NCHRP
REPORT 520

NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM

Sharing Information between Public Safety and Transportation Agencies for Traffic Incident Management

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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Sharing Information between Public Safety and Transportation Agencies for Traffic Incident Management

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SUBJECT AREAS
Highway Operations, Capacity, and Traffic Control

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Academies was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration, U.S. Department of Transportation.

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FOREWORD

By B. Ray Derr
Staff Officer
Transportation Research Board

This report presents lessons learned from around the country on how public safety and transportation agencies share information for managing traffic incidents. Managers of traffic incident management programs, either public safety or transportation, can apply these lessons to improve the capabilities of their programs.

"Incident management is defined as the systematic, planned, and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders (*Traffic Incident Management Handbook,* 2000)." There are many organizations involved in traffic incident management, including public safety agencies (e.g., law enforcement, fire, and emergency medical services); transportation agencies; and other types of responders (e.g., environmental conservation, medical examiners, and towing and recovery). Efficient response is both a public safety issue and a mobility issue, because longer response and clearance times mean less effective critical care, more traffic congestion, and reduced mobility.

Interagency exchange of information promotes rapid, efficient, and appropriate response from all agencies. Public safety agencies benefit from obtaining closed-circuit television pictures for verification and assessment of an incident as they begin their response. This visual information helps the agencies to dispatch the appropriate response teams and to recall those teams if the incident clears up before they arrive. Public safety agencies can also benefit from information regarding traffic conditions on the response route and special information, such as blocked railroad crossings or construction, that might affect the response.

Transportation agencies also benefit from sharing information. Even in areas with good video surveillance, the great majority of incidents are first reported by cell phone to 911 public safety answering points (PSAPs). These PSAPs cover the entire transportation system while video surveillance is typically limited to the urban freeways. In most metropolitan areas, public safety agencies use computer-aided dispatch, which is often the best source of timely, detailed information on traffic incidents. In addition to sending response teams to the scene, transportation agencies can initiate actions such as variable message sign and highway advisory radio messages, traffic signal timing changes, and public information notices based on the information they receive from the public safety agencies.

In NCHRP Project 3-63, Mitretek Systems identified several regions across the United States with active traffic incident management programs. They then visited both public safety and transportation agencies in these regions and conducted in-depth interviews to determine how information is being shared and how well those methods work. The report includes detailed studies of the regions visited and a summary of lessons learned.

CONTENTS

CHAPTER 1

SUMMARY

Traffic incident management (TIM) is a planned and coordinated process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. It involves the coordinated interactions of multiple public agencies and private-sector partners. The objective of this study was to assess methods, issues, benefits, and costs associated with sharing information between public safety and transportation agencies in support of TIM.

Interagency exchange of information is the key to obtaining the most rapid, efficient, and appropriate response to highway incidents from all agencies. More and more, such information must be shared across system, organizational, and jurisdictional boundaries. Transportation and public safety agencies in locations across the United States are successfully sharing highway incident information through a variety of methods.

A case study approach based on site visits was used. Interviews and document reviews were conducted at a selected group of sites regarding the methods of information sharing between transportation and public safety organizations, the effectiveness of these methods, and the corresponding features of the interagency relationships. The limited sample represented by these surveys confirmed that working relationships between public safety and transportation organizations are positively correlated with information sharing. A summary of results is provided in Table 1.

Four broad methods of information sharing were identified: *Face-to-face* encompassed direct interpersonal activities, usually at joint operations or shared facilities. *Remote voice* included common communications options such as telephones and land mobile radio. *Electronic text* involved text messaging via paging, facsimile, or email devices and text access to traffic incident–related data systems, including computer-aided dispatching (CAD). *Other media and advanced systems* comprises technology-dependent methods not addressed in the previous categories, such as video and other imaging systems, and integrated technologies, such as advanced traffic management systems.

At six locations surveyed, communications and information systems are made accessible to both public safety and transportation organizations at a common location. These joint operations centers are often the cornerstone for information sharing between agencies in a region. The standard wireline telephone is still the primary means of center-to-center interagency communication at most locations. Transportation incident scene information is best and most immediately communicated via land mobile radio. This was reflected in the widespread practice of providing public safety radio access to some transportation agency units at most locations. Service patrols were the transportation units most commonly found to be equipped with public safety radios at the case study locations. Commercial cellular capabilities have greatly improved with the advent of push-to-talk and priority access features that can effectively emulate radio service. Key personnel from some of the agencies coordinate with interagency points-of-contact commercial wireless push-to-talk networks.

Alphanumeric pagers, cellular short message service text messaging, and email are used by some individuals to communicate within their agencies. However, these applications are not the key means for sharing TIM information with other agencies. CAD systems, while also not yet a key method for interagency information sharing, has become a component of incident information sharing networks in seven of the locations. Most existing CAD systems are proprietary and are not designed to exchange information with CAD systems offered by other vendors, let alone with transportation systems. When practical, public safety and transportation agencies should consider using compatible information systems to establish effective interagency information exchange.

Freeway management systems operated by transportation agencies in many metropolitan areas include closed-circuit television (CCTV) or other video systems, embedded sensors in roadways, dynamic message signs, and highway advisory radio systems. Information generated by these systems is readily shared where public safety staff are co-located at the relevant transportation centers. In some locations, video and still images are shared remotely.

The survey locations provided clear examples of successes and failures of sharing traffic incident information between transportation and public safety agencies. Of the various methods of sharing information presented in this report, no single one is best. The characteristics of the local environment and organizations are key factors affecting the success of a method. There is no guarantee that implementing any of these methods under different institutional, operational, or technical situations will achieve the same results as reported in the case studies. However, the successful programs identified in the case studies are certainly viable candidates for emulation elsewhere.

TABLE 1 Summary of information-sharing methods by location

Location	Face-to-Face	Remote Voice	Electronic Text	Other Media and Advanced Systems
Albany, NY	Two co-location sites	Some sharing of public safety radios; some use of commercial wireless service "talk groups"	Shared CAD system	Roadway data, images, and video shared remotely
Austin, TX	Co-location site ready to open	Service patrols equipped with local police radios	CAD data to be shared remotely	CCTV control shared with local police
Cincinnati, OH	Transportation center hosts regional incident management team operations	Some sharing of public safety radios; some use of commercial wireless service "talk groups"	Shared CAD under development	CCTV and other traveler information are shared with public
Minneapolis, MN	Multiple co-location sites	Shared radio system; some use of commercial wireless service "talk groups"	Shared CAD data	CCTV and other traffic management systems are shared
Phoenix, AZ	—	Service patrols equipped with state police and DOT radios	DOT data workstations provided to local public safety agencies	CCTV shared with local fire department
Salt Lake City, UT	Co-location site	Shared radio system	Shared CAD data	CCTV and other traffic management systems are shared
San Antonio, TX	Co-location site	Service patrols equipped with local police radios; shared radio system to be deployed	Shared CAD data	CCTV and other traffic management systems are shared
San Diego, CA	Co-location site	Service patrols equipped with local police radios	Shared CAD data	CAD data are posted on traveler information website
Seattle, WA	—	Service patrols equipped with state patrol radios; center-center intercom system	Shared CAD data	Control of CCTV is shared with state patrol

All locations use standard telephones and facsimile machines for information sharing.
CAD = computer-aided dispatching.
CCTV = closed-circuit television.
DOT = department of transportation.

Effective communications arise between transportation and public safety organizations that work well together. Interaction between the two communities can work to build the mutual trust and respect necessary to build close working relationships. Many factors influence interoperability. For multiagency TIM information sharing, the broad factors are institutional, technical, and operational.

The willingness of leaders and organizations to work within cooperative partnerships is a cornerstone of successful TIM. As documented in the case studies, each of the locations with effective information sharing between transportation and public safety had formal frameworks in place for cooperative activities and day-to-day working relationships at many levels of the organizations. In all cases investigated, the frameworks were based on formal agreements or regional plans. Some of the frameworks could serve as models for other locations planning to implement cooperative programs.

Personal relationships among a handful of key staff are crucial to success. As demonstrated in successful locations, operational personnel have found innovative ways to overcome institutional and technical limitations to TIM coordination. Whether through informal traffic task forces or cellular talk groups, the trust established through these individuals permeates through the corresponding organizations. Moreover, co-location strengthens these interagency relationships and trust.

Changes in leadership often affect the relationships among organizations. At one location with a strong working relationship throughout the years, a change in leadership helped reinvigorate the partnership. At another location, when champions moved on in their careers, an information exchange project lost essential management support. That allowed previous minor problems to escalate, eventually leading to the project's demise.

The case studies identify some of the limitations of capacity, service availability, and cost of technologies for exchanging information between certain transportation agencies and their respective public safety partners. However, as also shown in the case studies, technology is capable of enhancing TIM information sharing and overcoming interoperability barriers. Agencies in the survey locations have shared common proprietary communications or data systems, have used commercial wireless services, and are testing ways of crosslinking their information system.

Fundamentally, sharing TIM information is an operational issue. Information sharing is a core value of public safety and of transportation agencies that work well together. The shared information leads to better decisions and performance—that is, faster help to those in need, shorter time that an incident impedes traffic, and ultimately less economic costs to the key stakeholders involved. However, exchanges of information concerning incidents are difficult if transportation staff are not available. Many transportation operations centers have increased their hours of operation in recent years, and transportation agencies in Arizona and Washington State have demonstrated the benefits of providing 24/7 incident response teams.

Most local officials interviewed were strongly supportive of sharing traffic incident information and employing multiagency teams to manage traffic incidents. However, no location visited during this study could formally quantify the benefits of information sharing. Moreover, most locations had no data to measure how other TIM practices affected detection, notification, response, clearance time, responder safety, or other metrics of performance. It is recommended that a set of performance measures be formulated and that sampling of these statistics be taken before and after the implementation of new TIM elements. Documenting and promoting the effectiveness of TIM enhancements, such as information-sharing programs, will help ensure that political leaders and public safety professionals increase their awareness of TIM problems and opportunities.

CHAPTER 2
INTRODUCTION

Transportation operations and public safety operations are intertwined in many respects. Public safety providers—law enforcement, fire and rescue, and emergency medical services (EMS)—ensure safe and reliable transportation operations by helping to prevent crashes and rescuing crash victims. Conversely, the transportation network enables access to emergency incidents and, increasingly, provides real-time information about roadway and traffic conditions.

Interagency exchange of information is the key to obtaining the most rapid, efficient, and appropriate response to highway incidents from all agencies. More and more, such information must be shared across system, organizational, and jurisdictional boundaries. Public safety agencies and transportation organizations often have information that is valuable to each other's operations. For example,

- Better incident detection and notification can engage appropriate public safety resources sooner, provide more rapid medical care to save lives and to minimize injury consequences, and reduce transportation infrastructure disruption;
- Better road situation information can speed the delivery of emergency (and support) resources to the scene; and
- Better incident site status and coordination information can improve the safety of emergency responders and hasten incident stabilization, investigation, and clearance.

Some transportation and public safety agencies in locations across the United States are usefully exchanging information through various methods. As part of this study, interviews were conducted at a selected group of sites regarding the methods of information sharing between transportation and public safety organizations, the effectiveness of these methods, and the corresponding features of the interagency relationships.

2.1 INCIDENT MANAGEMENT CONTEXT FOR TRAFFIC OPERATIONS

The incident management system (IMS) was born out of the chaos of wildland fires in California in the early 1970s. The fire service created a nationally standardized command and control paradigm to adopt common operational task responsibilities, organizational lines of command, and good management practices. It has been adopted throughout the fire service and by EMS because of their close organizational and operational association with the fire service. Law enforcement is also beginning to use IMS as well, especially for large or complex incidents. Transportation agencies, in seeking to operationally integrate their handling of congestion-producing highway incidents with public safety, have also embraced IMS principles and broadened IMS application beyond on-scene operations to include traffic management center operations.

TIM is a planned and coordinated process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. It involves the coordinated interactions of multiple public agencies and private-sector partners (*1*). TIM may be used for a range of purposes, from a fender bender on the highway to a hurricane evacuation. TIM requires transportation and public safety organizations to work together. Effective TIM depends on rapid and effective exchange of information among all involved parties, including agreement on task definitions, lines of authority, organizational framework, divisions of responsibility, and means of resolving conflicts. However, in many regions, key officials from one agency can rarely talk to their counterparts in another agency by radio, let alone share detailed and situational information. Interoperability—that is, two or more different agencies exchanging information according to prescribed methods in order to achieve predictable results—is essential. Many factors influence interoperability. For multiagency TIM information sharing, the broad factors are institutional, technical, and operational.

At the highest level are the institutional factors that enable and influence multiagency willingness to share information. Key factors include policies for coordination and cooperation (e.g., legislative or executive branch mandates), common or coordinated budgets, memoranda of understanding or agreement, co-location of personnel or equipment, and information security or privacy restrictions. Technical factors determine the capability to efficiently share information. Radio, computer, and video systems can greatly strengthen information-sharing capabilities. At the same time, however, incompatibilities among these systems can also impede communication. Spectrum, standards, bandwidth, and equipment reliability influence the ability of technologies to support interoperability. Although institutional and technical aspects are crucial factors, the operational context ultimately determines the efficiency and effectiveness of the information sharing. The operational context implies that all personnel understand the importance of the information, that the information is usable, and that it can usefully affect decisions. Operational factors that can set this context include cross-agency training and other training and joint operations frameworks, such as incident response teams and general IMSs.

Following the events of September 11, 2001, these interoperability factors have gained national attention. There is an expanding range of possibilities for coordinating public safety and transportation agencies, some of which are identified in this study. There is also strong public and political support, a range of information technology options, and new funding mechanisms for improving interoperability. The challenge is to engage public safety and transportation professionals and to enable them to implement successful practices for generating and sharing safety information. This project assesses some of these information-sharing practices and the degree to which localities have taken advantage of these opportunities.

2.2 RESEARCH APPROACH

A case study approach based on site visits and interviews was used. A list of the candidate sites to visit was compiled from a literature review and Intelligent Transportation Systems (ITS) Integration Program information. On the ITS Integration Program list, several projects exemplified cutting-edge efforts to integrate transportation and public safety information systems, institutions, and operations.

Using NCHRP guidance, the list also contained locations with failed or no attempts at such integration. These types of situation were desired to provide a more rounded view of information sharing between transportation and public safety organizations. The proposed visit lists were presented to the NCHRP Project 3-63 Panel for review and approval. The sites visited are identified in Table 2.

In selecting the list of candidate interview sites, the term "transportation management center (TMC)" as used in the research problem statement was loosely interpreted in a manner that encompasses any facility containing information systems that are used to manage traffic flow, including transportation operations centers (TOCs) that also manage field resources, or other communications centers that also provide similar services. Also, the researchers regarded linked transportation management and public safety organizations to be worthy of initial consideration for a site visit and interview, regardless of whether the organizations were physically co-located.

An approach was used to gather information about incident management programs at the sites that concentrated on using face-to-face interviews with participants in an environment designed to maintain the privacy of discussions. Interviews, meetings, and conversations were conducted with participants at multiple organizational levels, including actual operators at all key agencies and their direct supervisors where practicable.

Prior to each site visit, researchers contacted the interviewees and sought to obtain a packet of background and orientation information about the TIM coordination activities. There were varied responses from the sites, ranging from voluminous documentation to telephone conversations. After studying the information received, gaining an appreciation of the history of interaction between the local transportation and public safety communities, and understanding the background of the project or system in use at the site, researchers visited the sites and conducted the interviews. As time permitted, and as the opportunities presented themselves, researchers augmented their information gathering with ride-along sessions, tours, and demonstrations.

2.3 WHAT INFORMATION AND METHODS OF SHARING WERE CONSIDERED?

The following types of traffic incident information were considered within the scope of this study:

- **Detection and Notification Information**—Identifies the incident (e.g., vehicle crash or other event) and informs

TABLE 2 Case study locations and agencies

Location	Key Transportation Agencies	Key Public Safety Agencies
Albany, NY	New York State DOT; New York State Thruway Authority	New York State Police; Albany Police
Austin, TX	Texas DOT	Austin Police
Cincinnati, OH	Ohio DOT; Kentucky Transportation Cabinet	Hamilton County Dept. of Communications; Cincinnati Police; Covington Police
Minneapolis, MN	Minnesota DOT	Minnesota State Patrol
Phoenix, AZ	Arizona DOT	Phoenix Fire Dept.
Salt Lake City, UT	Utah DOT	Utah Dept. of Public Safety Highway Patrol and Communications Bureau
San Antonio, TX	Texas DOT	San Antonio Police Dept.
San Diego, CA	California DOT	California Highway Patrol
Seattle, WA	Washington State DOT	Washington State Patrol

the agencies responsible for dispatching appropriate personnel and equipment and for managing traffic.

- **Response Information**—Provides incident details (e.g., number and type of injuries and precise location) to speed the delivery of the optimal emergency resources to the scene. Related information includes local traffic conditions and agency resource location.
- **Site Management Information**—Provides status details about the incident site and resources to enable on-scene coordination within and among agencies. This supports emergency responder safety, traffic management, incident stabilization, investigation, and clearance.

For the purpose of this case study, the results are grouped according to categories of traffic incident information-sharing methods:

- **Face-to-Face**—Personal communication where staff from different agencies share office space (such as joint operations centers or mobile command posts).
- **Remote Voice**—Common options readily available to support operations within most transportation and public safety agencies, such as telephone and land mobile radio.
- **Electronic Text**—Lower-bandwidth interconnection applications such as facsimile machines, electronic messaging, CAD, or record management systems.
- **Other Media and Advanced Systems**—Technology-dependent methods not addressed in the previous categories. This category contains primarily higher-bandwidth communications options, such as video and other imaging systems, and integrated systems, such as advanced traffic management systems.

CHAPTER 3

INFORMATION SHARING FOR TRAFFIC INCIDENT MANAGEMENT

Investigators found that several methods of sharing TIM information between transportation and public safety agencies have been tested, implemented, or planned for future implementation. This section summarizes the methods put into practice at the survey locations.

3.1 SUMMARY OF CASE STUDY RESULTS

Researchers conducted interviews at nine locations selected by the NCHRP panel. The locations and key agencies are listed in Table 2. Each case study is described briefly below. The methods of sharing TIM information at these locations are presented in Table 3.

3.1.1 Albany

The Albany, New York, region provides a wealth of experience and advances in transportation and public safety information sharing. Transportation and public safety agencies have close working relationships in this region and have deployed or tested a wide variety of information-sharing applications. The agencies included in this case study are the New York State Department of Transportation (DOT), the New York State Thruway Authority, the New York State Police, and the Albany Police Department.

The Albany region has a number cooperative frameworks for coordinating public safety and transportation operations. The unusual situation of two highway operating agencies with overlapping jurisdiction, each supported by different divisions of a law enforcement agency, underscores the need for close coordination in the region. Methods of sharing TIM information included co-location at two centers; shared radio systems and commercial wireless "talk groups"; a shared CAD system; and freeway data, images, and video shared remotely through a prototype broadband system.

3.1.2 Austin

Efforts to enhance coordination of incident management functions in the Austin metropolitan area through the cooperative development of technology has its origins in the ITS Early Deployment Plan that was jointly sponsored by the Federal Highway Administration, Texas DOT (TxDOT), and the City of Austin Public Works. These initiatives ultimately led the partner agencies in the Austin metropolitan area to embark on an effort to develop the Combined Transportation, Emergency, and Communications Center (CTECC), which includes the development and implementation of various integrated data and communication systems.

When completed, the CTECC will house TxDOT, the Austin Police Department, the Austin Fire Department, and Travis County EMS and serve as a focal point of information sharing between public safety and transportation agencies in the Austin metropolitan area. Methods of sharing TIM information include co-location in a center, shared radio systems, integration of the Austin/Travis County CAD system with TxDOT traffic management systems, and CCTV images.

3.1.3 Cincinnati

A mature interagency operation is in place in Cincinnati, where various types of information are regularly and routinely exchanged between transportation and public safety. The Advanced Regional Traffic Interactive Management Information System (ARTIMIS) unites interests in three states to address traffic management in the metropolitan area. The Freeway Service Patrols are of particular note, representing a public-private partnership between the state DOTs and CVS Pharmacies, where roadway assistance is provided by certified mechanics who are also licensed emergency medical technicians. Information sharing is accomplished primarily under the auspices of regional incident management teams, which are convened at ARTIMIS for major incidents. ARTIMIS is now part of the Hamilton County Communications public safety radio system and has the ability to talk directly to every police and fire agency in Hamilton County. In addition, ARTIMIS talks to multiple police, fire, and transit agencies by using Nextel talk groups. There is also significant face-to-face interaction between the freeway service patrols and other highway incident response personnel.

3.1.4 Minneapolis

The Minnesota DOT (MnDOT) and the Minnesota State Patrol (MSP) began operation of a new co-located Regional

TABLE 3 Methods of sharing TIM between transportation and public safety agencies at survey locations

Geographical Region	Face-to-Face	Remote Voice	Electronic Text	Other Media and Advanced Systems
Albany, NY	State Police co-located with State DOT at one center; State Police co-located with Thruway Authority at another center.	State DOT Service Patrols share public safety radios; State Police and Thruway share a radio system and dispatchers; Senior staff use commercial wireless service "talk groups."	Joint CAD system shared at Thruway center.	ATMS data, images, and video shared remotely through experimental wireless broadband service.
Austin, TX	State DOT, city fire and police depts., and county EMS will be co-located at center.	Service Patrols equipped with local police radios.	Capability under development to share traffic incident data from public safety CAD data remotely.	Control of transportation CCTVs shared with local police.
Cincinnati, OH	Transportation center hosts regional Incident Management Team operations.	ARTIMIS shares public safety radios; multiple agencies use commercial wireless service "talk groups."	Capability under development to share CAD data with ARTIMIS.	Transportation CCTV images available on traveler information website.
Minneapolis, MN	State Patrol and State DOT staff co-located at a regional center. State Patrol and service patrol staff co-located at another location.	State Patrol and State DOT share the 800MHz radio system. Senior staff use of commercial wireless service "talk groups."	Service Patrols have read-only terminals from State Patrol CAD. State DOT can access State Patrol CAD.	State DOT CCTV and other traffic management systems are shared with State Patrol.
Phoenix, AZ	—	Service Patrols equipped with State Patrol and State DOT radios.	State DOT highway condition workstations provided to local fire dept. and emergency services div. County DOT incident response teams use alphanumeric pagers.	State DOT CCTV shared with local fire dept.
Salt Lake City, UT	Highway Patrol and State DOT staff co-located at the regional center, but separated by elevated soundproof glass partition.	All Highway Patrol and State DOT field units use the same radio system and dispatchers. Service Patrols are fully integrated into law enforcement radio system.	State Patrol CAD shared with State DOT	State DOT CCTV and other traffic management systems are shared with Highway Patrol.
San Antonio, TX	Local Police and State DOT co-located at the regional center.	Service Patrols equipped with local police radios. New radio system will provide common channels for State DOT and local police and fire.	Incident data from local police CAD shared with State DOT traveler information system.	State DOT CCTV images are shared with local government and news agencies.
San Diego, CA	State Patrol and State DOT co-located at the regional center.	Service Patrols equipped with local police radios.	State DOT has read-only access to Highway Patrol CAD.	Incident information from Highway Patrol CAD is provided to State DOT traveler information website.
Seattle, WA	—	Service Patrols equipped with State Patrol radios. Intercom system (with handsets) is used between State DOT center and State Patrol 9-1-1 call center.	State DOT partially shares State Patrol CAD system. State DOT has CAD terminal for entering traffic incident information.	State DOT CCTV shared with State Patrol (includes control of cameras).

All locations use standard telephones and facsimile machines for information sharing.
ARTIMIS = Advanced Regional Traffic Interactive Management Information System.
ATMS = advanced traffic management system.
CAD = computer-aided dispatching.
CCTV = closed-circuit television.
DOT = department of transportation.
EMS = emergency medical services.

Traffic Management Center (RTMC) in April 2003. There are workstations located in the RTMC control room for freeway operations, police dispatch, maintenance operations, and traffic news media.

MnDOT and MSP share an 800-MHz radio communications system. Working with MnDOT, MSP is deploying nine transportation operations communications centers throughout greater Minnesota (five operational with four coming on-line). These centers serve as communication hubs for emergency response, maintenance operations, traffic management, and traveler information.

3.1.5 Phoenix

Through a variety of initiatives, Arizona DOT, Maricopa County DOT, and the Phoenix Fire Department have all tried to enhance TIM through information sharing. Methods of information sharing include shared radio systems, direct phone lines, traveler information workstations, facsimile, alphanumeric pagers, and CCTV images. Relative to the other locations surveyed, there is a limited amount of actual information sharing between public safety and transportation agencies. Institutional issues are the primary factors limiting information sharing.

3.1.6 Salt Lake City

Information sharing between Utah DOT (UDOT) and Utah Highway Patrol (UHP) in Salt Lake City is beneficial, persistent, and effective. Relationships between the two communities are mutually reinforcing and are exemplified by the good fit between the two communities at all levels. UDOT was able to take advantage of the Winter Olympics event being held in Salt Lake City to upgrade many of its systems and operations to a high degree of readiness. Also, much of the technical integration challenges were avoided by incorporating UDOT and UHP into the same radio communications and CAD systems. Information sharing between UDOT and UHP is primarily accomplished within the CAD system; however, highway CCTV imagery is used by both agencies at the traffic operations center. UDOT and public safety field personnel are tightly integrated and work exceptionally well together at the scene of highway incidents.

3.1.7 San Antonio

Much of the success of TIM functions in the San Antonio metropolitan area can be attributed to (1) the strong institutional structures that have underpinned development and operation of data and communications systems and (2) joint planning and training activities. Critical to the institutional framework is the corridor management team (CMT), which provides an unofficial and informal platform to discuss traffic operations. CMT membership consists of representatives from the Metropolitan Transit Authority, the San Antonio Public Works Department, Alamo Dome, the San Antonio Police Department, the Bexar County Sheriff's Department, EMS providers, towing and recovery service providers, and county health agencies.

TIM operations in the San Antonio metropolitan area have further benefited from the TransGuide Operation Center, which has been specifically designed to provide a central point of coordination in responding to emergencies for TxDOT and the San Antonio Police Department. This center has also provided a platform to share voice, data, and multimedia communications among multiple responders. Methods of information sharing include co-location in the operations center, a shared radio system, a trunked radio system, a CAD-traveler information system, and CCTV images.

3.1.8 San Diego

California DOT (Caltrans) and the California Highway Patrol (CHP) have demonstrated a commitment to manage traffic incidents cooperatively. To support incident management functions, the two agencies developed an interface between CHP and Caltrans through the San Diego Regional Computer Aided Dispatch Interconnect (InterCAD) project. Although development and implementation of InterCAD was not deemed a success, many technical and institutional lessons were learned from the project. These lessons learned will be critical as both agencies remain committed to sharing information and may embark on a similar project in the future. Methods of information sharing include co-location in the operations center and a "sanitized CAD system" that enables Caltrans to enter details into a record external to the CHP CAD system.

3.1.9 Seattle

The Washington State Legislature, the Washington State Patrol (WSP), and the Washington State Department of Transportation (WSDOT) share a common focus to reduce congestion on roadways in Washington State through coordinated and cooperative incident management. As a result, both agencies are able to make decisions internal to their own agencies to provide the foundation that ultimately supports information sharing between the two agencies. Leadership and support of decision makers enables those responsible for TIM to focus their efforts on improving safety and mobility in the Seattle metropolitan area through the sharing of information. As a result, WSP and WSDOT have demonstrated an ability to collectively develop and implement advanced technologies to support coordinated and cooperative interjurisdictional and interdisciplinary communications in the context of TIM. Methods of information sharing include an intercom system between the WSDOT center and the WSP call center, a common radio system, CAD integration with traveler information system, and CCTV images.

3.2 METHODS USED IN PRACTICE

3.2.1 Face-to-Face

At six of nine locations surveyed, communications and information systems are made accessible to both public safety and transportation at a common location. These joint operations centers are often the cornerstone for information sharing between agencies in a region. As would be expected in jointly operated facilities, the primary method of information sharing is face-to-face voice communications. Face-to-face communication is an effective way of sharing incident notification and status information and for coordinating response and management of the traffic incident or other emergencies. For example, the control room in the San Diego center is specifically designed to foster interaction by arranging consoles in a manner that facilitates operator-to-operator contact. This arrangement has proven especially beneficial as it provides the opportunity to communicate openly between transportation and highway patrol staff as incidents evolve without depending on communications or data systems.

Other face-to-face information-sharing methods include on-scene coordination and planning task forces. These are not considered in more detail here. In the case of on-scene coordination, this is transitory in nature and common to incident scenes across the United States. Various traffic-planning task forces at some of the surveyed locations provide the basis for coordinated incident management, but are not directly involved in the real time sharing of incident detection, response, or scene management information.

3.2.2 Remote Voice

The standard wireline telephone is still the primary means of interagency communication, incorporating facsimile. The public switched telephone network is essential and elemental for public safety and transportation information sharing; telephone use was explicitly cited as a means of information sharing at most survey sites. Portions of most information flows of mutual interest depend on the wireline network, such as 911 call processing and even cellular telephone services. Some locations have established hotlines. For example, the WSP call center and the WSDOT center communicate via an intercom system. This system enables the WSP dispatcher to communicate directly with a traffic system operations specialist in the WSDOT center 24 hours a day, 7 days a week.

Action on the highway is best and most immediately described via land mobile radio, as is evidenced by its near universal use by transportation and public safety agencies. However, in most situations, field personnel from one agency cannot talk directly by radio to counterparts from other agencies. Public safety agencies, particularly law enforcement agencies, can be reluctant to allow other organizations access to their communications or information-processing systems. However, as these systems have evolved over recent years, they have incorporated sufficient security safeguards to safely permit access and use by personnel who are not sworn law enforcement officers. Modern systems are therefore usually not a significant security problem, although older systems can pose difficulties. In either case, transportation personnel who are granted access privileges to law enforcement systems containing sensitive information are usually required to pass a background investigation. Where permitted and practicable, such joint system use has been shown to improve the efficiency of all users. It has also been shown to improve responder safety. A simple wanted-vehicle check can warn a service patrol operator to avoid contact with a wanted vehicle, where assistance might have been previously offered. This check could avoid jeopardizing a service patrol crew or inadvertently aiding a perpetrator.

