Traffic Incident Management Gap Analysis Primer

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Traffic Incident Management

Gap Analysis Primer

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16. Abstract The research conducted for this gap analysis determined that there is no one-size-fits-all TIM program. As a result the recommendations contained within this document should be tailored towards the needs of the area in which the TIM program will be implemented. Not only should the needs of that area be considered but the capabilities and available resources of that area are equally important to understand the level of customization needed. It does not matter how big or small a TIM program is but rather how successful the program is at engaging stakeholders and managing incidents. Whether a TIM program has already been established or is starting from scratch, it is essential to identify the overall needs of the local area and determine TIM program elements necessary to fulfill these needs. If a program has already been deployed a key driver is identifying the existing gaps in the program and identifying activities/actions to bridge these gaps.		
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AAA	American Automobile Association
AAR	After-Action Review
CAD	Computer Aided Dispatch
CCTV	Closed-Circuit Television
CMM	Capability Maturity Model
DMS	Dynamic Message Sign
DMV	Department of Motor Vehicles
DOH	Department of Health
DOT	Department of Transportation
E911	Enhanced 911
ELG	Executive Leadership Group
EMS	Emergency Medical Services
ERSI	Emergency Responder Safety Institute
FAST-TRAC	Faster and Safer Travel through Traffic Routing and Advanced Controls
FHWA	Federal Highway Administration
GPS	Global Positioning System
HAR	Highway Advisory Radio
HazMat	Hazardous Materials
HSIP	Highway Safety Improvement Program
IACP	International Association of Chiefs of Police
IAP	Incident Action Plan
ICS	Incident Command System
IRV	Incident Response Vehicle
ISP	Information Service Providers
IRT	Incident Response Team
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
ITS JPO	Intelligent Transportation Systems Joint Program Office
LTAP/TTAP	Local and Tribal Technical Assistance Programs
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization

MUTCD	Manual on Uniform Traffic Control Devices
NIMS	National Incident Management System
NITTEC	Niagara International Transportation Technology Coalition
NTIMC	National Traffic Incident Management Coalition
NUG	National Unified Goal
NYS	New York State
PDA	Personal Digital Assistant
PHMSA	Pipeline and Hazardous Materials Safety Administration
PM	Performance Measures
PPE	Personal Protective Equipment
PSEs	Planning for Special Events
RISC	Rapid Incident Scene Clearance
SHRP2	Second Strategic Highway Research Program
SHSP	Strategic Highway Safety Plan
SOGs	Standard Operating Guidelines
SOPs	Standard Operating Procedures
SP	State Patrol
SSP	Safety Service Patrol
TI&EM	FHWA Traffic Incident & Events Management
TIM	Traffic Incident Management
TIM SA	Traffic Incident Management Self-Assessment
TMC	Traffic Management Center
TOC	Traffic Operations Center
TRAA	Towing and Recovery Association of America
TTC	Temporary Traffic Control
UCS	Unified Command Structure
USDOT	United States Department of Transportation
USFA	United States Fire Administration

1 INTRODUCTION

A traffic incident is "any non-recurrent event, such as a vehicle crash, vehicle breakdown, or other special event, that causes a reduction in highway capacity and/or an increase in demand".[1] Traffic incidents are a significant cause of congestion delays that motorists encounter every day on roadways and according to the Federal Highway Administration (FHWA), these incidents (ranging from a flat tire to an overturned hazardous material truck) account for about 25% of all non-recurring congestion.[2] Non-recurring incidents dramatically reduce the available capacity and reliability of the entire transportation system and when an incident occurs, congestion quickly builds up and chances of a secondary incident increase. The sooner incidents are detected, the sooner personnel can respond to the incident and clear it from the roadway, thereby allowing traffic lanes to re-open.

Traffic incident management (TIM) "consists of a planned and coordinated multidisciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible". Effective TIM reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims, and emergency responders. The TIM goals are to:

- Promote the safety of motorists, crash victims, and incident responders.
- Reduce the time for incident detection and verification.
- Reduce response time (the time for response personnel and equipment to arrive at the scene).
- Exercise proper and safe on-scene management of personnel and equipment, while keeping as many lanes, as possible, open to traffic.
- Conduct an appropriate response, investigation, and safe clearing of an incident.

Figure 1. Photo. Traffic Incident Management (TIM).[3]

- Reduce clearance time (the time required for the incident to be removed from the roadway).
- Provide timely and accurate information to the public that enables them to make informed choices.
- Get traffic moving again as soon as possible after a partial or complete roadway closure while managing the affected traffic until normal conditions are restored.

While individual efforts may be made by various agencies, the overall objective of TIM is to bring these efforts together to formalize a partnership among all agencies. TIM achieves this by coordinating the resources of a number of different entities who represent incident responders as well as private agencies that have a vested interest in TIM, with the mutual goal of reducing the impacts of incidents on congestion, while protecting the safety of on-scene responders and the traveling public.

1.1 The Need for a Primer

One of the most important responsibilities of both State and local transportation and public safety agencies is to ensure the safe and quick clearance of traffic incidents. Traffic incidents pose a significant threat to life safety and influence travel time, economic productivity, and transportation system performance. Effective TIM procedures and advance planning are essential to achieve quick incident clearance without compromising safety for motorists or responders.

Policies and operating procedures for TIM programs not only vary from State to State, but vary regionally within each State and among rural, suburban, and urban areas. Many of the nation's TIM programs lack a robust, full-scale, comprehensive approach that includes all aspects of incident management with long-term vision and objectives.

For these reasons, an inventory and review of current practices was conducted to analyze the existing capabilities of both the institutional and technical aspects of the national TIM program led by FHWA, as well as those managed by local and/or State governments. This analysis of existing TIM gaps highlighted the need for a primer that outlines a common national structure for TIM programs.

In order to investigate how TIM practitioners currently perceive the need for conducting gap analysis on their respective TIM programs, a TIM gap analysis webinar was conducted in October 2014. More than 50 attendees from various TIM stakeholder groups responded to a series of poll questions. The webinar attendees responded to questions about their self-assessment as well as gap analysis activities, as summarized in Figure 2. It can be seen from the results that although many TIM stakeholders (69%) conduct self-assessments, only 30% have undertaken a gap analysis. These results confirm the need for a TIM gap analysis primer to help guide TIM practitioners in conducting the gap analysis process that will in turn, help to develop a sound traffic incident management program.

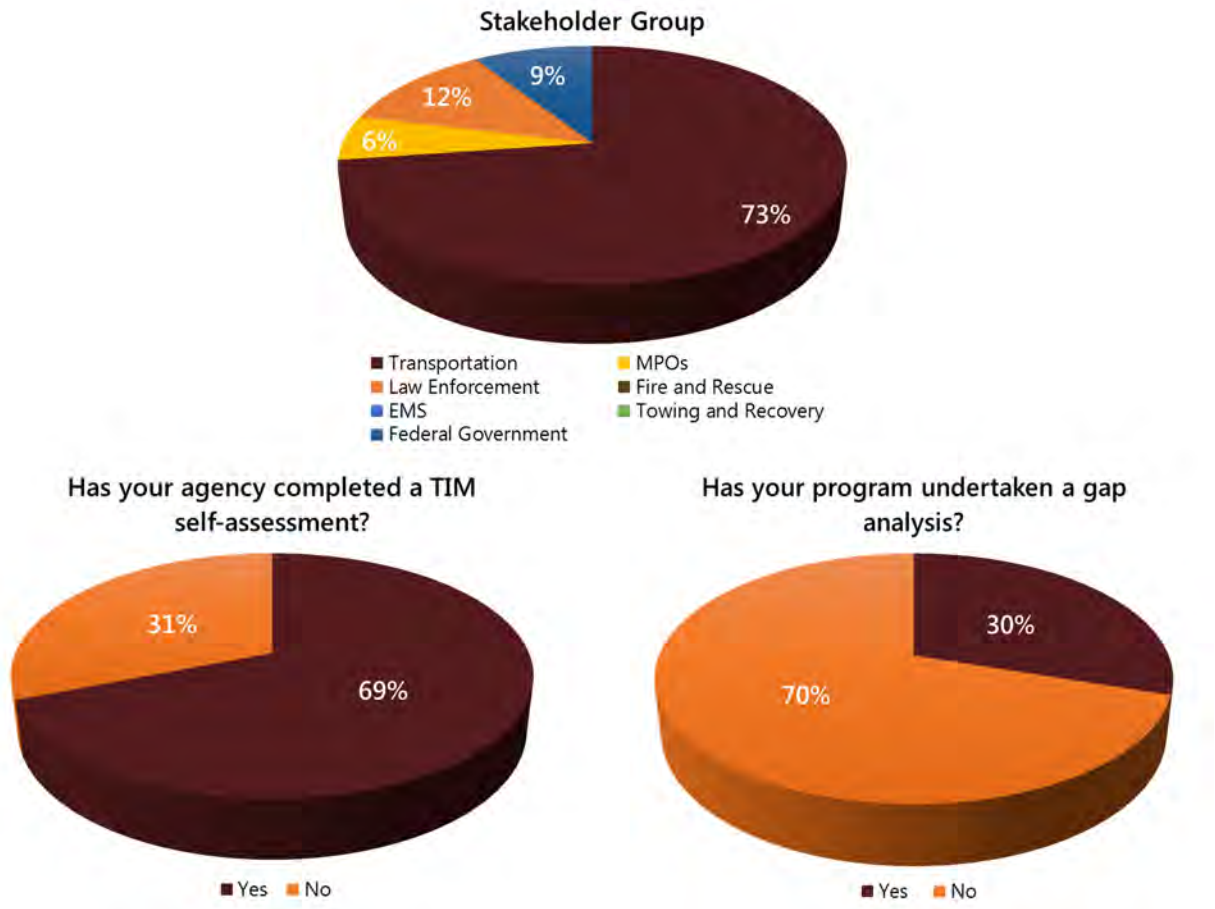

Figure 2. Chart. TIM Stakeholders' Responses about Self-Assessment and Gap Analysis.
(Credit: FHWA TIM Gap Analysis Webinar, October 2014)

Based on what was learned during the webinar discussion, it is appropriate to highlight the difference between the "gap analysis" and the "self-assessment" concepts. Although both are used to evaluate the current state of performance and help identify areas of improvement, the gap analysis concept is a more analytical technique which identifies the specific steps needed to reach the desired state of practice. Self-assessment is defined as "a continuing process through which managers at all levels evaluate the effectiveness of their performance in all areas of responsibility, and determine what improvements are required",[4] whereas gap analysis is defined as "a technique that businesses use to determine what steps need to be taken in order to achieve a future state". It can also be said that gap analysis helps programs to reflect on who they are and ask who they want to be in the future.[5]

1.2 Primer Objectives

This document provides guidance to federal, State and local TIM programs and their involved partners on the components needed to develop and sustain a successful full-fledged TIM program. The objectives of this primer are to:

- Identify and summarize the current state of TIM practice and activities at the national and State/local levels.
- Identify and summarize gaps found in TIM activities/information for national and State/local departments and agencies.
- Identify and outline a framework for achieving a complete TIM program for the different levels of government utilizing national guidelines.
- Outline the key elements that are contained in successful TIM programs.

A key objective for this document is to address the actual challenges that different TIM stakeholders with varied levels of responsibility face in their current TIM practices on a day to day basis.

1.3 Target Audience

The information contained within this document is geared towards multidisciplinary TIM stakeholders from both the public and private sectors. This includes but is not limited to personnel from transportation agencies, law enforcement, fire and rescue, emergency medical services (EMS), public safety communications, emergency management, towing and recovery, hazardous materials (HazMat), utilities, contractors, and traffic information media.

The target audience for this document includes staff responsible for incident response coordination along with executive decision makers who develop and promote incident management policies, plans, and programs. For technical staff, this primer is useful in detailing the step-by-step procedures used for incident management and an effective TIM response. For executive decision makers, this guidance document is useful for conveying the most practical and effective TIM programs and policies, and the steps and resources needed to implement these programs/policies.

1.4 Primer Organization

The content of this primer is divided into six chapters as follows:

- **Chapter 1: Introduction** – Provides an overview of this document including the motivation behind its development and the topic areas discussed.
- **Chapter 2: TIM Gap Analysis Summary** – Summarizes the results of the TIM Gap Analysis conducted and describes the elements needed to develop a successful TIM program.
- **Chapter 3: Components of Successful TIM Program** – Outlines the various components necessary to achieve a mature TIM program that is both effective and sustainable.
- **Chapter 4: Roles and Responsibilities of TIM Stakeholders** – Identifies the roles and responsibilities of each TIM stakeholder and the level of involvement needed by each agency in individual TIM components.

- **Chapter 5: TIM Program within Transportation Operations Program** – Outlines the various components necessary to achieve a mature TIM program that is both effective and sustainable.
- **Chapter 6: Conclusions and Recommendations** – Provides a summary of the important findings in this document, including a summary of the implementation of a successful TIM program.

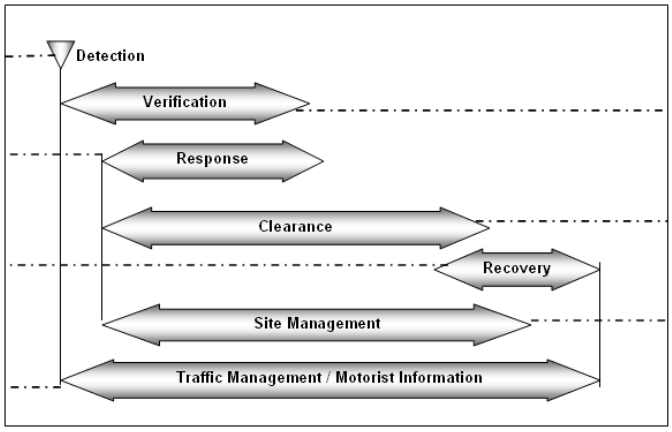

Figure 3. Chart. Timeline of Stages in the TIM Process.[6]

1.5 TIM Overview

To better understand the complexity of TIM it is best to analyze the eight stages of the TIM process as depicted in Figure 3:

- 1. Detection.
- 2. Verification.
- 3. Response.
- 4. Scene Management.
- 5. Traffic Management.
- 6. Motorist Information.
- 7. Clearance.
- 8. Recovery.

The following are descriptions of each TIM stage as well as the TIM methods used during each stage.

- **1. Detection** – determines that an incident has occurred and is brought to the attention of the agency/agencies responsible for maintaining traffic flow and safe operations on the facility. Various methods of detection include:
  - Cell phone calls from motorists.
  - Closed-circuit television (CCTV) images viewed by traffic management center (TMC) operators.
  - Electronic detection (video processing, radar, induction loops) with traffic incident detection algorithms.
  - Police/service patrols.
  - Calls from public works crews.
  - Motorist aid telephones and call boxes.
- **2. Verification** – confirms that an incident has occurred, determines its exact location, and obtains as many relevant details about the incident in order to dispatch the proper initial response. Methods used to verify an incident include:
  - Field units (e.g., police, service patrols) at the incident site.

- CCTV images.
- Communication with helicopters operated by police, media, or information service providers.
- Combining information from multiple cellular calls.

- **3. Response** – dispatches the appropriate personnel and equipment, and activates the appropriate communication links and motorist information media as the incident is verified. Timely and effective response reduces the incident's duration, and therefore, the time of roadway operation at reduced capacity. In addition to on-scene response personnel, response also includes:
  - Response vehicles that include capabilities such as a mobile communications platform, global positioning system (GPS), and other features to facilitate efficient response.
  - Personnel and logistics support.
  - Interagency response planning and mutual-aid agreements.
  - Intra-agency and interagency communications.
- **4. Scene Management** – effectively coordinates and manages on-scene resources. Effective scene management increases safety for crash victims, motorists, and responders; coordinates responder activities; and decreases the impacts of an incident on the roadway system. Examples of scene management activities include:
  - Accurate assessment of incidents.
  - Proper establishment of priorities.
  - Use of an Incident Command System (ICS) and Unified Command Structure (UCS).
  - Notification and coordination with appropriate agencies and organizations.
  - Proper placement and staging of response vehicles at traffic incident scenes.
- **5. Traffic Management** – applies traffic control measures onsite and in areas affected by an incident. Effective traffic management minimizes traffic disruption while maintaining a safe workplace for responders and reduces the likelihood of secondary crashes. Examples of traffic management activities include:
  - Establishment and operation of alternate routes.
  - Use of cones, flares, warning signs, arrow boards, portable dynamic message signs (DMS), and other traffic control resources.
  - Use of traffic control devices such as DMS, highway advisory radio (HAR), ramp meters, and traffic signals.
  - Queue management to actively monitor the end of a queue and warn approaching motorists.
  - Reduction of long-term traffic incident duration.

- **6. Motorist Information** – disseminates incident-related information to affected motorists through the use of various methods including:
  - Dynamic message signs (DMS).
  - Highway advisory radio (HAR).
  - Commercial radio and television broadcasts.
  - Telephone information systems (i.e., 511).
  - In-vehicle or personal digital assistant (PDA) information.
  - Information service providers (ISP).
- **7. Clearance** – removes wreckage, debris, or any other elements that disrupt the normal flow of traffic. Improved traffic incident clearance procedures has many positive effects including the ability to:
  - Minimize motorist delay.
  - Make effective use of all resources.
  - Enhance the safety of responders and travelers.
  - Protect the roadway and private property from unnecessary damage during the removal process.
- **8. Recovery** – evaluates the long-term impact of an incident and identify recovery actions needed to mitigate those impacts. The goal of recovery is to restore the roadway capacity to its pre-incident condition and includes these actions:
  - Restore traffic flow.
  - Restore pre-incident capacity quickly and safely.
  - Debris clearance.
  - Damage assessments.
  - Restoration of damaged infrastructure.
  - Structural inspections.[6]

The impact of an incident typically occurs on the local network but can also extend to the regional network.

It should be noted that Figure 3 is obtained from the Freeway Management and Operations Handbook which was published in 2003.[6] Subsequent evolution in TIM community experience on this subject have resulted in revised thinking regarding the TIM elements and their relative timing, especially with regard to the development of TIM performance measures (PM).

