for Motorists in Need				
3.1.1 Develop Functional Requirements and Specifications	**X**	**X**		
3.1.2 Establish Test Site in Lacrosse		**X**		

PROGRAM AREA 3

Emergency Management Services

YR1 YR2 YR3.5 YR6-10 PROJECTS/PHASES

Mayday Test Site

PROJECT 3.1 OVERVIEW

Project 3.1: Establish "Mayday" System for Motorists in Need

Objective:

Under this project a personal security system for motorists will be developed for implementation throughout the IH 90/94 corridors. The personal security system will be designed to help motorists get immediate assistance with medical emergencies, mechanical problems and to quickly contact the appropriate emergency service provider. The potential benefits from this project are:

- Improved safety through a low-cost automated system.
- Identification of the necessary structure, responsibilities, and service level goals of a Mayday dispatch center to assess benefits and efficiency.
- Identification and evaluation of human factors issues associated with this approach.

Current Conditions:

Wisconsin has recently made it possible for mobile telephone owners to access the 911 emergency response center via cellular telephones. As long as motorists are within cellular coverage areas, motorists with cellular phones can access the normal array of emergency services available to users of typical land-lines. Wisconsin does not have any motorist aid telephones located along its roadways.

Minnesota Guidestar is undertaking the "Mayday Plus Initiative" that covers a 60-mile radius from Rochester, Minnesota, and includes a portion of III-90 near Lacrosse.

Scope:

This project is divided into the following phases:

Phase 1 - 3.1.1 Develop Functional Requirements and Specifications

Functional requirements and detailed specifications will be developed initially for a test deployment and then for the corridor-wide deployment of a Mayday system.

Phase 2 - 3.1.2 Establish Test Site in LaCrosse

The first Mayday test location will be near the Lacrosse area to coordinate with the Mayday Plus Initiative. This initiative is sponsored by Minnesota Guidestar and is an accident location and severity notification system within a sixty-mile radius from Rochester, Minnesota. A portion of IH 90 near Lacrosse is located within this radius **and may** therefore have operational and technological exchange capabilities for this part of the III 90/94 Corridor, particularly if the Mayday Plus coverage is expanded, as planned, in the future.

PROJECT 3.1 INFRASTRUCTURE

Functional Requirements:

General Applications

- The Mayday system shall be comprised of the following components at a minimum:

  - Field Devices. Equipment used to activate and transmit information from the vehicle to the dispatch center when an emergency arises.

  - Dispatcher Workstation. Equipment housed in the dispatch center which receives distress calls/information from the vehicle and displays the location and severity of the vehicle-in-distress on a digitized map to the operator.

Field Devices

- The field devices shall provide a means to manually and automatically summon assistance.

- The field devices shall contain a button box that supports manual call-ins for assistance. The button box shall contain three (3) buttons at a minimum as follows:

  - Emergency Button. This button shall call for police, ambulance, and fire departments.

  - Non-Emergency Button. This button shall call for roadside assistance agencies.

  - Test Button. This button shall allow users to place a test call in order to test the functionality of the system.

- The button box shall provide a means to acknowledge a successful call for help.

- The field devices shall support automatic calls for emergency situations through the provision of in-vehicle crash sensors.

- The field devices shall include GPS receivers that automatically determine the vehicle's position (Please refer to "Project 2.4: Install GPS on Vehicles" for more details).

- The field devices shall include a mechanism to determine vehicle ownership.

- The field devices shall work reliably under extreme weather conditions.

Data Collection

1) The Mayday system shall provide the following information from the field devices at a minimum:

   - Vehicle location;
   - Nature of emergency;
   - User ID; and
   - Type of emergency.

Dispatcher Workstations

1) The dispatcher workstations shall support the existing enhanced E-911 land-line based telephone services.

2) The dispatcher workstations shall support the following at a minimum:

   - Caller Identification. The cellular telephone number and vehicle ownership shall be available to the dispatch workstation.

   - Call Forwarding. The telephone facility shall have the capability to forward incoming calls either internally or to outside response agencies.

   - Call Queuing The Mayday system shall be capable of receiving and managing multiple simultaneous calls.

   - Recalling As a minimum, the Mayday system shall be able to call back the vehicle operators in case of communication failure.

3) The Mayday system shall receive all of the data from the in-vehicle unit within 60 seconds of the start of the transmission.

Preliminary System Architecture:

This section discusses the overall preliminary system architecture for the Mayday system. The Mayday system shall require, at a minimum the following components in order to achieve full operationality:

GPS System

(Please refer to "Project 2.4: Install GPS on Vehicles.")

Communication

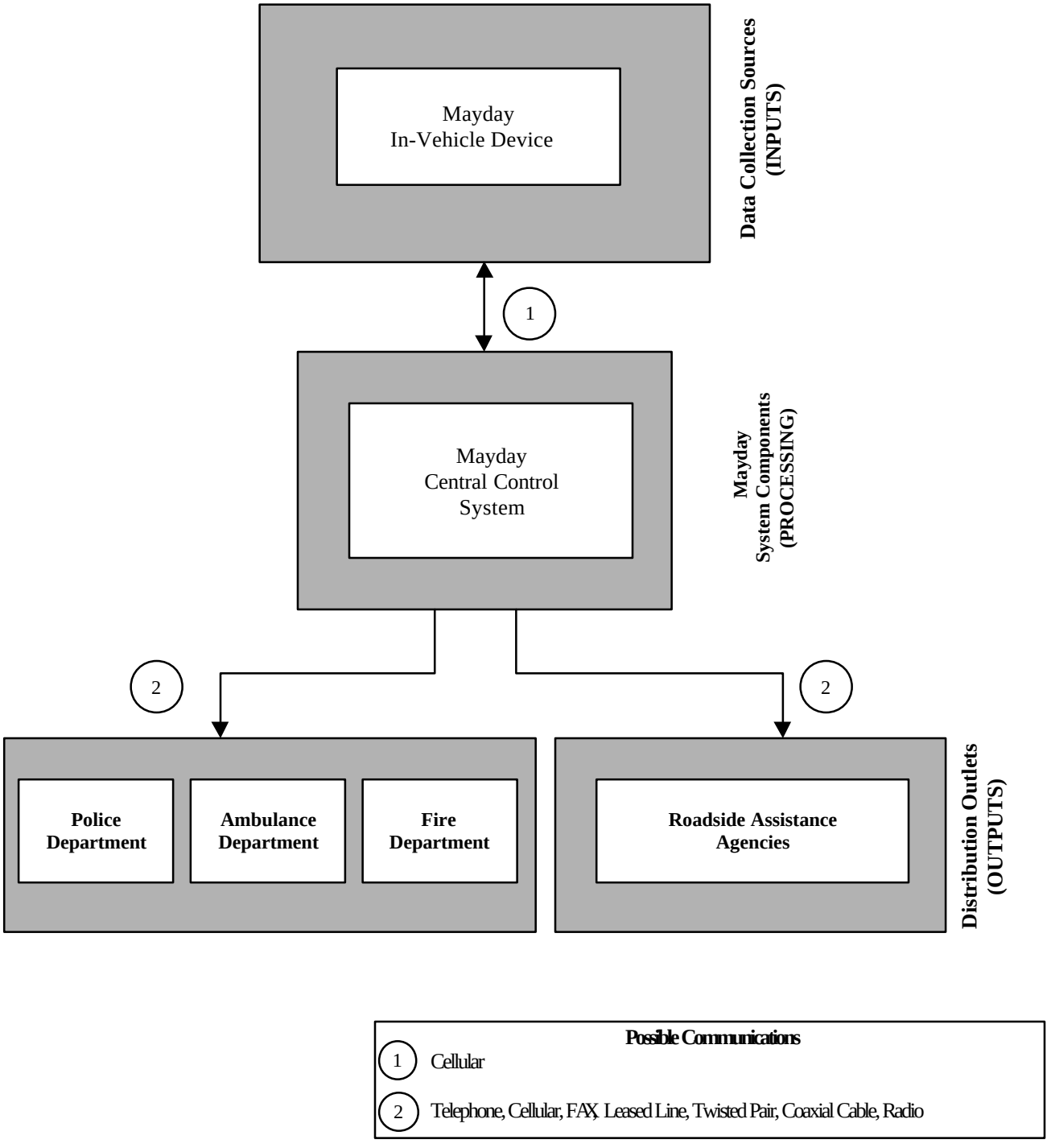
Communications between the vehicle and the dispatch center will most likely be via a cellular communication network. If more than one center is desired, a communication network will be required.

Dispatch Center

The dispatch center is the brain of the system. The dispatch center receives distress signals from motorists using a GPS receiver and determines the appropriate action through the use of a dispatcher workstation. The dispatcher workstation shall provide a log to track usage, location of distress signal, type of distress, action taken, and response time. In addition, the log shall include equipment and communication working status (i.e., online or fail).

Data Flow: The graphic on the following page illustrates Project 3.1's data flow.

MAYDAY SYSTEM
Data Flow Diagram



PROGRAM AREA 4: REGIONAL MULTIMODAL TRAVELER INFORMATION

PROGRAM AREA OVERVIEW

Description:

Providing timely travel information will enable the public to make informed transportation choices. An integrated source of roadway and transit information can provide a comprehensive and integrated view of the roadway and travel conditions throughout the IH 90/94 Corridors. Users such as travelers, traffic managers, transit operators and motor carriers may use this information directly. Additionally, the private sector may elect to m-package the information and provide it as part of a marketable value-added service. The information repositories may be either centralized systems (i.e. housed and managed in one facility) or distributed systems (housed and managed in separate facilities) that directly receive roadway and transit information from the various roadway surveillance systems and other information sources, either public or private. Data will be combined from various sources, which will allow data packaging in a variety of formats and provision of information through a variety of media, including telephone voice and data services, radio and TV broadcasts, kiosks, computer-based (e.g., Internet) services, etc.

Many options exist for either public or private sector distribution of transportation information. Traveler information may be provided directly to Information Service Providers (ISP's) who can supplement it with additional information, features and services, then market the enhanced service products.

This program area includes three primary project areas to provide pre-trip, en-route traveler, and transit schedule information for travelers. The pre-trip traveler information project will expand the l-800 ROADWIS system and establish an Internet home page with travel and weather information. The en-route traveler information project will expand the use of changeable message signs, establish a statewide highway advisory radio, provide traffic information to cellular telephone customers, install automated interactive kiosks and automated road condition warning signs, and establish a portable travel time reporting system. The transit schedule information project will provide an automated, call-in service for travelers using public transit services throughout the State of Wisconsin.

Rationale:

The top problems in the IH 90/94 Corridors that are addressed under this program area are:

- *Lack of alternative route information*
- *Limited pre-trip travel information*
- *Need for current travel & road condition information*
- *Delays related to construction projects*
- *Congestion*

This program area supports 17 of the 25 overriding factors established by the IH 90/94 Technical Team.

- *Corridor- Wide Perspective*
- *Safety*
- *Funding/Sponsor - Opportunity for Private Funding*
- *Serves Many*
- *Consistent with Translink 21*
- *High Visibility*
- *An "Early Winner"*
- *User Acceptance*
- *Risk/Benefits*
- *Ease of Deployment*
- *Social/Economic Awareness*
- *Regional/National Impact and Consistency*
- *Maintenance/Operation*
- *Meets User/Agency Expectations, Needs & Perceptions*
- *Building Block Approach/Incremental*
- *Measures Performance/Benefits*
- *Integration w/Existing Systems*

Expected Results:

The expected results of implementing the three regional multi-modal traveler information projects include the following:

1. Regional coordination in collecting, processing, and presenting traveler information;

2. Timely and comprehensive data made available to travelers in the IH 90/94 Corridors; and,

3. Readily-accessible and "user friendly" information for meaningful use to the traveler; and, deployment of a wide range of communication media (broadcast radio, cellular telephones, the Internet, Cable TV) for access through a variety of devices/locations (home/office computers, TV monitors, kiosks, and radio in homes, offices, ground and air transportation hubs, and personal/transit vehicles) to fully utilize available electronic communication sources.

En-Route Driver Information, Pre-Trip Travel Information, and ***Public Transportation Management*** are the ITS user services that will be provided under this program area.

Project Ideas Discussed But Not Selected:

During the development of the strategic deployment plan, other project ideas were considered, but are not included in the final plan. These project ideas are not part of the strategic deployment plan since they did not address a minimum level of IH 90/94 problems and/or overriding factors or did not incorporate ITS Technology. These project ideas are listed below:

- More Coordination Between All Transit Sectors
- Coordinate Transfer Times
- Coordinate Multiple Use of Vehicles
- Computer Assisted Dispatch & AVL
- Plastic "Debit Card" for Transit Fare Payment

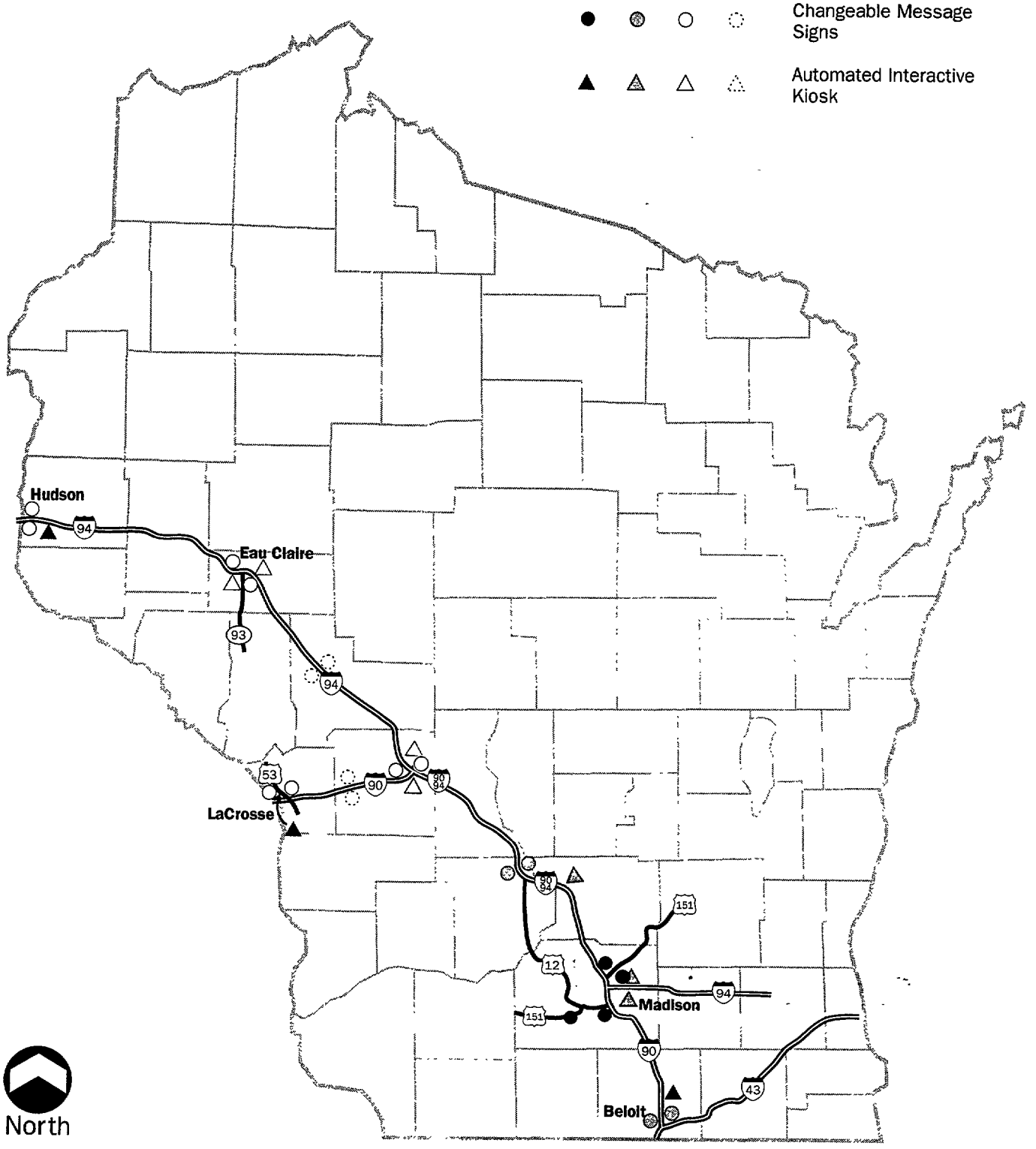
Following is the proposed timetable for each of the projects under Program Area 4.

Program Area 4: Regional Multimodal Traveler Information	Implementation Timeframe			
	Year 1	**Year 2**	**Years 3 - 5**	**Years 6 - 10**
4.1 Provide Pre-Trip Traveler Information				
4.1.1 Expand l-800 ROADWIS Automated Telephone Information Service	X	X		
4.1.2 Expand Home Page Information on the Internet	X	X		
4.2 Provide En-Route Traveler Information				
4.2.1 Expand Use of Changeable Message Signs	X	X	X	X
4.2.2 Establish Corridor-Wide Highway Advisory Radio	X	X	X	X
4.2.3 Provide Formation via Cellular Telephone	X	X	X	X
4.2.4 Install Automated Interactive Kiosks	X	X	X	X
4.2.5 Install Automated Road Condition Warning Signs	X	X	X	X
4.2.6 Establish Portable Travel Time Reporting System	X	X	X	X
4.3 Provide Transit Schedule Information via Automated Service				
4.3.1 Develop Functional Requirements and Specifications			X	
4.3.2 Automated Transit Schedule Test			X	

PROGRAM AREA 4 (PART A)

Multimodal Information Sites

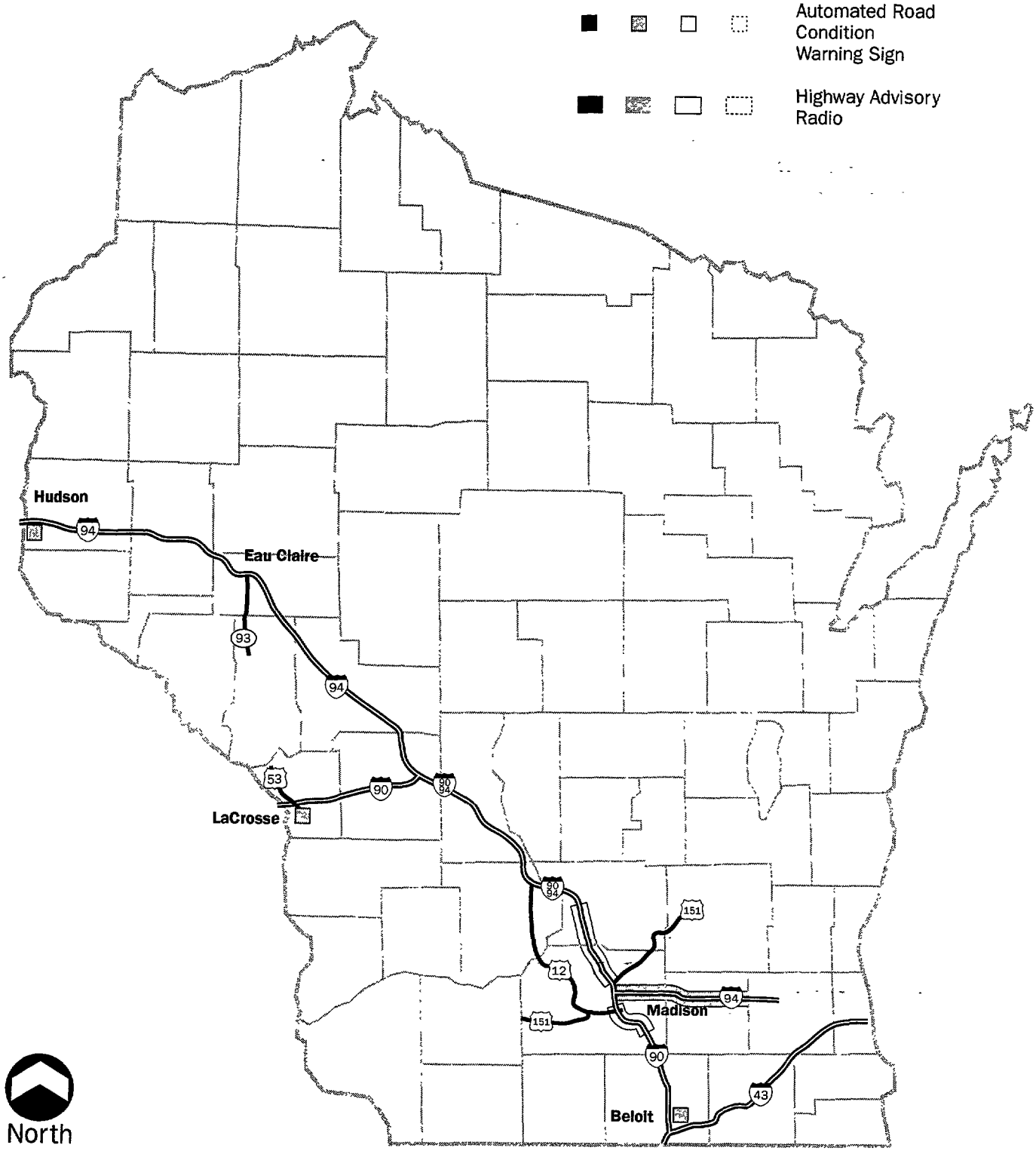
YR 1	YR 2	YR 3-5	YR 6-10	PROJECTS/PHASES
●	◍	○	◌	Changeable Message Signs
▲	◬	△	◬	Automated Interactive Kiosk



PROGRAM AREA 4 (PART B)

Multimodal Information Sites

YR 1	YR 2	YR 3-5	YR 6-10	PROJECTS/PHASES
■	▩	□	⬚	Automated Road Condition Warning Sign
■	▩	□	⬚	Highway Advisory Radio



PROJECT 4.1 OVERVIEW

Objective:

Under this project, useful information on travel and weather conditions in the IH 90/94 corridors will be made available to travelers prior to leaving their destination. One way of supplying this information is to provide additional information through the existing l-800 ROADWIS automated telephone information service. A second way of providing pre-trip traveler information is through the expansion of WisDOT's home page on the Internet. The potential benefits from this project are:

- Pre-trip traveler information that assists motorists in making informed decisions concerning:
  - mode choice
  - route choice
  - travel/departure time choices
- Improved highway traffic safety, decreased congestion, and mitigation of the problems associated with recurring and non-recurring congestion through the provision of timely, relevant, and accurate pre-trip Road Report traffic advisory information.
- A centralized source of transportation information that is easily accessible by the motoring public.

Current Conditions:

The Road Report system has been in existence since November 1990. Since that time, it has been operated by the Wisconsin State Patrol (WSP) at a cost of $70,000 per year (1994 data). In the past five to six years, it has helped countless motorists reach their destination in a safe and efficient manner.

The State of Wisconsin's l-800 ROADWIS "Road Report" telephone advisory system provides transportation information to dial-in callers all year, 24 hours a day, 7 days a week.

The Road Report system has two seasonal operation schedules:

- Winter Season. The Road Report system's winter season extends from November 1st through April 1st. During this five month period, the Road Report system only broadcasts valid, current roadway conditions information (e.g., roadway closed, icy/wet/snowy pavement, scattered slippery spots/stretches). At this time, **the Road Report system does not broadcast any other type of** information **(e.g., traffic/congestion conditions, incident/accident information, environmental/weather** conditions, roadway construc-**tion and detour information)** in the winter season. Road Report **information is updated at least four times per day at 6 AM, 10 AM, 3** PM, and 7 PM. This schedule is flexible and accommodates changes in the updating frequency dependent upon

prevailing roadway conditions and staff availability. Road Report data is collected by Districts from information sources approximately every 30-45 minutes, then forwarded to the State Patrol's Central Office for distribution.

- Construction Season. The Road Report system's construction season extends from April 1st through November 1st. During this seven month period, the Road Report system only broadcasts valid, current roadway construction and detour information (e.g., lanes blocked, roadway closed, use alternate route). At this time, the Road Report system does not broadcast any other type of information (e.g., traffic/congestion conditions, incident/accident information, environmental/weather conditions, roadway conditions data/information) in the construction season. Road Report information is updated at least once per week.

During the winter season, the Road Report system receives all of its roadway conditions information from the seven WSP districts throughout the state. Each WSP district collects its Road Report information through combinations of the following two methods:

- WSP Officers in the Field. The primary source of information within the Road Report system rests with individual district WSP officers in the field. When there is something of importance to report, WSP officers in the field radio or call their respective district dispatcher and relay this information. The WSP officers in the field are extremely reliable sources due to their first hand observance of the actual roadway conditions.

- County Sheriff Departments. In more remote/rural WSP districts where WSP officers in the field are not as readily available, district staff call the local county Sheriff Department for roadway conditions information. The local county Sheriff Departments are extremely reliable sources due to their first-hand observance of the actual roadway conditions.

Each WSP district then manually compiles and prioritizes the data collected. Then, by using the Department of Justice's TIME (Transaction Information Management Enforcement) system (i.e., teletype system), this information is transmitted to WSP District 1 (Madison) for system processing approximately 30-45 minutes prior to each update period.

During the construction season, the roadway construction and detour information is provided by WisDOT maintenance crews. Each WisDOT district's maintenance crews manually compile and prioritize construction and maintenance activities of importance to motorists, then transmit this information via e-mail to WSP District 1 for system processing at least once per week.

Currently, there are three separate telephone numbers from which the motoring public can access the Road Report system:

- Statewide Wisconsin --> l-800 ROADWIS
- Madison (Local) --> (608) 246-7580
- Milwaukee (Local) --> (414) 785-7140

The l-800 number also accommodates calls from four neighboring states-Minnesota, Illinois, Iowa, and Michigan. Calls from other states cannot be handled by the l-800 number; instead, these callers must access either the local Madison or Milwaukee number. There is also a private line for direct media access.

Basically, the Road Report system is comprised of two digital pieces of recording/broadcast equipment known as the Messenger 612 System provided by the Automation Electronics Corporation (AEC) in Dublin, California. Each Road Report recorder is capable of handling 24 lines. The WSP possesses two such recorders: one located in Milwaukee and one in Madison. Therefore, between the three call-in numbers (above), there is a total of 48 telephone lines from which to access the Road Report system. Because Milwaukee is the State's largest city by population and is the origin of a majority of the Road Report calls, 24 of these lines have been dedicated to this local number. The remaining 24 lines are shared between the Statewide l-800 and local Madison numbers with one line reserved for direct media access.

At this time, the Madison recorder works in conjunction with both AT&T (for the l-800 number) and Ameritech (for the local Madison number) telephone service providers. In December, 1997, WSP District 1 is planning to move its offices (and the Road Report system). There is some concern that the telephone services in the area in which they are planning to move may not be as adequate as those they currently receive. (This situation needs to be analyzed/resolved prior to the planned move).

During the winter season, the Road Report system averages approximately 55,000 calls/month. One hundred thousand (100,000) calls per month is considered very busy. For the most part, the Road Report system is handling the volume of calls. However, during severe weather conditions, a significant number of calls are not getting through. For example, in January 1996, the Road Report system received approximately 250,000 calls'. Of this total, only 70,000 calls (or 28%) got through. Therefore, over 180,000 callers (or 72%) did not get the Road Report information they wanted. The Road Report system's current inability to service each caller has the potential to erode usage of the system, as a caller may get frustrated at the lack of service and never try to call again.

The WSP central dispatchers in District 1 are responsible for manually performing a majority of the system processing required for the Road Report system. These dispatchers receive information from the WSP districts (winter season) via the TIME system and WisDOT maintenance (construction season) via e-mail. Once the information is received, the District 1 dispatchers are responsible for performing the following functions at least four times a day (winter season) or once a week (construction season):

- Compiling and prioritizing Road Report information
- Generating the Road Report voice recording for the Madison and Milwaukee recorders
- Downloading the Road Report voice recording to the Milwaukee recorder via dedicated leased-line
- Distributing Road Report information to the National Weather Service (NWS)
- Distributing Road Report information to all TIME system terminals throughout the State (e.g., Federal/state/local law enforcement agencies, WisDOT, Dept. of Corrections, Dept. of Resources)
- Distributing Road Report information through WSP's computer bulletin board system
- Reformatting and distributing Road Report information to the Internet

Over the years, the Road Report system has developed a very streamlined message format that is concise, and detailed. At the beginning of each Road Report playback, the type of information that the rest of the Road Report message contains is identified. During the winter season, the message begins, "The following is a report of current roadway conditions throughout the State of Wisconsin." During the construction season, the message begins, "The following is a report of current roadway inconveniences and detours throughout the State of Wisconsin." Following this brief introduction, the Road Report message structure has three distinct parts and is broken down as follows:

- Roadway Identifier/Name. The first piece of information presented is the roadway name in question (e.g. I-90, I-94, SH 73, County Road "N"). Because the majority of callers are primarily interested in receiving Road Report information that pertains to the Interstates, these roadways are presented first (in an order of decreasing priorities/lesser impact on the motoring public). Next, information on the State highway system is presented (in an order of increasing numerical sequence). If there is any pertinent information on a county/local road and the Interstate and State highway portions of the Road Report tape are not excessive (e.g., not over 4 minutes of a 12 minute tape), these roadways will be presented. However, county/local roads are not a priority of the Road Report system.

- Geographical Boundaries. The second piece of information presented sets the geographical boundaries for which the Road Report data/information pertains (e.g., from Illinois State Line to Milwaukee, from Madison to Portage). This to/from approach is primarily designated in a city-specific manner with the occasional use of a state line reference. County line designations are not used as it is felt that the majority of motorists are able to discern these location references.

- Condition. The last piece of information presented is that of the actual condition or item to report. During the winter season, messages usually use words such as "scattered slippery spots," "snow-covered roads," and "icy pavement." During the construction season, messages usually use words such as "right lane blocked," "2 left lanes blocked," and "use SH 30 as an alternate." Despite the above examples, Road Report messages are not limited in their word choice although a certain amount of uniformity has evolved over the years.