Public safety radio systems were shared with some parts of transportation agencies at most locations. This was done with full transmit and receive units or with monitoring scanners. Service patrol vehicles often were equipped with public safety radios and had access to certain channels. Service patrols are usually sponsored by state or local transportation agencies and offer motorist assistance to vehicles traveling on limited-access public roadways. Service patrol access to public safety radios provides dual benefits. The service patrol operators can be directed to minor incidents by public safety dispatchers, allowing public safety responders to handle more pressing emergencies. Service patrol operators frequently arrive first at serious incidents and can best be the eyes and ears of public safety via direct radio contact (while the public safety responders are en route). At their operations centers, the agencies also monitor each other's relevant radio communications.

Service patrol operators in Seattle, Washington, are equipped with hand-held state patrol radios that enable the operators to communicate with officers responding to an incident. Use of the WSP radio also enables WSDOT to communicate with local fire departments via a common frequency. The fire channel is programmed to communicate only mobile unit to mobile unit. Service patrol operators or vehicles in each of the case study locations were equipped with public safety radios.

In the Salt Lake City, Minneapolis, and New York Thruway regions, all state troopers and transportation field units share a common radio system. San Antonio, in cooperation with Bexar County, is in the process of deploying a new trunked-radio system in late 2003 to support public safety operations throughout the city and county. Once implemented, this system will provide a common frequency for San Antonio Police, San Antonio Fire Department, and TxDOT to communicate in the field while managing traffic incidents.

Until recently, radio systems and cellular telephone services were quite far apart in capabilities, and cellular could not replace radio. Lately, cellular capabilities have improved so much that they have almost equaled radio capabilities. Key personnel from some of the agencies can coordinate with points of contact at other agencies (and within their own agency) via commercial wireless push-to-talk networks.

3.2.3 Electronic Text

Alphanumeric pagers, cellular short message service text messaging, and email are used by some individuals to communicate within their agencies. However, these applications are not the key means for sharing TIM information with other agencies.

CAD systems, while also not yet a key method for interagency information sharing, have become a component of incident information-sharing networks in six locations. CAD systems provide automation support for tracking incidents or other events and resources allocated to the emergency scene. Each transaction is logged into a database and available for later retrieval and analysis (as required by law for certain agencies and jurisdictions). Advanced systems include graphical maps, the ability to locate vehicles automatically, and mobile data terminals in vehicles. Such information sharing, at present, is primarily in the form of text messaging.

Depending on local interpretations of security restrictions, such access may range from a limited and filtered read-only stream of incident status information to nearly the level of access enjoyed by law enforcement officers. A CAD terminal may be deployed out to the transportation agency, or a transportation system terminal may be placed in a public safety facility.

The San Antonio Police Department (SAPD) can provide TxDOT with incident data through an interface between SAPD's CAD system and the TransGuide traveler information system. For many years, WSP has provided incident data to WSDOT via a WSP CAD terminal located in the Northwest Region Traffic System Management Center. In San Diego, Caltrans receives incident data output from the CHP CAD system. Salt Lake City's incident response teams have nearly fully functional CAD terminals in their vehicles (along with radios compatible with the law enforcement radio system).

Security considerations are paramount when sensitive communication and information-processing systems are used, particularly by people who are not sworn law enforcement officers or even members of law enforcement agencies. The implications can be daunting from the standpoint of human resources management. Transportation personnel may be required to undergo background investigations, have specialized training, and be exposed to greater personal and professional risk than might have been originally expected. And, even with as much preparation as might be imagined, transportation responders may still be prevented from participating in certain incidents and be subject to information restrictions. This possibility could be due to risks to responders, criminal justice considerations, or homeland defense intelligence considerations.

In an unusual, but effective arrangement, New York State Thruway Authority funds and operates a joint CAD system with the New York State Police (Troop T) that patrols the Thruway. Thruway Authority personnel dispatch Troop T officers for all traffic-related operations and emergency events. However, there are criminal justice activities and other law enforcement functions that Thruway staff are not authorized to perform. State police staff, also located at the Thruway center, handle all nontraffic calls and coordinate law enforcement activities with other public safety agencies. Incorporating all of the combined public safety and transportation users into the same CAD system obviously avoids the technical integration headaches that integrating separate systems would bring.

Most existing CAD systems are proprietary and are not designed to exchange information with CAD systems offered by other vendors, let alone with transportation systems. Additional challenges are posed by variations in formats and protocols for data and for messaging and by variations in system standards in the transportation and public safety communities. The USDOT launched two projects in 2003 to demonstrate that the technical and institutional barriers to public safety and transportation system integration can be overcome. It is expected that exchanges between these resources will allow equipment and personnel to be more efficiently deployed, incidents to be more quickly resolved, and traffic to be more safely managed. Some public safety agencies, such as the CHP, are already publicly posting real-time traffic incident information from their CAD systems. For example, live updates of traffic incidents from the CHP CAD are posted on the World Wide Web (*2*).

3.2.4 Other Media and Advanced Systems

Transportation and public safety agencies in most regions employ a wide range of surveillance and communications technologies. The traveler information and traffic management systems operated by transportation agencies in many metropolitan areas include CCTV or other video systems, embedded sensors in roadways, variable message signs, and highway advisory radio systems. Information generated by these systems is useful for detecting and responding to incidents, managing traffic, and informing the traveling public. Traveler information and traffic management systems are designed to provide information to the general traveling public regarding road and traffic conditions. Features of these systems make it easier for the traveler to determine his or her location, the best route to take to reach a chosen destination, and the travel conditions along the route. Public safety also has a frequent need to travel quickly and efficiently from one location to another using the same roadway system. Many features and services provided by transportation and traffic management systems can therefore also benefit fire and rescue, law enforcement, and EMS while responding to calls. Traffic management services can provide valuable information regarding real-time traffic congestion, road conditions, and the situation at the scene of an incident. Even though public safety personnel may be familiar with the road geography of the jurisdiction, they may be less so of surrounding jurisdictions to which they may be called when an incident escalates beyond the capabilities of local responders to handle. This is especially true for major incidents and disasters that may require state, regional, or federal response from a long distance.

TIM has embraced the advanced information formats offered by the Internet and other modern information systems. Some of the data, such as video and still images, are shared between agencies through co-location and remote access to the systems. However, most agencies make imagery available to the public through the Internet; some provide low-bandwidth "snapshot" frame captures of highway CCTV camera video, and some provide streaming video. Dynamic, interactive mapping displays are commonly used to portray the overall traffic situation for metropolitan areas, linked to detailed information for each trouble spot. This multilayered information is ideally formatted for quick and easy use, providing simultaneous summary, brief descriptions, and detailed information for the traveler. The stratification of this information fits well with TIM, where top-level managers want the big picture and task leaders need detailed and specific information.

The Arizona Department of Public Safety (DPS) has Highway Conditions Reporting System (HCRS) workstations in three dispatch centers statewide. These workstations enable the Arizona DPS to directly input information about roadway closures or any other circumstances affecting the operations of state highways.

WSDOT currently operates more than 250 CCTVs throughout the Seattle metropolitan area. Through an operational agreement, WSDOT provides WSP with the images from these cameras. In addition, WSDOT provides WSP with secondary control of the cameras to enables WSP dispatchers to view the incident scene, verify incidents, and dispatch additional officers if needed.

The TxDOT-operated TransGuide system includes CCTVs that are implemented on 73 miles of freeway throughout the metropolitan area. Although TxDOT maintains control of the cameras, video images are disseminated to the media and to the San Antonio City Hall via the City of San Antonio Wide Area Network (WAN). In addition, TransGuide shares video with other emergency responders, the local media, and the general public by broadcasting live video over a 1,000-watt Low Power Television (LPTV) system (*3*). This system provides up to four views that are selected by the TransGuide operations staff. This system can also be used by incident responders to assist in determining what equipment and vehicles are the most appropriate for the response.

The new regional center in Austin will enable police dispatchers to view monitors showing CCTV images. Dispatchers will have control of the cameras when TxDOT personnel are not present.

Through an agreement with Arizona DOT, Phoenix Fire Department dispatchers receive video images that are shown on monitors in the dispatch center. Although rights to control the pan-tilt-zoom functions of the cameras are not defined in a formal agreement, dispatchers are able to control the cameras. Dispatchers primarily use the information to provide responders with closure information that helps to foster a more expedient response.

In the Salt Lake City, transportation operations center, either UDOT or highway patrol dispatchers can control CCTV systems during significant incidents. DOT staff have more experience and usually accomplish this task during the hours they work at the center.

Broadband technologies enable high-speed communications. The USDOT ITS Joint Program Office partnered with Albany region agencies to demonstrate the benefits of such high-speed communications for traffic management operations (*4*). The network supported simultaneous interchange of voice, data, and video services in a cost-effective manner. Data encryption was established by the wireless component, and a firewall was added to provide access control and authentication. This prototype system allowed cross-agency sharing of freeway management system information and video feeds and enabled video teleconferencing, direct audio feed from radio systems, and dedicated telephone "hotlines" (*5*).

CHAPTER 4

IMPLICATIONS AND CHALLENGES

The purpose of this section is to provide reference examples and lessons learned for TIM practitioners from other jurisdictions. Presented below are analyses of the findings from the site investigations. The major categories are benefits and performance measures, institutional implications, technological implications, and operational implications.

4.1 BENEFITS AND PERFORMANCE MEASURES

Most local officials interviewed strongly supported sharing traffic incident information and employing multiagency teams to manage traffic incidents. The consensus opinion among these officials was that information sharing provides strong benefits in supporting coordination and cooperation in planning for and managing traffic incidents. However, these opinions were based generally on anecdotes and experience rather than hard evidence. No location visited during this study could formally quantify the benefits of information sharing. Moreover, most locations had no data to measure how other TIM practices affected detection, notification, response, clearance time, responder safety, or other metrics of performance.

Some locations have conducted subjective and empirical assessments of TIM benefits. Incident responders in San Antonio have estimated that joint training and planning activities of the CMT has resulted in a 40-percent decrease in incident clearance times. WSDOT has developed a quarterly reporting process to track a variety of performance and accountability measures for routine review by the Washington State Transportation Commission and others. This report includes a section on incident response, including the total number of responses by month, the average clearance times by month, and the number of incidents that last more than 90 minutes. To add some specificity and to link these statistics to actual highway situations, examples of incidents that lasted more than 90 minutes in the quarter are also provided.

All the sites visited face similar performance measurement difficulties. They generally lack a baseline set of performance data with which current performance data can be compared. Such a baseline database would characterize the performance of the system prior to implementing the new TIM capability. This baseline database is not intended to cover a situation without any TIM system in operation; it need only reflect the conditions prior to enhancing the current TIM system. This lack of general TIM performance measures precludes quantifiable assessment of the portion of the benefits corresponding to better information sharing.

4.2 INSTITUTIONAL IMPLICATIONS

The willingness of leaders and organizations to work within cooperative partnerships is a cornerstone of successful TIM. As documented in the case studies, each of the locations with effective information sharing between transportation agencies and public safety agencies had formal frameworks in place for cooperative activities and day-to-day working relationships at many levels of the organizations.

4.2.1 Frameworks

Successful, long-lasting joint operations must be built on firm institutional foundations. Such foundations are constructed out of mutual commitments that bind transportation agencies and public safety agencies to a common purpose and that ensure continuing support. A number of cooperative frameworks for coordinating public safety and transportation operations were found during the site investigations. All frameworks involved regional traffic management or incident management plans and organizations. Some of the frameworks could serve as models for other locations planning to implement cooperative programs.

In all cases investigated, the frameworks were based on formal agreements or regional plans. These are memoranda of agreement, memoranda of understanding, and other forms of interagency contractual accord. Copies of some of these agreements are included in the case studies; all agreements are public documents that may be available from the organizations listed for the survey sites. Some of the content might be reusable; however, the format and content follow locally applicable statutes and regulations.

In New York, the relationship between the Thruway Authority and the state police epitomizes public safety and transportation integration. With a formal partnership extending over five decades, these agencies have established a rare institutional framework. At the Thruway Statewide Operations Center, TIM information sharing between public safety and transportation is seamless; single individuals serve as the nexus for both agencies. This seamless integration is made possible by transportation funding of state police operations and by Thruway Authority employees serving as public safety dispatchers.

San Antonio region organizations established a CMT in the 1960s to address regional transportation management issues. As the importance of managing traffic incidents has increased, the CMT has proved to be an effective mechanism for fostering communication and coordination among responders. The CMT consists of representatives from the Metropolitan Transit Authority, the San Antonio Public Works Department, Alamo Dome, the San Antonio Police Department, the Bexar County Sheriff's Department, EMS providers, towing and recovery service providers, and county health agencies.

WSP and WSDOT have cooperatively developed a joint operations policy statement. The purpose of this working agreement is to document the joint policy positions between the two agencies regarding issues of mutual interest in operating state highways. As a result, both agencies are able to make decisions internal to their own agencies to provide the foundation that ultimately supports information sharing between the two agencies.

Minnesota DOT and state police have established multiple memoranda of understanding and guidelines since 1999 that lay the groundwork for coordinated TIM and interagency information sharing. Early in the process of establishing closer working relationships between transportation and law enforcement in the Salt Lake City region, the senior leadership in both departments signed a memorandum of agreement between their respective agencies. This expression of commitment and support proved to be an effective tool for bringing the members of each department closer together. The close working relationship was evidence that the spirit of the agreement was emphasized in the following years by senior and mid-level management in both departments, and it has come to be regarded as a native and natural way of doing business together.

4.2.2 Relationships

TIM information sharing is part of the broader issue of interoperability among all agencies for emergency response. As illustrated in the locations identified above, an established regional coordination or interagency partnership framework provided the foundation for effective TIM information sharing. Moreover, incentives help to foster interagency partnerships. In the case of new joint operations centers, the pooling of resources can bring an economy of scale in capital investment and operational capabilities. Leveraging resources in joint centers or shared information systems are politically popular.

Personal relationships among a handful of key staff are crucial to success. A few key individuals can make a big difference in TIM information sharing. As demonstrated in successful locations, operational personnel have found innovative ways to overcome institutional and technical limitations to TIM coordination. Whether through informal traffic task forces or cellular talk groups, the trust established among the individuals permeates through the corresponding organizations. Moreover, co-location strengthens these interagency relationships and trust. Daily face-to-face interaction fosters team-building and facilitates problem identification and resolution.

The incident response teams (IRTs) in Salt Lake City exemplified perhaps the tightest integration between public safety and transportation for highway incident operations. The IRTs use the same CAD system as the highway patrol uses and speak with the same dispatchers over the same radio system. The dispatching center also services the other DOT assets in the region, as well as other public safety and fire organizations. Long interaction between the responders has built a mutual familiarity and respect between them, which is evident in their face-to-face interaction on the scene of an incident. All responders are comfortable with each other's missions, roles, and responsibilities, and all responders work well together.

Relationships at the leadership level can also make the difference between successful and unsuccessful TIM partnerships. Leaders also serve as champions for their agency, project, or system. TIM programs can come to depend on such champions for their continued existence. The unexpected departure of a champion can leave an operation's program at risk.

Changes in leadership often affect the relationships among organizations. At one location with a strong working relationship throughout the years, a change in leadership helped reinvigorate the partnership. Through this change, both agencies learned that support and commitment from the leadership has made possible both joint operations and procurement of technology to support TIM functions. At another location, when champions moved on in their careers, an information exchange project lost essential management support. That allowed previous minor problems to escalate, eventually leading to the project's demise. Since no heirs to the previous champions were available to step into the role, the project also suffered from a lack of effective advocacy.

The link between the transportation and law enforcement agencies is certainly important. However, the relationships among all the public safety agencies are crucial to the optimal sharing of notification, response, and other TIM information. The ability to coordinate and resolve 911 calls is one example of critical public-safety-to-public-safety TIM information sharing.

4.3 TECHNOLOGY IMPLICATIONS

The case studies identify some limitations of capacity, service availability, and cost of technologies for exchanging information between certain transportation agencies and their respective public safety partners. However, as is shown in the case studies, technology is capable of enhancing TIM information sharing and overcoming interoperability barriers. For example, agencies in the survey locations have shared common proprietary communications or data systems, have used commercial wireless services, and are testing ways of crosslinking their information system.

Various mature and off-the-shelf technologies can support voice and digital communications. They are widely used and supported by a significant vendor community. Configuration differences are the primary challenges for interoperability. These challenges take the form of differences in data encoding and messaging; radio frequencies, protocols, and licenses; and rules of security, privacy, and propriety. Data conversion and access management must be used to allow each side to exchange information with the other.

However, if practical, public safety and transportation agencies should consider using compatible information systems when establishing effective interagency information exchange. Of course, institutional and operational realities usually complicate such clean solutions. When public safety agencies and transportation agencies can manage with a single system, the benefits can be substantial. Examples of shared radio systems are commonplace, but examples of shared information systems are rare. A good example of a shared information system can be found in Salt Lake City.

Sometimes circumstances do not make the above solutions practical, and neither joint use of communications systems nor integrating dissimilar systems can fulfill all users' needs. As demonstrated in Albany and Minneapolis, cellular telephones can be used for radio-like voice interoperability. There is an increasing range of commercial options available to organizations desiring push-to-talk capability, and five wireless carriers plan to offer push-to-talk service by 2004. Service costs will likely fall because of competition (*5*).

Interagency integration of multimedia or advanced systems is a notable challenge. But as demonstrated with the Albany region's wireless high-bandwidth prototype, the advanced capabilities of one organization can be effectively shared with other agencies through crosslinking. The Broadband Wireless Integrated Service prototype demonstrated that high-bandwidth services such as live video relay can readily be provided across operational centers for a fraction of the cost of previous lease-lined options.

However, if new systems cannot be made to work or are too impractical to use, then the negative consequences can reflect on the broader transportation–public safety relationship in a region. In one location, a monitor in the dispatching center sat idle because of a technical problem in video processing. Not only did that block the presentation of highway CCTV to dispatchers, but its long period of uselessness demonstrated a lack of commitment by both agencies to solve the problem.

4.4 OPERATIONAL IMPLICATIONS

Fundamentally, sharing TIM information is an operational issue. The importance of sharing information should be a core value of public safety and transportation agencies. The shared information should lead to better decisions and performance—faster help to those in need, shorter time during which an incident impedes traffic, and ultimately less economic costs to the key stakeholders involved.

4.4.1 Information to Support Emergency Response

Transportation agencies have important roles in TIM. Some transportation agencies operate advanced data collection and surveillance systems that can provide information useful for detecting and verifying incidents. Cellular 911 calls from motorists, delivered to public safety call centers, provide most highway incident notifications. However, neither the transportation data collection nor the public safety answering points will detect and locate all incidents alone. Both must cooperate in order to address all incidents affecting transportation in the most expeditious manner possible. That means that each must be responsive to the other concerning efforts to resolve conflicting or unclear incident information, such as location, type, severity, and impact.

Integrating highway incident operations strongly builds a community highway response team with a shared purpose and attitude. The more interaction between members, the better, as interaction improves each others' understanding and appreciation of the varying roles and responsibilities as they apply to the highway. Constant interaction between team members, or at least monitoring each others' activities, improves everyone's familiarity with everyday operations. Then, when incidents arise, and responders are assigned together, no time is wasted on familiarization and orientation. And, when the major incidents happen, everyday and ordinary operational practice can be easily adapted to larger-scale activities.

Public safety can usually provide the most immediate field response to an incident and is able to provide the earliest remediation to resolve the incident's near-term and nearby effects. Transportation agencies can support and accommodate immediate response through whatever means are available, such as CCTV imagery, road condition reports, and traffic signal preemption. However, the most immediate and effective means for transportation agencies to support incident response and management is to influence the traveling public's reaction to a blocking incident. This can be accomplished through prompt and effective use of highway advisory radio, variable message signs, 511 systems, detours, and traffic news service interfaces. These means are most effective when public safety agencies support and accommodate such traffic management methods.

Public safety agencies are also important sources of TIM information for transportation agencies. Notably, 911 call centers provide valuable incident detection and notification information. Cellular calls from motorists are a growing source of incident notification information. Since wireless calls can come from any location within a region, effective ways are needed to quickly process the call and notify transportation authorities of the highway incidents.

The effects of wireless phones have rippled through most regions of society—business, family, and public safety, to name a few. More than 25 percent of the 190 million annual 911 calls are now made on wireless phones, and more than 50 percent of 911 calls at some metropolitan call centers are from wireless phones. Although these phones permit emergency access from a wide range of locations, they can also degrade emergency response. It is not unusual for an urban 911 call center to receive dozens of calls about a highway fender-bender, which may delay answering calls from other emergencies. Moreover, the lack of automatic location information and the inability of many individuals to describe their location add to the call center workload and can constrain effective response.

Achieving this readiness among the nation's 5,000 dispatch centers requires cooperation and collaboration among wireless carriers, dispatch centers, local telephone exchange carriers, emergency responders, state legislatures, and others. To date, only about 20 percent of counties across the nation have implemented location-capable wireless E911 (*6*). A Federal Communications Commission report and order (*7*) mandates implementation of the service by wireless carriers by 2005, contingent on readiness of local public safety answering points to accommodate and use the wireless location information.

4.4.2 Service Patrols

At all case study locations, service patrols—also known as Highway Emergency Local Patrol (HELP) trucks, motorist assistance vehicles, incident management patrols, and other names—offer aid to vehicles traveling on limited-access public roadways. The service patrols are usually operated by DOT employees or by DOT-contracted services. However, the private sector, such as CVS Pharmacy's Good Samaritan program, also provides highway assistance services. Incident detection and incident clearance are the main focus of a service patrol program. By quickly identifying and responding to incidents, the service patrol operators are able to minimize the effect on the traveling public. Service patrol operators are usually required to go through training and background checks prior to beginning employment and are also trained and certified in first aid and CPR. Service patrol vehicles are natural nodes for public safety and transportation information sharing. They provide probably the most immediate and positive person-to-person interaction with the traveling public that is available to a transportation organization. They can remove many causes of traffic congestion while simultaneously handling minor problems that do not require public safety involvement. The effective use of service patrol vehicles is greatly affected by their ability to reach an incipient problem in a timely manner. The response can be greatly facilitated by cooperative transportation and public safety management and direction. In most locations, service patrols are equipped with public safety radios.

4.4.3 Full-Time Operations

Over its long history of responding to emergency calls from citizens, which happen around the clock, public safety has developed an operational posture that is designed for continuous operation. Transportation agency duty schedules came from different origins, partially from construction and maintenance management and partly from traffic management. The lack of full-time incident management operations by transportation agencies was an issue identified by public safety agencies in the survey locations. Public safety agencies recognize that transportation field resources provide important incident management services and have identified important roles for highway operations staff. However, transportation agency personnel—because of contractual, political, and budgetary restrictions—often have multiple-hour response lags at night and on weekends (typically 2–3 hours or more). These response lags are generally too slow for all but the largest traffic incidents.

Exchanges of information concerning incidents are difficult if transportation staff are not available. Many transportation operations centers have increased their hours of operation in recent years, and transportation agencies in Arizona and Washington have demonstrated the benefits of providing 24/7 incident response teams. Transportation agencies would be more effective TIM partners with 24/7 operations. Public safety responds in minutes in most situations at any time. The safety of the first responders, the care of the incident victims, and traffic operations for other drivers are important regardless of the time of day.

Providing public safety agencies with traffic control equipment and allowing direct access to, and control of, transportation information systems are among the ways some regions are addressing off-hour restrictions. There were concerns expressed at some sites that control of assets can work at cross purposes. For instance, highway cameras are not only useful in traffic management, but can also aid public safety in incident operations. While traffic managers might be interested in monitoring traffic flow around an incident, law enforcement dispatchers might rather view suspects or responders in high-risk situations. Viewing public safety issues as paramount, at least one law enforcement agency would even like preemptive control of transportation cameras at any time.

4.4.4 Incident Management System and Interagency Training

Public safety uses a mature and proven methodology in managing emergency incidents called the incident management system (IMS). All departments have used similar adaptations of the nationally standardized IMSs for some years, with the fire service having the longest experience. These procedures are now becoming even more formal and standardized as the Department of Homeland Security establishes the National IMS (NIMS). The procedures will soon be mandatory for all agencies that respond to emergency incidents, and federal funding will require that it be followed. The use of NIMS will probably be extended into the non-emergency incident realm as well, if only to maintain consistency and to practice procedures. Transportation responders are just beginning to assume some roles within incident management, but they need to better integrate their activities within the operational structures that are established for each transportation incident.

The responder in charge at a traffic incident is selected from those on the scene. For example, in some locations where state patrol or local police respond to traffic incidents, the officer who arrived first is in charge. If the incident involves fire or injuries, then the fire department or EMS unit may be in charge. If the problem involves only a highway repair or maintenance, then the highway or transportation department's supervisor will run the activity. Incident management operating principles specifically and explicitly cover situations where even though a particular agency may hold jurisdiction, none of the responders have yet arrived on the scene. In such cases, it is incumbent upon those actually present on the scene to organize themselves, deal with the problems presented, and agree upon leadership. There is a growing desire among the response community that responders be certified by an accredited authority before they can fill the higher positions in an incident's management organization. Such formality may eventually extend into the support community, including transportation.

Fire and law enforcement training academies usually offer advanced training in multiagency incidents, but not on small multiagency incidents and not specifically on highway incidents. The National Highway Institute is offering a recently updated course on TIM (*8*). The National Fire Academy is modifying its standardized courses to incorporate some material on transportation incidents. The newly revised national standard training course for incident safety officers will include material relating to the management and control of traffic in and around a highway incident scene. This material is presented from the standpoint of risk management and recognizes the danger presented by moving traffic.

Generally, interagency training is not provided on traffic incident operations by local agencies. Researchers specifically looked for instances of formal interagency training regarding highway operations and for TIM in particular. No instances could be identified at the time of the site visits. However, standard preparatory and on-the-job training are provided to field and operations center staff on procedures, policies, and equipment related to traffic incidents.

In some locations, outside consultants have been brought in to help foster coordinated operations by conducting workshops to improve joint operations. The workshops have been beneficial in that they have encouraged responders to be more actively involved in cooperatively managing highway incidents. They have also inspired responders to work toward a common goal of enhancing responder and traveler safety while opening the highway more quickly following an incident. The improved communication and understanding of the operational roles and responsibilities of each response agency fosters coordination and cooperation among all the response agencies.

Drills and exercises are another effective way for transportation and public safety agencies to train together. WSDOT annually participates in earthquake response drills with the King County, Seattle, Fire Department and the Seattle Police Department. WSDOT is also in the process of planning mock incidents with the Mercer Island Fire Department and the Seattle Fire Department. An interesting idea under discussion in Minneapolis involves crosstraining transportation and public safety field personnel in each other's duties as a way to increase mission awareness across agencies.

4.4.5 Security, Terrorism, and Homeland Defense

The general public's level of awareness regarding terrorism has been greatly heightened by the media and official government notices since the events of September 11, 2001. Because public safety agencies provide the front-line defense against domestic terrorism, they have been better informed and more involved in security and homeland defense than any other kind of agency has. However, the transportation community has also been eager to contribute and to become involved and has used whatever formal and informal channels of communication were available to keep abreast of threat assessments, periods of heightened awareness, and current operations. Joint preparatory activities have become commonplace, and joint standard operating procedures are usually available for implementation when needed. In the few instances since September 11 that special operational antiterrorism working relationships were needed, these relationships were formed on an ad hoc basis and appear to have met the needs of the participants.

Public safety and transportation agencies recognize the importance of managing surface transportation in the context of a terrorist incident. Moreover, they realize that the same types of homeland defense information exchanged between transportation agencies and public safety agencies can be applied to the less serious (but more common) domains of everyday crime and traffic law enforcement. More everyday use of each other's information by public safety agencies and transportation agencies will both heighten awareness of the information's value and increase the skills of both communities to use each other's information. Such an improvement will serve the public well should another terrorist event occur.

Some of the agencies interviewed during this project actively participated in Top Officials (TOPOFF)—a national-level, multiagency, multijurisdictional, real-time, limited-notice weapons of mass destruction (WMDs) response exercise. TOPOFF was designed to better prepare senior government officials to effectively respond to an actual terrorist attack involving WMDs. TOPOFF involved more than 100 federal, state, local, and private-sector entities (*9*). This exercise involved a simulated multipoint attack. In Seattle, the exercise simulated a radiological dispersal device, or dirty bomb, detonation. During the exercise, WSDOT provided staff in the State Emergency Operations Center. Most of WSDOT's operations during the exercise focused on roadway closures. The exercise identified gaps and inconsistencies in information that was disseminated to WSDOT by the state and county departments of health. This exercise included 36 hours of continuous, live, full-scale exercise, with a follow-up table-top exercise.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The survey locations provided clear examples of successes and failures of sharing traffic incident information between transportation agencies and public safety agencies. The case studies further illustrated that there is no single guaranteed solution and that considerable and continuing effort must be devoted to fostering collaboration between public safety agencies and transportation agencies. Investigators did not find major problems between public safety and transportation agencies at any of the locations. Indeed, a fair amount of effort went into selecting these particular sites because public safety agencies and transportation agencies were already exchanging information. These exchanges were not spontaneous—far from it. Most exchanges depended on relationships that had been built up over many years with a great deal of effort invested by all agencies involved. However, even within established, successful, and mature joint operations between transportation agencies and public safety agencies, some conflicts still surface now and again.

