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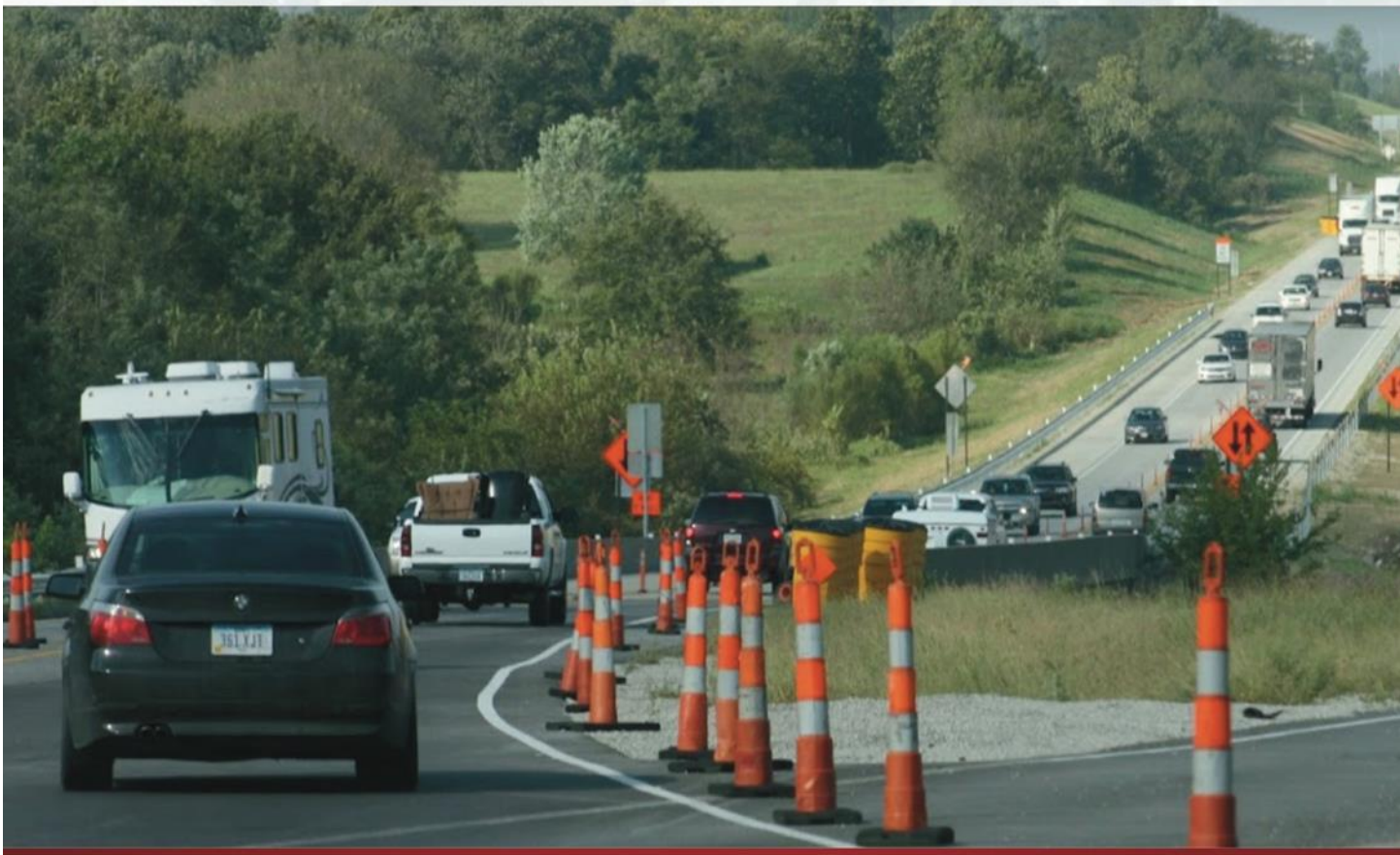

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATION

Work Zone Management Service Layer

REVISION HISTORY

This document will be periodically updated by the Iowa Department of Transportation (DOT). The following table provides the date and a brief description of each revision to track revision history.

Revision Number	Date of Revision	Description of Revision
1.0	June 2018	Initial Version

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LIST OF ABBREVIATIONS

AADT	Annual Average Daily Traffic
App	Application
ATMS	Advanced Traffic Management Systems
ATSSA	American Traffic Safety Services Association
AVL	Automated Vehicle Locating
CCTV	Closed Circuit Television Cameras
CFR	Code of Federal Regulations
CMF	Capability Maturity Framework
CTRE	Center for Transportation Research and Education
DMS	Dynamic Message Sign
DOT	Department of Transportation
ERL	Electronic Reference Library
FHWA	Federal Highway Administration
GIS	Geographic Information System
IMs	Instructional Memorandums
INFLO	Intelligent Network Flow Optimization
InTrans	Institute for Transportation
IT	Information Technology
ITS	Intelligent Transportation System
IWZ	Intelligent Work Zones
LCPT	Lane Closure Planning Tool
MP	Maintenance Preservation
MPH	Miles per Hour
MUTCD	Manual on Uniform Traffic Control Devices
MVE	Motor Vehicle Enforcement
PDMS	Portable Dynamic Message Signs
PI	Public Information
PPM	Policy and Procedure Manual
RCE	Resident Construction Engineer
RISC	Roadway Industry Safety Committee
RS	Road Standards
RWIS	Road Weather Information System
TAS	Traffic and Safety Manual
TC	Traffic Control
TCP	Traffic Critical Project
TIM	Traffic Incident Management
TMC	Traffic Management Center
TSMO	Transportation Systems Management and Operations
TTC	Temporary Traffic Control
WZMSL	Work Zone Management Service Layer

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PDMS	Portable Dynamic Message Signs
PI	Public Information
PPM	Policy and Procedure Manual
RCE	Resident Construction Engineer
RISC	Roadway Industry Safety Committee
RS	Road Standards
RWIS	Road Weather Information System
TC	Traffic Control
TCP	Traffic Critical Project
TIM	Traffic Incident Management
TMC	Traffic Management Center
TSMO	Transportation Systems Management and Operations
TTC	Temporary Traffic Control
WZMSL	Work Zone Management Service Layer

INTRODUCTION

The 2014 Iowa DOT Strategic Plan established a mission of ***"Getting you there safely, efficiently, and conveniently"*** and defined a vision of ***"Smarter, Simpler, Customer Driven."*** The Iowa DOT Transportation System Management and Operations (TSMO) Strategic Plan and accompanying program plan outline a TSMO-oriented approach towards managing and operating the transportation system in a way that will help facilitate progress towards this mission and vision.

The TSMO Strategic Plan states, "Within Iowa DOT there are multiple disciplines, offices, and regions with the responsibility and ability to deliver safe and reliable mobility at the statewide and regional level. TSMO does not replace any of the current responsibilities; instead, it offers resources and strategies to realize the full capacity of the existing transportation system, increase reliability, improve safety, and target safety and operational problem locations."

Iowa DOT's TSMO Program Plan is organized into eight service layers, as illustrated in Figure 1.

Traffic Management Center	ITS and Communications	Traveler Information	Traffic Incident Management
Emergency Management Operations	**Work Zone Management**	Active Transportation and Demand Management	Connected / Automated Vehicles

Figure 1 Iowa DOT TSMO Service Layers

The Work Zone Management Service Layer (WZMSL) focuses on the planning and deployment of various strategies to maintain traffic flow and safety through work zones. This document defines the plan for the work zone management service layer by describing challenges and opportunities, existing services and conditions, future direction, gaps and actions to bridge them, performance metrics, and estimated costs.

Definition of Work Zones

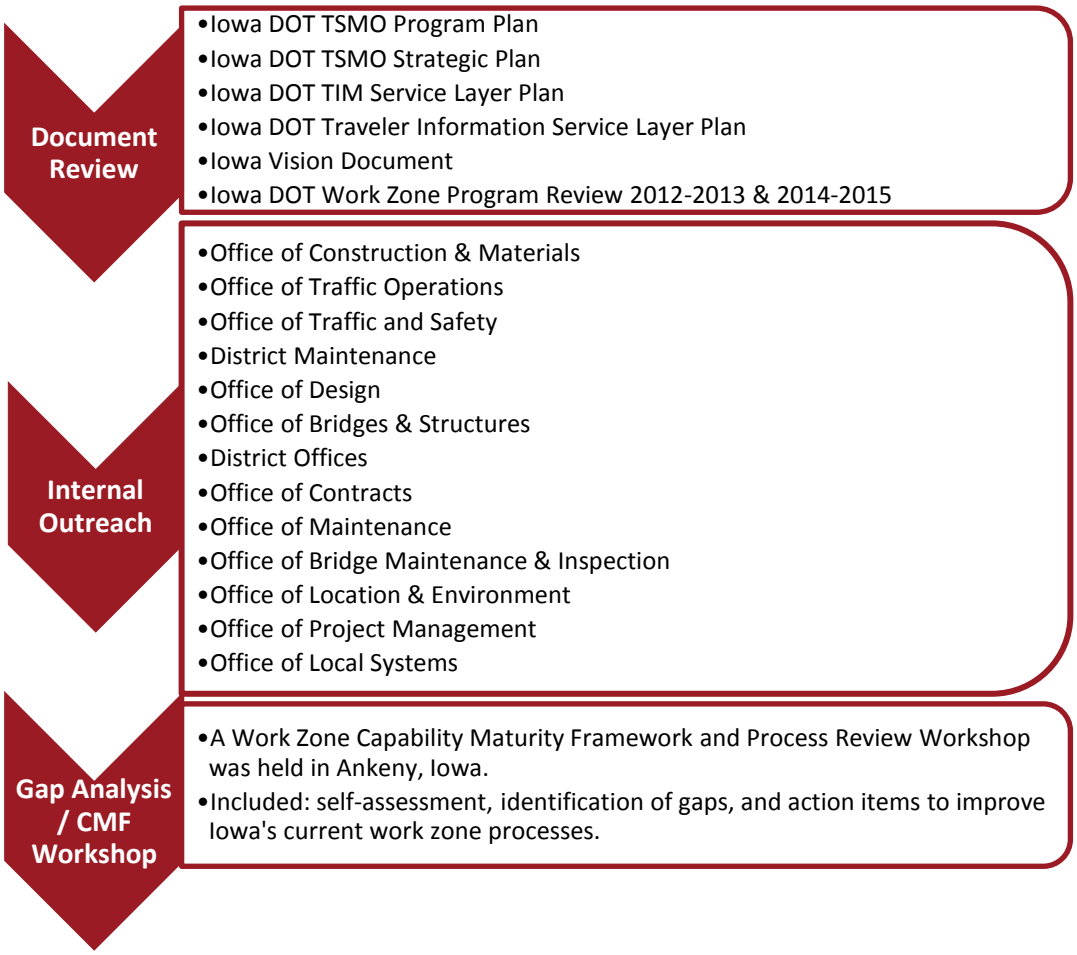
A work zone is defined as anywhere road user conditions are changed on any public way, designated for purposes of vehicular travel, where a road authority or its agent is constructing, reconstructing, or maintaining the physical structure of the roadway, its shoulders, or features adjacent to the roadway, including underground and overhead utilities and highway appurtenances.

Work zones directly impact the safety and mobility of road users, roadway workers, law enforcement officers, emergency responders, utility workers and other authorized personnel. These safety and mobility impacts are exacerbated by aging infrastructure and growing congestion in many locations throughout the state. Addressing safety and mobility issues requires considerations that start early in project development and continue through project completion. The challenge of moving traffic safely and efficiently through work zones underscores the need for finding, deploying, and developing new ways to enhance work zone traffic management.

Service Layer Plan Development Process

Development of this service layer plan was accomplished by engaging and enabling staff at all levels and areas throughout the DOT to envision the future of work zone management in Iowa. A series of in-person meetings, supplemented with on-line meetings and phone interviews, were instrumental in creating this plan.

This effort was coordinated by a work zone management service layer subcommittee, whose members represented several previously-established work zone groups including the Traffic Critical Projects (TCP) Working Group and the Work Zone Safety Committee. An overview of the work zone management service layer development process is shown below:



Document Content and Intended Use

This document is intended to serve as a tactical plan for managing the work zone management service layer in a way that is consistent with and in support of both the Iowa TSMO Strategic Plan and Iowa TSMO Program Plan. Content will be used to further Iowa DOT's organizational vision, mission, and goals by providing a clear plan for performance measures, operations and data management, and increased communication and collaboration between DOT offices.

Following this introduction, the next sections are organized as follows:

- **Opportunities and Challenges** – Key opportunities and challenges facing work zones in Iowa, as identified by DOT personnel, and explores TSMO work zone management service layer goals and objectives.
- **Existing Services and Systems** - Brief overview of the existing services, groups, initiatives and resources, and how they interact with Iowa work zones.
- **Existing Conditions** - Assessment of existing conditions as identified by DOT personnel.
- **Gap Analysis** - Review of Iowa DOT's Work Zone Capability Maturity Framework (CMF) across six separate dimensions to identify gaps in current processes and procedures.
- **Action Recommendations** - List of actionable recommendations and an outline of measures and staffing considerations for each using the results of the above activities and findings.
- **Performance Management** - Action plan and process for completing the action recommendations.
- **Five-Year Service Layer Cost Estimate** - Cost estimate by fiscal year that will be used to refine the TSMO Program Plan budget estimate.

OPPORTUNITIES AND CHALLENGES

Work zone management is a paramount function of the Iowa Department of Transportation (DOT) due to the number of offices and people that are involved in the work zone process. From project fruition and design, to district management, final construction, and maintenance, the multitude of people involved is larger than any other functions of the Department. Putting together a comprehensive and thorough plan for the TSMO work zone management service layer required participation and input from a large and varied group of stakeholders.

This section provides a summary of the opportunities and challenges facing Iowa work zones that were provided by DOT employees based on their experiences and insights.