None of the Road Report messages contain a time-of-day (TOD) stamp in order to limit confusion as to when the message is in effect and as a means to avoid outdated messages. All lines within the Road Report system (i.e., l-800, Madison, Milwaukee) contain the same informational messages. In addition, the Road Report system only provides information on those roadways which are currently experiencing bad roadway conditions or construction. At the end of the Road Report message, there is a brief statement which says "...and all other roadways in the State of Wisconsin are in good driving condition."

One user-friendly feature of the Road Report system sets the playback tape back to the beginning of the message with each initiation of a new call. With this feature, callers do not get frustrated while waiting for the Road Report tape to repeat itself. Because the information concerning the Interstate system is provided at the beginning of the tape (and frequently the information desired most by callers), this tape reset feature is extremely accommodating.

The Road Report system supports transportation information dissemination for the following distribution outlets:

- Statewide l-800 ROADWIS telephone number
- Local Madison telephone number
- Local Milwaukee telephone number
- National Weather Service (NWS)
- All TIME system terminals throughout the State (e.g., Federal/state/local law enforcement agencies, WisDOT, Department of Corrections, Department of Resources)
- WSP's computer bulletin board system
- Internet
- Local media (i.e., private line and Bulletin board system)

The WSP also sends Road Report information to the NWS who performs some data processing before this data is retransmitted to its subscriber base. The TIME terminals provide an excellent method of distributing Road Report information to various public sector interests due to the number of locations which have access throughout the state. In addition, the WSP's bulletin board system also provides computer access to Road Report information. The WSP also uses two staff to reformat and distribute Road Report information to interested parties via the Internet (automation of this task is expected in November, 1996).

Another distribution outlet for Road Report information is through various local media broadcasts. To facilitate media distribution, WSP has provided a private line only for media access that is available through the Madison recorder. For the first six months of Road Report's existence, there was a fair amount of media activity which has since dropped off sharply. Today, Road Report only receives about 6 to 12 calls per month from the media. The WSP first began to offer Road Report information over its bulletin board system primarily to facilitate media access during the 6 AM and 10 AM update periods. During the winter season, the WSP bulletin board system receives a large number of calls from the media; local media frequently tape Road Report information for playback to listeners over the air (in its entirety or selected bits as the media feels is appropriate). At Road Report's conception, the WSP bulletin board system was also set to provide access to information for some local CATV applications. CATV providers were originally interested in providing Road Report information as scrolling text over its broadcasts but soon dropped this initiative.

WisDOT also maintains a home page on the Internet but with no real-time traffic or transportation conditions.

Scope: This project is divided into the following phases:

Phase 1 - 4.1.1 Expand l-800 ROADWIS Automated Telephone Information Service

This phase will consist of expanding the existing WisDOT "Road Report" telephone advisory system. The major components of this system will be enhanced through integration and information service improvements (operations, data collection sources, system access/communications, system processing, message content, and distribution outlets).

Phase 2 - 4.1.2 Expand Home Page Information on the Internet

This phase involves expanding the IH 90/94 Corridor home page on the Internet. The home page would be accessible to the Internet's World Wide Web and would include pre-trip transportation information. The project will result in the display of real-time traffic/transportation information, graphical map displays, scheduled construction and

maintenance activities, transit information, and roadway/weather conditions, among other information.

Location: The information on the Home Page and l-800 ROADWIS telephone service will cover the entire IH 90/94 Corridor.

Technology: The technology for this project will include telephone system recorders through the Road Report Central Control System, network communications, an internet system server, server software, a firewall, and network communications (leased lines and a local area network).

Other types of technology will include inductive loop detectors; magnetic detectors; self-powered vehicle detector; microwave radar detectors; wide-area radar; ultrasonic detectors; infrared detectors; video image detection (VIDs); optical vehicle motion detectors; passive acoustic; overheight detectors; and vehicle classification.

Automated sources for data collection systems will include automated weather observation systems (AWOS known as Weathermation units in WI); road/weather information systems (RWIS); surface/pavement sensors; sub-surface temperature sensors; and atmospheric sensors.

Another potential technology for this project involves the usage of dynamic telephone lines. Basically, this means that the Road Report system would have access to additional lines (provided by AT&T and/or Ameritech) that would dynamically provide Road Report information when the original 48 lines are in service. Additional lines would be provided on an as-needed basis only; the Road Report system would revert back to its original number of lines when demand decreases. In addition, this service would most likely be available only during the winter season.

Administration: The WisDOT Division that sponsors this project will either provide staff or hire a third party to manage the development of this project. It is expected that WisDOT will hire contractors to complete certain portions of this project. It is also proposed that an oversight committee be established for administrative review and oversight of the project.

Time Frame: Both project phases will require development costs in Year 1 (systems, automated linkages with other projects) and incremental project costs thereafter.

Budget:

Year 1:	$126,000
Year 2:	$66,000
Year 3:	$53,000
Year 4:	$58,000
Year 5:	$60,000

Staffing: For project development and oversight only (in full-time equivalent person years per year):

Year 1:	.58 FTE
Year 2:	.35 FTE
Year 3:	.15 FTE
Year 4:	.15 FTE
Year 5:	.15 FTE

Sponsor: The Wisconsin State Highway Patrol is recommended to sponsor Phase 4.1.1 and the WisDOT Office of Public Affairs is recommended to sponsor Phase 4.1.2 of this project.

PROJECT 4.1 INFRASTRUCTURE

Functional Requirements:

Phase 4.1.1 Expand l-800 ROADWIS Automated Telephone Information Service

Information Provided

Road Report could begin to broadcast the following data/information year-round:

1) Traffic/congestion information (e.g., heavy congestion, slow travel speeds, increased travel times, lane blockages)
2) Incident information (e.g., type, location, severity, duration)
3) Roadway conditions information (e.g., roadway closed, icy/wet/snowy pavement, scattered slippery spots/stretches)
4) Roadway construction information (e.g., lanes blocked, roadway closed)
5) Maintenance activities
6) Alternate routing information (as needed)
7) Weather/environmental conditions (e.g., snowing, foggy, low visibility)

If the Road Report system is to provide the above information year-round, it would require a number of changes within its current operations, as follows:

- Use of additional and real-time data collection sources
- Increase in the number of Road Report call-in telephone lines
- Use of real-time system/data processing
- Use of a menu-driven, touch-tone telephone advisory system to provide expanded, yet standard, number/types of messages
- Expanded distribution/outlet delivery system

Data Collection

Expanding the number and use of real-time data collection sources for information processing serves to integrate various ITS user services into realistic, achievable project initiatives. The Road Report system shall be capable of accepting data/information from the following data collection sources at a minimum:

- Telephone call-ins (e.g., in-vehicle cellular, emergency call box, roadside pay phones, residence/business phone)
- Radio call-ins (e.g., maintenance crews, construction sites)
- Law enforcement/police call-ins and dispatch reports
- Weather/environmental and roadway conditions systems

- Surveillance systems (where appropriate/implemented) (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope)
- Transit call-ins, dispatch reports, and fleet management systems
- Private sector traffic reports (e.g., Shadow Traffic, Metro Traffic)

System Access/Communications

Two functional requirements can be implemented to enhance the current Road Report system accessibility and communications:

1) The number of telephone lines can be increased for the l-800 ROADWIS system by using a dynamic telephone line/automatic adjustment to accommodate the number of callers; and,

2) Provide out-of-state callers with access to Road Report data and information that currently are blocked from accessing the l-800 number. The Road Report system could be easily accessible to the motoring public through the following telephone numbers:

. Statewide Wisconsin	--> l-800 ROADWIS
. Madison (Local)	--> (608) 246-7580
. Milwaukee (Local)	--> (414) 785-7140

System Processing

System enhancing functional requirements include the following:

1) Automate the Road Report system processing to the fullest possible extent. This improvement would increase the efficiency and effectiveness of dispatch personnel.

Message Content

System enhancements for this system would include the following functional requirements:

1) Implement a menu-driven, touch-tone system that is conjugated on a regional basis, i.e. a menu-driven, touch-tone system that would enable callers to select the region and type of information desired.

2) Reorganize the Road Report message so that callers are informed that "... all other roadways are in good traveling conditions except for the following..." at the beginning, rather than at the end, of the Road Report message.

Distribution Outlets

System enhancements for distribution outlets would include the following functional requirements:

1) Enhance the existing outlets and expand the distribution system via the local media, such as radio, TV, CATV, Metro/Shadow traffic broadcast services, etc. These media should be contacted to ascertain interest and ability to broadcast information provided by the Road Report system.

2) The Road Report system shall be capable of disseminating information over the following distribution outlets at a minimum:

- Statewide l-800 ROADWIS telephone number
- Local Madison telephone number
- Local Milwaukee telephone number
- Private media line
- NWS
- All TIME system terminals throughout the State (e.g., Federal/state/local law enforcement agencies, WisDOT, Dept. of Corrections, Dept. of Resources)
- WSP's computer bulletin board system
- Internet
- Local Media (e.g., radio, TV, CATV, Metro/Shadow traffic services)
- Interactive kiosk system

Type of Operation

1) The Road Report system shall be capable of operating 24 hours a day, 7 days a week.

2) The Road Report system shall be capable of providing pre-trip and en-route information to motorists as follows:

- Traffic conditions/congestion
- Incident information
- Alternate routing information (as needed)
- Roadway conditions
- Weather/environmental conditions
- Maintenance activities
- Construction activities
- Transit schedules/availability
- Special event management activities
- Potential hazards ahead
- Transportation-related public service messages

Phase 4.1.2 Expand Home Page Information on the Internet

General Applications

1) The Corridor's Internet home page on the World Wide Web (WWW) shall be a fully-automated system (to the greatest extent possible) that requires minimal manual processing.

2) The Corridor's Internet system shall consist of the following components at a minimum:

- Internet system server
- Server software
- Home page/maps/graphics
- Firewall protection

3) The Corridor's Internet system shall be capable of accepting data from the following data collection sources at a minimum:

- Telephone call-ins (e.g., in-vehicle cellular, emergency call box, roadside pay phones, residence/business phone)
- Radio call-ins (e.g., maintenance crews, construction sites)
- Law enforcement/police call-ins and dispatch reports
- Trucker/CVO dispatch reports, CB radio call-ins, and fleet management sys terns
- Weather/environmental and roadway conditions systems
- Surveillance systems (where appropriate/implemented) (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope)
- Transit call-ins, dispatch reports, and fleet management systems
- Private sector traffic reports (e.g., Shadow Traffic, Metro Traffic)

4) The Corridor's Internet system shall be capable of providing the following information at a minimum:

- Roadway conditions information
- Traffic and congestion information
- Alternate routing information (as needed)
- Weather/environmental conditions
- Traffic maps/graphical displays
- Special event management activities
- Directions to specified destinations
- Roadway construction information (i.e., route planning)
- Tourism information
- Transit information (e.g., schedule, fares)
- Incident information

- Modal information (e.g., airline, rail)
- Maintenance activities
- Transportation-related public service messages

System Features

1) The Corridor's Internet system shall use a high-level development language (e.g., Java) in order to allow multi-platform user access.

2) The Corridor's Internet system shall contain standard formats to present and exchange information through the Internet.

3) The Corridor's Internet system shall contain an open architecture that allows the interaction and linking of information dissemination tools developed by other jurisdictions.

4) The Corridor's Internet system shall contain standards for data exchange over the Internet in a variety of formats including graphical, tabular, and textual.

Preliminary System Architecture:

Phase 4.1.1 Expand l-800 ROADWIS

This section discusses the overall preliminary system architecture for the l-800 ROADWIS system. It is envisioned that the Road Report system will require the following components in order to achieve full functionality.

Distribution Outlets

Foremost, the Road Report system needs to provide the traveler interface for the motoring public -- primarily, the telephone call-in system. In addition, the telephone call-in system will be complemented by the various distribution outlets identified within the Functional Requirements (above). All Road Report messages will be taped messages received from the Road Report central control system.

Road Report Recorder

The Road Report system's AEC Messenger 612 System recorders are responsible for receiving information from the central control system, storing the taped messages, and distributing this information upon traveler call-in.

Network Communications

Interconnecting the entire Road Report system will be the communication network. Outbound communication will primarily be accomplished through the telephone system (i.e., either land-based lines or cellular). In order to accomplish communication with the other

distribution outlets, the Road Report system will need to consider additional communication media such as fiber-optic, leased lines, FAX, and WSP's microwave system.

Road Report Central Control System

The Road Report central control system will be responsible for ensuring that the entire l-800 ROADWIS system operates in an efficient and appropriate manner. Currently, Road Report system operations/ processing is primarily manual in nature. Automated processing techniques will be introduced (to the greatest extent possible) in order to enhance and simplify the central control system's data collection activities, data fusion/integration processes, message generation activities, and data distribution system.

Phase 4.1.2 Expand Home Page Information on the Internet

This section discusses the overall preliminary system architecture for the Corridor's Internet system. It is envisioned that the Corridor's Internet system will require the following components in order to achieve full functionality.

Internet System Server

The Internet system server will be responsible for ensuring that the entire Internet application operates in an efficient and appropriate manner. It will be responsible for formatting the data received from the various data collection sources and for interacting with the WWW server in order to disseminate Corridor-wide information. The system server will also use a standard file transfer protocol and contain an open architecture that allows the interaction and linking of information dissemination tools developed by other jurisdictions.

Server Software

The server software will reside on the Internet system server and be responsible for processing data into standard formats to present and exchange information through the Internet. This software will be a high-level development language in order to allow multi-platform user access. In addition, this software shall contain graphical, tabular, and textual standards for data exchange over the Internet.

Firewall

The firewall is a security access device that is comprised of a combination of hardware equipment and software programs. It is responsible for filtering information between the Corridor's Internet server system and the Internet/WWW. Firewall protection is necessary in order to only allow for a specific subset of controlled activities to

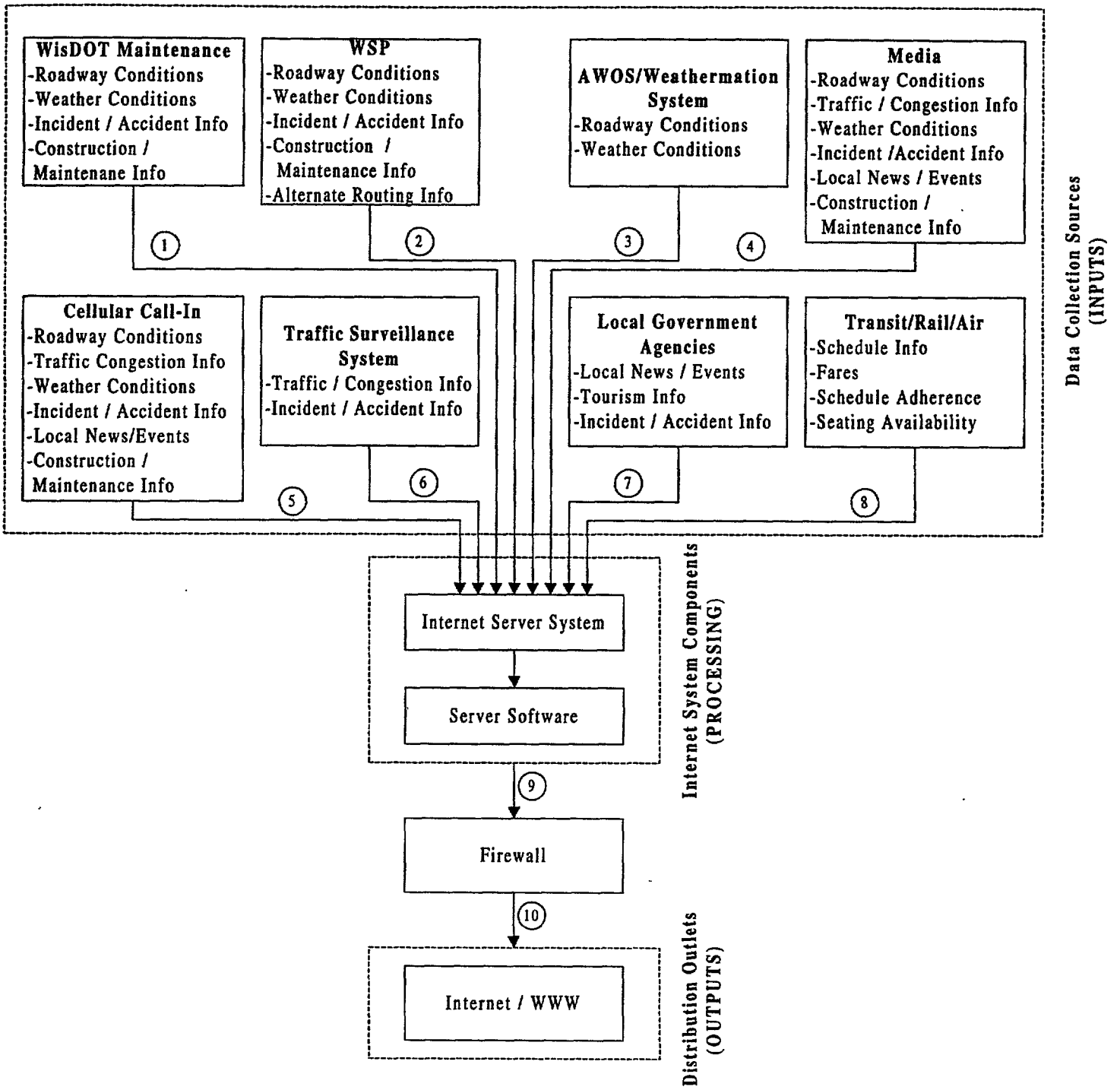
occur (i.e., guard against unauthorized "break-in" attempts by computer hackers).

Network Communications

A communication network based on an open system architecture and NTCIP protocols will be established to connect the corridor's communication network to the Internet. Between the Internet server system and the firewall, leased lines and a local area network (LAN) are being considered as the primary communication media. Between the firewall and the Internet / WWW, leased lines and cellular are being considered.

Data Flow: The following graphics illustrate data flow for Project 4.1.

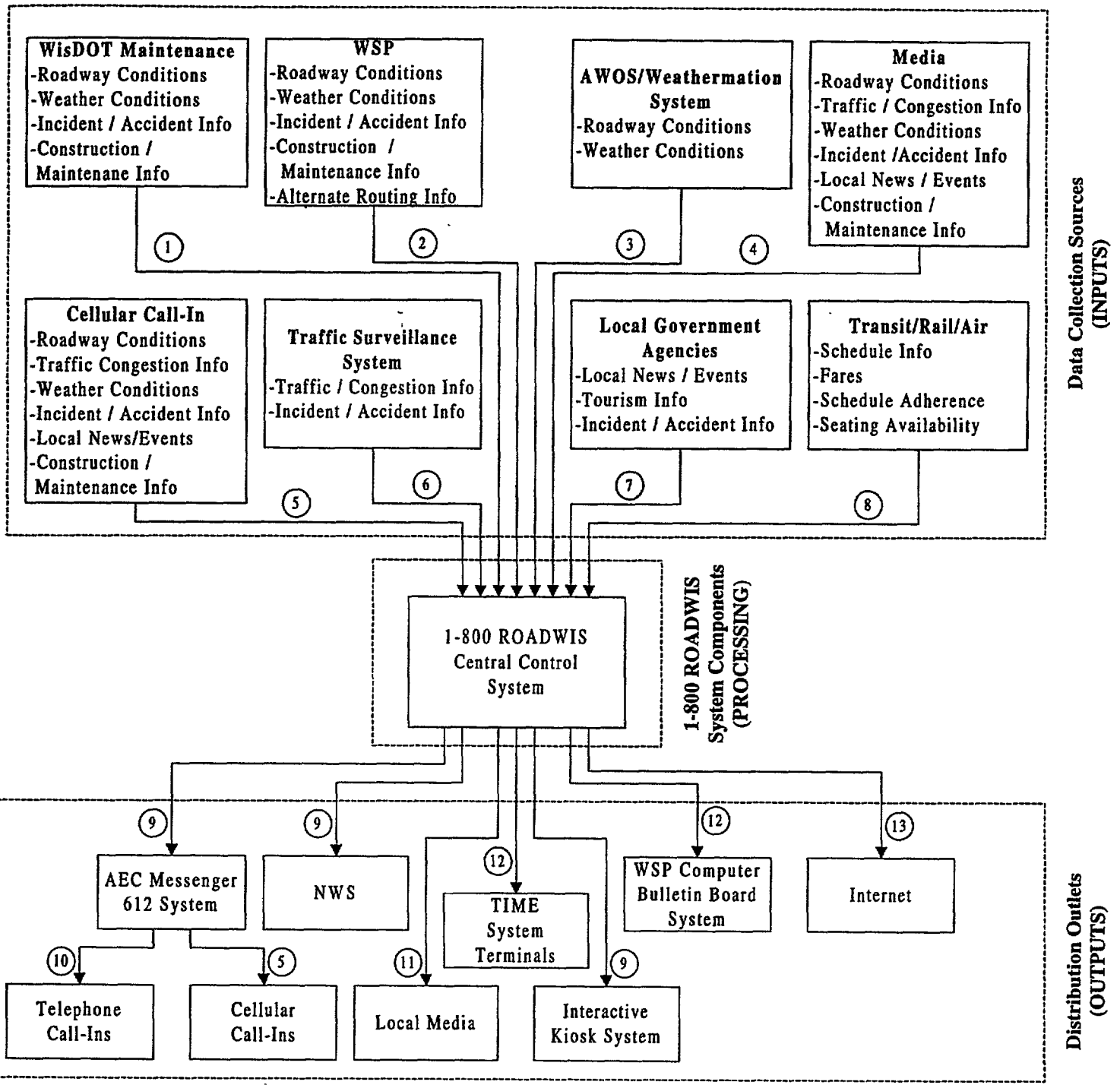
INTERNET SYSTEM
Data Flow Diagram



Possible Communications

1. Radio Call-In, Telephone, Cellular
2. Microwave, Radio Call-In, TIME, Telephone, Cellular
3. Leased Lines, Fiber-Optics, Twisted Pair, Coaxial Cable
4. Telephone, FAX, Leased Line
5. Cellular
6. Fiber-Optics, Spread Spectrum Radio, Microwave, Leased Line
7. Telephone, Radio, TIME, Cellular, Leased Line
8. Leased Line, Telephone, Radio, TIME, Cellular
9. Leased Line, LAN
10. Leased Line, Cellular

1-800 ROADWIS SERVICE
Data Flow Diagram



Possible Communications

1. Radio Call-In, Telephone, Cellular
2. Microwave, Radio Call-In, TIME, Telephone, Cellular
3. Leased Lines, Fiber-Optics, Twisted Pair, Coaxial Cable
4. Telephone, FAX, Leased Line
5. Cellular
6. Fiber-Optics, Spread Spectrum Radio, Microwave, Leased Line
7. Telephone, Radio, TIME, Cellular, Leased Line
8. Leased Line, Telephone, Radio, TIME, Cellular
9. Leased Line
10. Telephone
11. FAX, Leased Line
12. Leased Line, Microwave
13. Leased Line, Cellular

PROJECT 4.2 OVERVIEW

Project 4.2: Provide En-Route Traveler Information

Objective:

This project will collect and distribute useful information on traffic and weather conditions to travelers while driving through the IH 90/94 corridors. Several separate initiatives will be carried out under this project including development of interactive kiosks at selected wayside rests and truck stops. An expanded network of changeable message signs (CMS) and installation of active warning and automated road condition warning signs along with a highway advisory radio (HAR) system with coverage ultimately throughout the entire IH 90/94 corridors will be pursued under this project.

Portable travel time reporting systems will also be introduced in selected parts of the IH 90/94 corridors. Travel time reporting systems are mobile systems that can be set up near significant areas of congestion and provide motorists with information on the extent of congestion and expected travel time through the congested area. Another initiative under this project is to provide cellular telephone users with a "free" cellular telephone call to learn more about travel and weather conditions. The potential benefits from this project are:

- En-route traveler information that can assist motorist in making informed travel decisions (mode, route, travel/departure choices).
- Improved highway traffic safety, decrease congestion, and mitigate the problems associated with recurring and non-recurring congestion.
- A centralized source of transportation information that is easily accessible by the motoring public.

Current Conditions:

Wisconsin currently has several advance warning communication systems in place to aid motorists. The Wisconsin Department of Transportation commonly uses 24-hour highway advisory radio broadcasts near construction zones. As part of the Milwaukee. MONITOR Freeway Traffic Management System, WisDOT will be implementing a portable HAR system in 1996. WisDOT also publishes a seasonal brochure showing larger construction zones and, in some cases, offering alternate routes. For reports of detours, closures, traffic inconveniences or winter road conditions travelers can tune to Wisconsin Public Radio or call l-8OO-ROADWIS - these services are supported by WisDOT.

At this time, the State of Wisconsin does not have a kiosk system from which to disseminate transportation/traffic information.

Scope: The project is divided into the following phases:

Phase 1 - 4.2.1 Expand Use of Changeable Message Signs

This phase consists of expanding the use of portable and fixed changeable message signs throughout the IH 90/94 Corridor.

Phase 2 - 4.2.2 Establish Corridor-Wide Highway Advisoy Radio (HAR)

This phase involves the establishment of a number of strategically-placed HAR locations, including high-powered HAR for wide-range broadcasts, and portable/mobile HAR for service or maintenance vehicles and for short-term motorist warnings of changes in normal highway conditions.

Phase 3 - 4.2.3 Provide Information Via Cellular Telephone

This phase will augment the l-800 ROADWIS system's operations by offering additional access to information for the motoring public via in-vehicle cellular telephones.

Phase 4 - 4.2.4 Install Automated Interactive Kiosks

This phase includes planning, design, and installation of automated interactive kiosks to disseminate transportation/traffic information in the IH 90/94 Corridor as well as provide a foundation for expanding the system throughout the State of Wisconsin.

Phase 5 - 4.2.5 Install Active Warning Signs and Automated Road Condition Warning Signs

Active warning signs and automated road condition warning signs alert motorists of roadway and weather conditions, permanent obstructions, and recurring roadway geometric hazards. The signs will consist of CMS units, a roadway surveillance system, a roadside processor, and in-vehicle user interface, and an AWS central control system. The automated road condition warning signs are used for potentially dangerous situations involving poor driving surface and weather conditions.

Phase 6 - 4.2.6 Establish Portable Travel Time Reporting System

This phase involves the establishment of a mobile system that can be set up near areas of significant congestion. Its purpose is to provide motorist information on the extent of the congestion the expected travel time through the congested area, and possible alternative routing information.

Location: Preliminary Project Locations

Changeable message signs are proposed at the following locations:

Year 1:
1 fixed - Madison along Hwy. 12/14/18
1 portable - north of Madison along SB I-90/94
1 portable - south of Madison along NB I-90
1 portable - east of Madison along WB I-94

Year 2:
1 fixed - north of Madison along SB I-90/94
1 portable - I-90 SB into Beloit
1 portable - I-90/94 NB into Wisconsin Dells
1 portable - I-90/94 SB into Wisconsin Dells

Year 3:
1 fixed - south of Madison along NB I-90
1 fixed - east of Madison along WB I-94
1 portable - I-90 WB into Lacrosse

Year 4:
1 fixed - I-90 SB into Beloit
1 fixed- I-90 NB into Wisconsin
1 portable - I-90 NB into Wisconsin
1 portable - Hwy. 53 SB into Lacrosse
1 portable - I-94 WB into Eau Claire
1 portable - I-94 EB into Eau Claire

Year 5:
1 fixed - I-90/94 NB into Wisconsin Dells
1 fixed - I-90/94 SB into Wisconsin Dells
1 portable - I-90/94 WB south of Tomah
1 portable - I-90/94 EB, north of Tomah
1 portable - I-94 EB east of Hudson
1 portable - I-94 WB east of Hudson

Technology: CMS technology includes permanent and portable field elements and a CMS central control system. The IH 90/94 Corridor HAR system is envisioned to contain high-powered HAR and portable/mobile HAR. The Interactive Kiosk system will require, at a minimum, interactive presentation software, a kiosk central control system, a user interface system, and kiosk units. Technology requirements for the Active Warning Signs and Automated Road Condition Warning Signs include roadside surveillance systems and processors, a CMS unit, and an in-vehicle user interface. The Portable Travel Time Reporting system will consist of field data collection sensors, an inbound/outbound communications network, a central control system, and information dissemination units.

Administration: The WisDOT Division that sponsors this project will either provide staff or hire a third party to manage the development of this project. It is expected that WisDOT will hire contractors to complete various phases of this project. It is recommended that the Architecture/

Communications/Information Work Group and its subcommittees participate in the oversight of this project as well.

Time Frame: During the first year, lead WisDOT staff will be identified, committees will be formed and a project implementation plan will be developed.

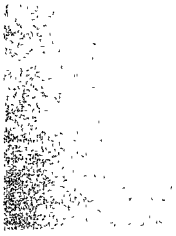
Budget:

Year 1:	$581,000
Year 2:	$633,000
Year 3:	$771,500
Year 4:	$1,145,500
Year 5:	$1,187,500

Staffing: For project development and oversight only (in full-time equivalent person-years per year):

Year 1:	.85 FTE
Year 2:	1.10 FTE
Year 3:	.95 FTE
Year 4:	.95 FTE
Year 5:	.95 FTE

Sponsor: WisDOT is recommended to sponsor this project.



PROJECT 4.2 INFRASTRUCTURE

Functional Requirements:

Phase 4.2.1 Expand Use of Changeable Message Signs

General Applications

1) The CMS system shall be comprised of the following subsystems/components, at a minimum:

- Portable field elements
- Permanent freeway field elements
- CMS central control system

2) The CMS system shall be capable of accepting data from the following data collection sources, at a minimum:

- Telephone call-ins (e.g., in-vehicle cellular, emergency call box, roadside pay phones, residence/business phone)
- Radio call-ins (e.g., maintenance crews, construction sites)
- Law enforcement/police call-ins and dispatch reports
- Trucker/CVO dispatch reports, CB radio call-ins, and fleet management systems
- Weather/environmental and roadway conditions systems
- Surveillance systems (where appropriate/implemented) (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope)
- Public transit call-ins
- Private sector traffic reports

3) The CMS system shall be capable of providing en-route information to motorists as follows:

- Traffic conditions/congestion
- Incident information
- Alternate routing information
- Roadway conditions
- Weather/environmental conditions
- Maintenance activities
- Construction activities
- Transit schedules/availability
- Special event management activities
- Potential hazards ahead
- Transportation-related public service messages

4) The CMS system shall provide a number of strategically located installations from which to disseminate information.