Some steps can be taken to minimize conflict and establish the basis for effective information coordination:

- Establish a working-level rapport with responders from every agency that works on incidents in the area of interest.
- Ensure that working-level relationships are supported by standardized operational procedures.
- Create interagency agreements and system interconnections with key involved agencies.
- Institutionalize senior-level relationships among the key agencies through a combination of policy agreements, interagency organizations, coordinated budget planning, and other processes to ensure that operational partnerships survive changes in political or management leadership.

Furthermore, the National Fire Service Incident Management System Consortium's (NFSIMSC's) guidebook on the subject of managing highway incidents (due to be published in mid-2004) makes the case for cooperative relationships:

> It is imperative that those working together on highway incident management understand everyone's functional capabilities and that they resolve jurisdictional and institutional issues. The success of any sort of joint operation rests upon the ability of people to work together. This guide will not presume to instruct the user in achieving operational harmony, but shall insist it be done. Incident Commanders must be empowered to accomplish their jobs, trained in how to perform, and given sufficient resources. When they are, they can accomplish all of our missions to save and protect lives, property, and the environment and to maintain traffic flow on our nation's highways (*10*).

The case study investigations for this study confirmed the NFSIMSC's conclusion. Of the various methods of sharing information presented in this report, no single one is best. The characteristics of the local environment and organizations are key factors affecting the success of a method. There is no guarantee that implementing any of these methods under different institutional, operational, or technical situations will achieve the same results as reported in the case studies. However, the successful programs identified in the case studies are certainly viable candidates for emulation elsewhere.

As has been shown in all of the communities visited during this research project, it is important to consider the information needs of all of the members of the highway response community. Information sharing should be planned and implemented between the transportation agencies and a community of peer organizations. It is a fundamental mistake to presume that public safety organizations in a community "speak with one voice." If such a presumption is translated into institutional agreements, organizational procedures, or technical system designs, then information sharing between transportation and the rest of the response community will be restricted and could be delayed, filtered, or discontinuous.

Ultimately, decisions to add or change information-sharing methods for TIM will depend on valid trade-off analyses. Robust, quantified data on the benefits of specific TIM information-sharing practices will be essential to policy decision makers and operational practitioners looking to improve traffic operations and safety in their jurisdictions. However, as noted in the previous section, such data on TIM performance and benefits are rare.

It is recommended that a set of statistical measures of effectiveness be formulated by the participating agencies and that sampling of these statistics be taken for as long a baseline period as possible prior to implementing new TIM elements. Continued sampling after joint operations commence will then provide the basis for comparing performance before and after the implementation. This comparison will generate an original contribution to the highway incident management body of knowledge.

CHAPTER 6

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APPENDIX A

ALBANY, NEW YORK, CASE STUDY

1 SUMMARY

The Albany, New York, region provides a wealth of experience and advances in transportation and public safety information sharing. Transportation and public safety agencies have close working relationships in this region and have deployed or tested a wide variety of information-sharing applications. The agencies included in this case study are the New York State Department of Transportation (NYSDOT), the New York State Thruway Authority (NYSTA), the New York State Police (NYSP) and the Albany Police Department (APD).

The Albany region has a number cooperative frameworks for coordinating public safety and transportation operations. The unusual situation of two highway operating agencies with overlapping jurisdiction, each supported by different divisions of a law enforcement agency, underscores the need for close coordination in the region.

Methods of sharing traffic incident management (TIM) information included the following:

- **Face-to-Face**—NYSP and transportation agency staff are co-located at two sites.
- **Remote Voice**—NYSP and transportation agency staff share radio channels on the Thruway; service patrol vehicles can access some Emergency Medical Services (EMS) and NYSP radio channels. Key personnel use commercial wireless “talk groups” on a limited basis.
- **Electronic Text**—A computer-aided dispatching (CAD) system is shared by NYSP and NYSTA.
- **Other Media and Advanced Systems—**Freeway data, images, and video are shared remotely through a prototype broadband system.

2 BACKGROUND

2.1 Albany, New York, Selection

The Albany, New York, region was selected by the NCHRP committee for further investigation. Two transportation agencies (NYSDOT and NYSTA) and two public safety agencies (NYSP and APD) were the focus of the study. The operational boundaries of the NYSDOT capital region overlap with the Thruway system in and around Albany, New York (see Figure 1). NYSP supports operations along the NYSDOT and NYSTA roadways and receives all cellular 911 calls. APD patrols the local roadways in the region, receives all landline 911 calls, and dispatches fire and EMS responders for all emergencies, including those on the NYSDOT and NYSTA roadway system.

2.2 Acknowledgments

The key contributors to the Albany, New York, case study are

- Mr. Daniel W. Howard, P.E., Civil Engineer, NYSDOT (also NCHRP Panel Member);
- Mr. Raymond W. Engel, Traffic Supervisor, NYSTA;
- Staff Sergeant Gerard McGreevy, Communications Supervisor, NYSP;
- Commander Leonard J. Crouch, Special Operations, APD; and
- Mr. Keith Biesecker, Senior Principal, Mitretek Systems, Inc. (Broadband Wireless Integrated Service Prototype).

3 INTRODUCTION

The Albany, New York, region provides a wealth of experience and advances in transportation and public safety information sharing. NYSDOT and NYSTA have established close institutional and operational relationships with NYSP. These relationships go beyond sharing information to include sharing facilities and other resources.

NYSDOT and NYSTA collect traffic incident and other operational data through their intelligent transportation systems (ITS) deployments. These agencies have tested and are presently using a wide range of technologies for sharing this information between themselves and with public safety agencies.

3.1 Institutional Framework

Two transportation agencies and two public safety agencies were studied. Their roles and responsibilities relating to traffic operations and incident response are briefly described below.

3.1.1 NYSDOT

The NYDOT headquarters is in Albany, and the agency has 11 regions across the state. The Capital Region, which encompasses Albany, contains 5,300 miles of highways and serves approximately 1 million customers residing in 9 cities, 45 villages, and 108 towns. NYSDOT and NYSP share a transportation management center (TMC) located in the NYSP division headquarters building.

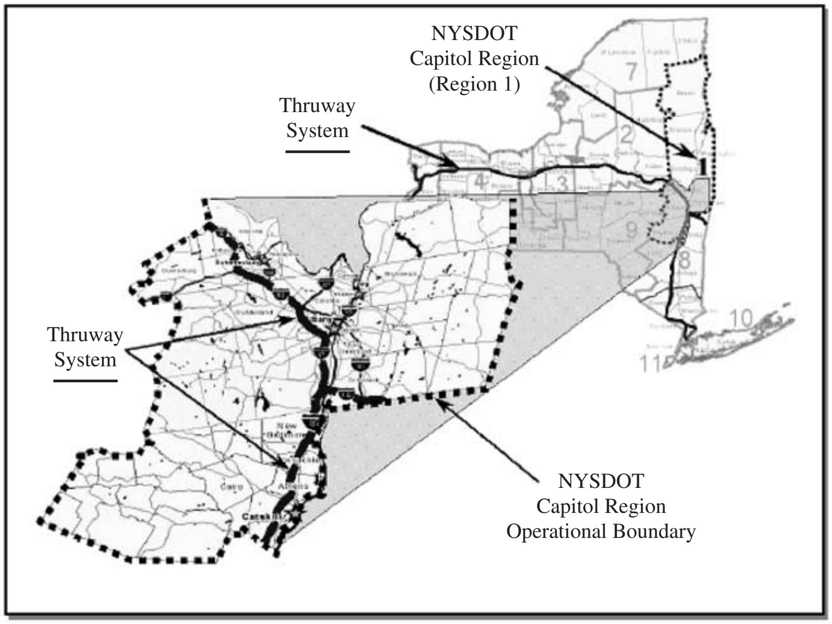

Figure 1. Albany, New York, region.

3.1.2 NYSTA

The New York State Thruway, officially named "The Governor Thomas E. Dewey Thruway," is a 641-mile superhighway crossing the state of New York. The highway is operated by NYSTA, an independent public corporation created in 1950 by the state legislature and established to build, operate, and maintain the Thruway system.

3.1.3 NYSP

NYSP is one of the largest law enforcement agencies in the United States, providing a full range of law enforcement and public safety services across the state. Uniformed troopers patrol various geographic regions of the state and are the first responders to most calls for police services on the highways. NYSP is organized into a division headquarters (in Albany) and 11 separate troops, two of which serve the Albany region. Troop G is responsible for 10 counties, including the Albany Capital Region. Troop T has exclusive policing authority within its service area, which includes the entire New York State Thruway. Troop T specializes in highway and canal operations and relies on other troops for investigative or other special functions.

3.1.4 APD

There are four patrol stations and several specialized units in APD. The Communications Division is the Public Safety Answering Point (PSAP) for the city of Albany, handling all landline 911 calls. Additionally, the division handles all non-emergency requests for service and administrative calls. The Communications Division dispatches all calls for APD and the Albany Fire Department, oversees the radio and telephone systems on a citywide basis, and operates a CAD system on a countywide basis.

3.2 Interviews

Face-to-face interviews were conducted October 28–29, 2002, in Albany. Sessions were held with staff of each key agency. Other personal communications were made prior to and following the field visit. The staff members who were interviewed included the following:

- **NYSDOT**: Daniel W. Howard, Civil Engineer; Brian S. Menyuk, Civil Engineer.
- **NYSTA**: Raymond W. Engel, Traffic Supervisor; Christopher W. Jones, Director, Bureau of Intelligent Transportation Systems; Kevin M. Tuffey, Director of Travelers' Information Systems.
- **NYSP**: Staff Sergeant Gerard McGreevy, Communications Supervisor.
- **APD**: Commander Leonard J. Crouch, Special Operations; Bill Trudeau, Traffic Engineering Technician.

3.3 Agreements and Formal Programs

NYSTA and NYSDOT have each instituted various agreements, including memoranda of understanding (MOUs) with the NYSP. In 1954, NYSP established a state police unit dedicated to the Thruway. This unit evolved into Troop T.

NYSDOT and NYSP signed an MOU in February 1995 establishing an incident management program for I-87. In 1997, these agencies agreed to develop and operate an incident management center. This facility is now known as the Capital Region Transportation Management Center. Copies of these agreements are available from the agencies involved.

NYSTA and NYSDOT recently completed a formal agreement to allow the exchange and use of certain types of information between themselves.

4 INFORMATION-SHARING METHODS

4.1 What Information and Methods of Sharing Were Considered?

This study examined how the following types of traffic incident information were shared:

- **Detection and Notification**—Such information engages public safety resources, enabling rapid medical care to save lives and minimize injury consequences and reducing transportation infrastructure disruption.
- **Response Information**—Traffic conditions, resource location, and incident details speed the delivery of the optimal emergency resources to the scene.
- **Incident Management**—Incident scene status and resource coordination information support emergency responder safety and can hasten incident stabilization, investigation, and clearance.

For the purpose of this case study, the results are grouped according to categories of traffic incident information-sharing methods. These methods and some examples are as follows:

- **Face-to-Face**—Personal communication where staff from different agencies share office space (such as joint operations centers or mobile command posts).
- **Remote Voice**—Common options (such as telephone, land mobile radio, and facsimile machines) that are readily available to support operations within most transportation and public safety agencies.
- **Electronic Text—**Lower-bandwidth interconnection applications, such as electronic messaging and access to CAD systems or record management systems (RMSs).
- **Other Media and Advanced Systems—**Higher-bandwidth options, such as video and other imaging systems, and integrated systems, such as advanced traffic management systems.

4.2 What Agency Combinations Were Included?

There are three primary transportation–public safety "pairings" for traffic incident information sharing in the Albany Capital Region: NYSDOT-NYSP Troop G, NYSTA-NYSP Troop T, and NYSDOT-NYSTA. Although NYSDOT-NYSTA is fundamentally a transportation-transportation pairing, information sharing between these agencies has recently increased in quality and quantity and provides the conduit for NYSDOT-NYSP Troop T and NYSTA-Troop G communications when needed. TIM-related information sharing involving APD is also noted where appropriate.

The methods of sharing TIM information in the Albany region are summarized in Table 1. Details are provided in the following sections.

4.3 Information-Sharing Methods in the Albany Capital Region

Overviews and specific examples of TIM-related information sharing are identified and described below according to the categories listed in Section 4.1.

4.3.1 Face-to-Face Methods

In the Albany Capital Region, NYSDOT and NYSTA each support joint operations centers with NYSP. The TMC and the Thruway Statewide Operations Center (TSOC) are the flagships for transportation–public safety information sharing in the Capital Region. The centers enable the rapid face-to-face sharing of incident detection and status information and allow coordinated response and management of the traffic incident or other emergencies.

TABLE 1 Overview of TIM Information-Sharing Methods in Albany

Agencies Involved	Face-to-Face	Remote Voice	Electronic Text	Other Media and Advanced Systems
NYSP-NYSDOT	Yes	Yes	No	Yes
NYSP-NYSTA	Yes	Yes	Yes	Yes
NYSDOT-NYSTA	No	Yes	Yes	Yes
APD-NYSDOT	No	Limited	No	Limited
APD-NYSTA	No	Limited	No	No

Other face-to-face traffic incident information-sharing frameworks include on-scene coordination and planning task forces. These are not considered in more detail here. On-scene coordination is ad hoc, transitory, and common to incident scenes across the United States. Various traffic-planning task forces in the Albany region, including the Capital Region Traffic Management Task Force and the Saratoga-Warren Traffic Incident Management Task Force, provide the basis for coordinated incident management, but are not directly involved in the real-time sharing of incident detection, response, or scene management information.

4.3.1.1 NYSDOT-NYSP Transportation Management Center. Jointly operated by NYSDOT and NYSP, the Transportation Management Center (TMC) is physically located in the NYSP headquarters building on the state office campus in Albany (see Figure 2). NYSP Troop G works closely with NYSDOT personnel to support commuter assistance, incident management, and law enforcement operations within the Capital Region. As of 2003, this is one of two NYSP traffic operations centers in New York.

As would be expected in a joint agency facility, the primary method of information sharing between NYSDOT and NYSP staff at the TMC is face-to-face voice communications. This is supplemented by NYSP access to the NYSDOT advanced traffic management system (see Section 4.3.4.1).

NYSDOT personnel at the TMC control vehicle and speed detectors, traffic cameras, message signs, highway advisory radios, and other field devices throughout the region. They dispatch DOT work crews and Highway Emergency Local Patrol (HELP) vehicles when appropriate. In conjunction with local transit agencies and private traffic-reporting firms, NYSDOT personnel also disseminate information to the commuters in the area. NYSDOT personnel staff the TMC 7 days a week during normal operating hours. NYSP provided staff 24 hours a day, 7 days a week.

The TMC also houses the Public Safety Answering Point (PSAP) for all wireless 911 calls in the Capital Region. NYSP headquarters personnel handle those 911 calls, dispatch Troop G officers, and coordinate with other public safety agencies to respond to those calls. Having the NYSP wireless 911 call center located in the TMC facilitates traffic incident response, as cellular calls from motorists are a growing source of incident notification information. Since wireless calls can come from any location within the region, NYSP transfers nonfreeway cellular calls to the ADP PSAP. Calls dialed from the Thruway are received at either the NYSP PSAP (for wireless calls) or the APD PSAP (for landline calls). These calls must then be transferred to the Thruway Statewide Operations Center (TSOC) for dispatch and response operations.

Figure 2. The Transportation Management Center.

NYSP also coordinates all Amber Alerts from this location. The Amber Alert plan is a voluntary partnership among law enforcement agencies, broadcasters, and other agencies to disseminate an Alert bulletin in qualifying child abduction cases. Transportation agencies can support the alert distribution through variable message signs, highway advisory radio, and other traveler information services.

4.3.1.2 NYSTA-NYSP Thruway Statewide Operations Center. Communications for the whole Thruway are centralized in the Thruway Statewide Operations Center (TSOC) at NYSTA headquarters in Albany. The TSOC is operated 24 hours a day, 7 days a week and is the central reporting and dispatching point for all incident and traffic management activities along the system.

Transportation and public safety operations are more integrated at the TSOC than at the TMC. While both centers co-locate NYSP and transportation staff, NYSTA and NYSP operations are more closely coupled at the TSOC. Notably, NYSTA provides 100 percent of the funding for Troop T services on the Thruway. Equally important, traditional transportation and public safety functions have been combined and assigned to NYSTA staff. In this unusual, but effective arrangement, NYSTA personnel dispatch Troop T officers for all traffic-related operations and emergency events. These dispatchers, like their NYSDOT counterparts in the TMC, also monitor traffic cameras for incidents that could affect operations and operate highway advisory radio and variable message signs. However, there are criminal justice activities and other law enforcement functions that NYSTA staff are not authorized to perform. NYSP troopers, also located at the TSOC, handle all nontraffic calls and coordinate law enforcement activities with other public safety agencies.

4.3.2 Remote Voice Methods

Each of the four agencies covered in this case study has procedures and policies in place for interagency telephone notification and coordination for major incidents and emergencies. Key personnel from some of the agencies can also coordinate with points of contact at other agencies via a commercial wireless push-to-talk Nextel network. At the operations centers, these agencies also monitor each other's relevant radio communications. Some field personnel from the transportation agencies can access pertinent public safety radio channels.

4.3.2.1 Telephones. The public switched telephone network (PSTN) is the primary means of communication between NYSDOT and NYSTA (and consequently, their respective NYSP troops). TSOC and TMC personnel notify each other about incidents and coordinate traffic management activities over the phone. Facsimile machines are used to supplement PSTN communications. Increasingly, more advanced, multimedia capabilities are being used in conjunction with voice coordination (see Section 4.3.4).

The commercial wireless technology industry offers public agencies a growing number of options for enhancing their existing communications and interoperability. Agencies in the Albany region are providing cellular phones and especially enhanced specialized mobile radio (ESMR) services, such as Nextel's push-to-talk capability, to link key personnel. ESMR is a commercial service that provides digital dispatch, cellular, and paging services through a single network. ESMR relies on advanced proprietary technology; there is no common, industrywide standard.

As part of a broadband communications prototype, a NYSTA-NYSDOT phone network was established. Five lines were provisioned with five-digit extensions, and one line was set up such that the phone on either end would ring its counterpart at the other facility when taken off hook—a hotline. During the prototype demonstration, the hotline phone has been used by various TMC and TSOC personnel to exchange time-critical incident management and law enforcement information. The extensions were used to support noncritical activities, such as coordinating routine traffic management activities.

4.3.2.2 Land Mobile Radio. NYSDOT, NYSTA, and NYSP use land mobile radio (LMR) systems to coordinate routine and emergency activities. While using different radio systems, each of these agencies often monitors the others' radio activity, particularly when relevant to the operations.

The Capitol Region TMC has access to a 155-MHz, very high frequency (VHF), nonrepeating LMR system with channels allocated to public safety, state police, NYSDOT, and other groups and functions. They also have access to the Capitol District Emergency Radio Network (CDERN), operating at 460-MHz ultra high frequency (UHF). Within the TMC, the use of these channels is managed by a PC-based radio control and monitoring system.

TMC operations personnel use specific channels to coordinate with DOT field units (e.g., freeway service patrols). Service patrol vehicles (e.g., HELP vehicles) are contracted by NYSDOT to offer motorist assistance to vehicles traveling on limited-access public roadways. The program is coordinated and monitored by the TMC. Incident detection and incident clearance are the main focus of the HELP program. By quickly identifying and responding to incidents, the HELP truck operators are able to minimize the effect on the traveling public. Each HELP operator is required to go through training and background checks prior to beginning employment and is also trained and certified in first aid and CPR.

In the Albany region, NYSDOT HELP vehicles have NYSP radios on board and can access an EMS channel also. Outside the region in Hudson Valley, HELP vehicles have limited access to NYSP radios and data systems for incident details. NYSP uses other channels to communicate with Troop G field units. Both NYSDOT and NYSP use the system to communicate with other public safety entities.

Likewise, TSOC personnel use NYSTA's LMR to communicate with and monitor the field units. This system employs radio control and monitoring mechanisms similar to those used by the system in the TMC. On the Thruway system, however, transportation and public safety field staff use a shared LMR system.

The NYSTA LMR is a 450-MHz repeating system. By way of various base stations, both repeating and nonrepeating systems allow mobile units to receive radio transmissions from a central command facility (e.g., dispatch at the TSOC). However, repeating systems also allow other mobile units to receive audio from the transmitting mobile unit (i.e., repeating systems allow one to monitor the entire conversation between dispatch and the mobile unit; nonrepeating systems do not).

APD operates an 800-MHz repeating system. APD also shares the radio system used by the NYSP Capitol Region detail, as each agency has overlapping policing responsibilities.

4.3.3 Electronic Text Methods

Text pagers, Nextel text messaging, and email are used by some individuals to communicate within their agencies. However, these applications are not key means for sharing TIM information with other agencies. CAD systems, while also not yet a key method for interagency information sharing, may become primary components of information-sharing networks in the near future. Such information sharing, at least initially, is expected to be in the form of text messaging.

CAD systems provide automation support for tracking incidents or other events and resources allocated to the emergency scene. Each transaction is logged into a database and available for later retrieval and analysis (required by law for certain agencies and jurisdictions). Advanced systems include graphical maps, the ability to locate vehicles automatically, and mobile data terminals in vehicles.

Two of the four agencies included in this case study operate CAD systems, and NYSP plans to procure a CAD for its operations at the TMC. However, these CAD systems are not interoperable. Most existing CAD systems are proprietary and are not designed to exchange information with CAD systems offered by other vendors, let alone with transportation systems. Additional challenges are posed by variations in formats and protocols for data and for messaging and different system standards in the transportation and public safety communities.

In their roles as PSAPs, NYSP and APD each employ technologies for managing 911 calls and emergency response. NYSP and APD can transfer calls between themselves through the 911 network. For example, NYSP receives all cellular 911 calls for the region at the TMC. The nonhighway calls are transferred to the APD PSAP for response. The APD PSAP is also notified about traffic incidents, as the PSAP dispatches APD officers and fire apparatus to all crashes in its jurisdiction. These and other calls are routed as necessary to other local public safety agencies, twelve of which share access to the APD CAD system.

In August 2002, NYSTA installed a CAD system for the Thruway. The CAD system supports the dispatching of NYSP and NYSTA resources on the Thruway. NYSDOT does not yet have access to CAD information. However, in the Lower Hudson Valley, NYSDOT Region 8 and the NYSP are building a new joint TMC. The new NYSP CAD system in this region will be integrated with the TMC's advanced traffic management system (ATMS). This is one of a number of projects throughout the country that are helping define the state of the practice in CAD-TMS integration.

4.3.4 Other Media and Advanced Systems

The transportation and public safety agencies in the Albany region employ a wide range of surveillance and communications technologies. Much of the information generated by these systems can be useful for transportation operations such as detecting and responding to incidents, managing traffic, and informing travelers. Some of the data, such as video and still images, are shared between agencies through local and remote access to the systems described below.

4.3.4.1 Traffic Management Systems. NYSDOT and NYSTA control and monitor various field devices and manage freeway traffic throughout the Capital Region. These systems are shared broadly with their partner NYSP troops and to a lesser extent with other public agencies.

NYSDOT "Management Information System for Transportation." MIST® (Management Information System for Transportation) is a freeway management software platform developed by PB Farradyne. The MIST system provides a variety of functions, including control of variable message signs and closed-circuit television (CCTV) cameras. The system is also used to monitor traffic and roadway conditions by assembling data from different vehicle and roadway detectors. MIST uses map displays and windows-based text reports to support user operations, as shown in Figure 3.

The MIST system can also store incident response plans. This feature helps facilitate operations by allowing users to

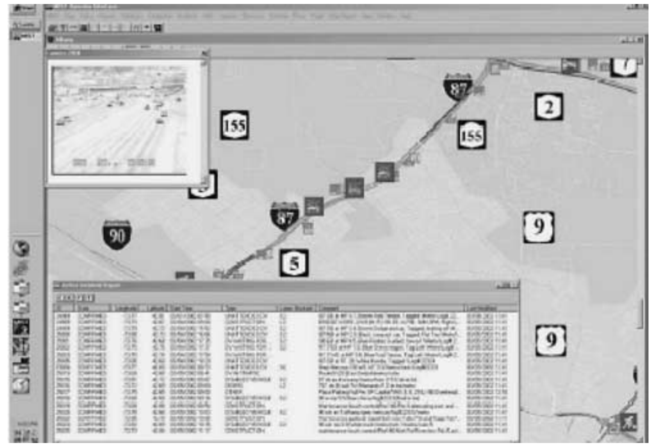

Figure 3. MIST incident report information.

select predefined variable message sign messages and to monitor predefined camera views while performing other system management functions.

NYSTA and APD dispatchers can view NYSDOT traffic cameras, review incident reports, monitor loop detectors, and do other applications, and they have a limited incident data entry capability. However, NYSTA and APD personnel cannot control any NYSDOT field device.

NYSDOT has developed applications that synthesize information from the system for use internally and by other agencies. "Snapshots" is an application that collects still images from its traffic video cameras. These images, as shown in Figure 4, are then viewable through any standard network browser and are refreshed every 30 seconds. "Speedmap" collects traffic flow statistics from loop detectors and other sensors throughout the region. This information is then displayed in graphical form (i.e., a map with color-coded roadways that has different colors to represent different levels of congestion). Like the Snapshots imagery, these data are stored on a network server, refreshed every 30 seconds, and viewable through any standard network browser. This information is also available in text form. While currently limited to

Figure 4. "Snapshots" images via web browser.

use by public agencies, NYSDOT intends to make Snapshots and Speedmap information available to the public via the Internet.

NYSTA Freeway Management System. NYSTA has similar roadway surveillance and traveler communications technologies—cameras, detectors, highway advisory radios (HARs), and variable message signs—as described for NYSDOT. However, these resources cannot presently be shared with other agencies except through the prototype communications system described in the following section.

4.3.4.2 Broadband Wireless Integrated Service. Broadband wireless technologies enable high-speed, untethered communications. The USDOT ITS Joint Program Office (JPO) partnered with NYSDOT, NYSTA, and NYSP to demonstrate the benefits of such high-speed communications for traffic management operations. Under contract to JPO, Mitretek Systems successfully linked the NYSTA TSOC and the NYSDOT TMC with the Broadband Wireless Integrated Service prototype (see Figure 5). The prototype has two primary components: the broadband wireless system and the multiservice access device (MSAD). The wireless system provided a 23-megabits-per-second (Mb/s) link between the two operations centers. The MSADs were used to establish a multiservice network that supported simultaneous interchange of voice, data, and video services in a cost-effective manner. Data encryption was established by the wireless component, and a firewall was added to provide access control and authentication.

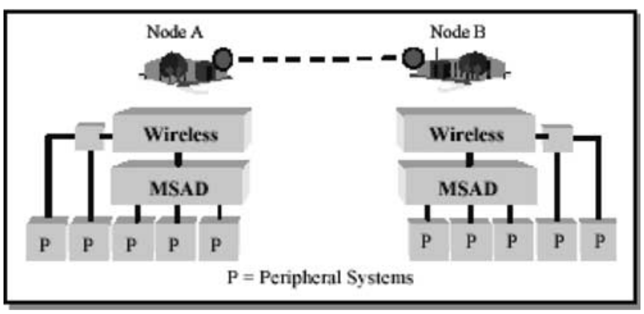

Figure 5. Broadband wireless integrated service.

These services were used to provide for various interagency operations, including the following:

- **Shared Traffic Management**—The prototype deployment allowed NYSTA to access the NYSDOT MIST system and monitor conditions on NYSDOT highways. Likewise, the Thruway's traffic management system information was available to NYSDOT.
- **Traffic Video Exchange**—Both agencies use many different traffic cameras to support their traffic management functions. The prototype allowed shared video feeds, both networked packet video and synchronous channelized video.
- **Voice Communications**—Dedicated voice links (both "off-hook" and "one-button") were used.
- **Video Teleconferencing**—Video teleconferencing sessions (either desktop-to-desktop or through video teleconferencing units) were tested to facilitate better communications during common incident management situations and special events.
- **Public Safety Radio Extension**—A direct audio feed from the Thruway's radio communication system was provided to NYSDOT and NYSP Troop G personnel at the TMC. A similar audio feed from the TMC radio communication system was provided to both NYSTA and NYSP Troop T personnel at the TSOC.
- **Data Sharing and Desktop Multimedia**—A local area network (LAN) extension was used to support the exchange of documents and desktop multimedia. This capability allowed the agencies to better coordinate mutual activities, such as emergency response traffic routes and less time-critical administrative efforts.

APPENDIX B

AUSTIN, TEXAS, CASE STUDY

1 INTRODUCTION

Numerous public safety and transportation agencies in the Austin metropolitan area have operational responsibilities in the context of traffic incident management (TIM). Together, these agencies have initiated a number of planning and systems development initiatives that focus on enhancing response to emergencies and delivery of emergency and transportation services. This section describes the institutional framework that underpins these efforts, as well as the operational roles and responsibilities of each of the involved agencies.

The following were the primary contacts for the site summarized in this report.

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1.1 Institutional Framework

1.1.1 Joint Planning Activities

Efforts to enhance coordination of incident management functions in the Austin metropolitan area through the cooperative development of technology has its origins in the intelligent transportation systems (ITS) early deployment plan (EDP) that was jointly sponsored by FHWA, TxDOT, and the City of Austin Public Works. The EDP included both short-term and long-term objectives for developing and implementing ITS technologies throughout the metropolitan Austin area, including initiatives to enhance incident management and emergency operations. A significant outcome of the EDP was a memorandum-of-understanding (MOU) that was executed by TxDOT and the City of Austin Public Works. Documented in the MOU were policy statements that outlined the agencies' commitment to

- Cooperate in the planning and development of a regional public safety wireless emergency communications system,
- Provide appropriate staff to cooperate with staff designated by other governmental entities to develop plans for a unified public safety communications system and center,
- Jointly apply for funding from whatever source of funds may be available for cooperative intergovernmental projects (including federal, state, local, or private grants funding), and
- Provide necessary information to management and support policy decisions needed to develop such systems.