A more recent understanding of the traffic incident elements and timeline was developed by the USDOT ITS Joint Program Office (ITS JPO) and is depicted below in Figure 4, with the key incident times summarized in Table 1.[7]

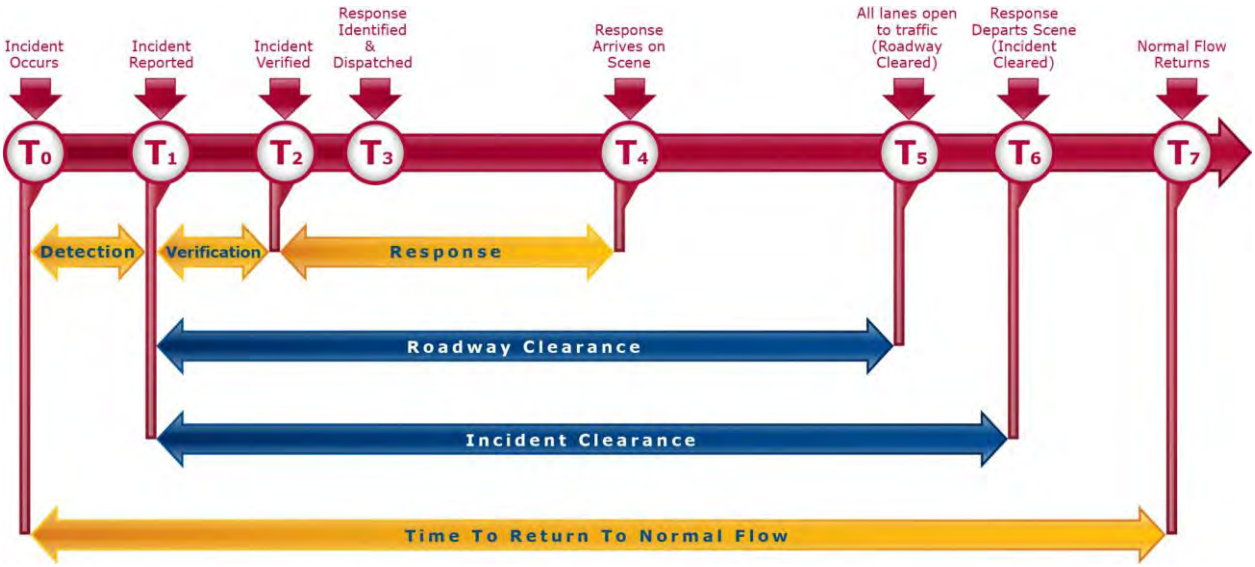

Figure 4. Chart. Timeline of Traffic Incident Elements.[7]

Table 1. Key Traffic Incident Times.[7]

Measure	Definition
Detection Time T1 – T0	Time between the incident occurring and the incident being reported. Detection time is not typically reported due to the fact that the actual time the incident occurred is often unknown.
Verification Time T2 – T1	Time between incident being reported and the incident being verified. TMCs can typically assist with verification through use of their CCTV cameras.
Response Time T4 – T2	Time between the incident being verified and the first responder arriving on scene. Law enforcement may not always be the first party to arrive on scene.
Roadway Clearance Time (RCT) T5 – T1	Time between the first recordable awareness of the incident by a responsible agency and the first confirmation that all lanes are available for traffic flow.
Incident Clearance Time (ICT) T6 – T1	Time between the first recordable awareness of the incident by a responsible agency and the time at which the last responder has left the scene.

2 TRAFFIC INCIDENT MANAGEMENT GAP ANALYSIS SUMMARY

In preparation for the development of this primer, a necessary first step was to inventory current traffic incident management (TIM) practices nationwide. To accomplish this, a two-tier gap analysis was conducted on (1) the federal TIM program as well as (2) State and local programs to investigate what the institutional, technical, and financial capabilities of TIM programs currently are at the different government levels. This analysis included a review and synthesis of relevant literature regarding agency practices, experience, process, and outcomes; as well as reviewing the summaries of Federal Highway Administration (FHWA) TIM workshops conducted across the nation between March 2010 and June 2013 and recent TIM self-assessment (TIM SA) reports.

2.1 The National Unified Goal (NUG) Gap Analysis Framework

Although the details of the comprehensive TIM gap analysis are presented in-depth in a separate report, the key findings of that analysis are summarized within this document to help TIM stakeholders recognize the gaps identified in current TIM practices and reflect them in their own respective TIM programs.

To classify the gaps identified, the 18 National Unified Goal (NUG) strategies were used as a framework to assess the challenges and barriers in the current TIM process. The NUG for TIM encourages local and State transportation and public safety agencies to adopt unified, multidisciplinary policies/procedures/practices that help improve the way traffic incidents are managed on roadways. Although the NUG does not address funding, it does emphasize that by joining together to pursue common goals TIM stakeholders can leverage their opportunities to secure resources to pursue these goals. The NUG strategies are separated into these four categories: crosscutting strategies; responder safety; safe, quick clearance; and prompt, reliable, interoperable communications; and include the following:

Crosscutting Strategies

- **1. TIM Partnerships and Programs** – TIM partners at the national, State, regional, and local levels should work together to promote, develop, and sustain effective TIM programs.
- **2. Multidisciplinary NIMS and TIM Training** – TIM responders should receive multidisciplinary National Incident Management System (NIMS) and TIM training.
- **3. Goals for Performance and Progress** – TIM partners should work together to establish and implement performance goals at the State, regional, and local levels for increasing the effectiveness of TIM, including methods for measuring and monitoring progress.
- **4. TIM Technology** – TIM partners at the national, State, regional, and local levels should work together for rapid and coordinated implementation of beneficial new technologies for TIM.
- **5. Effective TIM Policies** – TIM partners at the national, State, regional, and local levels should join together to raise awareness of proposed policies and legislation that affect the achievement of the NUG strategies of Responder Safety; Safe, Quick Clearance; and Prompt, Reliable Interoperable Communications.
- **6. Awareness and Education Partnerships** – Broad partnerships should be developed to promote public awareness and education regarding the public's role in safe, efficient resolution of incidents on roadways.

Responder Safety

- **7. Recommended Practices for Responder Safety** – Recommended practices for responder safety and for traffic control at incident scenes should be developed and widely published, distributed, and adopted.
- **8. Move Over/Slow Down Laws** – Drivers should be required to Move Over/Slow Down when approaching traffic incident response vehicles and traffic incident responders on the roadway.
- **9. Driver Training and Awareness** – Driver training and awareness programs should teach drivers how to react to emergencies on the roadway in order to prevent secondary incidents, including traffic incident responder injuries and deaths.

Safe, Quick Clearance

- **10. Multidisciplinary TIM Procedures** – TIM partners at the State, regional, and local levels should develop and adopt multidisciplinary procedures for coordination of TIM operations, based on national recommended practices and procedures.
- **11. Response and Clearance Time Goals** – TIM partners at the State, regional, and local levels should commit to achievement of goals for traffic incident response and clearance times.
- **12. 24/7 Availability** – TIM responders and resources should be available 24/7.

Prompt, Reliable, Interoperable Communications

- **13. Multidisciplinary Communications Practices and Procedures** – Traffic incident responders should develop and implement standardized multidisciplinary traffic incident communications practices and procedures.
- **14. Prompt, Reliable Responder Notification** – All traffic incident responders should receive prompt, reliable notification of incidents to which they are expected to respond.
- **15. Interoperable Voice and Data Networks** – State, regional, and local TIM stakeholders should work together to develop interoperable voice and data networks.
- **16. Broadband Emergency Communications Systems** – National TIM stakeholders should work together to reduce the barriers to integrated broadband emergency communications systems development and integration (both wired and wireless).
- **17. Prompt, Reliable Traveler Information Systems** – TIM stakeholders should encourage development of more prompt and reliable traveler information systems that will enable drivers to make travel decisions to reduce the impacts of emergency incidents on traffic flow. This includes use of ITS-type methods such as dynamic message signs (DMS), highway advisory radio (HAR) and 511 systems as well as non-ITS methods such as local media and social networking sites.
- **18. Partnerships with News Media and Information Providers** – TIM stakeholders should actively partner with news media, ISPs and other pertinent resources such as social media service providers to provide prompt, reliable incident information to the public.

The comparison of the different TIM programs to the 18 NUG strategies serves as a basis for developing a framework to:

- Document the identified challenges and barriers in the current TIM practice.
- Develop a means to bridge these challenges and barriers.
- Propose the components of a complete TIM program.

The main intent of using the NUG strategies as a benchmark is to identify the missing strategic and tactical aspects in the current TIM practices at the local, State, and national levels. However, the emphasis on the NUG strategies is not meant to understate the need to address budget limitations and availability of dedicated funding to develop a complete and successful TIM program that is sustainable over time.

The outline of the NUG gap analysis framework is presented in Table 2, listing the key elements of each of the 18 NUG strategies as well as the identified challenges, barriers, and strategies based on the inventory and review of current TIM practices.

Table 2. The National Unified Goal (NUG) Gap Analysis Framework.

NUG Strategy	Key Elements	Gaps	Strategies to Overcome Gaps
1. TIM Partnerships and Programs	Synchronized TIM programs at the local, regional, State, and multistate levels. Formalized partnerships through written agreements, joint written operational policies and procedures, and joint training exercises. Co-location of the multidisciplinary partners. Inclusive partnerships, including: • Emergency dispatch (Enhanced 911 (E911) Center). • Fire/rescue. • EMS. • HazMat. • Law enforcement. • Medical examiner/ coroner. • Towing and recovery. • Transportation. • Media, traffic reporters and other traveler information service providers. • Others (trucking industry, traffic control industry, insurance industry and emergency management agencies).	Departments of Transportation (DOTs) often are not included in emergency planning and preparedness organizations' activities. TIM responder agencies need dedicated resources (personnel and funding). Positive interaction between and consistency of actions between statewide and regional TIM teams. Partner agencies are not aware of the capabilities and restrictions of others. In some instances, there is conflict when partner agencies do not work well together. Involvement of TIM activities into State's Strategic Highway Safety Plan (SHSP). Lack of executive level support. Institutional barriers. Lack of legislation.	Agency executive/senior leader engagement and buy-in. Definition and documentation of the roles of the different TIM team partners. Simultaneous institutionalization of TIM within the agencies of the TIM team partners. Implementation of statewide comprehensive multidisciplinary TIM program. Utilize the planning for special events (PSEs) and emergency management activities to build stronger relationships among TIM partners. Effective use of highway service patrols as effective statewide TIM resources that typically have dedicated vehicles and staff. Memoranda of Understanding (MOUs) between partner agencies. Safe, quick clearance laws. Promote and support TIM stakeholder participation in current and future efforts to update the State's SHSP to ensure TIM-related strategies continue to be included. Examples of States that include TIM in their SHSP are Arizona (in progress), Connecticut, Indiana, Kentucky, and Wisconsin. Regional TIM Operational Plans and Guidelines: several States have developed regional- or corridor-level TIM programs, where partners jointly developed recommended operational guidelines or response procedures. Examples of these programs include, but are not limited to: Arizona, Florida, Georgia, Indiana, Kansas, Massachusetts, Missouri, New Jersey, New York, North Carolina, Rhode Island, Tennessee, Virginia, Wisconsin
2. Multidisciplinary NIMS and TIM Training	Cross train incident scene roles and responsibilities. A thorough understanding of the ICS. Include all partners and those across State boundaries, if appropriate.	Volunteer agencies do not have the same time available for training that full-time agencies have. Lack of familiarity and established working relationships between responding agencies and individuals within those agencies. Cultural differences among responder agencies. Need to ensure ICS continuity, as it should not end until the last responder leaves the scene. Lack of interagency buy-in. For police and fire, conflict with other's training requirements. Backfill staffing issues.	Availability of multidisciplinary TIM training courses and delivery processes appropriate for full-time and volunteer agencies. Classroom training provides education and team building so that responders know each other before they arrive at an incident scene. Multidisciplinary training to help overcome cultural differences. Use of a formal handoff of command at an incident scene. Incorporation of TIM and NIMS into in-service training programs. Coordination with State emergency management agencies to leverage existing training opportunities. Designated funds for safety training.

Table 2. The National Unified Goal (NUG) Gap Analysis Framework. (cont.)

NUG Strategy	Key Elements	Gaps	Strategies to Overcome Gaps
3. Goals for Performance and Progress	A systematic approach for measuring TIM program performance across national and State/local levels. Accountability: personnel must be responsible for reporting performance results up a chain of command. TIM data collection. Performance management.	Chain of command and reporting requirements for TIM functions vary widely. DOTs may not have established chains of command and reporting channels for TIM functions. Law enforcement and fire agencies have centralized command and control; DOTs typically are decentralized. Performance metrics vary across agencies, making it difficult to compare results. Difficulties brought on by on-scene paper reporting. Cost of data collection and analysis.	The NIMS planning framework provides an opportunity to identify a formal DOT chain of incident command and reporting requirements. Development and implementation of a TIM team structure to conduct incident management self-assessment and evaluation of incident responses and techniques. Development of performance measures (PM) and data collection methods including those for each stage of an incident. Collection of TIM data on police crash reports.
4. TIM Technology	Sustainable and interoperable ITS technologies for TIM. Data collection and analysis technologies to support performance metrics. Integrated communication technologies (e.g., Computer Aided Dispatch (CAD)) between DOT and emergency responders (police, fire, EMS, towing).	Aging communications and Intelligent Transportation Systems (ITS) infrastructure. Lack of prioritization. Inconsistent use of existing technologies by all disciplines. Need to identify new technologies and their use in TIM (how new technologies can help reduce the time for an investigation of the incident scene).	Coordination through TIM Task Force organizations to reach senior agency personnel. Establishment and implementation of standard and efficient use of technology. Explore use of new, less costly and interoperable technologies.
5. Effective TIM Policies	Formal strategic plans and written interagency operational policies. Performance measurement (incident clearance time). Performance metrics (e.g., 30 minute clearance for fender-benders; 60 minutes for injury crashes; 90 minutes for fatalities). Statewide current practices guidelines. Regional TIM operational plans and guidelines. Agency Standard Operating Procedures (SOPs) and Guidelines (SOGs).	Lack of interagency coordination at all levels including the senior executive level. Lack of clear guidance and implementation coordinated policies among agencies. No sharing of TIM resources.	TIM Task Force representatives with information to educate their agencies, senior leaders. Framework and tools that is adaptable to State, local, and regional programs; as well as urban and suburban programs. Development and implementation of multidisciplinary TIM policies and procedures including the development, use, and sharing of individual agency resources. Survey how agencies measure performance and develop tools for all to use the same criteria. Institutionalization of the program among all of the agencies involved in the TIM program. Executive level sign-off at all the agencies.

Table 2. The National Unified Goal (NUG) Gap Analysis Framework. (cont.)

NUG Strategy	Key Elements	Gaps	Strategies to Overcome Gaps
6. Awareness and Education Partnerships	Develop partnerships to educate responders and motorists on responsibilities of the safe, quick clearance of incidents.	Lack of awareness and education regarding the public's role. Necessary safe, quick clearance legislation has not been passed. Lack of funding to conduct outreach to stakeholder agencies and organizations.	Public-private partnerships with schools, insurance and towing companies, and organizations (e.g., American Automobile Association (AAA)). Incorporation into academy and in-service training programs. Identification of the best ways of getting information out to the public. Development of pilot public outreach to explain how TIM process works. Education or awareness campaigns can be conducted without legislation to achieve a desired outcome.
7. Recommended Practices for Responder Safety	Promote practices to protect responders on-scene.	Lack of interagency coordination at the senior executive level. Lack of coordinated safety practices for TIM responders.	Incorporation into academy and in-service training programs. Clarification of roles for responders under unified command for traffic incidents. Developing and adopting coordinated safety practices. Responder training.
8. Move Over/Slow Down Laws	Ensure that motorists provide a safety buffer for responders when possible.	Lack of education and awareness. Lack of and challenges related to legislation and enforcement. Lack of resources for enforcement. No judicial support of the laws. Discrepancies with laws and language.	Public-private partnerships with schools, insurance and towing companies, and organizations (e.g., AAA). Incorporation into responder's in service programs and into driver's training and manual. Development and implementation of TIM policies and procedures for Move Over/Slow Down laws. Coordination with the advancement of legislation with multi-organization support. Safety campaigns/driver education. Model legislative language.
9. Driver Training and Awareness	Teach drivers how to prevent secondary incidents from behaviors such as incident scene curiosity.	Lack of education and awareness. Lack of driver understanding of what to do in an incident scene. Unpredictable or inappropriate driver actions during emergencies.	Public-private partnerships with schools, insurance and towing companies, and organizations (e.g., AAA). Development and implementation of a program to promote public awareness and education about the public's role in safe, efficient resolution of TIM events, such as Move Over and safe, quick clearance concepts. Coordinate with State Traffic Safety Committees and Department of Motor Vehicles (DMV) for driver training and awareness. Use technology to help drivers respond properly to diversions as well as awareness.

Table 2. The National Unified Goal (NUG) Gap Analysis Framework. (cont.)

NUG Strategy	Key Elements	Gaps	Strategies to Overcome Gaps
10. Multi-disciplinary TIM Procedures	Encourage widespread adoption of procedures for quickly clearing incident scenes.	Lack of interagency coordination at the senior executive level to empower TIM task force representatives. Lack of coordination of TIM operations. Institutional barriers. The different responders at the scene (e.g., public safety, fire, or transportation) have different goals, roles, and responsibilities.	Unified planning following the NIMS rules. Active participation of TIM stakeholder agencies. Agency executive/senior leader engagement and buy-in. Development of procedures for sharing resources. Development and implementation of agency/interagency policies to ensure safe, quick clearance practices. Development of towing policy based on improved coordination and practices including a template for towing on interstate highways. Multidisciplinary training.
11. Response and Clearance Time Goals	Establish benchmarks, or time goals for incident response and clearance.	Lack of data consistency. Inconsistency in defining response and clearance time elements.	Establishment of metrics based on obtainable data. Uniform reporting procedures. Agreements on measurement of response times and clearance times. Development of response and clearance time goals. Data collection on crash reports.
12. 24/7 Availability	Encourage 24 hours a day, 7 days per week availability of traffic incident responders and equipment.	Lack of organizational capabilities on a 24/7 basis. Unavailability of after-hours responders other than police and fire service. Agencies have limited resources, staffing, and budgets.	Identification of availability of TIM resources on a 24/7 basis. Development of policy and procedures for 24/7 response considering operational limitations of responders other than police and fire service.
13. Multi-disciplinary Communications Practices and Procedures	Develop guidelines for standardized communications practices and procedures.	Disparate communications systems and protocols. Lack of understanding of information needs of other agencies. Communication capabilities of TIM organizations are lacking.	Unified planning following the NIMS rules. Communications work plans. Listing of communication protocols including technologies used and distribute list to all incident management stakeholders. Support implementation of a common interagency communications protocol/process for all incident management personnel. Common language, operational channels. Compatible on-scene equipment. Use of the common backbone of 800 MHz that allows transportation to be included, and allows for both voice and data; whereas 700 MHz allows for voice only.

Table 2. The National Unified Goal (NUG) Gap Analysis Framework. (cont.)

NUG Strategy	Key Elements	Gaps	Strategies to Overcome Gaps
14. Prompt, Reliable Responder Notification	Develop systems and procedures to ensure prompt and reliable notification of incident information to incident responders.	Disparate communications systems and protocols. Lack of understanding of information needs of other agencies. Current notification procedures are ineffective.	Clearly defined roles and responsibilities. Provide timely notification of incidents to responders. Clarify notification processes and roles. Development of standards for notification information. Promote the use of technology to improve notification processes.
15. Interoperable Voice and Data Networks	Create links between incident responder information and communications systems.	Disparate communications systems. Incompatibility of current voice and protocol data networks.	Require vendors of new communications equipment to provide open architectures that make it possible to link to and share information with other jurisdictions and agencies. Determine how interoperable communications equipment could improve TIM and promote implementation.
16. Broadband Emergency Communications Systems	Promote integrated broadband networks linking emergency service providers.	Integration between broadband emergency communication systems does not exist.	Promote common interagency communications system for all TIM personnel. Promote integration of TMC and law enforcement CAD systems. Integration of CAD systems with ITS. Implementation of wireless E911 location technologies; and implementation of Next Generation E911 systems.
17. Prompt, Reliable Traveler Information Systems	Encourage the development and deployment of traveler information systems to deliver real-time traveler information.	Need to provide timely and relevant information to motorists to avoid additional incidents. Lack of funding to implement integrated systems.	Provide funding based on strategic planning at the State and/or regional level. Expand capabilities for the use of technology to provide timely and accurate information to motorists. Examine additional outlet mechanisms for traveler information. Identify and utilize new and emerging technologies.
18. Partnerships with News Media and Information Providers	Develop recommended practices for working with news media and ISP to deliver timely and reliable traveler information.	Conflicting priorities and unfamiliarity with the media's TIM role. Current partnerships with news, media, and information providers need improvement.	Inclusion of major media sources in the planning process. Foster relationships with the news media sources and information providers. Educate media of their TIM role. Identify role of the TIM committee with the media. Involve the local media in the TIM committee.