5) The CMS system shall possess uniform, non-proprietary sign formats and communication protocols.

6) The CMS system shall operate in an efficient manner and have minimal "downtime" when a problem is encountered.

Sign Display/Viewing Characteristics

1) The CMS system shall adhere to the FHWA's "Guidelines on the Use of Changeable Message Signs" (or WisDOT-developed requirements) in the following areas:

- Message content (i.e., concept units, words)
- Viewing time
- Legibility distance
- Legibility angle
- Number of phased / alternating messages
- Number of lines of text
- Number of characters
- Character size

2) The CMS system shall contain active display elements that are yellow (as specified in the MUTCD) or amber (in accordance with ITE's amber traffic signal lens standards).

Physical Sign Characteristics

1) All components shall meet NEMA TS-1 Environmental and Electrical Requirements.

2) All sign supports shall meet AASHTO requirements (e.g., wind, ice, dead and live loads).

3) Portable CMS's should be programmable by cellular telephones and solar powered with a back-up generator.

CMS Control

1) Access to any of the CMS system's sign elements and field controllers for control, message modifications, and configuration modifications shall be governed by user ID, password, and priority access as configured by a system administrator.

2) The CMS controller shall be capable of displaying messages from the following:

- Downloaded from CMS central processing system
- Downloaded from local CMS controller inputs via laptop computer
- Provided from local CMS controller via front panel

3) The CMS controller shall blank out any message displayed on a CMS sign / field element in the event of the following failures:

- Controller
- Power / electrical
- Communication (within a user-specified time period)

4) The CMS controller shall permit a user request to clear the display.

5) The CMS controller shall send status information to the CMS central control processor (as specified by the user) that includes the following information at a minimum:

- Controller address
- Time and date stamp
- Mode of operation
- Current message displayed
- Presence and type of any error detected
- Sign status
- Communications status

6) The CMS controller shall send notification and status information (continuously updated) automatically in real-time to the CMS central control processor when an error is detected.

Activity Log

1) The CMS activity log shall record and store (including time stamp in military format, day, date, and year) the following information at a minimum:

- Controller address
- User log-in / log-out
- All event information (up to 14 days)
- Any type of detected error
- All messages currently being displayed
- Origin of user ID
- All event and error information of CMS controller when sign or field element is under local control

Phase 4.2.2 Establish Corridor-Wide Highway Advisory Radio (HAR)

General Applications

1) The HAR system shall be comprised of the following equipment, components, or subsystems at a minimum:

- Permanent freeway field elements / transmitters
- Portable / mobile field elements / transmitters
- HAR central control system

2) The HAR system shall be capable of accepting data/information from the following data collection sources at a minimum:

- Telephone call-ins (e.g., in-vehicle cellular, emergency call box, roadside pay phones, residence/business phone)
- Radio call-ins (e.g., maintenance crews, construction sites)
- Law enforcement/police call-ins and dispatch reports
- Trucker/CVO dispatch reports, CB radio call-ins
- Weather/environmental and roadway conditions systems
- Surveillance systems (where appropriate/implemented) (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope)
- Public transit call-ins
- Private sector traffic reports

3) The HAR system shall be capable of providing en-route information to motorists as follows:

- Traffic conditions/congestion
- Incident information
- Alternate routing information (as needed)
- Roadway conditions
- Weather conditions
- Maintenance activities
- Construction activities
- Transit schedules/availability
- Special event management activities
- Potential hazards ahead
- Transportation-related public service messages

4) The HAR system shall provide a number of strategically located installations from which to disseminate en-route information. At this time, potential locations under consideration include the following:

Mobile Field Elements/Transmitters:

- Construction sites
- Maintenance activities
- Special events/routes
- Alternate routes (e.g., freeway/arterial coordination, incident diversions)

5) The HAR system shall possess uniform, non-proprietary transmission formats and communication protocols.

6) The HAR system shall operate in an efficient manner and have minimal "downtime" when a problem is encountered.

7) All HAR messages shall be of the highest audio broadcast quality.

Physical HAR Characteristics

1) The HAR system shall be designed to operate in conformance with CFR Title 47, Section 90.242 of the FCC Rules and Regulations.

2) All HAR system equipment, components, and subsystems shall conform to the specifications/requirements outlined within the *Transmitter, Radio AM Broadcast Band, Highway Advisory Radio,* State of California, Department of Transportation, March, 1991, Specification BS-038.

Message Content

1) The HAR system shall be capable of broadcasting 24 hours/day and 7 days/week.

2) The maximum HAR message cycle length shall be 48 sec/transmitter.

3) Each HAR message shall include the following "categories of statements":

- Attention (e.g., route, location, exit number, cross street, township, direction)
- Problem (e.g., type of problem/incident, condition of delay in one or two words)
- Action (e.g. advises motorists of what they should do about the problem)

4) A repeating HAR message shall contain the "Attention" and "Action" statements

5) The HAR system shall be capable of broadcasting messages that take into account the following message characteristics:

- Audio quality (i.e, "clear" sounding)
- Easy-to-understand
- Conciseness (i.e., short, to-the-point)
- Detailed/necessary information
- Sequence of independent phrases
- Internal message redundancy

6) When no "current" incident or congestion information is being broadcast, the HAR system shall broadcast construction, maintenance, and transit information that affects motorists in the Corridor.

7) HAR traffic advisory messages shall be updated at least once an hour.

Signing

1) The HAR system shall contain advance signing on the roadway upstream of the HAR broadcast zone.

2) A sign message shall include the following at a minimum:

- Subject statement (e.g., what type of information is the HAR broadcasting)
- Action statement (e.g., tune to designated frequency)
- HAR broadcast boundary (i.e., where the broadcast begins/ ends)
- Dynamic indication that a message of importance is being broadcast (e.g., flashing beacons)

3) The sign size, shape, character size, and color shall conform with the Office of Traffic Operations of the FHWA guidelines.

HAR Broadcasts

1) The HAR system shall be separated into broadcast zones (based upon the selected technology and WisDOT priorities) in order to provide travelers with geographically specific traffic information prior to the problem area.

2) The HAR system shall minimize broadcast interference (e.g., overlapping transmission zones, commercial broadcasters with primary FCC license) through the deployed system and technologies.

Phase 4.2.3 Provide Information Via Cellular Telephone

(Please refer to "Project 4.1, Phase 4.1.1 "Expand l-800 ROADWIS Automated Telephone Information Service".)

Phase 4.2.4 Install Interactive Kiosks

General Applications

1) The kiosk system shall be a fully-automated system (to the greatest extent possible) that requires minimal manual processing.

2) The kiosk system shall consist of the following components at a minimum:

- Interactive presentation software
- User interface system
- Kiosk central control system
- Kiosk units

3) The kiosk system shall support direct interactions through a user-friendly graphical user interface (GUI) which supports an embedded menu system approach. (e.g., via touchscreen, keyboard, voice-activated).

4) The kiosk system shall be capable of accepting data/information from the following data collection sources at a minimum:

- Telephone call-ins (e.g., in-vehicle cellular, emergency call box, roadside pay phones, residence/business phone)
- Radio call-ins (e.g., maintenance crews, construction sites)
- Law enforcement/police call-ins and dispatch reports
- Trucker/CVO dispatch reports, CB radio call-ins, and fleet management systems
- Weather/environmental and roadway conditions systems
- Detection/surveillance systems (where appropriate/implemented) (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope)
- Public transit call-ins
- Private sector traffic reports

5) The kiosk system shall be capable of providing the following real-time information:

- Roadway conditions information
- Traffic/congestion information
- Alternate routing information (as needed)
- Weather/environmental conditions
- Traffic maps/graphical displays
- News concerning local events;
- Directions to specified destinations
- Roadway construction information; (i.e., route planning)
- Tourism information
- Transit information (e.g., schedule, fares)
- Incident information
- Modal information (e.g., airline, rail)
- Maintenance activities

6) The kiosk system shall be capable of supporting equipment installations at the following locations:

- Activity centers
- Rest areas
- Service plazas
- Hotel lobbies
- Airport/rail/transit terminals
- Office building lobbies
- Tourist attractions

7) The kiosk system shall conform to all regulations / provisions of the Americans with Disabilities Act (ADA).

8) Communication between the kiosk system and the central control system shall be uni-directional in nature (i.e., central to kiosk) for traveler information. Kiosk status data shall be via 2-way communication.

9) The kiosk system software shall be developed in a high-level language and shall be developed with portability in mind to ensure that the kiosk software can migrate and be enhanced to take advantage of improvements in processing capabilities.

Kiosk Displays

1) The kiosk system shall be capable of supporting the provision of real-time transportation information in the following manner:

- Text-based informational displays
- Scrolling text feature
- Traffic maps / graphical displays
- Pan / zoom graphic features
- Audio presentations
- Slideshow capabilities
- Printed instructions / reports

2) The kiosk system shall present the user with positive feedback indicating that they have successfully engaged an interactive button or other input device.

Physical Characteristics

1) The kiosk system's physical enclosure shall maintain the proper operating environment for the computer and display subsystems, hold the display screen at the proper height, and aesthetically blend into the environment while still attracting users.

2) Kiosk system installations located in an outdoor environment shall require external enclosures to protect the system from the elements.

Activity Log

1) The kiosk system shall be designed such that a complete transaction log can be obtained for each kiosk as well as for the entire kiosk system. This transaction shall provide the following information at a minimum:

- Time and date stamp of usage
- Type of transaction

- Time spent in each transaction
- Kiosk time "down"
- Time service call was made
- Time back on-line
- Kiosk "downtime"
- Type of failure
- Total number of times the kiosk was used (on a daily, weekly, and monthly basis)

Phase 4.2.5 Install Active Warning Signs (AWS) and Automated Road Condition Warning Signs

General Applications

1) The AWS system shall be comprised of the following subsystems/components at a minimum (where appropriate):

- Roadway surveillance system
- Roadside processor
- CMS unit
- In-vehicle user interface
- AWS central control system

2) The AWS system shall be capable of accepting data from the following data collection sources at a minimum (where appropriate):

- Weather, environmental, and roadway conditions systems
- Surveillance systems (e.g., CCTV, roadway detection systems like inductive loops, radar, microwave, Autoscope, magnetic sensors)
- Weigh-in-motion (WIM) and automatic vehicle characteristics (AVC) sensors
- Height sensors

3) The AWS system operational test shall provide three strategically-located installations from which to disseminate AWS alarms/indications to motorists. At this time, potential locations under consideration include the following:

- AWS/Weathermation system (e.g., icy roadways, low visibility)
- Permanent obstructions (e.g., low clearances, blind spots)
- Recurring roadway hazards (e.g., steep grades, sharp bends/curves)

4) The AWS system shall possess uniform, non-proprietary CMS unit/sign formats, in-vehicle interface standards, and communication protocols.

5) The AWS system shall operate in an efficient manner and have minimal "downtime" when a problem is encountered.

CMS Sign Display/Viewing Characteristics

1) The CMS sign(s) shall adhere to the FHWA's "Guidelines on the Use of Changeable Message Signs" (or WisDOT-developed requirements) in the following areas:

- Message content (i.e., concept units, words)
- Viewing time
- Legibility distance
- Legibility angle
- Number of phased/alternating messages
- Number of lines of text
- Number of characters
- Character size

2) The CMS signs used within the AWS system operational test shall be capable of becoming fully-functioning components within WisDOT's Corridor-wide CMS system.

In-Vehicle Unit/Interface

1) The in-vehicle interface shall be capable of providing one or more of the following alarms to the traveler:

- Audible warning
- Synthesized voice warning
- Simple tone/beep/sound
- Flashing light/beacon

Phase 4.2.6 Establish Portable Travel Time Reporting (PTTR) System

System Usage

1) The situations in which use of the PTTR system could be considered are as follows:

- Areas of recurrent or seasonal congestion, construction work zones, maintenance work zones, and roadway closures which are expected to have delays of at least five minutes or longer
- Construction/maintenance activities which last a minimum of one week
- Weather/environmental conditions (e.g., floods, earthquakes, landslides, heavy snow/blizzards) which meet or approach the above requirements

2) A "Design Feasibility Study" shall be conducted in order to determine the most appropriate PTTR system configuration.

3) A "Traffic Operations Review" shall be conducted in order to determine the roadway segments or locations which need to be instrumented with the PTTR system components.

General Applications

1) The PTTR system shall be capable of providing the following information at a minimum:

. Active indication that a delay actually exists
. Real-time estimate of the amount of delay (i.e., travel time estimate)
. When to change vehicle speed
. When to change roadway lane
. Alternate route information (e.g., when to divert from their present route, which route to divert to) because of large time delays downstream

Data Collection Sensors

1) Field data collection sensors shall be capable of collecting the following vehicle information at a minimum:

. Speed
. Link travel times
. Volumes
. Occupancy
. Location
· Traffic composition

2) Field data collection sensors shall be easily installed, removed, and re-installed both within a PTTR zone and between different PTTR installations (i.e., portability).

3) Field data collection sensors shall be capable of operating on alternate power sources (e.g., electrical power, solar power, on-site generators).

4) Field data collection sources shall be capable of sending field-collected data to the central control system via the communications network.

5) Field data collection sensor quality shall not deteriorate due to repeated applications.

6) Sensor detection (i.e., data collection of vehicle information) shall be reliable in that at least 95 percent of passing vehicles are detected.

7) Detector stations (exact number TBD) shall supply enough vehicle information to form representative estimate of vehicle speeds and segment travel times.

8) Vehicle speed measurements shall be within two miles per hour of the actual speed.

9) All detection sensors will be sufficiently rugged in order to endure the rigors of deployment in an outdoor environment.

Communication Network

1) The inbound communication network shall be for the transmission of data, collected by the field devices, to the central control system.

2) The outbound communication network shall be for the transmission of data, generated by the central control system, to the information dissemination units.

3) The communication network shall possess the following characteristics at a minimum:

- Ability to interface with, and transmit data from, the appropriate devices
- Ability to interface with, and transmit data to, the appropriate devices
- Ability to communicate with multiple systems / units / devices
- Ability to operate on alternate power sources (e.g., electrical power, solar power, on-site generators)
- Sufficiently rugged in order to endure the rigors of deployment in an outdoor environment

Central Control System

1) The central control system shall be capable of receiving the field-collected data, aggregating and processing the data to identify and quantify delay, and transmitting that delay information to the information dissemination units.

2) The central control system shall contain the appropriate delay determination algorithms in order to compute vehicle speeds, segment travel times, and travel time delay.

3) The central control system shall be capable of communicating with both the inbound and outbound communication networks.

4) The central control system shall be capable of saving / storing detector sensor vehicle information and delay computational outputs for off-line analysis.

5) The central control system shall be capable of displaying real-time traffic conditions and PTTR system status and message contents.

6) The central control system shall be capable of detecting inbound and outbound transmission errors.

7) The central control system shall contain a password-type security mechanism to allow authorized personnel access to the PTTR system for manual override-type situations.

Information Dissemination Units

1) The information dissemination units shall provide the traveler interface aspect of the PTTR system, communicating delay information to motorists.

2) The information dissemination units shall be capable of receiving delay information from the central control system via the outbound communications network.

3) The information dissemination units shall be capable of operating on alternate power sources (e.g., electrical power, solar power, on-site generators).

4) All information dissemination equipment shall be sufficiently rugged in order to endure the rigors of deployment in an outdoor environment.

5) Placement of information dissemination units shall be strategic locations along the roadway (e.g., upstream of work zone, at appropriate diversion points, at rest areas or tourist information centers) as appropriate.

Preliminary System Architecture:

Phase 4.2.1 Expand Use of Changeable Message Signs

This section discusses the overall preliminary system architecture for the CMS system. It is envisioned that the CMS system will require the following components in order to achieve full functionality:

CMS Field Display Signs

Foremost, the CMS system needs to procure the traveler interface for the motoring public -- the field display signs. It will be these signs (both permanent and portable) that display the messages to the traveler. There are various CMS technologies from which to chose (e.g., fiber-optic, LED, flip-disk, incandescent bulb, hybrids of the aforementioned types), each possessing unique characteristics and capabilities.

CMS Sign/Field Controllers

The CMS field display signs are monitored and controlled by the CMS controllers. These controllers provide the necessary interface between the field display signs and the CMS central control system. Basically, these controllers house the brains of the CMS field system's local operations. The local CMS firmware is responsible for ensuring that the proper message is being displayed on the CMS signs, that the field location is operating as intended, and that all monitoring, control, and status communication is being carried out between the field and the central control system.

Network Communication

Interconnecting the entire CMS system will be a communication network. This network shall be of a uniform, non-proprietary nature (where possible) and use the NTCIP protocol. It is envisioned that there will be two primary types of communication:

- Controller-to-Sign. This communication will most likely run over relatively short distances. At this time, the primary technologies under consideration for this communication include fiber-optic, twisted-pair, coaxial cable, and leased lines.

- Controller-to-Central. This communication will most likely be a part of a larger network which consolidates most, if not all, of the I-90/94 Corridor's communications. At this time, the primary technologies for consideration include fiber-optic, the WSP's microwave system, spread spectrum radio, cellular telephone, and leased lines.

CMS Central Control System

The CMS central control system has the primary responsibility of ensuring that the entire CMS system operates in an efficient and appropriate manner. It will provide the support necessary for operations of the field elements (i.e., signs, controllers), the communications system, and other peripheral devices (e.g., operating system/software, PC workstations, activity logs, user interface). In addition, the CMS central control system will allow the system administrator (through user ID, password, and priority access) to manage all CMS field elements, system configurations and set-ups, and all authorized users.

Phase 4.2.2 Establish Corridor-Wide Highway Advisory Radio (HAR)

This section discusses the overall preliminary system architecture for the HAR system. It is envisioned that the HAR system will require the following components in order to achieve full functionality.

HAR Field Elements/Transmitters

Foremost, the HAR system needs to procure the traveler interface for the motoring public -- the transmitters. It will be these transmitters (both permanent and portable) that broadcast the actual HAR messages from their roadside location to the traveler. Messages broadcast by the HAR system can either be live messages, pre-selected taped messages, or voice-synthesized messages (based on information from an ITS traveler information database). Therefore, the HAR system transmitters shall be capable of receiving a live or recorded message from the central control system or equipment at the HAR station. Primary HAR system components include the AM transmitter, transmitter controller, power supply (and back-up unit), broadcast antenna, ground system, and communication interface.

Network Communications

Interconnecting the entire HAR system will be the communication system. This system shall be of a uniform, non-proprietary nature (where possible). At this time, the primary communication media under consideration between the permanent HAR transmitters and the central control system include twisted pair, fiber-optic, the WSP's microwave system, leased lines, and cellular telephone links. Communication between the central and the portable HAR stations will most likely be via cellular telephone.

Central Control System

The HAR central control system will be responsible for ensuring that the entire HAR system operates in an efficient and appropriate manner. Basically, the "brains" of the central control system is the audio recorder; a digital processor with solid-state memory and playback capabilities. Most of the logic that determines how the HAR system operates is housed in the digital recorder. The central control system shall allow an operator to perform the following functions:

- Broadcast live, pre-selected taped, or voice-synthesized messages
- Schedule specific library messages for broadcast on a TOD/DOW basis
- Monitor and/or modify current or scheduled messages
- Acquire existing HAR transmission mode (e.g., off-line, stand-by, prerecorded message, live message, digitized message) and display current message selection
- Develop HAR messages for library storage as well as for immediate broadcast
- Govern system access by user ID and password access as configured by the system administrator

Phase 4.2.3 Provide Information Via Cellular Telephone

(Please refer to "Project 4.1, Phase 4.1.1.: "Expand l-800 ROADWIS Automated Telephone Information Service".)

Phase 4.2.4 Install Interactive Kiosks

This section discusses the overall preliminary system architecture for the kiosk system. It is envisioned that the kiosk system will require the following components in order to achieve full functionality.

Kiosk Units

Foremost, the kiosk system needs to procure the traveler interface for its user base -- the physical kiosk unit. Potentially located at various public access locations, the kiosk unit will provide the interactive tool from which consumers can view kiosk messages, displays, and information in order to inform themselves of current transportation/traffic conditions. In order to operate the kiosk unit, the user will require some type of interactive component, such as a touchscreen monitor, keyboard entry/access, or voice-activated operations. In addition, the kiosk unit needs to contain a processing system which will allow it to receive informational updates, interact with the user, and display its messages and graphical displays. From a physical perspective, the kiosk unit's exterior design requirements need to include an aesthetically-pleasing appearance, compliance with ADA specifications, climate control equipment (e.g., weatherproofing, heating and cooling systems), and the smallest footprint possible for the required components.

Network Communication

The network communication design will be an open system architecture based on TCP/IP protocols and will allow for some variation in the final, implemented conditions. Communication between the kiosk unit and the kiosk central control system will most likely be via a T1 (1.5 Mbps) leased packet switch telephone network. The kiosk system design should allow for this link to be upgraded to be part of a possible future fiber-optic network or to be incorporated as part of the WSP's microwave system. It is expected that some locations may have more than one kiosk installed, such as an airport/rail/transit station or other high traffic areas. In such a situation, a single telephone drop will serve all kiosks via an inter-networking of a small LAN within the facility. To ensure security, communications between the kiosk unit and the kiosk central control system shall be uni-directional in nature (i.e., central to kiosk).

Kiosk Central Control System

The kiosk central control system will be responsible for ensuring that the entire kiosk system operates in an efficient and appropriate manner. The kiosk operating system/software will probably be a map-based

application running on a PC workstation. Its two primary functions will be to collect, process, and display information from the kiosks and to provide a tool to maintain kiosk data files and displays. In addition, the PC workstation will also provide the kiosk system's primary operator interface thereby enabling an operator to perform various functions (e.g., access kiosk management software, load and analyze kiosk logs to track usage/conditions/maintenance/response times, perform system updates, retrieve maps/graphics files).

Phase 4.2.5 Install Active Warning Signs and Automated Road Condition Warining Signs

This section discusses the overall preliminary system architecture for the AWS system. It is envisioned that the AWS system will require the following components in order to achieve full functionality:

Roadway Detection/Surveillance System

The AWS system's roadway surveillance system will be responsible for obtaining the data necessary to determine if an AWS warning is required. At this time, it is envisioned that the AWS system will consist of a roadway/weather conditions systems, surveillance system, WIM/AVC sensors, and height sensors. It is further anticipated that the AWS system will possess both primary and secondary sensor subsystems in order to assess AWS system effectiveness. The primary sensor subsystem will be located upstream of the potential roadway hazard and the secondary sensor subsystem downstream of it.

Roadside Processor

The roadside processor will be the central AWS system element for receiving, aggregating, and maintaining the data collected by the sensor systems for the roadway/weather conditions and recurring roadway hazards scenarios. In addition, the roadside controller will process the above data in order to calculate and transmit (i.e., roadside-to-vehicle communications) a real-time, AWS-specific warning for the prevailing conditions.

CMS Unit

The CMS units will serve as the primary roadside traveler interface for the AWS system (where appropriate). They will be responsible for visually conveying the real-time, AWS warnings to passing motorists. The CMS units will be located after the roadside processors but prior to the upcoming roadway hazard. It is envisioned that the CMS units will contain a pre-programmed library of messages from which the AWS system can select.

In-Vehicle User Interface

This AWS traveler interface may use an in-vehicle user interface (where appropriate). These in-vehicle devices can indicate the actual AWS warnings to the traveler via an audible warning, synthesized voice warning, simple tone/beep/sound, or flashing light/beacon.

Network Communications

Interconnecting the entire AWS system will be a communication network. It is envisioned that there will be four primary types of communication as follows:

- Surveillance System-to-Roadside Processor. These communications will most likely run over relatively short distances. At this time, the primary technologies under consideration for these communications include fiber-optic, twisted-pair, coaxial cable, and leased lines. If the installation site allows, the sensor system may be wired directly into the roadside processor.

- Roadside Processor-to-CMS Unit. These communications will most likely run over relatively short distances. At this time, the primary technologies under consideration for these communications include fiber-optic, twisted-pair, coaxial cable, and leased lines. In addition, this system shall be of a uniform, non-proprietary nature (where possible) and use the NTCIP protocol.

- Roadside Processor-to-In-Vehicle Device. This type of communication requires a wireless medium. Primary technologies under consideration include radio frequency (RF), microwave, infrared, and spread spectrum radio.

- Roadside Processor-to-WisDOT ITS. The sensor systems, roadside processor and CMS units are stationary and will require power. Primary technologies under consideration include leased lines, cellular, fiber-optic, and WSP's microwave system.

AWS Central Control System

A terminal in a central operations building will allow AWS system operators to have full control over the primary sensor sub-system (including a disabling function) and the ability to change the message on the CMS units. Data analysis software will provide the ability to take two data files (one from each, primary and secondary sensor sub-system) and perform an analysis on vehicle operators' compliance to the CMS warnings. Specific vehicle records can be matched between the two sensor subsystems, and reports can be generated on the effectiveness of the AWS system.

Phase 4.2.6 Establish Portable Travel Time Reporting System

This section discusses the overall preliminary system architecture for the PTTR system. It is envisioned that the PTTR system will require the following components in order to achieve full functionality:

Data Collection Sensors

The foundation of the PTTR system is the use and appropriate placement of a series of vehicle detection sensors in the field for data collection. Vehicle information in terms of vehicle volumes, speed, occupancy, location, and traffic composition may be measured. This raw data will form the basis for the subsequent delay determination process. These sensors will most likely be part of a portable detection system to estimate delay, congestion, and travel times. Permanent detection sources, like paired inductive loops, may be considered because the installation cost is not excessive and long-term maintenance may not be an issue unless the detector location can also double as part of a regional traffic management system. Portable detection concepts include the following:

- Paired, side-mounted radar units
- License matching at the ends of the PTTR zone
- Vehicle signature recognition at ends of the PTTR zone
- Video image detection (VID) for spot locations
- Automatic vehicle identification (AVI) of tagged commercial vehicles

Network Communication

Interconnecting the entire PTTR system is the communication network. It is envisioned that the communication will include the following components:

- Inbound Communication (i.e., field-to-central). This communication network is for the transmission of data, collected by the field devices, to the central control system. At this time, possible communications include leased lines, cellular, and cellular digital packet data (CDPD).

- Outbound Communication (i.e., central-to-field). This communication network is for the transmission of delay/congestion/travel time information, generated by the central control system, to the information dissemination units. At this time, possible communications include leased lines, radio remote control, cellular, and CDPD.

Central Control System

The central control system is the heart of the PTTR system. It receives the field-collected data, aggregates and processes the data to identify and

quantify delay, and transmits that delay information to the information dissemination units. At this time, the central processor is envisioned to be an IBM-type personal computer (PC). The central processor does not need to be placed in the field; it could be placed conveniently nearby (e.g., in a construction or maintenance manager's office).

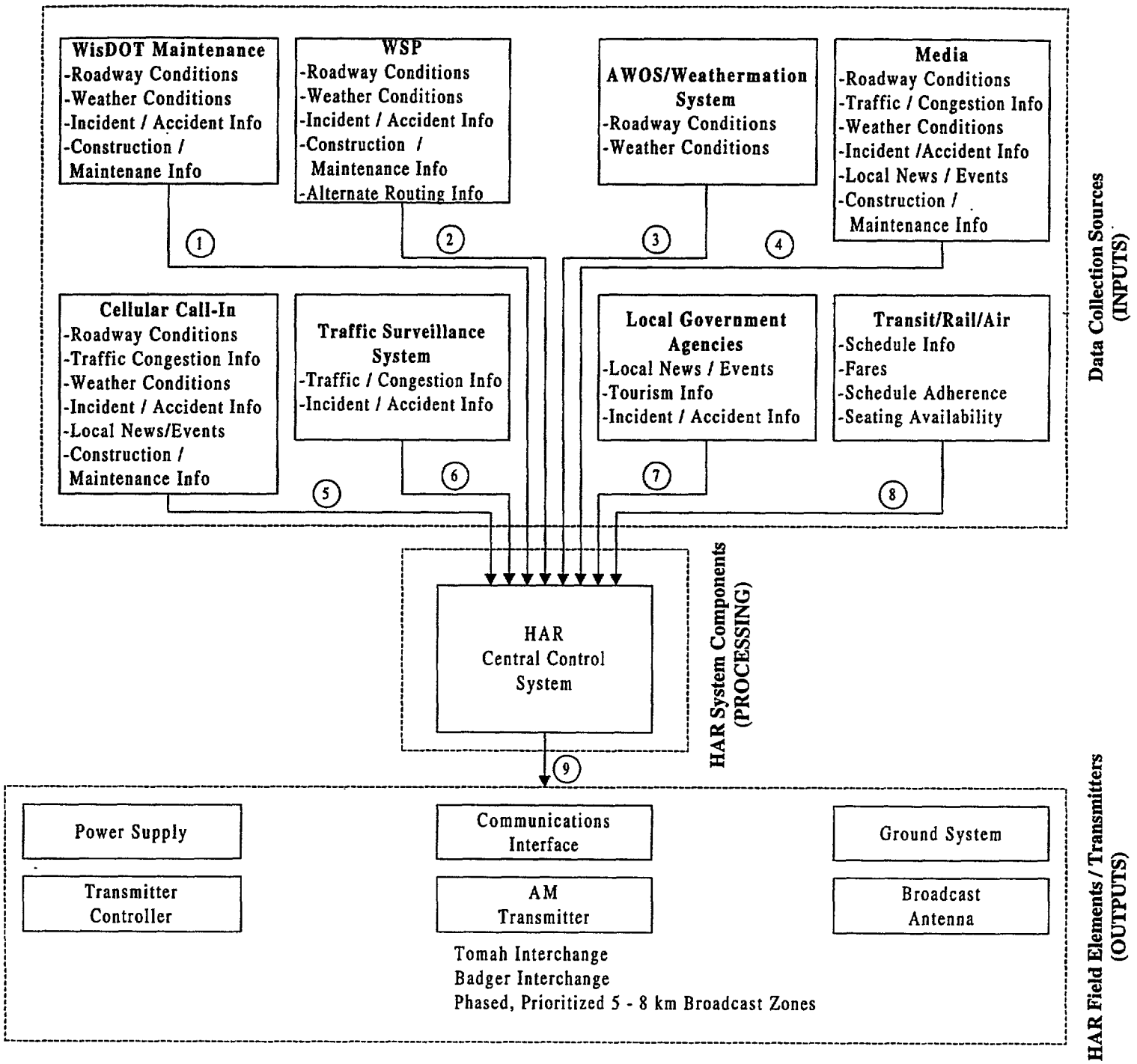
Information Dissemination Units

The information dissemination units are used as the traveler interface component for the PTTR system. At this time, the use of a static panel sign with attached signal flashers (e.g., EXPECT DELAYS WHEN FLASHING") and CMS are envisioned. Strategically located along the roadway (e.g., upstream of work zone, at appropriate diversion points, at rest areas or tourist information centers), these units will display the delay/congestion travel time information to the passing motorists.