In addition, the need to integrate transportation and public data and communications was outlined in the IH-35 Corridor Plan that was prepared in February of 1998.

1.1.2 Joint Development and Procurement of Technology

Pursuant to laying the groundwork through joint planning activities, TxDOT and the city of Austin are actively engaged in the development of technological systems to support TIM functions. Central to these efforts is the development of the Combined Transportation, Emergency, and Communications Center (CTECC). The CTECC will house a collection of systems referred to as 911 RDMT, including 911 call handling, radio trunking, computer-aided dispatch, mobile data terminals, automatic vehicle location, and transportation and transit services. The goal of CTECC is to integrate public safety, ITS management, and public service operations and systems. It is anticipated that the CTECC will be operational in October 2003.

Another significant effort related to this initiative that will foster information sharing between transportation and public safety agencies is the integration of the city of Austin's CAD system with TxDOT's advanced traffic management system (ATMS). This system will provide the technological basis to manage multimodal and multiagency emergencies ranging from automobile crashes to major disasters.

1.2 Roles and Responsibilities

1.2.1 TxDOT

TxDOT is committed to supporting a number of TIM functions in Austin, from within the operations center and at the incident scene. TxDOT has responded to the need to manage traffic both during the incident and during normal operations through the ATMS that was developed internally and deployed in other TxDOT regions throughout the state. The ATMS is intended to provide automation and decision support for traffic management center (TMC) operations. The ATMS includes three operational components that provide the functionality to support TIM:

- **Incident Detection—**Loop detectors that continuously monitored traffic flow are embedded in the pavement throughout the freeway network. When the flow reaches a predetermined threshold set by the system administrator, the ATMS notifies the operator of a potential incident. Other detection methods that were used by the operator include calls from service patrol operators in the field, telephone calls from the police, or (on rare occasions) monitors showing closed-circuit television (CCTV).
- **Incident Assessment—**After detecting an incident, the operator in the TMC assesses the situation to ascertain the most appropriate action to take. The assessment and reporting function of TxDOT's ATMS affords operators in the TMC two options for monitoring roadway conditions: (1) with a graphical display of the level of service for any segment on the roadway that is equipped with detectors and (2) with CCTVs.
- **Traffic Management—**Three types of devices are used in the Austin metropolitan area to support traffic management functions, lane control signals (LCSs), dynamic message signs (DMSs) and ramp metering stations. Each of the components is controlled through the ATMS.

To support incident management operations at the scene, TxDOT also operates two courtesy patrols during the weekdays between 6 a.m. and 10 p.m. It is important to note that service patrols only operate on I-35 during peak periods. Typical duties of the service patrol operators include removing debris, assisting motorists with broken down vehicles, assisting Austin Police Department (Austin PD) with traffic management, and helping to move and operate TxDOT equipment.

Additionally, TxDOT also supports TIM functions through the dissemination of traveler information. A highway advisory radio (HAR) system is used to alert travelers of delays and closures. This system includes three HAR stations, which also support TxDOT's Amber Alert system. Messages on the HAR system are updated daily except during emergencies, when updates are dictated by the prevailing circumstances. TxDOT also shares video feeds with the media from CCTVs implemented throughout the network of freeway network in Austin. Cameras are selected by the media with TxDOT assistance. In exchange for video feeds, television stations provide in-kind services such as weather data and public service announcements (PSAs) for TxDOT.

1.2.2 City of Austin Police Department

In the state of Texas, local police agencies are responsible for responding to traffic incidents that occur on the freeway system within the city limits. In the context of TIM, Austin PD operational responsibilities include controlling traffic, conducting crash investigations, providing assistance with containment of hazardous materials spills, and supporting traffic management activities during special events.

1.2.3 City of Austin Fire Department

The Austin Fire Department (Austin FD) plays a critical role in supporting TIM functions, including

- Fire suppression;
- Extraction and rescue of crash victims from the vehicle;
- Containment and assistance with clean-up of hazardous materials spills, including chemical spills, gas leaks, and other situations involving hazardous materials; and
- First response to all advanced life support emergencies within the city of Austin.

1.2.4 Austin-Travis County Emergency Medical Services (EMS)

The Austin-Travis County EMS Department is the primary provider for medical rescue within the city of Austin and Travis County. To support TIM functions, the department operates 21 paramedic ambulances, 5 paramedic rescue ambulances, 1 tactical paramedic rescue ambulance, 1 shock/trauma air rescue helicopter (STARFlight) and four command units that are equipped with advanced life support (ALS).

2 INFORMATION-SHARING METHODS

Several public safety and transportation agencies are in the process of upgrading, replacing, and integrating communications and data systems. Descried below are the current voice, data, and multimedia information-sharing methods, as well as methods that will be operational with the completion of the new CTECC, which is scheduled for October 2003.

2.1 Face-to-Face

When completed, co-location in the new CTECC will provide responders from the various agencies with the opportunity to communicate face-to-face while cooperatively managing incidents. Responders believe that it will be necessary to establish operational procedures for interagency communications (face-to-face and remote voice) to efficiently manage incidents.

2.2 Remote Voice

To coordinate response activities, the operator in the TxDOT operations center currently must rely on the telephone to communicate with the Austin PD dispatcher. This requirement has not proven to be consistently effective during emergency operations because the dispatcher many times is unable to communicate with TxDOT operations staff because of the increased workload that the emergency presents.

To support center-to-vehicle communications, TxDOT service patrols are equipped with Austin PD radios. This enables the Austin PD communications officer in the dispatch center with the ability to directly dispatch the service patrol. In addition, having the service patrols equipped with the Austin PD mobile radio unit enables the service patrol operator to communicate with Austin PD patrol officers in the field. However, most of the communications in the field are conducted face-to-face at the incident scene. Service patrol operators and TxDOT communications officers in the center are also equipped with scanners that allow them to monitor radio traffic and proactively respond to incidents.

2.3 Text Transfer

To support the exchange of incident-related data, TxDOT and the city of Austin have initiated efforts to integrate a CAD system with TxDOT's ATMS. When implemented, the CAD-ATMS interface will provide TxDOT with additional incident information from the Austin/Travis County CAD system. This interface will help supplement the ATMS where surveillance functions have yet to be implemented. At a minimum, the interface will include an address or latitude/longitude coordinates and the nature of the incident that are entered into the CAD system.

In addition, the integration of the CAD system and ATMS will provide TxDOT with the ability to archive incident data. Data generated through the CAD system will be filtered prior to being communicated to TxDOT to ensure that sensitive data are kept internal to the police department.

From the perspective of the city of Austin, this integration project will serve as a conduit to TxDOT-generated data, including road closure and real-time speed data that will support real-time dynamic routing of responders. In addition, this project will provide the city of Austin with incident information that has not been available before.

In the future, TxDOT would like to implement police mobile data terminals (MDTs) in the service patrol vehicles to help prevent service patrol operators from inadvertently providing service to a stolen vehicle or from placing the operator in any other potentially dangerous situation.

Efforts are also underway to integrate the city of Austin's signal system, including video, with TxDOT ATMS. Additional ITS integration projects are underway to integrate TxDOT ATMS with adjacent jurisdictional CAD systems of Round Rock and Williamson County.

2.4 Other Media and Advanced Methods

Completion of the new CTECC will enable Austin PD dispatchers to view monitors showing CCTV images. This will help dispatchers to initiate the most appropriate response. Dispatchers will have control of the cameras when TxDOT personnel are not present. These communications will be addressed in joint operational procedures that still need to be refined further.

APPENDIX C

CINCINNATI, OHIO, CASE STUDY

ACKNOWLEDGMENTS

The research reported herein was performed under NCHRP Project 3-63 by Mitretek Systems, Inc. The principal investigators for this project are Kevin Dopart, Manager, and Ken Brooke, Principal Engineer. The other researchers on this project were Aimee Flannery (now Assistant Professor at George Mason University, Fairfax, Virginia) and Ted Smith, both Lead Engineers at Mitretek Systems. The principal authors of this case study were Aimee Flannery and Ken Brooke.

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1 SUMMARY

A mature interagency operation is in place in Cincinnati, where various types of information are regularly and routinely exchanged between transportation and public safety. The Advanced Regional Traffic Interactive Management Information System (ARTIMIS) (see Figure 1) unites interests in three states to address traffic management in the metropolitan area. The freeway service patrols are of particular note, representing a public-private partnership between the state DOTs and CVS Pharmacies, where roadway assistance is provided by certified mechanics who are also licensed emergency medical technicians.

2 INTRODUCTION

This document summarizes information collected while assessing information sharing as facilitated by ARTIMIS in the greater Cincinnati metropolitan area. Partners in ARTIMIS include the Ohio Department of Transportation (ODOT), the Kentucky Transportation Cabinet, the Federal Highway Administration, the city of Cincinnati, and the Ohio-Kentucky-Indiana Regional Council of Governments (OKI).

2.1 Site Contributors

Information collected related to information exchanges between ARTIMIS partners was collected during site visits in January 2003. Site visits provided researchers with the opportunity to observe data sharing and communication between ARTIMIS partners in the context of actual operations. Tim Schoch, ARTIMIS Deputy Program Manager, hosted the site visit to the ARTIMIS Operations Control Center in downtown Cincinnati. Bill Hinkle, Director of Communications, Hamilton County Communications Center, hosted the site visit to the Hamilton County Communications Center. A drive along was also conducted with Police Officer Mark Ziegler of the Traffic Unit of the Cincinnati Police Department. Finally, an interview was also conducted with Sergeant Neil Gilreath, Traffic Division Supervisor of the Covington Police Department at the ARTIMIS Operations Control Center.

3 SHARING INFORMATION

3.1 Methods Used in Practice

This section summarizes information-sharing activities between ARTIMIS and its partners in the greater Cincinnati

Figure 1. ARTIMIS logo.

metropolitan area. The relay of information from ARTIMIS to its partner agencies is accomplished either verbally (using radio or telephone reports) or by the transfer of video to the partners equipped to receive it. ARTIMIS has also distributed many video tapes to television stations, cable television providers, and driver's education schools.

3.1.1 ARTIMIS Public Information Services

ARTIMIS supports several traveler information services for the general public. Even though ARTIMIS is designed as a means to inform the traveling public, the information content is designed in cooperation between transportation and public safety. ARTIMIS reflects the result of information being exchanged between the two communities. Following are the system's operating components:

- **Roadway Message Signs Information—**Dynamic message signs (DMSs) are located at fixed locations prior to major freeway interchanges and at temporary locations as needed for special events or other occurrences (see Figure 2). They display short textual information to alert travelers to incidents ahead and to notify travelers about alternative routes.
- **Highway Advisory Radio (HAR) Advisories**—HAR advisories notify travelers about major incidents and highway construction activities. HAR advisories broadcast 24 hours a day.
- **Traveler Advisory Telephone Service (511)**—The first of only two 511 systems in the United States that is accessible by using a single three-digit calling number from either landline or cellular telephones, this system fields on average 64,000 calls per month. The information content is updated automatically more than 1,400 times per day, providing up-to-date, route-specific information and construction information accessible by dialing 511. The service is free to landline callers and most wireless callers.
- **Television and Radio Reports**—Local television and radio stations use reports and video feeds supplied by ARTIMIS to convey traveler information to the viewing audiences. Since April 2002, all four major television network affiliates in the Cincinnati area have been broadcasting live closed-circuit television (CCTV) video feeds from the ARTIMIS Operations Center showing current freeway traffic situations. As part of the agreement with these television stations, ARTIMIS requires that its website URL (www.artimis.org) be displayed at the bottom of these images when re-broadcasted to increase the URL's visibility in the community. On average, 25 television traffic reports using ARTIMIS-supplied information are made each day. In addition, traffic conditions are e-mailed every 10 minutes to 10 radio stations.
- **ARTIMIS Website**—A traveler information website (www.artimis.org) is maintained by ARTIMIS that (along with a complete ARTIMIS system description) provides continuous camera image coverage of the region's freeways and information about congestion and construction zones. Approximately 760 updates are made each day to the website. The popularity of the website is evidenced by the 6 million hits per month it receives.
- **Radio System**—ARTIMIS is part of the new Hamilton County 800-MHz radio system.

Figure 2. DMS sign.

3.1.2 ARTIMIS Special Information Services

ARTIMIS also provides several specialty services for the general public, public safety, and services organizations:

- **Freeway Service Patrol Vans—**To help clear incidents and disabled vehicles from the traveled lanes, five service patrol vans (see Figure 3) have been deployed by ARTIMIS in cooperation with CVS Pharmacy stores. The service vans patrol the freeway in the ARTIMIS jurisdiction between 6:30 a.m. and 7:00 p.m. weekdays and during special events. The service patrol drivers are

Figure 3. Freeway service patrol van.

certified mechanics by the National Institute for Automotive Excellence (ASE) and are licensed emergency medical technicians in the jurisdictions where they patrol. The freeway service patrol vans have been loaned to other cities for major events (e.g., Thunder Over Louisville and the Kentucky Derby). These vans are listed as an information service because of the interaction that occurs among the service patrol drivers, the traveling public, and public safety responders.

- **ARTIMIS Primary Radio Frequency**—This radio channel is used by ARTIMIS to exchange information with freeway service patrols, aircraft, mobile probes, and police and fire agencies throughout the region.
- **ARTIMIS Transit Radio Frequency**—ARTIMIS provides timely information regarding closures and major incidents to the Queen City Metro Authority (Metro) and Transit Authority of Northern Kentucky (TANK) through a direct radio link.
- **ARTIMIS Transit Video Feed**—ARTIMIS provides direct video feeds of freeway CCTV imagery to the major transit agencies in the greater Cincinnati area.

3.2 Institutional Implications

Four central themes provide foundation for traffic incident management (TIM) endeavours in the Cincinnati metropolitan area:

- Unique leadership at the helm of ARTIMIS to facilitate the cooperation between ARTIMIS staff and public safety officers, in particular with Hamilton County Department of Communications;
- A commitment from ARTIMIS leaders to assist public safety officers in their day-to-day duties, including accident investigation;
- A commitment from ARTIMIS staff and leaders to be eager providers of incident information to many public agencies to achieve the common goal of moving people and goods through the system quickly without sacrificing safety; and
- The ability to work cooperatively on TIM operations to ensure the safety and mobility of travellers in the region, as well as responders.

3.2.1 Institutional Framework of ARTIMIS

This section describes the ARTIMIS system, specifically the network coverage of ARTIMIS, the services provided by ARTIMIS, the institutional agreements that support ARTIMIS, and the various public safety partners that currently receive information and support from ARTIMIS regarding traffic incidents (see Figure 4).

The ARTIMIS program is funded by ODOT and the Kentucky Transportation Cabinet and operates in cooperation with OKI and the Federal Highway Administration. ARTIMIS acts as an independent organization whose mission is to improve air quality, overall safety, and motorist's travel time and is governed as a partnership between several agencies that encompass the greater Cincinnati area, which includes areas in the states of both Ohio and Kentucky. The partnership was formed among ODOT, Kentucky Transportation Cabinet (KYTC), and OKI. ARTIMIS began limited operations in June 1995, and the current system was completed in December of 1998.

Figure 4. ARTIMIS member organizations.

There are three major components of ARTIMIS:

- Regional Traffic Management System (RTMS),
- Traveler Information System (TIS), and
- Freeway service patrol vans.

These components were deployed to meet the following goals:

- Improve air quality,
- Improve overall safety, and
- Improve motorists' travel time.

ARTIMIS is made possible by joint funding provided by ODOT and KYTC. ODOT contributes 75 percent of systemwide costs, and KYTC provides the remaining 25 percent. The deployment of various monitoring sensor equipment is paid for by each state independently. The freeway service patrol vans are funded through a public-private joint venture with CVS Pharmacy stores. ODOT pays for 51 percent of three service patrol vans, and KYTC pays for 51 percent of two service patrol vans. The remaining costs for all five service patrol vans are paid for by CVS Pharmacy stores.

3.2.2 Coverage Area of ARTIMIS

The ARTIMIS coverage area is split into two areas: the North Area and the South Area. Both areas primarily consist of Interstates and freeways. The North Area consists of the following roadways:

- Portions of I-275 in Ohio and Kentucky;
- Portions of I-75, I-74, and I-71 in Ohio;
- State Route 562 in Ohio;
- Ronald Reagan Highway; and
- US 50 from downtown Cincinnati to I-275 in Dearborn County, Indiana.

The South Area consists of the following roadways:

- Portions of I-275 in Kentucky, Ohio, and Indiana;
- I-71, I-75, and I-471 in Kentucky; and
- Portions of I-71 and I-75 in Ohio.

In all, 88 miles of freeway are monitored by ARTIMIS (as of April 21, 2002). The system uses cameras and sensors to continuously monitor traffic conditions 24 hours a day, 7 days a week. Information is routed by fiber-optic cable or via dial-up telephone line to the control center, where the imagery and data are analyzed to determine the occurrences of traffic incidents. Various response plans are then activated as needed.

3.2.3 Issues and Barriers

The few issues mentioned to the investigator all related to desired improvements to ARTIMIS. It was unusual not to hear about problems with current systems, policies, or operations.

Reportedly, there are no traffic management components in the mass evacuation plans for the greater Cincinnati area. While it would be somewhat surprising for the topic to be completely missing from the mass evacuation plans, it would not be surprising for the plans to lack an explicitly labeled section on traffic management. It would also be understandable for transportation agencies to desire coverage in these plans, for it would provide the agencies with the opportunity to become involved in that aspect of emergency management.

Mention was made that there is a need to improve the emergency medical services (EMS) communications systems in the area and to include the ARTIMIS community in their upgrade. This would presumably cover radio systems that are used by EMS response agencies in the greater Cincinnati metropolitan area. Such communications would typically be used to enable EMS vehicles to communicate with each other and with emergency departments of local hospitals.

A logical extension to the current transportation/public safety interaction was noted on one suggestion passed along to the investigator. Noting the coverage of freeway incident scenes that ARTIMIS is now able to provide to public safety, it was suggested that the same sort of CCTV coverage be extended to cover the response and approach routes to those incidents. It would of course be an obvious enhancement to also provide coverage on demand from public safety for any response planned to traverse the ARTIMIS CCTV coverage area. A related suggestion extended the concept to include the emergency rooms at local hospitals because the additional visual information would help prepare emergency room staff for incoming trauma cases.

And finally, it was suggested that the changeable message sign (CMS) network be extended to include more major arterials. This extension appears to be a logical enhancement that might help a great deal in managing traffic approaching the freeway system.

3.3 Technical Implications

ARTIMIS consists of several components:

- **CCTVs—**More than 80 CCTVs have been deployed in the greater Cincinnati area. Three types of cameras have been deployed: full-motion color video, slow-scan color video, and fixed black-and-white cameras. The majority of cameras are full-motion color video, but in some areas where poor lighting exists (such as tunnels), fixed black-and-white cameras have been installed.
- **Changeable Message Signs (CMSs)—**Forty CMSs are located before the major freeway interchanges to notify motorists of traffic problems and potential alternate routes. There are also three portable CMSs that can be towed to locations where a specific, short-term need exists.
- **Highway Advisory Radio (HARs)—**ARTIMIS broadcasts traffic advisories and construction information on broadcast radio 530 AM (from fixed locations) and 580 AM (from temporary locations), which may be received by standard car radios. Advisories are available during operational hours, and construction information is available 24 hours a day.
- **Vehicle Detection—**Eleven hundred vehicle detection locations are maintained by ARTIMIS (as of April 21, 2002). Vehicle count, occupancy, and speed information is collected at each of these locations using one of three technologies: radar, induction loop detectors, and video imaging.
- **Reference and Ramp Markers—**To assist travelers and emergency responders in locating incidents or those in need of assistance, reference and ramp markers have been deployed on most of the freeway systems in the greater Cincinnati area. Blue and white signs have been positioned about every 500 feet that contain information relating to the roadway name, direction of travel, and the specific milepost location.

3.4 Operational Implications

3.4.1 ARTIMIS

ARTIMIS often serves as the coordination center for major incidents. A typical evolution of an incident proceeds as follows. An incident management team is formed once either a major incident has been declared by a public safety officer on the scene or the ARTIMIS staff issues a warning based on input gathered from the system. Specific roles and responsibilities for each team member involved have been documented and accepted by the agencies involved.

ARTIMIS acts as the host for the incident management team and provides necessary facilities, including work space and equipment. ARTIMIS personnel provide support materials and resources to the incident management team, including communication services, video feeds, portable and fixed HAR/DMS systems, and freeway service patrol vehicles. Finally, ARTIMIS staff assess and report the status of upstream and downstream traffic flow from the incident and propose and prepare potential alternative routes.

3.4.2 Public Safety Agencies

ARTIMIS has established close working relationships with several local jurisdictions' public safety organizations, including the Cincinnati and Covington Police Departments. During major incidents, the following things happen: Command-level personnel are assigned to serve on the major incident team. An agency command post is established to manage police activity and personnel. Public safety agencies also establish a perimeter around the incident to isolate the incident from the surrounding area, control the crowd and traffic at the incident, and identify and implement alternative routes on the Interstate system. Finally, the public safety agencies investigate the incident and determine causal factors. These findings—as well as the usual forums related to traffic, civil court, criminal court, and insurance claims—can sometimes be used to improve travel conditions on the freeways.

3.4.3 ODOT and KYTC

ARTIMIS coordinates traveller information and TIM for the greater Cincinnati area, acting on behalf of ODOT and KYTC. This has off-loaded a significant amount of ODOT and KYTC's day-to-day operational responsibilities. The agencies have been assigned on-call responsibilities for major incidents and provide representatives to serve on the incident management team. These duties include providing support resources as requested; assessing and evaluating the repair needs of the freeway infrastructure; and collecting cost data pertaining to personnel, equipment, and material relating to the major incident.

3.4.4 Fire Departments

Metropolitan area fire departments that respond to major incidents in the ARTIMIS jurisdiction provide staff to serve on the incident management team. They also provide specialized technical information related to hazardous materials incidents. Hazardous materials incidents can involve complex information that can have far-reaching effects on traffic flow, such as hot zones; areas of isolation and evacuation; control, containment, and stabilization operational requirements; and remediation operations. The fire departments also provide EMS and aid to those at the scene of the incident.

The Cincinnati Fire Department is the oldest professional fire department in the nation, having a full-time paid professional staff since 1853. The fire service is known for its traditions, which can at times be barriers to innovation. If transportation/public safety partnerships work in Cincinnati with this sort of institutional history, they can work anywhere.

3.4.5 Special Events

There are plans to use ARTIMIS as a central command post for Riverfest September 2003, which draws 500,000+ visitors to the riverbanks. That is a significant traffic load for the region. There will be several major street closures (including Interstates) on the night of the fireworks, and coordination will be required among the cities of Covington, Newport, and Cincinnati; the law enforcement, EMS, and fire components of public safety; and the Ohio and Kentucky DOTs.

3.5 Benefits

In October of 2001, Cambridge Systematics, Inc., with PB Farradyne, conducted an evaluation of the ARTIMIS system for OKI. The investigator did not research the content of this evaluation; however, the investigator believes that it might be fair to characterize all of ARTIMIS as such an information-sharing system and activity and credit all of the reported benefits to that category.

One law enforcement source estimated that the time savings for roadway closures after fatal accidents were as much as 90 minutes to 2 hours. The source attributed this savings to the use of the Total Station survey equipment, which was provided by ARTIMIS to public safety agencies in the area. The source reports that this act was seen as a very good gesture by ARTIMIS to forge better relationships with public safety agencies.

3.6 Training

The Tri-State Emergency Management System has been in place for many years and holds regular forums to help bring together police, fire, EMS, city building inspection, traffic, and other communities. The group has prepared a library of pre-plans, ostensibly to make up for the lack of technology. Many exercises have been conducted and critiqued in an attempt to prepare for emergencies. Participants have found that these exercises also help to resolve "turf wars" before disasters strike or major incidents occur.

One training oddity was noticed by the investigator. Public safety dispatchers undergo a rigorous 6- to 9-month training curriculum before they gain the minimum skill levels necessary for the job. In contrast, they learn about ARTIMIS on the job, with no specific training relating to the services they provide. As a result of this report, ARTIMIS staff now instruct recruits at the Cincinnati Police Academy as well as provide part of the initial training given to Cincinnati public safety dispatchers.

4 COMMENTARY

4.1 Security, Terrorism, and Homeland Defense

No specific ARTIMIS features were apparent that related to homeland defense. It was reported to the investigator that variable message signs were used in the summer of 2002 to tell the public about riot-induced curfews. There is also an Amber Alert system in operation in the Cincinnati area, called the Child Abduction Alert; however, policies regarding the use of variable message signs in conjunction with such an alert have not yet been settled.

4.2 Responder and Motorist Safety and Economic Implications

The CVS Pharmacy Samaritan vans have been very helpful to clear minor incidents. They provide experienced motorist assistance and have also become involved in several other locations besides Cincinnati. Both the ARTIMIS and the CVS logos are prominently displayed on the side of these freeway service patrol vans, one indicating the involvement of a quasi-governmental organization, and one indicating the involvement of a major pharmacy chain store. Since CVS pays for 49 percent of the cost of the vans and Samaritania provides the service, the arrangement is a flagship example of a successful public-private partnership. The costs are directly reduced through CVS's involvement, and the benefits are undiminished.

APPENDIX D

MINNEAPOLIS, MINNESOTA, CASE STUDY

1 SUMMARY

The Minnesota Department of Transportation (MnDOT) and the Minnesota State Patrol (MSP) have a long history of cooperatively managing traffic incidents in the Minneapolis metropolitan area, as well as developing and implementing data and communications systems that support such activities as the new co-located Regional Traffic Management Center (RTMC). This case study describes the institutional framework and initiatives that underpin these activities, as well as the roles and responsibilities of both MnDOT and MSP as they relate to traffic incident management (TIM).

Methods of sharing TIM information include the following:

- **Face-to-Face**—MnDOT and MSP are co-located at one facility, and MSP and the Freeway Incident Response Safety Team (FIRST) are co-located at a second facility.
- **Remote Voice—**MSP, FIRST, and MnDOT Maintenance all share the same 800-MHz radio system. However, MSP does not allow non–law enforcement agencies access to their talk groups. Only senior MSP and MnDOT Maintenance personnel receive agency-supplied cell phones; however, all FIRST units have agency-supplied cell phones. In addition, there are four operating Transportation Operations Communications Centers (TOCCs) on-line with five more planned to serve MnDOT and MSP communication needs throughout Minnesota.
- **Electronic Text—**MSP has smart terminals, which are limited to simple processing and display operations such as blinking and boldface. FIRST is currently using dumb terminals, which have no processing capabilities, but will receive smart terminals by 2004. This will allow FIRST to communicate with MSP. MSP and MnDOT/RTMC are currently using computer-aided dispatching (CAD).
- **Other Media and Advanced Systems—**Freeway electronic sensing data, both active (signage and traffic control) and passive (loop technology); closed-circuit television (CCTV); and other traffic management systems are used.

2 BACKGROUND

2.1 Minneapolis and St. Paul Regional Area

In April 2003, MnDOT began operations of the new co-located RTCM located in Roseville, Minnesota, 7 miles northeast of the city of Minneapolis. The RTMC covers freeway operations, including roadway maintenance, traffic signal control for major arterials, and state police dispatch. There are 23 workstations in the RTMC control room. Six are for freeway operations, eight are for police dispatch, six are for maintenance, two are for MnDOT's Metro Division's traffic signal control, and one is for traffic radio.

2.2 Acknowledgments

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- Susan Groth, Traffic Engineering Section, Transportation Management Center (TMC);
- Nick Thompson, TMC Operations Manager;
- Teresa Hyde, TMC Operations Supervisor;
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- Jeff Thorstad, MSP Communications Shift Supervisor;
- Tom Peters, TOCC Program Manager;
- Roberta Dwyer, Duluth Traffic Engineer;
- Captain Clarence Nyland, MSP District Captain; and
- Marge Kangas, Radio Communications Supervisor.

3 INTRODUCTION

MSP and MnDOT have traditionally approached TIM in a cooperative manner. Effective incident management in the Minneapolis/St. Paul region is further supported by information sharing at the programmatic and operational levels.

3.1 Institutional Framework

Many of MSP and MnDOT's TIM activities and coordination result from longstanding working relationships between the two agencies. Roles and responsibilities of both agencies as they relate to TIM are detailed below.

3.1.1 MnDOT

The first TMC was established in 1972 to provide traffic management services to the Interstate highways within MnDOT Metro Division, which is the Minneapolis and St. Paul metropolitan area. The TMC managed traffic using 241 CCTVs with formal guidelines for operations established in

April 1999. In addition, TMC had 65 variable message signs (VMSs), 419 ramp meters, lane control signals, loop detectors, traffic radio (KBEM-FM) and traffic signal management tools. The TMC was superseded by the RTMC in April 2003.

3.1.2 MSP

MSP is the state's operational law enforcement organization within the Minnesota Department of Public Safety. With funding from the U.S. Department of Justice, MSP had adopted an automated CAD system in 2002 that helps to manage the workload of the RTMC system and allows multiple users to access information simultaneously. In addition, MSP has installed mobile data computers in 180 squad cars. These computers allow troopers to enter various information systems, including the National Crime Information Center (NCIC). The computers thus increase trooper security, homeland security, and overall public safety. Working with MnDOT, MSP is working to deploy nine TOCCs throughout greater Minnesota (five operational, four coming on-line). These centers serve as communication hubs for emergency response, maintenance operations, traffic management, and traveler information for the state of Minnesota.