2.2 Current State of TIM Practice

On the local and State levels, many variations exist among the different TIM programs. Variations in TIM practice occur between urban and rural areas where most of the urban areas have regional TIM programs that cover large metropolitan areas and the rural TIM programs are mainly corridor-based programs that may extend coverage to multiple States. TIM practices also vary between States, where some States have strong statewide support and coordination among the different regional TIM programs within the State while others do not.

The success of the TIM practice at any of the State/local level programs depends primarily on the active involvement and coordination between the different TIM partners. Examples of the State/local level TIM activities include conducting regularly scheduled TIM committee meetings, multidisciplinary training programs, tracking of targeted performance goals, developing and promoting TIM procedures and policies, coordinating the available TIM resources including equipment and data, and successful incident scene interagency collaboration. In addition, inclusion of TIM into the State's Strategic Highway Safety Plan (SHSP) is essential in order to ensure the full funding opportunity under the Highway Safety Improvement Program (HSIP). It also utilizes the presence of the different TIM partners within the SHSP. Examples of States that include TIM in their SHSP are Arizona (in progress), Connecticut, Indiana, Kentucky, and Wisconsin.

On the national level, government and non-governmental agencies and coalitions contribute to the development and success of the TIM practice at both the policy and operations levels. A key role of the national TIM agencies is to provide support to the State/local level TIM programs to enhance and advance their TIM practices. Examples of the national TIM-involved agencies include FHWA Office of Operations' Traffic Incident & Events Management (TI&EM) Team, International Association of Chiefs of Police (IACP), International Association of Fire Chiefs (IAFC), National Volunteer Fire Council (NVFC), National Association of State EMS Officials (NASEMSO), Emergency Responder Safety Institute (ERSI), Towing and Recovery Association of America (TRAA), and the U.S. Fire Administration (USFA). Another important national effort that started in 2004 and ended in 2013 is the National Traffic Incident Management Coalition (NTIMC) that was instrumental in the development of the NUG. The NTIMC was succeeded by the National TIM Executive Leadership Group (ELG), which was formed in 2012 by FHWA following the Senior Executive Transportation & Public Safety Summit.[8]

Figure 5. Photo. FHWA Senior Executive Transportation & Public Safety Summit.[8]

The coordination among these agencies and others is key to the success of the national TIM practice. Examples of the coordinated activities at the national level include the development of tools, primers, guidelines, handbooks, and outreach packages; offering training courses, workshops, and educational materials; formulation of policies and standards, and conducting research and synthesis on new TIM initiatives.

As mentioned earlier, a TIM gap analysis webinar was conducted in October 2014 in order to seek TIM stakeholders' input on the current state of their TIM practice and their presently identified gaps. Figure 6, Figure 7, and Figure 8 summarize the webinar attendees' responses to questions about the NUG, their TIM program strategic plans, and their current TIM gap analysis process, respectively. It can be seen that many TIM programs (74%) incorporate the NUG into their TIM program (Figure 6), and this suggests that the different TIM programs are quite familiar with the NUG strategies and they can easily adopt the NUG gap analysis framework presented earlier.

In addition, only half of the stakeholders have a TIM strategic plan, and only 55% keep their strategic plan updated periodically (Figure 7). Such results indicate the significance of the strategic/institutional gaps in the current practice of most TIM programs. Furthermore, and as presented in Chapter 1, only 30% of the webinar attendees indicated that their TIM programs have undertaken gap analysis. Among those TIM programs, their gap analyses revealed a fair distribution, between strategic, tactical, and support types of gaps. Moreover, it was found that the institutionalization of the TIM activities among the different partners are some of the important strategic TIM gaps (Figure 8).

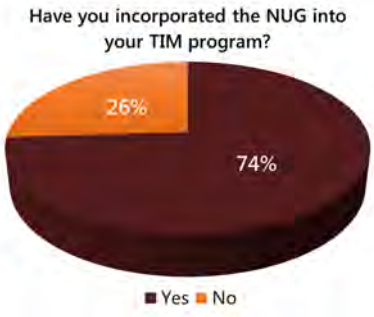

Figure 6. Chart. Current State of TIM Practice: TIM Stakeholders' Responses about National Unified Goal.
(Credit: FHWA TIM Gap Analysis Webinar, October 2014)

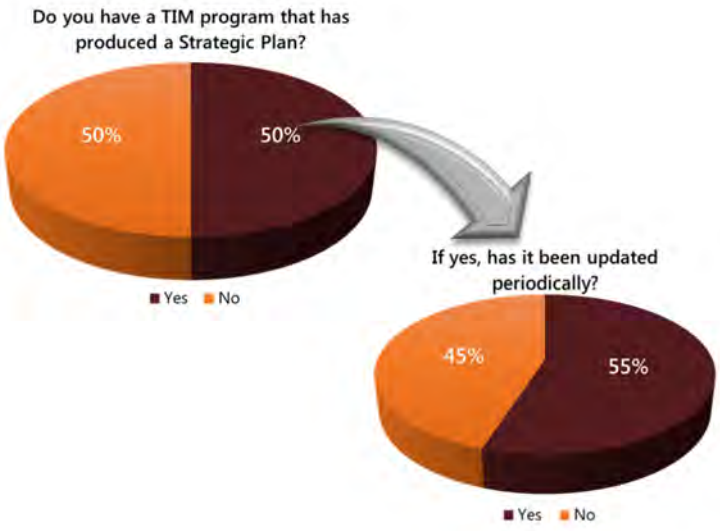

Figure 7. Chart. Current State of TIM Practice: TIM Stakeholders' Responses about TIM Strategic Plan.
(Credit: FHWA TIM Gap Analysis Webinar, October 2014)

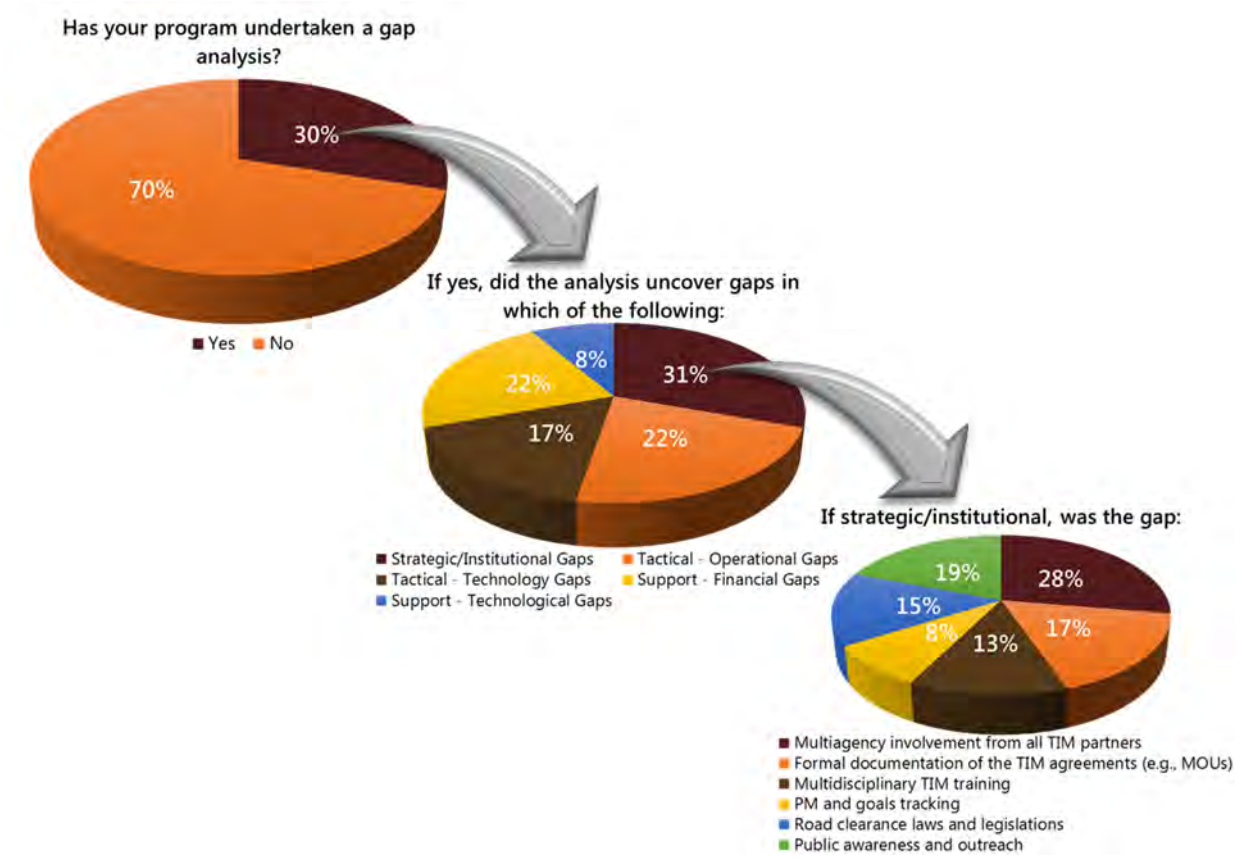

Figure 8. Chart. Current State of TIM Practice: TIM Stakeholders' Responses about TIM Gap Analysis.
(Credit: FHWA TIM Gap Analysis Webinar, October 2014)

2.3 TIM Gaps and Gap Filling Recommendations

The variations in the current TIM practice between the different State/local level and national level TIM programs result in differences in the gaps identified in each program. The TIM gap analysis presented here identifies specific themes of the gaps in the overall state of TIM practice. The identified gaps outline the barriers and challenges that hinder the State/local level TIM programs from having a complete TIM practice in their areas. These gaps also represent focus areas for national level TIM agencies in order to most effectively support State/local programs in achieving their TIM goals. It is worth reiterating that lack of funding and budget limitations are key challenges facing different State and local TIM programs, and can hinder them from achieving their envisioned TIM goals. Nevertheless, the focus of the analyses based on the NUG strategies is primarily on the strategic and tactical aspects that are missing in the current TIM practice of these programs. However, that does not diminish the fact that availability of dedicated funding is vital for a complete and successful TIM program.

In addition to the need for dedicated funding, the ability to efficiently utilize the available resources in order to achieve the 18 NUG strategies represents the founding framework for a successful and complete TIM program. These elements build upon the benchmarking of the current TIM process against the NUG strategies, as well as the analysis of the TIM SA results, in order to identify and prioritize the different TIM gaps. Based on the analyses conducted, examples of these gaps include:

Program and Institutional Gaps

- Multiagency involvement from all TIM partners.
- Formal documentation of the TIM agreements (e.g., memorandum of understanding (MOUs)).
- Multidisciplinary TIM training.
- Performance measures (PM) and goals tracking.
- Road clearance laws and legislations.
- Public awareness and outreach.

Operational Gaps

- Responder safety procedures and practices.
- Equipment staging and scene management.
- Accident reconstruction and investigations.
- 24/7 responder availability.
- Safety service patrol (SSP) availability.

Communication and Technology Gaps

- Emergency communications systems during incident response.
- Prompt incident detection and notification.
- Interoperable data sharing.

The recommended actions and measures at both the State/local level and national level based on the conducted TIM gap analysis are summarized in Table 3. This table of actions is a tool that can be used to allocate TIM resources at the different government levels into the focus areas that still need additional improvements. It is worth noting that the action items below are recommended based on the information gathered when this analysis was conducted. Some of these actions may have been already addressed by the time the report is publicly available.

Table 3. Summary of State/Local and National Level Actions.

#	NUG Strategy	State/Local Level Actions	National Level Actions
1	**TIM Partnerships and Programs**	Initiate or formalize regional or statewide TIM task force/ committee. Promote and support TIM stakeholder participation in current and future efforts to update the State's SHSP to ensure TIM-related strategies continue to be included. Engage and obtain buy-in from agency executive/ senior leaders. Institutionalize and gain participation in TIM program(s). Engage absent agencies in the TIM task force/ committee. Prepare TIM policy statement and/or MOU. Conduct regular TIM committee meetings and/or TIM conferences. Increase awareness of available State funding opportunities. Formalize the After-Action Review (AAR) process.	Update FHWA TIM strategic plan and roadmaps. Benefit from PSEs (planned special events) and emergency management agencies in building stronger relationships among TIM partners. Continue to conduct annual FHWA TIM SA. Develop strategies for building stronger State TIM programs such as strategic plans, best practices, and guidelines. Develop guidance for recruitment and retention of fire service traffic control personnel. Develop multidisciplinary safe, quick clearance plans. Increase awareness of available national funding opportunities. Support relationships with other federal agencies and departments. Support involvement of and relationships with insurance and towing companies. Include TIM support activities in the Local and Tribal Technical Assistance Programs' (LTAP/TTAP) strategic plan.
2	**Multidisciplinary NIMS and TIM Training**	Increase awareness of NIMS/ICS training requirements. Develop training courses for the various disciplines. Identify cultural differences between responder agencies and work to overcome those differences through multidisciplinary training. Integrate TIM training into police and fire training curriculum. Consider tabletop exercises with multiple agencies and disciplines. Provide cross-training that highlights roles and responsibilities of each responder. Establish TIM training subcommittee. Emphasize importance of multidiscipline TIM training. Participate in the Second Strategic Highway Research Program (SHRP2) training courses. Promote awareness and training of TIM guidelines.	Develop virtual and web-based training courses for the TIM community to support ongoing classroom training courses. Continue to disseminate the SHRP2 training courses. Use available government grants to develop new TIM training materials and courses. Develop job performance requirements for TIM responders.

Table 3. Summary of State/Local and National Level Actions. (cont.)

#	NUG Strategy	State/Local Level Actions	National Level Actions
3	**Goals for Performance and Progress**	Review existing data sources to identify standard TIM PM. Address performance discrepancies among different local response centers. Develop a mission statement and identify attainable goals for TIM Task Force. Initiate a mechanism to collect secondary incident data. Add fields to the crash report to support tracking roadway and incident clearance times.	Communicate and promote the best practices and effects of TIM improvements. Initiate PM followed by close monitoring with select TIM programs. Promote the new performance metrics questions in the FHWA TIM SA.
4	**TIM Technology**	Expand use of ITS equipment (e.g., CCTV, DMS, signal preemption). Increase awareness among responders about the location of ITS equipment. Use enhanced accident reconstruction technologies (e.g., photogrammetry and total station). Enhance awareness of the TMCs' capabilities in managing traffic at incident scene. Add mobile cameras to the SSP and Incident Response Vehicles (IRVs). Review regularly technology advancements. Identify potential funding sources for purchasing crash reconstruction equipment.	Conduct research on the uses and benefits of ITS technologies in TIM operations. Develop guidelines for the proven technologies to be adopted into TIM operations.
5	**Effective TIM Policies**	Review strategies for TIM response equipment availability including mutual-aid agreements and vehicle take-home policies. Enhance safe, quick clearance through towing and recovery focused initiatives. Review Hold Harmless/safe, quick clearance policies and HazMat response. Designate IRVs as emergency responders.	Consider reviewing the new proposed amendment for Chapter 6I of the 2017 Manual on Uniform Traffic Control Devices (MUTCD) that is scheduled to be out in May 2015, and provide any comments regarding control of traffic at TIM areas during the 6-month docket comment ending in November 2015. Support how State/local TIM programs review and revise safe, quick clearance legislation.
6	**Awareness and Education Partnerships**	Work with DOT public information to facilitate education efforts. Partner with roadside assistance, local insurance companies, and local media for promoting awareness of TIM-related laws. Develop public outreach plans focusing on TIM legislation and responder safety. Increase TIM benefit awareness.	Promote increased knowledge of and use of available FHWA TIM outreach and awareness materials (e.g., the FHWA Traffic Incident Management Outreach Toolkit).[3] Poll different States to identify if additional materials need to be developed. Conduct TIM outreach campaigns and workshops. Develop websites for TIM education.

Table 3. Summary of State/Local and National Level Actions. (cont.)

#	NUG Strategy	State/Local Level Actions	National Level Actions
7	**Recommended Practices for Responder Safety**	Promote wearing high visibility safety personal protective equipment (PPE). Address problems with law enforcement not wanting to wear their high visibility PPE. Review responder safety practices/policies and identify best practices. Investigate the possibility of installing computers in all maintenance field vehicles. Identify consistent means to notify on-scene responders when a scene is being deconstructed. Review and update existing emergency vehicle lighting legislation. Develop multidiscipline guidelines for traffic control and incident scene management, including vehicle placement, emergency vehicle lighting, end of queue warning and HazMat response.	Promote continuous use of best practice guidelines for responder safety. Clarify roles for responders by establishing a unified chain-of-command for traffic incidents. Review/develop on-scene emergency vehicle lighting policies. Research methods to expedite the crash investigation process.
8	**Move Over/Slow Down Laws**	Organize joint efforts to advocate passing necessary legislation (e.g., adding towing, recovery and maintenance personnel to the Move Over/Slow Down laws). Install permanent signage to support the Move Over/Slow Down and driver removal laws. Investigate opportunities for public-private partnership with insurance companies and roadside assistance companies to promote Move Over/Slow Down laws and other related TIM messages. Review and revise existing Move Over/Slow Down laws to include response vehicles and tow trucks. Develop and distribute educational materials to increase awareness of the Move Over/Slow Down law.	Conduct Move Over/Slow Down law campaigns. Develop and promote multidisciplinary TIM policies and procedures for Move Over/Slow Down laws.
9	**Driver Training and Awareness**	Increase driver awareness about TIM related laws (both Move Over/Slow Down and Driver Removal). Seek dispatchers help with educating motorists about the Steer It, Clear It law. Initiate efforts to establish a TIM/Safety Awareness Week. Integrate TIM-related legislation (Move Over/ Slow Down and Driver Removal Laws) into driver's education programs and the DMV driver handbooks. Pursue funding support for driver awareness. Use local public access television channel for outreach efforts. Initiate subcommittees to focus on TIM-related public outreach/education efforts.	Promote driver training about how to react when an emergency vehicle approaches. Model legislation. Promote public awareness and education about the public's role in safe, efficient resolution of TIM events.

Table 3. Summary of State/Local and National Level Actions. (cont.)