Challenges Facing Iowa Transportation

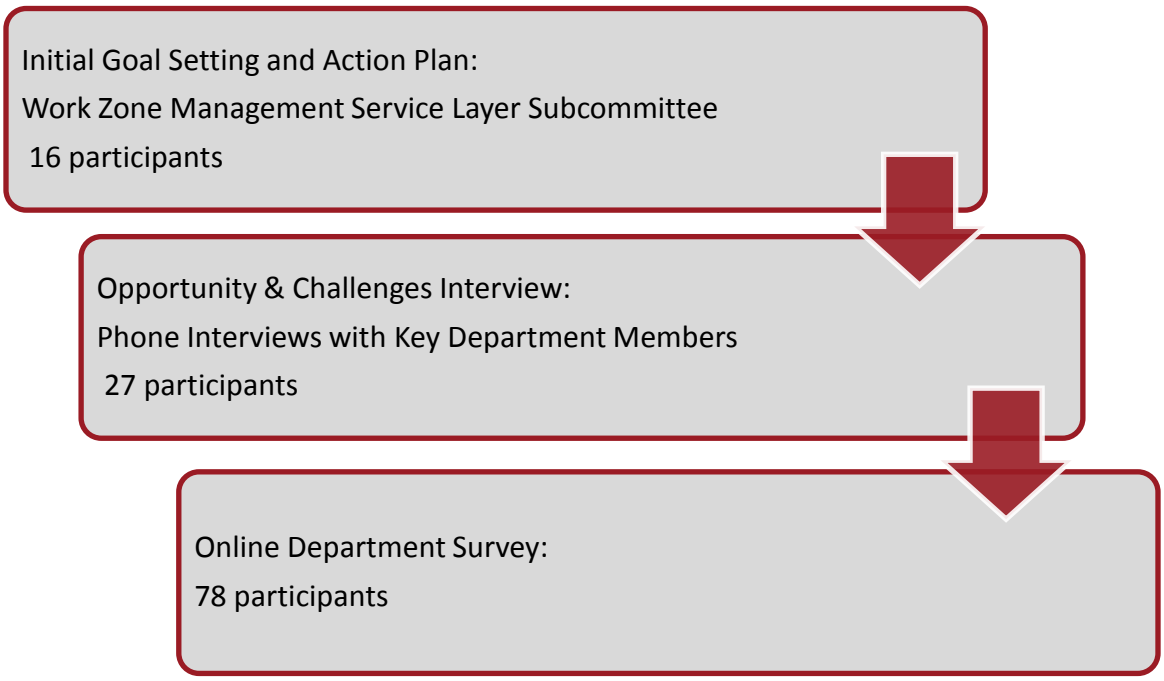
The work zone management service layer goals and objectives were derived during the initial subcommittee kick-off meeting. Goals and objectives were mapped to related TSMO Plan Strategic Goals and Program Objectives to ensure that the work zone management service layer aligns with Iowa's vision of ***Smarter, Simpler, Customer Driven.***

TSMO Strategic Goal		TSMO Strategic Objective	TSMO Program Objectives	Work Zone Management Objectives
	1.Safety	Reduce crash frequency and severity.	• Reduce number of overall major crashes. • Reduce number of Secondary crashes. • Reduce the number of work zone related traffic incidents.	• Ensure consistent application of safety mitigations on all work zones. • Improve work zone crash information.
	2.Reliability	Improve transportation system reliability, increase system resiliency and add highway capacity in critical corridors.	• Improve travel time reliability. • Increase the resilience of the transportation system to floods, winter weather, and other extreme weather events. • Work with special event generators to actively manage traffic during large scale events that impact the highway network.	• Promote consistency, uniformity, best practices, and innovation throughout the state's work zones.

	3. Efficiency	Minimize traffic delay and maximize transportation system efficiency to keep traffic moving.	• Maximize use of existing roadway capacity. • Respond to and clear traffic incidents as quickly as possible.	• Define and monitor performance measures. • Explore ways to quantify the user costs of work zone impacts. • Begin safety and mobility analysis during the concept stage.
	4. Convenience	Provide ease of access and mobility choices to customers.	• Provide timely, accurate and comprehensive information to customers. • Provide high quality, machine ready data in open formats.	• Provide accurate, comprehensive, and easy to use 511 / Communications / Data Management.
	5. Coordination	Engage all DOT disciplines, and external agencies and jurisdictions to proactively manage and operate the transportation system.	• Provide staff knowledge and management resources to enable adaptation to rapidly changing technology.	• Create a means for effective communication between field operations and planning/design (concept through delivery). • Encourage information sharing with other service layers.
	6. Integration	Incorporate TSMO strategies throughout DOT's transportation planning, design, construction, maintenance, and operations activities.	• Implement integrated corridor management strategies to manage traffic across multiple jurisdictions.	• Promote institutionalization and culture change within the Department through coordination, training, & education.

Work Zone Management Service Layer Systematic Approach

Due to the comprehensive nature of this service layer, the subcommittee determined that outreach and input from all areas of the DOT involved with work zones was necessary. A systematic approach for outreach was developed and administered to maintain focus on strategic goal areas.



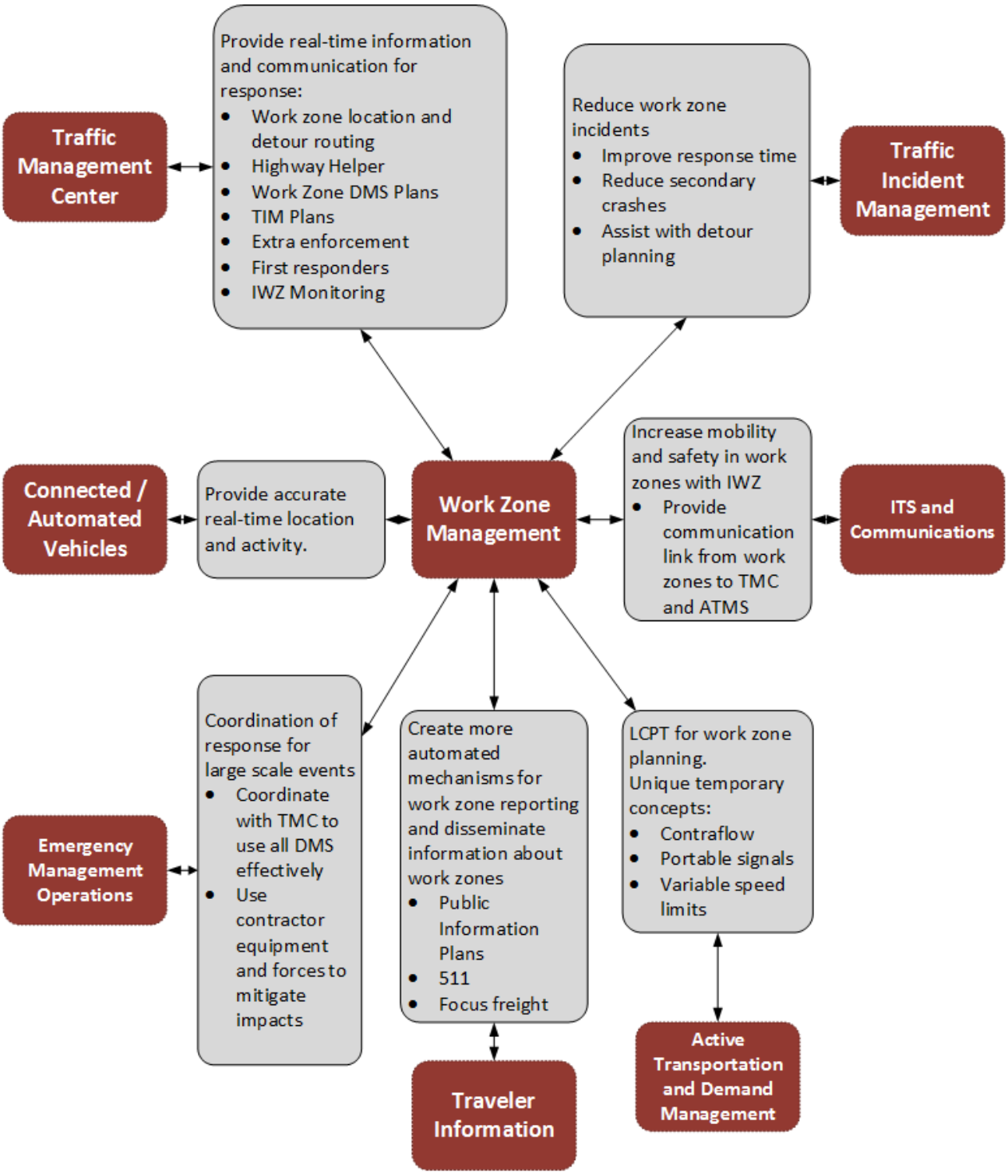
A current practices questionnaire was created and conducted via phone interviews with 27 representatives from across the Iowa DOT. Questions reflecting design, project scheduling, project coordination, outreach to public, training, and each department's 'current focus' were discussed to gain insight into each group's current practices, areas of concern, and future opportunities (see Appendix A). Common themes emerged from the responses in the areas of: planning, concept and delivery (concept-to-delivery), performance measures, data collection and use, best practices and standards, and a catch-all category of "other" (see Appendix B).

Using results generated from the phone interviews, an online survey was created and distributed to better gauge the importance of various work zone components at different levels throughout the Department. To best facilitate a wide array of input, it was requested that management share the survey with all DOT employees who interact with work zones, from design staff to field personnel. Anyone was welcome to complete the survey, including managers, supervisors, and employees.

The survey asked participants to rank a series of items in six categories to determine the largest opportunities for improvements within the department (see Appendix C). Participation varied throughout the offices with 52 of 78 responses coming from people identifying the "District" being their functional area. Input generated from the survey helped the subcommittee determine the final next steps and action recommendations.

Opportunities Created by a TSMO Based Approach

The core mission of TSMO as defined by the Federal Highway Administration (FHWA) is to facilitate system management and operation by building on existing staff, processes, and systems to fully realize a transportation system's capacity. By identifying the relationships and interconnection of Iowa's TSMO service layers, collaboration, and new opportunities for growth within the DOT can be realized.



EXISTING SERVICES AND SYSTEMS

A tactical approach for TSMO begins with an evaluation of the current conditions, services, and systems that Iowa DOT uses for work zone management. This evaluation allows the DOT to determine where improvements can be made, and redundancy reduced, when making action recommendations.

Work Zone Services

Work Zone services in Iowa are provided by District Offices and the central offices of: Bridges and Structures, Contracts, Construction and Materials, Design, Local Systems, Location and Environment, Maintenance, Project Management, Systems Planning, Strategic Communications, Traffic and Safety, and Traffic Operations.

To ensure uniform application of temporary traffic control and operations, it is necessary to establish policies, standards, guidelines, procedures, and practices that address work zone mobility and safety. Iowa work zone standards include:

- Work Zone Mobility Rule
- Work Zone Safety and Mobility Policy, PPM 500.18
- Manual on Uniform Traffic Control Devices
- Iowa DOT Design Manual, Standard Road Plans, and Road Design Details
- Construction Manual
- Traffic and Safety Manual
- Instructional Memorandums
- Standard Specifications
- Special Provisions
- Intelligent Work Zone Strategies

Work Zone Mobility Rule

The Federal Highway Administration (FHWA) published the Work Zone Safety and Mobility Rule on September 9, 2004. The regulation is intended to facilitate comprehensive consideration of the broader safety and mobility impacts of work zones through a project's life cycle, and the implementation of appropriate strategies to help manage these impacts. The provisions in the rule recognize that traffic control and worker safety are essential, but that work zone impact management should also address transportation operations and public information, as appropriate for the needs of the project.

The primary goal of the FHWA's rule is to reduce crashes and congestion caused by work zones. To accomplish this, the rule facilitates the systematic consideration of safety and mobility impacts of work zones and the development of strategies and plans to reduce work zone impacts.

Work Zone Safety and Mobility Policy (PPM 500.18)

The Iowa Department of Transportation (Iowa DOT) established a work zone safety and mobility policy in accordance with 23 CFR 630 Subpart J on October 11, 2007. This Work Zone Safety and Mobility Policy establishes guidance for providing safe and efficient movement of traffic in work zones. The DOT made modifications to policies, procedures, and contract documents in accordance with 23 CFR 630 Subpart K and received FHWA Division Office concurrence on April 14, 2009. This policy is currently undergoing updates that should be finalized during FY2019.

Manual on Uniform Traffic Control Devices

The Manual on Uniform Traffic Control Devices (MUTCD) contains standards, guidelines, and support material for the design, placement, operation, maintenance, and uniformity of traffic control devices on all public roads or private roads open to public travel. The current edition of the federal MUTCD has been adopted by Iowa Administrative Code 761—Chapter 130.

Iowa DOT Design Manual, Standard Road Plans, and Road Design Details

The guidelines in Chapter 9 of the Design Manual are intended to provide safe and expeditious movement of traffic through construction and maintenance zones while ensuring the safety of crews performing work operations.

Guidelines refer to the Standard Road Plans TC Series which are part of Section RS of the Standard Road Plans and sections 520 and 521 of Road Design Details which show typical applications of various traffic control methods. Since there are many combinations of site geometry, location, and work types, it is not possible to have a layout for every conceivable work zone scenario. However, the layouts in these sections do provide a basis from which other layouts may be derived to fulfill the traffic control needs of a specific work zone.

The layouts provided in the Standard Road Plans and the Road Design Details represent minimum requirements for the situations depicted. Factors such as traffic volume, sight distance, and work area location may require modifications to these layouts.

Iowa DOT Construction Manual

Chapter 5, Sections 20, 30, and 40 of the Construction Manual contain standards, guidelines, and procedures for the application of temporary traffic controls on State construction projects. The provisions contained in these sections are intended to be included in contract documents including project plan references. An extensive list of information sources regarding traffic control can be found in Appendices 5 - 8 of the Construction Manual.

Iowa DOT Traffic and Safety Manual

Temporary Traffic Controls (TTC)are contained in Chapter 8 of the Traffic and Safety Manual (TAS).

Instructional Memorandums

Instructional Memorandums (IMs) aid on a wide variety of transportation-related topics. Some IMs provide detailed information or instructions on how to address impacts to mobility and safety in construction and maintenance work zones.

There are three major categories of (IMs):

- Maintenance
- Local Systems
- Materials

Standard Specifications

Section 2528 of the Standard Specifications for Highway and Bridge Construction describes various materials, equipment, and procedures involved in providing traffic control during construction and are incorporated into contract documents by reference.

Special Provisions

Special Provisions are additions and modifications to the Standard and Supplemental Specifications covering conditions specific to an individual project. Special Provisions are required whenever the work intended cannot be covered by the Standard or Supplemental Specifications.

Intelligent Work Zone Strategies

Intelligent Work Zone (IWZ) strategies have been developed to mitigate mobility and safety impacts in construction and maintenance work zones when traditional methods are deemed ineffective or impractical. Details of these strategies can be found on the Iowa DOT Traffic Critical Projects Website at https://sites.google.com/site/iowatcp/.

Work Zone Groups

To manage and ensure proper application of temporary traffic controls for mobility and safety in work zones, the Iowa DOT has established several groups and committees. These include:

- Work Zone Traffic Safety Committee
- Work Zone Process Review Team
- Traffic Critical Projects Working Group
- Intelligent Work Zone Team
- Traffic Critical Projects Mitigation Committee
- Specification Committee
- Major Projects Group
- Roadway Industry Safety Committee

Appendix D shows membership in these groups as of May 2018. The overlapping staff and personnel in these groups illustrates the interrelationships between the various work zone groups that encourages communication and collaboration to address needs and implement innovative solutions.

Work Zone Traffic Safety Committee

The Work Zone Traffic Safety Committee oversees work zone traffic safety issues that affect the traveling public and road workers within temporary traffic control zones. Areas of oversight include: design policies, standard road plans, specifications, training, research, and new product evaluation as they relate to temporary traffic control zones. This committee recommends updates to details or information required for temporary traffic control in work zones and provides details for the Office of Design to include in the Design Manual, Standard Road Plans, and/or the Road Design Details. Information provided by this committee aids in plan development, traffic management and operations, staging, work zone restrictions, traffic incident management, and intelligent work zones. Committee members conduct field reviews during the construction season to observe traffic control installations and recommend changes for future work zones.

Work Zone Process Review Team

A process review is required to be conducted every two years by 23 CFR 630.1008(e) to examine the Iowa DOT's progress implementing these rules and identifying best practices and areas that need further development to improve.