3.1.3 Freeway Incident Response Safety Teams (FIRST)

To support traffic management, FIRST (formerly known as Highway Helpers) is a key component of MnDOT's incident management program. Currently, FIRST covers eight routes and 160 miles of the Twin Cities metro area freeways. The FIRST teams are dispatched by the RTMC using a global positioning system to locate the closest FIRST vehicle to the incident, and that vehicle will respond to the incident and support MSP and emergency responders in traffic control and other duties as needed. FIRST aided more than 14,000 motorists in the RTMC region in 2002. FIRST assistance to stranded motorists includes

- Changing the vehicle's flat tire,
- Jump-starting the vehicle,
- Refilling the radiator and taping hoses,
- Providing a gallon of fuel,
- Contacting MSP and/or a tow truck and staying with the motorist until help arrives, and
- Pushing the disabled vehicle off the roadway or away from a dangerous location.

3.1.4 RTMC

The purpose of the RTMC is to integrate MnDOT's Metro Maintenance Dispatch; FIRST; the Office of Traffic, Security, and Operations; and the Minnesota Department of Public Safety's State Patrol Dispatch into a unified communications center. Components of the RTMC include

- Surveillance via CCTV and loop detectors,
- Ramp meters,
- Electronic message signs,
- Lane control signals,
- A travel information program,
- A high-occupancy vehicle system,
- An incident management program, and
- The FIRST program.

3.2 RTMC Agreements and Formal Programs

Primary initiatives that have set the stage for institutional coordination and cooperation between MnDOT and MSP have resulted in enhanced TIM activities through formal agreements covering information sharing. These memoranda of understanding and guidelines formalize the relationships between MnDOT, MSP, and FIRST.

From an institutional perspective, the memoranda establish programmatic directions that relate directly to TIM and the sharing of information. Components of the memoranda include the following:

- Leveraging information at MnDOT, TMC, and MSP dispatch centers.
- Sharing information needed to facilitate joint operations of highways. These activities may include, but are not limited to, video data terminals/computer-aided dispatching 911 (VDT/CAD 911) access and user training, real-time traffic flow, collision and weather information, video surveillance, video road inventories, high-speed data transmission, geospatial data, and interchange drawings.
- Creating a standard for data sharing that includes, but is not limited to, content and formatting, documentation, a meta-database, collection and update methods, accuracy, update cycles, and stewardship. Memoranda of understanding shall be used to document the sharing of information, which cover the items addressed in the standards.
- Coordinating public information and outreach messages to the community on issues that affect both agencies and their customers.
- Communicating timely and accurate information via radio, telephone, television, and Internet to the public regarding traffic and travel conditions. This communication includes travel restrictions and information on incidents that allow the public to make decisions about traveling convenience and safety.
- Assisting motorists with service patrols that clear lane-blocking debris, disabled vehicles, and their occupants.

- Coordinating all public and private resources in the effort to respond to incidents and clear incidents as quickly as possible.
- Resolving other problems within the ability and scope of MSP and MnDOT.

4 INFORMATION-SHARING METHODS

4.1 What Information and Methods of Sharing Were Considered?

To perform at their best, transportation and public safety professionals need accurate and timely information. National security concerns have further highlighted the need for information-sharing capabilities to enhance traffic incident detection, response, and management. And, more often today, such information must be shared across systematic, organizational, and jurisdictional boundaries.

MTS examined how the following types of traffic incident information were shared:

- **Detection and Notification**—Such information engages public safety resources, enables rapid medical care to save lives and minimize injury consequences, and reduces transportation infrastructure disruption.
- **Response Information**—Traffic conditions, resource location, and incident details speed the delivery of the optimal emergency resources to the scene.
- **Incident Management**—Incident scene status and resource coordination information support emergency responder safety and can hasten incident stabilization, investigation, and clearance.

For the purpose of this case study, the results are grouped according to categories of traffic incident information-sharing methods. These methods and some examples are as follows:

- **Face-to-Face**—Personal communication where staff from different agencies share office space (such as joint operations centers or mobile command posts).
- **Remote Voice**—Common options readily available to support operations within most transportation and public safety agencies, such as telephone, land mobile radio, and facsimile machines.
- **Electronic Text**—Lower-bandwidth interconnection applications, such as electronic messaging and access to CAD or record management systems.
- **Other Media and Advanced Systems**—Higher-bandwidth options, such as video and other imaging systems, and integrated systems, such as advanced traffic management systems.

Current methods of sharing TIM information at the RTMC are summarized in Table 1.

4.2 Information-Sharing Methods in the Minneapolis RTMC

Overviews and specific examples of TIM-related information sharing are identified and described below according to the categories listed in Section 4.1.

From a network infrastructure prospective, MnDOT, RTMC, and MSP uses an optical fiber network with a 2.4-Gb backbone with video channels using an OC3 bandwidth; the wireless network is a 2.1-GHz analog service used for public safety voice communication. The infrastructure has been reviewed by a technical contractor, and plans have been made to ensure adequate capacity.

4.2.1 Face-to-Face

MSP and MnDOT are co-located at the RTMC, and MSP and FIRST are co-located at another location. Before MSP and MnDOT were co-located at the RTMC, the only opportunity that the MSP and FIRST team members had to communicate was at the incident scene. The co-location of MSP and FIRST has built positive relationships between the personnel.

4.2.2 Voice Communication (Radio/Cellular)

FIRST, MSP, and MnDOT Maintenance all share the same 800-MHz radio system. MSP does not allow non–law enforcement agencies access to their talk groups, although MSP has access to all MnDOT talk groups. Only senior MSP and MnDOT Maintenance employees have agency-supplied cell phones, and all FIRST units have agency cell phones. Many lower-level employees use their personal cell phones for official communications. RTMC has its own dispatchers. RTMC

TABLE 1 Overview of TIM information-sharing methods at the RTMC

Agency	Face-to-Face	Remote Voice	Electronic Text	Other Media and Advanced Systems
MnDOT	Yes	Limited	Limited	Yes
MSP	Yes	Yes	Yes	Yes
MnDOT/FIRST	Limited	Limited	Limited	Limited

and FIRST operate only between 5:30 a.m. and 8:30 p.m. Through a partnership with MnDOT, MSP is deploying TOCCs to operate throughout the state on a 24/7 basis and will share the resources and do the dispatching for MnDOT and FIRST as needed.

4.2.3 Electronic Text

MSP has smart terminals in approximately 180 patrol cars, FIRST has dumb terminals in its vehicles and will be getting smart terminals in 2004. The smart terminals will allow FIRST to communicate with MSP and the MnDOT/RTMC, which will give all agencies full access to the CAD system.

4.2.4 Other Media and Advanced Systems

MSP provides the following 24/7 services for MnDOT:

- Communications monitoring,
- Dispatching,
- Road hazard reporting,
- Weather updates,
- Facility security monitoring traffic and surveillance management, and
- System performance management.

MnDOT provides the following up-to-date systems for MSP:

- CAD,
- Mobile data terminals,
- Wireless communication infrastructure,
- Traffic Surveillance CCTV,
- Amber Alert signs,
- Center facilities and technology, and
- Weather reporting.

APPENDIX E

PHOENIX, ARIZONA, CASE STUDY

1 INTRODUCTION

This section details the various roles and responsibilities of agencies responsible for traffic incident management (TIM) activities in the Phoenix metropolitan area, as well as the institutional framework that supports these activities.

1.1 Institutional Framework

The Phoenix metropolitan area was selected in 1997 as one of four federally funded national metropolitan model deployment initiatives (MMDIs) that focused on aggressive deployment of regionwide intelligent transportation systems (ITS).[1] Phoenix's MMDI efforts are collectively referred to as AZTech. AZTech was formed by 19 public-sector partners and 13 private-sector partners by building on existing relationships and recruiting organizations and interest groups not traditionally involved in transportation activities. On behalf of the partnership, Arizona DOT (ADOT) performs project administration, and Maricopa County performs project management. Individual projects are administered through collaborative arrangements among AZTech partners (*1*). Many of the projects implemented as part of the MMDI specifically focused on sharing of information between public safety and transportation agencies in the Phoenix metropolitan area.

1.2 Roles and Responsibilities

1.2.1 Phoenix Fire Department

The Phoenix Fire Department (Phoenix FD) operates 47 fire stations, 54 engine companies, 13 ladder companies, and 29 ambulances. The primary roles and responsibilities of the Phoenix FD in the context of TIM include fire suppression, hazardous materials containment, clean up, extraction of crash victims from vehicles, and the provision of emergency medical services (EMS). Nine hundred Phoenix firefighters are trained emergency medical technicians (EMTs), while an additional 300 firefighters have received additional training to become certified paramedics, which enables them to provide advanced life support treatment.

The Phoenix FD also operates the regional dispatch center. The center is staffed 24 hours a day, 365 days a year. The center serves as the dispatch center for fire and EMS in 18 jurisdictions throughout the Phoenix metropolitan area.

1.2.2 Arizona Department of Public Safety

The Arizona Department of Public Safety (Arizona DPS) is a state-level law enforcement agency that works in partnership with other state, local, and federal agencies to protect the public. The Arizona DPS's highway patrol division is responsible for responding to incidents that occur on freeways in the Phoenix metropolitan area. Primary responsibilities at the incident scene are to establish traffic control measures and conduct crash investigations.

Arizona DPS, under the sponsorship of the American Automobile Association (AAA) and the Maricopa County Association of Governments (MAG), also operates freeway service patrols 18 hours a day, 7 days a week. Operational responsibilities of the freeway service patrols as they relate to TIM include

- Assisting uniformed officers with traffic control strategies at the incident scene,
- Assisting motorists with minor repairs and tire changes,
- Removing debris from the roadway,
- Request towing services for disabled vehicles,
- Removing disabled vehicles from the roadway to a safe location, and
- Supporting tasks force initiatives such as driving under the influence (DUI) enforcement.

Arizona DPS also assists in providing traveler information through the Highway Condition Reporting System (HCRS). HCRS functions are described below.

1.2.3 Maricopa County Department of Transportation

The focal point of Maricopa County Department of Transportation operations as they relate to TIM is the operation and coordination of the Regional Emergency Action Coordinating Team (REACT). REACT's operations are critical in supporting the TIM functions of local police and fire departments, especially in assuming traffic management functions, which enable the roadway to be opened quicker. REACT members are assigned specially designed response vehicles that are equipped with traffic control equipment and devices that meet city, state, and federal requirements. REACT operates within a limited number of jurisdictions 24 hours a day, 7 days a week.

[1] The Metropolitan Model Deployment Initiative (MMDI) was an aggressive deployment of intelligent transportation systems (ITS) at four urban sites: New York/New Jersey/Connecticut, Phoenix, San Antonio, and Seattle. These sites were chosen because of their high level of preexisting ITS and the promise of evaluating the integration of these legacy ITS components together with new ITS components.

1.2.4 Arizona Department of Transportation

The ADOT Traffic Operations Center (TOC) serves as the statewide control center for traffic operations and is operational 24 hours a day, 7 days a week. The ADOT TOC also serves as the focal point for the TIM operations. TIM functions housed in the TOC include detection, verification, traffic management, and traveller information dissemination (*2*).

With respect to incident detection, ADOT has embedded detectors in the pavement on the freeways to collect speed and volume data. Should an incident occur that significantly disrupts traffic, an alarm will be triggered. The operator in the TOC can then use one of the more than 60 closed-circuit televisions (CCTVs) that have been implemented throughout the freeway system to verify the incident should the incident happen within proximity to the camera. The CCTV can also be used to monitor the ensuing traffic impacts of the incident. With this information, the operator can execute the most appropriate response in terms of controlling ramp meters and variable message signs (VMSs).

The ADOT also operates a traveler information website that contains a number of data elements, including

- Images captured every 7 minutes from the system of CCTVs, and
- A color-coded flow map that provides link speeds for the freeway system in the Phoenix metropolitan area.

The traveler information system also includes information that is generated through the HCRS. HCRS is designed to provide statewide traveler information that is generated through a variety of sources, jurisdictions, and operating agencies. Data provided by HCRS include

- Current and planned road closures and alternate routes;
- Current restrictions, such as closed lanes and speed reductions;
- Incident or accident location and status; and
- Current roadway conditions, including weather information.

The TOC also serves as a remote point of operation for the I-10 deck tunnel. Tunnel operations systems controlled from within the TOC include

- Vent room fans,
- 25 CCTV cameras,
- A tunnel lighting system,
- Emergency call boxes,
- Carbon monoxide sensors, and
- Loop detectors.

In the Phoenix metropolitan, the ADOT also operates the freeway service patrol. The freeway service patrol is composed of trained operations staff who assist in the operation of freeways. As it pertains to TIM, the primary function of the freeway service patrol is to support traffic control functions near the incident. The freeway service patrol's assistance is typically requested only when one or more travel lanes are closed on the freeway for more than 1 hour. The freeway service patrol's vehicles are operated by ADOT under a grant provided by the Maricopa Association of Governments (MAG).

1.3 Study Approach and Methodology

Specific data related to information exchanges in the Phoenix metropolitan area were collected during site visits to Phoenix FD, the Maricopa County Department of Transportation, the City of Mesa Police Department, and the Maricopa County Sheriff's Department in July 2002. Site visits provided researchers with the opportunity to observe data sharing and communication between the agencies in the context of actual operations. Andy MacFarlane and Ron Burch hosted the visit to the Phoenix FD. Barbara Hauser hosted the site visit to the Maricopa County Department of Transportation Operations Center. Joe Noce hosted the site visit to the City of Mesa Police Department. A telephone interview was conducted with Tim of Wolfe of ADOT. Periodic follow-up phone interviews were conducted with the hosts to collect and verify additional information. Additionally, an extensive literature search was conducted to provide background information on various information-sharing projects that had been initiated in the Phoenix metropolitan area.

1.4 Acknowledgments

The key contributors to the Phoenix case study are

- Ron Burch, Phoenix FD;
- Barbara Hauser, ITS Incident Management Coordinator, Maricopa County Department of Transportation; and
- Andy Macfarlane, Phoenix FD;
- Joe Noce, Project Manager, City of Mesa Police Department; and
- Tim Wolfe, ADOT.

2 INFORMATION-SHARING METHODS

Described below are the voice, data, and multimedia methods employed in the Phoenix metropolitan area between public safety and transportation agencies to exchange information in the context of TIM.

2.1 Remote Voice

Freeway service patrol vehicles are dually equipped with Arizona Department of Public Safety (DPS) and ADOT radio systems. As a result, a majority of the time, DPS officers who respond to incidents in the field request freeway service patrol assistance directly using the Arizona DPS radio system, as opposed to routing communications through the agencies' respective dispatch centers, as is common practice with service patrol operations. However, occasionally it is necessary for the Arizona DPS dispatcher to contact the ADOT dispatcher via telephone to request assistance in managing traffic at the incident scene. When this occurs, information that is typically communicated to the ADOT dispatcher includes

- Location and type of incident,
- Equipment and number of response personnel requested,
- Number of lanes blocked by the incident,
- Name and call sign of the officer in the field requesting assistance, and
- Location of the command post and best access route (*3*).

When Phoenix FD was receiving video feeds from ADOT, it was sometimes necessary for the Phoenix FD dispatcher to verbally communicate with the operator in the TOC. More often than not, the Phoenix FD dispatcher would request camera views to be changed so that the dispatcher could view the prevailing traffic conditions and route the response vehicle along the most expeditious path. A direct phone line was used between the dispatch center and the TOC to accommodate these communications.

2.2 Text Transfer

Arizona DPS has HCRS workstations in three dispatch centers statewide. This enables Arizona DPS to directly enter roadway closures or any other circumstance affecting the operations of state highways into HCRS. Typically, DPS enters the information directly if it responds to the incident without support from ADOT. If ADOT assists in the response, ADOT enters the closure information. When DPS enters information, an operator in the Arizona DOT TOC reviews the information to ensure that it has been entered correctly.

The Arizona Division of Emergency Services also has an HCRS workstation; however, the workstation is not set up to enable the division to enter data. Rather, it is set up to enable the division to monitor closures that could affect operations.

Maricopa County DOT's REACT is responsible for assisting with traffic management and traveler information functions of TIM. REACT is notified of requests for assistance with traffic management at the scene of the traffic incidents via alphanumeric pagers. At least 1 of REACT's 12 team members is on-call 24 hours a day, 7 days a week.

Phoenix FD receives emergency and planned maintenance road closure updates from the City of Phoenix Public Works via facsimile. Closure data assist the Phoenix FD dispatchers with ensuring that response vehicles avoid closures, thereby increasing response times.

Also of note about information sharing between public safety and transportation agencies was a plan to develop a system that would move incident data to the Phoenix FD from the ADOT TOC. However, no formal plan, let alone a well-defined end user application, was ever defined. ADOT's interest in planning, designing, and implementing such a system began to diminish, and consequently this initiative never moved forward beyond initial discussions.

2.3 Other Media and Advanced Technologies

Previously, through an agreement with ADOT, Phoenix FD dispatchers received video images that were shown on monitors in the dispatch center. Although rights to control the pan-tilt-zoom functions of the cameras were never defined in a formal agreement, dispatchers were able to control the cameras. Dispatchers primarily used the information to provide responders with closure information that helped to foster a more expedient response. This system is no longer operational due to a technical problem with the video coder/decoder (CODEC) that is on the ADOT end. Dispatchers found this interface to be very beneficial and would like to restore this functionality. Dispatchers have a significant interest in getting the video links back into the operations center.

2.4 Additional Activities

The Phoenix FD has been quite active in recent years in exchanging information within the public safety community and between public safety and outside agencies, such as transportation. Several years ago, the U.S. Department of Transportation's ITS Joint Program Office, in partnership with the Institute of Electrical and Electronics Engineers (IEEE), decided to develop a family of standards that covered the exchange of incident information between and within public safety and transportation systems. That standard became the IEEE 1512 family of standards, which contains the specifications for message sets and data elements needed to implement such an interface. For a time, a Phoenix FD representative chaired the committee that developed the standard. In addition, the Phoenix FD was involved with (1) a Health Level 7 effort to standardize the exchange of medical information and (2) the Association of Public-Safety Communications Officials (APCO) on Project 36, which worked to standardize the exchange of information between computer-aided dispatching (CAD) systems.

3 REFERENCES

1. *Phoenix Metropolitan Model Deployment Initiative—Evaluation Report*. US Department of Transportation, Federal Highway Administration, ITS Joint Program Office.
2. *Arizona Department of Transportation Traffic Operations Center Operations Manual*, October 1998.
3. *Arizona Department of Transportation Traffic Operations Center Operations Manual*, October 1998.

APPENDIX F

SALT LAKE CITY, UTAH, CASE STUDY

1 SUMMARY

Information sharing between transportation agencies and public safety agencies in Salt Lake City is beneficial, persistent, mature, and effective. Relationships between the two communities are mutually reinforcing and exemplified by the good fit between them at all levels. Of particular interest, the Utah Department of Transportation (UDOT) was able to take advantage of the Winter Olympics event being held in Salt Lake City soon after the terrorist incidents of September 11, 2001, and upgraded many of its systems and operations to a high degree of readiness. Also, much of the technical integration challenges were avoided by incorporating UDOT and the Utah Highway Patrol (UHP) into the same radio communications and computer-aided dispatching (CAD) systems. Field personnel were unusually tightly integrated and work exceptionally well together at the scene of highway incidents.

1.1 Incorporative, Rather than Integrative, Approach

Transportation operations have been brought within the UHP radio communications system, and transportation personnel have been provided nearly fully functional mobile computer terminals connected with the UHP CAD system. By so doing, Salt Lake City has brought transportation and public safety together under the same communications and information systems, thus avoiding the challenges of integrating disparate systems. The approach has worked well.

1.2 Opportunities Exploited

Even though UDOT and UHP already had some working relationships prior to the terrorist events of September 11, 2001, when the Winter Olympics were held in Salt Lake City soon thereafter, both the transportation community and the public safety community responded in unison to prepare for and counter further threats of this type. Additional means were provided, and, because of the anti-terrorism motive and the Olympics opportunity, an effective working-level relationship was quickly formed and persists to this day.

1.3 Tight Operational Integration

There is a highly developed operational relationship between the incident management team (IMT) specialists and the UHP personnel. A similar close working association exists between them and the other emergency responders. There was a comfortable familiarity among all of the responders, who all functioned quickly and efficiently within an implicit, but well-understood, command and control structure.

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Billy Frashure
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Salt Lake TOC

Barbara Barton
Shift Supervisor
Salt Lake Communications Center

Sergeant Ted Tingey
Utah Highway Patrol

3 INTRODUCTION

There has been a long and productive institutional and operational relationship between the Utah Department of Public Safety (DPS) and UDOT. The relationship was well established concerning traffic management on the Interstate and state highways in the greater Salt Lake City region. This relationship was brought even closer with the construction of the Salt Lake City Traffic Operations Center (TOC) next door to UDOT Region 2 Headquarters. Part of the motivation for establishing strong centralized traffic management in the Salt Lake City area was the concern for safety and security at the 2002 Winter Olympics, particularly because of terrorism concerns in the wake of September 11, 2001. The TOC also houses the UDPS Communications Bureau (with statewide responsibilities) and the Salt Lake Communications Center, which dispatches for both UDOT Region 2 and the DPS Highway Patrol. This close association further integrated the use of the emergency services, UDOT construction and maintenance resources, and automated traffic management systems. Under a recent reorganization, the TOC was reassigned from Region 2 to UDOT headquarters and given statewide traffic management responsibilities.

3.1 Interviews Held

Interviews that were held include the following:

1. Telephone contacts, Carol Groustra, Director, Communications Bureau, Utah DPS, (801) 887-3892.
2. Face-to-face, February 14, 2003, David Kinnecom, Traffic Operations Engineer, UDOT, (801) 887-3707.
3. Face-to-face, February 14, 2003, Adrian Ruiz, Manager, Salt Lake Communications Center, UHP, Utah DPS, (801) 887-3840, aruiz@utah.gov.
4. Face-to-face, February 14, 2003, Mack O. Christensen, P.E., Traffic Operations Engineer, Region 2, UDOT, (801) 975-4827, mchriste@dot.state.ut.us.
5. Face-to-face, February 14, 2003, Sergeant Ted Tingey, Public Information and Education, UHP, Utah DPS, (801) 284-5531.
6. Ride-along, February 14, 2003, Salt Lake City Incident Management Team field unit (Billy Frashure, Incident Management Specialist, TOC, UDOT, [801] 910-2910 [cell], [801] 887-3781, bfrasure@utah.gov).
7. Sit-along, February 15, 2003, the Salt Lake City Communications Center (Barbara Barton, Shift Supervisor, Salt Lake Communications Center, Communications Bureau, Utah PDS, [801] 887-3800).

Material for this case study was also taken from the Salt Lake Area Advanced Traffic Management System's *Traffic Operations Center Operations Manual* (December 2002) and the *Salt Lake Area Advanced Traffic Management System Design Report* (August 1999), both published by UDOT.

3.2 Institutional Framework

3.2.1 UDOT

3.2.1.1 Salt Lake City Traffic Operations Center (TOC). The Salt Lake City TOC (see Figure 1) provides traffic management services to the interstate highways within UDOT Region 2. Primarily, the TOC manages traffic using closed-circuit television (CCTV), variable message signs (VMSs), and traffic signal management. The TOC was a Region 2 resource until a recent reorganization elevated the TOC to a state-level resource directly under UDOT. Discussions are underway to expand the traffic management responsibilities of the TOC to encompass the entire state.

3.2.1.2 UDOT Region 2. UDOT Region 2 has general state transportation responsibilities for the geographical area around and including Salt Lake City.

Figure 1. Salt Lake City TOC.

3.2.2 Utah DPS

3.2.2.1 UHP. UHP is the state operational law enforcement organization within Utah DPS. UHP has jurisdiction over the Interstate and state highways within Utah, and UHP troopers normally assume command over highway incidents in their jurisdiction. The UHP Bureau II geographical jurisdiction is roughly equivalent to UDOT Region 2.

3.2.2.2 Communications Bureau. The Communications Bureau is an element of Utah DPS separate from UHP that provides dispatching services and communications systems to Utah DPS and to UHP. The director's office is located at the Salt Lake City TOC. The Region 2 Communications Center is also located in the TOC building and dispatches for both UHP Bureau II and UDOT Region 2, as well as for several other local emergency services under formal memoranda of agreement.

3.3 Agreements and Formal Programs

Very early in the process of establishing closer working relationships between UDOT and Utah DPS, the senior leadership in both departments signed a memorandum of agreement between their respective agencies. This expression of commitment and support proved to be an effective tool for bringing the members of each department closer together. The investigator concluded from observing interactions between the two departments that no paper agreement could have possibly covered the many close associations that made up day-to-day joint operations. This close working relationship was evidence that the spirit of the agreement was emphasized in the previous years by senior and midlevel management in both departments, and this spirit has come to be regarded as a native and natural way of doing business together.

4 METHODS USED IN PRACTICE TO SHARE INFORMATION

4.1 Introduction

UHP manages incidents on the Interstate highways, the joint area of concern for UHP and for UDOT. The only exceptions are either temporary situations, such as when UHP is not yet on the scene, or incidents that might occur in unusual circumstances related to extraordinary situations, such as off-highway incidents that affect the highway (such as with smoke, wildland fire, or plumes or runoff from hazardous materials spills). UDOT participates in a support role, primarily providing motorist assistance and traffic control in the vicinity of an incident scene. The Communications Bureau provides dispatching services to both UHP and UDOT. Exchange of information between public safety and transportation is primarily visual and verbal, using radios, telephones, and a great deal of face-to-face conversation. Incident response teams are fully equipped with the necessary mobile communications and computer equipment to directly participate in the public safety CAD network. Dispatchers have direct visual access to the large TOC video wall displays, and TOC console operators can monitor public safety operations through a link with the public safety CAD system.

No substantial computer integration between transportation and public safety has been necessary. The investigators speculate that years ago, planners chose the low-risk approach of incorporating UDOT field highway operations into the existing UHP systems, rather than building separate systems and integrating them into the UHP systems. The approach appears to have worked well.

4.2 Common CAD System and Communications System

All field units, including UDOT Region 2 construction and maintenance units, UHP troopers, fire and rescue, emergency medical services (EMS), and UDOT incident management team (IMT) units share a common 800-MHz trunked radio communications system. Most, if not all field units are also equipped with cellular telephones. Dispatchers, UHP troopers, IMTs, and traffic management operators all have computer terminals connected to the same CAD system.

Specialists in the IMT units have been granted sufficient access privileges to be able to check the status of disabled and abandoned vehicles encountered on the highway. In this manner, the IMT specialists are able to confirm that these vehicles are not stolen before rendering assistance to their occupants. This unusual privilege was extended to the IMT specialists in an effort to avoid unwittingly aiding perpetrators or becoming involved in a crime in progress. As explained to the investigator, this privilege was extended primarily for the safety of the IMT specialists.

4.3 Diligent Radio Traffic Monitoring

The IMT units constantly monitor fire dispatch radio channels for information on new highway incidents. Their dispatching center (the TOC Communications Center) is a secondary public safety answering point for 911 calls, and the transfer of alarm information regarding some incidents can be delayed. The cumulative delay can result in the radio dispatch of fire and rescue and EMS units before UHP and IMT units. By obtaining advance notice, IMT units can pre-position themselves to more rapidly respond should they be later dispatched.

This monitoring is a background activity and depends upon the IMT specialists' knowledge of the other services' operations and geographical knowledge of the Salt Lake City area. Advance warning of potential dispatches can significantly speed response.

4.4 Field Teamwork

The investigator observed that there is a highly developed operational relationship between the IMT specialists and the UHP troopers and inferred that a similar close working association exists between them and the other emergency responders. There was a comfortable familiarity among all of the responders, who functioned quickly and efficiently within an implicit but well-understood command and control structure. As part of this multidisciplinary team, the IMT units provided traffic control services with a minimum of coordination and detailed direction.

This independent but effective coordinated mode of operation indicates a long association between Utah DPS and its troopers and a long association between UDOT and its IMT specialists. These associations have generated a high degree of confidence in the competence of staff capabilities. The operation mode also shows a great deal of past information exchange, to the extent that explicit information exchange is no longer needed except for unusual circumstances.

5 BENEFITS OF INFORMATION SHARING AND CO-LOCATION: PERFORMANCE MEASURES

It is difficult to rigorously and precisely measure the benefits of information sharing between transportation agencies and public safety agencies for several reasons, any one of which can invalidate attempts to do so:

- No baseline, or control group, has been established to provide a basis for comparing current performance with former arrangements. Because it would have been extremely difficult, if not impossible, for transportation agencies and public safety agencies to ever have conducted separate and isolated operations, it is likely that some information is always shared and exchanged.
- It is difficult to establish defensible cause and effect relationships between information-sharing activities and apparent consequences related to improved traffic flow or reductions in mortality or morbidity.
- It is difficult to quantify the public benefits of sharing information between transportation agencies and public safety agencies. Improvements brought about through cooperative highway activities are often difficult to express in economic terms, such as reductions in costs or improvements in revenue.

No specific examples of benefit reporting was obtained from the TOC in Salt Lake City that could highlight the performance measures and benefits attributable to information sharing between public safety agencies and transportation agencies. The investigators feel that there is nevertheless a substantial, albeit unquantified, public benefit that is intuitively attributed to the close working relationships between UDOT, UHP, and the remainder of the emergency response community.

5.1 Public Comment Postcards

Following each instance of providing motorist assistance, the IMT specialist provides the motorist with a stamped postcard. The motorist may then fill out the preprinted comment form and provide feedback to TOC management regarding the quality and effectiveness of the IMT units. Many of these postcards have been filled out and returned, providing a database of evaluation data. While the investigator did not have the opportunity to examine the database, he did hear from several sources that many of those helped did not know that such assistance was available. Direct requests for such assistance are rare, and many encounters by IMT units are by chance during the course of IMT patrols, relays from UHP units, or CCTV observation at the TOC.

6 TRAINING STAFF

The UDOT and Utah DPS staffs that the investigator met were qualified, competent, and very experienced. They mentioned only two types of new technical skills outside of their main duties that related to exchanging information between UDOT and Utah DPS: interfacing with the CAD system and using the CCTV and VMS systems. Radio system usage did not appear to be an issue or a challenge for anyone.