#	NUG Strategy	State/Local Level Actions	National Level Actions
10	**Multidisciplinary TIM Procedures**	Prepare emergency traffic control and incident scene management guidelines based on best practices. Establish common understanding of the roles, responsibilities and priorities of each response partner. Establish authority removal (hold harmless) legislation. Implement a heavy-duty towing and recovery incentive programs. Use enhanced technologies (including but not limited to total stations, mini helicopters and photogrammetry) for accident reconstruction. Provide a basic overview of incident reconstruction procedures to all responders. Enhance the use of after incident reviews. Utilize the existing HazMat reference guides (e.g., Emergency Response Guidebook from the USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA)).[9] Establish minimum standards for towing and recovery rotation lists. Identify opportunities to facilitate coroners and medical examiners' ability to access the incident scene. Develop joint interagency protocols and common resource investments.	Incorporate developed ICS procedures into the training of agencies and private entities (e.g., towers) who are involved in on-scene response. Develop guidelines for TIM towing operations work plans. Conduct research on emergency vehicles visibility and warning lights. Continue to offer and conduct multidisciplinary safety procedures training sessions.
11	**Response and Clearance Time Goals**	Review closely and identify reasons those incidents with clearance times exceeding the targeted times. Initiate rapid incident scene clearance (RISC) programs through public safety agencies.	Initiate PM and monitor closely with select TIM programs. Promote the new performance metrics questions in the FHWA TIM SA.
12	**24/7 Availability**	Address after hours availability of DOT responders and responders other than police and fire service. Address operational limitations and resources availability for DOT responders.	Conduct research on alternative automated incident notification methods/approaches during after hours.
13	**Multidisciplinary Communications Practices and Procedures**	Improve understanding of "mutual" radio channels to enhance TIM communications. Investigate possible ways to enable on-scene photo sharing during response. Incorporate the dispatch/tele-communicator community into the TIM program. Develop a comprehensive communication process. Consider TMCs to act as data fusion centers to enhance information sharing. Improve accuracy and quality of information shared from the field to agencies not on-scene. Utilize van pools and other transit providers to assist with incident detection and verification. Conduct TIM exercises focused on communications. Create single point of contact lists. Initiate efforts to enhance mile markers to consider adding route and direction to the markers.	Support implementation of a common interagency communications protocol/process for all incident management personnel. Support State/local TIM programs to review/update existing emergency communication procedures.

Table 3. Summary of State/Local and National Level Actions. (cont.)

#	NUG Strategy	State/Local Level Actions	National Level Actions
14	**Prompt, Reliable Responder Notification**	Develop master contact lists to facilitate notification and incident response communications. Implement after hours notification process. Identify opportunities to enhance local-level notification. Increase sense of urgency from responding agencies. Allow medical examiners to request an escort when responding to incident scenes.	Provide guidance for developing common standards for notification information. Promote the use of eminent technology to improve notification processes.
15	**Interoperable Voice and Data Networks**	Insure that the different regions collect the same data. Promote and educate responders on interoperable real-time communications. Better planning of on-scene communications at large incident scenes when multiple agencies are responding. Investigate possibility of providing a statewide communications system or integrating into the existing systems.	Promote the benefits of using interoperable communications equipment to improve TIM response and on-scene operations.
16	**Broadband Emergency Communications Systems**	Verify that traffic conditions information reaches responders at the incident scene. Identify opportunities to share data with TMCs using CAD system. Maintain awareness of current and future data integration projects. Address the problems of communication dead areas. Enhance notification process.	Promote common interagency communications system for all TIM personnel. Promote integration of TMC and law enforcement systems. Promote integration of CAD systems with ITS. Promote deployment of Faster and Safer Travel through Traffic Routing and Advanced Controls (FAST-TRAC) systems.
17	**Prompt, Reliable Traveler Information Systems**	Investigate distribution of traffic messages via social media (e.g., Facebook and Twitter). Develop a statewide 511 system with smart phone applications. Identify additional methods to provide incident information to the freight industry. Expand the use of variable message signs by all responders and improve coordination to avoid conflicting messages.	Promote efforts for TMCs to proactively provide traffic management and traveler information early on at greater distances.
18	**Partnerships with News Media and Information Providers**	Develop a working relationship with the news media and other information providers.	Continue current efforts by IACP's TIM subcommittee to educate media of their TIM role and include them in the planning process.

3 COMPONENTS OF A SUCCESSFUL TRAFFIC INCIDENT MANAGEMENT PROGRAM

3.1 Framework of a TIM Program

Chapter 10 of the Federal Highway Administration (FHWA) Freeway Management and Operations Handbook is devoted to traffic incident management (TIM). It describes a TIM program as follows:

"A TIM program is a logical, structured, and integrated set of TIM activities tailored to a specific geographic area. It includes policies, strategies, and technologies integrated into a multiagency, multijurisdictional environment aimed at reducing the occurrence and impact of traffic incidents. To be successful, a TIM program must be ongoing and actively managed. The TIM program should be developed and managed in conjunction with the area's freeway management and operations program. The organization of the TIM program and the operational responsibilities of its participants should fit into the organization structure of the region, recognizing the existing assignment of TIM activities and addressing gaps and overlaps in those assignments." [6]

In addition, the FHWA Traffic Incident Management Handbook points out that:

"Creating a formalized TIM program is an evolutionary process and it should not be presumed that success in each of the elements will be easily achieved. Many well established TIM programs, with 10 to 15 years' experience, are still working to resolve key issues in attainment of the elements of a formal program." [10]

In 2006, the National Traffic Incident Management Coalition (NTIMC) examined a number of TIM programs across the country and identified the following items as the building blocks of an institutional framework for implementing a successful TIM program:[11]

- Incident Management Policies and Plans.
- Interagency Relationships.
- Organizational Structure.
- TIM Programs.
- Staffing and Training.

- Performance Goals.
- Reporting Channels.
- Budget.

These quoted resources recognize that there is no one-size-fits-all to the structure, components and implementation of a TIM program. Rather, it must be customized to fit the capabilities and needs of the local deployment area. However, it can be said that all successful TIM programs consist of the following elements (Figure 9):

- **Strategic Program Elements** – that form a framework for TIM activities. These elements provide the multiagency planning, programming, and evaluation necessary to support efficient and collaborative on-scene operations; as well as how to plan, prepare for, and measure performance of the program. Strategic elements include items such as strategic plans, policies and training.
- **Tactical Program Elements** – that provide the tools and technologies for traffic management and interagency communications for on-scene operations. Tactical elements include items such as on-scene traffic control procedures, motorist assist patrols and pre-staged response equipment.
- **Support Program Elements** – that provide for the operational, tactical, and institutional support for effective communication and information exchange. Support elements include items such as communications systems, data and video collection and sharing, and traveler information.

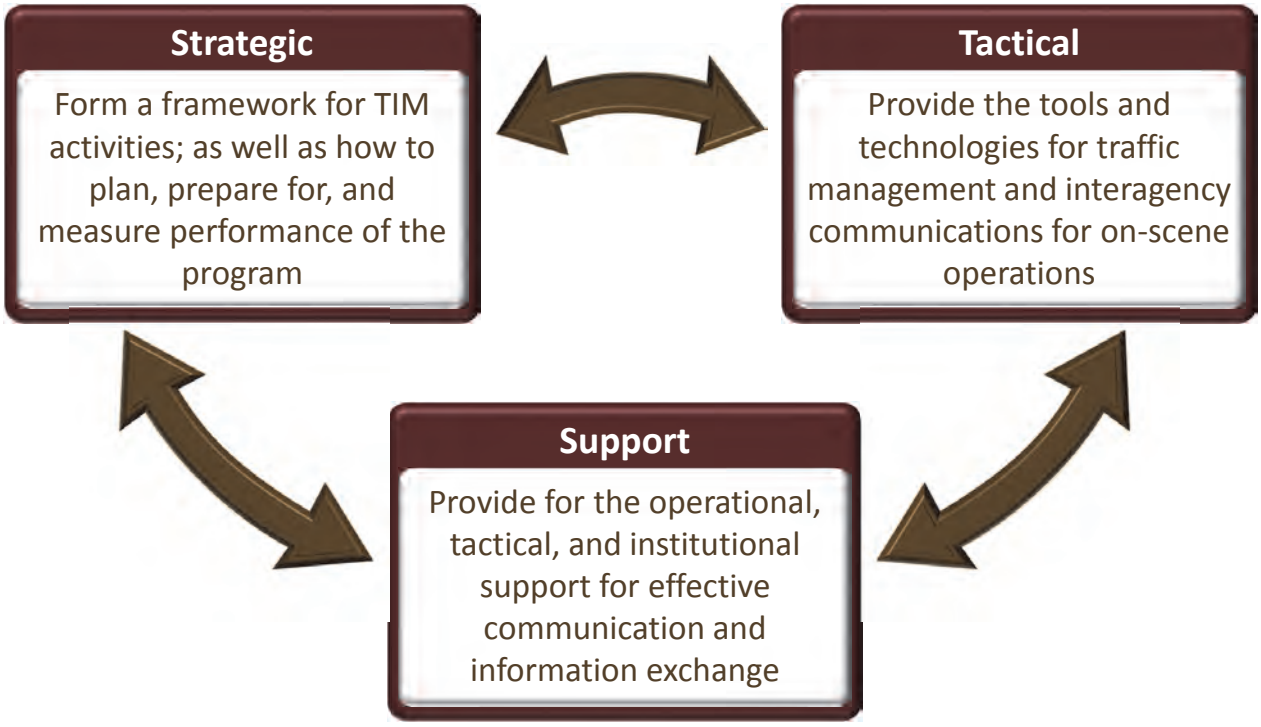

Figure 9. Chart. Framework of a Successful TIM Program.

Just as there is no one-size-fits-all TIM program, there is no one-size-fits-all way to describe the approach, structure and components of a comprehensive program. Numerous documents have been created over the years that take different approaches and include different components. In the current State of the national program, two documents stand out as commonly known and comprehensive approaches to describing TIM strategies and evaluating TIM program components and overall TIM program success. Those are:

- The National Unified Goal (NUG), developed by NTIMC, contains three overall objectives: responder safety; safe, quick clearance; and prompt, reliable interoperable communications. In order to achieve its objectives, the NUG outlines 18 strategies as discussed in Section 2.1.
- The Traffic Incident Management Self-Assessment (TIM SA) was developed by FHWA as a benchmarking tool for evaluating TIM program components and overall TIM program success. Through the TIM SA, State and local TIM program managers are able to assess progress and identify areas for improvement at State and local levels. The 2012 survey contained 34 questions under three categories: strategic, tactical, and support.

When the two approaches, NUG and TIM SA, are examined, it is clear there is significant overlap between the two, but also elements that are contained in one but not the other. Accordingly, for this analysis both resources were examined and components integrated while removing any duplication. In addition, certain emerging components have been added such as planning, budget, resource management, and cost recovery.

It should be noted that TIM participants may not be completely familiar with some of the emerging components. It is beyond the scope of this primer to provide details on these components. To learn more about these components, the FHWA TIM Publications website has various resources that can be used to obtain further information and guidance on the different relevant subjects.[12]

Sections 3.3, 3.4 and 3.5 contain itemized lists of the comprehensive components of a mature TIM program, categorized as strategic, tactical, or support, respectively. A fully consolidated checklist is included at the end of the chapter.

3.2 Key Stakeholders and TIM Partners

A key for the success of the TIM practice is the collaborative coordination between the multidisciplinary partners involved in the process. The level of involvement of the different partners in different TIM activities varies by the discipline as well as the nature of the TIM activity.

The FHWA Regional Incident Management Programs Implementation Guide stresses the importance of identifying and involving stakeholders as follows:

"Coordinating and managing responses to an incident by multiple agencies and jurisdictions requires a complex array of interagency relationships, and relationships between key incident management personnel at those agencies. These relationships form the basis for the institutional framework of an incident management program, and in most cases must exist before a formal framework can be undertaken.

The impact of major traffic incidents transcends political, jurisdictional, and geographical boundaries, and may affect entire regional road networks and hundreds of thousands of travelers. For those reasons, it is important to coordinate response regionally rather than just locally. Often, agencies across jurisdictions can share information about how to address specific incident management situations, allowing agencies to benefit from the experience of outside partner organizations."[13]

The NTIMC's "Example Strategies for Building Stronger State TIM Programs" also identifies this as a critical activity and states:

"Strong working partnerships among all responding disciplines and agencies are a basic underlying principle of effective TIM programs. NTIMC encourages partnerships that are formalized through written operational agreements, joint, written operational policies and procedures, and joint training exercises. Ideally, the partnerships include all TIM partners—which, at a minimum, would include transportation, law enforcement, fire, EMS, and towing and recovery. Additional partners that ideally would be involved include the trucking industry, traffic control industry, insurance industry, and emergency management agencies."[11]

At the local/regional level there can be a significant number of stakeholders involved in TIM depending upon the incident type and severity as well as the institutional structure of the area operations environment. Some stakeholders will be routinely involved while others will be involved only when circumstances dictate their involvement. In addition, there are stakeholders who may not respond to an incident but collect and/or disseminate incident related information. Finally, users of the systems such as the traveling public are also stakeholders. Table 4 identifies the most common local stakeholders and the nature of their involvement.

Table 4 focuses on stakeholders that are more directly involved in incident response, information and transportation system use at the local/regional level. However, when TIM is looked at from a broader level, that is, from the national level to the local level, and when the full gamut of activities are considered, including elements such as planning and program support, the list of stakeholders and their roles grows significantly. Table 5 identifies key TIM stakeholders that are involved from this broader view, their prime responsibility under TIM and their role (primary or secondary) related to ten broad categories.

Table 4. Traffic Incident Management Stakeholders Roles and Descriptions.[10]

Traditional Responders	Special/Extreme Circumstance Responders	Incident Information Providers	Transportation System Providers and Users
Law Enforcement	HazMat Contractors	Public Safety Communications	Traveling Public
Fire and Rescue	Coroners and Medical Examiners	Traffic Media	Trucking Industry
EMS	Emergency Management Agencies	Traveler Information Services	Insurance Industry
Towing and Recovery	Environmental/ Natural Resources/ Departments of Health (DOH)	Transportation Agencies	Public Transportation Providers
Transportation Agencies	Utilities		Motorist Organizations

Table 5. Key Stakeholder Roles and Responsibilities.[1]

P: Primary **S**: Secondary

Category	Stakeholder	Funding	TIM Planning	Ops & Management	Law Enforcement	Fire/Rescue	EMS	HazMat	Outreach	Training	Other	Prime Responsibility
Federal Agencies	Federal Highway Administration	P	S						S	P		Aid operation of highways, sets standards, publish "best practices" and planning guides.
	Federal Emergency Management Administration	S	S					P	S	P		Manage national emergencies and hazards, federal response and recovery efforts, initiate proactive mitigation activities, train emergency responders, and manage the National Flood Insurance Program, the USFA, and the PHMSA.
State Agencies	State DOT											Operate and maintain State highway system, overall planning and implementation of TIM programs, operate TMCs, and manage service patrols.
	Traffic Operations Office/ITS Section	P	P	P					P	P		Operate ITS and TMCs, set standards for traffic devices, in some areas operate Service Patrol.
	Planning Office	S	S									Plan transportation improvements.
	Maintenance Office	P		P								Maintain infrastructure; in some areas operate Service Patrol.
	Safety Office	S	S						S	S		Set safety standards, goals, and practices.
	Motor Vehicle Compliance Office	S			P					S		Regulate and enforce commercial motor carriers.
	State Patrol (SP)	S	P		P				P	P		Manage the majority of freeway incidents on State highways, involved in all aspects of TIM, and dispatch federal and State law enforcement.
	Department of Law Enforcement	S			S					S		Criminal investigations, including traffic incidents.
	Department of Environmental Protection							P			P	Lead agency for environmental management; administer regulatory programs and issue permits for air, water, and waste management.
	Division of Emergency Management											Ensure State is prepared to respond to emergencies, recover from them, and mitigate their impacts.
	Joint Telecom Task Force			P	P							State law enforcement radio system, also participates in regional law enforcement dispatch centers. In many States, it's the DOT that manages the statewide communications backbone.

Table 5. Key Stakeholder Roles and Responsibilities. (cont.)[1]

P: Primary **S**: Secondary

Category	Stakeholder	Funding	TIM Planning	Ops & Management	Law Enforcement	Fire/Rescue	EMS	HazMat	Outreach	Training	Other	Prime Responsibility
Local Agencies	Law Enforcement (Police and Sheriff)	S			P				P	S		Conduct TIM on arterial and local (and some freeway) systems.
	Fire/Rescue	S	S			P	S	P	S	S		Primary emergency response/incident command agency for fire suppression, HazMat spills, rescue, and extrication of trapped crash victims, some EMS.
	Emergency Medical Services						P					Primary EMS, if separate from fire/rescue, triage, treatment, and transport of crash victims.
	Medical Examiner/ Coroner										P	Investigate traffic crash deaths.
	City and County Public Works and Traffic Engineering	S	S	P					S	S		Operate and maintain local highways, streets and utilities such as sewer and water.
	Transit Agencies	S	S	P							P	Operate and maintain public transportation systems (may be private, too).
Authorities	Expressway Authorities	P	P	P					S		S	Operate and maintain toll roads.
Private Partners	Towing and Recovery Operators		S	P								Removal of wrecked or disabled vehicles and debris from incident scenes.
	HazMat Contractors							P				Clean up and dispose of toxic or HazMat.
	Motor Carriers								S			Train and implement carriers and drivers regarding good TIM practice. Support TIM responders on safe, quick clearance.
	Utility Companies			P								Repair and/or manage utility resources at the scene such as electric, communications and gas service, lines and wires.
	Insurance Industry								P	S	P	Insure vehicles, promote safe practices.
	Traffic Media								P			Report incidents, alert motorists, provide alternate route information.

Table 5. Key Stakeholder Roles and Responsibilities. (cont.)[1]

P: Primary **S**: Secondary

Category	Stakeholder	Funding	TIM Planning	Ops & Management	Law Enforcement	Fire/Rescue	EMS	HazMat	Outreach	Training	Other	Prime Responsibility
Associations	Technical Societies (ITS/ITE State Chapters)	S							S	S		Assist agencies, support TIM programs, and provide training.
	American Automobile Association	S							P			Assist agencies, support TIM programs, inform motorists.
	Community Traffic Safety Teams	P							P	S		Assist agencies, support TIM programs, and provide safety programs.
	Chamber of Commerce								S			Assist agencies, support TIM programs.
	Associations of Cities, Counties, Sheriffs, Police, EMS, and others	S							S			Assist agencies, support TIM programs.
Other	Citizens for Better Transportation (State by State)								S			Assist agencies, support TIM programs.
	Citizens Groups								S			Assist agencies, support TIM programs.

Figure 10. Photo. NYSDOT Bi-monthly TIM Steering Committee Meeting. (Credit: VHB)

3.3 TIM Program Strategic (Institutional) Capabilities

Strategic program elements form a framework for TIM activities. These elements provide the multiagency planning, programming, and evaluation necessary to support efficient and collaborative on-scene operations; as well as how to plan, prepare for, and measure performance of the program. Strategic elements include items such as strategic plans, policies, and training as well as budgeting and resource management. The following is a list of strategic components associated with a mature, comprehensive TIM program.

- Have a TIM multiagency team or task force that meets regularly to discuss and plan for TIM activities.
- Conduct multiagency training (held at least once a year) on TIM-specific topics such as:
  - National Incident Management System (NIMS)/Incident Command System (ICS) 100.
  - Training of mid-level managers from primary agencies on the NUG.

- National Traffic Incident Management Responder Training Program (Second Strategic Highway Research Program (SHRP2)).
- Traffic control.
- Work zone safety.
- Safe on-scene parking.