The joint FHWA and Iowa DOT Work Zone Safety and Mobility Process Review Team fulfills this requirement by examining Iowa's progress implementing rules related to work zone safety and mobility, as well as identifying best practices and areas that need improvement for the safety and efficiency of Iowa work zones for motorists, workers, and pedestrians. Reviews include inspections of randomly selected projects throughout Iowa, and an assessment of the development and implementation procedures for specifications, standards, and evaluation of work zone data at the state level. Results of these reviews are used to further develop future work zone standards and processes.

Traffic Critical Projects Working Group

The Traffic Critical Projects (TCP) Working Group supports and guides the TCP program by making recommendations for department policy updates and providing guidance to improve mobility and safety mitigations to enhance construction and maintenance work zone operations on Iowa's most critical roadways.

Intelligent Work Zone Team

The Intelligent Work Zone (IWZ) Team is an internal/external group that plans, deploys, and monitors all Intelligent Work Zone (IWZ) projects on DOT roadways. The team holds an annual season kick-off meeting in the Spring that highlights the activities and IWZ projects for the upcoming year. They then have weekly teleconferences to discuss current and upcoming IWZ projects and resolve any issues

related to the operation of these systems. At the end of the construction season a workshop is held to review the past construction season and to develop a set of recommendations to improve the IWZ program for the year ahead.

Traffic Critical Projects Mitigation Committee

The Traffic Critical Projects (TCP) Mitigation Committee members are technical experts that act as a resource for traffic mobility and safety mitigations employed by the Iowa DOT. The committee:

- Assists designers with identification and selection of methods to ease mobility and safety impacts during construction.
- Assists with development of full TCP plans.
- Conducts periodic reviews to ensure TCP goals are being met.
- Recommends thresholds and performance criteria for TCP.

The committee also develops processes and tools that facilitate selection and evaluation of mobility and safety mitigation methods.

Specification Committee

The Specification Committee consists of approximately 10 - 20 office directors, or their designees, from both the central office and field offices. This committee meets monthly to review and discuss possible additions or changes to the specifications for work on construction projects.

Major Projects Group

The Major Projects Group's main goal is to inform the public of upcoming major projects across the state and provide project updates during construction. The work zone safety and mobility component of the Major Projects Group is the collection and distribution of accurate project and work zone information.

Roadway Industry Safety Committee

The Roadway Industry Safety Committee (RISC) is an industry-formed group. The group's mission is to sponsor safety related initiatives for Iowa's heavy highway industry in cooperation with the Iowa DOT to improve the safety of highway work zones. The RISC is a working group made up of representatives of the following agencies and associations:

- Asphalt Paving Association of Iowa: http://www.apai.net/
- Iowa Concrete Paving Association: http://www.iowaconcretepaving.org/
- Iowa American Traffic Safety Services Association (ATSSA) Chapter: no formal website
- Associated General Contractors of Iowa: http://www.agcia.org/
- Iowa DOT https://iowadot.gov/home#/services

Work Zone Training Group

The Work Zone Training Group has co-sponsored annual training courses in work zone traffic control since 1979. Between 2014 and 2017, 34 sessions of the six-hour course on "Temporary Traffic Control in Construction, Maintenance, and Utility Work Zones" were held. A total of 3,015 persons attended the course. Participants included workers from DOT construction and maintenance, public and private utility companies, cities, counties, and private contractors. Additional information, such as the number of participants trained by work type and location and evaluation summary by breakout session, is available in the full training report available through the Office of Traffic and Safety.

The Work Zone Training Group fulfills the FHWA's requirement of 23 CFR 630.1008(d) that the Department conduct training for personnel involved in the development, design, implementation, operation, inspection, and enforcement of work zone traffic management. Periodic training updates are conducted that reflect current industry practice and State processes and procedures.

EXISTING CONDITIONS

A review of the existing work zone management conditions was performed for the following areas of the Iowa DOT:

- **Data Assessment** of current data availability and monitoring procedures provided on work zones.
- **Safety and Services Assessment** of the Traffic Management Center (TMC) and their interactions with work zones.
- **Design Process Assessment** to determine if Iowa DOT is utilizing the latest techniques for work zones, how agile the DOT is when making field changes, and if they include the right stakeholders (e.g., law enforcement, towing, oversize/overweight permits, etc.) when designing projects.
- **Traveler Information Assessment** to benchmark Iowa DOT against other transportation agencies on how well they provide work zone information.

Data Assessment

An assessment of the current data availability and monitoring procedures provided on work zones.

Performance Measures: Performance monitoring tools were developed to give the Iowa DOT the ability to view both the impacts of work zone projects on traffic and monitor the traffic sensor operating status. Connecting to the data collected by cameras, sensors, and dynamic message signs, the web-based performance monitoring tool is updated every night to add the information of the previous day into the view. All the historical data is retained from the database so that information from any time interval can be queried at any point.

Traffic sensors have been the primary source of data for performance monitoring since the TCP program was established. Sensors provide high granularity data which is beneficial when monitoring performance but could be highly variable based on the make/model of the sensors. During the 2017 construction season, Institute of Transportation (InTrans) significantly improved performance monitoring results by using machine learning to eliminate common false traffic events, by using a fixed 45 mph threshold. The machine learning process better identifies traffic events and has significantly improved the accuracy of the performance measures and decreased the number of false events detected by the previous systems.

Recently, InTrans expanded the use of INRIX data to monitor projects and roadways which do not have sensors deployed. INRIX probe data does not include volume, so the performance measures differ slightly than what is available using permanent or portable sensors. The amount of INRIX data is highly variable based on the type of roadway.

InTrans receives a weekly snapshot of crash data from the DOT which provides the ability to perform further crash analysis on a regular basis.

Text Alerting: InTrans developed a work zone text messaging alert system during the 2017 construction season. Machine learning was utilized to identify slow and stopped conditions within the work zone which was then used to develop an algorithm to send text alerts of slowdowns in work zones across the state. A feed was developed to summarize this information for each work zone and is used in the TMC operations dashboard as well as for text alerting to DOT staff.

Work Zone Capacity: InTrans is currently working with Iowa DOT to determine the capacity of different work zone configurations, including a capacity comparison for bridge-related work using a single lane vs two narrow lane operation. Additionally, InTrans is looking at the impacts towing and extra enforcement have on capacity.

Lane Closure Planning Tool (LCPT): The lane closure planning tool provides convenient access to traffic data which can be used to determine when a lane can safely be closed. LCPT uses data from Intelligent Transportation System (ITS) sensors to update its database every month, which includes the hourly volume by month, day of week, and time of day. The hourly volumes are currently being expanded to include the average, minimum, maximum, 25th and 75th percentile. In addition to the raw hourly volume and the passenger car equivalent hourly volume is also calculated.

I-80/380 TMP: InTrans developed baseline performance measures for the I-80/380 reconstruction project. Relevant performance measures for evaluation were determined through a series of meetings with consultants and DOT staff. Weekly, monthly and annual baseline performance measures were calculated for using data from 2016. The performance measures came from a variety of data sources including INRIX, traffic sensors, Advanced Traffic Management Systems (ATMS), and crash databases.

Open Data Service: InTrans has developed an open data service which is intended to provide high quality, near real-time data feeds for any public or private entity. Data feeds and services support both agency and external users over a wide range of use categories.

The sources are varied and can include operation, roadway, weather, maintenance, and safety data. Several InTrans initiatives including text alerting, TMC operations dashboard, and the lane closure planning tool use the open data service for the database. This data service integrates multiple data sources available to the DOT.

Safety & Services Assessment - Traffic Management Center

The Traffic Management Center (TMC) provides real-time information and communication for responses related to work zones on the Iowa state highway system. There is one TMC operator dedicated to monitoring, coordinating, communicating, and advising of traffic conditions and operations through construction and maintenance work zones. This operator ensure that work zones and detour routing are properly located, displayed, and communicated to agency personnel and the traveling public by verifying all work zone messages are accurate and in the proper location. False alerts or inaccurate information are corrected. TMC operators also alert DOT contacts if ITS equipment is misaligned by traffic impact or winds.

Highway Helper: The TMC coordinates and oversees the highway helpers to provide motorist assistance on freeways and interstates in the Des Moines, Council Bluffs, and Cedar Rapids/Iowa City areas. All motorist assists are entered into ATMS for future reference and analysis.

Traffic Incident Management: TMC operators program and implement Traffic Incident Management (TIM) plans and global diversion routes and provide leadership and communication in TIM plan execution in response to traffic incidents. Operators verify incident type and location, contact law enforcement and first responders as necessary, coordinate use of diversion routes, and provide traveler information via TMC systems such as Dynamic Message Sign (DMS), 511, etc.

Intelligent Work Zones: TMC operators monitor automated work zone DMS messages which are run via the TMC's ATMS. When slow or stopped traffic is detected near or within a work zone, alerts are sent for operators to check the nearest traffic camera and verify the alert validity – when possible. False alert messages are removed, and the managing party is notified so troubleshooting can occur.

Extra Enforcement: In an effort to reduce speed and driver inattentiveness extra enforcement by police or highway patrol can be requested for construction projects. When extra enforcement is requested by the Resident Construction Engineer (RCE) the TMC sends the request to available enforcement agencies for the work zone location. Once these agencies respond with availability, the TMC enters this information into the construction incident management report and manages the schedule for the enforcement agencies and the RCE. Software is currently being developed to automate this process and incorporate it into a construction project dashboard.

Work Zone Crash Data: When the TMC operators are alerted to a crash in a construction work zone, they capture any available video and other information and enter it into the ATMS database. This information is provided to Center for Transportation Research and Education (CTRE) at Iowa State University to aid in their work zone crash analysis efforts. This data is also shared with the RCE for the construction project.

The TMC operators receive many alerts and emails related to incidents on the Iowa highway system. Alerts from intelligent work zones on Traffic Critical Projects are coded as construction work zones and receive a high priority for response. Even so, this is a very time consuming and labor-intensive process that necessitates the operator to open an email or alert, determine the location, establish that it is in a work zone, and find the appropriate CCTV camera to determine if the event is still active. This process

can result in delays to response resulting in reduced or ineffective TMC assistance. Automation of this procedure would help to ensure the TMC operators can address these construction work zone alerts in an efficient and timely manner resulting in effectively mitigating the impacts of the work zone incident that triggered the alert.

Design Process Assessment

Construction Projects: The Office of Design, Office of Bridges and Structures, and the Districts work to develop project concepts that guide project development each construction season. The project development process is not formally defined across the Department, leading to inconsistencies between concepts across the state. The Office of Bridges and Structures has a process for concept development that could be used as a model to develop an improved process to guide concept development for use on all projects.

Currently, concept development does not include developing or revising existing Traffic Incident Management (TIM) plans because construction activities may impact diversion routes or recovery areas. For large or complex projects, consultants are typically brought on board to develop detailed Transportation Management Plans (TMP) and temporary traffic control plans.

Routine projects generally utilize standard road plans, when the standard plans require modification or a more innovative approach, designers contact the offices of Traffic and Safety or Construction and Materials for assistance. There is concern that the lack of guidance regarding when to use, or when not to use, the standard road plans has resulted in less effective temporary traffic control.

Input from the construction industry, law enforcement, emergency responders, and other stakeholders during the design process is not typically collected during the project development process. This results in designers continuing to use traditional staging and traffic control methods, limiting the use of innovation on construction projects, and leading to designs that have unintended consequences for these stakeholders.

Opportunities for feedback from construction to design includes: concept and plan review by District construction personnel, semi-annual standards review conference calls, and informal feedback from the district construction personnel to the design staff. The current feedback process during construction is ad-hoc and is typically only done when there are major problems encountered during construction. The previous practice of holding formal, post-construction review meetings was suspended due to staff resource limitations.

The Iowa DOT does provide annual work zone traffic control and safety training, but there is very little training focused on design for managing traffic through work zones. Consistently, this results in limited participation by designers in these annual sessions.

Maintenance Operations: Maintenance does not use the same tools as design due to time and resource constraints. Maintenance generally uses typical layouts contained in the standard road plans for temporary traffic control to determine when to perform work and what type of traffic controls to use. Some maintenance areas have begun to use the lane closure planning tool to determine work

hours while others have standing time restrictions, i.e. morning and evening rush hours, night work only on specific sections, etc.

Many major maintenance activities have moved to Maintenance Preservation (MP) projects and are being performed under contract and considered a construction project. Maintenance plays a key role in ensuring these projects address immediate and future needs and provide designers with information on the condition of the roadway.

Response to incidents and other emergency needs are a major concern to maintenance due to the exposure and necessity of having to work during high traffic hours and adverse conditions.

Traveler Information Assessment

The Iowa DOT has been a national leader in providing traveler information and offers many services to the public, local government, emergency services, and commercial operators. These services typically include information for construction and maintenance activities. Table 1 identifies the traveler information services managed by the DOT and shows the status of these services in bordering states.

The traveler information service layer identified the need to automate collection and retention of real-time information to maintain historical construction and maintenance information. Collected and archived information is also of value to department management, traffic operations staff, project managers, and evaluation staff working on or near work zones.

A review of other state traveler information systems did not reveal any automated condition reporting for construction and maintenance work zones.

Table 1 : Traveler Information Existing Conditions

	Traveler Information Services										Traveler Information Systems								
State	511 Telephone	511 Website	511 Mobile App	Social Media			XML Data Feed	DMS	Multi Year Construction Project Webpages	Track-a-plow Webpage	Roadway Weather Webpage	Press Releases	Road Condition Reporting System (CARS) - 3	ATMS	AVL	RWIS	GIS	Cameras	Video /Images
IA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	4
WI	●	●	●	●	●	●		●	●		●		●	●		●	●	●	4
IL		1		●	●	●		●	●		●	●	●			●		●	4
MO		2	not 511	●	●	●		●			●		●			●		●	4
KS	text only	●	●	●	●			●	●		●		●	●		●		●	4
NE	●	●	●		●	●												●	4
SD	●	●	●	●	●	●		●			●	●	●	●		●		●	4

Notes:

1 - Gettingaroundillinois.com

2 - Traveler.modot.org

3 - CARS or Similar

4 – Still image only

Trends and Forecast for the Future

Per the Iowa DOT Program Plan, "vehicle miles are projected to grow 20% by 2030 and truck freight volumes by 43%." This increased demand on Iowa roadways will also increase the sensitivity of roadway users to delays created by work zones. The TSMO work zone management service layer aims to be a dynamic and agile document that is updated every two to three years to stay relevant with the changing times and technologies that will influence Iowa work zones including:

- Connected Vehicle Technologies
- Automated Vehicle Technologies
- Increased use of ITS technology
- Intelligent Network Flow Optimization (INFLO)
    - Speed Harmonization
    - Queue Warning
    - Cooperative Adaptive Cruise Control
    - Merge Assist

The evaluation of the current conditions, services, and systems that Iowa DOT currently has in place for work zone management allows us to determine what changes and improvements can be made when looking towards the future.

GAP ANALYSIS

A gap analysis to review Iowa's current work zone management practices across six different dimensions was completed using the FHWA Work Zone Management Capability Maturity Framework (CMF) model.