6.1 CAD Skills

TOC operators and IMT personnel monitor highway incidents that appear within the Utah DPS CAD system in order to provide assistance as required. The CAD system also tracks IMT unit status in the same manner in which it tracks the status of the other field units managed in the system. Also, in the event that transportation personnel become aware of an incident before UHP is aware, the transportation personnel enter the new incident into the CAD to notify UHP. Recently, IMT personnel have been granted permission to use CAD to verify that the vehicles being assisted are not stolen or otherwise of interest to law enforcement.

Currently, transportation personnel only need relatively limited CAD skills; however, their involvement is growing in scope and complexity as traffic management becomes more and more integrated into highway law enforcement. Given the increasing assimilation of traffic management into the overall highway incident approach, it is reasonable to project the need for more comprehensive CAD skills among transportation personnel to support their evolving operational role. Utah DPS could benefit from creating a new pool of qualified CAD operators who could serve as a backup resource in times of overload, such as during major incidents or disasters.

6.2 CCTV and VMS Skills

When significant incidents occur, available CCTV imagery is usually shown on the TOC video wall, which is in sight of both TOC operators and dispatchers. There did not appear to be any issue regarding who accomplished the task—if TOC operators were on duty, they did it, and if not, the dispatchers did it. TOC operators had more experience than the dispatchers in operating the controls and were probably less distracted by other activities, but either could do and did the job.

6.3 Job Qualifications, Skills, and Knowledge

The investigator found no impediments to information exchange between UDOT and Utah DPS that could be attributed to limited staff training. However, there does appear to be forthcoming opportunities to objectively document requirements for staff competencies that facilitate this vital information flow.

TOC operator positions are currently manned by TransCore employees under a contract to UDOT. In an effort to gauge the skill levels of currently assigned staff versus required competencies, UDOT recently administered objective evaluations of those assigned to these positions. Position descriptions have also been prepared for these positions, should they be converted to state civil service positions. Such a staffing conversion will more firmly link required job skills, knowledge, and experience to the demands of these positions. It should also better link these competencies to the contents of the current TOC operations manual, which has been developed over the last few years while these services have been provided by contractors. This should better incorporate the requirements for TOC operators to be proficient in CAD usage.

Dispatchers in the TOC Communications Center have been provided the means to control CCTV cameras and to post VMS messages directly from their consoles. A few dispatchers are highly proficient, but a few dispatchers are less so. Dispatchers can receive guidance and assistance from the traffic management operators either in person (when they are on duty) or by telephone (when they are not). It is clear that rapid view of an accident scene and quick posting of VMS messages can be extremely helpful during highway incident management.

7 ISSUES AND BARRIERS

7.1 Institutional Challenges

The disjointed jurisdictions between UHP, the Salt Lake City Communications Center, TOC, and UDOT Region 2 shift incident management and traffic management responsibilities because different organizations have jurisdiction. For many historical reasons, these organizations have different jurisdictional areas of responsibility. The jurisdictions overlap to a large extent, but relationships are not uniform everywhere. For example, UHP contracts with local law enforcement to provide services in some of the area. Also, roadways other than the Interstates, U.S. highways, and state highways may be handled by local organizations. The effects of highway incidents can spread through all jurisdictions, which can require the formation of ad hoc multiparty efforts involving outside agencies.

The recent elevation of the TOC and expansion of its traffic management responsibilities to a statewide scope will present significant institutional challenges in the future, as new relationships are established with the other UDOT regions, UHP Bureaus, and Communications Bureau Dispatch Centers.

7.2 Technical Challenges

No significant technical challenges were noted that materially affected the exchange of information between transportation agencies and public safety agencies. This lack of significant technical challenges is unusual in any large operation and very unusual when large organizations attempt to work together. In fact, the lack is extraordinary, considering the amount of technology in use, the wide area of coverage, and the urgency exhibited by most users.

7.3 Procedural Challenges

The investigator did not notice any significant procedural challenges that rose to levels that jeopardized any participating organization's mission objectives.

7.4 Conflict Resolution Processes

No significant conflicts were noted, and no staff highlighted the use of conflict resolution mechanisms outside of those implemented within the existing organizational structure.

8 COMMENTARY

8.1 Security, Terrorism, and Homeland Defense

The present facility, systems, and the partnership between law enforcement agencies and transportation agencies probably owe much of their reason for existence to the terrorist attacks of September 11, 2001. It was the motivation of protecting the attendees and participants in the Winter Olympics that channeled significant amounts of attention and resources into Salt Lake City and probably accounted for a significant portion of the support needed to construct and staff the TOC. The continuing benefit to regional travelers and local public safety is a rare example of good works that can be attributed to terrorism.

8.2 Responder and Motorist Safety

Two anecdotes heard by investigators probably illustrate the need for close cooperation and exchange of information between transportation and public safety.

First, it is a surprisingly common occurrence for IMT vehicles and personnel to be struck by vehicles while at the scene of a highway incident. Thankfully, the occurrence usually results in only minor damage to vehicles and no injury, but the cumulative effect on the vehicles and technicians must be significant. This battering was cited as one of the reasons why new vehicles were being procured somewhat earlier than planned and why they might need to be a little stronger. It has also apparently raised the awareness of IMT personnel to a high degree of cautiousness, since one of them required hospitalization from being struck.

Second, not all disabled motorists are innocent travelers. The story is told of a trooper helping a motorist to change a flat tire on the freeway. Later, the trooper found out that the vehicle and its driver matched the description of a robbery suspect. Apparently, this story was one of the reasons that IMT personnel have been granted permission to check vehicle license numbers for possible entries in wanted files before they render assistance.

8.3 Using a Common CAD System and Communications

The Salt Lake City participants in highway incident management are enjoying an unusual luxury: there has been sufficient capacity on these systems to accommodate transportation along with public safety users. When project planners decided to use a common CAD and communications system, they conveniently sidestepped all of the problems associated with integrating dissimilar systems, which are famous for consuming large quantities of time and money and for still not succeeding. By bypassing most of the technical distractions, highway incident participants were free to work out their other institutional and operational challenges and have appeared largely successful.

8.4 Diligent Radio Traffic Monitoring

Diligent radio traffic monitoring is a learned skill and can require a significant amount of training and practice. The dispatchers in the Communications Bureau are highly experienced radio operators and have learned to handle two or three simultaneous and independent channels of chatter, but it takes unusual talent to monitor more than that, especially if there is a significant amount of traffic. The IMT members have found radio monitoring to be the best way to keep abreast of activity on the highway and an excellent early warning method that can be used effectively to pre-position and pre-alert responding resources. IMT members have also found radio monitoring to be an excellent way to keep abreast of developments in public safety, such as changes in personnel assignments or operating procedures.

8.5 Field Teamwork

Salt Lake City incident management field personnel have developed a healthy skeptical attitude regarding field operations. They tend to appreciate actions over words and over plans, and their respect for other responders directly stems from positive interactions with the other responders. Such a tight and efficient relationship that has grown up between the UHP and IMT responders is evidence of a long history of positive mutual experiences.

APPENDIX G

SAN ANTONIO, TEXAS, CASE STUDY

1 INTRODUCTION

A number of public and private stakeholders alike in the San Antonio metropolitan area play an active role in traffic incident management (TIM) activities, including TxDOT, San Antonio Police Department (San Antonio PD), San Antonio Fire Department (San Antonio FD), San Antonio Emergency Medical Services (San Antonio EMS), and towing and recovery service providers. The efforts of these responders have been greatly enhanced through information sharing, especially between public safety agencies and transportation agencies, both in the context of planning and operational activities.

Initiatives enhancing information sharing in the context of TIM in the San Antonio metropolitan area include the development of sound institutional structures, joint planning and operations, and joint-procurement and operation of communication and data systems. Discussed in this section are the institutional structures, roles, and responsibilities of TxDOT, San Antonio PD, San Antonio FD, and San Antonio EMS as they relate to TIM.

The points of contact for this site visit were as follows:

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1.1 Institutional Framework

The institutional framework underlying information sharing among public safety agencies and transportation agencies in the San Antonio metropolitan area is the result of the Corridor Management Team (CMT) and joint planning, joint training, and co-location of transportation and law enforcement in the TransGuide Operations Center. Each of these elements is described below.

1.1.1 Corridor Management Team

The CMT, chaired by the TxDOT District Traffic Engineer, was originally conceived in the 1960s. Increased importance was placed on the CMT as it was identified as an effective mechanism for fostering communication and coordination among responders when TxDOT and San Antonio PD began to more aggressively manage traffic incidents in the 1990s. The CMT consists of representatives from the Metropolitan Transit Authority, San Antonio Public Works Department, Alamo Dome, San Antonio PD, Bexar County Sheriff's Department, EMS, towing and recovery service providers, and county health agencies.

The sole purpose for the CMT and its meetings is to provide an unofficial and informal platform to discuss traffic operations. Critical to the success of the CMT is that turf issues are set aside and participants are provided the opportunity to speak freely without feeling intimidated. The CMT meets each month to discuss, among other things,

- Current traffic hot spots and potential mitigation strategies,
- Operational strategies during construction activities,
- Potential traffic impacts of upcoming special events and potential response strategies, and
- Operational performance during major incidents that recently occurred.

1.1.2 Joint Planning Activities

Under the leadership of the San Antonio/Bexar County Metropolitan Planning Organization, a regional incident management plan was developed in May 2002 to enhance an already accomplished incident management program. The plan is intended to serve as a foundation to ensure that the knowledge and relationships previously developed are carried on and that the goals and objectives of detecting, responding to, investigating, and clearing incidents quickly and safely are maintained (*1*). The plan included strategies to improve response, site management, and clearance.

1.1.3 Joint Training Activities

Join training activities have strengthened the institutional framework and operational capabilities of incident responders in the San Antonio metropolitan area. Three varieties of training activities have been employed: mock incidents, tabletop exercises, and classroom workshops that are taught by outside consultants. Each of these training activities is structured in a manner to encourage participation by each responder.

1.1.4 TransGuide Operations Center Co-Location

The TransGuide Operation Center has been specifically designed to provide a central point of coordination in responding to emergencies for TxDOT and San Antonio PD. Co-location has strengthened existing relationships of the two agencies from two perspectives. First, it provided the opportunity to foster coalition through cooperative development of operational requirements and deployment of communication and data systems that support incident management functions. Second, the agencies have been able to work side by side during major and minor incidents, which has ultimately resulted in stronger working relationships. Further centralization of San Antonio PD and TxDOT dispatch functions in the TOC lends itself to synergy and optimization in responding to incidents.

The relationship between the city of San Antonio and TxDOT has been further strengthened by the San Antonio PD co-location in the center in that the city of San Antonio has worked with TxDOT to implement a back-up public safety answering point (PSAP) in the same facility that houses the TransGuide Operations Center. An interface with the City Hall has also provided a foundation for information sharing with other responders such as San Antonio FD, or those whose operational responsibilities might be affected by traffic incidents and other transportation emergencies.

1.2 Roles and Responsibilities

Outlined below are the diverse roles and responsibilities of the primary public-sector entities that respond to traffic incidents in the San Antonio metropolitan area. It is important to note that in the state of Texas, local law enforcement agencies are responsible for responding to traffic incidents that occur on the freeways within the city limits.

1.2.1 TxDOT

TxDOT provides numerous support functions related to managing traffic incidents, including freeway management, traveler information dissemination, congestion management, and operations of courtesy patrols. Each of these functions is an element of TransGuide, TxDOT's "Smart Highway" project for the San Antonio metropolitan district. TransGuide objectives include

- Improve traveler safety on San Antonio's freeway system,
- Improve response by police and emergency services personnel and equipment in (1) treating and transporting injured people to hospitals and (2) assessing and clearing traffic incidents, and
- Reduce the traffic congestion delay experienced by freeway travelers.

Originally implemented in the mid-1990s, TransGuide had many of its functions enhanced through the San Antonio Metropolitan Model Deployment Initiative (MMDI). Under the leadership of TxDOT, the San Antonio metropolitan region was selected in 1997 as one of four federally funded, national MMDI projects that focused on aggressive deployment of regionwide intelligent transportation systems (ITS). The system has since been expanded to cover 73 miles of freeway in the San Antonio metropolitan area (*2*). The TransGuide Operations Center is operated 20 hours a day (4:00 a.m. until 12:00 a.m.) usually and 24 hours a day during special events, emergencies, major incidents, and adverse weather conditions (such as flooding or icing).

Also critical to TxDOT's incident management functions is the incident detection system that is composed of three primary components: loop detectors that are implemented along the freeway to collect traffic data, a central processing system, and a set of predefined scenarios. Data collected by the loop detectors are communicated to the TransGuide Operations Center, where they are processed to identify abnormalities in traffic flow. If possible, the abnormality that has been detected is verified with closed-circuit television (CCTV). If it is determined that there is an incident, various predetermined scenarios can be implemented to control dynamic message signs (DMSs) and lane control signals (LCSs), and advisories can be posted on the TransGuide website.

The TransGuide traveler information website provides a variety of information:

- **Current Conditions Map**—Provides current traffic conditions, with congestion levels indicated by average speeds, on San Antonio's freeways.
- **Incident Map**—Combines a traffic conditions map with icons representing incidents that have been reported to the San Antonio PD and TxDOT.
- **Incident Data**—Provide a textual description of all active incidents in the San Antonio metropolitan area.

- **Lane Closure Map**—Combines the traffic conditions of the main map with icons representing scheduled and emergency lane closures throughout the city.
- **Lane Closure Data**—List all scheduled and emergency lane closures in the San Antonio metropolitan area.
- **Equipment Status**—Provides status of TransGuide equipment, such as messages being displayed on message signs around town and camera images (*3*).

Traveler information functions also include the operation of a low-powered television station that is used to disseminate CCTV images to the local media. CCTVs are spaced at 1-mile intervals throughout the freeway system. The CCTV system was also designed to provide other responders with video surveillance to help support response activities.

TxDOT also operates courtesy patrols during peak periods. These patrols are dispatched from the TransGuide Operations Center by both TxDOT and San Antonio PD, and their duties typically include

- Removing debris,
- Assisting motorists with broken-down vehicles,
- Assisting San Antonio PD with traffic management, and
- Helping to move and operate TxDOT equipment.

1.2.2 San Antonio PD

As mentioned previously, local police agencies in the state of Texas are responsible for responding to traffic incidents that occur on freeways in the metropolitan areas. To support this effort, San Antonio PD has 210 officers assigned to the traffic operations unit. Officers in this unit are responsible for managing traffic, conducting crash investigations, and providing assistance with containment of hazardous materials spills. The traffic operations unit also actively participates in traffic management during special events.

Officers in the traffic operations unit are dispatched from one of the two consoles that San Antonio PD has located within the TransGuide Operations Center. In addition, from its position within the TransGuide Operations Center, San Antonio PD is able to provide updated incident information, including traffic conditions and lane closures, and interface with TxDOT's traveler information system.

1.2.3 San Antonio FD

San Antonio FD also plays a critical role in managing traffic incidents in the San Antonio metropolitan area. Primary roles at the incident scene include fire protection and medical treatment that are provided by first responders. Special operations units within the department, each with unique apparatus and response equipment, also play a critical role in incident management in managing traffic incidents. The operations units include the following:

- **Fire Fighting Division**—Provides fire protection and medical first responder service from 48 different fire stations in the San Antonio metropolitan area. The Fire Fighting Division operates 15 first responder squads in fire stations designated as double companies (including both a pumper-truck and a truck).
- **Hazardous Materials Response Team (HMRT)**—Provides specially trained personnel at the site of a hazardous materials release who can perform the proper corrective actions to end the threat of a release or potential release of hazardous materials. The HMRT is also the primary response arm of the Weapons of Mass Destruction Domestic Terrorism Program. Members are trained to identify hazardous materials agents, assist in the collection of samples, and supervise mass decontamination operations performed by the Fire Suppression Division.
- **San Antonio EMS**—Provides advanced life support at the incident scene and transports patients to appropriate medical facilities. Medical control is also provided to San Antonio EMS by physicians via voice communication on a 24-hour basis (*4*).

The San Antonio FD is responsible for determining—through information provided by either the person placing the emergency call or another responder—whether HMRT needs to be dispatched along with responders from the firefighting division. As a result, at times it is necessary to dispatch both HMRT and the firefighting division because it is not always possible to determine whether an incident involves hazardous materials.

1.3 Site Contributors

Pat Irwin, Director of Transportation Operations, TxDOT, San Antonio District, hosted the site visit to the TransGuide operation center along with Captain Tom Polonis of the San Antonio PD. Additionally, Brian G. Fariello, Traffic Management Engineer, TxDOT, San Antonio District, hosted a tour of the TransGuide operation center that provided an opportunity to observe operations.

2 INFORMATION-SHARING METHODS

Incident responders in San Antonio have a long history of cooperatively managing traffic incidents. Underpinning these activities has been the ability to communicate and exchange information from both a planning and operational perspective. Described below are methods employed by the various incident responders in the San Antonio metropolitan area to share operational information.

2.1 Face-to-Face

To support incident management operations, TxDOT and San Antonio PD have multiple means of supporting voice communication. By virtue of their co-location in the TransGuide Operations Center, operations personnel are able to communicate face-to-face to support incident management operations. This has proven very useful in enhancing operations and fostering coordination and cooperation.

2.2 Remote Voice

The San Antonio PD dispatcher located in the TransGuide Operations Center, using one of two consoles, is also able to dispatch TxDOT courtesy patrols using the San Antonio PD radio system. Each courtesy patrol is equipped with a San Antonio PD mobile radio unit. Having the San Antonio PD radio in the courtesy patrol also enables TxDOT to communicate with San Antonio PD officers responding to incidents while in the field.

The city of San Antonio, in cooperation with Bexar County, is in the process of deploying a new trunked-radio system to support public safety operations throughout the city and county. Once implemented, this system will provide a common frequency for San Antonio PD, San Antonio FD, and TxDOT to communicate in the field while managing traffic incidents.

2.3 Text Transfer

San Antonio PD is able to provide TxDOT with incident data through an interface between San Antonio PD's CAD system and the TransGuide traveller information system. This interface enables incidents occurring on surface streets and the freeway network alike to be entered by San Antonio PD and displayed on the TransGuide website. However, this system does not provide TxDOT with the ability to modify incidents generated by San Antonio PD. This data interface was implemented during the initial phase of TransGuide.

2.4 Other Media and Advanced Methods

The TxDOT-operated TransGuide system includes CCTVs that are implemented on 73 miles of freeway throughout the metropolitan area. Although TxDOT maintains control of the cameras, video images are disseminated to the media and to the San Antonio City Hall via the City of San Antonio Wide Area Network (WAN).

The direct video connection serves two purposes. First, it enables live video to be broadcast to the public via the City Hall informational television channel. Second, the video signal is routed from City Hall to other incident responders, including City of San Antonio Public Works Department, San Antonio PD, San Antonio FD dispatch center, City Council office, and the city's emergency operations center, which is also located in the same building as TransGuide. Plans to upgrade the system include an external video switch that enables external users to view images that they select, as opposed to limiting images to those pre-selected by TxDOT.

In addition, TransGuide shares video with other emergency responders, the local media, and the public by broadcasting live video over a 1,000-watt, low-power television (LPTV) system (*5*). This system provides up to four views that are selected by the TransGuide operations staff. This system can also be used by incident responders to assist in determining what equipment and vehicles are the most appropriate for the response.

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APPENDIX H

SAN DIEGO, CALIFORNIA, CASE STUDY

1 INTRODUCTION

The California Department of Transportation, District 11 (Caltrans), and California Highway Patrol (CHP) have combined to coordinate transportation operations and communications during both normal and emergency operations in San Diego County. With respect to traffic incident management (TIM) and information sharing between the two agencies, this case study provides an analysis of

- Joint planning, development, and operations of the regional traffic management center (TMC);
- Roles and responsibilities of each agency in the context of TIM;
- Information-sharing methods and the supporting voice and data systems; and
- Technological and institutional issues that were addressed in developing data and communications systems, as well as issues that are operational in nature.

This case study also examines the San Diego Regional Computer Aided Dispatch Interconnect (InterCAD) project. The project that is designed to support improved traffic operations and incident management in the San Diego County portion of the Southern California Intelligent Transportation Systems (ITS) Priority Corridor. However, because of a variety of institutional and technological issues, the project was never fully implemented.

The following person was the primary point of contact for this site visit:

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1.1 Institutional Framework

1.1.1 Joint Planning and Development

A focal point of the institutional framework that supports TIM operations is the cooperation and coordination that was fostered by Caltrans and CHP through the planning and development of the regional TMC. A shared vision of operational requirements and supporting systems, as well as joint planning activities, ultimately resulted in the development of the TMC. The cooperative efforts of the champions began in 1992 and resulted in the TMC that serves the collective needs of the agencies and enables the agencies to coordinate incident management operations. This TMC became operational in 1996 and was the first fully co-located TMC in the state of California. The institutional coordination that led to the development of the TMC also provided the foundation to embark on an effort to develop a system interface between CHP and Caltrans information systems through the InterCAD project.

From an institutional perspective, another arrangement unique to the San Diego region with regard to cooperatively managing freeway operations in San Diego is that service patrols are funded by the San Diego Association of Governments (SANDAG). SANDAG is the metropolitan planning organization (MPO) for the San Diego region and includes representatives from each of the region's 19 local governments. This financial support demonstrates the importance that the region has collectively placed on providing travelers with safe and efficient transportation services.

1.1.2 Co-Location and Joint Operations

As mentioned, a focal point of traffic operations and incident management in the San Diego region is the TMC that was jointly developed by CHP and Caltrans. The purpose in developing the center was to develop a unified, co-located communications and command center for Caltrans Traffic Operations, Caltrans Maintenance, and CHP Communications. The TMC provides communications and surveillance functions that are critical during normal operations, special events, and incidents (during incidents, the TMC becomes a command center for traffic operations in the region).

The TMC was also designed to support operations that far exceed the normal day-to-day traffic operations. Depending on the prevailing conditions, the TMC can also serve as a central point of operations when federal, state, and local agencies have to coordinate operations with military, law enforcement, fire or civil agency efforts. As an example, the TMC has served as a focal point of operations for the Secret Service and FBI during Presidential visits to the region. In addition, the design of the center has provided eight console positions for the San Diego Sheriff's Office should they ever be needed during emergency operations or should their primary facility become inoperable (*1*).

CHP is operational in the center 24 hours a day, 7 days a week. Caltrans staffs the TMC 24 hours a day, from 8:00 p.m. Sunday through 8:00 p.m. Friday.

1.2 Roles and Responsibilities

1.2.1 Caltrans

Caltrans operates and maintains approximately 1,000 miles of freeways and highways in the San Diego region (District 11), which is the southernmost part of California. The Traffic Operations Department is responsible for the safe and efficient operation of all the urban freeways in the district, which includes supporting TIM functions. Caltrans functions supporting TIM include traveler information dissemination and traffic management.

A focal point of the traveler information dissemination activities performed by Caltrans is maintaining a traveler information website. Information provided by the website includes

- Real-time traffic speed on individual links of urban freeways,
- Snapshots of closed-circuit television (CCTV) images on I-5 and the I-5/I-805 and the I5/I-805 merge area (images are updated every 90 seconds),
- Current lane closures for construction and maintenance activities,
- Textual descriptions of operational problems and potential sources of delay on the freeways, and
- A link to the CHP website that provides filtered outputs from the CHP computer-aided dispatching (CAD) system on the location and type of incidents.

Additional traveler information functions supported by Caltrans include the operation and control of more than 20 dynamic message signs (DMSs) and a highway advisory radio (HAR) system. CCTV images are also disseminated to the media through this center. The traveler information system has become a vital element of Caltrans operations while managing the impacts of traffic incidents.

Traffic management functions supported by Caltrans include control of reversible high-occupancy vehicle (HOV) lane and ramp-metering stations and the collection of flow data that are used, among other reasons, to support traveler information functions. The operations of these facilities are many times adjusted to support operations during major incidents.

Caltrans also operates service patrols in the San Diego region through the previously mentioned cooperative agreement with SANDAG. Service patrols are operated Monday through Friday during the morning and afternoon peak periods. The primary function of the service patrol is to assist drivers of disabled vehicles and to help move their vehicles from travel lanes if needed. Service patrols do not actively participate in managing traffic incidents.

1.2.2 CHP

CHP operates a secondary public safety answering point (PSAP) from within the TMC 24 hours a day, 7 days a week. Cellular calls from the region are routed to the PSAP, and calls from call boxes are routed to this PSAP through a private call center. CHP also dispatches patrol officers from the TMC.

CHP is also the lead agency for the Multidisciplinary Accident Investigation Team (MAIT). The MAIT program was established to conduct in-depth investigation and analysis of major traffic collisions throughout the state. MAIT activities include determining the cause of crashes through

- Reconstruction of accidents and
- Analysis of contributing factors, including human, environmental, and/or mechanical factors in the pre-crash, at-crash, and post-crash states (*2*).

CHP also staffs a service desk from within the TMC that coordinates the dispatch of resources to the incident scene. CHP also supports traveler information functions through the broadcasts of traffic reports. A uniformed officer in the media office of the TMC broadcasts 37 traffic reports throughout the day.

2 INFORMATION-SHARING METHODS

2.1 Face-to-Face

From within the TMC, Caltrans and CHP staff communicate face-to-face in the course of managing incidents. The control room at the TMC has been specifically designed to support this type of interaction by arranging consoles in a manner that facilitates operator-to-operator contact. This arrangement has proven especially beneficial because it provides the opportunity to communicate openly as the incident evolves without being dependent on communications or data systems. This collaboration enables Caltrans to execute the most appropriate response in terms of traveller information and traffic management strategies.

2.2 Remote Voice

CHP communications officers located in the TMC are responsible for dispatching Caltrans service patrols. The only direct interaction between Caltrans and public safety agencies at the incident scene takes place during the crash investigation phase. Although the service patrols are not active participants in managing major incidents, they are responsible for moving disabled vehicles out of the roadway and providing motorist assistance. This function helps to reduce the probability of secondary incidents and helps to restore the facility to normal flow. To enable the service patrols to interact with their dispatchers, the service patrols are equipped with special Caltrans radios. The radio system only enables the service patrol operator to communicate with the dispatcher in the TMC. The service patrol operator cannot be a part of a radio talk group with CHP officers in the field.

Caltrans also has a direct phone line with the City of San Diego Fire and Rescue Department. Essentially, the Caltrans dispatcher is able to communicate with the fire department using speed dial. Caltrans rarely uses this system because CHP is usually the agency that contacts the fire department.

2.3 Text Messaging

Currently, Caltrans has an interface to the CHP CAD system. Caltrans characterizes this system as a “sanitized” CAD system. The system enables Caltrans operators in the TMC to enter additional detail into an incident record, but the record remains external to the CHP CAD system. Essentially, the CAD system is publishing incident data to Caltrans, which further processes the data in order to initiate the most appropriate response to the incident. This response is in the form of traveler information dissemination and traffic management. Caltrans has the capability to archive the CAD incident data provided by CHP; however, Caltrans has opted not to do this archiving.

CHP has also provides an interface to the Caltrans traveler information website. The interface enables users to view all active incidents that have been entered into the CHP’s CAD system. Data cannot be downloaded, archived, or processed.

Prior to implementing the existing CAD interface, an attempt was made to develop a CAD interface between CHP and Caltrans. The InterCAD project was designed to facilitate improved incident management in the San Diego County portion of the Southern California ITS Priority Corridor through the transfer of critical incident data between agencies using dissimilar CAD systems (*3*). The original concept for this ambitious project was to tie together the CAD systems of the CHP Border Division, the San Diego PD, the San Diego Sheriff’s Department, and the advanced traffic management system (ATMS) operated by Caltrans District 11. However, because of a variety of technical and institutional issues, the system was never fully implemented.

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APPENDIX I

SEATTLE, WASHINGTON, CASE STUDY

1 INTRODUCTION

Washington State Department of Transportation (WSDOT) and Washington State Patrol (WSP) have a long history of cooperatively managing traffic incidents in the Seattle metropolitan area, as well as developing and implementing data and communications systems that support traffic incident management (TIM). This section describes the institutional framework and initiatives that underpin these activities, as well as the roles and responsibilities of both WSDOT and WSP as they relate to TIM.

1.1 Institutional Framework

WSP and WSDOT have traditionally approached TIM in a coordinated and cooperative manner. Effective incident management in the Seattle metropolitan area is further supported by information sharing at the programmatic and operational levels. Three primary initiatives have set the stage for the institutional coordination and cooperation between WSDOT and WSP that have resulted in enhanced TIM activities through information sharing:

- A joint operations policy statement (JOPS),
- Joint development of a WSP computer-aided dispatching (CAD) system and the WSDOT Traffic System Management Center (TSMC) interface, and
- The Smart Trek Metropolitan Model Deployment Initiative (MMDI).

1.1.1 Joint Operations Policy Statement

WSP and WSDOT have cooperatively developed a working agreement referred to as a joint operations policy statement (JOPS). The purpose of the JOPS is to document the joint policy positions between the two agencies regarding issues of mutual interest in operating Washington State Highways. The WSP Chief and the Washington State Secretary of Transportation both endorse the JOPS for statewide implementation. The Seattle metropolitan region has taken the lead in implementing the concepts identified in the JOPS.