- Conduct multiagency post-incident debriefings that include elements such as:
  - A chronology of the event and response.
  - An assessment of what went right/wrong.
  - An identification of improvements needed and an action plan for implementation of such.
- Conduct planning for Planned Special Events (PSEs,) including:
  - Sporting events.
  - Concerts.
  - Festivals.
  - Conventions at permanent multi-use venues.
  - Public events at temporary venues such as parades, fireworks displays, marathons, bicycle races, sporting games.
- Conduct planning for Construction and Maintenance projects:
  - Typically this activity is part of the development of the Traffic Management Plan (TMP) for the project. All highway construction and maintenance projects that use federal aid highway funds are required to develop TMPs.
- Have multiagency agreements/memorandum of understanding (MOUs) including:
  - Agreements/MOUs signed by top officials from participating agencies.
  - Clearly defined incident scene roles and responsibilities for each participating agency.
  - Clearly defined agency roles and responsibilities for planning and funding the TIM program.
  - Safe, quick clearance goals stated as time goals for incident clearance (e.g., 90 minutes) in the agreement/MOU.
- Conduct planning to support the TIM activities across and among participating agencies including the Metropolitan Planning Organization (MPO).
- Establish an institutionalized approach to TIM program leadership by having someone from at least one of the participating agencies responsible for coordinating the TIM program as their primary job function.
- Have multiagency agreements on the two performance measures (PM) being tracked:
  - Incident clearance time.
  - Roadway clearance time.

- Have established methods to collect and analyze the data necessary to measure performance in reduced roadway clearance time and reduced incident clearance time.
- Have targets (e.g., time goals) for performance of the two measures.
- Routinely review whether progress is made in achieving the targets.
- Track performance in reducing secondary incidents.
- Deploy effective and affordable TIM technology to support TIM activities including:
  - Incident detection.
  - Prompt and reliable responder notification.
- Have 24/7 availability of key responders and equipment.
- Develop and perform efficient and effective multiagency resource management based on the utilization of:
  - Appropriate personnel who are best qualified (i.e., capable but not over-qualified) for the various tasks.
  - Appropriate equipment by function (i.e., use of the least costly equipment capable of performing the function).
  - Appropriate technology capable of supporting various onsite resource tasks.
- Have a multiagency commitment and approach to the establishment of effective budgeting to provide stable funding for TIM within the processes and capabilities of the individual and/or collective agencies as appropriate to the activity.
- Education and awareness partnerships including driver training and awareness.

Figure 11. Photo. Safe Zone for Incident Response Operations.[3]

3.4 TIM Program Tactical (Technical/ Operational) Capabilities

Tactical program elements provide the tools and technologies for traffic management and interagency communications for on-scene operations. Tactical elements include items such as on-scene traffic control procedures, motorist assist patrols and pre-staged response equipment. The following is a list of tactical components associated with a mature, comprehensive TIM program.

- Have "authority removal" laws allowing pre-designated responders to remove disabled or wrecked vehicles and spilled cargo:
  - "Authority removal" law in place.
  - Understood and utilized by responders.
- Have "driver removal" laws that require drivers involved in minor crashes (i.e., not involving injuries) to move vehicles out of the travel lanes:

- "Driver removal" law in place.
- Adequately communicated to motorists.

- Use a Safety Service Patrol (SSP) for incident and emergency response.
- Utilize multidisciplinary training such as the SHRP2 TIM National Training.
- Utilize the ICS on-scene.
- Have response equipment pre-staged for timely response.
- Identify and document resources to ensure that a list of towing and recovery operators (including operator capabilities and special equipment) is available for incident response and clearance.
- Identify and document resources to ensure that a list of hazardous materials (HazMat) contractors (including capabilities and equipment) is available for incident response.
- Give at least one responding agency the authority to override the decision to utilize the responsible party's HazMat contractor and call in other resources.
- Have the medical examiner response clearly defined and understood for incidents involving fatalities.
- Have the electric utility companies' role clearly defined for incidents involving downed electrical wires.
- Have procedures in place for expedited incident reconstruction/ investigation.
- Have a policy in place for removal of abandoned vehicles.
- Have "Move Over" laws that require drivers to slow down and if possible move over to the adjacent lane when approaching workers or responders and equipment in the roadway:
  - "Move Over" law in place.
  - Adequately communicated to drivers.
- Train all responders in traffic control following Manual on Uniform Traffic Control Devices (MUTCD) guidelines.
- Routinely utilize transportation resources to conduct traffic control procedures for various levels of incidents in compliance with the MUTCD.
- Routinely utilize traffic control procedures for the end of the incident traffic queue.
- Have mutually understood equipment staging and emergency lighting procedures onsite to maximize traffic flow past an incident while providing responder safety:
  - Vehicle and equipment staging procedures.
  - Light-shedding procedures.
  - Personal Protective Equipment used by responders.
  - Pre-established, signed incident investigation sites.
- Have procedures in place for prompt responder notification.

3.5 TIM Program Support (Financial/ Technological) Capabilities

Support program elements provide for the operational, tactical, and institutional support for effective communication and information exchange. Support elements include items such as communications systems, data and video collection and sharing, traveler information, and cost management and recovery. The following is a list of tactical components associated with a mature, comprehensive TIM program.

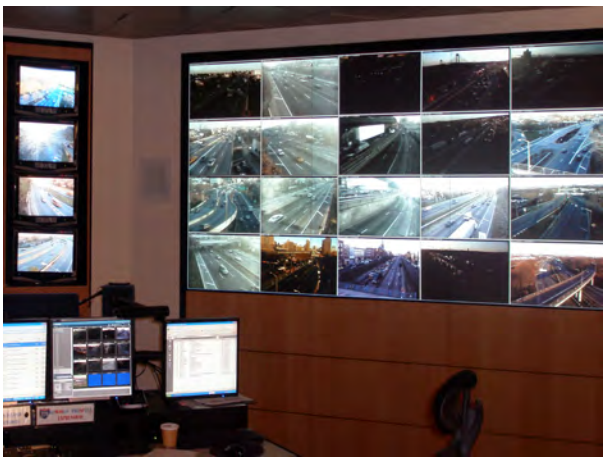

Figure 12. Photo. NYSDOT Joint Traffic Management Center. (Credit: VHB)

- Use a traffic management center (TMC)/traffic operations center (TOC) to coordinate incident detection, notification and response.
- Share data/video among agencies.
- Have specific policies and procedures for traffic management during incident response:
  - Signal timing changes.
  - Pre-planned detour and alternate routes identified and shared among agencies.
- Provide for interoperable, interagency communications onsite between incident responders.
- Have a real-time motorist information system providing incident specific information:
  - Traveler information delivered via 511/website.
  - Traveler information delivered via mobile applications.
  - Traveler information delivered through traffic/news media partnerships and access to TMC/TOC information.
- Provide motorists with travel time estimates for route segments.
- Develop and implement cost recovery and management systems including:
  - Costs recovery for the reimbursement for services from sources outside of the direct budget that funds the program seeking reimbursement.
  - Cost management includes efforts to maximize the cost-benefit relationship of program activities via a cyclical loop of cost planning, tracking, analysis, and evaluation and reprogramming.

3.6 Checklist for a Comprehensive, Mature TIM Program

Table 6, Table 7, and Table 8 provide a comprehensive checklist that integrates the strategic, tactical, and support components identified in the previous three subsections. They are provided in this format to allow TIM program managers and participants an easy way to print/extract the tables and use them to identify the elements of a comprehensive program as well as to benchmark their progress and identify gaps.

It is clear that many of the components listed contain multiple elements and/or relate to activities that can be implemented to a variety of degrees. For example, one TIM strategic component relates to the need to have multiagency MOUs. It is possible that MOUs exist for on-scene roles and responsibilities but not for performance measures. Similarly, MOUs may exist between some TIM responders but not others. As a result, the tables are constructed in a manner similar to the FHWA TIM SA in that users may not only track elements that are implemented, but also identify the degree to which they are implemented; Low, Medium, or High according to the following criteria:

- **Low (L)** – Little to no activity in this area; no discussions or some informal discussions with no or minimal action taken.
- **Medium (M)** – There is some or good level of activity in this area; has been put into practice with some multiagency agreement and cooperation and with fair to good results.
- **High (H)** – Activity in this area is outstanding; efforts in this area are well coordinated with a high level of cooperation among agencies.

Table 6. Traffic Incident Management Program Strategic (Institutional) Components.

TIM Program Strategic (Institutional) Components	Implementation Degree		
	L	M	H
Have a TIM multiagency team or task force which meets regularly to discuss and plan for TIM activities.			
Conduct multiagency training held at least once a year on TIM-specific topics: • NIMS/ ICS 100. • TIM SHRP2 Training. • Training of mid-level managers from primary agencies on the NUG. • Traffic control. • Work zone safety. • Safe on-scene parking.			
Conduct multiagency post-incident debriefings. Develop and distribute summaries of after action reports.			
Conduct planning for special events (PSEs): • Sporting events. • Concerts. • Festivals. • Conventions at permanent multi-use venues. • Public events at temporary venues such as parades, fireworks displays, bicycle races, sporting games.			

Table 6. Traffic Incident Management Program Strategic (Institutional) Components. (cont.)

TIM Program Strategic (Institutional) Components	Implementation Degree		
	L	M	H
Conduct planning for construction and maintenance projects.			
Have multiagency agreements/MOUs including: • Agreements/MOUs signed by top officials from participating agencies. • Clearly defined incident scene roles and responsibilities for each participating agency. • Clearly defined agency roles and responsibilities for planning and funding the TIM program. • Safe, quick clearance goals stated as time goals for incident clearance (e.g., 90 minutes) in the agreement/MOU.			
Conduct planning to support the TIM activities across and among participating agencies including the MPO.			
Have someone from at least one of the participating agencies responsible for coordinating the TIM program as their primary job function.			
Have multiagency agreement on the two PM being tracked: • Roadway clearance time. • Incident clearance time.			
Have established methods to collect and analyze the data necessary to measure performance in reduced roadway clearance time and reduced incident clearance time.			
Have targets (e.g., time goals) for performance of the two measures.			
Routinely review whether progress is made in achieving the targets.			
Track performance in reducing secondary incidents.			
Deploy effective and affordable TIM technology to support TIM activities including: • Incident detection. • Prompt and reliable responder notification.			
Have 24/7 availability of key responders and equipment.			
Develop and perform efficient and effective multiagency resource management based on the utilization of: • Appropriate personnel who are best qualified (i.e., capable but not over-qualified) for the various tasks. • Appropriate equipment by function (i.e., use of the least costly equipment capable of performing the function). • Appropriate technology capable of supporting various onsite resource tasks.			
Have a multiagency commitment and approach to the establishment of effective budgeting to provide stable funding for TIM within the processes and capabilities of the individual and/or collective agencies as appropriate to the activity.			
Education and awareness partnerships including driver training and awareness.			

Table 7. Traffic Incident Management Program Tactical (Technical/Operational) Components.

TIM Program Tactical (Technical/Operational) Capabilities	Implementation Degree		
	L	M	H
Have "authority removal" laws allowing pre-designated responders to remove disabled or wrecked vehicles and spilled cargo: • "Authority removal" law in place. • Understood and utilized by responders.			
Have "driver removal" laws that require drivers involved in minor crashes (i.e., not involving injuries) to move vehicles out of the travel lanes: • "Driver removal" law in place. • Adequately communicated to motorists.			
Use a SSP for incident and emergency response.			
Utilize the ICS on-scene.			
Have response equipment pre-staged for timely response.			
Identify and document resources so that a list of towing and recovery operators (including operator capabilities and special equipment) is available for incident response and clearance.			
Identify and document resources so that a list of HazMat contractors (including capabilities and equipment) is available for incident response.			
Give at least one responding agency the authority to override the decision to utilize the responsible party's HazMat contractor and call in other resources.			
Have the medical examiner response clearly defined and understood for incidents involving fatalities.			
Have the electric utility companies' role clearly defined for incidents involving downed electrical wires.			
Have procedures in place for expedited accident reconstruction/ investigation.			
Have a policy in place for removal of abandoned vehicles.			
Have "Move Over" laws that require drivers to slow down and if possible move over to the adjacent lane when approaching workers or responders and equipment in the roadway: • "Move Over" law in place. • Adequately communicated to drivers.			
Train all responders in traffic control following MUTCD guidelines.			
Routinely utilize transportation resources to conduct traffic control procedures for various levels of incidents in compliance with the MUTCD.			
Routinely utilize traffic control procedures for the end of the incident traffic queue.			
Have mutually understood equipment staging and emergency lighting procedures onsite to maximize traffic flow past an incident while providing responder safety. • Vehicle and equipment staging procedures. • Light-shedding procedures. • PPE used by responders. Pre-established, signed accident investigation sites.			
Have procedures in place for prompt responder notification.			

Table 8. Traffic Incident Management Program Support (Financial/Technological) Components.

TIM Program Support (Financial/Technological) Components	Implementation Degree		
	L	M	H
Use a TMC/TOC to coordinate incident detection, notification and response.			
Share data/video between agencies.			
Have specific policies and procedures for traffic management during incident response: • Signal timing changes. • Pre-planned detour and alternate routes identified and shared between agencies.			
Provide for interoperable, interagency communications onsite between incident responders.			
Have a real-time motorist information system providing incident-specific information: • Traveler information delivered via 511/ website. • Traveler information delivered via mobile applications. • Traveler information delivered through traffic/news media partnerships and access to TMC/TOC information.			
Provide motorists with travel time estimates for route segments.			
Develop and implement Cost Recovery and Management systems including: • Costs recovery for the reimbursement for services from sources outside of the direct budget that funds the program seeking reimbursement. • Cost management includes efforts to maximize the cost-benefit relationship of program activities via a cyclical loop of cost planning, tracking, analysis, and evaluation and reprogramming.			

4 ROLES AND RESPONSIBILITIES OF TRAFFIC INCIDENT MANAGEMENT STAKEHOLDERS

The components of the traffic incident management (TIM) program as well as the multidisciplinary TIM partners have been identified in the previous chapter. This chapter provides the linkage between the different TIM roles and responsibilities, program components, and stakeholders. As indicated previously, there are many stakeholders involved in TIM, some with key daily roles and others with support roles under occasional circumstances. This chapter describes program involvement for nine stakeholders:

- Transportation.
- Law Enforcement.
- Fire and Rescue.
- Emergency Medical Services (EMS).
- Public Safety Communications.
- Emergency Management.
- Towing and Recovery.
- Hazardous Material (HazMat).
- Traffic Information Media.

The following subsections identify the various key stakeholders and their roles and responsibilities. Roles and responsibilities are generally identified and discussed in the context of the eight stages of TIM identified earlier in Chapter 1. This is done in a tabular checklist format to help stakeholders identify their roles and responsibilities as well as ascertain areas in which their program has gaps. In some cases, stakeholders have little or no direct role in TIM response and/or are rarely involved except under extreme or special circumstances. Therefore these individual support roles will not be listed in the tabular checklist. Rather, the responsibility overview and the general roles will be combined into one.

The last subsection of the chapter shows the relationship between the TIM components identified in Chapter 3, the stakeholders and their relative level of involvement/ responsibility in the component. This is presented in a matrix format.

It should be noted that the bulk of the information contained in the tables and matrices in this chapter was obtained from two significant TIM resources, namely Federal Highway Administration (FHWA) Traffic Incident Management Handbook[10] and FHWA Emergency Transportation Operations website.[14]

4.1 Transportation

Responsibility Overview

Transportation agencies exist at the federal, State, local and tribal governmental levels. Definitions for both local and tribal governments have been added to the Glossary of Terms, in order to clarify their distinction and involvement in TIM efforts and activities. These agencies are typically responsible for the overall planning and implementation of TIM programs. Typically, these agencies are also involved in the development, implementation, and operation of traffic operations centers (TOCs), as well as the management of service patrols. In some areas the local metropolitan planning organization (MPO) plays a leadership role in TIM planning, policy and program management, while the transportation agencies focus on TIM operations and management.

Within transportation agencies, it is the operational sections—traffic management centers (TMCs), maintenance field staff, and service patrols—that play a critical role in TIM. TMCs serve as the hub for the collection and dissemination of incident information and play a critical role with incident detection and verification. At the incident scene, transportation agency responders focus on temporary traffic control (TTC), expedite scene clearance, and restore traffic flow. Transportation agency responders include maintenance personnel and specialized traffic incident responders, such as service patrol personnel.

Table 9. Checklist for Traffic Incident Management Responsibilities of Transportation Stakeholders.

Specific Roles by Transportation Agencies and Service Patrols	Checklist
Assist in incident detection and verification.	
Initiate traffic management strategies on incident impacted facilities.	
Protect the incident scene.	
Initiate emergency medical assistance until help arrives.	
Provide traffic control.	
Assist motorist with disabled vehicles.	
Provide motorist information.	
Provide sand for absorbing small fuel and anti-freeze spills.	
Provide special equipment used for clearing incident scene.	
Determine incident clearance and roadway repair needs.	
Establish and operate alternate routes.	
Coordinate clearance and repair resources.	
Serve as incident commander for clearance and repair functions.	
Repair transportation infrastructure.	

4.2 Law Enforcement

Responsibility Overview

Law enforcement agencies include State police and highway patrols, county police and county sheriffs, township and municipal police and other agencies that have officers sworn to enforce laws. Law enforcement agencies are emergency responders at traffic incident scenes, providing 24-hour emergency response and operating under a paramilitary command structure.

Upon arrival, the first officer on-scene assesses the situation and calls for additional resources (e.g., fire/rescue, EMS, utilities, and towing and recovery, among others) as needed. The officer secures the scene for responder and motorist safety, and conducts traffic control as necessary. Law enforcement also conducts scene investigation and/or evidence collection as dictated by the type of incident scene and severity. At most traffic incidents, law enforcement officers act alone and are trained to make unilateral command decisions.

Table 10. Checklist for Traffic Incident Management Responsibilities of Law Enforcement Stakeholders.

Specific Roles by Law Enforcement Officials	Checklist
Secure the incident scene.	
Provide emergency medical aid until help arrives.	
Safeguard personal property.	
Conduct incident investigations.	
Serve as incident commander.	
Supervise scene clearance.	
Assist disabled motorists.	
Direct traffic.	

4.3 Fire and Rescue

Responsibility Overview

Fire and rescue services are provided by county and municipal fire departments, and by surrounding fire departments through mutual aid agreements. In most jurisdictions, the fire department is the primary emergency response agency for HazMat spills. Like law enforcement agencies, fire and rescue departments also operate as emergency responders under a well-defined command structure providing 24-hour emergency response. Unlike law enforcement, who operate individually for most duties, fire departments operate under a highly organized team structure with the close supervision of a commanding officer. Typically, fire departments and EMS providers also act under the direction of one decision maker, and may not respond individually to requests from other response agencies unless their command officer directs them to do so. In most large urban areas, full time professional personnel staff the fire and rescue departments. In

many suburban and in most rural areas, volunteers primarily provide fire, rescue services and EMS.

In some cases, fire and rescue personnel may be the first to arrive at the incident scene. Upon arrival, fire and rescue personnel secure the scene to protect responders and motorists. After securing the scene, these personnel assess injured parties, and if warranted, request EMS support. Fire and rescue personnel provide first aid until EMS personnel arrive (if requested). Fire and rescue personnel address any fire or potential fire hazards and assist in scene recovery. In most locations, they also assess the scene for HazMat and notify remediation or cleanup contractors, as needed.

Table 11. Checklist for Traffic Incident Management Responsibilities of Fire and Rescue Stakeholders.

Specific Roles by Fire and Rescue Services	Checklist
Protect the incident scene.	
Suppress fires.	
Provide emergency medical care.	
Serve as incident commander.	
Provide initial HazMat response and containment.	
Rescue crash victims from contaminated environments.	
Rescue crash victims from wrecked vehicles.	
Arrange transportation for the injured.	
Assist in incident clearance.	

4.4 Emergency Medical Services

Responsibility Overview

The primary responsibility for EMS is to assess injuries, administer triage on-scene as needed, and quickly remove injured parties for transport to medical facilities for additional care. In those areas of the country where EMS is a fire service-based function, the fire and rescue personnel provide EMS functions.