A 2-day workshop hosted by the FHWA and Battelle, was held in Ankeny, Iowa on November 6th and November 7th, 2017. The workshop was attended by 37 participants representing eleven offices including all six Districts, construction and maintenance personnel, the FHWA Division Office, and consultant support. The analysis looked at six dimensions of work zone management within the DOT through a self-assessment quiz (see Appendix E). During the workshop, the results of the self-assessment were reviewed and a current 'level' of capability for each dimension was assigned and discussed. At the end of the workshop, Iowa was provided with actionable steps to advance the lowest scoring dimension up to the next capability level. An overview of the CMF process and scoring is shown in Figure 2, below.

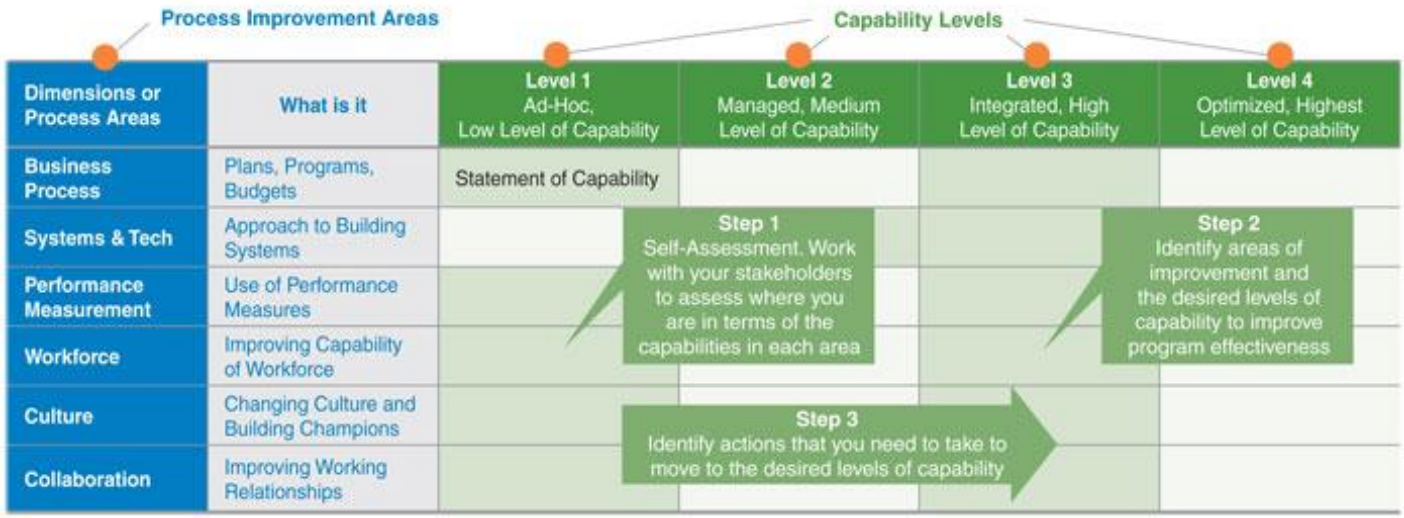


Figure 2 : FHWA CMF Framework. Source: FHWA

FHWA CMF Workshop Scoring *(Source FHWA):*

Level 1 (ad hoc): Very little effort made to predict, plan for, and manage expected and actual work zone impacts; what efforts are made occur late in the project development cycle.

Level 2 (recognized): Basic agency policies and procedures exist that require analysis of work zone impacts and developing a plan to manage those impacts beginning during project planning; application across the organization is uneven and not well understood.

Level 3 (mainstreamed): Policies and procedures to predict, plan for, and manage impacts are integrated and diligently applied throughout organization; effectiveness of policies/procedures is unknown.

Level 4 (optimized): Effectiveness of integrated policies and procedures to predict, plan for, and manage work zone impacts are regularly reviewed and critiqued, and improved upon where possible.

Iowa's scores from the CMF workshop are shown in Table 2, below. Also shown in the table are the the FHWA work zone dimensions mapped to the originally-identified Iowa TSMO work zone management service layer dimensions.

Table 2 : Iowa DOT FHWA CMF Dimension Scores

Iowa CMF Score/Level	FHWA Work Zone Dimensions	Iowa TSMO Dimensions
1.0	Performance Measurement	Performance Measurement
1.8	Business Processes	Planning, Concept, & Design
2.0	Systems & Technology	Data
2.0	Organization & Workforce	Best Practices & Standards
2.0	Culture	Other
3.0	Collaboration	*new category

For the remainder of this report and for future revisions; the FHWA dimensions will be used for the work zone management service layer dimensions. The full report from the TSMO work zone management service layer CMF workshop is located in Appendix F.

Gaps, Issues, and Other Changes Needed

Utilizing answers collected from the Department-wide poll, as well as the results of the CMF workshop, the work zone management initiatives in Table 3 were identified by the subcommittee.

The work zone management service layer dimensions are listed in order of lowest score to highest score, with the lowest scoring dimension requiring the most improvement. All dimensions have been assigned initiatives or "strategies intended to improve" dimensions by one scoring level; a goal of the Work Zone Management Subcommittee. Initiatives for each dimension have been mapped to the Iowa TSMO Strategic and Program Goals and Objectives for transparency in the relationship between the master TSMO Plan and this service layer.

Table 3: Mapping Work Zone Initiatives to TSMO Goals

Mapping of Iowa Work Zone Management Initiatives to TSMO Goals								
FHWA Gap Analysis Work Zone Dimensions		Work Zone Management Initiatives	TSMO Strategic Goals and Objectives					
			Reduce crash frequency and severity	Improve transportation system reliability, increase system resiliency, and add highway capacity in critical corridors	Minimize traffic delay and maximize transportation system efficiency to keep traffic moving	Provide ease of access and mobility choices to customers	Engage all DOT disciplines, external agencies, and jurisdictions to proactively manage and operate the transportation system	Incorporate TSMO strategies throughout DOT's transportation planning, design, construction, maintenance, and operations activities
			Safety	Reliability	Efficiency	Convenience	Coordination	Integration
A. Performance Measures	1	Set performance measure goals for ongoing mobility and safety evaluations and improvements of work zones.	•	•	•			
	2	Establish standards for evaluating traffic management practices during and after a project.	•	•	•	•	•	•
	3	Create a work zone crash information database.	•					
	4	Create a feedback loop for post project construction evaluations and feedback to design.			•		•	•
B. Business Process	1	Update concept procedures and complete safety and mobility analysis in the concept stage of projects.			•			•
	2	Develop best practices for review of traffic staging by field and/or district staff during plan development.	•		•		•	•
	3	Update the design manual to include best practices for traffic staging, coordination with maintenance and utilities.Update the processes, procedures, and manuals to assist with projects utilizing outside help.		•			•	•
C. Systems & Technology	1	Update Iowa's data suite and develop a program for quality, accessibility, and training for all data and available data tools, including plans, and project files.	•		•	•		•
	2	Update work zone record keeping including access to and quality of work zone mobility data (volume, speed, classification).		•		•	•	
	3	Standardize data management including access to and quality of work zone mobility data (volume, speed, classification).	•	•	•		•	•
D. Organization & Workforce	1	Develop criteria/SOP for determining when and how to use standard temporary traffic control and staging in the design phase (and when not to).	•		•	•		
	2	Document & publicize innovations in work zones that improve safety, mobility, and/or work zone operations.		•			•	
	3	Incorporate innovation in work zones to improve safety, mobility, and/or work zone operations.	•	•	•	•	•	•
E. Culture	1	Establish quality standards for the quality/durability of work and maintenance repairs performed.			•		•	
	2	Review and update fund allocation to determine what is more important: delay or economic impact of a project.					•	•
	3	Develop a SOP for coordination between department and local area to assist with timeliness of the work to be both done on-time & in conjunction with other agencies.			•		•	•
F. Collaboration	1	Update/expand formal and ongoing training opportunities available.			•		•	•
	2	Periodically review processes for considering WZM needs for law enforcement, funding levels, and implementation procedures. Revise, as needed, any mutual agreements or memorandums of understanding between law enforcement and the agency for WZM purposes.		•	•		•	•
	3	Establish processes (liaisons, etc.) for upper agency management to garner TMP development support from other stakeholders.			•		•	•

ACTION RECOMMENDATIONS

The following action recommendations are being proposed to achieve the Work Zone Management Service Layer's (WZMSL) objectives outlined in the previous sections. Action recommendations are presented in order of priority.

1. Iowa Work Zone Data Hub

   Iowa has incredible amounts of data used for work zone applications, but it is located in many different places and in different formats. The proposed Iowa Data Hub will be a collection of data from multiple sources organized for distribution, sharing, and sub-setting.

   The Iowa Data Hub recommendation would create a one-stop-shop with research-grade data which could be used by Department staff and others for meaningful, and useful applications such as future project planning. Beyond collecting data, Iowa DOT wants to turn data into useful information.

   Action: Assemble all of Iowa's data feeds and historical data into one location with both auto tools and the option to pull raw data. The research-grade data hub will include, but is not limited to: work zone data, crash data, LCPT, hourly volumes, AADT, annual cultural events, weather history, etc.

   Lead: Office of Traffic and Safety

   Support: Office of Traffic Operations, IT, TMC, GIS

   Duration: 5 years

   Work in Progress: March 2018 InTrans began work on a Concept of Operations for creating an Iowa Data Hub. Report due December 2019.

2. Research/Evaluation/Study - Determine Standard Delay in TCP Work Zones

   Iowa's lowest scoring dimension during the CMF workshop was Performance Measures. This action item will work to determine the delay in TCP work zones to provide a baseline of the current state of traffic delays in Iowa work zones and will not focus on goal setting at this time. Goal setting and targets will occur as a follow-up action after this initial evaluation. Initial steps in this evaluation may include starting with data available in Iowa DOT's annual mobility report.

   Action: Utilizing work zone data from the past three years of the TCP program, this study will determine the current work zone delay on TCP's in Iowa looking at both urban and rural locations. This process will track and report for work zone delay of projects across the state.

This process will be updated every three years to review and refine the urban and rural benchmark delays and queue lengths.

Lead: Office of Traffic Operations

Maintenance: Revised every three years

Duration: 6 months

3. Information Sharing Initiative Workshop

This recommendation proposes the initiation of an annual two-day workshop with one day of technical presentations and one day discussion bringing together field and design personnel from across the state to collaborate, share, and begin working towards closing the feedback loop between field staff and project designers.

Action: This workshop will be held at Iowa DOT's central office during the winter months and will promote innovation and collaboration while providing learning experiences through review of 1 or 2 items/initiatives/examples from each district.
The items/initiatives/examples can be chosen for: innovative practices, lessons learned (the good, the bad, the ugly), maintenance, etc.
District engineers, field personnel, and designers should be in attendance. A facilitator for this workshop will be brought in to assist with the presentations, facilitate discussion, and record/host the presentations as a webinar so they can be viewed by others that are unable to attend.

Lead: Office of Construction and Materials

Support: Offices of Traffic and Safety, Traffic Operations, Office of Design, and Maintenance

Duration: Annually

4. Work Zone Library

Most Iowa DOT departments/functional areas currently have splash pages where all their informational items are stored or linked that are updated annually. Examples include Specification Committee, Office of Design, Office of Construction and Materials, etc. This action item will create a similar page for all items related to work zones. It would be similar to the format for the specification page but would be work zone specific and could be linked to Electronic Reference Library (ERL).

Action: Create an Iowa DOT work zone information splash page on the Iowa DOT website to serve as a work zone document retention and revision information page. This site will house work zone standards and supporting documents using the specifications page as a model. This page will be reviewed, and content updated twice a year.

Work zone splash page could include:

i. TTC standards
ii. Specifications book
iii. Link to website of crash data
iv. Link to LCPT
v. Work zone safety committee meeting minutes
vi. TSMO WZMSL Subcommittee Meeting Minutes
vii. List of all work zone group/committee members
viii. Iowa TCP/IWZ Information

Lead: Office of Construction and Materials

Support: Office of Strategic Communication and Policy

Maintenance: Ongoing

Duration: Ongoing, updated twice per year.

5. Review of Current Plan Development Process and Collaboration Tools

This program action item will assist in creating a process for communication and collaboration between design and field staff by updating the process from an ad-hoc process to a more formal review using available technology to streamline the process. This may include:

i. Creating a formal process to communicate work zone field changes to central design
ii. Increase feedback between design/safety/field staff and Motor Vehicle Enforcement (MVE)
iii. Establish a means for design/safety/field staff to access crash reports
iv. Determine a means to systematically collect work zone issues and changes
v. Examine alternatives for creating a statewide repository of work zone changes
vi. Examine alternatives to establish a statewide Design Review Team and/or Safety Review Team
vii. Develop training sessions or presentations on new or changed standards and processes

Lead: Office of Construction and Materials

Support: Office of Design, Office of Bridges and Structures, Office of Traffic and Safety

Duration: 5 years - ongoing

6. Transition from Managed TCP to In-house TCP

This action item is currently in progress. The TCP program deals directly with Iowa work zones so having the TCP program housed under the TSMO WMZSL umbrella is appropriate. This action recommendation is a continuation of the TCP program as it transitions to an internal process for the DOT as 'a way of doing business' for Iowa work zones.

Action: Update the concept procedures and design manual with TCP initiatives that have been developed. Incorporate IWZ layouts into the design manual and begin incorporating them into projects' traffic control plans. Move the TCP group towards a support role of training, plan review, and system monitoring and assisting the DOT transitioning into an in-house TCP program.

Lead: Office of Traffic Operations

Support: Office of Traffic and Safety, Office of Design, Office of Construction and Materials, Office of Bridges and Structures.

Duration: 3 years

The six action recommendations are mapped to the work zone initiatives in Table 4.

Table 4: Mapping Work Zone Initiatives to Action Recommendations

Mapping of Iowa Work Zone Management Initiatives to Action Recommendations									
FHWA Gap Analysis Work Zone Dimensions		Work Zone Management Initiatives	TSMO Work Zone Management Action Recommendations: Iowa Work Zone Data Hub	Research/Evaluation/Study - Determine Standard Delay in Work Zones	Information Sharing Initiative Workshop	Work Zone Library	Review of Current Plan Development Process	Transition from Managed TCP To In-house TCP
A. Performance Measures	1	Set performance measure goals for ongoing mobility and safety evaluations and improvements of work zones.		•				
	2	Establish standards for evaluating traffic management practices during and after a project.	•	•	•		•	
	3	Create a work zone crash information database.	•		•	•		
	4	Create a feedback loop for post project construction evaluations and feedback to design.			•		•	
B. Business Process	1	Update concept procedures and complete safety and mobility analysis in the concept stage of projects.					•	•
	2	Develop best practices for review of traffic staging by field and/or district staff during plan development.			•		•	
	3	Update the design manual to include best practices for traffic staging, coordination with maintenance and utilities.Update the processes, procedures, and manuals to assist with projects utilizing outside help.			•	•	•	•
C. Systems & Technology	1	Update Iowa's data suite and develop a program for quality, accessibility, and training for all data and available data tools, including plans, and project files.	•					
	2	Update work zone record keeping including access to and quality of work zone mobility data (volume, speed, classification).	•					
	3	Standardize data management including access to and quality of work zone mobility data (volume, speed, classification).	•					
D. Organization & Workforce	1	Develop criteria/SOP for determining when and how to use standard temporary traffic control and staging in the design phase (and when not to).				•	•	•
	2	Document & publicize innovations in work zones that improve safety, mobility, and/or work zone operations.			•	•		
	3	Incorporate innovation in work zones to improve safety, mobility, and/or work zone operations.	•		•	•		•
E. Culture	1	Establish quality standards for the quality/durability of work and maintenance repairs performed.			•		•	
	2	Review and update fund allocation to determine what is more important: delay or economic impact of a project.	•	•	•	•	•	•
	3	Develop a SOP for coordination between department and local area to assist with timeliness of the work to be both done on-time & in conjunction with other agencies.			•			
F. Collaboration	1	Update/expand formal and ongoing training opportunities available.	•		•	•	•	•
	2	Periodically review processes for considering WZM needs for law enforcement, funding levels, and implementation procedures. Revise, as needed, any mutual agreements or memorandums of understanding between law enforcement and the agency for WZM purposes.			•	•		•
	3	Establish processes (liaisons, etc.) for upper agency management to garner TMP development support from other stakeholders.			•	•		•

PERFORMANCE MANAGEMENT

Once the work zone management service layer plan is completed and approved, the TSMO Work Zone Management Subcommittee will be charged with plan implementation. Cross-discipline coordination and cooperation is needed to ensure success for each of the initiatives and actions included in this plan. It is the goal of this plan to improve all six work zone dimension gaps identified during the Capacity Maturity Framework workshop.

The TSMO Work Zone Management Subcommittee will provide coordination to the various groups to encourage and assist with establishing performance measures for each dimension and action item as shown in Table 5. This subcommittee will also provide insight and recommendations for the development of future TSMO work zone management service layer updates and activities.

Table 5: Performance Management Objective Evaluation

Action	Steps to Complete the Action	Priority (H,M,L)	Status/ Timing	Measure of Success	Responsible Iowa DOT Office
Systems & Technology					
Iowa Data Hub		H			Traffic & Safety
Performance Measures					
Determine Standard Delay in Work Zones		H			Traffic Operations
Culture					
Information Sharing Initiative Workshop		M			Construction and Materials
Collaboration					
Work Zone Library		M			Construction and Materials
Business Process					
Review of Current Plan Development Process		M			Construction and Materials
Organization & Workforce					
Managed TCP To In-house TCP		L			Office of Traffic Operations

The work zone management subcommittee will meet monthly to monitor and guide implementation of the six action items from the service layer plan.

Every three years the TSMO work zone management service layer will be reviewed and updated using additional CMF workshops to see how the DOT is performing/improving.

FIVE-YEAR SERVICE LAYER COST ESTIMATE

The Iowa DOT spent an estimated $680 million dollars on over 500 road and bridge projects during 2017. The 2018-2022 Iowa Transportation Improvement Program Report allocates approximately $3.5 billion for roadway construction with a focus on safety, maintenance, and modernization. Consistent and vigilant management of these roadway projects are an integral part of the Department. Consistent funding for work zone management is recommended for continued support, training, and innovation.

An annualized cost estimate ranging from $1M to $400K over a five year period was prepared and provided to the DOT as a reflection of the initiatives proposed by the WZMSL subcommittee and supporting DOT staff. The costs prepared assume that the work will be performed by outside sources such as consultants and managed by the named office. The estimate does not include Iowa DOT staff resources and are additional costs needed to achieve the work zone management objectives by completing each action recommendation. The estimates are based on previous experience and will be refined as the Work Zone Management Subcommittee begins to implement these recommendations.

Once funding is approved the Work Zone Management Subcommittee will provide oversight and coordination with the lead offices for each of the work zone management action recommendations.

APPENDIX A

Name:

Position:

Department/Office:

Current Work Flow Process:

1. Design
    a. How is a project initiated for your functional group? How are projects determined? (How is work generated?)
    b. How is the project/work design developed? (in house plans, standard details, other?)
    c. If applicable, does post-construction feedback from previous projects influence the design of new projects?

2. Project Scheduling
    a. How are projects scheduled (or prioritized) for your functional group?
    b. What are your department's typical working hours for crews on the road?
    c. What currently determines date or time restrictions?
    d. What resources do you use to determine which restrictions to utilize?

3. Project coordination
    a. What methods are used to avoid conflicting/adjoining work areas/projects?
    b. Are closures coordinated with other departments when work is to be performed in overlapping or adjoining areas to optimize the closure?
    c. How does this coordination take place? If no coordination takes place - why not?

4. Outreach to public
    a. How do you communicate project activities to the public?
    b. What determines the level of public communication for a project?

5. Training
    a. What training is currently provided within or for your department?
    b. How often does training take place?

6. Current Focus
    a. What "needs work" in your department? (what are the issues/challenges?)
    b. What is your department "currently working on"? (i.e. safety, erosion, etc.)
    c. What does your department want to work on? (ignoring money/time/staffing constraints)

7. Other items:
    Any Additional Input??

APPENDIX B

TSMO Work Zone Management Service Layer

Concept to Delivery

Staffing

- Too much work and not enough time to address.
- Lost 2/3 staff to retirement. Have inexperienced people in these spots.
- We are not competing with the industry with wage and benefits and cannot draw individuals to the agency. Private sector is drawing them in.
- Need surveyors, entry level technicians, or we will be paying the price.
- Losing internal staff and out sourcing work results in losing expertise with retirements resulting in open position.
- Need to have the ability to keep key staff and expertise.
- This may result in a safety issue by being short-handed or rushed.
- Work on more projects and less dependency on consultants. Use internal staff.
- Need additional people to complete work. Are not doing the things like we use to. Wish we had better staffing numbers. Don't complete at the work.
- Too much to do too little resources.
- Competing priority with competing resource.
- How do you sort through 100 Emails a day?
- Well-staffed, but getting harder to get the work done. Using co-op and interns to get the work done. Doing more consultant work to make ends meet.
- Need more designers to get more done in the district
- Keep work in house rather than rely on consultants. Don't know internal costs.
- Challenges are to support traffic operations staff, they are too thin to do themselves and Linda relies on their expertise in traffic operations.

Design

- Look at unique methods of staging traffic.
- Develop best practices for design and staging during project development that focus on traffic operations, not just infrastructure development/ maintenance. Link operational performance measures to design and staging.
- DOT should consider ways to involve contractors in project development process and use this more frequently.
- Begin safety and mobility analysis during the concept stage.
- Re-write the concept policy – develop a manual on how to write a concept. Or Re-do this process completely.
- Need to improve process review. CMF workshop may offer a great opportunity to start this improvement effort.
- Need to make sure to get input from the field.
- Could do better in communicating with each other.
- Coordination of feedback from construction and maintenance back to designers.
- Encourage designers to go to pre-con, visit project personnel, contractors and have post construction meetings.

Construction

- Culture change is a changing of the mindset – safety is more important than a batch ticket these days: traveler safety, erosion control, the needs have changed in the last 15 years.

Utility

- How can utility coordination and utility projects be coordinated or managed to follow standard DOT procedures?
- Lost time, work on permits that are never taken since applicant does not pay until the permit is issued.

Maintenance Typical/Emergency

- How can maintenance coordination and maintenance projects be coordinated or managed to follow standard DOT procedures?
- Changing on how plans are available, electronic plans and training is not the best on how to use this.
- Make sure proper communication is being done so issues get addressed and including in project schedule and restrictions.
- Would be good to get higher quality submittals to avoid delay and rework which sometimes results in political pressure to complete the permit (helps to keep people informed).
- Look at better preventive maintenance and not be too reactive. Maintain what you have.
- ABC (accelerated bridge construction) projects are needed in many places but constrained to resource (people and money).
- Because of traffic we don't always do the best repairs and must come back more frequently.
- Balance serviceability to public inconvenience.
- Add traffic people staffed in the bridge office.

Local

- How can local coordination and local projects be coordinated or managed to follow standard DOT procedures?
- Better coordination of work – meet with county and cities to understand their needs.

Performance Measures

Mobility

- What is unacceptable on Iowa roadways?
- Work zones, by definition are going to take a lane, etc. where do we need to restrict stuff?
- How much delay is too much? What is our threshold, tolerance, risk for delay? Rural vs urban.
- What hours are unacceptable for working on what roadway and make these standard rules. (Jesse's example of three different projects with all different work hours).
- On what system are we going to hold the contractor to a tight schedule and what systems can we live with having a bit of delay?
- What is the right balance between safety and system preservation? Pavement management and preservation bridge and safety and mobility.

Safety

- Post project construction evaluation - effectiveness of the TMPs is evaluated at the completion of the project.
- Work near signalized/ unsignalized intersections; when specific travel lanes must be closed, how driveways affect traffic control setup, accommodating pedestrians, etc.
- Traffic management/safety during winter construction and severe weather winter operations.
- Safety performance functions and crash modification factors for work zones.
- Connected vehicle/ automated vehicle enabling technologies in work zones.
- Bicycles and work zone safety.
- Quantify the soft costs of work zone impacts.

Data Collection & Use

Crash

- Better documentation of work zone crashes – state patrol checks this on the crash form.
- EIN crash information being sent over and they are not technically in the work zone.
- More consistent training on when Law Enforcement should classify as a work zone and when not to; Chief Lorenz is open to work zone training for his officers.
- Investigate work zone crashes – internal investigation, after action, what is going wrong out there? What 5 things when wrong?
- Looking at crash data, trying to analyze every way they can, came up with 2 summaries: 52% of all work zone crashes deal with lane closures. 47% or wz crashes are rear end crashes. Need to look at if these are 2 lane or 4 lane, still more focus needed here

Communications

- 511 needs to be more real time instead of three week updates.
- Traveler information / 511 must be accurate and timely.
- Editing 511 information is time consuming and not a priority for field staff.
- The information entering system needs updating so project limits are better defined.
- Consistent uniform SOP for field personnel, TMC staff and other traffic ops personnel is needed for the 511 system.
- Data needs to be basic and streamlined and be easy to use.
- Important to know what lanes are closed within 5 minute up to date with GPS start and end points and a historic record of these closures.
- Communicating better with the people we are impacting and giving them more access to help affect decisions.
- Improved communications inside and outside the agency.

Data

- Research grade – work zone database. What does this mean? All 50 states university would like to use Iowa's data because their information is so complete and accurate. The pinnacle of research grade data.
- Process of incorporating temp traffic sensors into the DOT data system. After collection is done, how do we expand this and enter this into the LCPT.
- Work zone activity data recordkeeping & applications - what should be included on the construction side (e.g., daily work reports), on the traffic side (e.g., volumes before/during construction), etc.
- (Bandages to help with being on leading edge.) Gather more data and use it to give answers. Use equipment to gather this data and go to data managers to help give us useable information. Measure, analyze, act. Data driven decisions.
- More access to data so you can see what is going on around the bridge without having to rely on the district input.
- Automation of construction side needs to be developed for items such as payment and certifications.
- GIS data for projects in the district and region that includes local governments and others. To aid in planning.
- Electronic files for retention of files.

Consistency, Uniformity, & Innovation

Training

- Need SOPs to support policy
- The risk group "Roadway Industry Safety Committee" asphalt, PCC, guys, AGC, traffic control (ATTSA) – industry and Mark and Willy.
- Not much training on how to use the data portal.
- Need to understand systems engineering requirement interpretation and they are really needed.

Standards/ Best Practices

- Speed limits in work zones. What should they be and why?
- Certain level of service on the entire system.
- TBR vs no TBR for TLTW operations, a litmus test - when to use, when to not use? This is on the agenda for Iowa State to review this. We need a policy on this. One district is doing TBR down the middle- we need to have a process
- Need to have better processes and procedures and manuals to hire outside help. And related training.
- More needs than resources and how to make the priority decision?
- Consistency is needed each district has their own idea of how they want things.
- Do not have a written document as to why they are doing specific things. Important to have documentation on TBR down the middle other do not, why? Consistency in application.
- Need guidelines to improve consistency. What is clear zone in work zones? The same everywhere? Close the ramp or not close the ramp, should be based on facts.
- Very rural network – how do you balance lower volume system?
- How do you get TSMO into lower volume work 80% of projects are not impacted by TSMO. What should we look at with count down timers, queue detectors, & portable rumble strips on lower volume roads?
- Management system – depends on informal practices to manage the system which causes high and low success. System should cover this. Could identify needs and action. Need flexibility in more formal system.

Innovation

- Need to encourage and document innovations like using speed feedback trailers, lane rental, and other innovative contract methods, etc.
- Count-down clocks for temp signals and flagger ops.
- Lane closure app – lane closure permitting app (non-emergency lane closure permitting system) contractor on the side of the road can use the app to "close" the road. Maintenance can also use for prior approval
- Smart arrow boards - and how to understand where are work zones are
- Crossflow Lanes (Cedar Rapids, 2017)
- Speed trailer guidelines
- Portable rumble strips implementation. Standard item on all projects with pilot car operations. TC-214 in October.
- Lane rental specs and usage. The spec is different now than it was; due to the length restrictions.
- More virtual design. take this to the public to show.
- Moving to electronic plans with intelligence.

APPENDIX C

TSMO Work Zone Opportunity Survey

The Office of Construction and Materials is in the process of working on the Transportation System Management and Operations (TSMO) Work Zone Management Service Layer. To help determine what opportunities and areas for improvement exist in our current work zone management practices, please rank the items in the following categories in order of importance (most important to least important).

Functional Area:

Planning, Concept, & Design

Before a project hits the road, it is planned within the DOT. Please rank the following items in the order of importance (most important to least important) regarding planning, concept, and design:

- Complete safety and mobility analyses in the concept stage of a project.
- Involve contracting industry in the project development process for complicated projects.
- Actively consider work zone safety and mobility during the design phase.
- Balance maintenance needs with consideration of safety and mobility during field maintenance activity planning.
- Review of Traffic staging by field and/or district staff during plan development.
- Standardize the coordination of feedback from construction and maintenance back to design.
- Improve the quality of plans before review.
- Provide a feedback loop on design from construction.
- Higher quality submittals to avoid delay and rework.
- Minimize reactive maintenance through consideration of better preventive maintenance.
- Work Zone safety for Bicycles/pedestrians/motorcycles/other modes of transportation

Data

Having good information on a project can aid in planning, innovation, and safety. Please rank the following items in the in order of importance (most important to least important) regarding data and data tools:

- Access to, and quality of, work zone mobility data (volume, speed, classification).
- Access to, and quality of, work zone safety data (crash, worker incidents, location, etc.).
- Access to timely interpretation of the data for consumption and use.
- Measuring increase in delay through a work zone.
- Automation of work zone activity recordkeeping (location of work zone, direction of travel, daily work reports, traffic volumes before/during/after work).
- Retention and accessibility of historical work zone data.
- Improving the utility of the Lane Closure Planning Tool (LCPT).
- Managing and communicating lane closure permits and work zone activities via an online application.
- Develop a program for quality, accessibility, and training for data and available data tools, plans and project files.
- Quantifying the soft costs associated with work zone impacts.

Performance

Measuring how well a system performs can only be accomplished when clear definitions are established. Please rank the following items in the in order of importance (most important to least important) regarding performance:

- Identifying clearly defined delay goals.
- Identifying project-specific delay goals.
- Ongoing mobility and safety evaluations and improvements of work zones.
- Post project construction evaluations and feedback to design.
- Evaluating traffic management practices during and after the project.
- Monitoring Connected/Automated vehicle technologies for consideration in the work zone.
- Identifying a system-wide (state-wide) level-of-service.

Best Practices & Standards

Documenting the procedures currently in place allows for review of what works well and where opportunities exist. Please rank the following items in the in order of importance (most important to least important) regarding best practices and standards:

- Develop criteria for determining when and how to use standard temporary traffic control and staging in the design phase.
- Traffic management policies/procedures during severe weather or severe weather/winter operations.
- Identify/Implement standard operating procedures to support department policies.
- Create a process for speed limits in work zones.
- Create a process for the use and implementation of using TBR for TLTW operations.
- Incorporate innovation in work zones to improve safety, mobility, or work zone operations.
- Create a process for specifications for lane rental or other innovative contracting mechanisms.
- Create a process for methods for communicating work zone information/project activities to the public.

Other

All the items below are important to the DOT; but **in your role,** with regard to work zones, what order of importance (most important to least important) are the below items ranked:

- Safety of the traveler
- Safety of the worker
- Delay (economic impact) of the Project
- Quality/Durability of the work performed
- Environmental impacts of the project (erosion control, etc.)
- Timeliness of the work (done on time)
- Budget of the project (done on/under budget)
- Utilizing innovations in the project
- Record management of the work zone (tickets, dailies, etc.)

APPENDIX D

Work Zone Groups and Membership
DRAFT March 15, 2018

Office or District	Position	Name	Work Zone Traffic Safety Committee	Work Zone Process Review Team	TCP Working Group	IWZ Team	TCP Mitigation Committee	TSMO WZMSL Subcommittee	Specification Committee	Major Projects Group	Roadway Industry Safety Committee (RISC)	Work Zone Training Group
Project Delivery Bureau	Bureau Director	Charlie Purcell							X			
Systems Operations Bureau	Bureau Director	Scott Marler										
Bridges and Structures	Assistant Office Director	Gary Novey							X			
Construction and Materials	Office Director	Wes Musgrove						X	X			
	Traffic Safety Engineer	Mark Bortle	X	X	X		X	X			X	X
		Rhonda Pecenka								X		
Contracts and Specifications	Office Director	Mark Dunn							X			
	Specifications Engineer	Tom Reis	X						X			
	Assistant Specifications Engineer	Eric Johnsen							X			
Design	Acting Design Methods Engineer	Daniel Harness	X									
	Design Field Exam Engineer	Kevin Patel					X	X				
Local Systems	Field Review Technician	Brenda Boell	X									
	Office Director	Donna Buchwald							X			
Maintenance	Office Director	Bob Younie						X				
	Assistant Office Director	Ken Morrow	X									X
Traffic and Safety	Office Director	Steve Gent						X				
	Traffic and Safety Engineer	Willy Sorenson		X	X		X	X	X		X	
	Work Zone Traffic Control Engineer	Dan Sprengeler	X	X	X		X	X			X	X
	Traffic Engineer	Tim Crouch	X									
Traffic Operations	Acting Office Director	Donna Matulac			X			X				
	ITS Engineer	Tim Simodynes			X	X	X	X			X	
	Traffic Incidents and Emergency Management	Jared Smith			X	X						
	Traffic Incidents and Emergency Management	Ted Shipley				X						
	Traffic Management Center	Bonnie Castillo				X						
	Traffic Incidents and Emergency Management	Brian Pribyl				X						
Strategic Comm. and Policy	Office Director	Andrea Henry								X		
	Project Manager	Cherice Ogg								X		
District 1	District Construction Engineer	Jesse Tibodeau	X		X		X	X		X		
	Field Services Coordinator	Andy Loonan								X		
District 2	Highway Maintenance Supervisor	Pete Andera						X				
	District Construction Engineer	Dave Roeber								X		
	Field Services Coordinator	Pete Hjelmstad								X		
District 3	District Construction Engineer	Darwin Bishop							X	X		
	Field Services Coordinator	Dakin Schultz								X		
District 4	District Construction Engineer	Dan Redmond								X		
	Field Services Coordinator	Scott Suhr								X		
District 5	District Construction Engineer	Jim Webb						X		X		
	Field Services Coordinator	Hector Torres-Cacho								X		
District 6	Resident Construction Engineer	Mark Brandl							X			
	District Construction Engineer	Doug McDonald								X		
	Field Services Coordinator	Catherine Cutler								X		
FHWA Division Office	Safety and Traffic Ops Engineer	Paul LaFleur	X	X	X							X
	Program Analyst/Ops Specialist	John Gibson			X							
	Program Delivery Team Leader	Andy Wilson			X							
Iowa State University	Associate Director, InTrans	Neal Hawkins			X			X			X	
	Research Engineer	Skylar Knickerbocker			X	X						
	GIS Coordinator	Daniel Betts				X						
	LTAP	David Veneziano										X
	LTAP	Paul Albritton										X
Iowa Chapter of ATSSA	Iowa Chapter President, ATSSA Vice President, Iowa Plains Signing	Jeff Koudelka	X								X	
Kapsch		Mary Bundridge				X						
Digital Traffic Services		Shane Gilligan				X						
TransCore		Brian Thyssen				X						
Street Smart Rental	Iowa IWZ Project Manager	Jeff Miller				X						
Asphalt Pavement Association of Iowa											X	
Associated General Contractors of Iowa											X	
Iowa Concrete Pavement Association											X	
Jasper County Engineer's Office		Pam Olson										X
City of West Des Moines		Wayne Barrett										X
Iowa Association of Municipal Utilities		Steve McLaughlin										X
Iowa Association of Electric Cooperatives		Jim Wolfe										X
SRF Consulting	Engineer	Cortney Falero			X	X		X				
	Engineer	Zach Hanson			X	X		X				
	Senior Associate	Jon Jackels			X		X	X				

APPENDIX E

Iowa DOT Work Zone Capability Maturity Framework: Assessment Worksheet

Name:_____ Agency Division:_____

Business Processes	
1. How does the determination of project "significance" affect project development decisions?	
L1	Project significance not considered in most key analyses and decisions throughout the project development process.
L2	Project significance is considered in most key analyses and decisions throughout project development, but for only "big" projects.
L3	Project significance considerations in all key project development analyses and decisions are institutionalized throughout the agency.
L4	Project significance considerations in key analyses and decisions are regularly evaluated and refined as needed to improve their effectiveness.
	N/A
Notes:	
2. How well does your agency estimate and use road user costs (RUC) in making WZM decisions?	
L1	Work zone RUCs are generally not estimated or used to make WZM decisions for significant projects
L2	Efforts to estimate and use realistic RUCs to help make improved WZM decisions occur for most "big" projects.
L3	Efforts to estimate and use realistic RUCs to help make improved WZM decisions for significant projects is institutionalized throughout the agency.
L4	Procedures for computing and using road user costs in WZM decisions are regularly evaluated and improved as needed.
	N/A
Notes:	
3. How does your agency utilize innovating contracting to help achieve WZM goals and objectives?	
L1	Agency does not utilize innovative contracting techniques such as A+B bidding, incentive/disincentive clauses, design-build, etc., specifically to achieve WZM objectives.
L2	Potential innovative contracting alternatives are examined and implemented for WZM purposes on "big" projects only.
L3	Processes to examine and implement innovative contracting alternatives for WZM purposes are institutionalized throughout the agency.

L4	Processes to examine and implement innovative contracting alternatives for WZM purposes are regularly evaluated and updated/improved as needed.
	N/A
Notes:	
4. How well does your agency develop, implement, and evaluate transportation management plans (TMPs)?	
L1	TMPs are typically prepared superficially, providing only limited direction on how WZM needs will be met.
L2	Effective and useful TMPs are typically developed and implemented for "big" projects.
L3	Effective TMP development for all appropriate projects is incorporated into business processes throughout the agency.
L4	Effectiveness of implemented TMPs implemented are regularly evaluated and improvements made as needed to TMP development procedures. TMP outcomes are considered in performance assessments of upper management.
	N/A
Notes:	
5. How does your agency coordinate between multiple projects in a corridor to achieve overall WZM objectives?	
L1	Projects are developed, let, and performed independently; little or no effort is made to coordinate them from a WZM perspective.
L2	Agency projects are generally coordinated internally from a WZM perspective.
L3	Project coordination efforts within the agency and between agencies for WZM purposes are incorporated into agency business processes.
L4	Effectiveness of project coordination processes within and across agencies from a WZM perspective is evaluated on a regular basis, and improvements to those processes made as needed.
	N/A
Notes:	

Systems and Technology	
1. How well does your agency assess and adopt new technology, procedures, and strategies to help meet WZM needs?	
L1	WZM is typically limited to tried and true technologies and applications with little thought about potential use of recent WZM innovations.
L2	Consideration and use of innovative technologies and strategies for improving WZM on projects occurs unevenly across the agency.
L3	Processes to ensure consideration and use of innovative technologies and strategies for improving WZM on projects is institutionalized throughout the agency.
L4	Processes to ensure consideration and use innovative technologies and strategies for improving WZM on projects are continually evaluated and updated to improve their effectiveness.
	N/A
Notes:	
2. How does your agency apply existing technology already in place to address WZM needs?	
L1	Efforts to utilize existing technology and systems to address WZM needs on projects does not typically occur.
L2	Efforts to utilize technology already in place for WZM needs sometimes occurs, but application is uneven across the agency.
L3	Use of existing technologies and systems resources to address WZM needs is institutionalized throughout the agency.
L4	Processes to ensure proper use of existing technologies and system resources to address WZM needs are continually evaluated and updated throughout the agency.
	N/A
Notes:	

Performance Measurement	
1. How does your agency quantify WZM performance?	
L1	WZM performance measures are primarily output based or are non-existent.
L2	Some project-level and regional (program)-level outcome-based WZM performance measures have been established. Data to evaluate these measures are sometimes collected for "big" projects.
L3	Both project- and program-level WZM measures that focus on corridor and network-level outcomes exist. Data are collected and evaluated routinely across projects. Measures feed into assessments of regional operations objectives.
L4	WZM performance measurement of project-, program-, and system-wide outcomes are reviewed on an on-going basis for relevance to regional objectives and improved as needed.
	N/A
Notes:	
2. How are WZM performance measures used by your agency?	
L1	WZM performance measures, when collected, are only used to document efforts and justify costs.
L2	WZM measures are assessed during and after some projects to determine whether strategies typically used need to be revised.
L3	WZM measures from multiple projects across the state or region are systematically evaluated to improve policies and procedures.
L4	WZM measures are incorporated into the strategic planning decisions for the region or agency by upper management.
	N/A
Notes:	

Organization and Workforce	
1. What types of WZM knowledge and skills exist within the agency?	
L1	Desired knowledge and skills for WZM decision-making throughout the agency are not formally defined or are limited to temporary traffic control (TTC) requirements and regulations.
L2	Knowledge and skills needed to develop, implement, and evaluate more advanced WZM initiatives are defined in some parts of the agency, but not all.
L3	Advanced WZM knowledge and skills needed throughout the agency are defined and applied systematically.
L4	Advanced WZM knowledge and skills needed across the agency are regularly reviewed and updated as improvements in WZM evolve over time.
	N/A
Notes:	
2. How are WZM knowledge, skills, and abilities developed amongst staff within the agency?	
L1	WZM training occurs on an ad-hoc basis (individual initiated, primarily TTC focused).
L2	WZM training to develop appropriate WZM knowledge/skills/abilities is systematic in some, but not all, divisions or districts in the agency.
L3	Available WZM training is comprehensive, applied strategically throughout the agency, and may include some agency partners.
L4	WZM training is regularly evaluated throughout the agency and improved as needed to keep pace with advancements in WZM.
	N/A
Notes:	
3. How is institutionalized WZM knowledge in various part of the agency captured and shared?	
L1	Institutional WZM knowledge retention is ad-hoc or non-existent.
L2	Processes for capturing institutional MZM knowledge are established amongst some divisions/offices and shared within, but sharing across divisions and districts in the agency is uneven.
L3	Institutional WZM knowledge is systematically and strategically captured throughout the agency, and shared agency-wide to improve overall WZM effectiveness.
L4	Processes for capturing and sharing institutional WZM knowledge throughout the agency are evaluated and refined on a regular basis.
	N/A
Notes:	

Culture	
1. How is WZM valued within the agency?	
L1	Perceived value of WZM efforts is uneven across agency, and varies by division/district project development and delivery responsibilities.
L2	Processes that improve staff understanding of WZM value and importance exist across some project development and delivery responsibilities, but application across agency is uneven.
L3	Processes that improve staff understanding of WZM value and importance are institutionalized across project development and delivery responsibilities of the agency.
L4	Processes that improve staff understanding and acceptance of WZM value and importance are evaluated regularly, systematically refined, and monitored by upper agency management.
	N/A
Notes:	
2. How is WZM innovation encouraged within the agency?	
L1	Little or no encouragement to innovate to solve WZM challenges occurs within the agency.
L2	Some processes have been developed to encourage core WZM staff and design consultant innovation for managing work zone impacts, but its application is uneven across the agency.
L3	Encouragement to innovate to address WZM challenges is institutionalized throughout the agency.
L4	Efforts to encourage innovation to address WZM challenges are regularly reviewed, and improvements to further encourage innovation are made as needed.
	N/A
Notes:	
3. What type of agency WZM outreach and reporting exists?	
L1	Project-level WZM efforts and benefits/successes are generally not documented nor shared throughout the agency or externally.
L2	WZM efforts and benefits/successes on "big" projects are typically documented and shared internally and externally.
L3	WZM efforts and benefits/successes at a programmatic or regional level are documented and shared internally and with external partners, decision-makers, etc.
L4	Documentation methods and outreach efforts regarding WZM efforts and benefits/successes are regularly reviewed for relevance and revised as needed.
	N/A
Notes:	

Collaboration	
1. How does the agency utilize law enforcement for WZM needs?	
L1	Law enforcement use for WZM purposes occurs on an ad-hoc basis throughout the agency.
L2	Procedures determining when and how law enforcement is used for WZM are fully developed, but adoption throughout the agency is uneven.
L3	Procedures determining when and how law enforcement is used for WZM are fully integrated throughout the agency.
L4	Procedures determining when and how law enforcement is used for WZM are continuously evaluated, refined, and reported to upper agency and law enforcement agency management.
	N/A
Notes:	
2. How does the agency consider private-sector input (e.g., contractors, affected businesses) when addressing WZM needs?	
L1	Adoption and use of potential contributions or suggestions from private sector relative to WZM are ad hoc.
L2	Procedures for considering and adopting good WZM contributions/ suggestions from private sector have been developed, but adoption throughout the agency is uneven.
L3	Procedures for considering and adopting good WZM contributions/ suggestions from private sector have been developed and fully integrated throughout the agency.
L4	Procedures for considering and adopting good WZM contributions / suggestions from private sector are continuously evaluated, and lessons learned are incorporated into agency TMP development processes.
	N/A
Notes:	
3. How does the agency incorporate other stakeholders (general public, schools, business, EMS, etc.) into the WZM process?	
L1	Inclusion of other stakeholders into WZM decision making occurs on an ad hoc basis.
L2	Formal processes exist for involving stakeholders in the WZM decision making, but adoption throughout the agency is uneven.
L3	Processes for involving stakeholders in WZM decision making are fully integrated throughout the agency.
L4	Integrated processes for involving stakeholders into WZM decision making are continuously evaluated, refined, and monitored by upper agency management.
	N/A
Notes:	

APPENDIX F

U.S. Department of Transportation
Federal Highway Administration

BATTELLE
Texas A&M Transportation Institute

Work Zone Capability Maturity Framework and Process Review Workshops

Iowa Department of Transportation Workshop

November 6-7, 2017
Ankeny, Iowa

I. EXECUTIVE SUMMARY

A Work Zone Capability Maturity Framework (WZ CMF) and Process Review workshop was conducted with the Iowa Department of Transportation (Iowa DOT) in Ankeny, Iowa on November 6 and November 7, 2017. The workshop featured the attendance of 31 Iowa DOT employees from a variety of agency divisions, one Federal Highway Administration (FHWA) representative, and five consultants.

Workshop participants completed the WZ CMF self-assessment to identify the agency's levels of capability in work zone management (WZM). The agency was assessed in their levels of capability in six separate process improvement areas on a scale from 1 (Ad Hoc) to 4 (Institutionalized). Iowa DOT's aggregate levels of capability in each process area are detailed below.

Process Improvement Area	Level of Capability
Business Processes	2
Systems and Technology	2
Performance Measurement	1
Organization and Workforce	2
Culture	2
Collaboration	3

At the completion of the agency-wide self-assessment, participants identified action items to advance Iowa DOT's work zone management capabilities. Once identified, the action items from the CMF assessment were compared to the list of strengths and weaknesses Iowa DOT had identified in their past process review. After further discussion, the list of action items was refined and prioritized. Once a final list of actions was selected, workshop participants discussed how these actions could be incorporated into the agency's next process review and what data and information would need to be collected to do so.

Iowa DOT's final list of action items from the CMF self-assessment for incorporation into future process reviews is below.

ACTION ITEMS:

Performance Measurements	
1	Identify outcome measures relative to mobility, safety, customer satisfaction, and/or work productivity/efficiency that are specified or implied in the agency's work zone safety and mobility manual.
2	Identify available data sources and data collection methods needed to develop measures of interest to the agency.
3	Continue/restart development of lane closure permitting system/app to provide an electronic record of time and location of lane closures.
4	Develop a written policy/guidance on allowable lane closures and volume thresholds that considers project geometry, characteristics, and location.

II. INTRODUCTION

The concept of a capability maturity framework (CMF) emerged from the Strategic Highway Research Program 2 (SHRP2) L01 and L06 projects that promoted a process-driven approach to improve Transportation Systems Management and Operations (TSMO).

Adapted from the software development world, the notion of CMFs rests on the following three tenets:

- Process matters: to address the challenge that projects fail or do not achieve the desired functionality for a variety of reasons unrelated to the technology.
- Prioritizing the right action is important: to address the questions: Is an agency ready, how do they know, and what should they do next?
- Focus on the weakest link: to address the question: What is holding the agency back in becoming a leader in a particular area?

Building on SHRP2 results, the American Association of State Highway and Transportation Officials (AASHTO) continued development of this concept resulting in the publication of a capability maturity concept as part of the TSMO guidance. SHRP2 implementation activities have successfully used the overall framework to work with state DOTs and other transportation agencies (i.e. toll authorities and planning organizations) to develop action plans to improve their TSMO capabilities.

To continue the emphasis on capability maturity and to provide program-level guidance, FHWA developed additional frameworks that focus on improvement actions for specific TSMO program areas including:

- Traffic Management
- Traffic Incident Management
- Road Weather Management
- Planned Special Events
- **Work Zone Management**
- Traffic Signal Management

These frameworks are designed to help agencies and regions to identify their current strengths and weaknesses and to develop a targeted action plan for the process area(s). Specifically, the Work Zone Management (WZM) CMF assesses the agency's or region's capability for effective

work zone traffic management including assessing work zone impacts and implementing strategies for mitigating the impacts. Following a self-assessment process, specific actions are identified to move capabilities towards a more institutionalized stage across the desired improvement areas.

III. FWHA'S WORK ZONE MANAGEMENT CAPABILITY MATURITY FRAMEWORK

The WZM CMF is specifically geared towards improving capabilities related to work zone management needs and objectives. It is best described as a matrix defining process improvement areas and levels of capability from Level 1 (low-level ad-hoc) to Level 4 (high-level optimized). Following a self-assessment process, specific actions are identified to increase capabilities across the desired process areas of relevance to work zone management. Capabilities are described for the following six areas and subdimensions:

1. Business processes
    a. Project significance
    b. Road user cost considerations
    c. Innovative contracting
    d. Transportation Management Plan development
    e. Coordination between projects
2. Systems and technology
    a. Assess and adopt new WZM technology and procedures
    b. Use of existing WZM technology and procedures
3. Performance measurement
    a. Performance measure definition
    b. Performance measure utilization
4. Organization and workforce
    a. Identification of needed knowledge and skills
    b. Staff development of knowledge and skills
    c. Use and application of knowledge and skills
5. Culture
    a. Leadership valuation of WZM
    b. Leadership encouragement of innovation
    c. Outreach
6. Collaboration
    a. Use of law enforcement
    b. Consideration of private-sector input in WZM
    c. Inclusion of stakeholder input in WZM

The purpose of the framework is to build consensus regarding institutional changes at an agency or regional-level. It is not strategy-specific, but rather the framework is specific to process areas that are applicable to work zone management concerns.

IV. WORKSHOP PURPOSE

On November 6 and 7, 2017, the Iowa Department of Transportation (Iowa DOT) hosted a one-and-a-half-day workshop to assess the agency's current WZM capabilities via the WZM CMF, and to utilize the self-assessment results in advancing the agency's current and future process review efforts. The workshop was held from 8:00 AM to 4:00 PM in Ankeny on November 6, and from 8:00 AM to 12:00 PM on November 7. The agenda for the workshop is included as Appendix A. Key WZM professionals were in attendance from numerous Iowa DOT divisions and districts, and FHWA's Iowa Division Office.

Workshop facilitators led participants through the capability maturity framework to assess Iowa DOT's current WZM capabilities, and identified actions to improve Iowa DOT's capabilities. Facilitators also conducted a review of Iowa DOT's past process review efforts and discussed ways the action items identified in the CMF could be incorporated into future process reviews. The result of the workshop was a set of actions for Iowa DOT to further cultivate during their upcoming work zone management and process review improvement efforts.

V. WORKSHOP PARTICIPANT LIST

Name	Office/Agency
Iowa Department of Transportation	
Mark Bortle	Iowa DOT Construction and Materials
Dean Bierwagen	Iowa DOT Bridge
Tom Bruun	Iowa DOT Motor Vehicle
Tim Crouch	Iowa DOT Traffic and Safety
Nicole Fox	Iowa DOT Local Systems
Steve Gent	Iowa DOT Traffic and Safety
Tony Gustafson	Iowa DOT District 1 ADE
Bruce Hucker	Iowa DOT District 5
David Jensen	Iowa DOT Bridge Maintenance
Yanxiao Jia	Iowa DOT Design
Jared Klein	Iowa DOT District 5 Operations
David Little	Iowa DOT District 2 ADE
Wes Mayberry	Iowa DOT District 4 ADE
Wes Musgrove	Iowa DOT Construction and Materials
Linda Narigon	Iowa DOT Project Management
Jim Nelson	Iowa DOT Bridges and Structures
Kent Nicholson	Iowa DOT Design
Gary Novey	Iowa DOT Bridges and Structures
Kevin Patel	Iowa DOT Design
Tom Reis	Iowa DOT Contracts
Brenda Sanders	Iowa DOT District 5
Tim Simodynes	Iowa DOT Traffic Operations
Willy Sorenson	Iowa DOT Traffic and Safety
Dan Sprengeler	Iowa DOT Traffic and Safety
Jesse Tibodeau	Iowa DOT District 1 Construction
Shane Tymkowicz	Iowa DOT District 3 ADE
Mark VanDyke	Iowa DOT District 5 ADE
Jim Webb	Iowa DOT District 5 Construction
Ken Yanna	Iowa DOT District 6 ADE
Bob Younie	Iowa DOT Maintenance
Tim Zeimet	Iowa DOT District 6 Maintenance

Name	Office/Agency
Federal Highway Administration	
Paul LaFleur	Iowa Division Office
Consultants	
Cortney Falero	SRF Consulting
Jon Jackels	SRF Consulting
Hunter McCracken	Battelle
Erik Minge	SRF Consulting
Jerry Ullman	TTI

VI. IOWA DOT'S WORK ZONE MANAGEMENT PROGRAM

Prior to beginning the capability assessment activity, workshop participants provided the following feedback regarding Iowa DOT's work zone management strengths and areas needing improvement.

Work Zone Management – Iowa DOT Strengths

- **Willingness to do things the right way.** There is a lot of interest and attention given to making sure work zone management is done properly.
- **Financial support.** Upper management supports work zone management initiatives and is willing to fund the initiatives as well.
- **Innovative.** The agency is willing to try new things.
- **TTC consistency.** There is a lot of consistency in the agency's standard approach for temporary traffic control.
- **Inter-organization communications.** Management has given the agency direction that work zone mobility and safety are priorities so there is a clearly defined pathway for moving forward. All divisions and districts know that this is a priority.
- **Peer support.** There is good peer-to-peer support and technical resource availability from peers.
- **Industry cooperation.** There is a good working relationship with, and buy-in from subcontractors. They understand the agency's ultimate goals.

Work Zone Management – Iowa DOT Challenges/Areas of Improvement

- **Resources.** Staffing and funding resources are limited.
- **Organizational structure.** Decentralized organizational structure that makes getting everyone, and all districts, on the same page. This can also make communication difficult.
- **Project scheduling and coordination**. The agency does not give itself enough time to develop proper TTC strategies after design and before project letting. Coordinating multiple projects at one time has also been an issue in the past.
- **Completing minor projects in traffic critical locations.** Even a small joint replacement project on a major bridge can cause very large impacts.
- **Standardization of implementation.** There is no good process to determine when certain strategies are needed for different project conditions. Nothing to tell the agency which strategies to apply in different traffic conditions.

- **Mid-volume roadway guidance.** Most metrics and tools that the agency has are for high volume roads, but there is little guidance on strategies and techniques for lower volume roads. Traffic Critical Project program just focuses on high volume roads.
- **Training for designers.** There is not a lot of training done and the designers need more training.
- **Succession planning.** Design manual needs to be improved with the addition of institutional knowledge that has been collected over the years. There are several retirements coming in the next couple of years and there has been no capture of that knowledge.
- **Training for contractors**. The agency needs a minimum certification for contractors for setting up TTC.
- **TTC inspections.** It is a challenge to get staff in the field to be more aware that they are responsible for assuring TTC is properly set up and is effective. Not just following the plan but having an effective TTC deployment. Even when the agency uses consultants for inspections, the agency isn't sure that they are as astute as they should be when it comes to TTC inspections. These inspections are a strength in some districts but lacking in others. Generally, a lack of awareness and critical thinking of whether what is deployed is working and whether it could be done better. The agency needs to empower work staff to be more operationally aware and take ownership of conditions.
- **Coordination with local agencies.** The agency needs to do a better job at recognizing how local projects on local streets can have large impact on state-maintained roads. Generally, the agency could do a better job at coordinating with other agencies and private companies such as utilities. Traffic control with utility work is consistently a big issue.
- **Public notification.** The agency is not able to provide real time information to travelers for queues or lane closures. 511 is not very accurate for when lanes are closed or when there will be a queue.
- **Work zone database.** There is currently no way to see how work zones performed, what the agency did well, and what it did poorly.
- **TTC standards of acceptability.** The agency needs to reconsider what its standard of acceptability is for TTC on projects. It is easy to say that TTC meets standards and it's good enough, but the agency needs to rethink what it is willing to accept.

VII. IOWA DOT'S WZM CMF SELF-ASSESSMENT RESULTS

Workshop participants were asked to briefly assess and assign a capability level (from 1 to 4) to Iowa DOT's WZM processes using the six capability dimensions. Capability levels are defined as follows:

- ***Level 1 (ad hoc):*** Very little effort made to predict, plan for, and manage expected and actual work zone impacts; what efforts are made occur late in the project development cycle.
- ***Level 2 (recognized):*** Basic agency policies and procedures exist that require analysis of work zone impacts and developing a plan to manage those impacts beginning during project planning; application across the organization is uneven and not well understood.
- ***Level 3 (mainstreamed):*** Policies and procedures to predict, plan for, and manage impacts are integrated and diligently applied throughout organization; effectiveness of policies/procedures is unknown.

- ***Level 4 (optimized):*** Effectiveness of integrated policies and procedures to predict, plan for, and manage work zone impacts are regularly reviewed and critiqued, and improved upon where possible.

The following tables and accompanying text provide Iowa DOT's assessment of its current WZM capabilities based on the above capability level definitions.

BUSINESS PROCESS (BP) DIMENSION

Overarching BP Score: 1.8		
Amplifying Questions	**Current Level**	**Why?**
How does the determination of project "significance" affect project development decisions?	2	There is a draft policy for determining significance, but it is not standardized or evenly applied.
How well does your agency estimate and use road user costs (RUC) in making WZM decisions?	1	No standard policy in place, and any determination of user costs is done so by engineering judgement.
How does your agency utilize innovative contracting to help achieve WZM goals and objectives?	2	Strategies are recognized but not considered early enough in development process to be as effective as possible.
How well does your agency develop, implement, and evaluate TMPs?	2	TMP components are completed when necessary, but not valued and done so to meet requirements.
How does your agency coordinate between multiple projects in a corridor to achieve overall WZM objectives?	2	Projects are coordinated informally but formalizing the coordination process is very difficult with existing technology and tools.

- Project Significance
  - More projects qualify as significant in the agency's draft policy than would with just the federal regulation.
  - Think we should look at "significance" through the lens of what we call traffic critical projects. Traffic critical has a different, more strict definition. Developing a check list to help identify which projects are traffic critical. All "significant" projects will be a subset of traffic critical projects.
  - May currently have 70 traffic critical projects but three or four significant projects. No difference in how work zones are managed between the two, but it's mainly a difference in reporting requirements.
  - Don't have a written policy so we couldn't possibly be a three. Have a draft policy but it's not standardized. Trying to apply it, but it's not being applied evenly.
- Road User Impacts (RUI)
  - We employ good strategies on bigger projects but not on smaller projects. We do not have a good handle on whether it would be beneficial to use these same strategies on smaller projects.
  - Have some institutionalized knowledge of these things but no formal governance.
  - We don't calculate user costs, but we look at whether we anticipate a queue. We don't have a definition for acceptable delay or queues. We look at queues, but don't necessarily consider delay.

  - We aren't very mature in this area. Need to have conversations on where we can and should go.
  - We accept that there will be delay, and will assign liquidated damages if a contract exceeds expected delays.
  - We do a great job at acknowledging user costs but a bad job at determining user costs. We just use engineering judgement and the outcome will vary by engineer.
  - Have considered user costs in the past when evaluating accelerated construction options on projects.
  - We consider user costs on all major urban projects, but it is not really formalized. We think about traffic impacts during project development, but we do not put a dollar value on it.
  - Any determination of user costs is just engineering judgement and there is no real standardized way to calculate the costs.
  - We need to be able to tell our story about how the agency is using its funds, and this could help. Could say we are spending X dollars on this strategy and it will provide X dollars in benefits in return.
- Innovative Contracting
  - Not a lot of people in the room can even identify three different innovative contracting methods. It is something we aspire to do, but have not spent a lot of time doing it.
  - It is never actually incorporated into the design of projects. No systematic process in place to apply these strategies to different projects. We need a way to identify what our options are and know when to apply them.
  - We do accelerated bridge construction. Some minor ad hoc processes are in place.
  - Often only consider these things once the design is complete and we are boxed in. Might have a lot of different options and can change the design to accommodate these different strategies if we consider them earlier in the project development process.
  - Innovative contracting just is not considered early enough in the development process unless a contractor is involved.
- Transportation Management Plans (TMPs)
  - TMPs are only prepared when they are required to be. There is always a TTC plan and projects are always placed in 511, but we only do TMPs because we must, and they are not really valued.
  - The different components of TMPs are being done but they are not necessarily in one cohesive package that we call the TMP.
  - We have a TMP on every single project we let, but may not have all three necessary components.
  - When plans are developed they make their way to the field and are implemented.
  - There are likely projects that needed formal TMPs that did not get them.
  - Generally, an uneven application. They get done for most projects that require and need them, but some do occasionally fall through the cracks.
- Project Coordination
  - Districts work well at this. There is talk within districts, but coordination is difficult without a GIS map of what is going on at any given time.
  - Will need better tools to advance this. We are generally cognizant of what is going on at any given time.

- Need to better utilize geo-located data in PSS. We are cognizant of our shortfalls.

SYSTEMS AND TECHNOLOGY (ST) DIMENSION

Overarching ST Score: 2.0		
Amplifying Questions	**Current Level**	**Why?**
How well does your agency assess and adopt new technology, procedures, and strategies to help meet WZM needs?	2	There is no process in place for evaluating new technologies, but innovation is encouraged from the top down and the agency is open to trying new things.
How does your agency apply existing technology already in place to address WZM needs?	2	No process in place for determining which technology should be used for different situations, but working towards this.

- Adopting New Technology
  - We do not have a process in place to evaluate everything that comes out, but we look at a lot of different technologies and try a lot of them.
  - There is a lot of management interest in innovative things and therefore we get funding from management to try these things.
  - No procedures in place for evaluating these technologies, but certainly do a lot of innovative things.
- Application of Existing Technology
  - Currently in the fourth year of using the statewide intelligent work zones contract, but there is still not a smooth process in place for determining which technology should be used for different characteristics.
  - A year from now we will likely be at a three as designers are even starting to think about this.
  - Not institutionalized yet but working towards this.

PERFORMANCE MEASUREMENT (PM) DIMENSION

Overarching PM Score: 1.0		
Amplifying Questions	**Current Level**	**Why?**
How does your agency quantify WZM performance?	1	No formal work zone performance measures exist.
How are WZM performance measures used by your agency?	1	There are no available measures to use.

- Quantifying WZM Performance
  - Have found that having access to geo-located data is very helpful in this realm.
  - There is significant management interest here and they are willing to allocate resources. Just need an action plan to make some progress.
  - Do not know of any data that we collect except for in intelligent work zones and what is collected in the TMP.
  - ISU has been working with data from sensors where we have them and with INRIX data where we do not have sensors.
  - It is very difficult to come up with PMs if we are not consistently collecting data.

- We collect some data, but performance measures have not been established so we do not know what we should be collecting.
- We do not even know what our delay tolerance is because it has not been established. We have access to data, but we do not know what to do with it.
- Need to define what it is that we want to do.
- CTRI does a good job at collecting data that is out there, but they will then come to us to ask what was happening on the roadway to return that data. We have a lot of data but do not have a way to corroborate it with incidents or construction.
- Only performance measure that we currently have is "no queues."

- Utilizing WZ Performance Measures
  - No further discussion from above.

ORGANIZATION AND WORKFORCE (OW) DIMENSION

Overarching OW Score: 2.0		
Amplifying Questions	**Current Level**	**Why?**
What types of WZM knowledge and skills exist within the agency?	2	Most WZM knowledge sits with two people in the agency who field questions from everyone else.
How are WZM knowledge, skills, and abilities developed amongst staff within the agency?	2	Training is unevenly applied across agency divisions with some receiving more than others.
How is institutionalized WZM knowledge in various parts of the agency captured and shared?	2	No processes in place for capturing why things are done the way they are. Information is shared informally.

- Existing Knowledge and Skills
  - The agency has annual training that has good aspects, particularly that we train local government staff. Very accessible. DOT designers typically get training every four or five years and is limited to TTC layouts and not broad WZM strategies.
  - Have been getting a better understanding of what all we do not know as we go down the line implementing TSMO.
  - There are not enough people in the agency who are intimately knowledgeable about WZM that have the time to come up with a training course.
  - There is knowledge of the options that are available and that we should be looking at advanced and/or innovative areas, but we don't always have the knowledge to do so. Often required talk to a consultant who does have the knowledge for some of the more innovative things.
  - If it is an area that someone does not have expertise in, they still know where to go to get it. Not all offices need to know everything.
  - Main question is how much do we expect each office to know so they are not having to go to Mark or Dan for every question. There are things that every office should know on their own.
  - "Applied systematically" not only implies that knowledge is there but that it is applied as soon as it should be in the project development process, which it is not.

- Knowledge Development
  - Dan and Mark teach construction/traffic classes to field inspection staff. This class is heavily safety oriented, mainly looking at TTC, and mobility is not really discussed. This is the only training that happens besides what little internal training occurs.
  - Field staff gets training, but there's not much for design staff.
  - There is nothing that defines which staff need what training.
- Knowledge Capture
  - Various design manuals, memos, and training capture some knowledge, but the design manual has not been updated recently.
  - Pretty much all work zone management knowledge sits within the head of a couple people and has not been written down anywhere.
  - There are some sites of known corporate knowledge that exist. Maybe not updated regularly or comprehensive, but some of the knowledge is housed.
  - A lot of times we might know that we are supposed to do something, but maybe not why we are supposed to do something a certain way.
  - There is no post-project sharing of lessons learned that could help us in this realm.
  - Written processes capture some of the knowledge, but never "why" we do something a particular way. Design manual needs to be updated to explain why we do stuff the way we do it.
  - W-Drive serves as a repository for a lot of information, but basically just an electronic version of a filing cabinet that someone left in their office.
  - There is no process in place for ensuring that information gets stored anywhere or what information gets stored.

CULTURE DIMENSION

Overarching Culture Score: 2.0		
Amplifying Questions	**Current Level**	**Why?**
How is WZM valued within the agency?	2	WZM is valued in some divisions and by upper management, but value is inconsistent.
How is WZM innovation encouraged within the agency?	2	Innovation happens, but is typically limited to situations when innovation is required.
What type of agency WZM outreach and reporting exists?	1	No formal mechanism is in place to share successes.

- WZM Value
  - From a safety perspective, it is very valued. When we look at it from a TSMO, mobility perspective, not as much, but we are transitioning towards this. Each office is trying to figure out what this means for them.
  - Some divisions do not give it a second thought while other areas think about it a lot.
  - We can say we value WZM all we want, but unless we are willing to invest to implement strategies, then it is hollow. There have been many initiatives come through the agency over the years that were valued but did not get an investment, so they slowly died.

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  - We recognize the need and value, but the value is inconsistent across the state and within the agency.
  - Has only recently started to come down from upper management that this is important as we have started moving towards TSMO and the WZM service layer.
  - It is in our minds as we develop projects, but no real processes in place to encourage its importance.
- WZM Innovation
  - Innovation is encouraged, but not everyone knows about it.
  - Sometimes you're just forced to innovate on certain projects.
  - In general, we only innovate when we must. If a regular lane closure works, we would never look at something innovative.
  - No other state has taken intelligent work zones to the statewide level like Iowa has. Other parts of the agencies are looking at CV/AV to see what impacts they are going to have. Innovation is encouraged, but it is not really institutionalized.
  - Have certainly been given a license to innovate, but it is not written down anywhere.
- WZM Outreach and Reporting
  - Do not do nearly enough of this, if we do any of it at all.
  - DOT News goes out with blurbs but does not capture the technical side of things.
  - Should be better processes in place to capture what we do well, how we did it well, and why we did it the way we did it.
  - Need to set up post-project reviews to share successes and lessons learned.
  - Anything that is captured and shared is more of good news and less a capturing of technical components.

COLLABORATION DIMENSION

Overarching Collaboration Score: 3.0		
Amplifying Questions	**Current Level**	**Why?**
How does the agency utilize law enforcement for WZM needs?	4	Process in place is effective, universally applied, and continually evaluated.
How does the agency consider private-sector input (e.g., contractors, affected businesses) when addressing WZM needs?	3	Private-sector input is routinely solicited and considered. Processes in place for receiving input are effective and consistently applied.
How does the agency incorporate other stakeholders (general public, schools, business, EMS, etc.) into the WZM process?	2	There are processes in place, but they vary by district and project manager.

- Use of Law Enforcement
  - There is a good policy in place for placing uniformed law enforcement on projects that is uniformly applied. Requests are generally not denied and there is a good pot of money available to pay for law enforcement.
  - When law enforcement is in place we see a reduction in crashes. Construction has taken suggestions from law enforcement for things like barrier placement.
  - There is some flexibility built into projects for getting law enforcement if something unanticipated comes up.

  - Used to be that law enforcement would invoice us but now law enforcement is part of the DOT so it's more of an internal process where money is allocated at the beginning of the year.
  - When law enforcement is on a project, speeds are reduced, but it reduces the capacity of the work zone which can cause a domino effect.
  - Process that is in place is well integrated throughout the department, and we are at the point where we are starting to refine the process. In some places we are collecting data to determine possible process improvements.
  - Some additional training for law enforcement could be useful.
- Private Sector Input
  - There will typically be a public meeting if we are going to disrupt access to a business. Disrupted business will have a chance to give input if their access is restricted.
  - There is a good effort from the resident engineer to keep businesses updated on project status.
  - Also have meetings with industry for major projects to get their feedback to incorporate into plans. Other stakeholder input is also considered.
  - Industry gets a chance to give input for spec changes and a traffic control contractor sits on the work zone committee.
  - We never do blanket changes without talking to the industry. You must get their buy-in or you'll get pushback.
- Stakeholder Involvement
  - Project Information Management Database (PIMA) set up so that stakeholders can leave comments on projects.
  - Very formal in having public information, but each district has a different approach to mitigating disruptions. Very dependent on project manager.

VIII. SELF-ASSESSMENT RESULTS, SELECTED CMF ACTIONS, AND PRIORITIZATION OF ACTIONS

The ratings given by workshop participants to each dimension are presented in an ascending order.

- Performance Measurement (1.0)
- Business Processes (1.8)
- Organization and Workforce (2.0)
- Systems and Technology (2.0)
- Culture (2.0)
- Collaboration (3.0)

Based on the current capabilities and the discussions, workshop participants identified the following four actions from the Performance Measurement dimension.

- **Identify outcome measures relative to mobility, safety, customer satisfaction, and/or work productivity/efficiency that are specified or implied in the agency's work zone safety and mobility manual.**
- **Identify available data sources and data collection methods needed to develop measures of interest to the agency.**
  - This will have to be automated and use new technology to make successful.

  - Could possibly use TMC staff to help automate data entry and quality control.
- **Continue/restart development of lane closure permitting system/app to provide an electronic record of time and location of lane closures.**
  - Currently available crash data is not able to be tied back to projects.
  - This would tie into an approval app where contractors request a lane closure that confirms that the lane can be closed. Would be tied to 511 as well.
- **Develop a written policy/guidance on allowable lane closures and volume thresholds that considers project geometry, characteristics, and location.**
  - Currently only done by engineering judgment.
  - This should be done sooner than the other action items.
  - Plan notes state allowable lane closures so this could be quickly changed with whatever is decided or developed.

IX. POST-WORKSHOP ACTION PLAN

FHWA will continue to coordinate with Iowa DOT following the completion of the WZ CMF workshop to track the agency's progress in implementing identified actions, the addition of any new actions, or any other developments within the agency's work zone management program related to the WZ CMF. Three follow-up calls with be conducted with Iowa DOT in the months following the workshop to track progress. Information obtained during those calls will be appended to this summary report.

X. SELECTED ACTION RESOURCES

An additional set of available examples, best practices, and resources pertinent to Iowa DOT's selected actions will be incorporated into future versions of this workshop summary sheet following the first post-workshop follow-up call discussed below.

- General
  - Work Zone Capability Maturity Framework Online Tool
  - National Work Zone Safety Information Clearinghouse
  - FHWA Work Zone Management Program
  - Project Coordination Toolkit
  - Work Zone ITS Implementation Guide
- Process Reviews
  - Guidance for Conducting Effective Work Zone Process Reviews
  - Work Zone Process Review Toolbox
- Performance Measures
  - FHWA Performance Measure Development Toolkit
  - Work Zone Data Examples
  - A Primer on Work Zone Safety and Mobility Performance Measurement
- Training
  - Work Zone Safety Grant Training Courses
  - Work Zone Safety Information Clearinghouse Training
  - FHWA Work Zone Management Program Training
  - ARTBA Learning Management System

APPENDIX A: WORKSHOP AGENDA

Iowa Department of Transportation

Work Zone Capability Maturity Framework and Process Review Workshop

November 6, 2017
Ankeny, Iowa
8:00am – 4:00pm

Morning Session

8:00 – 8:15	***Welcome and Introductions*** - Wes Musgrove – Iowa Department of Transportation - Jerry Ullman – Texas A&M University Transportation Institute (TTI)
8:15 – 8:30	***Workshop Overview and Outcomes*** - Jerry Ullman – TTI
8:30 – 9:15	***Group Discussion*** - Discussion of Iowa DOT WZM strengths and weaknesses
9:15 – 9:30	***Overview of WZ CMF*** - Jerry Ullman – TTI
9:30 – 9:45	***Break***
9:45 – 12:30	***Self-Assessment*** - WZM capability self-assessment by Iowa DOT using online tool
12:30	***Lunch***

Afternoon Session

1:30 – 2:30	***Selection of CMF Actions*** - Iowa DOT selection of actions based on self-assessment results
2:30 – 2:45	***Break***
2:45 – 4:00	***Recap of Previous Process Review*** - Review status of action implementation

Federal Highway Administration
Office of Operations – Work Zone Management

U.S. Department of Transportation
Federal Highway Administration

BATTELLE
Texas A&M Transportation Institute

Iowa Department of Transportation

Work Zone Capability Maturity Framework and Process Review Workshop

November 7, 2017
Ankeny, Iowa
8:00am – 12:00pm

Morning Session

8:00 – 8:15	***Recap of Previous Day***
	- Jerry Ullman – TTI
8:15 – 9:00	***Improving Future Process Reviews***
	- Guidance on process review best practices
9:00 – 10:00	***Incorporating Action Items into future Process Review***
	- Discussion of including priority list of actions in Iowa DOT's next PR
10:00 – 10:15	***Break***
10:15 – 11:00	***Data/Information to Collect in Next Process Review***
	- Identifying critical data and info need to quantify improvements
11:00 – 12:00	***Action Planning/Process Review Roadmap***
	- Developing a plan to advance action implementation

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