From an institutional perspective, the JOPS makes many references regarding programmatic directions that relate directly to TIM and the sharing of information, including the following:

- Leveraging the advantages of co-location, including WSDOT TSMCs and WSP dispatch centers.
- Sharing information needed to facilitate joint operations of highways. This idea may include but is not limited to CAD access and user training; real-time traffic flow, road, collision, and weather information; video surveillance; video road inventories; speed data; and geospatial data, including interchange drawings.
- Creating a joint policy for data sharing that includes, among other things, content and formatting, documentation and meta-data, collection and update methods and procedures, accuracy, update cycles, and stewardship. Memoranda of understanding will be used to document the sharing of information for the items addressed in the joint policy.
- Coordinating public information messages and outreach on issues that affect agencies and/or their customers. Sample areas of coordination include highway incidents, special events (such as winter and mountain pass driving), the "Give 'Em a Brake" campaign, or new policy initiatives such as "Steer it and Clear It."
- Communicating timely and accurate information to the public on traffic and travel conditions, including restrictions and information on incidents to allow the public to make decisions about their traveling convenience and safety.
- Assisting motorists with service patrols by clearing lane-blocking debris and disabled vehicles and their occupants and resolving other problems within the ability and scope of WSP and WSDOT.
- Coordinating all public and private resources in the effort to clear incidents within 90 minutes. This includes using resources to expedite responding to incidents, efficiently and effectively conducting needed investigations, and reducing highway lane and state-designated ferry route closures to a minimum.

A copy of the JOPS is attached to this appendix.

1.1.2 CAD-ATMS Integration

In the late 1980s, WSDOT and WSP entered into a joint venture to disseminate WSP CAD data to WSDOT. The activities that were required to develop, implement, and operate the system further illustrated the high level of institutional coordination and commitment of the two agencies. In early 2003, WSP and WSDOT entered into a federally sponsored cooperative agreement for a field operational test (FOT) to integrate intelligent transportation system (ITS) technologies and CAD systems from multiple vendors across organizational boundaries. This CAD-ATMS integration project is structured around WSP and WSDOT's capability to cooperatively manage multiagency incidents with significant multimodal transportation challenges, ranging from automobile crashes to natural and non-natural disasters.

WSP and WSDOT are cooperatively approaching the integration between CAD and the advanced traffic management system (ATMS) using applicable standards that enable exchange of traffic management information systems and public safety dispatch information systems. This integration will further facilitate existing exchanges of information between the WSP CAD system and the WSDOT TSMC information systems. Ultimately, benefits related to locating and responding to the incident, including on-scene activities and incident documentation, will be realized.

Commitment to cooperatively manage incidents is demonstrated in that WSDOT provided WSP with capital resources to help procure WSP's new CAD systems. WSDOT also has a technical representative supporting the procurement of the CAD system that is a focal point of this project and that will enhance the existing interface with WSDOT.

1.1.3 Smart Trek Model Deployment Initiative

WSDOT has a long history of cooperatively implementing, operating, and supporting advanced technologies with regional partners, like WSP, to support transportation operations and traffic incident management. Under the leadership of WSDOT and supported by WSP, the Seattle metropolitan area was selected in 1997 as one of four federally funded national Metropolitan Model Deployment Initiatives (MMDIs) that focused on aggressive deployment of regionwide intelligent transportation systems (ITS) (*1*). Seattle's MMDI efforts are collectively referred to as Smart Trek.

Recognizing the significant potential benefits of sharing information between WSP and WSDOT Smart Trek included a project that specifically addresses the need to share information between WSP and WSDOT—a regional fiber-optic backbone. The backbone interconnects a diverse coalition of regional, multimodal traffic and transit data and information sources. This interconnection improves capabilities to receive, process, and prepare freeway and arterial traffic and transit data for further distribution to ISP and to other users. The interconnection is also used for transportation research and the exchange of CAD data and has resulted in enhanced system monitoring and traffic control through a regional, multiagency, advanced transportation management system. The backbone enables video sharing between WSDOT and WSP.

The institutional structures that underpinned Smart Trek deployments also provided transportation and public safety agencies with the ability to cooperatively increase levels of service to the traveling public through the integration of traditional functions of traffic signal control; transit management; freeway management; incident management; emergency services management; and regional, multimodal traveler information services.

1.2 Roles and Responsibilities

Many of WSP and WSDOT's TIM activities and coordination result from longstanding working relationships between the two agencies. Roles and responsibilities of both agencies as they relate to TIM are detailed below.

1.2.1 WSDOT

WSDOT, created by the Washington State Legislature in 1977, is responsible for managing most of the state's transportation infrastructure, including approximately 7,048 centerline miles of state roadways. WSDOT is organized into executive staff, five service centers, three modal divisions, and six operating regions. The state's transportation infrastructure is managed through four major programs: maintenance, operations, preservation, and improvements.

Central to WSDOT's incident management functions are the incident response teams (IRTs) that are operated in each of its six regions. IRTs are specially trained groups of WSDOT maintenance employees who respond to blocking incidents on state highways and freeways. IRT vehicles are available 24 hours a day, 7 days a week, to provide traffic control, traffic rerouting, mobile communications, and incident clearance and clean up. IRTs also assist motorists with changing flat tires, jump starts, directions, and many other types of calls for assistance. WSDOT has operated the IRT program since 1990 (*2*). In the Seattle metropolitan area, IRTs are dispatched from the WSDOT TSMC. IRTs can be requested by WSP for assistance through communication with the WSDOT traffic system operations specialist.

In addition, to help support incident management efforts, WSDOT currently operates five traffic management centers (TMCs) throughout the state, including the Northwest Region TSMC that services the Puget Sound cities of Seattle, Everett, and Tacoma. The TSMC is the central processing and operational facility for freeway, tunnel, and selected arterial management systems in the Seattle metropolitan area. TSMC flow operations cover 124 miles on I-5, I-405, I-90, State Route (SR) 167, and SR 520. The current system includes 3,000 loop sensors that collect traffic flow data, more than 250 closed-circuit television (CCTV) cameras, a fiber-optic communication system, 113 ramp metering systems operating on 75 freeway ramps, and numerous motorist call boxes.

The TSMC is operational 24 hours a day, 7 days a week. The facility collects, integrates, processes, and disseminates regional freeway system information. The facility and the regional roadway ITS infrastructure include traffic surveillance to detect traffic flows on the freeways, fixed and pan-tilt-zoom CCTV to allow WSDOT operators to observe traffic on the freeways, and ramp metering systems to regulate the flow rate of traffic entering freeways. In addition, more than 45 variable message signs (VMSs) are installed on the freeways in the region, 7 highway advisory radio (HAR) stations are in operation, and several weather stations are distributed throughout the region.

WSDOT also has a history of working cooperatively with the media in the Seattle metropolitan area. This history enables the agency to offer accurate and timely traffic information to travelers. The area's major television stations have direct video connections that permit them to select the view of any CCTV camera. These stations also have a connection to (1) the "FLOW" congestion map for real-time traffic conditions and (2) information on construction activities and incidents. The FLOW map is available to the public on WSDOT's Internet home page and averages over 100,000 hits each day (*3*).

1.2.2 WSP

WSP is organized into seven bureaus that administer the activities of nearly 1,000 commissioned offices and more than 1,000 noncommissioned personnel. Bureaus include

- Field operations,
- Fire protection,
- Forensic laboratory services,
- Investigative services,
- Management services,
- Technical services, and
- Offices of the chief.

The primary response to traffic incidents on highways owned and operated by the state of Washington is provided by WSP. Duties administered by WSP include patrolling and conducting accident investigations on highways owned and operated by the state of Washington. WSP commissioned traffic officers also work traffic law enforcement. These positions include

- Traffic officers (troopers),
- Traffic sergeants,
- Traffic assistance detectives,
- Traffic assistant detective sergeants, and
- Lieutenants and command officers assigned to the field operations.

WSP is divided into eight geographical areas organized as districts. Troopers in District 2 (headquartered in Bellevue) are responsible for responding to incidents on state-owned facilities in the Seattle metropolitan area. WSP units involved in response to TIM include

- Office of the State Fire Marshall, Emergency Mobilization Section;
- Field Operations Bureau, Statewide Incident Response Team (SIRT);
- Investigative Services Bureau, Major Accidents Investigations Team (MAIT); and
- Technical Services Bureau, Communications Division.

The communications division of the WSP Technical Services Bureau operates a 24/7 statewide emergency communications system that includes eight centers statewide. The division provides emergency dispatch services for mobile units of WSP, the Department of Fish and Wildlife, the Liquor Control Board, the Department of Transportation, state parks, and federal agencies. Duties performed by the communications division include

- Receiving, relaying, and dispatching emergency calls for services;
- Dispatching services provided to line troopers and other state agencies;
- Providing assistance to the public via telephone or in person;
- Using CAD to dispatch officers to calls;
- Working with other law enforcement agencies and communications centers; and
- Answering all regional cellular 911 calls.

1.3 Study Approach and Methodology

In August 2002, specific data related to information exchanges between WSDOT and WSP were collected during site visits to (1) WSDOT's Northwest Region TSMC located in Shoreline, Washington, and (2) the WSP communications center located in Bellevue, Washington. Site visits provided researchers with the opportunity to observe data sharing and communication between the two agencies in the context of actual operations. Site visits entailed observations of actual operations and an extensive question and answer session. Periodic follow-up phone interviews were also conducted with the hosts to collect and verify additional information.

1.4 Acknowledgments

The key contributors to the Seattle case study are

- Jerry Althauser, Maintenance/Operations Superintendent—Traffic, WSDOT;
- Bill Legg, Assistant ITS Program Engineer, WSDOT—Washington State Transportation Center; and
- Linda Spaetig, WSP.

2 INFORMATION-SHARING METHODS

As mentioned, WSDOT and WSP have a long history of cooperatively managing traffic incidents in the Seattle metropolitan area. Various methods are used to communicate at the scene of the incident and between operations personnel in the communications or operations centers. Because of the maturity of the agencies and their level of institutional coordination, information-sharing activities between WSP and WSDOT serve as a model for many other transportation agencies and public safety agencies around the nation. Described below are the remote voice, text transfer, and other media and advanced methods that WSP and WSDOT use to communicate when managing traffic incidents.

2.1 Remote Voice

Voice communication at the incident scene between WSDOT and WSP is also accomplished using the WSP radio systems. IRT operators are equipped with WSP radios that enable the operators to communicate with officers responding to the same incident. Use of the WSP radio also enables WSDOT to communicate with local fire departments via a common frequency. This frequency does not enable WSDOT or WSP to communicate with fire dispatch.

The WSP call center and WSDOT TSMC communicate via an intercom system. This system enables the WSP dispatcher to communicate directly with a traffic system operations specialist in the TSMC communications center 24 hours a day, 7 days a week. Essentially, for after-hour calls, if a responding officer requests assistance from the IRT at the incident scene, the officer contacts the WSP dispatcher via radio and requests assistance. The WSP dispatcher then contacts a WSDOT traffic system operations specialist in the call center via the intercom system. The WSDOT traffic system operations specialist in turn dispatches the IRT to the incident scene. Conversely, if needed, the WSDOT traffic system operations specialist can contact the WSP dispatcher via the intercom system if needed.

2.2 Text Transfer

For many years, WSP has provided incident data to WSDOT via a WSP CAD terminal located in the TSMC. Information provided by WSP typically includes incident location, nature of the incident, and resulting lane closures. This information is filtered and read-only.

To enable the provision of data dissemination to WSDOT, data are collected in the field by the responding WSP officer. The officer enters the incident data into the CAD system at the scene, and the data are transmitted to the WSP call center in Bellevue. The data are then processed to remove any sensitive information, such as crash victim's name or vehicle tag information, and are then sent to the TSMC.

Upon receiving the data, operators in the TSMC manually enter the location, nature, and duration of the incident into WSDOT's traveler information system. This system includes website and 511 information. The traffic system operations specialist in the TSMC also has a WSP CAD terminal in the communications room. The traffic system operations specialist uses this information to dispatch the IRT and update traveler information.

The data sent via the current CAD system are archived. However, they are difficult to process for future analysis. The process of entering the data into the traveler information system is not automated. It must be keyed in by an operator in the TSMC. However, the new CAD-TMC integration will significantly increase the systems functionality, as will be discussed later.

Recognizing that the first generation of the system was beneficial, WSDOT and WSP are currently developing a next generation of the system to further enhance information sharing. To make this system deployment even more timely, WSP is in the process of procuring and installing a new CAD system for statewide use. This system will maintain state-of-the-art dispatching across the entire state of Washington and bring all dispatchers to a common platform. The two agencies have worked cooperatively in this procurement. Commitment to information sharing between the two agencies is further illustrated in that WSDOT has provided funding for WSP's procurement of the system and has provided a WSDOT representative on the procurement committee.

WSDOT operates the Condition Acquisition and Reporting System (CARS). WSDOT dispatchers use CARS to record accident, construction, traffic, and road condition events. CARS is viewed by WSDOT dispatchers to assist in roadway response, and it supplies a portion of the traveler information content in WSDOT's 511 system and Internet pages.

Further assisted by an FHWA cooperative agreement, the new WSP CAD system and the WSDOT CARS system will be integrated. As part of this system, three components will be developed to work together in a system called the Unified Incident Information System (UIIS). The overall vision for UIIS is to facilitate open communications between the WSP CAD system and the WSDOT CARS system in a manner that improves emergency response and traveler information distribution without causing any additional burdens on the already busy emergency response and radio operations staff. UIIS components include the following:

- **Primary Alert**—Serves as a direct line of communication from WSP to WSDOT. At the core of the primary alert is an institutional filter to ensure that only appropriate information reaches WSDOT and that any details not suited for public consumption are not exchanged. Within 1 minute from the time an event is entered into the WSP CAD system, a filtered report will appear before every relevant WSDOT CARS user. The filtered report will be geo-coded, and a map will be provided on an on-screen display.

  Using the institutional filter, data communicated from the WSP CAD system to WSDOT will include
  - The agency entering the incident,
  - The identification of the operator,

- The text of the message relating to the incident,
- The time and date on which the incident record is created,
- The location of the incident,
- The type of incident,
- The incident priority,
- The status of the incident,
- The incident detail, and
- The tracking number for the incident.

- **Response Support**—Enables the WSDOT traffic system operations specialist to provide WSP dispatchers with information about other conditions surrounding the incident location. As an example, traffic, construction, or adverse weather conditions that could affect the trooper's response will be provided to dispatchers to provide the safest and most efficient response. Response support respects any concerns from WSP about inserting elements of nonemergency into the CAD system. To make this noninvasive, a dynamic web page with the conditions will be created that can be linked to and from the WSP CAD system.
- **Secondary Alert—**Offers a direct line of communication to a number of secondary responders, including emergency medical services (EMS), towing and recovery service providers, and utility companies. Secondary alert transfers incident information to responders about events in the WSP CAD system and the WSDOT CARS system.

2.3 Other Media and Advanced Methods

Another element of information sharing between WSDOT and WSP is the exchange of video images. WSDOT currently operates more than 250 CCTVs throughout the Seattle metropolitan area. Cameras are currently deployed on SR-167, I-5, I-405, SR-520, SR-99, and SR-90. More cameras are continually implemented throughout the Seattle metropolitan area and further enhance WSP's ability to monitor traffic.

Through an operational agreement, WSDOT provides WSP with the images from these cameras. In addition, WSDOT provides WSP with secondary control of the cameras. This function enables WSP to view the incident scene, verify incidents, and dispatch additional officers if needed. As with the CAD data, CCTV images are communicated to the call center via the fiber-optic backbone that, as previously discussed, was a project included in Smart Trek.

3 REFERENCES

1. The Metropolitan Model Deployment Initiative (MMDI) was an aggressive deployment of ITS at four urban sites: New York/New Jersey/Connecticut, Phoenix, San Antonio, and Seattle. These sites were chosen because of their high level of pre-existing ITS and because of the promise of evaluating the integration of these legacy ITS components together with new ITS components.
2. Washington State's Incident Response Team Program Evaluation. Washington State Transportation Center (TRAC). Draft Final—Research Project T9903, Task 58. May 1997. Prepared for Washington State Transportation Commission.
3. Systems Overview Specification. Metropolitan Model Deployment Initiative Project of the Washington State Department of Transportation, Regional and Local Partners, Commercial and Academic Partners, and the United States Department of Transportation. Version 2.0—March 23, 1999. http://depts.washington.edu/trac/mdi/partners/pdf/sos.pdf

ATTACHMENT TO APPENDIX I

A JOINT OPERATIONS POLICY STATEMENT

"The purpose of this Joint Operations Policy Statement is to document the joint policy positions between the Washington State Patrol and the Washington State Department of Transportation regarding issues of mutual interest in the operations of Washington State Highways. This policy statement supercedes the "WSDOT/WSP Interagency Joint Operations Policy Statement - Jan. 19, 1999."

Chief Ronal Serpas
Washington State Patrol

Date: Feb. 13, 2002

Secretary Douglas B. MacDonald
Washington State Dept. of Transportation

Date: Feb. 13, 2002

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1. Agency Missions and Organizational Alignment

a) Washington State Patrol

The Washington State Patrol (WSP) was established in 1921 and operates under the authority of R.C.W. 43.43.010, which gives full police powers to the commissioned officers of the department. The Washington State Patrol is comprised of the following six bureaus;

- Field Operations Bureau (FOB)
- Investigative Services Bureau (ISB)
- Technical Services Bureau (TSB)
- State Fire Protection Bureau
- Forensic Services Bureau
- Management Services Bureau

The Chief of the WSP commands all department employees. The chain of command continues as follows;

- Deputy Chiefs are appointed by the Chief, this person is in charge of a bureau.
- Captains are appointed by the Chief, these people command a district or other command area and are accountable to a bureau commander;
- Lieutenants are appointed on a permanent basis from a promotional list; they command a section, unit, or other command area and are accountable to a captain;
- Sergeants are appointed on a permanent basis from a promotional list; they supervise a section, detachment or unit; and
- Trooper are a permanent appointment by the Chief upon graduation from the academy

The Washington State Patrol (commissioned) traffic officers work traffic law enforcement or in direct support of traffic enforcement. These positions include:

- Traffic officers (troopers);
- Traffic sergeants;
- Traffic assistance detectives;
- Traffic assistance detective sergeants; and
- Lieutenants and command officers assigned to the Field Operations Bureau

The WSP is divided into eight geographical areas designated as districts. A captain who is directly accountable to the FOB commander commands each of these districts.

The distribution of troopers is based on service needs within each districts' Autonomous Patrol Area (APA). An APA is an area within a district where specific detachments patrol and respond to calls for service.

Some investigations may require immediate response and investigation. The Traffic Investigation Division (TID) provides specialized investigative services. Upon receiving notification from a traffic sergeant or a district command officer the appropriate TID supervisor shall assign a detective to conduct follow up investigations. The TID commander (captain) is directly accountable to the ISB commander.

The Commercial Vehicle Division (CVD) is responsible for commercial vehicle safety requirements, to include freight terminal safety audits under R.C.W. 46.32.080. The CVD commander (captain) is directly accountable to the ISB commander.

The communications division is responsible to expedite communications between mobile units and District offices as well as other governmental agencies and the general public. The regional communications centers are located at the district headquarters offices. These communications centers operate 24 hours a day to ensure timely response and availability for calls for service. The Communications Division manager is directly accountable to the TSB commander.

The Property Management Division (PMD) is responsible for providing facilities management through the capital and operating budget process. The PMD manager is directly accountable to the Management Service Bureau. This division consists of the following three sections:

- Fleet;
- Supply; and
- Property Management.

The Information Technology Division (ITD) provides the WSP with technology and software engineering, as well as field support. This includes mobile radio and statewide telecommunications (microwave, data, and voice). The division also provides project management, application development, a 24-hour help desk, and system maintenance. The ITD manager is directly accountable to the TSB commander.

The Government and Media Relations office serves two functions for the Office of the Chief. The commander of this office (captain) serves as the WSP's legislative liaison, responsible for coordinating agency legislation with legislators, committees, and other state agencies. The liaison also reviews and seeks input from interested stakeholders on agency legislation and answers policy questions for legislative constituents. This office also handles all statewide media relations for the agency.

Budget and Fiscal Services is responsible for the management off all WSP financial activities and allotting the department's operating and capital budgets. The commander (captain) of this office is directly accountable to the Management Service Bureau.

b) Washington State Department of Transportation

The Washington State Department of Transportation was first created by the State Legislature as a State Highway Department in 1905. It was further organized into highway districts (the precursor to today's Transportation Regions) in 1925. In 1951, the State Highway Commission was formed to govern the Highway Department. Further, the Highway Department also assumed the functions of the then Puget Sound Ferry System. In 1977, today's Department of Transportation was created.

The Transportation Commission governs the policy and budget actions of the Department, as well as selecting the Secretary of Transportation. The Commission is a seven member body, appointed by the Governor, and represents all transportation interests in Washington. Commissioners serve six year terms and no more than four of them can be from the same side of the state or affiliated with the same political party.

The mission of the WSDOT is to "keep people and business moving by operating and improving the state transportation systems vital to our taxpayers and communities." The Department of Transportation is organized with a headquarters function to provide centralized guidance and a field function to provide decentralized implementation of transportation policies. The Secretary of Transportation is an ex-officio member of the Transportation Commission and is the chief executive officer of the DOT. The Office of the Secretary of Transportation contains the following functions:

1. Chief of Staff
2. Engineering and Regional Operations Division
   This Division includes Planning and Capital Programs, Environmental and Engineering Programs, and Maintenance and Operations Programs. The Maintenance and Operations Programs include the Maintenance Office; Traffic Office; Facilities and Equipment Office (which includes Radio) and Employee Safety Programs.
   Four of the six transportation regions report to this Division (Southwest, North Central, South Central, and Eastern)
3. Northwest Division
   This Division includes the Northwest Region, the Olympic Region, and the Urban Corridors Office.
4. Washington State Ferries
5. Administration and Support
6. Audit Office
7. Equal Opportunity Office

DOT Transportation regions are led by Region Administrators who report to the Office of the Secretary. The Region's boundaries were originally determined based on the number of state highway centerline miles in each region and are divided into the Northwest, North Central, Olympic, South Central, Southwest and Eastern Regions. With few exceptions, each Region manages the maintenance, operations, and construction activities within their geographical boundaries.

c) Joint Operations

Policy: Valuable coordination has resulted from numerous facilities where WSP and WSDOT have co-located operations. It is the policy for WSP and WSDOT to continue to leverage the advantages of co-locating including WSDOT Traffic Management Centers (TMC's) and WSP dispatch centers.

Roles: Reviews of joint operations will be conducted annually.

Action: WSDOT and WSP will continue to implement plans for joint operations centers where co-location has not yet occurred.

2. Data Sharing

a) General

Policy: It is the intent of the WSDOT and WSP to share information needed to facilitate joint operations of state highways. This information is envisioned to consist of things like:

- CAD access and user training
- Real time traffic flow, road, collision, and weather information
- Video from surveillance cameras
- Video road inventories, like SRView
- Speed Data
- Geo-spatial data, including Interchange Drawings

Roles: WSP and WSDOT will create a standard for data sharing. Such as:

- Data content and formatting
- Data documentation and Meta-data
- Data collection and update methods and procedures
- Data accuracy
- Data update cycles
- Third party data
- Stewardship

Information will be shared between agencies at the same cost as if the information were shared between programs within the agency. (Cost recovery data will be shared at the same rate). Memorandum of Understandings will be used to document the sharing of information, which would cover the items addressed in the standards.

Action: WSDOT and WSP will work to transition the collision data reporting system from WSP to WSDOT per the budget notes of the 2001 Legislative Session. This will require joint development and support of the needed legislation in the 2003 Legislative Session.

b) Budget

WSDOT and WSP will strategically plan and coordinate the development of budget initiatives that involve activities performed by both agencies before submittal to OFM and the Legislature.

OFM Budget Instructions include the following Statement:

> "If applicable, agencies should describe key programs or initiatives involving major partners, such as other state agencies. The description should include a clear statement of each partner's responsibilities. We strongly encourage agencies to coordinate with these major partners and with OFM during the budget development process to share initiatives and plans."

3. Traffic Management

a) Coordinated Public Communication

Policy: It is the policy of WSDOT and WSP to coordinate public information messages and outreach on issues that affect both agencies and/or their customers. Sample areas of coordination include highway incidents, special events such as the winter and pass driving, "Give 'em a Brake" campaign, or new policy initiatives such as "Steer it and Clear It" and the Operations Initiative.

Roles: WSDOT will disseminate road and traveler information through the HAR, VMS, web and 1.800.695 ROAD phone line. WSP will disseminate road and traveler information by referring citizens to the WSDOT site and through its communications centers and public information officers.

i) Traveler Information

Policy: Communicating timely and accurate information to the public on traffic and travel conditions including restrictions and information on incidents allows the public to make decisions about their traveling convenience and safety. To accomplish this important communication activity it is the policy of WSDOT and WSP to provide information using Highway Advisory Radio (HAR), Variable Message Signs (VMS), the Internet, telephone hotlines, and through partnership with the media. It is the policy to ensure that this information is updated within 10 minutes of a change in conditions.

Roles: It is the role of the WSDOT Traffic Management Centers (TMCs), and Washington State Ferries (WSF) Operations Center functioning as a TMC, to communicate using the various tools mentioned above the traffic and travel conditions and restrictions. The TMCs will disseminate the messages with proper coordination with WSP and WSDOT Public Information Officers.

It will be the role of WSDOT Maintenance, WSDOT Incident Response Teams, WSF Operations Center, WSDOT sponsored Service Patrols and WSP to provide the TMC's and the public with accurate and timely information on the status of emergency responses and traffic conditions.

Reference: Chapter 2 of the WSDOT Traffic Manual (M 51-02). Policy on the use of VMS, Policy on the use of HAR.

Action: WSDOT TMCs will work with WSP Districts to develop standard operating procedures for use of HAR, VMS, Hotlines, the Internet, etc.

ii) Media

Policy: It is the policy of WSP and WSDOT that press releases affecting the other agency will be shared with the affected agency prior to their release.

b) Service Patrols

Policy: During peak congestion periods, on some of the most heavily traveled freeways, roving service patrols will assist motorists by clearing lane-blocking debris, disabled vehicles and their occupants, and resolving other problems within the ability and scope of the WSP and WSDOT.

Roles: WSDOT TMC managers will administer day-to-day management of WSP Agreements and Registered Tow Truck Operators (RTTO) Contracts for these Service Patrol services. In addition, WSP will provide some service patrols using cadets.

Reference: WSDOT Agreement GCA - 1932; GA Procurement Contract 13199; Service Patrol Study, Nov. 14, 1998; Evaluation of Service Patrol Program, August, 2001 draft.

Action: Working with WSP, the Washington Tow truck Association (WTTA), and the WSDOT TMC in the Tacoma area, initiate a pilot test of "expedited tow, or instant dispatch", as recommended in the November, 1998 Study. Also, WSDOT will advertise for a "renewable term" RTTO contract through the Dept. of General Administration. Finally, WSDOT and WSP will jointly develop a plan for education legislative membership on the decision package to expand service patrols.

c) Enforcement processes

Policy: The quality of life in Washington State is heavily dependent upon the free movement of people and vehicles. The WSP and the WSDOT share the responsibility for achieving and maintaining the degree of order necessary to make this free movement possible. Implicit in the objective of facilitating the movement of people on the interstate and state route systems and state designated ferry routes, is the overriding concern for their safety.

The WSP, in cooperation with the WSDOT, support enforcement processes that facilitate the efficient movement of people and vehicles that travel on the interstate and state route, and state designated ferry route, systems. This includes, but is not limited to the necessary enforcement of traffic laws and regulatory signs (i.e. HOV and Required Traction Devices), the investigation of traffic collisions, and the direction of traffic to facilitate the safe and expeditious movement of vehicles and pedestrians.

Roles: In order to obtain compliance with traffic laws, provide the necessary and appropriate driver education, and to develop driver awareness of the causes of traffic collisions, WSP officers issue warnings, infraction notices, cites, or arrests traffic violators. WSP officers are aware of and sensitive to the fact that these enforcement processes can contribute to traffic congestion.

Action: WSP officers will take the necessary steps to mitigate the traffic congestion caused by enforcement processes whenever possible.

d) Incident response

Policy: The WSP and WSDOT will collaborate to respond to incidents and coordinate all public and private resources in this effort to work toward clearing incidents within 90 minutes. It is the policy of WSP and WSDOT to effectively use resources to expedite responding to incidents, efficiently and effectively conduct needed investigations, and reduce highway lane and state designated ferry route closures to a minimum.

Action: WSP will begin conversations with emergency medical services and fire districts to explore ways to reduce highway incident blockage time.

i) Road Ranger Program

Policy: The WSDOT will deploy Road Rangers on congested freeways and highways where and when incidents cause significant congestion. These well-coordinated, strategically positioned, fleet and qualified staff will rove in a service patrol mode (see above) during the hours of the day when congestion occurs and will respond to incidents when they occur.

Roles: During major incidents (incidents lasting 30 minutes or more), the priorities for Road Rangers are to first, coordinate with WSP, emergency responders, and second, provide traffic control for a safe incident zone, and third, provide incident and traffic condition information to the TMC for traveler information.

If funded in the WSDOT budget request, the WSP will deploy the helicopter to respond to serious incidents with an estimated clearance time of 45 minutes or more to first, expedite investigations of incidents, and second, provide incident information and traffic condition information to dispatch centers and TMCs, and third, provide a tool for traffic management.

Reference: IRT manuals, procedures, training to be identified.

Action: WSP and WSDOT Identify where and when Road Rangers and the helicopter should be deployed and jointly support funding to implement needed resources.

ii) Hazardous material handling

Policy: On all state and interstate highway corridors and in other political subdivisions that have designated the State Patrol as Incident Commander, the first arriving Trooper at the scene of a collision involving hazardous material will assume the role of Incident Commander. Other "first responders" will be trained to recognize hazardous materials and follow procedures to ensure qualified clean-up resources are available to expedite the removal of hazardous materials. The policy of WSDOT and WSP is to coordinate the removal of hazardous materials within the targeted time frame of 90 minutes.

Roles: WSDOT Traffic Office, WSF and WSP Field Operations will work with Department of Ecology and/or the USCG as appropriate/necessary to identify how hazardous material clean-up will be accomplished within the time needed to meet the target of clearing incidents within 90 minutes. WSF must also work with both the WSP and the U.S. Coast Guard, who has ultimate authority over WSF actions in a hazardous materials spill on a vessel.