Table 12. Checklist for Traffic Incident Management Responsibilities of Emergency Medical Services (EMS) Stakeholders.

Specific Roles by Emergency Medical Services	Checklist
Provide advanced emergency medical care.	
Determine destination and transportation requirements for the injured.	
Coordinate evacuation with fire/rescue, police and ambulance or airlift.	
Serve as incident commander for medical emergencies.	
Determine approximate cause of injuries for the trauma center.	
Remove medical waste from incident scene.	

4.5 Public Safety Communications/E911

Responsibility Overview

E911 personnel are normally the first to have knowledge that an incident has occurred. The mission of dispatchers is to convey quickly, accurately, and completely the necessary information to the proper agencies and field personnel to get the right personnel and equipment to the scene as quickly as possible. E911 personnel normally begin the data collection on an incident by recording information in a computer aided dispatch (CAD) system.

Call takers route emergency calls to appropriate dispatch. In some areas, all public safety emergency calls (i.e., police, fire and rescue, and emergency medical) are handled in one joint center with call takers sending calls to appropriate agency dispatch depending on the nature of the call. In smaller urban areas and in many rural areas, call takers may also dispatch public safety response. Most larger urban areas have E911 capabilities so that call takers can obtain the location of landline 911 calls. Many rural areas do not yet have E911.

Table 13. Checklist for Traffic Incident Management Responsibilities of Public Safety Communications/E911 Stakeholders.

Specific Roles by Emergency Medical Services	Checklist
Receive incident notification call and verify as necessary.	
Accurately relay incident information and/or dispatch appropriate responders.	
Log incident information into CAD or other systems.	

4.6 Emergency Management

Responsibility Overview

When the scope and severity of an incident escalates, State and local emergency management agencies may be called upon to direct and/or participate in incident response as part of the overall response to major emergencies. These types of responses could be precipitated by man-made or natural disasters, such as fire, earthquakes, floods, hurricanes, or other weather events.

State and local governments have agencies whose duties are to plan for and coordinate multiagency response to large scale emergencies such as natural and man-made disasters. They have specific responsibilities under both federal and State law. Large highway incidents rarely activate emergency response plans unless they necessitate evacuation due to a spill or presence of HazMat. Emergency management agencies maintain lists of the location of many public and private sector resources that might be needed in a major emergency. These lists and contacts for activating resources are valuable tools in planning multiagency response to major highway incidents.

Table 14. Checklist for Traffic Incident Management Responsibilities of Emergency Management Stakeholders.

Specific Roles by Emergency Management	Checklist
Maintain lists of the location of many public and private sector resources.	

4.7 Towing And Recovery

Responsibility Overview

The towing and recovery personnel primarily remove disabled vehicles, clear incident debris, and clean up spilled cargo. Towing and recovery companies are secondary responders operating under a towing arrangement usually maintained by a law enforcement agency.

Towing and recovery arrangements generally fall under one of two major types – rotation or contract. In rotation towing, a police department will maintain a list of pre-qualified companies and will rotate the calls of those companies. In many locations, rotation lists are classified by specific company capabilities so that a company with only automobile towing equipment does not get called to a truck incident. Rotation lists may also be maintained by location zones so that companies closer to the incident scene will get called. In contract towing, companies are contracted to provide specific on call services. The contracts are often awarded through a bidding process. The qualification requirements to bid may be more rigid than requirements for placement on a rotation list. Contracts may also be awarded on a zone basis to help enable response by the closest qualified company.

Table 15. Checklist for Traffic Incident Management Responsibilities of Towing and Recovery Stakeholders.

Specific Roles by Towing and Recovery Services	Checklist
Recover and remove vehicles from incident scene.	
Protect victims' property and vehicles.	
Remove debris from the roadway.	
Provide other services, such as traffic control, as directed or under contract.	

4.8 Hazardous Material

Responsibility Overview

HazMat contractors operate in a number of regions in the United States. They are hired by emergency or transportation authorities to clean up and dispose toxic or hazardous materials. Usually small quantities of common engine fluid spills (e.g., oil, diesel fuel, gasoline, and/or anti-freeze) can be contained and cleaned up without calling HazMat contractors.

When the incident scene involves HazMat that require response and cleanup beyond the capabilities provided by fire and rescue resources, specialized HazMat contractors are dispatched to the incident scene. Their primary responsibility is to remove the HazMat and mitigate additional risks from the continuous release of such material into the environment.

Table 16. Checklist for Traffic Incident Management Responsibilities of Hazardous Material Stakeholders.

Specific Roles by HazMat Contractors	Checklist
Remove the HazMat.	
Mitigate additional risk from the continuous release of the HazMat.	

4.9 Traffic Information Media

Responsibility Overview

Traffic Information Service Providers (ISP) are primarily private sector companies that gather and disseminate traffic condition information. These private providers are the primary source of information for commercial radio traffic information broadcasts, the most common source of traffic information for motorists. These companies also package specific information on a route or time of day basis to paying clients who subscribe for the information. In recent years, many internet sites have been created to provide road condition and traffic information. A mixture of public sector agencies and private ISP maintains these sites.

In 2000, the Federal Communications Commission (FCC) approved 511 as a national traffic information telephone number. A number of States and regions now provide robust traffic information through a 511 number. In some cases this activity is contracted to a private traffic information service provider. In other cases, the data from public sector operated 511 systems is shared with the ISP and/or provided directly to smart phones to expand the availability of the information.

Table 17. Checklist for Traffic Incident Management Responsibilities of Traffic Information Media Stakeholders.

Specific Roles by Traffic Information Media	Checklist
Gather and disseminate traffic conditions information to travelers.	
Maintain a website to provide road condition and traffic information and/or link to the transportation agency website for such.	
In areas where 511 service is contracted/privatized, provide robust traffic information through a 511 number.	

4.10 TIM Responsibilities Matrix

Chapter 3 identified the components of a comprehensive, mature TIM program as well as the key stakeholders involved in the program. Table 18 complements that chapter by providing the level of involvement needed by each TIM stakeholder in each of the individual TIM components.

Note that the table has been developed to represent a typical TIM program. As always, there are unique situations in many areas that would affect the various levels of involvement. In particular, in some areas a particular stakeholder takes a leadership role in components that might otherwise be led by another stakeholder. This is particularly true in components related to issues such as policy development, legislation, or outreach. It is important that each TIM program be adapted to the local environment and take advantage of any local champions, who can encourage the institutionalization of TIM throughout the various disciplines. Accordingly, it is recommended that each local area use the table as a starting point, but adapt the roles and responsibilities as well as the "primary" and secondary" designations to meet local needs and capabilities.

Table 18. Traffic Incident Management Key Stakeholder Roles and Responsibilities Matrix.

P: Primary **S**: Secondary

	Components of a Successful TIM Program	Transportation	Law Enforcement	Fire and Rescue	EMS	Public Safety Communications	Emergency Management	Towing and Recovery	Hazardous Materials	Traffic Information Media
Strategic (Institutional)	TIM multiagency team or task force	P	P	P/S	S	S	S	S	S	S
	Multiagency training	P	P	P	S	S	S	S	S	S
	Multiagency post-incident debriefings	P	P	S	S	S	S	S	S	S
	PSEs	P	P	S	S	S	S	S	S	S
	Multiagency agreements/memoranda on incident scene roles and responsibilities; planning for and funding for the TIM program; and safe, quick clearance goals	P	P	P	P	S	S	S	S	
	Planning to support the TIM activities	P	S	S	S	S	S	S	S	S
	Designated point person for TIM – primary activity	P	P	S	S	S	S	S	S	
	Multiagency agreement on incident PM	P	P	P	S	S	S	S	S	
	Collect and analyze data related to roadway response and clearance times	P	P	P	S	S	S	S	S	
	Have targets (i.e., time goals) for roadway response and clearance times	P	P	P	P	S	S	S	S	
	Routinely review whether progress is made in achieving the targets	P	P	P	S	S	S	S	S	
	Track performance in reducing secondary incidents	P	P	S	S	S	S	S	S	
	Deploy effective and affordable TIM technology	P	P	S	S	S	S	S	S	S
	Have 24/7 availability of key responders and equipment	P	P	P	P	P	P	P	P	
	Develop and perform multiagency resource management	P	P	P	S	S	S	S	S	
	Perform effective TIM budgeting	P	P	S	S	S	S	S	S	
	Education and awareness partnerships	P	P	P	P	S	S	S	S	S
Tactical (Technical/ Operational)	Have "authority removal" laws in place and understood	P	P	P	S	S	S	S	S	
	Have "driver removal" laws in place and understood	P	P	P	S	S	S	S	S	
	SSP for incident response	P	S	S	S		S	S	S	
	Utilize the ICS	P	P	P	P	S	P	S	S	
	Have response equipment pre-staged	P	S	S	S	S	S	S	S	
	Identify type of towing and recovery	P	P	P	S	S	S	P	S	
	Identify type of HazMat	P	P	P	P	S	S	S	P	
	One responding agency has authority to override the decision to utilize the responsible party's HazMat contractor and call in other resources	P	P	P	P	S	S	S	P	
	Medical examiner response is clearly defined and understood for incidents involving fatalities	S	P	P	P	S	S	S	S	
	Have the electric utility companies' role clearly defined for incidents involving downed electrical wires	S	S	S		S	S	P		
	Procedures in place for expedited accident reconstruction/ investigation	S	P	S	S	S	S	S	S	
	Policy in place for removal of abandoned vehicles	P	P	S	S	S	S	S	S	
	"Move Over" laws in place and understood	P	P	P	S	S	S	S	S	
	All responders trained in MUTCD traffic control guidelines	P	P	P	S	S	S	S	S	
	Utilize transportation resources to conduct MUTCD compliant traffic control for various levels of incidents	P	S	S	S	S	S	S	S	
	Routinely utilize traffic control procedures	P	P	P	P	S	S	P	P	
	Have mutually understood equipment staging and emergency lighting procedures	P	P	P	S	S	S	S	S	
	Have procedures in place for prompt responder notification	P	P	P	P	P	P	P	P	S

Table 18. Traffic Incident Management Key Stakeholder Roles and Responsibilities Matrix. (cont.)

P: Primary **S**: Secondary

	Components of a Successful TIM Program	Transportation	Law Enforcement	Fire and Rescue	EMS	Public Safety Communications	Emergency Management	Towing and Recovery	Hazardous Materials	Traffic Information Media
Support (Financial/ Technological)	TMC/TOC coordinates incident detection, notification and response	P	S	S	S	S	S	S	S	
	Share data/video between agencies	P	S	S	S	S	S	S	S	S
	Have specific policies and procedures for traffic management during incident response	P	P	P	P	S	P	P	P	
	Provide for interoperable, interagency communications onsite between incident responders	P	P	P	P	S	S	S	S	
	Have a real-time motorist information system providing incident-specific information	P	S	S	S	S	S	S	S	P
	Provide motorists with travel time estimates for route segments	P	S	S	S	S	S	S	S	P
	Develop and implement cost recovery and management systems	P	P	P	S	S	S	S	S	

5 TRAFFIC INCIDENT MANAGEMENT PROGRAM WITHIN TRANSPORTATION OPERATIONS PROGRAM

This chapter examines the manner in which traffic incident management (TIM) programs are implemented within the structure and resources of a typical transportation department.

It begins by presenting information on the process for establishing a TIM program. Then, an overview of the major organizational areas within a typical State Department of Transportation (DOT) that need to be involved in supporting a comprehensive TIM program are identified along with their required roles. The chapter also identifies key transportation operation staff needed to implement and support the program as well as their functional roles. This will help identify the level of involvement of different transportation department staff within the different TIM-related activities, in addition to the new roles and positions that need to be fully dedicated to the TIM program. In order to reinforce the efficiency of the TIM program components, example TIM success story of the New York State TIM program will be presented with more focus on the common elements that can be transferred to other TIM programs.

5.1 Steps for Establishing a TIM Program

Transportation departments typically play a lead role in the establishment and implementation of local/regional TIM programs. Within the transportation departments, it is typically staff assigned to traffic and safety or traffic operations that takes the leadership role in establishing the program.

Chapter 10 of the Federal Highway Administration (FHWA) Freeway Management and Operations Handbook[6] defines an 8-step process for implementing a successful TIM program. The steps are summarized as follows:

- **Identify Stakeholders:** Critical to the success of a TIM program is the development of a cooperative consensus among the various stakeholders. Therefore the first step is to identify the relevant stakeholders. Once these stakeholders commit to establishing a TIM program, they can sponsor a TIM task force that meets periodically to guide and enhance the program.

- **Define the Problem:** Before identifying, or selecting a solution, a clear understanding of the severity, impacts, and locations of incident-related problems is required. Problem definition can be accomplished through a combination of data collection, data compilation, brainstorming, and constructive critiques of existing practices.
- **Set Goals and Objectives:** The TIM Task Force should establish guiding principles for program development. These "guiding principles" most often take the form of a mission statement, backed up by goals and objectives and based on the identified problems. Simply stated, goals and objectives describe what the program is designed to accomplish. Goals and objectives need to be multiagency in scope; not merely the goals and objectives of individual agencies.
- **Develop Alternatives:** TIM programs consist of many individual practices, tools and infrastructure elements. Based on the goals and objectives, the group can develop alternatives to combine available TIM tools and techniques into program packages for evaluation.
- **Evaluate and Select Alternatives:** The developed alternatives can be evaluated using high-level estimates of costs, expected benefits of each alternative, and prioritization.
- **Implement Alternatives:** It is at the point of implementation that mechanisms for resolving many of the issues of incident management must be developed. These issues may include: funding sources, jurisdictional boundaries, operational responsibilities, joint training, field communications, onsite command and approval of alternate routes.
- **Reevaluate Alternatives:** TIM is an ongoing process, one that must take into account changes in the local operational, technological, political, and funding environment. Effective program evaluation and the subsequent revaluation of alternatives to refocus or refine an existing system require the routine collection of appropriate data (e.g., detection time, response time, clearance time, delay and costs).
- **Refine the System:** To continuously improve and adapt a TIM program, effective feedback is needed both from upper management and field-level personnel. Genuine communication and coordination on both levels will continue to improve the TIM process, adapt to the area's changing needs and meet the needs of the participating agencies, affected jurisdictions and the motoring public.

Furthermore, the I-95 Corridor Coalition Toolkit for Safe, Quick Clearance contains a more implementation oriented roadmap for developing a TIM program, as follows:[1]

- Establish your baseline - where is your jurisdiction regarding statutes, policies, and procedures? Where does executive leadership stand?
- Identify quick clearance counterparts in each pertinent State/local discipline and contact them. Hold a quick clearance kick-off team meeting to start establishing relationships.
- Identify champions who can encourage the institutionalization of TIM throughout the various disciplines and select/recruit 1-2 to lead the overall effort.
- Identify roles and responsibilities.

- Create an Open Roads policy.
- Maintain frequent update communications with the entire team (e.g., emails and/or conference calls).
- Develop Concept of Operations - National Incident Management System (NIMS)/ National Unified Goal (NUG)-compliant, integrated quick clearance operations.
- Execute operational memorandum of understanding (MOUs).
- Enable interagency communications and information exchange, as applicable, regional/ corridor-wide.
- Implement a training and certification program, including NIMS/NUG compliant interdisciplinary training, for all TIM responders.
- Educate the traveling public.
- The finish line - implement multidisciplinary NIMs/NUG-compliant, accredited TIM Team(s) and associated Field Operational Procedures for quick clearance.

5.2 Transportation Operations Organization/Program Overview

As indicated previously, responsibility for establishing and supporting the ongoing operation of a TIM program is typically assigned to a traffic and safety/traffic operations entity within the overall DOT organization. However, the numerous elements of the program make it nearly impossible for these entities to provide the total support needed. Rather, support is needed from a number of other program areas within the organization. Engaging the other program areas not only helps provide the staff effort needed, but also leads to a more effective and stable program since other program areas are involved on an ongoing basis.

There are numerous ways in which State DOTs and traffic and safety/traffic operations entities are organized such that it is nearly impossible to show a "typical" structure. However, within these diverse approaches there are many commonalities that can be identified.

Table 19 identifies functional areas within a State DOT that need to be engaged in TIM as well as the areas in which they can provide support. The functional areas are largely based upon the organization of the New York State DOT case study, presented later in this chapter.

Table 19. Traffic Incident Management Program within Transportation Operations Program.

DOT Organizational Entity	TIM Development/Support Role
Traffic and Safety/Traffic Operations	Lead the development and ongoing activities of the TIM program including the establishment of a TIM Task Force, coordination with stakeholders as well as TIM program strategic plans, goals, objectives and performance measures (PM). Lead the development of interagency TIM operational agreements. Lead or support, as appropriate to the item, the development of policies, laws. Lead TIM training in the department. Implement, manage and operate traffic operations elements to support TIM such as traffic management centers (TMCs), service patrols and motorist information systems. Gather and analyze data related to TIM operations as needed for performance measurement. Lead the ongoing activities of the TIM Task Force including regular meetings. Lead/participate in post incident debriefings. Create a chronology of the event occurrence, evolution and actions; identify what went right/wrong and areas for improvement; create an action plan for improvement implementation. Develop routine reporting on TIM program progress including PM and strategic plan implementation. Lead the development and implementation of TIM budgeting and financing. Lead the development and implementation of TIM resource management and cost recovery systems; implement resource management and cost recovery within the program.
Planning	Support planning elements of TIM such as development of strategic plans. Support coordination with the local metropolitan planning organization (MPO) on incorporating TIM into MPO budgeting and processes.
Design/Engineering	Support the design of intelligent transportation systems (ITS) that enable effective TIM such as detection, closed-circuit television (CCTV), or dynamic message sign (DMS).
Information Technology	Support the development and implementation of effective information technology standards and policies into TIM-related technologies; support the design, implementation and operation of systems and networks to share TIM related data and CCTV.
Maintenance/Fleet Management	Support the deployment and maintenance of TIM-related equipment and devices such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks.
Contracts/Purchasing	Support the procurement of TIM-related equipment such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks. Support the procurement of TIM-related services such as service patrols and towing.
Budget/Finance	Support the development of budgets and funding needed for TIM program elements. Support the development of effective cost recovery and management systems.
Legal	Support the development of TIM interagency agreements. Support the development of TIM-related laws such as "Move Over".
Public Transportation	Coordinate with public transportation agencies to enhance knowledge of and support for TIM.
Motor Carrier	Coordinate with commercial vehicle entities to enhance knowledge of and support for TIM.
Public Information	Support the development and implementation of outreach and awareness programs related to TIM.
Environmental	Support TIM efforts related to hazardous materials (HazMat) activities.
Asset Management	Support the development and implementation of effective resource management systems related to TIM.

It should be noted that in many cases, State DOTs are not organized to implement the most effective transportation operations programs, including TIM. The FHWA has worked closely with Transportation Research Board (TRB) and American Association of State Highway and Transportation Officials (AASHTO) to develop a series of documents and tools that will help transportation agencies identify what changes in processes and

organization are needed to move their operations and management program in the direction of improved effectiveness and efficiency.

A key element of this effort was the development of a specific guidance framework. The framework is called the Capability Maturity Model (CMM)and is based on self-evaluation regarding the key process and institutional capabilities required from a transportation agency (or group of agencies) to achieve effective operations and management.[15]

In order to bring the benefits of the CMM efforts to the TIM practice, FHWA has included a task in their FFY14 Work Program titled "Assess Self-Assessment Tool vis-à-vis Capability Maturity Model Tool & Develop Action Plan". Under this task the FHWA's Office of Transportation Management will work with the SHRP2 L06 product to integrate the TIM SA into the SHRP2 CMM products.[16]

5.3 Tim Involvement of Transportation Operations Staff

Just as there is no "one way" to organize for TIM, there is also no "one way" to staff for it. However, it is possible to create a generic staffing pattern and relate that to the TIM development/support roles involved in the program. It is noteworthy that the development of the generic staffing pattern does not specify the number of staff related to the function, and it also assumes that the staff will obtain support from other department entities as described in Table 19. The staffing functions to support TIM within traffic operations is based upon the structure presented in Table 20.

Table 20. Transportation Operations Staff Traffic Incident Management Involvement.

Staffing Component	TIM Function
ITS Program Manager	This position represents a single person responsible for the entire ITS program. The overall ITS program may include activities such as advanced traffic management system planning, design and deployment, program management of TMCs and ITS policy development. Managing and supporting TIM is only a part the ITS program manager's responsibilities.
TIM Program Manager and Staff	The TIM program manager is a single person whose full time job is to manage, coordinate, and implement the TIM program. A large part of the TIM program manager's time will be spent developing, implementing and monitoring the overall program, coordinating with stakeholders, leading policy and strategic elements of the program and assessing performance. The TIM program manager will also coordinate closely with the other staffing components within traffic operations as well as other entities within the department. The TIM program manager will have staff if the program size calls for it. Larger programs such as those involving multiple deployment areas or large numbers of trucks and many miles of coverage will need significant staff. Staff will support the TIM program manager in all functions but will likely take the lead at the staff level on many functions such as specific policy development, performance measurement, resource and cost management, budgeting, and TIM task team support.
TMC Operations Manager and Staff	The TMC operations manager is a single person who oversees the operation of the TMC on a full time basis. Support staff for the TMC operations manager will likely include: • Operators. • Program support. • Field support. TIM support is an important but part time effort for the TMC manager. His effort will be focused on the operations side of TIM (e.g., detection, verification, and response) but he will also be involved in oversight of data collection and PM. The TMC manager may be personally involved in the TIM Task Team and provide leadership in certain areas where the TMC is a primary player. The TMC manager's staff will provide considerable support to TIM, especially the program support staff, in areas such as data collection, PM, response policies and interagency coordination.
Service Patrol Manager and Staff	The service patrol manager will provide part-time support to the TIM program manager in pertinent TIM areas such as strategy and policy. The service patrol manager will provide leadership in areas that pertain directly to service patrols, such as service patrol support at the incident scene. Service patrol staff will provide occasional support to the TIM program/program manager in areas such as field staff input into response policies or after action reports.
Incident Response Team (IRT) Manager and Staff	The IRT manager will provide part-time support to the TIM program manager in pertinent TIM areas such as strategy and policy. The IRT manager will provide leadership in areas that pertain directly to IRTs, such as deployment of response and traffic control equipment at the scene. IRT staff will provide occasional support to the TIM program/program manager in areas such as field staff input into response policies or after action reports.

Table 21 contains the matrix relationship between TIM activities and the level of effort and support role that the various staffing components provide. In addition, Table 22 replicates a blank copy of the matrix that can be utilized by the readers for their program-specific TIM gap analysis.

Table 21. Traffic Incident Management Activities and Transportation Operations Staff Matrix.

TIM Involvement / Support Role	ITS Program Manager	TIM Program Manager/Staff	TMC Operations Manager/Staff	Service Patrol Manager/Operators	Response Team Manager/Staff
	P: Primary **S**: Secondary				
Lead the development and ongoing activities of the TIM program including the establishment of a TIM Task Force, coordination with stakeholders as well as TIM program strategic plans, goals, objectives and PM.	S	P	S	S	S
Lead the development of interagency TIM operational agreements.	S	P	S	S	S
Lead or support, as appropriate to the item, the development of policies, laws.	S	P	S	S	S
Lead the TIM training in the department.	S	P	S	S	S
Implement, manage and operate traffic operations elements to support TIM such as TMCs, service patrols and motorist information systems.	S	S	P	S	S
Gather and analyze data related to TIM operations as needed for performance measurement.	S	P	P	S	S
Lead the ongoing activities of the TIM Task Force including regular meetings.	S	P	S	S	S
Lead/participate in post incident debriefings.	S	P	S	S	S
Develop routine reporting on TIM program progress including PM and strategic plan implementation.	S	P	P	S	S
Lead the development and implementation of TIM budgeting and financing.	S	P	S	S	S
Lead the development and implementation of TIM resource management and cost recovery systems; implement resource management and cost recovery within the program.	S	P	S	S	S
Support planning elements of TIM such as development of strategic plans.	S	P	S	S	S
Support coordination with the local MPO on incorporating TIM into MPO budgeting and processes.	S	P	S	S	S
Support the design of ITS systems that enable effective TIM such as detection, CCTV, or DMS.	S	P	P	S	S
Support the development and implementation of effective IT standards and policies into TIM-related technologies; support the design, implementation and operation of systems and networks to share TIM related data and CCTV.	S	P	S	S	S
Support the deployment and maintenance of TIM-related equipment and devices such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks.	S	P	S	P	P
Support the procurement of TIM-related equipment such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks.	S	P	S	S	P
Support the procurement of TIM-related services such as service patrols, towing.	S	P	S	P	P
Support the development of budgets and funding needed for TIM program elements.	S	P	S	S	S
Support the development of effective cost recovery and management systems.	S	P	P	S	S
Support the development of TIM interagency agreements.	S	P	S	S	S
Support the development of TIM-related laws such as "Move Over".	S	P	S	S	S
Coordinate with public transportation agencies to enhance knowledge of and support for TIM.	S	P	S	S	S
Coordinate with commercial vehicle entities to enhance knowledge of and support for TIM.	S	P	S	S	S
Support the development and implementation of outreach and awareness programs related to TIM.	S	P	S	S	S
Support TIM efforts related to HazMat activities.	S	P	S	S	S
Support the development and implementation of effective resource management systems related to TIM.	S	P	S	S	S

Table 22. Blank Traffic Incident Management Activities and Transportation Operations Staff Matrix.

TIM Involvement / Support Role	**P**: Primary **S**: Secondary ITS Program Manager	TIM Program Manager/Staff	TMC Operations Manager/Staff	Service Patrol Manager/Operators	Response Team Manager/Staff
Lead the development and ongoing activities of the TIM program including the establishment of a TIM Task Force, coordination with stakeholders as well as TIM program strategic plans, goals, objectives and PM.					
Lead the development of interagency TIM operational agreements.					
Lead or support, as appropriate to the item, the development of policies, laws.					
Lead the TIM training in the department.					
Implement, manage and operate traffic operations elements to support TIM such as TMCs, service patrols and motorist information systems.					
Gather and analyze data related to TIM operations as needed for performance measurement.					
Lead the ongoing activities of the TIM Task Force including regular meetings.					
Lead/participate in post incident debriefings.					
Develop routine reporting on TIM program progress including PM and strategic plan implementation.					
Lead the development and implementation of TIM budgeting and financing.					
Lead the development and implementation of TIM resource management and cost recovery systems; implement resource management and cost recovery within the program.					
Support planning elements of TIM such as development of strategic plans.					
Support coordination with the local MPO on incorporating TIM into MPO budgeting and processes.					
Support the design of ITS systems that enable effective TIM such as detection, CCTV, or DMS.					
Support the development and implementation of effective IT standards and policies into TIM-related technologies; support the design, implementation and operation of systems and networks to share TIM related data and CCTV.					
Support the deployment and maintenance of TIM-related equipment and devices such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks.					
Support the procurement of TIM-related equipment such as portable DMS, response trucks, cones, incident response trailers, or service patrol trucks.					
Support the procurement of TIM-related services such as service patrols, towing.					
Support the development of budgets and funding needed for TIM program elements.					
Support the development of effective cost recovery and management systems.					
Support the development of TIM interagency agreements.					
Support the development of TIM-related laws such as "Move Over".					
Coordinate with public transportation agencies to enhance knowledge of and support for TIM.					
Coordinate with commercial vehicle entities to enhance knowledge of and support for TIM.					
Support the development and implementation of outreach and awareness programs related to TIM.					
Support TIM efforts related to HazMat activities.					
Support the development and implementation of effective resource management systems related to TIM.					

Figure 13: Photo. NYSDOT Bi-monthly TIM Steering Committee Meeting. (Credit: VHB)

5.4 Example TIM Success Story – NYSDOT TIM Program

Traffic incidents continue to be an important issue in New York State (NYS) because they are a significant cause of congestion delays that motorists encounter daily. In response to this continuous problem, the NYSDOT fostered the development of a statewide TIM program. In 2008, NYSDOT committed to formalizing the TIM program through the formation of a NYS TIM Steering Committee to oversee the advancement of the program. The NYS TIM Steering Committee consists of stakeholders from various member agencies within NYS who represent incident responders as well as private entities that have a vested interest in TIM. The first organizational meeting was held in Albany, NY in March 2009. Since then, the NYS TIM Steering Committee has continued to meet generally on a bi-monthly basis. Current members of the Committee include:

- Empire State Towing and Recovery Association (ESTRA).
- Federal Highway Administration (FHWA), New York Division.
- Fire Department of New York (FDNY).
- Metropolitan Transportation Authority (MTA) Bridges and Tunnels.
- New York State Association of Chiefs of Police (NYSACOP).
- New York State Association of Fire Chiefs (NYSAFC).
- New York State Department of Health (NYSDOH) Bureau of Emergency Medical Services (BEMS).
- New York State Division of Homeland Security & Emergency Services (NYSDHSES) Office of Fire Prevention and Control (OFPC).
- New York State Department of Transportation (NYSDOT).
- New York State Division of Homeland Security & Emergency Services (NYSDHSES) Office of Emergency Management (OEM).
- New York State Fire Coordinators' Association (NYSFCA).
- New York State Police (NYSP).
- New York State Sheriffs Association (NYSSA).
- New York State Thruway Authority (NYSTA).

In addition to this statewide Committee, an Executive TIM Steering Committee was also founded in NYS in 2013. The Executive Committee includes the individuals who are the

Figure 14: Photo. NYSDOT TIM Responder Training.
(Credit: VHB)

decision makers from the Steering Committee agencies. This committee has met in 2013 and 2014 at the NYS Executive Summit to discuss the progress of the TIM program throughout the year, and determine what support is needed from the Executive Committee regarding policies and procedures and how these policies/procedures can be implemented within each member's respective agency.

To assist with the implementation of the overall program a NYS TIM plan was developed in April 2010 to outline the necessary elements and improvements needed to develop and maintain a robust TIM program. Topics outlined in the plan included TIM program goals, roles and responsibilities of TIM stakeholders, current TIM initiatives, and a TIM action matrix.

The purpose of this plan was to provide a framework for agencies to organize and conduct current and future incident management efforts, and to evolve these efforts into a formal long-term sustained program. The plan was updated in September 2012 and again in December 2013 to reflect the current thinking of the NYS TIM Steering Committee and the progress made since 2010.

For the continued success of the NYS TIM program, actions were needed to address some of the current issues and gaps. With the support of the NYS TIM Steering Committee, an Action Plan Matrix was developed that organized these issues into the 18 NUG strategies. The purpose of this Action Plan Matrix is to be used as a reporting mechanism to update the status of each issue and who should lead the effort to ensure that any outstanding issue is addressed. Every time the TIM plan has been updated, the matrix has been reviewed and updated periodically for optimum effectiveness.

This TIM plan was one of many accomplishments of the NYSDOT TIM program. Other accomplishments include:

- Formation of NYS TIM Steering Committee, including:
  - NYS TIM Steering Committee Commitment of Cooperation.
  - NYS TIM Steering Committee Charter.
- Formation of NYS Executive TIM Steering Committee.
- Emergency Traffic Control & Scene Management Quick Reference Visor Card.
- Half-Day TIM Training Course for NYSDOT personnel.
- Full-Day TIM Training Course for emergency responders including a tabletop exercise.
- Development of a NYS TIM Self-Assessment Tool.
- Development of a NYS TIM website.

There are also a number of initiatives that are in support of NYS TIM efforts including:

- **NYS "Move Over" Legislation** – Law requires that, when possible, motorists must change lanes when they approach an incident where there is a vehicle with flashing red or amber lights. When it is not possible to move over, or there is only one lane, drivers must slow down. This law includes all responder vehicles as well as any other vehicle being used in the maintenance of roadways.
- **Section 15 of the NYS Highway Law** – Gives NYSDOT the ability to remove accidents, cargo, and debris from NYS right-of-way that obstructs or interferes with the use of such a highway.
- **NYS "Steer it, Clear it" campaign** – In lieu of legislation, a "Steer it, Clear it" outreach campaign was developed by the Niagara International Transportation Technology Coalition (NITTEC) and expanded statewide by NYSDOT to encourage motorists to move to the side of a road when they are involved in a minor crash.
- **NYS Emergency Traffic Control and Scene Management Guidelines** – The NYS TIM Steering Committee adopted guidelines to provide incident responders a uniform approach to emergency traffic control and scene management.
- **TIM teams** – A local jurisdictional program consisting of TIM stakeholders that work together on a daily basis. TIM teams address operational problems and develop strategies at the local level and then share these ideas and experiences at the regional level.

Figure 15: Photo. NYSDOT TIM Team.[17]

- **Highway Emergency Local Patrol (HELP) Program** – Special trucks patrol designated routes stopping to help stranded motorists and disabled vehicles, keeping roads and highways open and free of distractions to minimize the chances of secondary incidents.

Figure 16: Photo. NYSDOT Incident Response Trailer.[17]

- **Incident Response Trailers** – NYSDOT has deployed about 25 Incident Response Trailers throughout the State in support of TIM. Included in each trailer are items needed to set up a temporary traffic control (TTC) Zone around an incident in accordance with Section 6I of the MUTCD. Items include cones, barrels, barricades, flags for traffic control, and fluorescent pink signs indicating TTC.

Figure 17: Photo. NYS Office of Fire Prevention and Control (OFPC) Incident Management Trailer.[17]

- **NYS Office of Fire Prevention and Control (OFPC) Incident Management Trailer** – These trailers contain the same equipment as the previously mentioned trailers, but in addition also support the command portion in an all hazard, all weather environment. The additional equipment provided includes: tents for weather cover, an office for resource management, computerized tracking, and incident management Incident Action Plans (IAPs), among others.

Because of the success of the NYS TIM program in a relatively short period of time, the statewide TIM program was awarded the "ITS Project of the Year" in June 2010 by the Intelligent Transportation Society of New York (ITS-NY). Each member of the TIM Steering Committee was presented with an award at the annual ITS-NY meeting.

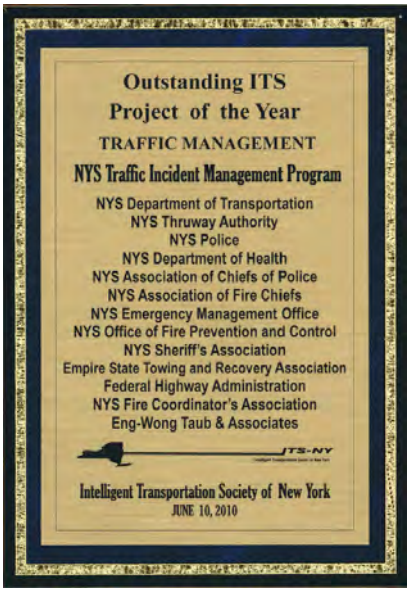

Figure 18: Photo. Outstanding ITS Project of the Year award for the NYSDOT TIM Program. (Credit: VHB)

In addition, the NYS TIM program was also featured in the August 2012 edition of the TIM Network's The Responder Newsletter under the title "New York State TIM Program Makes Strides Statewide".

Currently the NYS TIM program is continuing to make strides by tracking their ongoing training and outreach efforts.

In summary, the NYS TIM program is viewed as a success because of what the State has been able to accomplish in the context of TIM components:

- A statewide strategic plan.
- NYS Emergency Traffic Control and Scene Management Guidelines.
- A "Move Over" law.
- Numerous well developed regional TIM programs.
- An active statewide TIM task force.
- Model partnerships with the State police.
- A statewide service patrol.
- TMCs operational for 24 hours and 7 days a week in most regions.

6 CONCLUSIONS AND RECOMMENDATIONS

Overall the research conducted for this gap analysis determined that there is no one-size-fits-all traffic incident management (TIM) program, so the recommendations contained within this document should be tailored towards the needs of the area in which the TIM program will be implemented. Not only should the needs of that area be considered but the capabilities and available resources of that area are equally important to understand the level of customization needed. It does not matter how big or small a TIM program is but rather how successful the program is at engaging stakeholders and managing incidents. Whether a TIM program has already been established or is just beginning, it is essential to identify the overall needs of the local area and determine the TIM program elements necessary to fulfill these needs. If a program has already been deployed, a key driver is identifying the existing gaps in the program and identifying activities/actions to bridge these gaps.

6.1 Summary of the Successful TIM Program

It is important to emphasize the fact that the success of a TIM program is not measured by how long the program has been implemented or by how many people are involved in the TIM process but rather by how effective the program is accomplishing the goals of TIM. Key elements of a successful TIM program include a number of strategic, tactical, and support activities.

- **Strategic** – These elements form a framework for TIM activities and provide multiagency planning, programming, and evaluation necessary to support efficient and collaborative on-scene operations; as well as how to plan, prepare for, and measure performance of the program. Example products include but are not limited to strategic plans, policies, and training.
- **Tactical** – These elements provide the tools and technologies for traffic management and interagency communications for on-scene operations. Example products include on-scene traffic control procedures, motorist assist patrols, and pre-staged response equipment.
- **Support** – These elements provide for the operational, tactical, and institutional support for effective communication and information exchange. Example products include: communications systems, data and video collection and sharing, and traveler information.

Specific TIM activities associated with each element are summarized in Table 23.

Table 23. Summary of Traffic Incident Management Activities within Different Traffic Incident Management Program Elements.

	TIM Activity
Strategic (Institutional) Capabilities	Multiagency team/task force that meet regularly to discuss and plan for TIM activities.
	Multiagency training (at least once a year) on TIM-specific topics.
	Multiagency post-incident debriefings.
	Planning for special events (PSEs).
	Multiagency agreements/memorandum of understanding (MOUs).
	Planning to support TIM activities among participating agencies including metropolitan planning organizations (MPOs).
	Designated TIM coordinator as their primary job function.
	Multiagency agreement for tracking roadway clearance time and incident clearance time.
	Methods to collect and analyze data for reducing roadway clearance time and incident clearance time.
	Performance measure (PM) targets.
	Progress towards PM targets.
	Performance in reducing secondary incidents.
	Effective and affordable TIM technology to support TIM activities.
	24/7 availability of key responders and equipment.
	Multiagency resource management.
	Multiagency commitment for funding TIM.
	Education and awareness partnerships.
Tactical (Technical/Operational) Capabilities	"Authority removal" laws.
	"Driver removal" laws.
	Safety service patrol (SSP) for incident and emergency response.
	Incident Command System (ICS) used on-scene.
	Pre-staged response equipment.
	Available towing and recovery operator resources categorized and identified.
	Available hazardous materials (HazMat) contractors categorized and identified.
	Designated agency authorized to override decisions on HazMat resources.
	Medical examiner responsibilities defined for fatality incidents.
	Procedures for expedited incident reconstruction/investigation.
	Policy for removal of abandoned vehicles.
	"Move Over" laws.
	Responders trained in traffic control (according to Manual on Uniform Traffic Control Devices (MUTCD) guidelines).
	Transportation resources utilized to conduct traffic control procedures (complying with the MUTCD).
	Traffic control procedures utilized for the end of the incident traffic queue.
	Onsite equipment staging and emergency lighting procedures.
	Responder notification procedures.
Support (Financial/ Technological)	Traffic management center (TMC)/traffic operations center (TOC).
	Data/video shared between agencies.
	Policies and procedures for traffic management during incident response.
	Onsite interoperable, interagency communications.
	Real-time motorist information system.
	Travel time estimates provided to motorists.
	Cost recovery and management systems.

It is not necessary for every activity outlined in Table 23 to be implemented as part of the TIM program, but rather these items are example activities that have been identified in successful TIM programs. It is important that before an activity is implemented, there should be a great level of consideration for how useful and effective that activity will be for TIM in the local deployment area. In reviewing the current status of TIM programs across the nation, it is clear that there is no "one-size-fits-all" TIM program so it is possible that many of the components listed contain multiple elements and/or relate to activities that can be implemented in varying degrees depending on the needs of an area.

6.2 Summary of Implementation Steps

This primer identifies the elements of a comprehensive TIM program as well as how stakeholders can benchmark their progress and identify gaps within their existing program. Many factors incorporated into a typical TIM program include the following:

- Incident management policies and plans.
- Interagency relationships.
- Organizational structure.
- Staffing and training.
- Performance goals.
- Reporting channels.
- Budget.

If a TIM program has not already been established, an important preliminary first step is determining that a more coordinated effort for managing incidents is needed. After making this determination transportation agencies typically take the lead role in establishing and implementing local/regional TIM programs. Although this typically occurs, other TIM stakeholders are not precluded from taking the initiative in leading the effort to form a program. To accomplish this, a streamlined eight stage process for establishing a TIM program has been outlined.

Identify Stakeholders

Identifying relevant stakeholders is a critical first step to the success of a TIM program. Developing a cooperative spirit and consensus among the various stakeholders is quite essential. Once these stakeholders commit to establishing a TIM program, they can sponsor a TIM Task Force that meets periodically to enhance and guide the program.

Define the Problem

A clear understanding of the severity, impacts, and locations of incident-related problems is imperative before even attempting to identify or determine a solution. Defining the problem can be accomplished through a combination of data collection, data compilation, brainstorming, and a constructive assessment of existing practices.

Set Goals and Objectives

Guiding principles for the program development should be established by the TIM Task Force. These "guiding principles" usually consist of a mission statement with goals and objectives based on the identified problems. These goals and objectives describe what the program is designed to accomplish and are meant to reflect multiagency efforts and not those of individual agencies.

Develop Alternatives

TIM programs consist of numerous individual practices, tools and infrastructure elements. Based on the goals and objectives developed previously, alternatives should be determined to combine available TIM tools and techniques into program packages for evaluation.

Evaluate and Select Alternatives

The developed alternatives should be evaluated based on prioritization, high-level cost estimates, and expected benefits.

Implement Alternatives

As alternatives are being implemented, mechanisms for resolving the issues associated with incident management must be developed. Example issues include: jurisdictional boundaries, operational responsibilities, funding sources, joint training, field communications, onsite command and approval of alternate routes.

Reevaluate Alternatives

Since TIM is an ongoing process, changes in the local operational, technological, political, and funding environment should be evaluated and taken into account. An initial program evaluation and the subsequent revaluation of alternatives to refocus or refine an existing system require the routine collection of appropriate data (e.g., detection time, response time, clearance time, delay and costs).

Refine the System

For a TIM program to continuously mature and improve, effective feedback is needed from both upper management and field-level personnel. Constant communication and coordination from both levels will improve the TIM process; adapt to the changing needs of the area; and meet the needs of the participating agencies, affected jurisdictions, and the motoring public.

For optimal implementation, specific actions from the above stages may be followed:

1. Establish the baseline of where your jurisdiction is regarding statutes, policies, and procedures.
2. Identify counterparts in each pertinent local/State discipline and contact them.
3. Hold a kick-off team meeting to start establishing relationships.
4. Identify champions who can encourage the institutionalization of TIM throughout the various disciplines and select/recruit 1-2 to lead the overall effort.
5. Identify roles and responsibilities.
6. Create an Open Roads policy.
7. Maintain frequent communications with the entire team.
8. Develop a Concept of Operations.
9. Execute operational MOUs.
10. Enable interagency communications and information exchange regional/corridor-wide.
11. Implement a training and certification program, including interdisciplinary training for all TIM responders.
12. Educate the traveling public.
13. Implement multidisciplinary TIM teams and associated field procedures.

These actions will help identify the level of involvement necessary from transportation department staff as well as other TIM stakeholders within the different TIM-related activities, in addition to the new roles and positions that need to be fully dedicated to the TIM program.

GLOSSARY OF TERMS

Term	Definition
511	The national 3-digit telephone number for traveler information used by most States to provide real-time traffic and transit information about current operation status, highway conditions, weather advisories, and emergency warnings.
Closed-Circuit Television (CCTV)	A television system where cameras are connected to television monitors to perform surveillance of a limited area such as a regional interstate highway system.[18]
Crash	An incident can be classified as a reportable motor vehicle traffic crash/accident if the following criteria are met: • It includes one or more occurrences of injury, death, or damage. • It includes at least one occurrence of injury, death, or damage that was not a direct result of natural disaster. • It includes bodily injury, death, or damage to the property of any one person in excess of $1,000. • It involves one or more motor vehicles, and at least one of them was in transport. • It is an unstabilized situation. • If the unstabilized situation originates or includes injury or damage occurring on a highway. • If a railroad train collision occurs at or near a railroad crossing.[19]
Collaboration	Any cooperative effort between and among governmental entities (as well as with private partners) through which the partners work together to achieve common goals. Such collaboration can range from very informal, ad hoc activities to more planned, organized and formalized ways of working together. Collaboration's purpose should be that of combining the knowledge, expertise, and information of many agencies across jurisdictions to produce and operate an efficient regional system.[20] In the context of TIM programs, the activities of the statewide and local TIM Task Forces are good examples of collaboration.
Coordination	The process of systematically analyzing a situation, developing relevant information, and informing appropriate command authority of viable alternatives for selection of the most effective combination of available resources to meet specific objectives. The coordination process (which can be either intra- or interagency) does not involve dispatch actions.[21] A good example of coordination in the context of TIM is the activities involved in coordinating the most effective response to an incident including the continued assessment of the situation and updating response activities as appropriate as the incident evolves.
Corridor	A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways and transit route alignments.[20] Additionally, the corridor includes cross-network connections that permit the individual networks to be readily accessible from each other. In the context of TIM, managers and responders must recognize the incident may have on the entire corridor and take appropriate actions to mitigate such at the corridor level. Examples include: • Use of traveler information resources to warn motorists of the event and attempt to divert traffic from using the affected facility. • Changing signal timing on adjacent arterials to facilitate the clearance of traffic from the facility.
Dynamic Message Sign (DMS)	Signs capable of displaying one or more alternative messages, changeable manually, by remote control, or by automatic control. They are typically used on freeway and expressway mainlines, and can be fixed at a location, portable, or truck-mounted.[18] Also referred to as Changeable/Variable Message Sign (CMS/VMS).
Emergency	A serious, unexpected, and often dangerous situation requiring immediate action. Emergencies can require multiagency assistance to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety.

Term	Definition
Emergency Management/ Emergency Transportation Operations (ETO)	The process of preventing, preparing, responding, and recovering from an emergency. When an emergency has occurred (or the imminent threat of one has become known), ETO focuses on minimizing the time it takes to get an adequate force of emergency responders to the scene where they can help victims, provide assessments, and control access; and maximizing the proportion of the population moved away from the hazardous area without being subjected to other risks.[20]
Emergency[1] **Responder**	Any public safety official (e.g., police, fire rescue, emergency services, or medical examiner), transportation worker (e.g., road cleanup worker), towing and wrecker operator, and other specially-skilled people (e.g., HazMat handlers) that responds to the scene of an incident is generally referred to as a "responder". The term *Emergency* (First) Responder has traditionally been used to describe public safety emergency responders who have duties related to preservation of life and property.[22] As transportation agencies become more actively involved in traffic incident response and take active roles in Incident Command (as partners in Unified Command), they are becoming accepted as first responders for traffic incidents. For example, service patrols may be first on the scene of an incident and many are trained to provide traffic control to stabilize the scene and to provide emergency first aid. Some service patrols are also permitted limited use of emergency lights and sirens to get to an incident.
Enhanced 911 (E911)	Enhanced 911 is a location technology advanced by the Federal Communications Commission (FCC) that enables wireless phones to process 911 emergency calls and enables emergency call centers to automatically locate the geographic position of the caller.
Event	An occurrence, which includes all types of incidents, emergencies and disasters (natural or human caused), that affects the transportation system, and requires actions to maintain the safety and mobility of the system.[20]
Gap Analysis	A technique that managers use to determine what steps need to be taken in order to move from their current state to their desired, future state. Also called need-gap analysis, needs analysis, and needs assessment. Gap analysis consists of (1) listing of characteristic factors (such as attributes, competencies, performance levels) of the present situation ("what is"), (2) listing factors needed to achieve future objectives ("what should be"), and then (3) highlighting the gaps that exist and need to be filled. Gap analysis helps a company to reflect on who it is and ask who they want to be in the future.[5]
Hazardous Material (HazMat)	A substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce.[23] Incident responders must be keenly aware to check for the presence of hazardous materials at the incident scene, protect responders and the public from exposure and summon the proper response personnel and equipment to clean up the site.
Highway Advisory Radio (HAR)	A traffic information broadcasting system. Drivers are alerted to tune their car radios to a specific channel in order to receive transmitted information.[18] One of a number of real-time travel information options departments of transportation use to alert the motorist to changes in the roadway condition.
Incident Command System (ICS)	A standardized on-scene emergency management protocol specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.[21] ICS is the operational component of NIMS that allows agencies to work together using common terminology and operating procedures controlling personnel, facilities, equipment, procedures, and communications at a single incident scene. It facilitates a consistent response to any highway incident by employing a common organizational structure that can be expanded and contracted in a logical manner based on the level of required response.[22] NIMS specifies an ICS organization consisting of five major functions: • Command – provide on-scene management and control authority. • Operations – direct incident tactical operations. • Planning – prepare incident action plan and maintain situation and resources status. • Logistics – provide services and support to the incident. • Finance and administration – track incident costs and account for reimbursements. • A sixth function, intelligence, is sometimes added to an ICS organization in response to the NIMS guideline that an ICS must establish a process for gathering, sharing, and managing incident-related information and intelligence.

[1] First responder changed to Emergency responder to be in compliance with TRB's NCHRP Research Digest 385.[27]

Term	Definition
Intelligent Transportation Systems (ITS)	The application of advanced electronics, computers, communications, and sensor technologies – in an integrated manner – to increase the efficiency and safety of the surface transportation network. ITS encompasses a broad range of wireless and wireline communications-based information and electronics technologies.[20] ITS can play a critical role in support of TIM in a variety of ways including: • ITS detectors can help detect an incident. • ITS cameras can help verify the incident, assist in determining proper response and monitor the incident conditions. • ITS traveler information systems can be used to warn motorists of the incident. • ITS communications systems can be used to coordinate response among the involved agencies.
Local Government	A county, municipality, city, town, township, local public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; an Indian tribe or authorized tribal organization, or in Alaska a Native village or Alaska Regional Native Corporation; a rural community, unincorporated town or village, or other public entity.[21]
Memorandum of Understanding (MOU)	A document describing an agreement between two or more parties such as public agencies. It expresses a convergence of will between the parties, indicating an intended common line of action. It is often used in cases where parties either do not imply a legal commitment or in situations where the parties cannot create a legally enforceable agreement.[24] One of the critical elements in successful TIM programs is the development of MOUs among the agencies. Examples of areas where MOUs are useful include: • Defining agency roles and responsibilities. • Defining TIM program performance measures. • Establishing TIM program shared funding approaches.
Metropolitan Planning Organization (MPO)	Regional planning body, required in urbanized areas with a population over 50,000, and designated by local officials and the governor of the State that is responsible, in cooperation with the State and other transportation providers, for carrying out the metropolitan transportation planning requirements of federal highway and transit legislation.[20] Federal requirements call for consideration of management and operations in the metropolitan and statewide transportation planning processes. For instance, "to promote efficient system management and operation" is one planning factor. Legislation also states that transportation plans shall include operations and management strategies to improve the performance of the existing transportation system to relieve vehicular congestion and maximize the mobility of people and goods. As a result, in some metropolitan areas the MPO plays a significant role in TIM including funding, policy, program development, and performance measures.
National Incident Management System (NIMS)	A system mandated by Homeland Security Presidential Directive 5 that provides a consistent nationwide approach for governments, the private-sector, and non-governmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.[22] ICS is the operational component of NIMS.
National Unified Goal (NUG)	Developed and endorsed by the National Traffic Incident Management Coalition, the Traffic Incident Management National Unified Goal (NUG) is: • Responder safety. • Safe, quick clearance. • Prompt, reliable, interoperable communications. The NUG is based on 18 strategies. Key strategies include recommended practices for multidisciplinary TIM operations and communications; multidisciplinary TIM training; goals for performance and progress; promotion of beneficial technologies; and partnerships to promote driver awareness.[25]
Open Roads Policy	An interagency agreement that serves to inform incident responders of the urgent need to rapidly remove disabled or wrecked vehicles, spilled cargo, and debris that obstruct the normal flow of traffic. It disseminates key guidelines to ensure a cooperative incident removal effort between responding agencies.[22]

Term	Definition
Operations	All decision making and actions necessary for the proper functioning of a system, such as information gathering (from a variety of sources), synthesis and processing, and dissemination and distribution of the decisions and information to traffic control equipment, other agencies and decision makers, and the public.[20] This is done in anticipation of, or in response to, both recurring and nonrecurring conditions. Operations includes a range of activities in both urban and rural environments, including: routine traffic and transit operations, public safety responses, incident management, snow and ice management, network–facility management, planned construction disruptions, and traveler–shipper information.
Personal Protective Equipment (PPE)	Personal protective equipment refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.
Performance Measurement	A process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services, the quality of those outputs and outcomes, and the effectiveness of government operations in terms of their specific contribution to program objectives.[20] Examples of TIM PM are incident frequency, detection time, response time, roadway and clearance times, and secondary crashes.
Preparedness Organization	A committee of highway incident stakeholders that coordinates preparedness activities in advance of highway incidents. Common responsibilities of a preparedness organization may include establishing integrated guidelines, procedures, and protocols to promote interoperability, adopting response priorities, and developing coordinated plans that efficiently use all resources available to the organization.[22]
Program	A coordinated, inter-related set of strategies, procedures, and activities, all intended to meet the goals and objectives articulated in vision statements and policies.[20]
Recovery	The recovery phase of a traffic incident consists of restoring traffic flow at the site of the traffic incident; preventing more traffic from flowing into the area and getting trapped in the upstream queue; and preventing congestion from spilling across the roadway network. Thus it encompasses the activities of site management, traffic management and clearance. Emergency responders normally are focused on the immediate vicinity of the traffic incident and likely do not have the resources or information to handle the "big picture." Resources including traffic operations centers and their operating staff can facilitate recovery by managing the network-wide effects of traffic incidents and thus hastening recovery.[6]
Resource Management	The application of tools, processes, and systems for identifying available resources at all jurisdictional levels to enable the timely and unimpeded access to resources during an incident.[22]
Response	Activities that address the short-term, direct effects of an incident, including immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes.[21] With regard to TIM, response includes the activation, coordination, and management of the appropriate personnel, equipment, and communication links and motorist information media as soon as it is reasonably certain that a traffic incident has occurred.
Safety Service Patrol (SSP)	A safety service patrol is the umbrella term for a variety of programs implemented by government agencies, typically State Highway Patrols or Departments of Transportation, to reduce traffic congestion and improve highway safety by having specially marked and equipped vehicles patrol designated sections of roadway and provide incident management and motorist assistance at trouble spots they encounter.
Secondary Crash	A crash occurring within an accident scene or within the queue, including the opposite direction, resulting from an original incident.[26]
Self-Assessment	Continuing process through which managers at all levels evaluates the effectiveness of their performance in all areas of responsibility, and determine what improvements are required.[4]

Term	Definition
Stakeholder	A person or group affected by a transportation plan, program or project. Stakeholders are sources of the corridor/regional vision, goals and objectives, operational approaches and strategies, and requirements.[20] Traffic Incident Management is a planned and coordinated program process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. This coordinated process involves a number of public and private sector stakeholders including Law Enforcement, Fire and Rescue, Emergency Medical Services, Transportation, Public Safety Communications, Emergency Management, Towing and Recovery, Hazardous Materials Contractors and the Traffic Information Media. The inclusion of stakeholders in any TIM Task Force is critical to the TIM program's success.
Strategic TIM Program Elements	These elements form a framework for TIM activities. They provide the multiagency planning, programming, and evaluation necessary to support efficient and collaborative on-scene operations; as well as how to plan, prepare for, and measure performance of the program. Strategic elements include items such as strategic plans, policies and training.
Support TIM Program Elements	These elements provide for the operational, tactical, and institutional support for effective communication and information exchange. Support elements include items such as communications systems, data and video collection and sharing, and traveler information.
Tactical TIM Program Elements	These elements provide the tools and technologies for traffic management and interagency communications for on-scene operations. Example products include on-scene traffic control procedures, motorist assist patrols, and pre-staged response equipment.
TIM Responder	Personnel responding to an incident that mitigate its effects. May include personnel from law enforcement, fire service, EMS, HazMat, emergency management and public works.[27]
Traffic Control Device/ MUTCD	All signs, signals, markings, and other devices used to regulate, warn, or guide traffic placed on, over, or adjacent to a street, highway, pedestrian facility, or bikeway by authority of a public agency having jurisdiction.[27] The Manual on Uniform Traffic Control Devices. (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is published by the Federal Highway Administration (FHWA) under 23 Code of Federal Regulations (CFR), Part 655, Subpart F.
Traffic Incident	Any non-recurrent event, such as a vehicle crash, vehicle breakdown, or other special event, that causes a reduction in highway capacity and/or an increase in demand.[1]
Traffic Incident Management (TIM) / Incident Management	The systematic, planned, and coordinated use of human, institutional, electrical, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders. These resources are also used to increase the operating efficiency, safety, and mobility of the surface transportation network by systematically reducing the time to detect and verify an incident occurrence; implementing the appropriate response; and safely clearing the incident, while managing the affected flow until full capacity is restored.[20]
Traffic/Transportation Management Center (TMC) / Traffic Operations Center (TOC)	The hub of a transportation management and control system that brings together human and technological components from various agencies to perform a variety of functions.[20]
Tribal	Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (85 Stat. 688) (43 U.S.C.A. and 1601 et seq.), that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.[21]
Vision	An agreed statement of the overall aims of a transportation plan. The purpose of a vision statement is to portray the future system and its operation for a specific time horizon, providing a platform for establishing goals and objectives. The vision statement must also be simple, easy to read and accessible to a wide audience.[20] A vision statement is a critical element of a TIM Strategic Plan.

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