Data Flow:

The data flow between system components for the project phases are illustrated on the following pages.

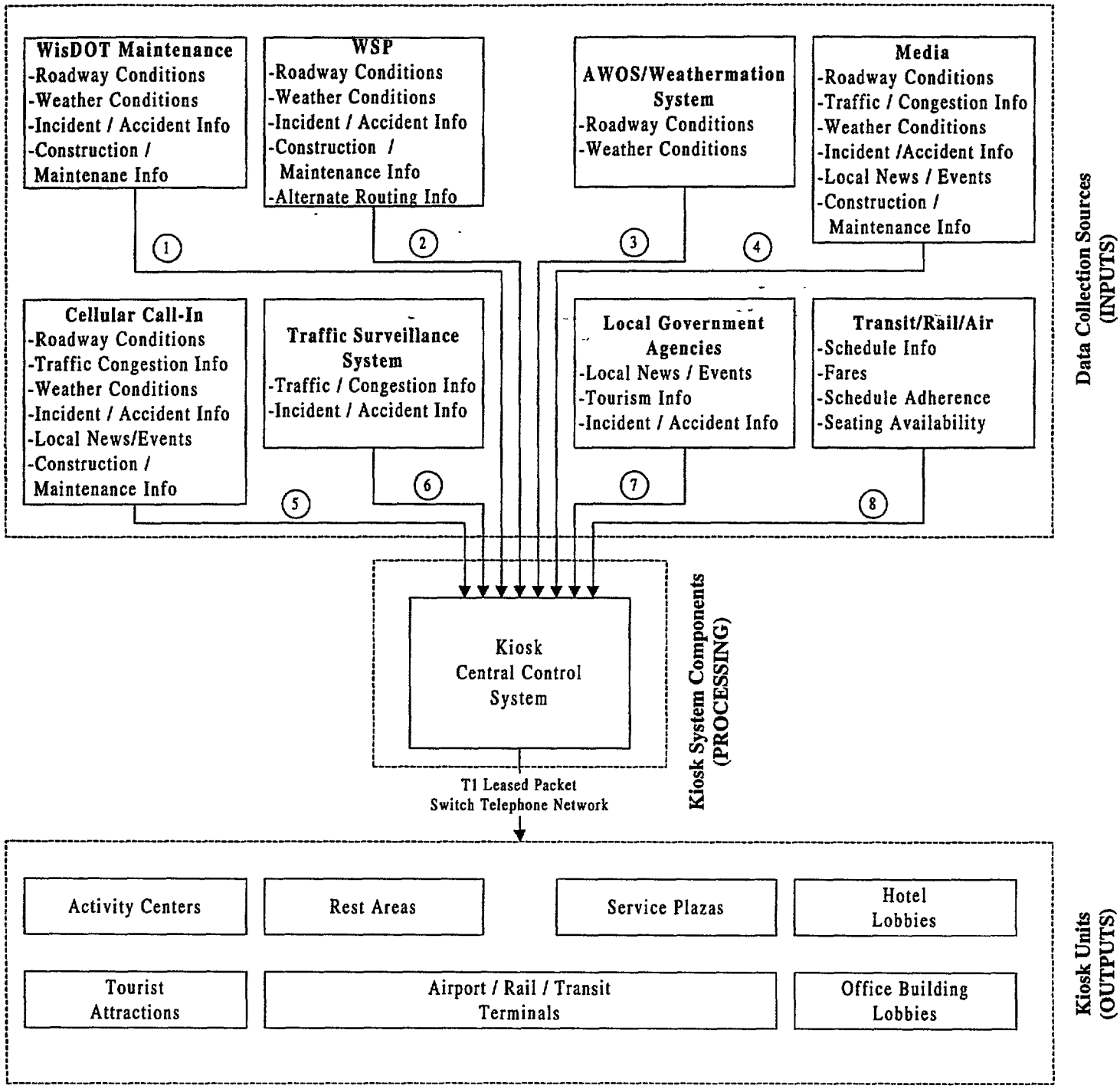
HAR SYSTEM
Data Flow Diagram



Possible Communications

1	Radio Call-In, Telephone, Cellular
2	Microwave, Radio Call-In, TIME, Telephone, Cellular
3	Leased Line, Fiber-Optic, Twisted Pair, Coaxial Cable
4	Telephone, FAX, Leased Line
5	Cellular
6	Fiber-Optic, Spread Spectrum Radio, Microwave, Leased Line
7	Telephone, Radio, TIME, Cellular, Leased Line
8	Leased Line, Telephone, Radio, TIME, Cellular
9	Twisted Pair, Fiber-Optic, Microwave, Leased Line, Cellullar

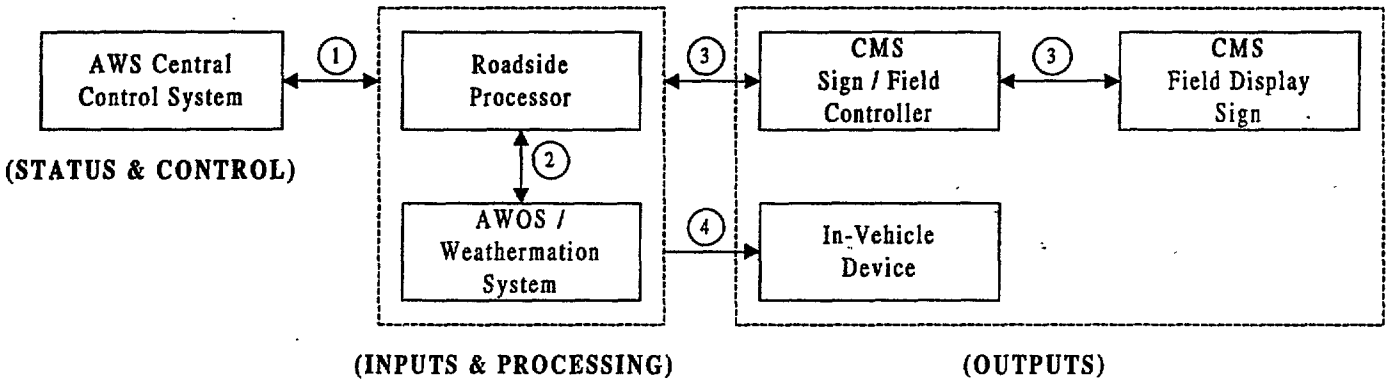
INTERACTIVE KIOSK SYSTEM
Data Flow Diagram



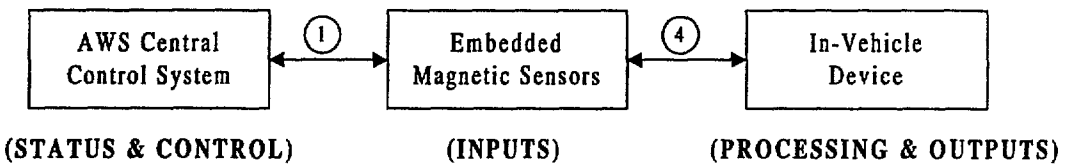
Possible Communications

1. Radio Call-In, Telephone, Cellular
2. Microwave, Radio Call-In, TIME, Telephone, Cellular
3. Leased Line, Fiber-Optic, Twisted Pair, Coaxial Cable
4. Telephone, FAX, Leased Line
5. Cellular
6. Fiber-Optic, Spread Spectrum Radio, Microwave, Leased Line
7. Telephone, Radio, TIME, Cellular, Leased Line
8. Leased Line, Telephone, Radio, TIME, Cellular

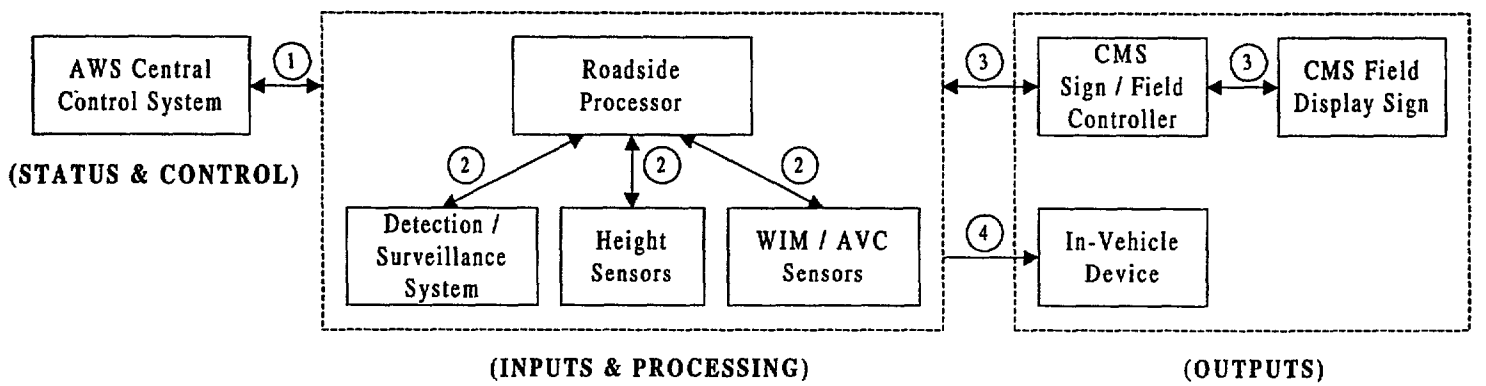
AWS SYSTEM
Data Flow Diagram



ROADWAY / WEATHER CONDITIONS TEST SITE



PERMANENT OBSTRUCTIONS TEST SITE

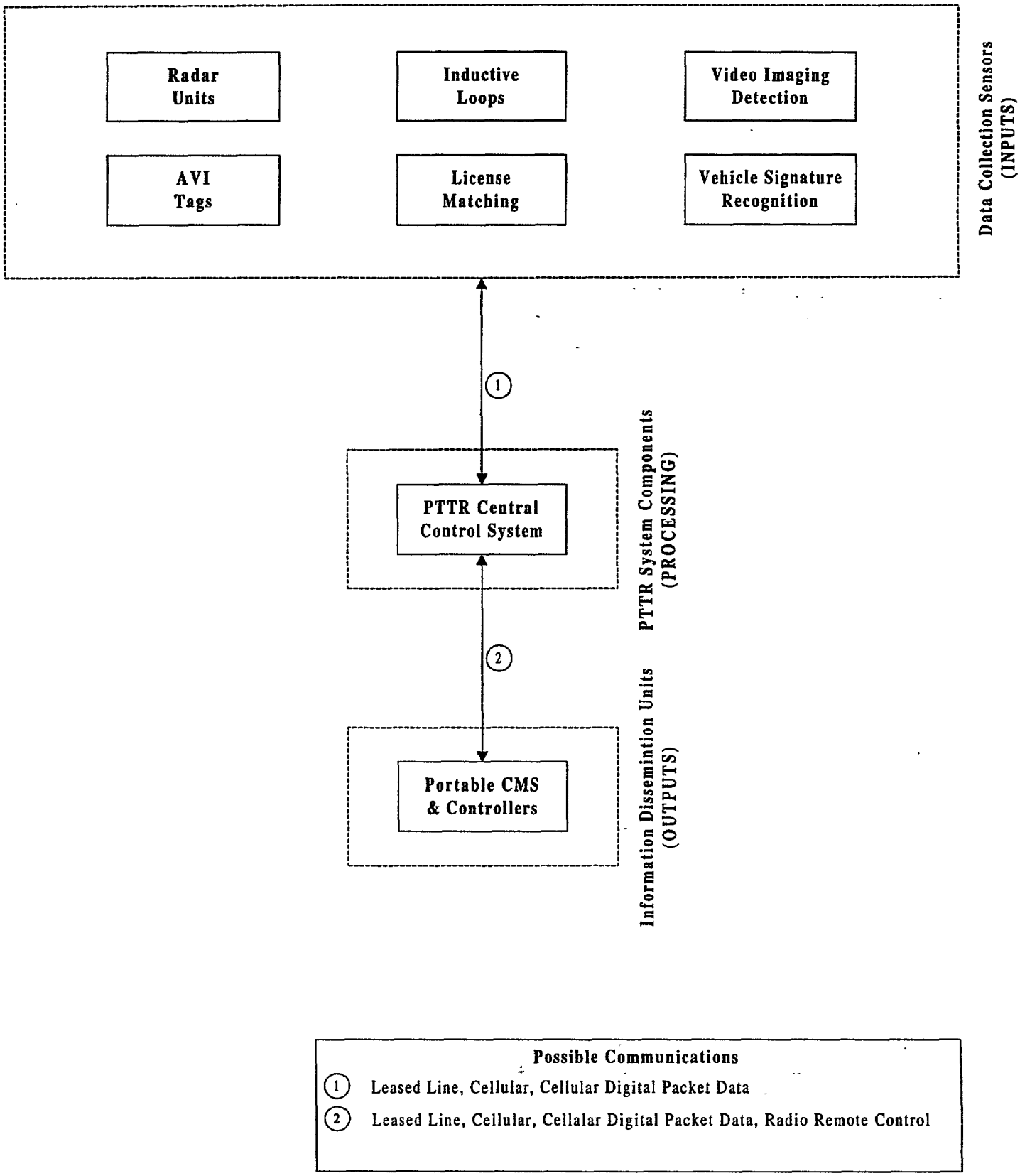


RECURRING ROADWAY HAZARDS TEST SITE

Possible Communications

1. Leased Line, Cellular, Fiber-Optic, Microwave
2. Fiber-Optic, Twisted Pair, Coaxial Cable, Leased Line, Hardwire Interconnect
3. Fiber-Optic, Twisted Pair, Coaxial Cable, Leased Line
4. RF, Microwave, Infrared, Spread Spectrum Radio

PTTR SYSTEM
Data Flow Diagram

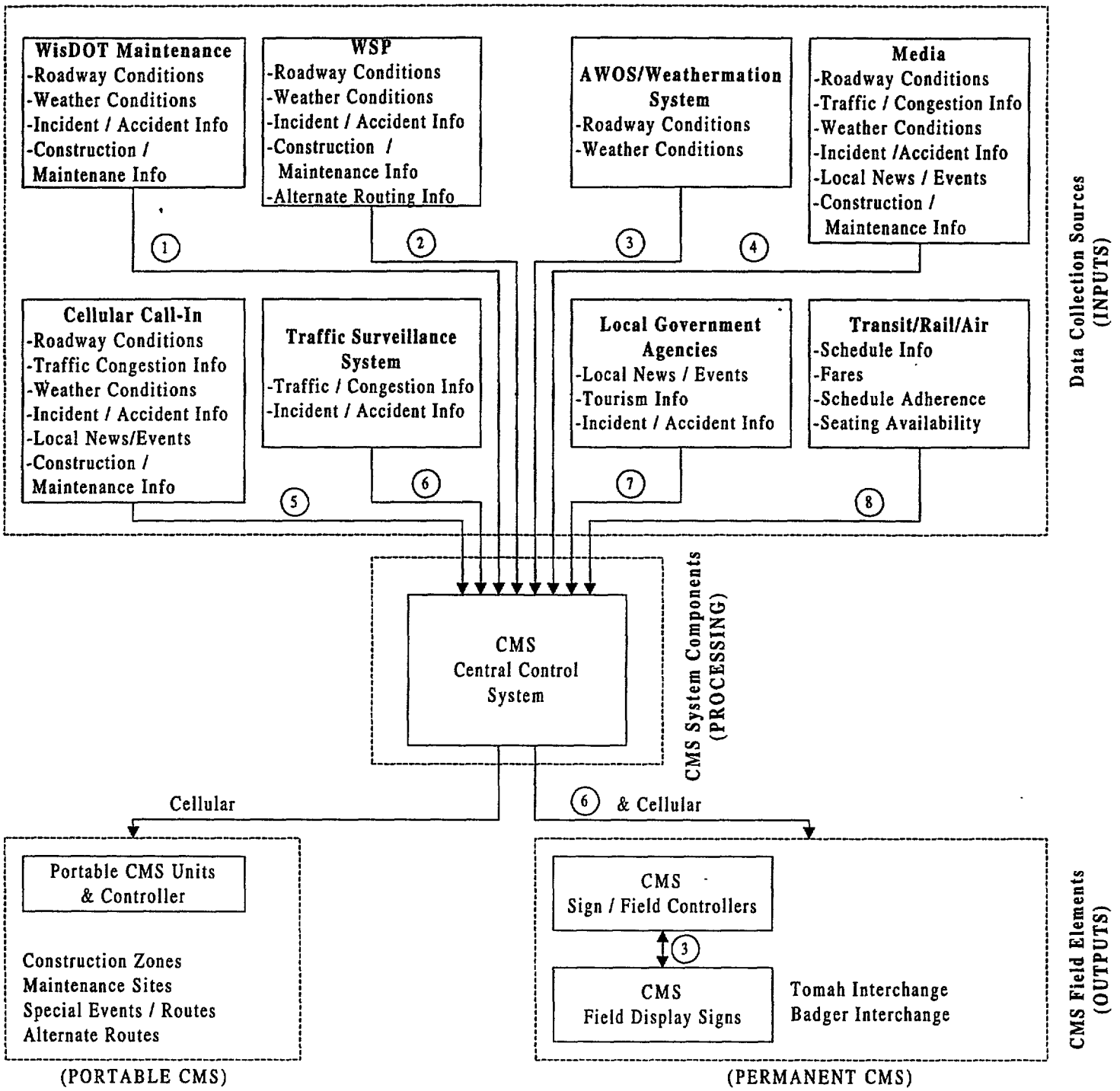


Possible Communications

(1) Leased Line, Cellular, Cellular Digital Packet Data

(2) Leased Line, Cellular, Cellalar Digital Packet Data, Radio Remote Control

CMS SYSTEM
Data Flow Diagram



Possible Communications

1. Radio Call-In, Telephone, Cellular
2. Microwave, Radio Call-In, TIME, Telephone, Cellular
3. Leased Lines, Fiber-Optics, Twisted Pair, Coaxial Cable
4. Telephone, FAX, Leased Line
5. Cellular
6. Fiber-Optics, Spread Spectrum Radio, Microwave, Leased Line
7. Telephone, Radio, TIME, Cellular, Leased Line
8. Leased Line, Telephone, Radio, TIME, Cellular

PROJECT 4.3 OVERVIEW

Project 4.3: Provide Transit Schedule Information Via Automated Service

Objective: This project will provide Wisconsin residents with a central point to call and receive information on public transit services provided by local bus and intercity operators. An automated telephone answering service will provide callers with service options and schedules for all areas in Wisconsin served by public transit. Callers will have access to information on a variety of services and be able to plan a route from their home to any destination in Wisconsin served by public transit. The potential benefits from this project are:

- Increased use of Public transit services in the IH 90/94 Corridors.
- Improved safety, decrease congestion through provision of timely, relevant, and accurate transit information.
- Quick and convenient access to transit information to inform consumers and improve their decision-making choices.

Current Conditions: Currently, there is no automated, comprehensive transit information service within the IH 90/94 Corridor.

Scope: *Phase 1 - 4.3.1 Develop Functional Requirements and Specifications*

Information requirements of a proposed l-800 caller access system will be assessed so that functional requirements can be developed. The functional requirements and specifications will define how data will be provided to the databases, including itinerary planning, and what type of access will be required.

Phase 2 - 4.3.2 Automated Transit Schedule Test

In order to provide the public with an automated system that can be accessed by telephone, the technology must first be tested with a prototype system. The technology to be deployed under this project is considered "off the shelf" and essentially the project's functional specifications will form the basis for competitive bids.

Location: Corridor-wide.

Technology: The technology for this project includes an automated telephone answering system.

Administration: The WisDOT Public Transit section is proposed to oversee this project. It is expected that WisDOT staff will hire the services of an individual or firm with expertise in the areas of electronic communications, software, and automate telephone answering services.

Time Frame: Both the development of functional requirements and specifications and the automated transit schedule test are proposed for Years 3 and 4.

Budget:

Year 1:	$0
Year 2:	$0
Year 3:	$50,000
Year 4:	$15,000
Year 5:	$0

Staffing: For project development and oversight only (in full-time equivalent person-years per year):

Year 1:	.00 FTE
Year 2:	.00 FTE
Year 3:	.10 FTE
Year 4:	.10 FTE
Year 5:	.10 FTE

Sponsor: WisDOT Transit Section is recommended to sponsor this project.

PROJECT 4.3 INFRASTRUCTURE

Functional Requirements: *(Please refer to "Project 4.1, Phase 4.1.1: Expand 1-800 ROADWIS Automated Telephone Service".)*

Preliminary System Architecture: *(Please refer to "Project 4.1, Phase 4.1.1: Expand l-800 ROADWIS Automated Telephone Service".)*

Data Flow: *(Please refer to "Project 4.1, Phase 4.1.1: Expand 1-800 ROADWIS Automated Telephone Service".)*

PROGRAM AREA 5:

PUBLIC - PRIVATE PARTNERSHIPS

PROGRAM AREA OVERVIEW

Description:

The successful introduction of ITS services relies on private as well as public sector commitments. Awareness and support of ITS Services must be developed in both sectors to allow ITS initiatives to reach their full potential, therefore, an early start to develop these relationships is critical.

Public-private partnerships include a range of activities, such as "design/build" project implementation, system operation and maintenance, and sharing of facilities. There will be several issues that the ITS Deployment Committee focuses on in terms of legal and procurement issues to help establish public-private partnerships, such as:

- Statutory Authority - the extent by which partnerships are allowed, including data, facility, and staff sharing.
- Partnerships involving purchases of equipment or software relative to competitive bidding or sole source of supply.
- Developing partnership agreements and purchase orders.
- Partnerships involving procurement of services.
- Property rights and ownership of documents.
- Intellectual property indemnification.
- Patents.
- Copyrights.
- Audit clauses.
- Confidentiality.
- Liability.
- License agreements.

This program area provides the means for identifying opportunities and actively involving the private sector in the implementation of ITS service initiatives in the IH 90/94 corridors.

This program area will include three components:

1. Specific *project opportunities* that are integral to the successful deployment of the IH 90/94 Corridor Strategic Deployment Plan and which involve a private sector component, including such projects as:

    - Outreach Initiatives
    - Cellular Telephone Origin & Promotion
    - Fiber-Optic Cable Installations
    - Changeable Message Signs

- Interactive Kiosks
- Home Page/Media Coordination

2. *Open initiatives* which provide forums and mechanisms through which IH 90/94 public-private partnerships can be pursued and integrated with the Strategic Deployment Plan; and,

3. A public-private partnership *education* and *outreach program.*

These components would be initiated simultaneously and over the lifetime of the IH 90/94 Corridor Strategic Deployment Plan.

Rationale: The program area has the potential to support all overriding factors established by the IH 90/94 Technical Team:

- *Corridor - Wide Perspective*
- *Consistent with Translink 21*
- *Regional Consistency*
- *Regional Impact*
- *Integration w/Existing Systems*
- *Social/Economic Awareness*
- *An Early Winner*
- *Ease of Deployment*
- *Measures Performance/Benefits*
- *Risk/Benefits*
- *Maintenance/Operation*
- *Building Block Approach/Incremental*
- *Meets User Expectations*
- *Meets User Needs*
- *Meets User Perceptions*
- *Meets Agency Expectations*
- *Meets Agency Needs*
- *Meets Agency Perceptions*
- *Opportunity for Private Partner*
- *Cost/Benefit: Life Cycle Cost*
- *User Acceptance*
- *Serves Many*
- *High Visibility*
- *National Consistency*
- *National Impact*

Expected Results: By **identifying** opportunities and stimulating private sector involvement, it is expected that many ITS projects along the IH 90/94 Corridors will attract private partners and funding.

Following is the proposed timetable for each of the projects under Program Area 5.

Program Area 5: Public-Private Partnerships		Implementation Timeframe*			
		Year 1	Year 2	Years 3 - 5	Years 6 - 10
5.1	Outreach Initiatives	X	X	X	X
5.2	Cellular Telephone Origin and Promotion		X	X	X
5.3	Fiber Optic Cable Installations		X	X	X
5.4	Changeable Message Signs		X	X	X
5.5	Interactive Kiosks		X	X	X
5.6	Home Page/Media Coordination		X	X	X

PROJECT 5.1 OVERVIEW

Project 5.1: Outreach Initiatives

Description: The purpose of this projecg is to identify opportunities and stimulate private sector involvement in the development and deployment of ITS in the IH 90/94 Corridors. The project includes the establishment of a regular forum to discuss private sector involvement and ongoing analysis of opportunities and benefits for private sector partners. This project will also research techniques, procedures, agreements and legislation that support public/private partnerships, provide this information to IH 90/94 projects and facilitate the support necessary to establish these partnerships.

Current Conditions: WisDOT currently uses agreements with private parties for the installation of fiber optic cable in public rights-of-way.

Scope and Partnership Responsibilities: It is expected that ITS Midwest chapter will play a lead role in organizing and the ongoing guidance of this project. ITS Midwest will work with other groups in the corridors, such as local agencies and WisDOT-ITS working groups which have shown a significant amount of interest in ITS initiatives. They will be given a small amount of staff support within this project for areas such as meeting coordination and resources for material development.

Time Frame: Initially, first-year activities would identify opportunities and potential private sector partners. Two-year contract periods between partners are recommended to encourage the stability of a project. After that, contracts could be awarded on an annual basis. This project will operate continuously throughout the deployment period.

Partnership Benefits: Partnership benefits will include a continuous outreach effort via a regular forum to encourage and support private sector involvement. Improved communications and educational exchanges between organizations and manufacturers will also result.

Budget:

Year 1:	$25,000
Year 2:	$25,000
Year 3:	$40,000
Year 4:	$50,000
Year 5:	$50,000

Sponsor: WisDOT ITS Section

PROJECT 5.2 OVERVIEW

Project 5.2: Cellular Telephone Origin & Promotion

Description: This project involves enlisting the participation of cellular telephone companies in freeway incident detection and travel information to reduce the burden of law enforcement in screening and dealing with the high number of telephone calls which do not require law enforcement or emergency vehicle response.

Scope and Partnership Agreement: An initial inventory of current cellular telephone systems will be conducted. The development of a strategic plan to integrate and develop cooperative agreements between agencies will require the participation of representatives from WisDOT, emergency response organizations, and local governments along the IH 90/94 Corridors.

Time Frame: A solicitation for such a partnership(s) should be made in the second year and continue in succeeding years as needs dictate.

Partnership Benefits: Benefits of such partnerships include cost savings of a coordinated emergency and traveler information cellular telephone system (additional funding options, i.e., time and life saving abilities) and greater accuracy in reporting such information. An improvement in law enforcement communication and efficiencies should also result.

Sponsor: WisDOT ITS Section

PROJECT 5.3 OVERVIEW

Project 5.3: Fiber Optic Cable Installations

Description: This project involves identifying installation opportunities and generating revenue through installation of fiber optic cable on existing highway rights-of-way.

Scope and Partnership Agreements: An inventory of desirable fiber optic cable expansion areas (in designated ITS deployment areas) should be prepared and matched with potentially available roadway right-of-way. A feasibility analysis and priority installation schedule could then be developed. Partnership agreements should include provisions for installation specifications, permitting, maintenance, compensation, and expansion review and authority.

Fiber optic installations have been completed on some sections of I-94 and WisDOT has received a flat fee for the installations. In the past, WisDOT has not marketed right-of-way access.

Time Frame: A solicitation for partnership(s) should be made when it is determined that fiber optic cable installation will take place.

Partnership Benefits: It is expected that revenue will be generated that will lead to monetary compensation for WisDOT and/or free or low cost access to bandwidth. Acquisition of bandwidth could help expedite ITS deployment in the IH 90/94 corridors.

Sponsor: WisDOT ITS Section

PROJECT 5.4 OVERVIEW

Project 5.4: Changeable Message Signs

Description: This project involves the participation of the private sector in the acquisition and maintenance of portable and permanent changeable signs.

Scope and Partnership Agreement: The acquisition and maintenance of changeable message signs could occur in any preapproved location. Partnership agreement items could range from revenue generated in return to advertising space to provisions for programming operations and maintenance, staffing, information display/distribution, and appearance/placement of corporate sponsorship images.

Time Frame: A solicitation for such a partnership(s) should be made after WisDOT and others have identified and approved opportunities for the private sector participation in financing CMS.

Partnership Benefits: Benefits include the potential for additional financial resources along with additional information being made available to travelers in the IH 90/94 corridors.

Sponsor: WisDOT ITS Section

PROJECT 5.5 OVERVIEW

Project 5.5: Interactive Kiosks

Description: This project involves the participation of the private sector in the acquisition and/or maintenance of interactive kiosks.

Scope and Partnership Agreement: The acquisition and maintenance of interactive kiosks could occur in any preapproved location, such as highway rest stops, information centers, or other transportation/traveler hubs (bus/passenger rail terminals, airports, hotels, etc.). Partnership agreement items could include provisions for programming operations and maintenance, staffing, information display/distribution, and appearance/placement of corporate sponsorship images.

Time Frame: A solicitation for such a partnership(s) should be made when it is determined that interactive kiosk installations will take place.

Partnership Benefits: Benefits include the potential for additional financial resources along with additional information being made available to travelers in the IH 90/94 corridors.

Sponsor: WisDOT ITS Section

PROJECT 5.6 OVERVIEW

Project 5.6: Home Page/Media Coordination

Description: This project involves the coordination of WisDOT, Internet, and private news resources for traveler information. WisDOT and major providers of AM radio traffic information in the IH 90/94 Corridors may maintain Internet world wide web sites which will include traveler information.

Scope and Partnership Agreement: Coordination efforts could include sharing information, procedures to ensure consistency in the information provided and provision contradictions, and provision of electronic links between these and related world wide web sites. Partnership agreements should include means by which information will be shared, updated, stored, and continuously linked.

Time Frame: A solicitation for such a partnership(s) should be made when it is determined that home page/media coordination activities will take place.

Partnership Benefits: Benefits include the potential for additional financial resources along with additional information being made available to travelers in the IH 90/94 corridors.

Sponsor: WisDOT ITS Section

PROGRAM AREA 6: TECHNICAL AND PLANNING SUPPORT

PROGRAM AREA OVERVIEW

Description:

This program area consists of support services to the IH 90/94 Corridors in the following areas:

ITS Deployment - It is recommended that an ITS Deployment Committee be formed to coordinate and facilitate the implementation of the IH 90/94 ITS projects. The current IH 90/94 Technical Committee is recommended to become the ITS Deployment Committee. This new committee should at least be represented by agencies from WisDOT, affected counties, and other governmental jurisdictions within the IH 90/94 Corridors. Services will be needed to support the formation, administration, and activities of this ITS Deployment Committee and technical sub-committees including decision support, project workshops, data collection, and meeting facilitation.

Technical Support - Technical services will be needed to support the ITS Deployment Committee in the development of projects and providing technical coordination, evaluation, and management of various projects in the IH 90/94 Corridors. Initial efforts will focus on developing detailed project plans including reviews of relevant and existing plans, systems, standards, specifications, and guidelines. Guidance will also be provided in coordinating the IH 90/94 ITS program with local, state, and national efforts and plans. Recommendations will be developed for joint working relationships, and private sector initiatives and responsibilities. It is expected that ITS Midwest will play an important role in the coordination and establishment of standards and guidelines.

Outreach and Public Education - Services will be provided to develop and conduct outreach and public education programs of ITS services and systems. Benefits such as increased efficiency and safety will be emphasized. Service will include workshops, meetings, public forums, and newsletters. The purpose of this program area is to build public awareness and support for ITS services.

It is expected that this program area will be supported through a combination of the ITS Midwest chapter and other groups in the IH 90/94 Corridor area which have shown interest in ITS initiatives. This support may be augmented by consultant services. The need for outside services will be reviewed and balanced against the program and internal staff resources.

Rationale: This program area will support all of the top problems in the IH 90/94 Corridor and all overriding factors.

Expected Results: This program area will result in a coordinated and systematic method for deploying ITS in the IH 90/94 Corridor.

Following is the proposed timetable for each of the projects under Program Area 6.

Program Area 6: Technical and Planning Support	Implementation Timeframe			
	Year 1	Year 2	Years 3 - 5	Years 6 - 10
6.1 ITS Deployment Committee				
6.1.1 Initial Committee Development	X			
6.1.2 Administrative and Coordination Support	X	X	X	X
6.1.3 Decision Support	x	x	X	X
6.2 Technical Support				
6.2.1 Develop Project Plans, Solicitations, Evaluations	X	X	X	X
6.2.2 Lead Projects at the Direction of the Deployment Committee Including System Architecture Refinement	X	X	X	X
6.2.3 Coordinate and Update IH 90/94 Corridors Strategic Plan as Necessary with Subregional, Regional, and National Plans	X	X	X	X
6.3 Outreach/Education				
6.3.1 Program Information Center	X	X	X	X
6.3.2 Public Outreach and Education	X	X	X	X
6.3.3 Internal Education and Interagency Involvement Program	X	X	X	X

PROJECT 6.1 OVERVIEW

Project 6.1: ITS Deployment Committee

Objective: Support the establishment of an ITS Deployment Committee and technical subcommittees and provide ongoing administrative support to these committees.

Current Conditions: The IH 90/94 Technical Team convened in September, 1995, and has continued to the present. It is anticipated that this project will activate new committees derived from the Technical Team.

Scope: This project involves the establishment of the ITS Deployment Committee and technical subcommittees, the administrative support of those committees, and the decision support for project lead agencies.

This project is divided into the following phases:

Phase 1 - 6.1.1 Initial Committee Development

It is recommended that an ITS Deployment Committee and technical subcommittees be formed from the current IH 90/94 Technical Committee to support the deployment of the Strategic Plan. The ITS Deployment Committee will oversee deployment in a consistent and integrated manner and ensure that the deployment plan is maintained and updated as necessary. The technical subcommittees or working groups will oversee specific projects conducted under the Strategic Plan.

This phase will support the creation of the committee structure including: developing a comprehensive plan for the operation, authority, responsibilities of each committee; identifying and securing representation on the committees by appropriate individuals and agencies; leading the development of organization goals and objectives for each committee; and identifying the initial plans for the committee operations.

Phase 2 - 6.1.2 Administrative and Coordination Support

This phase will provide support to the general operations of the IH 90/94 Corridor ITS committees. This will include coordination, facilitation and documentation of committee meetings, financial tracking of IH 90/94 ITS projects, correspondence support for internal activities, and provide a central contact for deployment and ITS in the IH 90/94 Corridor.

Phase 3 - 6.1.3 Decision Support

As the IH 90/94 Corridor Strategic Plan evolves and becomes a mature program, an ongoing decision support process will be necessary to determine project priorities and funding levels. A central element of this decision support is the gathering and analysis of relevant project information. A framework is needed to analyze the costs, benefits, impacts and other issues of corridor projects in a common manner such that relative merits of projects can be viewed in an objective manner.

This phase provides support services to individual projects and lead agencies to help justify project funding. It establishes a framework to perform cost-benefit impact and other analysis needed to justify corridor projects. It also provides staff support to perform analysis functions. Included will be the collection of data from relevant sources to support the analysis process.

Location: The ITS Deployment Committee and technical subcommittees will represent transportation agencies and interests throughout the IH 90/94 Corridors.

Technology: General purpose office automation technology will be used to support the ITS Deployment Committee and technical subcommittees.

Administration: It is recommended that the WisDOT ITS staff lead this project with staff support and/or assistance from a third party. The lead agency will receive proportional funds for the contract from supporting agencies. It is recommended that each supporting agency commit to a 15% participation level for at least one FTE to serve as a lead person.

Time Frame: This project will be the first initiative undertaken in the deployment of ITS in the IH 90/94 Corridors and would begin in Year 1. The ITS Deployment Committee will reconvene as needed throughout the deployment of ITS in iH 90/94 Corridors.

Budget:

Year 1:	$35,000
Year 2:	$60,000
Year 3:	$60,000
Year 4:	$60,000
Year 5:	$60,000

Staffing: Staff persons from each member agency will be needed to support the ITS Deployment committee and this effort be overseen by the ITS Section. Staff support will also be needed on each of the technical subcommittees.

Year 1:	.25 FTE
Year 2:	.25 FTE
Year 3:	.33 FTE
Year 4:	.33 FTE
Year 5:	.50 FTE

Sponsor: It is recommended that WisDOT ITS Section sponsor this project.

PROJECT 6.2 OVERVIEW

Project 6.2: Technical Support

Objective: Provide the ITS Deployment Committee and technical sub-committees with technical services and project management support for IH 90/94 Corridor ITS projects. The potential benefits from this project are:

- Provide the necessary level of staffing to deploy ITS in the IH 90/94 Corridors.
- Provide necessary support and guidance to facilitate deployment plans.
- Ensure continuous, long-term development of new and improved ITS initiatives and management techniques.

Current Conditions: Project management and technical support is currently being provided to the IH 90/94 Technical Team through WisDOT staff and the BRW consulting team.

Scope: This project involves providing technical project management support to the ITS Deployment Committee and technical subcommittees.

This project is divided into the following phases:

Phase 1 - 6.2.1 Develop Project Plans, Solicitations, Evaluations

The output of the Strategic Plan will establish the core elements of projects to be funded with local, state and federal funds. From these core elements, project plans and solicitations for consultants and contractors need to be identified and developed. The lead agencies for the projects will determine the project management needs for each project and the resources to develop and manage the projects. This phase provides ongoing support to the lead agencies for finalizing project definitions, developing project solicitations, selecting suppliers, and evaluating projects and results achieved. It is expected that if consultants are involved in project development and evaluations, they will be excluded from supplying the requested project services. It is expected that project development support will be requested for four to eight projects per year and evaluation support for two to four projects per year.

Phase 2 - 6.2.2 Lead Project at the Direction of the Deployment Committee Including System Architecture Refinement

This phase provides project management for those IH 90/94 projects not managed by participating agencies. Project management activities will include:

- Developing scope of work, schedule and budget with contractor
- Providing technical leadership for project activities
- Ensuring project meets objectives, budget and schedule
- Serving as a liaison with appropriate IH 90/94 Corridor ITS interests
- Managing administrative functions

It is expected that between one and three projects will be supported by this phase each year.

Phase 3 - 6.2.3 Coordinate and Update IH 90/94 Corridor Strategic Plan as Necessary with Subregional, Regional, and National Plans

The IH 90/94 Corridor Strategic Plan is a "living" document that needs to be updated on an annual basis to reflect changes in local, regional and national ITS plans, opportunities and needs. This phase will monitor the IH 90/94 ITS projects and other local and state ITS initiatives and track their compatibility with each other and national ITS initiatives and architectures. It will also support an annual update to the strategic plan including a process to review past plans, current status and needs, and a review and update of program area priorities and project funding.

Location: Corridor-wide.

Technology: General purpose office automation technology will be used to provide technical support.

Administration: If consulting services are determined necessary, then it is recommended that the contract for such services be administered by a lead agency. The lead agency will receive proportional funds for the contract from supporting agencies. The technical support contract is initially expected to be a two-year contract and be extended in two-year increments. This will allow the support consultant to dedicate adequate resources to the project and establish a project office.

IH 90/94 area agencies may request services of the technical support consultant on an as-needed basis. Each requesting agency should supply a liaison to the technical support consultant to coordinate issues. An oversight committee will also be established.

Time Frame: This project will be ongoing throughout the deployment periods.

Budget:

Year 1:	$45,000
Year 2:	$95,000
Year 3:	$95,000
Year 4:	$95,000
Year 5:	$95,000

Staffing: Staff support personnel from each member agency will be needed to support the ITS Deployment committee. Staff support will also be needed on each of the technical subcommittees.

Year 1:	.05 FTE
Year 2:	.05 FTE
Year 3:	.l0 FTE
Year 4:	.l0 FTE
Year 5	.10 FTE

Sponsor: It is recommended that WisDOT ITS section and corridor government agencies provide the sponsorship for this project.

PROJECT 6.3 OVERVIEW

Project 6.3: Outreach/Education

Objective: To build private and public awareness of and support for ITS services and benefits throughout IH 90/94 Corridors. The potential benefits from this project are:

- Education of local, state, and national political representatives on ITS services and their benefits to transportation and the general public.
- Education of the general public and private industry to increase knowledge of travel and business benefits of ITS applications.

Current Conditions: Outreach programs have been used to educate individuals and agencies throughout the IH 90/94 Corridor area. The IH 90/94 Technical Committee has held a series of individual meetings, conducted workshops and prepared newsletters to keep the public apprised of ITS plan developments.

Scope: The introduction of ITS services will be through a combination of public and private initiatives. Awareness and support of ITS services must be developed in both sectors to allow ITS initiatives to reach their full potential. In the public sector, local, state and national political representatives should be educated on ITS services and their benefits to transportation and the general public. This education will allow legislators to make informed funding decisions when proposals are presented for ITS initiatives. Public agency officials need to be educated on ITS services and plans for the IH 90/94 Strategic Plan so that they incorporate these services and plans when they make their planning decisions. Finally, the general public needs to be made aware of the ITS initiatives so they can support their representatives and become educated on benefits of ITS services.

In the private sector, service providers, equipment manufacturers and system developers need to be brought into a full partnership with the public sector initiatives. These private sector organizations need to be made aware of potential partnerships on all IH 90/94 Corridor projects and forums established to discuss how private sector involvement can be fostered.

This project is divided into the following phases:

Phase 2 - 6.3.1 Program Information Center

A Program Information Center (NC) will be developed to provide a centralized source of information of IH 90/94 projects and activities. As the official "voice" of the IH 90/94 Strategic Plan, the PIC will publish a

regular newsletter and press releases. It will also develop special communications materials such as brochures, displays, and media communication pieces as necessary throughout the life of IH 90/94 ITS initiatives. Finally, the PIG will serve as a central source for all inquiries on IH 90/94 ITS activities. Inquiries will be handled directly or forwarded to the appropriate agency.

Phase 2 - 6.3.2 Public Outreach and Education

This phase focuses initially on providing local and state political representatives with information on ITS services and benefits. Forums and workshops will be conducted throughout the region to provide legislators with information on issues such as IH 90/94 ITS projects, future plans, private initiatives, benefits from existing local systems and national operational tests. The general public will also be educated on these issues as projects near operation and funding requests are submitted.

Phase 3 - 6.3.3 Internal Education and Interagency Involvement Program

This phase focuses on educating public agency officials on the use of ITS services and the status of IH 90/94 ITS projects. Classes and workshops could be held on a regular basis to provide this education. Training could be provided for planners, design engineers, department leaders and others concerned with ITS services. A regular forum could also be established to discuss the use of ITS services and an exchange of ideas, practices and operating issues associated with ITS services. This training would cover technicians, system operators, and operation managers from ITS agencies throughout the lH 90/94 Corridor.

This phase will also provide a mechanism for interaction between the ITS Deployment Committee and subcommittees, ITS Midwest and environmental agencies to discuss the use of ITS services to address environmental (air quality) issues within the IH 90/94 area.

Technical support phases are proposed to continue over the lifetime of the Strategic Deployment Plan.

Location: Corridor-wide.

Technology: General purpose office automation technology will be used to provide technical support.

Administration: It is expected that ITS Midwest chapter will play a lead role in the organization and ongoing guidance of this project. ITS Midwest will work with other groups in the corridor, such as MPOs and WisDOT ITS working groups which have shown a significant amount of interest in ITS initiatives.

Time Frame: Initial two-year contract and a minimum of a second two-year contract.

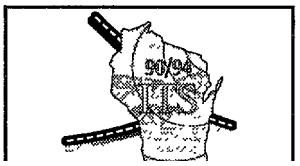
Budget:

Year 1:	$20,000
Year 2:	$45,000
Year 3:	$45,000
Year 4:	$45,000
Year 5:	$45,000

Staffing: Each IH 90/94 Corridor stakeholder should expect to commit staff support for this project. This level of support could come from various agencies within the State of Wisconsin, including WisDOT, the Wisconsin State Highway Patrol, city and county governments, private interests (commercial vendors), and other transportation agencies.

Year 1:	.05 ETE
Year 2:	.05 FTE
Year 3:	.05 FTE
Year 4:	.05 FTE
Year 5:	.05 FTE

Sponsor: It is recommended that the WisDOT ITS Section sponsor this project.



4.0 PERFORMANCE CRITERIA/ EVALUATION FRAMEWORK

4.1 Overview

To determine the success of the ITS initiatives recommended for the IH 90/94 Intercity Corridor, criteria have been proposed along with a framework to serve as a guide to monitor the impact of ITS in the IH 90/94 corridors. This section of the strategic deployment plan identifies specific performance criteria for each project along with a framework for evaluating ITS in the IH 90/94 corridors.

4.2 Performance Criteria

In the context of the ITS strategic development process, performance criteria focus on the types of benefits each user service bundle is expected to provide. To the extent possible, the performance criteria should be quantitative, even though it may be difficult to collect sufficient data to support their analyses. While quantitative assessments are desired, a qualitative assessment, such as a survey of the attitude of the people who interact with the system (e.g., operations personnel, decision makers) may also serve as a valuable source in evaluating the performance of ITS.

The performance criteria for the IH 90/94 Intercity Corridor have been developed with several conditions in mind. The criteria must be measurable, and the necessary data must be obtained or collected using resources typically available to agencies in the corridor area. The criteria must also measure or evaluate an effect created by a specific ITS project.

On the following pages, performance criteria are proposed for each program area and its associated projects as identified in Chapter 3. For each IH 90/94 ITS project, the following performance criteria areas are defined:

- Measures of performance criteria
- Data/information requirements for application of the measure
- Data/information sources for application of the measure

POTENTIAL BENEFITS

For Program Area 1:

Commercial Vehicle Operations

- *More Consistent Safety Inspections*
- *Decrease in Time Spent per Safety Inspection*
- *Increase in Number of Safety Inspections*
- *Reduction of Time Vehicles Spend in Weigh Stations*
- *Reduction in Back-up of Vehicles onto the Interstate*
- *Increase in Volume* of *Vehicles that One Weigh Station can Process*
- *Reduction of Safety Hazard Associated with Slow Vehicles Re-entering Interstate*
- *Reduction in Government Cost to Regulate Motor Carriers*
- *Reduction in Costs for Motor Carriers*
- *Establishment of a Common Database for CVO Credentials*
- *Third Party Access to CVO Database*
- *Streamlined Application Process for Motor Carriers*
- *Improved Motor Carrier Compliance*

Program Area 1: Commercial Vehicle Operations
Project 1.1: Automated Safety Inspections/Weigh In Motion Scales
Subpart 1: Implement Smart Scales Facility

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) Data on System Performance/Opertaions	-Message send time -Message content -Number of retries - Information presented to user -Message receipt time -Received message content -System reliability, accuracy, availability, durability, maintainability, etc.	- Test runs w/ automated and manual data logging (in the vehicle and at the control center) - Log kept by operators during system operations
Opertaional 1) Annual Number of Inspections 2) Weigh Station Delay	- "Pre-" average number of inspections (last 5-yrs) - "Post-" number of inspections (1st year) - "Pre-" average amount of delay (last 5-yrs) - "Post-" average amount of delay (1st year)	-Weigh station records/logs -Trucking firm records/logs -"Pre-/Post-" delay study
Financial 1)Annualoperatingcosts 2) Annual Maintenance Costs 3) Project Start-Up Costs	- "Pre-" average operating cost (last 5.yrs) - "Post-" operating cost (1st year) - "Pre-" average maintenance cost (last 5-yrs) - "Past-" maintenance cost (1st year) - Project cost (design. development. deployment)	- WisDOT financial records - Project financial records
Human Factors 1) User Perceptions of System	-System utility/usefulness -Location of system in vehicle -Types of features offered -Message content -Method of delivery -Perceived weigh station delay -Comfort level w/ system -Desired additional features -Willingness-to-pay for system -Perceived benefits of system -Appropriatenes of displayed information -Additional uses of system	- User survey (truckers & weigh station operators) - Interviews (truckers & weigh station operators) - "On-hands" use of system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-bwks." laws, regulations, standards, etc - WisDOT intra-agency divisions - Inter-agency roadblocks	- State law records - WisDOT interviews -Agency interviews

Program Area 1: Commercial Vehicle Operations
Project 1.2: Automated Safety Inspections/ Weigh In Motion Scales
Subpart 2: Expansion of Ramp Weigh In Motion Scales

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical I) Data on System Performance/Operations	- Message send time - Message content - Number of retries - Information presented to user - Message receipt time - Received message content - Vehicle weight (static scale) - Vehicle weight (WIM) - Observed vehicle data (axles, class, height, etc) - WIM/AVC data (axles, class, height, etc.] - System reliability. accuracy, availability, durability, maintainability, etc.	-Test runs w/ automated and manual data loggmg (in the vehicle and et the control center) - Log kept by operators during system operations -WisDOT project records -Agency project records -Database system
2) Regional Interoperability	-Technical inventory of WisDOT CVO systems . - Technical inventory of regional systems	..
3) Database Records	-Safety/inspection, weight, permits, fuel tax, etc.	
Operational I) Annual Number of Vehicles Processed	- "Pre-" average number of vehicles (last 5-yrs) -"Post-" number of vehicles (1st year)	-Weigh station records/logs -Trucking firm records/logs
2) Weigh Station Delay	- "Pre- average amount of delay (last.5-yrs) - "Post-" average amount of delay (1st year)	- "Pre-/Post-" delay study
3) Number of Accidents Related to Weigh Station	- "Pre-" average number of accidents (last 5-yrs) - "Post-" average number of accidents (1st year)	
Financial 1) Annual Operating Casts	- "Pre-" average operating cost (last 5-yrs) - "Post-" operating cost (1st year)	**- WisDOT financial records** **- Project financial records**
2) Annual Maintenance Costs	- "Pre" average maintenance cost (last 5-yrs) - "Post-" maintenance cost (1st year)	
3) Project Start-Up Costs	-Project cost (design, development, deployment)	
Human Factors 1) User Perceptions of System	-System utility/usefulness -Location of system in vehicle -Types of features offered -Message content - Method of delivery -Perceived weigh station delay -Comfort level w/ system -Desired additional features -Willingness-to-pay for system - Perceived benefits of system -Appropriateness of displayed information - Additional uses of system	-User survey (truckers & weigh station operators) - Interviews (trackers & weigh station operators) - "On-hand" use of system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws regulations, standards. etc - WisDOT intra-agency divisions - Inter-agency roadblocks	- State law records - WisDOT interviews - Agency interviews

Program Area 1: Commercial Vehicle Operations
Project 1.2: Purchase Credentials in Advance

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) Date on System Performance/Operations 2) Regional Interoperability 3)Database Records	-Types of credentials offered (oversize, overweight) -Type(s) of credentials requested -Time credentials requested -Time credentials received -Credentials delivery method (FAX, mail, e-mad) -Type of payment -System reliability accuracy, availability durability maintainability etc. -Inventory of participating States - Inventory of credentials offered by State -Trucking firm, credentials requested, payment method. transaction date, delivery method, etc	- Control tests w/ manual data logging (at control center) - Log kept by operators during system operations - WisDOT project records -Agency project records -Database system
Operational 1) Annual Number of Credentials Processed 2) Delivery Time	- "Pre-" average number of credentials (last 5-yrs) - "Post-" number of credentials (1st year) - "Pre-" average amount of delivery time (last 5-yrs) - "Post-" average amount of delivery time (1st year)	- WisDOT records/logs -Trucking firm records/logs - "Pre-/Post" time-delay study
Financial I) Annual Operating costs 2) Annual Maintenance Costs 3) Project Start-Up Costs	- "Pre-" average operating costs (last 5-yrs) - "Post-" operating cost (1st year) - "Pre-" average maintenance cost (last 5-yrs) - "Post-" maintenance cost (1st year) - Project cost (design, development, deployment)	- WisDOT financial records - Project financial records
Human Factors 1) User Preceptions Of system	-System utility/usefulness - System accessibility - Types of features offered -Timeliness of system operations -Credentials delivery method -Perceived credentials delivery time - Comfort level w/ system - Desired additional features - Willingness-to-pay for system -Perceived benefits of system - Additional uses of system	- User survey (trucking firms & system operators) - Interviews (trucking firms & system operators) - "On-hands" use of system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws, regulations. standards, etc - WisDOT intra-agency divisions -Inter-agency roadblocks	- State law records - WisDOT interviews -Agency interviews

POTENTIAL BENEFITS

For Program Area 2:

Incident Management

- *Quicker Incident Detection*
- *Quicker Response Times*
  - *Medical*
  - *Law Enforcement*
  - *Maintenance*
- *Decrease Risk of Fatalities*
- *Reduction in Incident Related Congestion*
- *Increased Safety*
- *Reduced Energy Consumption*
- *Cost Savings*
  - *Time*
  - *Fuel*
  - *Insurance*
- *Multi-Jurisdiction Coordination*
- *Ability to Identify Location of Cellular Calls*
- *Increased Efficiency of 911 Response System*

Program Area 2: Incident Management
Project 2.1: Develop an Incident Management Plan

PerformanceCriteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) Incident Response & Service Times 2) Data an Plan Performance/Operations 3) Regional Interoperability	- Time incident detected - Time incident verified - Time responsearriveson-scene - Time incident cleared -Time traffic restored to pre-incident condition -Agencies contacted - Location of incident - Type of response requested - Type of response on-scene -Type of resource utilized -Applicability of derived IM policies/procedures - Applicability of technology integration strategy -Hourly traffic volumes (pre-,during-, post-incident- -Technical inventory ofWisDOT resources -Technical inventory of regional agency resources	- Log kept by operators during system operations - WSP project rcords/logs - Agency project records/logs - Local IM Plan - AADT traffic volumes - ATMS traffic counts - Wis DOT project records/logs
Operational 1) Annual Number of Incidents (per type) 2) Number of Secondary Accidents 3) Incident Response Time (per type) 4) Incident Duration/Delay (per type) 5) Incident Location (per type)	- "Pre-"average number of incidents (last 5-yrs) - "Post-" number of incidents (1st year) - "Pre-" average number of accidents (last 5-yrs) - "Post-" average number of accidents 1st year) - "Pre-" incident response time (last5-yrs) - "Post-" incident response time (1st year) -"Pre-" incident duration (last 5-yrs) -"Post-" incident duration (1st year) - "Pre-" incident location (last 5-yrs) -"Post-" incident location (1st year)	- WSP records/logs - Local law enforcement agency records/logs - system operator records/logs
Financial 1) Annual Incident Response Costs 2) Project Start-Up Costs	- "Pre-" average cost per agency (last 5-yrs) - "Post-" cost per agency (1st year) - Project cost (design. development, deployment)	- Agency financial records - Project financial records
Human Factors 1) User Perceptions of Plan	-Plan utility/usefulness -Types of responses covered - Perceived incident duration/delay - Comfort level w/ plan -Desired additional features -Perceived benefits of plan - Additional uses of plan -Perceived improvements in coordination, cooperation, and communications betagencies - Perceived applicability of derived IM policies/procedures -Perceived applicability of technology integration strategy -Perceivedincidentresponseand handling	- User survey (public safety organizations, private firms, motorists, etc) - Interviews (public safety organizations, private firms motorists, etc) - "On-hands" use of system -Workshop meetings/discussions
Institutional 1) Legal impediments to deployment 2) Organizatinal impedimentsto deployment	- "On-the-books" laws. regulations, standards, etc - Intra-agency division -Inter-agency roadblocks -Public sector issues - Private sector issues -Coordinating hierarchical IM response	- State law records - Public safety organization interviews -Private company interviews -Workshop meetings/discussions

Program Area 2: Incident Management

Project 2.2: Determine Origin of Cellular Telephone Calls

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical I) Location Determination Service Time 2) Data on System Performance/Operations 3) Regional Interoperability 4) Location Information Presentation	- Time call enters system -Time dispatcher receives location information - Time dispatcher calls response agency - Time response arrives on-scene - Type of response requested - Type of response an-scene - Agencies contacted - Ability to locate call-in - Actual location of call-in (map, lat/long position on roadway link) -Reported location of call-in (map, lat/long position an roadway link) -Location of incident - Vehicle position (actual vs. reported) -Number of mad names or locations identified as missing or incorrect during operation - Lag of all road names and links accessed during operation of workstation -Ability to contact appropriate agency/jurisdiction -Legibility/accuracy of map location -Textual description of location	-Call- system operator/dispatcher logs/records - WSP project records/logs -Agency project records/logs - WisDOT records/logs
Operational 1) Number of Call-Ins 2) Time per Call-In (per incident type) 3) Incident Response Time (per type) 4) Incident Duration/Delay (per type) 5) Time to Display Location Information	-Total number of call-ins (daily, weekly, monthly) - Average number of call-ins daily, weekly, monthly) - Average time per call-in (per incident type) - "Pre-" incident response time (last 5-yrs) - "Post-" Incident response time (1st year) - "Pre-" incident duration (last 5-yrs) - "Post-" incident duration (1st year) - Average time to display location information	- WSP records/logs - Call-system operator/dispatcher log/records
Financial 1) Annual Incident Response Costs 2) Project Start-Up Costs	- "Pre-" average cost per agency (last 5-yrs) -"Post-" cost per agency (1st year) - Project cat (design, development, deployment, PR campaign, etc.)	-Agency financial records - Project financial records
Human Factors 1) User Perceptions of Call-In System	- Location system utility/usefulness - Types of responses covered -Perceived incident duration/delay - Comfort level w/ location system - Desired additional features - Perceived benefits of location system - Additional uses of call-in system - Perceived improvements in incident detection, verification, & dispatch notification -Perceived time to conduct location operations - Utility of PR campaign -Ability to interpret location information (map legibility/accuracy, textual descriptions - Appropriateness of displayed information	- User survey (system operators. public safety organizations, motorists/callers, etc) - Interviews (system operators, public safety organizations, motorists/callers, etc.) - "On-bands" use of call-m system
Institutional I) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws, regulations, standards, etc -Compliance of telecommunication carriers w/ FCC - Intra-agency divisions -Inter-agency roadblocks - Pblic sector issues -Private sector issues -Coordinating hierarchical IM response	- State law records -Federal regulations - Public safety organization interviews - Private company interview

Program Area 2: Incident Management
Project 2.3: Expand Use of Cellular Telephones

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical **I)** Call-in Service Times 2) Data on System Performance/Operations 3) Regional Interoperability	-Time call enters system -Time dispatcher receives call -Time dispatcher calls response agency -Time response arrives on-scene - Type of response requested - Type of response on-scene -Agencies contacted - Ability to locate call-in -Location of incident - Ability to contact appropriate agency/jurisdiction	- Call-in system operator/dispatcher logs/records -WSP project records/logs -Agency project records/logs -WisDOT records/logs
Operational I) Number of Call-Ins 2) Time per Call-In (per incident type) 3) Incident Response Time (per type) 4) Incident Duration/Delay (per type)	-Total number of call-ins (daily, weekly, monthly) - Average number of call-tns (daily, weekly, monthly - Average time per call-in (per incident type) - "Pre-" incident response time (last 5-yrs) - "Post-" incident response time (1st year) - "Pre-" incident duration (last 5-yrs) - "Post-" incident duration (1st year)	- WSP records/logs -Call-in system operator/dispatcher logs/records
Financial 1) Annual Incident Response Costs 2) Project Start-Up Costs	- "Pre-" average cost per agency (last 5-yrs) - "Post-" cost per agency (1st year) - Project cost (design, development deployment, PR campaign, etc.)	-Agency financial records - Project financial records
Human Factors I) User Perceptions of Call-In System	-Call-in system utility/usefulness -Types of responses covered - Perceived incident duration/delay - Comfort level w/call-in system - Desired additional features -Perceived benefits of call-in system -Additional uses of call-in system -Perceived improvements in incident detection. verification. & dispatch notification -Perceived time to conduct call-in operations -Utility of PR campaign	- User survey (system operators, public safety organizations. motorists/callers, etc) - Interview (system operators, public safety organizations, motorists/callers, etc.) - "On-hands" use of call-in system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	-"On-the-books" laws, regulations, standards, etc - Intra-agency divisions - Inter-agency roadblocks -Public sector issues - Private sector issues - Coordinating hierarchical IM responses	- State law records -Public safety organization interviews - Private company interviews

Program Area 2: Incident Management
Project 2.4: Install GPS on Vehicles

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical I) Impact on Response Time 2) GPS Location Device 3) Data on System Performance/Operations 4) Regional Interoperability 5) Location Information Presentation	-Time dispatcher receiver incident notification -Time of notification of emergency vehicle - Position of emergency vehicle when notified - Time response arrives on-scene -Position of motorist -Route taken to reach motorist -Ability to locate GPS vehicle - Actual location of GPS vehicle (map, lat/long, position on roadway link) -Reported location of GPS vehicle (map, lat/long, position on roadway link) - Time of location measurement - Vehicle position (actual vs reported) -Number of mad names or locations identified as missing or incorrect during operation -Log of all road names and links accessed during operation of workstation - Type of response requested - Type of response "n-scene -Agencies contacted - Ability to contact appropriate agency/jurisdiction - Legibility/accuracy of map location - Textual description of location	- GPS system operator logs/records -Agency project records/logs - WisDOT records/logs - WSP records/log - Test runs w/automated and manual data logging (in the vehicle and at the control center)
Operational 1) Annual Number of Incidents (per type) 2) Number of Secondary Accidents 3) Incident Duration/Delay (per type) 4) Incident Response Time (per type) 5) GPS Vehicle Data (delay, travel time, travel speeds)	- "Pre-" average number of incidents (last 5-yrs) -"Post-" number of incidents (1st year) - "Pre-" average number of accidents (last 5-yrs) - "Post-" number of accidents (1st year) - "Pre-" incident duration (last 5-yrs) - "Post-" incident durations (1st year) -"Pre-" incident response time (last 5-yrs) - "Post-" incident response time (1st year) - GPS Corridor data (peak & off-peak)	- WSP records/logs - GPS system operator/dispatcher logs/records - Test runs w/automated and manual data logging (in the vehicle and at the control center) - Call-in system operator logs/records
Financial 1) Annual Incident Response Costs 2) Project Start-Up Costs	- "Pre- average cost per agency (last 5-yrs) - "Post-" cost per agency (1st year) - Project cost (design, development, deployment)	- Agency financial records -Project financial records
Human Factors I) User Perceptions of GPS System	- Utility/usefulness of position location information - Types of responses covered - Motorist perceived response time -Comfort level w/ GPS system -Desired additional features -Perceived benefits of GPS system -Additional uses of GPS system - Perceived improvements in incident detection, verification, & dispatch notification - Ability to interpret GPS information (map legibility/accuracy, textual descriptions) - Perceived incident response and handling	- User survey (system operators, public safety organizations, motorists. etc) - Interviews (system operators, public safety organizations, motorists, etc) - "On-hands" use of GPS system -Market research activities
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	-"On-the-books" laws, regulations, standards, etc -Intra-agency divisions - Inter-agency roadblocks - Public sector issues - Coordinating hierarchical GPS response	-State law records - Public safety organization interviews

POTENTIAL BENEFITS

For Program Area 3:

Emergency Management Services

- *Development of a Proven Automated Accident Notification & Response System*
- *Participate in Established Mayday Project - Rochester, MN Mayday Plus*
- *Reduction in Serious Injuries and Fatalities*
- *Quicker Detection and Response to Injury Accidents*

Program Area 3: Emergency Management Services
Project 3.1: Establish a "Mayday" System for Motorists in Need

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical		
1) Impact on Response Time (date on Mayday system-initiated dispatches)	- Time motorist initiates Mayday signal - Time of receipt of request - Time of notification of emergency vehicle -Position of emergency vehicle when notified - Time response arrives on-scene	-Precise log completed for each event initiated by the Mayday system(including false alarms - Agency project records/logs - WisDOT records/logs - WSP records/logs - Test Run w/ automated and manual data logging (in the vehicle and at the control center)
2) Communications System	-Position of motorist -Route taken to reach motorist -Message send time -Message content -Number of reties -Information presented to user -Message receipt time -Received message content - Confirmation time - Confirmation content	
3) Location Device	- Ability to locate Mayday vehicle -Actual location of Mayday vehicle (map. lat/long, position on roadway link) -Reported location of Mayday vehicle (map, lat/long, position on roadway link) - Time of location measurement -Vehicle position (actual vs reported) -Number of road names or locations identified as missing or incorrect during operation -Lag of all road names and links accessed during operation of workstation	
4) Data on System Performance/Operations	- Type of response requested - Type of response on-scene - Agencies contacted	
5) Regional Interoperability	-Ability to contact appropriate agency/jurisdiction	
6) Location Information Presentation	- Legibility/accuracy of map location -Textual description of location	
Operational		
1) Number of Mayday Requests	- Total number of requests (daily, weekly, monthly) - Average number of requests (daily. weekly, monthly)	- WSP records/logs -Mayday system operator/dispatcher lo&records - Test runs w/ automated and manual data logging (in the vehicle and at the control center) - Call-in system operator logs/records
2) Data on Conventionally Notified Dispatches [log of similar date (above) for non-Mayday calls]	-Mayday response time (per type) -Non-Mayday response time (per type)	
3) Incident Duration/Delay (per type)	-W/Mayday-initiated dispatch (per type) -W/conventional dispatch (per type)	
4) Mayday Requests Requiring Medical Assistance	- Number of fatalities -Number of injuries (per type)	
5) EMS Response Vehicle Data (delay, travel time, travel speeds)	-Non-Mayday Corridor date (peak & off-peak) -Mayday Comdar data (peak & off-peak)	
Financial		
I) Annual Incident Response Costs	- "Pre-" average cost per agency (last 5-yrs) - "Post-" cost per agency (1st year)	-Agency financial records - Project financial records
2) Project Stand-Up Costs	-Project cost (design, development, deployment. PR campaign, etc)	
Human Factors		
I) User Perceptions of Mayday System	- Utility/usefulness of position location information - Types of responses covered - Motorist perceived response time - Comfort level w/ Mayday system -Desired additional features - Preceived benefits of Mayday system - Additional uses of Mayday system - Perceived improvements in incident detection, verification, & dispatch notification -Willingness-to-pay for Mayday system - Utility of PR campaign - Ability to interpret Mayday information (map legibility/accuracy textual descriptions)	-User survey (system operators, public safety organizations, motorists, etc.) - Interviews (system operators, public safety organizations, motorists, etc.) - "On-hands" use of Mayday system - Market research activities
2) Driver Interface Perceptions	- Appropriateness of displayed information - Location in vehicle -Types of features offered -Appropriateness of associated icons -Confirmation message content -Message delivery method -Utility/usefulness of motorist feedback information	
Institutional		
I) Legal impediments to deployment	-"On-the-books" laws, regulations, standards, etc	- State law records - Public safety organization interviews - Private company interviews
2) Organizational impediments to deployment	- Intra-agency divisions -Inter-agency roadblocks - Public sector issues -Private sector issues - Coordinating hierarchical Mayday response	

POTENTIAL BENEFITS

For Program Area 4:

Regional Multimodal Traveler Information

- *IH 90/94 Travelers Provided Useful Information to Help Select:*
  - *Transportation Mode*
  - *Route*
  - *Departure Times*
- *Establishment of a Central Source of Useful Traveler Information*
- *IH 90/94 Travelers Informed of Incidents & Congestion in Advance*
- *IH 90/94 Travelers Informed of Weather & Road Conditions in Advance*
- *Decrease in Congestion*
- *Reduced Energy Consumption*
- *Cost Savings*
  - *Time*
  - *Fuel*
  - *Insurance*
- *Improved Safety*
- *Quick and Convenient Access to Public Transit Information*
- *Increased Use of Public Transit Services*

Program Area 4: Regional Multi-Modal Information
Project 4.1: Provide Pre-Trip Traveler information
Subpart 1: Expand l-800 ROADWIS Automated Telephone Information Service

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) ROADWIS Service Times 2) Data on System Performance/Operations 3) Regional Interoperability	- Time call enters system -Time caller receives desired ROADWIS information -Time data reaches ROADWIS (per source) -Frequency of ROADWIS updates (per data source) -Frequency of ROADWIS information updates - Type of information provided by ROADWIS -Number/type of data source used by ROADWIS - Type of information desired by caller -Number of "outside" lines available to callers -Type of information delivery method used by caller -Number/type of telephone "menus" - Message content (per ROADWIS type) - ROADWIS information accuracy, reliability; timeliness, maintainability, etc. -Number/type of ROADWIS regions - Ability to receive data fmm various so-	- ROADWIS logs/records (automated & manual) - WSP project records/logs -Agency project records/logs - WisDOT records/logs - Trial call-ins (w/automated and manual logs)
Operational 1) Number of Call-Ins (per outside line, per desired information) 2) Time per Call-In (per desired information) 3) ROADWIS Line Utilization 4) ROADWIS System Processing	- Total number of call-ins (daily, weekly, monthly) -Average number of call-ins (daily, weekly, monthly) - Average time per call-m (per desired information) -Number of calls per "outside" line (daily, weekly, monthly) -Number/type of manual processes -Number/type of automated processes	- WSP records/logs - ROADWIS logs/records (automated & manual) - ROADWIS system design
Financial 1) Annual Operating Costs 2) Annual Maintenance Costs 3) Project Start-Up Costs	- "Pre-" ROADWIS cost (last 5-yrs) - "Post-" ROADWIS cost (1st year) - "Pre-" ROADWIS cost (last 5-yrs) - "Post-" ROADWIS cast (1st year) -Project cost (design, development/deployment, PR campaign, etc)	- WSP financial records - WisDOT financial records - ROADWIS financial records
Human Factors 1) User Perceptions of ROADWIS	- ROADWIS utility/usefulness - Types of information provided - Perceived time to receive ROADWIS information - Comfort level w/ ROADWIS -Desired additional features - Perceived benefits of ROADWIS - Additional uses of ROADWIS - Preceived improvements in traveler information dissemination -Utility of PR campaign -Perceived ROADWIS ease-of-access - Perceived utility of ROADWIS message (content, accuracy. realiability timeliness. maintainability, level-of-detail, etc)	- User survey (ROADWIS operators, data source organizations, motorists/callers etc) - Interview (ROADWIS operators. data source organizations, motorists/callers, etc) - "On-hands" use of ROADWIS system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws, regulations, standards. etc. - Intra-agency divisions - Inter-agency roadblocks -Public sector issues -Coordinating ROADWIS data sources/inputs	-state law records - Public sector agency interviews

Program Area 4: Regional Multi-Modal Information
Project 4.1: Provide Pre-Trip Traveler Information
Subpart 2: Expand Home Page Information on the Internet

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical I) Data on system Performance/Operations	- Type of information provided via Internet -Frequency of Internet information updates -Number/type of data sources wed by Internet - Type of information desired by traveler - Number/type of Internet screens -Message content (per Internet screen) - Internet information accuracy, reliability, timeliness, maintainability, etc - Time to access Internet screen(s)	Internet logs/records (automated & manual) - WisDOT project records/logs - Trial call-ins (w/ automated and manual logs)
Operational 1) Number of Internet "Hits"/Transactions 2) Time per Internet "Hit" 3) Internet System Processing	- Total number of "hits" (daily, weekly, monthly) - Average number of "hits" (daily, weekly, monthly) - Average time per "hit" -Number/type of manual processes -Number/type of automated processes	- WisDOT records/logs -Internet logs/records (automated & manual) - Internet Home Page system design
Financial I) Annual Operating Cost 2) Annual Maintenance Costs 3) Project Start-Up Costs	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) - "Pre-" Corridor Study cost (last 5.yrs) - "Post-" Corridor Study cost (1st year) -Project cost (design, development, deployment, PR campaign, etc.)	- WisDOT financial records - Internet project financial records
Human Factors I) User Perceptions of Internet Home Page	-Internet utility/usefulness - Types of information provided - Perceived time to receive Internet information - Comfort level w/ Internet -Desired additional features -Perceived benefits of Internet Home Page -Additional uses of Internet -Perceived improvements in traveler information dissemination - Utility of PR campaign - Perceived Internet ease-of-access - Perceived utility of Internet screen (content. accuracy, reliability timeliness, maintainability, level-of-detail, etc)	-Usersway (Internet developers/operators, motorists/callers. etc) - Interviews (Internet developers/operators motorists/callers, etc) - 'On-hands" use of Internet Home Page/screens
Institutional I) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws, regulations, standards, etc - Intra-agency divisions - Inter-agency roadblocks - Public sector issues -Private sector issues -Coordinating Internet data sources/inputs	- State law records - Public sector agency interviews - Private sector firm interview

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 1: Expand Use of Changeable Message Signs (CMS)

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical		
1) CMS Service Times	-Time CMS message is decided to be used -Time appropriate CMS message is generated -Time message reaches field signs(s) -Number of comunication retries - Frequency of CMS updates (per field sign) -Frequency of CMS message library updates	- CMS system logs/records (automated & manual) - WisDOT project records/logs -Test messages (w/automated & manual logging) - CMS system design & architecture - CMS vendor specifications
2) Data on System Performance/Operations	-Type of information provided by CMS system -Number/type of data sources used by CMS system - Type of information desired by motorist -Message sent to CMS field sign -Message displayed to motorist via CMS field sign - CMS message/content (concept units, words) -CMS message accuracy, reliabilityy timeliness, maintainability, etc.	.
3) Regional Interoperability	-Number/type of CMS signs in field - Ability to send messages to various field signs	
4) System Components	-Type of CMS system (fiber-optic, LED, flip-matrix) . -Open system architecture (comm. protocols, firmware, controllers, software sign formats, etc.)	
5) CMS Sign Location	-Roadway legibility/viewing distance -Roadway legibility/viewing angle - Viewing time - Appropriateness of sign location (strategic, diversion point, traffic need, visibility, etc)	
6) CMS Message	- Number of lines of text - Character size -Number **of** phased/alternating messages - Number of characters	
Operational		
1) Number of CMS Messages Displayed (per sign)	- Total number of displays (daily, weekly, monthly) - Average number of displays (daily, weekly, monthly) - Average time per display (par type of massage)	- WisDOT records/logs - CMS system logs/records (automated & manual) - CMS system design & architecture - CMS vendor specifications
2) Time per Display (per sign)	-Number/type of manual processes	
3) CMS System Processing	-Number/type of automated processes	
Financial		
1) Annual Operating Costs	- "Pre-" Corridor Study cost (last5-yrs) - "Post-" Corridor Study cost (1st year)	- WisDOT financial records - CMS system financial records - CMS vendor costs
2) Annual Maintenance Costs	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year)	
3) Project Start-Up Costs	- Project cost (design, development, deployment, PR campaign,)	
4) CMS Field Sign Cost (per technology type)	-Cos per field sign (per type)	
Human Factors		
) User Perceptions of CMS System	- CMS system utility/usefulness - Types of Information provided - Perceived Time to display CMS message (generation to field display) - Comfort level w/ CMS system -Desired additional features - Perceived benefits of CMS system - Additional uses of CMS system - Perceived improvements in traveler information dissemination -Utility of PR campaign -Perceived utility of CMS message (content, accuracy, reliability timeliness, maintainability level-of-detail, etc) -Public acceptance of CMS system	- User survey (CMS operators, public safety organizations, motorists, etc) -Interview (CMS operators, public safety organizations. motorists, etc) - "On-hands" use of CMS system
Institutional		
1) Legal impediments to deployment 2) Organizational Impediments to deployment	-"On-the-books" laws, regulations, standards, etc. - Intra-agency divisions -Inter-agency roadblocks -Public. sector issues - Coordinating CMS system operations (message content, signing strategies, etc.)	- state law records -Public sector agency interviews

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 2: Establish Corridor-Wide Highway Advisory Radio (HAR)

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) HAR Service Times 2) Data on System Performance/Operations 3) Regional Interoperability 4) System Components 5) HAR Broadcast Unit Location 6) HAR Message	-Time HAR message is decided to be used -Time appropriate HAR message is generated -Time message reaches broadcast unit(s) -Number of communication retries -Frequency of HAR updates (Per broadcast unit) -Frequency of HAR message library updates - Type of information provided by HAR system - Number/type of data sources used by HAR system - Type of information desired by motorist -Message sent to HAR broadcast unit - Message broadcast to motorists via HAR unit - HAR message content (attention, problem. & action statements) - HAR message accuracy, reliability, timeliness, maintainability, etc. -Number/type of HAR broadcast units in field - Ability to send messages to various HAR units - Type of HAR system - Open system architecture (comm. protocols, firmware broadcast units, software, etc.) - Appropriateness of HAR broadcast zone(s) -Advance signing location - Broadcast/listening time - Appropriateness of HAR location (strategic, diversion point, traffic need, etc.) -Message characteristics (audio quality, easy-to-understand, conciseness, phrase sequence, etc) - Abilty to repeat HAR message - HAR message cycle length (secs)	- HAR system logs/records (automated & manual) - WisDOT project records/logs -Test messages w/ automated & manual logging) - HAR system designs & architecture - HAR vendor specifications
Operational I) Number of HAR Messages Broadcast (per "nit) (daily, weekly, monthly) 2) Time per Broadcast (per "nit) 3) HAR System Processing	- Total "umber of broadcasts - Average number of broadcasts - Average time per broadcast (per type of message) - Number/type of manual processes -Number/type of automated processes	- WisDOT records/logs - HAR system logs/records (automated & manual) - HAR system design & architecture - HAR vendor specifications
Financial I) Annual Operating Costs 2) Annual Maintenance Costs 3) Project Start-Up Costs 4) HAR Broadcast Unit Cost (per technology type)	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) - "Pre-"Corridor Study cost (last 5-yrs) -"Post-" Corridor Study cost (1st year) - Project cost (design, development, deployment. PR campaign, etc) - Cost per broadcast unit (per type)	- WisDOT financial records - HAR system financial records - HAR vendor costs
Human Factors I) User Perceptions of HAR System	- HAR system utility/usefulness -Types of information provided - Perceived time to broadcast HAR message (generation to field broadcast) -Comfort level w/ HAR system -Desired additional features -Perceived benefits of HAR system - Additional uses of HAR system - Perceived improvements in traveler information dissemination - Utility of PR campaign - Perceived utility of HAR message (content, accuracy, reliability timeliness maintainability, level-of-detail, etc) - Public acceptance of HAR system	- User survey (HAR operators. pubhc safety organizations, motorists. etc) - Interviews (HAR operators, public safety organizations, motorists, etc) - "On-hands" use of HAR system
Institutional 1) Legal Impediments to Deployment 2) Organizational Impediments to Deployment	- "On-the-books" laws, regulations, standards, etc - Compliance w/ FCC regulations - Intra-agency divisions -Inter-agency roadblocks - Public sector issues - Coordinating HAR system operations (message content, broadcast strategies, etc)	- State law records - Federal regulations - Public sector agency interviews

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 3: Provide Information via Cellular Telephone

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) ROADWIS Service Times 2) Data on System Performance/Operations 3) Regional Interoperability	- Time call enters system - Time caller receives desired ROADWIS information - Tie data reaches ROADWIS (per source) -Frequency of ROADWIS updates (per data source) -Frequency of ROADWIS information updates - Type of information provided by ROADWIS - Number/type of data sources used by ROADWIS - Type of information desired by caller -Number of "outside" lines available to callers - Type of information delivery method used by caller - Number/Type of telephone "menu" -Message content (per ROADWIS type) - ROADWIS information accuracy, reliability, timeliness. maintainability, etc - Number/type of ROADWIS regions - Ability to receive data from various sources	- ROADWIS logs/records (automated&manual) - WSP project records/logs - Agency project records/logs - WisDOT records/logs -Trial call-ins(w/ automated and manual logs)
Operational I) Number of Call-Ins (per outside line, per desired information) 2) Time per Call-In (per desired information) 3) ROADWIS Line Utilization 4) ROADWIS System Processing	- Total number of call-ins (daily, weekly, monthly) -Average number of call-ins (daily, weekly, monthly) - Average time per call-in (per desired information - Number of calls per "outside" line (daily,weekly,monthly) -Number/type of manual processes - Number/type of automated processes	- WSP records/logs - ROADWIS logs/records (automated&manual) - ROADWIS system design
Financial 1) Annual Operating Costs 2) Annual Maintenance Costs 3) Project Start-Up Costs	- "Pre-" ROADWIS cost (last 5-yrs) -"Post-" ROADWIS cost (1st year) - "Pre-" ROADWIS cost (last 5-yrs) - "Post-" ROADWIS cost (1st year) - Project cost (design, development, deployment, PR campaign, etc.)	- WSP financial records - WisDOT financial records - ROADWIS financial records
Human Factors 1) User Perceptions of ROADWIS	- ROADWIS utility/usefulness -Types of information provided - Perceived time to receive ROADWIS information - Comfort level w/ ROADWIS - Desired additional features - Preceived benefits of ROADWIS - Additional uses of ROADWIS Perceived improvements in traveler information dissemination - Utility of PR campaign -Perceived ROADWIS ease-of-access -Perceived utility of ROADWIS message (content, accuracy ,reliabilit y timeliness. maintainability level-of-detail, etc)	- User survey (ROADWIS operators, data source organizations, motorists/callers etc) - Interviews (ROADWIS operators, data source organizations, motorists/callers, etc.) -"On-bands" "se of ROADWIS system
Institutional 1) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws. regulations, standards, etc - Intra-agency divisions - Inter-agency roadblocks - Public sector issues - Coordinating ROADWIS data sources/inputs	- State law records - Public sector agency interviews

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 4: Install Automated Interactive Kiosks

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) Kiosk Service Times 2) Data on System Performance/Operations 3) Regional Interoperability 4) System Components 5) Kiosk Location 6) Kiosk Message/Display	- Time kiosk is accessed -Time appropriate kiosk display is generated . Time display reaches kiosk unit(s) . Number of communication retries - Frequency of display updates (text data. graphics) - Frequency of kiosk system updates - Type of information provided bv kiosk system - Number/type of data sources used by kiosk system - Type of information desired by user - Data/information sent to kiosk system -Message displayed to user via kiosk system - Kiosk message/display content -Kiosk message/display accuracy reliability! timeliness, maintainability etc, - Number/type of kiosk unit in field . Ability to send message/display to various kiosks - Type of kiosk - Open system architecture (comm protocols, firmware server, software, display formats, etc) - Appropriateness of kiosk location (strategic, visible/high profile, probability of use, etc) - Private and public sector locations - Aesthetic integration into surroundings -Number of lines of text - Character size -Number of phased/alternating messages (i.e., slideshow capabilities) -Kiosk message/display legibility -Kiosk message/display/audial quality - Text-based informational displays - Scrolling text feature -Traffic maps/graphical displays - Pan/zoom graphic features - Audial/sound presentations - Printed instructions/reports	- Kiosk system logs/records (automated & manual) - WisDOT project records/logs -Test messages (w/automated & manual logging) -Kiosk system design & architecture - Kiosk vendor specifications
Operational 1) Number of Kiosk System Transactions (per kiosk, daily, weekly, monthly) 2) Time per Transaction (per kiosk) 3) Kiosk System Processing	- Total number of transactions - Average number of transactions -Average time per transaction - Number/type of manual processes - Number/type of automated processes	. WisDOT records/logs -Kiosk system logs/records (automated & manual) -Kiosk system design & architecture -Kiosk vendor specifications
Financial 1) Annual Operating Costs 2) Annual Maintenance Costs 3) Project Start-Up Costs 4) Kiosk Unit Cost (per technology type)	-"Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) - "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) -Project cost (design, development, deployment, PR campaign etc) - Cost per kiosk unit (per type)	- WisDOT financial records -Kiosk system financial records -Kiosk vendor costs - Private sector "sponsor" financial records
Human Factors 1) User Perceptions of Kiosk System	-Kiosk system utility/usefulness -Types of information provided -Perceived time to display kiosk message (generation to field display) - Comfort level w/ kiosk system -Desired additional features - Perceived benefits of kiosk system - Additional uses of kiosk system -Perceived improvements in traveler information dissemination - Utility of PR campaign - Preceived utility of kiosk message content, accuracy, reliability, timeliness. maintainability) level-of-detail etc) - Public acceptance of kiosk system -Perceived kiosk aesthetic integration	- User survey (kiosk operators, public safety organizations, motorists, etc) - Interviews (kiosk operators, public safety organizations, motorists, etc) - "On-hands" use of kiosk system
Institutional I) Legal Impediments to Deployment 2) Organizational Impediments to Deployment	-"On-the-bwks" laws. regulations, standards. etc - Kiosk placement on public right-of-way (R&V) - Kiosk advertising on public ROW or facilities - Intra-agency divisions - Inter-agency roadblocks - Public sector issues -Private sector/sponsor issues - Coordinating kiosk system operations (message content, display strategies, etc)	- state law records -Public sector agency interviews -Private sector firm interviews

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 5: Install Automated Road Condition Warning System (RCWS)

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) RCWS Service Times [for both Changeable Message Sign (CMS) & In-Vehicle Interface (IVI)] 2) Data on System Performance/Operations (for both CMS & IVI) 3) Regional Interoperability 4) System Componenets 5) RCWS System Location (for CMS) 6) RCWS Message (for CMS) 7) RCWS Message (for IVI)	-Time RCWS message is decided to be used -Time appropriate RCWS message is generated - Tune message reaches CMS/IVI -Number of communication retries -Frequency of CMS/IVI updates (per unit) - Frequency of CMS message library updates - Type of information provided by RCWS system - Number/type of data sources used by RCWS -Type of information desired by motorist - Message sent to CMS/IVI -Message displayed to motorists via CMS/IVI - CMS/IVI message content - CMS/IVI message accuracy, reliability, timeliness, maintainability, etc. -Number/type of CMS/IVI units in field - Ability to send messages to various CMS/IVI -Type of CMS system (fiber-optic, LED flip-matrix) - Type of IVI system - Open system architecture (comm. protocols, firmware, controllers, software, in-vehicle unit, etc.) -Roadway legibility/viewing distance -Roadway legibility/viewing angle - Viewing time - Appropriateness of sign location (strategic, diversion point, traffic need, visibility, etc) Number of lines of text - Character size -Number of phased/alternating messages -Number of characters - Audible warning system - Synthesized voice warning - Simple tone/beep -Flashing light/beacon	- RCWS system logs/records (automated & manual) - WisDOT project records/logs - Test messages (w/ automated & manual logging) - RCWS system design & architecture - RCWS vendor specifications
Operational I) Number of RCWS Messages (for both CMS & IVI 2) Time per Message (for both CMS & IVI) 3) RCWS System Processing	- Total number of messages (daily, weekly, monthly) - Avg number of messages (daily, 'weekly, monthly) - Average time per message -Number/type of manual processes -Number/type of automated processes	- WisDOT records/logs - RCWS system logs/records (automated & manual) - RCWS system design & architecture - RCWS vendor specifications
Financial 1) Annual Operating Costs 2) Annual Maintenance Costs 3) Project Start-Up Costs 4) RCWS System Cost (per installation)	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) - "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year) - Project cost (design, development, deployment, PR campaign, etc.) - Cost per CMS (per type) - Cost per IVI (per type)	- WisDOT financial records - RCWS system financial records - RCWS vendor costs
Human Factors 1) User Perceptions of RCWS System (for both CMS & IVI)	- RCWS system utility/usefulness -Types of information provided - Perceived time to display RCWS message (generation to field display) - Comfort level w/ RCWS system - Desired additional features -Perceived benefits of RCWS system - Additional uses of RCWS system -Perceived improvements in traveler information dissemination - Utility of PR campaign - Perceived utility of RCWS message (content, accuracy, reliability, timeliness. maintainability level-of-detail. etc) - Public acceptance of RCWS system	- User survey (RCWS operators. public safety organizations, motorists, etc) - Interviews (RCWS operators, public safety organizations, motorists, etc) - "On-hands" use of RCWS system
Institutional I) Legal Impediments to Deployment 2) Organizational Impediments to Deployment	- "On-the-books" law, regulations, standards, etc - Intra-agency divisions -Inter-agency roadblocks -Public sector issues - Private sector issues - Coordinating RCWS system operations (message content, signing strategies, etc)	- State law records - Public sector agency interviews - Private sector firm interviews

Program Area 4: Regional Multi-Modal Information
Project 4.2: Provide En-Route Traveler Information
Subpart 6: Establish Portable Travel Time Reporting (PTTR) System

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical		
1) PTTR Service Times	- Time PTTR message is decided to be used - Time appropriate PTTR message is generated - Time message reaches CMS -Number of communication retries -Frequency of PTTR system updates (per CMS) -Frequency of CMS message library updates	- PTTR system logs/records (automated & manual) - WisDOT project records/logs - Test messages (w/ automated & manual logging) - PTTR system design & architecture - PTTR vendor specifications
2) Data on System Performance/Operations	-Type of information provided by PTTR system -Number/type of data sources used by PTTR - Type of information desired by motorist - Message sent to CMS -Message displayed to motorists via CMS - CMS message content (concept units, words) - CMS message accuracy, reliability, timeliness, maintainability etc.	
3) Regional Interoperability	- Number/type of CMS units in field - Ability to send messages to various CMS	
4) System Components	- Type of CMS system (fiber-optic, LED, flip-matrix) - Open system architecture (comm. protocols, firmware, controllers, software, Sign formats etc)	
5) PTTR System Location	-Roadway legibility/viewing distance - Roadway legibility/viewing angle - Viewing time - Appropriateness of sign location (strategic, diversion point, traffic need, visibility, etc.)	
6) PTTR Message	-Number of lines of text - Character size -Number of phased/alternating messages -Number of characters	
Operational		
1) Number of PTTR Messages	- Total number of messages (daily, weekly, monthly) - Avg. number of messages (daily, weekly, monthly)	- WisDOT records/logs - PTTR system logs/records (automated & manual) - PTTR system design & architecture vendor specifications
2) Time per Message	- Average time per message	
3) PTTR System Processing	- Number/type of manual processes - Number/type of automated processes	
Financial		
1) Annual Operating Costs	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year)	- WisDOT financial records - PTTR system financial records - PTTR vendor cost
2) Annual Maintenance Costs	- "Pre-" Corridor Study cost (last 5-yrs) - "Post-" Corridor Study cost (1st year)	
3) Project Start-Up Costs	-Project cost (design, development, deployment, PR campaign, etc)	
4) PTTR System Cost (per installation)	- Cost per CMS (per type)	
Human Factors		
1) User Perceptions of PTTR System	- PTTR system utility/usefulness -Types of information provided - Perceived time to display PTTR message (generation to field display) - Comfort level w/ PTTR system -Desired additional features - Perceived benefits of PTTR system Additional uses of PTTR system - Perceived improvements in traveler information dissemination - Utility of PR campaign - Perceived utility of PTTR message (content, accuracy, reliability, timeliness. maintainability, level-of-detail, etc) -Public acceptance of PTTR system	- User survey (PTTR operators. public safety organizations, motorists. etc) - Interviews (PTTR operators. public safety organizations, motorists, etc) - "On-hands" use of PTTR system
Institutional		
1) Legal Impediments to Deployment 2) Organizational Impediments to Deployment	- "On-the-books" laws, regulations, standards, etc - Intra-agency divisions -Inter-agency roadblocks - Public sector issues - Private sector issues - Coordinating PTTR system operations (message content, signing strategies, etc)	- State law records - Public sector agency interviews -Private sector firm interviews

Program Area 4: Regional Multi-Modal Information

Project 4.3: Provide Transit Schedule Information via Automated Service

Performance Criteria

Performance Measure	Data/Information Needs	Data/Information Source
Technical 1) Data on System Performance/Operations	- Type of information provided via ROADWIS (schedules, service options, fares, schedule adherence, route planning, etc) - Frequency of transit updates to ROADWIS - **Type** of information desired by traveler -Number/type of transit options -Message content (per transit option) -Transit information accuracy reliability, timeliness. maintainability, etc. -Time to access transit option(s)	- Transit Agency logs/records (automated & manual) - ROADWIS project records/logs - Trial call-ins (w/automated and manual logs)
Operational 1) Number of ROADWIS Transit Calls 2) Time per Transit Call 3) Transit Information System Processing	- Total number of calls (daily, weekly, monthly) -Average number of calls (daily, weekly, monthly) -Average time per transit call -Number/type of manual processes -Number/type of automated processes	- Transit agency records/logs - ROADWIS records/logs (automated & manual - ROADWIS system design
Financial I) Annual Operating Costs 2) Annual Maintenance Cost 3) Project Start-Up Costs	- "Pre-" ROADWIS cost (last 5-yrs) -"Post-" ROADWIS cost (1st year) - "Pre-" ROADWIS cost (last 5-yrs) -"Post-" ROADWIS cost (1st year) -Project cost (design, development, deployment, PR campaign, etc.)	-Transit agency financial records - ROADWIS project financial records
Human Factors 1) User Perceptions of Transit Information (via ROADWIS)	- Transit information utility/usefulness - Types of information provided - Perceived time to receive transit information - Comfort level w/ ROADWIS - Desired additional features - Perceived benefits of transit information -Additional uses of transit information -Perceived improvements in traveler information dissemination -Utility of PR campaign -Perceived ROADWIS ease-of-access -Perceived utility of transit information (content, accuracy, reliability, timeliness, maintainability, level-of-detail, etc)	- User survey (transit agency operators, ROADWIS operators. motorists/callers, etc) - Interviews (transit agency operators, ROADWIS operators, motorists/callers, etc) - "On-hands" use of ROADWIS
Institutional I) Legal impediments to deployment 2) Organizational impediments to deployment	- "On-the-books" laws, regulations. standards. etc - Intra-agency divisions -Inter-agency roadblocks -Public sector issues - Coordinating inputs to ROADWIS	-State law records - Public sector agency interviews

4.3 Evaluation Framework

4.3.1 Overview

A thorough, effective evaluation framework is critical for WisDOT, its project partners, and the entire ITS community to identify measurable impacts and benefits of ITS initiatives in the IH 90/94 corridors. The evaluation framework will provide a guide to produce valid, relevant information concerning the technical, institutional, financial, and societal impacts on the ITS Community and motoring public. The data and information gained from the evaluations will prove useful in assessing each project concept and its deployed systems and technologies.

For this evaluation framework, the Consultant Team has compiled a preliminary set of evaluation guidelines. From these guidelines, an Evaluation Plan can be developed for each project to evaluate all of its aspects and component parts. The evaluation plan will document the testing goals and objectives, resources required, testing methodology, test results, and overall program recommendations. The Consultant Team expects that evaluations will be conducted to determine to what extent the program goals and objectives are met, system and subsystem functional and performance requirements are achieved, hardware and software components are deployed and fully operational, and that each project has improved transportation mobility throughout the Corridor. For each evaluation plan, it will be necessary to ensure that each project/system deployed performs at an acceptable level of quality, reliability, accuracy, and consistency.

This evaluation framework has been developed in conjunction with the Operational Test Evaluation Guidelines (dated October, 1993) developed by The MITRE Corporation for the FHWA. In addition, the overall evaluation framework has been developed for the entire I-90/94 Corridor Study based upon a number of logical evaluation "steps" (or stages) as follows:

Phase #l – Development of Evaluation Plan
- Step #l -- Evaluation Goal Definition
- Step #2 --Evaluation Definition
- Step#3 -- Evaluation Design

Phase #2 -- Implementation of Evaluation
- Step #4 -- Data Collection
- Step #5 -- Data Analysis
- Step #6 -- Reporting Activities

Steps #l-3 in Phase #l represent the tasks necessary to transform this evaluation framework into individual project/system evaluation plans. Steps #4-6 in Phase #2 identify those tasks necessary to conduct/perform the evaluation itself. The following sections describe each evaluation step in greater detail and providing a framework for developing evaluation plans for each individual project.

4.3.2 Phase #l -- Development of Evaluation Plans

Step #l -- Evaluation Goal Definition

Step #l identifies each projects/system's evaluation goal(s). The evaluation goals for each project build upon the foundation established by the individual project/system objectives previously identified within the Corridor's Strategic Deployment Plan. In addition, these goals seek to establish relevance to specific User Service objectives and their applicability to individual or system-wide projects. Ideally, this step is the first step of an iterative process continuing throughout each project's/system's design phase. Recommended areas to consider for inclusion as part of a project's evaluation goals are as follows:

- Evaluate the performance (e.g., technical, operational, etc.) of the project/system;
- Identify the effect of institutional and legal/policy issues on the implementation of the project/system;
- Assess users' acceptance (e.g., travelers, WisDOT, WSP, etc.) as reflected in attitudes, perceptions, and frequency of use;
- Evaluate the project's/system's benefits; and
- Evaluate the project's/system's costs.

Step #2 -- Evaluation Definition

Within this step, the following tasks should be undertaken as appropriate:

- Develop evaluation management structure;
- Select independent evaluator (if necessary);
- Finalize evaluation goals and objectives;
- Develop preliminary evaluation scope-of-work (SOW);
- Allocate responsibilities to management structure (i.e., identify "who" is responsible for performing the agreed-upon SOW in Steps #3-6);
- Explicitly define and establish evaluation performance criteria/measures-of-effectiveness (MOEs) (i.e., determine types of data/information to be collected such as accidents per million vehicle miles, vehicle occupancy rate, system utility, etc.). See Table 3.1 *for an example*
- Determine required sample sizes (as appropriate);
- Identify data collection sources;
- Establish time periods which data/information are to be collected and any limitations on when data should not be collected;
- Determine means/method/approach to obtain/collect data/information for measurement of performance criteria/MOEs (e.g., monitor system operations, obtain financial records, develop user survey forms, monitor system usage, measure travel times, etc.);
- Determine means/method/approach to analyze/reduce data/information for measurement of performance criteria/MOEs (e.g., maximum/average/minimum, total cost, # of gallons saved, percentage, normal distribution, statistically valid representation, etc);
- Identify amount of resources (e.g., plan preparation, staff time, equipment/system time, etc.) necessary for Steps #3-6);
- Develop schedule information for Steps #3-6; and
- Develop cost information for Steps #3-6.

Table 3.1
Performance Criteria/MOE Breakdown
EXAMPLE

General Category	Criteria	Measure
Goals	Corridor-Specific Public Opinion	Qualitative Discussion
Service Effectiveness	Peak Period Delay Peak Period Queue Length Peak Period Speed Traffic Reductions Modal Split Level-of-Service (LOS) Accident Reduction	Minutes Miles Miles per Hour (MPH) ADT sovs Percent (%) - LRT - Bus - Auto (HOV & SOV) AthruF # of Accidents by Type Total Cost of Reduction
Environmental Effectiveness	Criteria Pollutants Greenhouse Gas Emissions Noise Sensitivity Fuel Consumption	NOx, HOCs, CO, etc. Ozone # of Areas Unmitigated Barrels of Oil/Gas Saved
Cost Effectiveness	Capital Cost per Mile O&M Cost per Mile Annualized Total Cost per Trip Total Life Cycle Cost	$$/Mile $$/Mile $$/Trip-Maker $$ (Millions)
Land Use	Land Taken Displacements Conformity w / Existing Land Use Growth Inducement	Acres # of Dwelling Units Taken Qualitative Discussion

Step #3 -- Evaluation Design

Within this step, the following tasks should be undertaken as appropriate:

- Create individual test plans for appropriate systems and subsystems;
- Develop comprehensive data management plan (e.g., data coordination needs, data collection techniques, data transfer needs, data storage capabilities, etc.);
- Generate quality control / assurance procedures (i.e., procedures that ensure that evaluation testing is being properly conducted and adhered to);
- Address strategic evaluation issues (i.e., determine finalized evaluation responsibilities, MOEs, time schedule, costs, etc.);
- Effectively manage this step of the evaluation by monitoring the progress of the involved agencies and the creation of progress and / or deficiency reports; and
- Develop and finalize Evaluation Plan.

4.3.3 Phase #2 – Implementation of Evaluation

Step #4 -- Data Collection

A number of different instruments and data collection methods can be utilized during an evaluation process to ensure that the established evaluation objectives are adequately addressed. The actual performance criteria / MOEs, data collection source(s), sample sizes, data collection time periods, and responsible agency staff are defined in detail during the evaluation design phase as noted earlier. The Consultant Team has undertaken a preliminary definition of some of these methods, as presented earlier in this chapter. These data collection tables identify the individual areas that will be evaluated, the type(s) of data that will be collected, and the methods or tools that will be used to collect these data. In addition, some further tasks which should be considered for inclusion within this step are as follows:

- Confirm means / method / approach to obtain / collect data / information for measurement of performance criteria / MOEs (e.g., monitor system operations, obtain financial records, develop user survey forms, monitor system usage, measure travel times, etc.);
- Confirm data collection time periods (e.g., before / after MOEs, seasonal / DOW / TOD time periods, peak period system usage, etc.);
- Confirm responsible agency staff for data collection tasks;
- Perform data collection tasks (as defined above);
- Perform interim review and any necessary mid-course corrections / enhancements in order to determine if the evaluation is still on course; and
- Establish guidelines for the modification of the Evaluation Plan (as necessary).

Step #5 -- Data Analysis

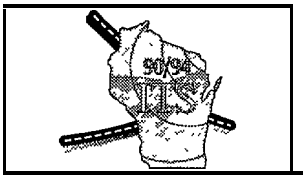
Once all of the required data has been collected as outlined in Step #4 (above), the data reduction and analysis stage is ready to commence. At this point in the evaluation, all of the necessary data reduction steps, analytical methods, and numerical procedures have been identified in Step #2. Therefore, this step confirms these analytical methods and performs appropriate computations / calculations upon the collected data. In addition, some further tasks which should be considered for inclusion within this step are as follows:

- Confirm means / method / approach to analyze / reduce data / information for measurement of performance criteria / MOEs (e.g., maximum / average / minimum, total cost, # of gallons saved, percentage, normal distribution, statistically valid representation, etc);
- Confirm responsible agency staff for data reduction / analysis tasks;
- Perform data reduction / analysis tasks (as defined above);
- Perform interim review and any necessary mid-course corrections / enhancements in order to determine if the evaluation is still on course; and
- Establish guidelines for the modification of the Evaluation Plan (as necessary).

Step #6 -- Reporting Activities

Every evaluation undertaken should provide for the involved parties to report / share the findings / results of the project's / system's operations, performance, and capabilities with the involved project partners, ITS Community, and public at-large. This step is crucial to the success of the project / system because it provides various transportation experts the opportunity to become informed consumers of the project's / system's capabilities and appropriateness to their own situation. At this point, discussion of the project's system design, performance, and results can allow the involved project partners to understand how the project / system exceeded, met, or failed-to-live-up-to expectations. These reporting activities also allow the opportunity to compare / contrast results of the evaluation with those of similar projects / systems. It is anticipated that each project / system evaluation will include the following interim- and post-evaluation reporting activities:

- Preparation of individual evaluation test plan reports to outline testing objectives, methodology, and results;
- Documentation of project reports to summarize, synthesize, and compare individual test plan reports for each evaluation goal / objective;
- Description and schedule of any evaluation shutdown tasks (as required);
- Completion of data archival tasks in compliance with Section 6053 of the ISTEA provisions;
- Presentation of evaluation findings / results to involved project partners; and
- Presentation of evaluation findings / results to the ITS Community through conferences, seminars, workshops, papers, publications, etc.



5.0 PROCUREMENT AND FUNDING

5.1 Procurement Overview

Traditional procurement policies used by public agencies may not always be well-suited to ITS projects due to unique characteristics of ITS. ITS projects are often unique in that extensive interagency cooperation is required, private sector personnel have been hired to staff public facilities, public-private partnership agreements need to be determined, and privacy issues need to be resolved. Additionally, ITS involves the acquisition and deployment of technical equipment which may pose special procurement considerations. Therefore, certain aspects of established WisDOT procurement methods **may require changes** to accommodate ITS projects.

Any changes to procurement methods will result in a significant demand on WisDOT staff time and resources. Potential issues that may require changes to procurement methods include private ownership/control of equipment & information, ownership of software, access to software code, proprietary information used by a vendor, use and access to right-of-way by a private entity. One potential strategy to resolve these issues is public solicitations for private partners to participate in the deployment of ITS. One example of this approach is an open Request for Proposals for Partners (RFPP) initiative undertaken by the Minnesota Department of Transportation's Guidestar program. Options pursued under Guidestar's RFPP include the following:

- Cost-sharing partnerships under which Minnesota Guidestar funds 20% of an ITS product or service. The private partner is responsible for the remaining 80% in funding. Under this arrangement ITS products or services come to market sooner, address identified needs and provide benefits.

- Private sector contribution of at least 20% towards the cost of a Minnesota Guidestar operational test.

- Cooperative programs that focus on ITS deployment with the goal of becoming self-sustaining through user fees.

Potential opportunities for public/private partnerships in the lH 90/94 corridors are discussed in greater detail in Projects 5.1 - 5.2 under Program Area 5.

5.2 Procurement Methods

There are five procurement methods commonly used by Departments of Transportation across the country. Some procurement methods are more well-suited to ITS projects than others. Regarding procurement methods, the National ITS program states:

> *"Traditional procurement methods are not compatible with ITS components. ITS applications, in general, will require a systems design approach and cross-jurisdictional cooperation in order to optimize effectiveness High technology procurements crossing jurisdictional lines pose problems for both public sector organizations and private sector providers. Public sector organizations must follow inflexible procurement regulations. Private sector providers are confronted with adhering*

to a *complex maze* of *procedures changing across* the boundaries of the proposed procurement. This *is a mid-to long-term challenge which will impact heavily on regional deployments."*

Commonly used procurement methods include the following:

1. Sole Source: This form of procurement is used when there is documented existence of only one technical or cost-effective solution to the requirements of a certain project. Sole source procurement is most often used in the instances when compatibility with existing equipment is required.

   When first establishing components of an ITS system, sole source procurement should not be necessary. In later stages of development, however, sole source procurement may need to be employed to ensure system-wide interoperability.

2. Engineer / Contractor: This is the most common procurement method used for highway projects. Plans, specifications, and estimates (PS & E packages) are prepared by an engineer (a consultant or agency engineer) and the contracting community bids on the project. Prequalified contractors are selected based on the lowest responsible bid. For construction projects, the contractor agrees to provide a complete system that is procured, installed and integrated by the contractor's organization.

   This method has been found to restrict the flexibility of system designers and implementers due to a typically standardized set of rules and procedures.

3. Two-Step Approach: This is a modified version of the Engineer / Contractor method. This approach allows prospective contractors to be rejected if they do not meet the technical criteria for the project. Technical merits of each proposal are fully considered prior to the award of a contract thus ensuring products will be of high quality. With traditional highway construction contracts, technical merits are considered during the "material submittal" stage of the construction project.

4. Design / Build: With this method a single contractor is selected to design, construct, and implement a project. This method proves to be very efficient in the cases when the design / builder fully understands the project concept because the public agency must only deal with one contractor. Fewer coordination issues to deal with on the agency's part may also allow the contractor to complete the work more quickly.

   One limitation to this approach is that the agency loses some control over the design of the project. The agency's role is reduced to oversight and monitoring of the design / builder and does not involve any of the design details that may impact operational needs of the agency.

5. System Manager / System In this approach a single firm or consulting team is selected to be responsible for system design, PS & E preparation, systems integration, documentation and training. The project is divided into several sub-

Administrator: projects and each sub-project is contracted out using the agency's normal bidding processes and the system manager oversees all work by the various contractors. Sub-project contractors can be selected on the basis of specific sets of skills required for each sub-project. This allows experts to be used for individual steps of the system development. The system manager is responsible for integrating the sub-projects into one overall, operating system.

The agreement between an agency and system manager is typically a negotiated contract which allows contract flexibility when projects are refined. This procurement method assigns responsibility of total system success to one entity and creates an environment to more easily meet specific project requirements.

5.3 WisDOT Procurement Issues

Certain aspects of established WisDOT contracting and procurement methods may require changes to accommodate ITS projects and every project will have its own unique characteristics that will need to be addressed individually. This section identifies some of the options and issues relevant to WisDOT contracting and procurement of ITS products and services.

One matter related to procurement issues with ITS projects is the establishment of public/private partnerships to develop and implement projects. Each project proposed as a public/private partnership should be investigated individually to determine that the partnership arrangements do not conflict with WisDOT regulations. Issues that may arise with public/private partnerships include conflict of interest, unfair advantage given to one competitor over another, etc.

Projects that outwardly appear to be good candidates for a public/private partnerships may be eliminated due to state and federal laws. For instance, Changeable Message Signs partially sponsored by a private company in exchange for displaying the company logo on the sign may sound like a good private/public partnership project. However, if advertising is not allowed in road right-of-way, such a project would not be a candidate for a partnership. If utility lines are allowed in the public right of way, a cable company could theoretically place cable in the right of way as part of a partnership agreement for communication access. Creativity and close study of regulations will be needed to ensure that private/public partnerships are viable projects that hold benefits for all involved parties.

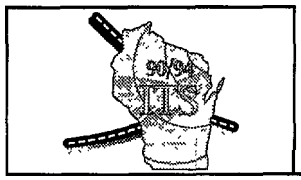
The procurement of materials, products, and contractual services related to ITS projects in the State of Wisconsin are regulated by two State Statutes - Wisconsin Statutes, Chapter 16, Department of Administration, Subchapter IV, Purchasing; and Wisconsin Statutes, Chapter 84, State Trunk Highways; Federal Aid. Chapter 16 regulates general purchasing and Chapter 84 regulates anything that is purchased or built in the highway rights-of-ways. All items purchased under Chapter 84 require the approval of the Governor's office, whereas items purchased under Chapter 16 do not require the Governor's approval.

Methods to obtain the materials and services which may be required for the ITS projects may be regulated by either State Statute. These are considered non-traditional contracts, and the responsibility is currently being evaluated by the Department of Business Management, Bureau of Financial Services.

The two most common methods of obtaining the goods and services required are competitive bidding and requests for proposals. In competitive bidding an Engineer prepares a PS&E package which is advertised for bidding and awarded to the lowest responsible bidder. The Requests for Proposals method allows the initiating agency to prepare a scope of services with detailed specifications and evaluation criteria (including cost) which is sent to qualified proposers for submittal. Upon receiving the proposals, the initiating agency evaluates the information and ranks the proposers in terms of the weighted evaluation criteria prior to awarding the project. The State of Wisconsin can purchase necessary goods and services from a Sole Source as long as the initiating agency can certify that there are no other vendors that can meet the needs of the project.

One example of a public/private partnership occurred when the Department of Motor Vehicles decided to evaluate alternative methods for the renewal of vehicle registrations. The project was established as a pilot with a vendor from West Virginia. Different methods were evaluated to determine what worked the best. Specifications were written that could be detailed in a Request for Proposals. After approximately a one year pilot, DMV prepared a Request for Proposals and subsequently awarded a contract to M&I Bank to process all vehicle registrations by mail. M&I Bank gives the DMV a tape with the renewal information for downloading into the system.

Procurement and contract issues presented here represent a brief overview and are by no means all inclusive to proposed or future ITS projects in the IH 90/94 Corridors. ITS projects will likely cross many jurisdictional boundaries and therefore will also need to comply with many local regulations. Most procurement issues will be addressed throughout a project's deployment process. State and local policies will be addressed as they apply to individual ITS projects through the development of project operation plans and scopes of work in addition to project contracts. It is important to consider the importance of procurement and contract issues and address them as early as possible to avoid needless delay in project deployment.



6.0 IMPLEMENTATION PLAN

6.1 Introduction

The IH 90/94 Implementation Plan is prepared in conformance with 23CFR655d and FAP Guide Transmittal 12. The purpose of these regulations is to provide policies and procedures related to Federal-aid requirements of traffic surveillance and control systems. The Implementation Plan provides an overview of the necessary legislation, systems design, procurement methods (discussed in the previous chapter), construction management procedures, including acceptance testing, system start-up plan, and an operation and maintenance plan to deploy ITS in the IH 90/94 corridors. This overview also addresses necessary institutional arrangements and the dedication of needed personnel and budget resources required for the proposed system.

6.2 Program Management

Development of the IH 90/94 Strategic Deployment Plan has led to strong institutional relationships that need to continue as the plan moves to the deployment stage. The deployment of ITS technology will require significant involvement by all stakeholders including federal, state, regional and local government agencies; transportation operating agencies; planning organizations; transit operators; private transportation companies; public safety services; and product and service providers. Maintaining public and political awareness and support is particularly important during the deployment process to assure success of the program.

A major responsibility in any ITS program plan is the management of the activities within the program. The formation of a management team is recommended to guide the IH 90/94 strategic planning process. This management team will manage the program activities and address the key technical and nontechnical issues that will arise during the deployment stages. The recommended organization of the Management Team is presented in Figure 6-1 on the following page.

There are several program management issues that will need to be addressed as ITS is deployed in the IH 90/94 corridors. These issues include multi-jurisdictional relationships, cooperative agreements, new legislation, legal considerations, public/private partnerships, monitoring of plan process, and jurisdictional authorities. Several of these issues will require involvement of legal departments and interaction between attorneys and technical staff. The future success of the IH 90/94 Strategic Plan is dependent upon quality management and mutual cooperation between all transportation agencies within the corridor.

Program Management

ITS Midwest

Oversight Committee

- Oversight
- Policy
- Conflict Resolution

Coordination Work Group

Deployment Committee

- Manage Program Activities
- Coordinate/Facilitate Implementation
- Funding

PROGRAM AREAS:
#5 Technical/Planning Support
#6 Public-Private Partnerships

Architecture/ Communications/ Information Group

PROGRAM AREAS:
#4 Regional Multimodal Traveler Information

Commercial Vehicle Operations Group

PROGRAM AREAS:
#1 Commercial Vehicle Operations

Incident Management Group

PROGRAM AREAS:
#2 Incident Management
#3 Emergency Management

A summary of the responsibilities of each committee/group recommended as part of the IH 90/94 program management team is as follows.

6.2.1 IH 90/94 Oversight Committee

The Oversight Committee will oversee all aspects of the strategic deployment plan including:

- Oversight of the ITS Deployment Committee
- Establishment of required policy
- Development of proposed legislation to appropriate states
- Resolution of any conflicts within the Coalition
- Review and approval of the final strategic plan
- Provision of overall direction for the deployment of the IH 90/94 Strategic Plan
- Monitoring of the deployment progress

Recommended membership:

Federal Highway Administration
Wisconsin Department Of Transportation
Wisconsin State Highway Patrol
Counties of:
- Juneau
- St. Croix
- Dane
- Jefferson
- Eau Claire

City of Madison
City of Beloit
Wisconsin Department of Natural Resources
University Representatives (University of Wisconsin, Marquette University, etc.)

6.2.2 IH 90/94 ITS Deployment Committee (presently the Technical Team)

The IH 90/94 ITS Deployment Committee will have a key role in the development and implementation of the strategic plan with members from the Wisconsin DOT, the Federal Highway Administration, planning organizations and transportation agencies throughout the IH 90/94 planning and deployment area.

The ITS Deployment Committee, with staff support, will oversee the activities of each Work Group and the implementation of the IH 90/94 Strategic Deployment Plan including:

- Managing program plan activities
- Coordinating and facilitating the implementation process
- Keeping the deployment process on schedule
- Setting or recommending required standards and policy
- Recommending the adoption of required legislation
- Securing funding
- Resolving conflicts within the Work Groups
- Providing technical support
- Reviewing deployment plans

- Providing guidance and administrative services to the operating agencies who are managing specific program area projects
- Developing, managing and evaluating projects not under direction of a specific operating agency
- Providing public education and outreach
- Developing and conducting awareness and support programs for ITS services to gain involvement of the public and private sectors
- Ensuring that the IH 90/94 plan is maintained and updated as necessary

Recommended Membership:

Federal Highway Administration
Wisconsin Dept. of Transportation
Wisconsin State Highway Patrol
Counties of:
Juneau
St. Croix
Dane
Jefferson
Eau Claire
City of Madison
City of Beloit
Wisconsin Department of Natural Resources
University Representatives (University of Wisconsin, Marquette University, etc.)

American Automobile Association
ITS Midwest

Communication Providers
Bus Transportation Providers
Trucking Associations

Representatives from Work Groups Established to Oversee Specific Program Areas

It is recommended that the ITS Deployment Committee meet once per month.

6.2.3 ITS Midwest

ITS Midwest can provide 'an important support role to the ITS Deployment Committee by assisting with developing and conducting the public outreach effort. ITS Midwest will also provide an important link to ITS America to assure that the IH 90/94 ITS deployment is consistent with the National Program Plan.

ITS Midwest is also expected to play an important role in providing input to the various work groups to assure the system architecture is compatible with standards that are being adopted on a National level.

6.2.4 **Work Groups**

Work Groups are recommended to provide support to the ITS Deployment Committee and oversee the details of specific program area projects included within the IH 90/94 strategic plan. These Work Groups will provide technical and policy expertise to the projects included within the plan. Some Work Groups will oversee groups of program areas when the different program areas are related or involve the participation of the same group of operating agencies. The Work Groups will report their activities to the ITS Deployment Committee.

The Work Groups could be considered as Subcommittees of the ITS Deployment Committee and could contain members of the ITS Deployment Committee or have members that are from the agencies represented on the ITS Committee. The Work Groups should also contain members that represent other stakeholders in the subject projects that are not members of the ITS Deployment Committee.

Each Work Group will be responsible for specific Program Areas. A summary of the Work Groups and the associated program area(s) they will oversee is included in Table 6-2.

6.2.5 IH 90/94 ITS Coordination Work Grout,

The Coordination Work Group (derived from the Deployment Committee) will oversee the following program areas:

- No. 5, Public - Private Partnerships
- No. 6, Technical and Planning Support

It is recommended that the Coordination Work Group be a branch of the ITS Deployment Committee and be represented by a consortium of agencies from the IH 90/94 Corridor area. This group will provide technical, planning and administrative support to the ITS Deployment Committee on the coordination and implementation of the IH 90/94 strategic plan. ITS Midwest will be a good source to provide support to the Coordination Work Group. Some of the responsibilities of the group will include:

- Provide support for the establishment of the Work Groups (Subcommittees)
- Provide administrative and general operations support for all committees / work groups and program areas
- Develop organizational goals and objectives for each committee / work group
- Coordination, facilitation and documentation of committee meetings
- Identify and pursue funding sources
- Financial tracking of IH 90/94 ITS projects
- Correspondence support
- Provide a central contact for IH 90/94 ITS organizational information
- Draft required interagency agreements

TABLE 6-1
RESPONSIBILITIES OF
IH 90/94 STRATEGIC PLAN WORK GROUPS

1. Coordination Work Group

   Responsible Program Area:

   Program Area No. 5 - Public-Private Partnerships
   Program Area No. 6 - Technical and Planning Support

2. Architecture / Communications / Information Work Group

   Responsible Program Area:

   Program Area No. 4 - Regional Multimodal Traveler Information

3. Commercial Vehicle Operations Management Work Group

   Responsible Program Area:

   Program Area No. 1 - Commercial Vehicle Operations

4. Incident Management Work Group

   Responsible Program Area:

   Program Area No. 2 - Incident Management Services
   Program Area No. 3 - Emergency Management Services

The other Work Groups (Architecture/Communications/Information, Commercial Vehicle Operations, and Incident Management) will concentrate on the implementation and operation of specific program areas. It is anticipated that these Work Groups will be responsible for the following:

- Provide support to the ITS Deployment Committee in the development of IH 90/94 ITS projects.
- Provide support on technical and nontechnical issues associated with the specific project areas.
- Recommend required policy for the implementation and operation of the lTS technologies.
- Promote adopted ITS policy.
- Take a pro-active role in improving relationships between agencies, cities, counties and states.
- Develop individual agency roles in the implementation and operation of the ITS projects.
- Identify funding needs for staff commitment and continued operation and maintenance of the specific projects.
- Identify and develop required interagency agreements.

6.2.6 IH 90/94 ITS Architecture/Communications/Information Work Group

The Architecture/Communications/Information Work Group will oversee Program Area No. 5 (Regional Multimodal Traveler Information).

This program area is comprised of the system architecture and communications needs for the IH 90/94 strategic deployment plan and will provide an architecture and communication base that all future ITS projects will build upon. It is recommended that representation of this group include all state agencies, major transportation and transit agencies, state highway patrols, police and emergency services.

This Work Group should coordinate its activities with ITS Midwest to assure the system architecture and communication frame work are consistent with the development of national ITS standards.

6.2.7 IH 90/94 ITS Commercial Vehicle Operations Management Work Group

The Commercial Vehicle Operations Management Work Group will oversee the following program areas:

- No. 1, Commercial Vehicle Operations

This ITS program area is specific to commercial vehicle operations. The Wisconsin Department of Transportation and several transit agencies will sponsor the specific projects within the program areas. It is recommended that this group be represented by the Wisconsin Department of Transportation, major transit agencies, and the trucking industry.

6.2.8 IH 90/94 ITS Incident Management Work Group

The Incident Management Work Group will be closely coordinated with the management of Program Area No. 2, Incident Management. This group would be comprised of a wide range of agencies and organizations, from the Federal Highway Administration to minor civil divisions and the electronic media and the Wisconsin Motor Truck Association. Initially, it is recommended that WisDOT serve in the role as facilitator for this work group.

6.2.9 Sub-Regional Forums

An important component for acceptance and the successful implementation and operation of ITS technologies is receiving cooperation and participation from the local agencies impacted by these programs. Individual cities need to be educated and provided with an opportunity to review or express their concerns or ideas on the implementation plans for these new technologies.

An approach to assure local agency participation is by establishing sub-regional forums that would **include** representation of the different city and county agencies within that region. These forums would serve as a place to provide information to the local agencies on development of the program and allow the agencies to express technical and political concerns within their jurisdiction.

The Coordination Work Group would be the likely candidate to establish these forums and take a leading role of the associated activities.

As the IH 90/94 strategic plan is further developed, the committees and work groups will need to address many technical and nontechnical issues. Some of the nontechnical issues will include:

- Institution and jurisdictional boundaries
- Existing and required legislation
- Liability concerns
- Partnership arrangements
- Plan monitoring and review
- Authority
- Ongoing program plan updates

A preliminary assessment of some issues within each category are included below.

6.3 Non-Technical Issues

6.3.1 Institutional Issues and Arrangements

The deployment of the ITS projects within the IH 90/94 Corridors will include many different public and private institutions across numerous jurisdictions. New relationships and cooperative arrangements will be required to assure the program's success. There will be a need to redefine

individual agency roles and establish agency relationships to carry out the developed traffic, transit and incident management plans. There must be an awareness that some jurisdictions and individuals may be resistant to change and refuse to participate in the program until they are shown that these technologies do in fact work. The issue of autonomy must also be addressed. Generally, most local agencies will not want to give up their transportation management activities to a larger agency such as the county or state. Other issues will include:

- Establishing plans for sharing information between agencies
- Assigning responsibilities for obtaining and distributing traffic/transit information and data
- Identifying and assuring dedicated funding sources for staff support to continue to operate and maintain the system after implementation
- Establishment of procedures and responsibilities for operating and maintaining the system
- Establishment of guidelines on who collects the ITS revenues and how are these revenues allocated to the various geographical locations.
- Provide a means to maintaining local agencies autonomy
- Social issues such as personal privacy

6.3.2 Legal and Legislative Issues

The committees and work groups will need to identify where new legislation will be required to assure successful implementation and operation of the ITS components. The IH 90/94 Corridor crosses geographic and legislative boundaries and will require consistency in approach relative to the strategic deployment plan. Staff will need to research existing legislation and identify problem areas that may require the adoption of new legislation. It is anticipated that specific legislation may be needed to address:

- Liability in partnerships
- Standards guidelines and enforcement
- Monitoring guidelines and procedures
- Jurisdictional regulations
- Personal privacy concerns
- Maintenance procedures
- Antitrust concerns

6.3.3 Liability Concerns

Research, development and deployment of ITS technology opens new areas in tort liability for participating public agencies and private firms. Liability is a sensitive area that needs to be addressed in partnerships. Carefully prepared agreements between the public agencies and private industries may help to resolve some of the concerns. Agencies will need to address concerns with liability when assisting in the traffic management operations outside of their jurisdiction. Other liability issues the committees and work groups will face include:

- Identifying the liability concerns of agencies, industry, and suppliers
- Establishing the distribution of liability within a partnership or multi-jurisdictional project
- Developing methods to evaluate risk
- Identifying legislation required to address liability concerns

6.3.4 Partnership Arrangements

The deployment of ITS technology will require the development of partnerships between the public and private sectors. Operational tests already completed or currently underway that have included the development of partnership arrangements can be used as a model for partnerships required within the IH 90/94 Corridor area. FHWA and ITS Midwest will also be good sources to provide direction on the establishment of public/private partnerships.

6.3.5 Authority

Several proposed projects included within the IH 90/94 strategic deployment plan will encompass multiple jurisdictions within the IH 90/94 Corridor. Clear lines of authority must be developed for each project included in the plan. The incident management plan may include the participation of all agencies. Decisions on who has the authority to implement a particular management plan and who is responsible for carrying out the plan must be addressed. Other issues to consider include:

- The distribution of authority on a regional, sub-regional and local level.
- Authority for the continued operation and maintenance of the system.

6.4 Plan Monitoring and Review

Monitoring and reviewing the deployment of the IH 90/94 will be addressed within Program Area No 6, Technical and Planning Support. The Coordination Work Group is expected to take the lead in this effort with support from the ITS Deployment Committee. The Committee/Work Group structure should provide the appropriate mechanism for monitoring the progress of the IH 90/94 strategic deployment plan and review details of the deployment strategies.

6.4.1 Ongoing: Program Plan Updates

The committee/work group structure created from Program Area No. 6, Technical and Planning Support, will support any ongoing program plan updates for the IH 90/94 strategic deployment plan. The ITS Deployment Committee is expected to give direction on incorporating future ITS projects within the plan. Revisions to the existing plan due to changes in the deployment of specific projects will be addressed by the Coordination Group and other Work Groups involved in the detailed program areas.

6.5 System Design

System design consists of taking the recommendations from the planning phase, converting those needs into hardware/software requirements, and formulating the equipment needs into contract documents. The system design may be based on off-the-shelf, customized, or experimental technologies and may be conducted by the public agency (WisDOT), contract, or franchise operation. Components include the following:

- System Designer: the responsible person(s) from WisDOT or a consulting firm needed to design the system. The designer needs to be identified in order resolve any conflicts.

- System *Design Life:* the functional operating life of the system should be identified.

- *System Coverage*: the area that the system will cover, including future expansibility.

- *System Design and Operations/Maintenance Philosophies:* correlations between systems operations and maintenance functions.

- *System Architecture:* a discussion of the overall system architecture (i.e. central, distributed, or hybrid) should be addressed.

- *Integration with Other Functions:* The integration and coordination of various traffic control systems to provide for data base exchange and other strategies.

- *System Components and Functions:* Hardware components needed to perform system functions such as surveillance, control and coordination.

- *Communication Subsystem Design Approach:* The communication portion of the system, because of necessary redundancy, represents a large portion of the system budget. The approach should consider an economic analysis of the communication subsystem design.

- *Traffic Operations Center Design Features:* Design features of the TOC are dependent upon the size of the system and the agency's operating philosophies.

- *Project Phasing/Scheduling:* A formalized tracking system used to manage the project (i.e. critical path).

- *Design Review:* A check on the system design and identification of problems and concerns are documented.

6.6 Construction Management Procedures

Construction management procedures are the procedures that will be used for the specific system being designed. They provide the necessary framework for coordinating construction and installation activities to ensure the system is built in accordance with the contract documents. Implementation plan construction management procedures that can be addressed include the following:

- Division of Responsibilities

- Scheduling and establishing mileposts (construction schedule)
- Conflict Mitigation (to resolve disputes)
- Coordination with other projects

6.6.1 System Start-Up Plan

A system start-up plan is necessary to verify and validate whether or not system requirements are being met. Verification of a component or subsystem determines if the components or subsystems are interfaced as per design and are working properly. *Validation* consists of ensuring (through acceptance testing) that all interfaced components or subsystems meet system requirements. Software coding and database development are also important elements of this phase.

The start-up process is typically performed in a limited time period immediately after system integration. A start-up plan is necessary to document the validation process (software and system evaluation) and should include the following:

- Software Acceptance Tests (responsibilities of those involved, test procedures, equipment involved, test criteria, verification of specific software features, methods to correct errors, etc.)
- System Acceptance Tests (responsibilities of those involved, test procedures, equipment involved, test criteria, verification that system performs required functions, methods to correct errors, final acceptance, etc.)
- Partial Acceptance (provisions for accepting a partially completed system)
- Documentation (detailed documentation pertaining to hardware and software should be discussed as well as references to operating manuals for the system)
- Transition from Old to New Control (procedures for transitioning from a previously functioning system to a system with new features and functions)
- Operational Support and Warranty Period (provisions for initial or continuing operational support and a system warranty period)
- Training (provided to system operators and maintenance technicians prior to system acceptance)
- Media Coordination (public support is critical to the success and ongoing operations of the system)

6.6.2 Operations & Maintenance Plan

Provisions will be made within the IH 90/94 ITS projects for an operations and maintenance plan. The primary purpose of this plan is to monitor long-term costs associated with implementation. Typically, an operations and maintenance plan includes a section for the evaluation of the system and applicable maintenance policies.

The *Evaluation* stage of the plan determines if a system is meeting the goals and objectives for which it was established. A formal evaluation is recommended at appropriate stages. The evaluation should be completed as soon after the implementation of the system as possible. Regular system reevaluations should be planned every few years and should be completed by the operations and maintenance personnel assigned to the project. Key evaluation issues to be described in the implementation plan include:

1) The system evaluator (an independent third party selected prior to the implementation of the system);

2) The method of evaluation (including the time period for evaluation); and,

3) The cost of the evaluation.

The Maintenance stage of the plan should include a number of factors to help WisDOT determine the necessary budget and staff maintenance resources needed for the system, including the following:

1) Maintenance Policies for preventative maintenance, system malfunctions, including a documentation of the policies as an attachment to the plan;

2) Formal Maintenance Management Programs (software and hardware agreements with the developers);

3) Initial inventory of spare parts and all necessary test equipment; and,

4) Training in providing limited maintenance to software and equipment.

6.7 Personnel & Budget Resources

This section presents conceptual project implementation costs and lead agency staffing requirements for program Years 1 through 5. The overall approach for categorizing resource requirements is summarized in Table 6-2 below.

TABLE 6-2
METHODOLOGY FOR CATEGORIZING RESOURCE REQUIREMENTS

Resource Requirement	Expressed As:
Lead Agency Project Management & Oversight	Staff person-years (Table 6-3)
ITS Program/Project Technical and Administrative Support	Dollar costs for contracted services (Tables 6-4 to 6-9)
Project Studies, Design and Equipment	Dollar costs (Tables 6-4 to 6-9)

Lead Agency Personnel Reuuirements

Table 6-3 presents lead agency estimated staffing requirements in person-years by project and year for Years l-5 of the recommended plan. These requirements reflect the estimated time required by lead agency personnel to manage projects and do not reflect time spent preparing plans or designs. Costs for plans and studies are reflected in the implementation costs discussed below.

Implementation Costs

Tables 6-4 to 6-9 present estimated conceptual implementation costs for each project from years l-5. Project implementation costs are the costs associated with planning and engineering studies, design, equipment, and project development, including software development and system integration.

Costs for agency project management and oversight are not included in Tables 6-4 to 6-9. These resources are expressed in terms of staff requirements in Table 6-3.

The costs shown in Table 6-9 under Program Area 6, Technical and Planning Support, represent contracted consultant services and include all ITS program activities not reflected in lead agency staff requirements (Table 6-3) or in project specific implementation costs.

TABLE 6-3

LEAD AGENCY CONCEPTUAL ANNUAL STAFFING REQUIREMENTS

Program Area/Project		Lead Agency Staff Requirements in Person-Years by Year				
		1	2	3	4	5
Program Area 1 Commercial Vehicle Operations						
1.1.1	Implement "Smart" Scales Facility	0.25	0.50	0.50	0.50	0.50
1.1.2	Expansion of Ramp Weigh-in-Motion Scales	0.25	0.50	0 50	0.50	0.50
1.2.	Purchase Credentials in Advance					
	Subtotal (Program Area 1)	**0.50**	**1.00**	**1.00**	**1.00**	**1.00**
Program Area 2 Incident Management						
2.1.1	Establish Incident Management Committee	0.33	0.25	0 25	0.25	0.25
2.1.2	Incident Management Test Sites		1.50	1.50	1.50	1.50
2.2.1	Establish Cellular Call Origin Test Sites	0.05	0.05	0.05	0.05	0.05
2.3.1	Cellular Telephone Hotline and Operations/Dispatch Center	0.33	1.25	1.25	1.25	1.25
2.3.2	Cellular Telephone Hotline Promotion	0.10	0.10	0.10	0.10	0.10
2.4.1	GPS Test Site in Dane County	0.50	0.25	0.10	0.10	0.10
	Subtotal (Program Area 2)	**1.31**	**3.40**	**3.25**	**3.25**	**3.25**
Program Area 3 Emergency Management Services						
3.1.1	Develop functional Requirements and Specifications	0.33				
3.1.2	Establish Test Site in La Crosse		0.25			
	Subtotal (Program Area 3)	**0.33**	**0.25**	**0.00**	**0.00**	**0.00**
Program Area 4 Multimodal Traveler Information System						
4.1.1	Expand 1-800 ROADWIS Automated Telephone Information Service	0.33	0.25	0.10	0.10	0.10
4.1.2	Establish a Home Page on the Internet	0.25	0.10	0 05	0.05	0.05
4.2.1	Expand Use of Changeable Message Signs	0.25	0.25	0 25	0.25	0.25
4.2.2	Establish Corridor-Wide Highway Advisory Radio	0.25	0.25	0.10	0 10	0.10
4.2.3	Provide Information via Cellular Telephone	****staffing included under Project 4.1.1****				
4.2.4	Install Automated Interactive Kiosks	0.25	0.10	0.10	0.10	0.10
4.2.5	Install Automated Road Condition Warning Signs		0.25	0.25	0.25	0.25
4.2.6	Establish Portable Travel Time Reporting System	0 10	0.25	0.25	0.25	0 25
4.3.1	Develop Functional Requirements and Specifications					
4.3.2	Automated Transit Schedule Test			0.10	0.10	0.10
	Subtotal (Program Area 4)	**1.43**	**1.45**	**1.20**	**1.20**	**1.20**
Program Area 5 Public-Private Partnerships						
5.1	Public-Private Partnership Outreach	0.10	0 10	0.10	0.10	0.10
	Subtotal (Program Area 5)	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Program Area 6 Technical and Planning Support						
	6.1 ITS Deployment Committee	0.25	0.25	0.33	0.33	0.50
	6.2 Technical Support	0.05	0.05	0.10	0.10	0.10
	6.3 Outreach/Education	0.05	0.05	0.05	0.05	0.05
	Subtotal (Program Area 6)	**0.35**	**0.35**	**0.48**	**0.48**	**0.65**
Total (All Program Areas)		**4.02**	**6.55**	**6.03**	**6.03**	**6.20**

Note: Staff requirements are for lead implementing agency and reflect project management, oversight and related functions.

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TABLE 6-4

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 1
YEARS 1 - 5

Program Area/Project		Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
			1	2	3	4	5	
Program Area 1: Commercial Vehicle Operations								
1.1.1	Implement "Smart" Scales Facility	Combine automated safety inspections with weigh-in-motion scales	$20,000	$415,000	$395,000			$830,000
1.1.2	Expansion of Ramp Weigh-in-Motion Scales	Install at 2 sites				$395,000	$400,000	$795,000
	Subtotal (Project 1.1)		**$20,000**	**$415,000**	**$395,000**	**$395,000**	**$400,000**	**$1,625,000**
1.2	Purchase Credentials in Advance	Develop electronic system and plan to upgrade record keeping		$75,000	$500,000			$575,000
	Subtotal (Project 1.2)			**$75,000**	**$500,000**			**$575,000**
Subtotal (Program Area 1)			**$20,000**	**$490,000**	**$895,000**	**$395,000**	**$400,000**	**$2,200,000**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
2. **All costs shown are total costs, not just WisDOT costs. The majority of the cost for many projects will be borne by other ITS deployment partners.**

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TABLE 6-5

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 2
YEARS 1 - 5

Program Area/Project		Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
			1	2	3	4	5	
Program Area 2: Incident Management								
2.1.1	Establish Incident Management Committee	Committee formation and administrative expenses	$40,000	$40,000	$60,000	$60,000	$60,000	$260,000
2.1.2	Incident Management Test Sites	Preparation of individual subregional incident management plans		$80,000	$80,000	$80,000	$80,000	$320,000
	Subtotal (Project 2.1)		**$40,000**	**$120,000**	**$140,000**	**$140,000**	**$140,000**	**$580,000**
2.2.1	Establish Cellular Call Origin Test Sites	Feasibility study and project development	$5,000	$20,000				$25,000
	Subtotal (Project 2.2)		**$5,000**	**$20,000**				**$25,000**
2.3.1	Cellular Telephone Hotline and Operations/Dispatch Center	Establish one test location and dispatch center	$40,000	$140,000	$50,000	$50,000	$50,000	$330,000
2.3.2	Cellular Telephone Hotline Promotion	Development of marketing campaign and media ads	$25,000	$25,000	$40,000	$45,000	$50,000	$185,000
	Subtotal (Project 2.3)		**$65,000**	**$165,000**	**$90,000**	**$95,000**	**$100,000**	**$515,000**
2.4.1	GPS Test Site in Dane County	Equip specific incident management fleet vehicles with GPS	$100,000	$178,750				
	Subtotal (Project 2.4)		**$100,000**	**$178,750**				**$278,750**
Subtotal (Program Area 2)			**$210,000**	**$483,750**	**$230,000**	**$235,000**	**$240,000**	**$1,398,750**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
2. **All costs shown are total costs, not just WisDOT costs. The majority of the cost for many projects will be borne by other ITS deployment partners.**

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TABLE 6-6

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 3
YEARS 1 - 5

Program Area/Project		Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
			1	2	3	4	5	
Program Area 3: Emergency Management Services								
3.1.1	Develop Functional Requirements and Specifications	Planning and design study	$38,000					$38,000
3.1.2	Establish Test Site in LaCrosse	Wisconsin deployment in conjunction with Mn/DOT Mayday Plus project		$125,000				$125,000
	Subtotal (Project 3.1)		**$38,000**	**$125,000**				**$163,000**
Subtotal (Program Area 3)			**$38,000**	**$125,000**				**$163,000**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
2. **All costs shown are total costs, not just WisDOT costs. The majority of the cost for many projects will be borne by other ITS deployment partners.**

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TABLE 6-7

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 4
YEARS 1 - 5

Program Area/Project		Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
			1	2	3	4	5	
Program	**Area 4: Regional Multimodal Traveler Information**							
4.1.1	Expand 1-800 ROADWIS Automated Telephone Information Service	Expand current automated telephone information service	$86,000	$46,000	$28,000	$28,000	$30,000	$218,000
4.1.2	Expand Home Page Information on the Internet	Enhance existing WisDOT Internet web page	$40,000	$20,000	$25,000	$30,000	$30,000	$145,000
	Subtotal (Project 4.1)		**$126,000**	**$66,000**	**$53,000**	**$58,000**	**$60,000**	**$363,000**
4.2.1	Expand Use of Changeable Message Signs	8 fixed and 17 portable CMS, controllers and wireless communications	$315,000	$270,000	$340,000	$460,000	$460,000	$1,845,000
4.2.2	Establish Corridor-Wide Highway Advisory Radio	5 permanent and 5 portable HAR stations	$110,000	$115,000	$115,000	$35,000	$35,000	$410,000
4.2.3	Provide Information via Cellular Telephone*							
4.2.4	Install Automated Interactive Kiosks	8 traveler information kiosks	$106,000	$18,000	$36,000	$36,000		$196,000
4.2.5	Install Automated Road Condition Warning Signs	3 test sites, each with different technological components		$80,000	$80,500	$254,500	$332,500	$747,500
4.2.6	Establish Portable Travel Time Reporting System	Project development/ design, test deployment, and expansion	$50,000	$150,000	$200,000	$360,000	$360,000	$1,120,000
	Subtotal (Project 4.2)		**$581,000**	**$633,000**	**$771,500**	**$1,145,500**	**$1,187,500**	**$4,318,500**
4.3.1	Develop Functional Requirements and Specifications	Planning and design study			$10,000			$10,000
4.3.2	Automated Transit Schedule Test	One test site and evaluation			$40,000	$15,000		$55,000
	Subtotal (Project 4.3)				**$50,000**	**$15,000**		**$65,000**
Subtotal (Program Area 4)			**$707,000**	**$699,000**	**$874,500**	**$1,218,500**	**$1,247,500**	**$4,746,500**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
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***The costs for this project are assumed to be covered under project 4.1.1.**

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TABLE 6-8

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 5
YEARS 1 - 5

Program Area/Project	Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
		1	2	3	4	5	
Program Area 5: Public-Private Partnerships							
5.1 Public-Private Partnership Outreach		$25,000	$25,000	$40,000	$50,000	$50,000	$190,000
Subtotal (Program Area 5)		**$25,000**	**$25,000**	**$40,000**	**$50,000**	**$50,000**	**$190,000**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
2. **All costs shown are total costs, not just WisDOT costs. The majority of the cost for many projects will be borne by other ITS deployment partners.**

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TABLE 6-9

CONCEPTUAL IMPLEMENTATION COSTS - Program Area 6
YEARS 1 - 5

Program Area/Project		Description	Implementation Costs by Year					Total Imp. Cost Years 1-5
			1	2	3	4	5	
Program Area 6: Technical and Planning Support								
6.1	ITS Deployment Committee	Organizational support, committee formation and facilitation	$35,000	$60,000	$60,000	$60,000	$60,000	$275,000
6.2	Technical Support	Project development, project management, coordination with other ITS initiatives	$45,000	$95,000	$95,000	$95,000	$95,000	$425,000
6.3	Outreach/Education	Public and internal/ interagency education and support-building	$20,000	$45,000	$45,000	$45,000	$45,000	$200,000
Subtotal (Program Area 6)			**$100,000**	**$200,000**	**$200,000**	**$200,000**	**$200,000**	**$900,000**
Total (All Program Areas)			**$1,100,000**	**$2,022,750**	**$2,239,500**	**$2,098,500**	**$2,137,500**	**$9,598,250**

Notes:
1. **Unless identified as a separate project, costs for all implementation projects include any necessary planning/design.**
2. **All costs shown are total costs, not just WisDOT costs. The majority of the cost for many projects will be borne by other ITS deployment partners.**

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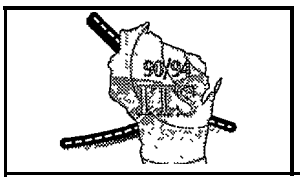


APPENDIX A:
February 1996, Prioritization Workshop Participants

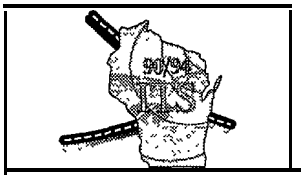
The following individuals participated in the Prioritization Workshop:

Technical Team Members:

Pete Rusch, WisDOT Central Office - Traffic Engineering
Patti Hansen, Wisconsin State Patrol - District 2
Tom Cantwell, WisDOT Division of Motor Vehicles
Bob Fasick, WisDOT Central Office - Maintenance
Phil DeCabooter, WisDOT ITS Program
Marty Beekman, WisDOT, District 6 - Planning
Mark Hoines, FHWA - Wisconsin District
John Corbin, WisDOT, District 2 - Highways
Dan Fedderly, St. Croix County
John Norwell, Dane County Highway Department

Consulting: Team Members & WisDOT Staff:

Dennis Foderberg, BRW Consulting Team - Expert Panel
Richard Braun, BRW Consulting Team - Expert Panel
Ralph Blum, BRW Consulting Team - BRW, Inc.
Mark Ryan, BRW Consulting Team - BRW, Inc.
Jeff Benson, BRW Consulting Team - BRW, Inc.
Mo Zarean, BRW Consulting Team - JHK & Associates
Jon Obenberger, WisDOT ITS Program



APPENDIX B:
April 1996, Focus Group Meeting Participants

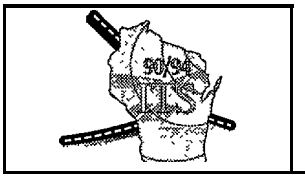
Participants in the April 15 & 16,1996 focus group meetings were:

Madison Area Focus Group:

WisDOT District 1 - Highways
Jefferson County Sheriff's Department
Beloit Area Metropolitan Planning Organization
Dane County Regional Planning Commission
Wisconsin State Patrol
Department of Tourism
WisDOT - Division of Planning
American Automobile Association of Wisconsin
WisDOT - Division of Transit Assistance
Professional Fire Fighters of Wisconsin
Dane County Highway & Transportation Department
Nationwide Travelers, Inc.

Eau Claire Area Focus Group:

John Dotseth Trucking, Inc.
Monroe County Safety Commission
Eau Claire County Sheriff's Department
West Central Wisconsin Regional Planning Commission
American Automobile Association of Wisconsin
WisDOT District 5 - Highways
Access Transit, Inc.
WisDOT District 6 - Highways
St. Croix County Highway Department
Eau Claire County Highway Department
Wisconsin State Patrol
City of Eau Claire



APPENDIX C:
August 1996, Workshop Meeting Participants

Auaust 6th in Madison:

John Norwell, Dane County
Bob Young, WisDOT - State Patrol
Ashwani K. Sharma, WisDOT - Traffic
Ron Sonntag, Marquette University
Jeff Haas, Jefferson County
Don Kush, WCWRPC
Janice Gibeau, WisDOT - District 1
Marty Beekman, WisDOT - District 6
John Freund, GMCVB
Bruce Belscamper, WisDOT - District 1
Skip Schneider, WisDOT - District 1
Dennis Nantt, WisDOT - District 1
Marshall Quade, WisDOT - District 2
Mark Hoines, FHWA
LeRoy Besler, WisDOT - District 1
MO Zarean, JHK & Associates
Mark Ryan, BRW
Larry Kieck, WisDOT - Transit
Tim Carnahan, WisDOT - State Patrol
Bob Fasick, WisDOT - Highway Operations
Steve Young, WisDOT - Freeway Operations
Bob Wagner, WisDOT - District 4
Bob McDonald, Dane County RPC
Tom Walsh, Madison DOT/TE
Debby Preman, GMCVB
Andrea Kolbe, GMCVB
Mike Groetzman, WisDOT - OPA
Phil DeCabooter, WisDOT - ITS
Tom Boguszewski, Rock County Highway
Romya Snyder, Wisconsin Dells CVB
Tom Cantwell, WisDOT - Div. Of Motor Vehicles
Bin Ran, University of Wisconsin - Madison
Jeff Benson, BRW

Auaust 7th in Lacrosse:

Daniel Fedderly, St. Croix Co. Highway
Greg Bethke, WisDOT - District 5
Don Hill, Wisconsin Dept. of Tourism
Norm Ewert, WisDOT - District 6
Roger Winter, WisDOT - District 5
Lance Rickaway, Lacrosse Police
Herman Kielhold, WisDOT - District 5
Ed Fitzgerald, WisDOT - District 5
Rick Roehl, Roehl Transport
Bob Fisher, MRRPC
Jeff Benson, BRW
Elwin Fedie, Pepin County
Tom Frank, FHWA
Ken Berg, Eau Clair County Sheriff's Office
Anne Greyson-Moths, WisDOT - District 5
Bill Leisso, WisDOT - District 5
Jerry Zuttlsdorf, WisDOT - State Patrol
Pat Caffrey, Lacrosse - Dept. Of Public Works
Greg Swanson, WisDOT - District 4
Norm Ewert, WisDOT - District 6
MO Zarean, JHK & Associates
Mark Ryan, BRW