Troopers and other first responders will attempt to identify the hazardous material, divert traffic, isolate and evacuate the area and deny entry. The trooper or other first responder will also make initial notifications necessary to deal with the incident; including fire, EMS, Department of Ecology, etc. Under the Unified Command System, troopers will then direct a coordinated response to the incident with assistance of other agencies at the scene.

Hazardous material incidents occurring at weigh stations will result in the immediate closure of the weigh station, isolation of the vehicle, evacuation of the area and denying of entry. Assistance will be requested and the first trooper arriving on the scene will assume Incident Command.

Action: The WSDOT Traffic Office will share this joint operations policy statement with DOE and U.S. Coast Guard to explore the options available to achieve the 90 minutes clearance time goal for hazardous materials.

iii) Tow truck use

Policy: It is the goal of both agencies that all incidents be cleared from the roadway and shoulder within 90 minutes. In order to achieve this objective, the right tow equipment (capable, certified, qualified operator), at the right price (contract, rotational list, etc.), will always be available at the time needed.

DOT/WSP will work together to address policy issues surrounding incidents where major clean up is required. Issues that need to be addressed are:

- Is there a way to reimburse tow companies for the “extras” which are associated with removal of materials from the scene?
- Does DOT have equipment available around the State to help the tow companies with the clean up?
- Since insurance companies do not always cover all costs, how will tow companies be reimbursed for cleanup?

Roles: WSP will initiate any changes necessary to their existing tow truck usage arrangements with the tow industry to ensure effective tow assistance

References: Existing rotational contract(s); certification requirements; tow categories/capabilities vs. estimated vehicle weights chart, and WAC’s.

Action: WSDOT’s Regional Administrators and WSP’s District Commanders will develop tailored incident response and tow truck usage for each region of the state. In all but rare exceptions, the WSP tow truck rotation list will be used. The WSDOT Traffic Office will evaluate the need to expand tow-away zones around the state. In conjunction with tow operators, WSP will re-evaluate the opportunity of including pay incentive clauses to current tow contracts.

iv) Accident clearance and civil liability (Damaged Load Clearance)

Policy: Traffic congestion caused by incidents has an enormous economic cost to society. This cost is often much greater than the value of trying to salvage a damaged load of cargo involved in a crash. It is the policy to remove the collision debris (and cargo) for the purpose of opening traffic lanes as a higher priority over attempting to salvage portions of the cargo. Salvage operations will be scheduled during non-peak hours of travel.

Roles: WSDOT Maintenance and Traffic Offices will develop and train its forces on a Damaged Load Clearance Policy in coordination with WSP, WSDOT Risk Management and the Attorney General. WSDOT Maintenance and Incident Response will coordinate with WSP during individual incidents to implement this policy. WSDOT will work with communications and regions to provide information about this policy to the trucking associations.

Action: WSP and WSDOT will develop a "Damaged Load Clearance Policy." Also, both agencies will support passage of legislation to implement rapid movement of damaged but drivable vehicles (e.g., SB 5961, "Steer It – Clear It").

v) Using technology to expedite investigations

Policy: Every effort will be made, in a coordinated fashion, to achieve all responders' objectives at incident scenes and to have roadways open and/or ferries operating in less than 90 minutes. Technology which reduces the scene investigation time will be part of achieving this goal. Therefore, WSP and WSDOT will aggressively pursuer new technologies to expedite investigations.

Roles: WSP, with assistance from WSDOT (traffic control, equipment, survey technologies, etc.) will take the lead in evaluating candidate technologies.. The WSDOT Design Office Computer Aided Engineering Branch provides training and some support to the State Patrol for total stations and other survey technologies that they use to collect data at accident and crime scenes.

Action: WSP will take the lead in forming a joint task force to identify procedures for reducing accident investigation time to achieve the 90 minute goal of clearing incidents.

vi) Incident Command System

Policy: WSP and WSDOT agree to use the Incident Command System (ICS) for all highway incidents and disaster management activities that warrant its use.

In the event of an incident necessitating emergent response on a ferry or at a terminal, WSF will use the ICS as the response organization. The ICS will be set up in the WSF EOC at the Colman Dock in Seattle.

Roles: WSP will provide joint agency and industry ICS training to facilitate communication and accomplishment of joint objectives.

e) Event planning

Policy: Periodically events are held on state highways or on WSF ferries by municipalities or other organizations or private entities. It is the policy to allow such events on non-limited access facilities provided that the transportation effects of the event are well publicized and a traffic control strategy is developed by the event organizer and approved in advance.

Roles: WSDOT HQ Traffic Operations Office, WSF Operations Center and Region Traffic Engineers' Offices approve events with coordination with State and Local law enforcement, allowing for adequate public communications lead-time. WSP is often asked by event organizers to provide police services during events at the expense of the event organizer.

Reference: Traffic Manual Chapter 7; MOU with WSP for special events/filming.

f) Disaster Response

Policy: The Washington State Comprehensive Emergency Management Plan (CEMP) establishes the policy under which all state agencies will respond to emergencies and disasters.

Action: The WSP and WSDOT agree to enhance existing procedures that will provide additional protection measures for the traveling public and the transportation system. Specifically, WSP and WSDOT will meet at least annually to discuss opportunities for improvement in disaster response and to establish cooperative partnerships with other emergency response agencies to increase our effectiveness. Lead participants for setting up the annual meeting will be Terry Simmonds (WSDOT) and Steve Kalmback (WSP). Separate meetings will be held for WSF. WSF has worked with WSP in the past to conducted exercises as part of disaster response planning, with other organization participation such as the US Coast Guard.

g) Winter driving

Policy: WSP and WSDOT acknowledge that proper communications, signage, and enforcement are key to providing safe motorist travel during the winter season. Each agency will respond to requests for service by the other with a joint commitment to enhancing motorist safety and mobility.

Action: WSP and WSDOT agree to hold a "Winter Summit" meeting before each winter season to discuss tactical response plans and to discuss any changes from the previous winter. In addition, WSP and WSDOT agree to hold a "Winter Debrief" meeting in the spring to discuss challenges and opportunities from the past winter and develop action plans for the upcoming winter. Lead participants for setting up the summits are Brian Ziegler (WSDOT) and Lowell Porter (WSP).

4. Work Zone Safety

Policy: Each day, highway workers are placed in hazardous circumstances working near traffic. Their safety and the safety of the traveling public is the top priority of WSDOT and WSP. It is the policy to achieve the highest level of safety in work zones through working together to maintain or improve work zone safety in those areas that will benefit from combining the expertise and resources of both agencies.

Roles: WSDOT will develop effective work zone strategies to ensure the safety of workers and the traveling public. WSP will enforce existing and new regulations in work zones based on methods to most effectively encourage motorists to traverse work zones in a safe manner.

WSP and WSDOT will work together through the Work Zone Safety Task Force to:

- Enforce traffic regulations in work zones
- Coordinate work zone strategies
- Develop and provide work zone training
- Develop and implement public information/education strategies
- Develop and support work zone safety legislation
- Develop and support new technologies to aid work zone safety
- Communicate work zone safety issues and provide recommendations
- Update procedures and standards
- Combine resources such as funding, equipment and workforce
- Address worker safety and security issues

References:

- WSDOT Instructional Letter, IL 4008.00
- WSDOT/WSP Agreement, GC 9131
- WSDOT Executive Order, E 1001.00
- WSDOT Policy Statement, P 2002.00
- WSDOT Manual, M 54-44
- Guidelines for WSP Traffic Control Assistance in Work Zones
- Guidelines for Security in Work Zones
- WSP Field Checklist, WSDOT Form 421-045 EF
- Proposed Procedures for WSP Traffic Control Assistance in Work Zones
- RCW's, section 46.61, several work zone-directly related (.015, .215, .527, etc.)
- RCW's, section 47.48, several work zone-indirectly related (closures, speeds,etc.)
- Directive, D 55-20, Reduced Speed in Maintenance and Construction Zones

Action: Currently, WSDOT and WSP are working together on a pilot project that will help to define new more effective procedures. The results of the pilot project will be reported in spring/summer of 2002, recommendations will be made and existing agreements and guidance will be updated.

Also, WSDOT may some day be delivering an expanded highway construction program. This will require an increased commitment of WSP resources to provide acceptable safety levels in more work zones. Therefore, WSDOT and WSP will jointly approach the legislature for the necessary increase in WSP resources.

5. Commercial Vehicles

a) Weigh Stations

Policy: The WSP and WSDOT agree that there is a need for fixed and portable weighing sites throughout the state. These sites include Plug and Run sites as well as other locations without permanent in-ground scales.

Roles: The role of the WSP is to identify where the portable weighing sites should be located and the role of the WSDOT is to prepare paved and level sites for conducting portable weighing events.

b) Permitting and Weight Enforcement (include curfews)

Policy: The WSDOT and the WSP recognize the need to move over-legal size loads as well as the need for a permitting process to regulate over-legal moves in order to provide for the safety of the motoring public, preserve the infrastructure and assist industry in completing their move.

Roles: RCW 46.44.090 authorizes the Department of Transportation to issue permits, authorizing the permits to operate or move a vehicle of a size or weight exceeding the maximums specified by law. The Washington State Patrol is one of several agents appointed by WSDOT to assist in issuing oversize and overweight permits. The State Patrol is charged with responsibility of enforcement of oversize and overweight permit use.

RCW 46.44 charges the WSP with enforcement of size and weight laws. Five permanent Port of Entry scales located on the interstate system are operational 24 hours per day, 7 days per week. Forty-seven other permanent scales are located throughout the state and operated on an as-needed basis. Portable scales are utilized in locations without scales as well as scale by-pass routes.

Action: WSP will also continue to work with DOT in selling permits at the Port of Entries. In collaborative manner we will work to streamline process through the use of technology and provide the best service possible to the trucking industry. The WSDOT and WSP also recognize the need to meet regularly, typically monthly, to review the relationship of administration and enforcement of the State's vehicle size and weight laws and rules. The WSDOT and the WSP jointly share in the preparation of the State's annual certification to FHWA, certifying that both state and federal law have been properly applied and enforced on the national highway system.

c) Commercial Vehicle Safety Inspections

Policy: Commercial vehicle safety inspections are required by the federal government. Also, a commercial vehicle examination (CVE) program conducted at WSF vehicle terminals, which supports both the safety and security of WSF is an integral and important part of the WSP vessel and terminal security program.

Roles: The Washington State Patrol performs safety inspections on commercial vehicles traveling in the state. Inspections are conducted by WSP at three inspection buildings located at the Ridgefield, Bow Hill, and Cle Elum weigh stations. Level 1, 2 and 3 inspections are also performed in weigh station parking lots and safe, designated roadside areas throughout the state. Vehicles with severe violations may be placed out of service until repairs are made.

Action: WSDOT will continue to advocate for use of its highway construction funding to build necessary commercial vehicle safety inspection facilities.

d) CVISN / WIM

Policy: It is the policy of the WSP, WSDOT, DOL and the Washington Trucking Associations (WTA) that the CVISN and WIM program will provide a framework for "architecture" that will enable government agencies, the motor carrier industry, and other parties engaged in CVO safety assurance and regulation to exchange information and conduct business transactions electronically. The goal of the CVISN program is to improve the safety and efficiency of commercial vehicle operations.

The Washington State Patrol, Washington State Department of Transportation, the Department of Licensing and the Washington Trucking Associations are jointly participating in a program to increase safety and to protect the states' highway infrastructure and enhance the movement of freight by mobility of commercial motor vehicles. The program is entitled "CVISN" (Commercial Vehicle Information Systems and Networks). Additionally, the agencies have installed weigh-in-motion (WIM) at each of these scale facilities in order to weigh trucks while they are traveling on the mainline freeway system. Together these programs are also designed to check credential and safety information on a commercial vehicle at freeway speeds. If the truck is safe and legal, it is permitted to stay on the mainline and bypass weigh stations. The Washington State Patrol is responsible for installation and maintenance of the weigh-in-motion scales at sixteen high traffic volume weigh station sites.

Roles: The role of WSP will be to manage the weigh in motion systems and act as the end line user of the roadside screening systems. The role of DOL is to manage the electronic credentialing component of CVISN and the role of WSDOT is to manage the overall program and act as the system architect, selling of transponders, and database management. The role of the WTA, the private sector partner, is to market the overall CVISN/WIM program to the motor carrier industry.

References: Weigh Station Memorandum of understanding (between WSP and WSDOT) and DIS Information Technology Feasibility Study.

Action: The actions items for the 01-03 biennium are to deploy CVISN/WIM at three or four sites, Everett southbound, SeaTac north and southbound, and, if time and funds permit, Kelso southbound.

6. Joint Facilities

Policy: WSDOT and WSP will work collaboratively to assure that joint support facilities needs are identified and met economically, service to the public is enhanced, environmental impact is minimized, and investment in support facilities (buildings and related sites) is maximized. WSDOT and WSP will provide integrated workplaces that meet joint agency strategic goals.

Action: To support the vision stated above, the two agencies agree to:

- Coordinate Agency Capital Plans to facilitate new joint facilities development.
- Modify existing facilities to accommodate both agencies' missions.
- Exchange facilities where shifting operational requirements allow.
- Share vehicle fueling facilities.
- Outreach to other development partners that can help leverage lower cost / higher efficiency facilities, and
- Simplify inter-agency facilities agreements.
- Meet monthly to identify joint facility opportunities and develop facility security plans.

7. Wireless Communication

Policy: The WSP and the WSDOT agree to support a shared vision to create a coordinated and integrated wireless transportation communications for the safe, effective, and efficient protection of the traveling public. The agencies mutually agree it is their joint goal to implement a statewide wireless mobile communications network that is fully interoperable between agencies and workgroups to provide needed services to our field forces and support groups to benefit the citizens of this State.

The WSP and WSDOT provide public safety communications to many public safety organizations. These organizations include local, state, and federal public safety agencies whose missions encompass the protection of life and property. This joint vision is consistent with the development of a Statewide Interoperability Executive Committee (SIEC). In particular, the SIEC will be working for the sharing of resources to create the basis of an intergovernmental wireless public safety network. Resource may include, but not be limited to spectrum, facilities, equipment, staff, and systems.

The WSP and the WSDOT agree to view their respective wireless communication systems as a single wireless system to plan for and foster interoperability among existing wireless networks and future wireless development that meets the requirements of local, state, and federal public safety.

Roles: To support the vision as stated above, the two agencies agree to:

- Improve public safety wireless communications by addressing each of the five issue areas of interoperability – coordination and partnerships, funding, spectrum, standards and technology, and security.
- Listen to, learn from, and collaborate with local and state public safety officials to improve communications interoperability.
- Encourage the implementation of interoperability by developing short-term action plans that support the long-term strategy of developing and sharing a statewide transportation wireless communication system.

8. Washington State Ferries

Policy: The safety and security of passengers and crews onboard ferries and at the terminals leading to the ferries is a primary concern of both the WSDOT and WSP. The WSP is the law enforcement agency with primary responsibility for terminal traffic management on the designated state highways, vessel and terminal security, and emergent incident response for all criminal events such as assault, DUI, bomb threats or other acts of terrorism. In carrying out these roles, any of the possible activities listed in the table below may be used singularly or collectively in an effort to fulfill these responsibilities.

Roles: The WSP will work cooperatively with the Washington State Ferries to ascertain the most appropriate and cost effective use of resources. The WSP has committed to perform the following functions at WSF terminals and onboard vessels:

Activity	Resources	Particulars
Terminal traffic control and on scene presence	Dedicated Vessel and Terminal Security (VATS) troopers.	Direct/control vehicle/passenger traffic at various terminals typically focused on high passenger/vehicle density locations.
Random vessel boardings/ferry rides	Two trooper teams; at various times throughout WSF's daily operating period	Onboard presence in general passenger spaces or located in pilothouse. Focus on high passenger density routes and times.
Random vehicle inspections at terminals	Existing and/or supplemental Vessel and Terminal Security (VATS) troopers	Consensual vehicle inspections conducted on random intervals. Again, focus on high passenger density routes and times.
Commercial vehicle enforcement (CVE) exams	Dedicated CVE troopers possessing vehicle inspection training/skills	Random vehicle searches focused on commercial trucks at high volume terminals and times.
Bomb dog team sweeps	Bomb dog teams from East and West Puget Sound Districts	Random team sweeps at various WSF terminals focused on high passenger and vehicle traffic
Other visible uniformed presence	Supplemental WSP troopers	At various locations (terminal and vessel) dictated by WSP operational tempo
Emergency response	Any combination of resources list above	Response level and dedication of resources is situational, depending upon the circumstances presented.

9. Transportation System Security

Policy: WSP and WSDOT are committed to transportation system security and agency preparedness.

Roles: WSP is responsible for transportation system security.

Action: The WSP and the WSDOT jointly agree to develop a plan to enhance the security of the transportation system for the benefit of the traveling public and protection of the infrastructure. This plan will identify high cost/high consequence locations on the transportation system which warrant extra protection measures. This plan will include, but not limited to, (1) periodic routine patrols by WSP, (2) thorough WSP enforcement of signed no parking-tow zones, (3) increased monitoring of traffic cameras by WSDOT, and (4) scheduled random drive-by inspections of key transportation facilities by WSDOT maintenance employees. The plan will address threat levels and a joint escalating response commensurate with the threat level. Lead participants are Terry Simmonds (WSDOT) and Dave Karnitz (WSP).

WSF, U.S. Coast Guard, and WSP will be charter members of the WSF Security Committee aimed at assuring the secure operations of WSF during normal and heightened states of terrorist/criminal threats.

10. Safety Rest Areas

Policy: It is our intent that the WSDOT and the WSP will work together to ensure that operations of the Safety Rest Areas are conducted to maximize the public health, safety, and enjoyment of these very popular sites.

Roles: WSDOT has responsibility for operations and maintenance of Safety Rest Areas and WSP has responsibility for enforcement of laws and regulations.

Actions: Safety Rest Area maintenance and operations will be an agenda topic at each annual joint meeting to determine if any operational or enforcement emphasis areas are necessary to benefit the users of the Safety Rest Areas.

11. Policy Performance Measures

WSDOT and WSP will coordinate the development of performance measurements that involve activities reported on by both agencies before submittal to OFM and the Legislature. Both agencies will work collaboratively to develop joint measures for incident response and clearance times.

12. Policy training

Each agency commits to provide resources and expertise to share this policy internally and with key constituencies.

13. Policy Update Process

This policy will be reviewed annually at the WSP/WSDOT joint meeting. In advance of that meeting, each agency will survey internally to identify accomplishments that will be reported at the annual meeting.

14. Appendices

a) Key Personnel Contacts

b) Tables of Organization

APPENDIX A – Key Personnel Contacts

WSDOT (Washington State Department of Transportation)

Headquarters
John Conrad, Assistant Secretary, Engineering & Regional Operations, Olympia (360-705-7032)
Brian Ziegler, Director of Maintenance and Operations, Olympia (360-705-7801)
Ken Kirkland, State Maintenance Engineer, Olympia (360-705-7851)
Fred DeBolt, Equipment and Facilities Administrator (360-705-7880)
Toby Rickman, State Traffic Engineer, Olympia (360-705-7280)
Jim Shanafelt, Assistant State Traffic Engineer, Olympia (360-705-7282)

Northwest Region
Lorena Eng, Regional Administrator, Seattle (206-440-4762)
Tom Lentz, Maintenance Engineer, Seattle (206-440-4656)
Dave McCormick, Traffic Engineer, Seattle (206-440-4487)

North Central Region
Don Senn, Regional Administrator, Wenatchee (509-667-3001)
Bob Stowe, Maintenance Engineer, Wenatchee (509-667-3065)
Jennene Ring, Traffic Engineer, Wenatchee (509-667-3080)

Olympic Region
Randy Hain, Regional Administrator, Tumwater (360-357-2658)
Jerry Walter, Maintenance Engineer, Tumwater (360-357-2619)
John Nisbet, Traffic Engineer, Tumwater (360-357-2670)

Southwest Region
Don Wagner, Regional Administrator, Vancouver (360-905-2001)
Rick Sjolander, Maintenance Engineer, Vancouver (360-905-2020)
Chris Christopher, Traffic Engineer, Vancouver (360-905-2240)

South Central Region
Don Whitehouse, Regional Administrator, Yakima (509-577-1620)
Casey McGill, Maintenance Engineer, Yakima (509-577-1901)
Rick Gifford, Traffic Engineer, Union Gap (509-577-1985)

Eastern Region
J.C. Lenzi, Regional Administrator, Spokane (509-324-6010)
Larry Chatterton, Maintenance Engineer, Spokane (509-324-6538)
Ted Trepanier, Traffic Engineer, Spokane (509-324-6550)

WSP (Washington State Patrol)

Headquarters
Deputy Chief Lowell Porter, Field Operations Bureau (360-586-2340)
Deputy Chief Steve Jewell, Investigative Services Bureau (360-753-1770)
Deputy Chief Maurice King, Technical Services Bureau (360-753-4632)
Director Diane Perry, Management Services Bureau (360-753-5141)
Captain Fred Fakkema, Commercial Vehicle Division (360-753-0302)
Mr. Marty Knorr, Communications Division (360-438-5862)
Mr. Tom Neff, Property Management Division (360-570-9820)

District 1
Captain Dan Eikum, Tacoma (253-536-4301)

District 2
Captain Les Young, Bellevue (425-649-4650)

District 3
Captain Dave Karnitz, Yakima (509-249-6701)

District 4
Captain Mike Dubee, Spokane (509-456-3061)

District 5
Captain Carrie Greene, Vancouver (360-449-7901)

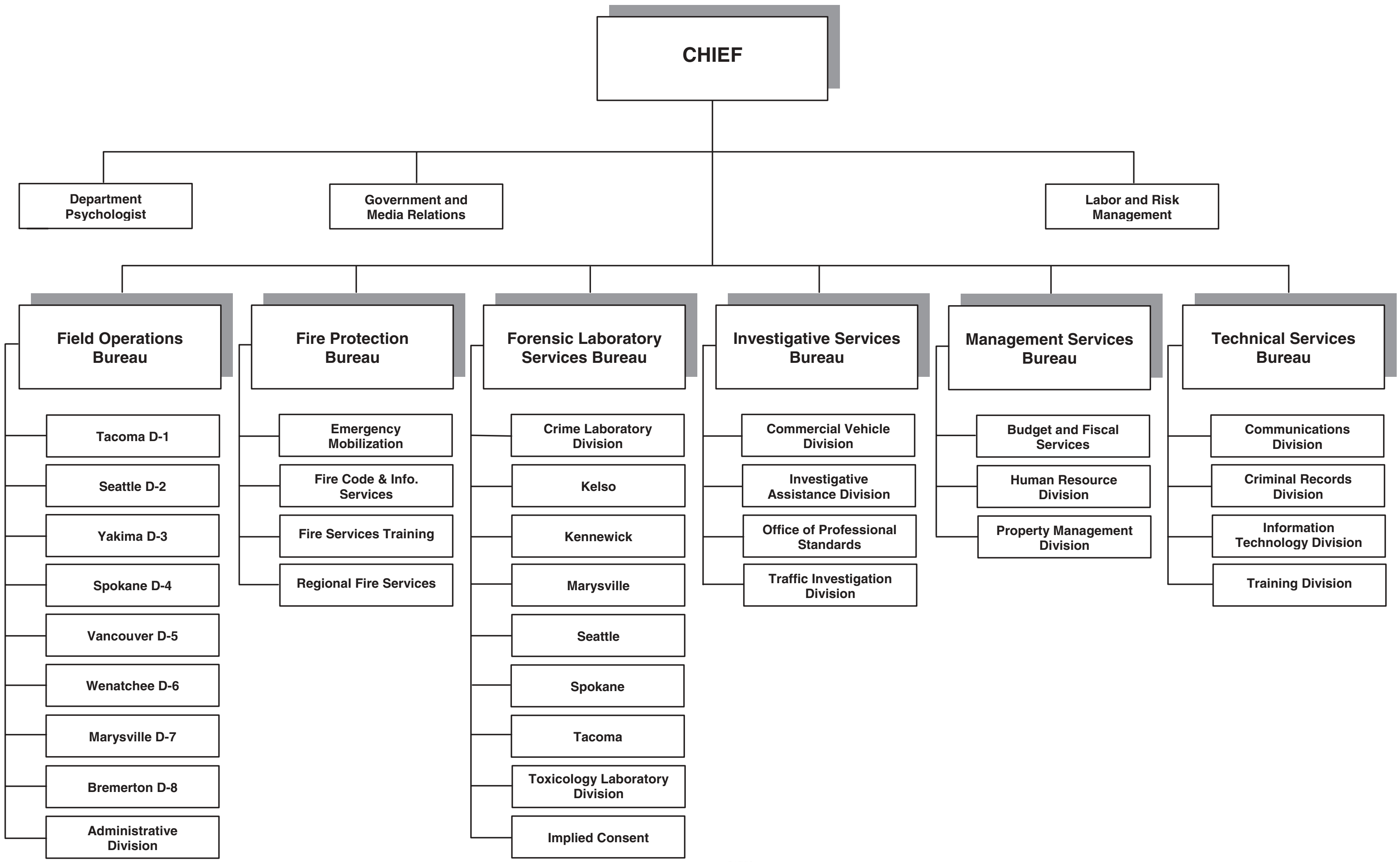
District 6
Captain Bill Larson, Wenatchee (509-665-4006)

District 7
Captain Bob Lenz, Marysville (360-651-6336)

District 8
Captain Gail Otto, Bremerton (360-405-6601)

APPENDIX B – Tables of Organization

WASHINGTON STATE PATROL
ORGANIZATIONAL CHART
JANUARY 2002



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Washington State Department of Transportation

Citizens of Washington State

Governor Gary Locke

Washington State Transportation Commission

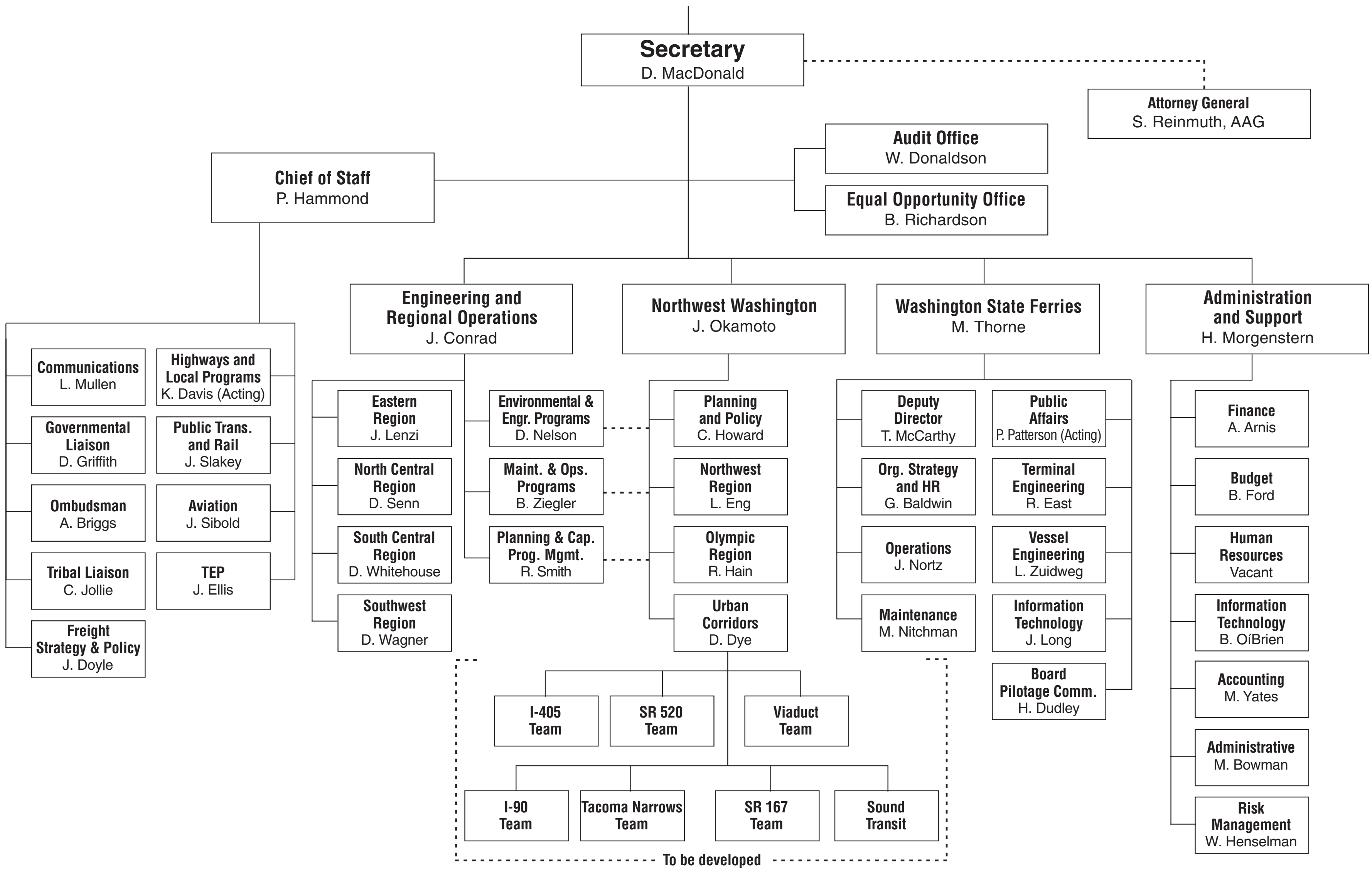
Christopher Marr, Chair

Ed Barnes
Aubrey Davis

Elmira Forner
George Kargianis

A. MichÈle Maher
Connie Niva

Douglas B. MacDonald   2/1/02
Date



Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation