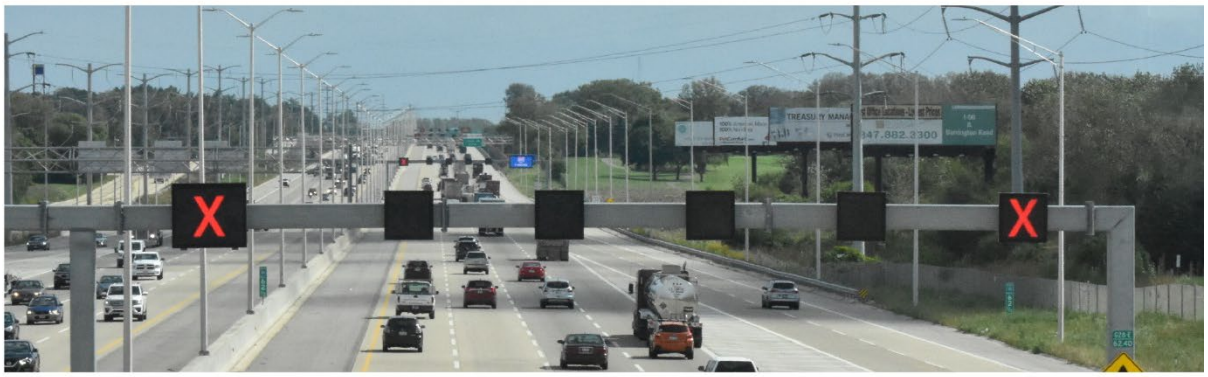


ACTIVE TRANSPORTATION & DEMAND MANAGEMENT

Service Layer Plan

December 2023

IOWA DOT

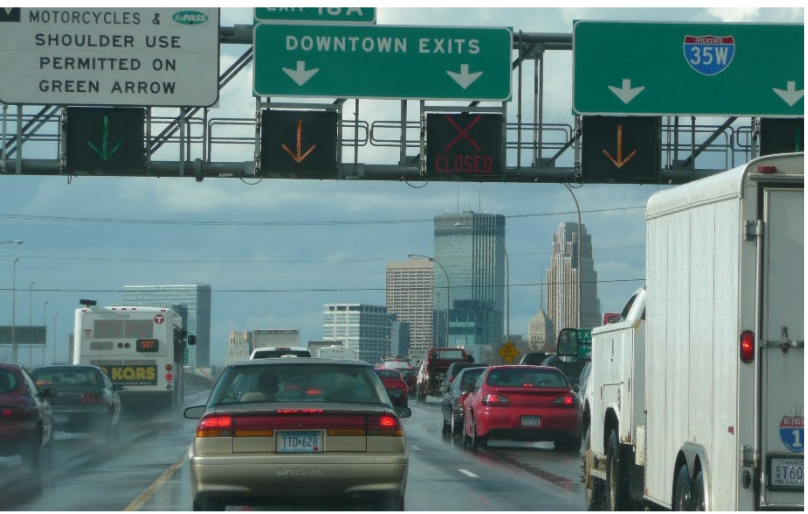


TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Iowa DOT Strategic Goals and Objectives 1

1.2 Iowa DOT Transportation Systems Management and Operations Goals and Objectives 1

1.3 Service Layer Plan Development Process 3

1.4 Document Contents and Organization 4

2 UNDERSTANDING ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT 6

2.1 ATDM Approaches 6

2.2 Role of ATDM in Transportation System Management and Operations 8

2.3 Relationship with Other Service Layer Plans 9

2.4 Indicators and Considerations for ATDM Deployment 10

3 CHALLENGES FACING IOWA TRANSPORTATION 17

3.1 Safety 17

3.2 Mobility and Accessibility 17

3.3 Sustainability 18

3.4 Travel Reliability 18

3.5 Resiliency 18

3.6 Congestion and Operational Issues 18

4 ATDM CAPABILITY MATURITY FRAMEWORK SELF-ASSESSMENT 19

4.1 CMF Workshop 19

4.2 Workshop Takeaways 22

5 ATDM VISION AND GOALS 24

5.1 ATDM Vision 24

5.2 ATDM Goals 24

6 ATDM PRIORITIES AND GAPS 27

6.1 ATDM Priority Area #1: Collaboration 29

6.2 ATDM Priority Area #2: Arterial Management 32

6.3 ATDM Priority Area #3: Freeway Management 34

6.4 ATDM Priority Area #4: Funding 36

7 ATDM STRATEGIES, TACTICS, AND ACTIONS 38
7.1 ATDM Strategies, Tactics, and Actions Details 39
7.2 Strategy and Tactic Implementation Approach 50
8 FIVE-YEAR SERVICE LAYER BUDGET ESTIMATE AND NEXT STEPS 52
8.1 Budget Estimate 52
8.2 Next Steps 52
APPENDIX A AWARENESS MATERIALS 53
A.1: ATDM Factsheet 53
A.2: ATDM Introduction Presentation 54
A.3: ATDM Survey Summary 63
APPENDIX B ATDM STRATEGIC PLANNING AND ANALYSIS 73
B.1 ATM Feasibility and Screening Guide Overview 73
B.2 Analysis Process and Results 74
B.3 Screening Corridors for ATM Strategies 81
APPENDIX C CMF WORKSHOP NOTES AND SCORES 83

LIST OF FIGURES

Figure 1: Iowa DOT TSMO Service Layers 1
Figure 2: ATDM SLP Development Process 4
Figure 3: ATDM Continuous Improvement Cycle. Source: FHWA 6
Figure 4: Relationship of the Iowa DOT ATDM Service Layer to Other TSMO Service Layers 9
Figure 5: CMF Dimensions Supporting ATDM Strategies. Source: FHWA 20
Figure 6: CMF Self-Assessment Process 21
Figure 7: Strategic Planning Process 25
Figure 8: Identified Priority Areas and Associated Priorities 29
Figure 9: Proposed Phasing of ATDM Strategies and Tactics 51

LIST OF TABLES

Table 1: Iowa DOT Priority Goals and Related Outcomes 2
Table 2: Iowa DOT Priority Goals and Correlated TSMO Objectives 2
Table 3: Example of ATDM Strategies 8
Table 4: ATDM Goals and Corresponding Rationale 25
Table 5: ATDM Goals and Priorities 27
Table 6: Mapping of ATDM Priority Areas, Priorities and Strategies 38
Table 7: Strategy #1 Implementation Details 41
Table 8: Strategy #2 Implementation Details 42
Table 9: Strategy #3 Implementation Details 45
Table 10: Strategy #4 Implementation Details 47
Table 11: Strategy #5 Implementation Details 49

1 INTRODUCTION

This document serves as the Iowa Department of Transportation's (Iowa DOT or Department) tactical plan for active transportation and demand management (ATDM). The Department is considering ATDM as a cost effective, sustainable approach to actively manage traffic flow and travel demand in real-time to meet the Department's strategic goals and objectives. The plan is one of eight service layer plans (SLP) that collectively provide detailed recommendations and actions for delivering the vision and goals of the Department's Transportation Systems Management and Operations (TSMO) Strategic and Program Plans. This ATDM SLP provides more detailed actions to advance ATDM throughout the state over a 5-year planning horizon. Included in this plan is a discussion of ATDM related opportunities and challenges, existing conditions, priorities and gaps, strategies, tactics, and actions. Iowa DOT's TSMO SLPs are shown in Figure 1 and available **here**.

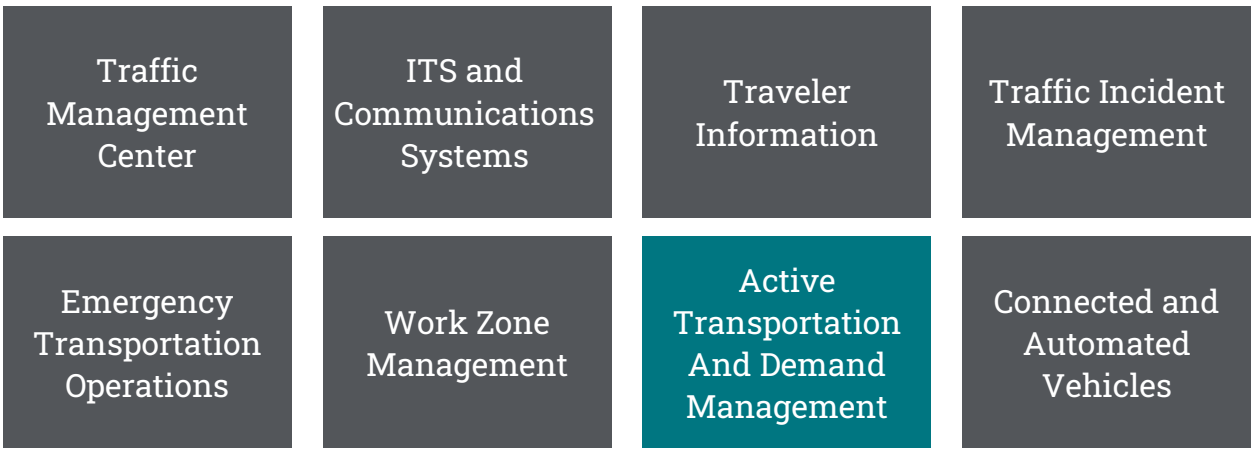


Figure 1: Iowa DOT TSMO Service Layers

1.1 Iowa DOT Strategic Goals and Objectives

In January 2021, Iowa DOT published its **2021–2025 Iowa DOT Business Plan**. The Plan, developed by the Department's Executive Leadership Team, guides actions of the Department over a five-year period. The Business Plan aligns with other long-range and modal plans and helps to position the Department to meet the demands of today and challenges of tomorrow. The Plan also identifies priority goals and related outcomes (Table 1) which drive Department activities and pursuits, including broader TSMO actions and activities as well as those specific to ATDM.

1.2 Iowa DOT Transportation Systems Management and Operations Goals and Objectives

Stemming from the 2021–2025 Iowa DOT Business Plan, the Department updated its existing TSMO Plan in May 2022. The **2022 TSMO Plan** updates the Department's 2016 TSMO Plan and aligns with the 5-year goals and objectives of the 2021–2025 Business Plan, as well as Department values, focus areas, and strategic direction. The updated TSMO Plan provides specific objectives relevant to all SLPs. Objectives that can be addressed directly by ATDM approaches are bolded in Table 2.

Table 1: Iowa DOT Priority Goals and *Related Outcomes*

Goal	Outcomes
Improve Transportation System Safety and Performance	• Zero fatalities in work zones • Total traffic fatalities significantly reduced • Increased efficiency, reliability, resiliency, and condition of Iowa's transportation system
Improve Customer Service	• Greater levels of customer satisfaction across all programs and services
Advance Workforce for Future Challenges & Opportunities	• Engaged and empowered employees • Increased diversity, equity, and inclusion • Steady reductions in turnover rate (non-retirement)
Secure, Stable, & Sustainable Funding	• Implemented funding strategies • Ensured diversified funding mechanisms • Reduced technical debt (e.g., legacy systems)
Grow Innovation	• Adopted smart technologies • Culture of innovation • Modernized systems

Table 2: Iowa DOT Priority Goals and Correlated TSMO Objectives

Goal	Correlated TSMO Objectives
Improve Transportation System Safety and Performance	• **Reduce the number of fatal and severe crashes** • **Reduce the number of secondary crashes caused by traffic incidents** • **Reduce the number of work zone (and maintenance) related traffic incidents** • **Improve travel time reliability** • **Increase the resilience of the transportation system to floods, winter weather, and other extreme weather events** • **Improve level of service on major freight corridors** • **Maximize use of existing roadway capacity** • **Respond to and clear traffic incidents as quickly as possible** • **Minimize the environmental impacts of the transportation system** • **Integrate TSMO into existing Iowa DOT policies, plans, and procedures**
Improve Customer Service	• **Provide timely, accurate, and comprehensive information to customers** • Allow no unplanned road closures or restrictions due to conditions within Iowa DOT's control • **Accommodate bike, pedestrian, transit, and commercial vehicles in transportation management and operations** • **Build coalitions that improve TSMO (e.g., Statewide TIM, Automated Transportation Council, etc.)** • Proactively coordinate response to large scale traffic incidents with adjacent states

Goal	Correlated TSMO Objectives
Advance Workforce for Future Challenges & Opportunities	• Provide staff knowledge and management resources to enable adaption to rapidly changing technology • Define TSMO workforce (position types) of the future • Develop strategies to attract and retain new types of positions to support TMSO.
Secure Stable & Sustainable Funding	• Develop cost sharing models for integrated corridor management • Consistently pursue grant opportunities
Grow Innovation	• **Provide high-quality, high-fidelity data in standards-based formats for partner collaboration** • **Use proven and emerging technologies to improve performance management and decision support systems** • **Implement integrated corridor management strategies to manage traffic across multiple jurisdictions and modes** • Develop highway automation infrastructure in coordination with industry trends • Leverage university partnerships to innovate • Engage Iowa's entrepreneur network to improve TSMO

1.3 Service Layer Plan Development Process

The ATDM SLP was developed by identifying the challenges facing transportation in Iowa as well as the needs and opportunities for actively managing those challenges. This included an information gathering process where various ATDM approaches were identified and conditions they can support were discussed. The information gathering process also looked at existing DOT planning reports to better understand and document the conditions affecting Iowa transportation that ATDM may be able to address. Next, the Department conducted a traffic management capability maturity framework (CMF) self-assessment to identify gaps in the Department's ATDM capabilities and gain consensus on an approach for advancing the Department's ATDM efforts. Based on the results of the CMF self-assessment, the Department developed a vision for ATDM and subsequently identified gaps and priorities for advancing ATDM efforts in the state. Finally, based on the ATDM priorities, a number of ATDM strategies, tactics, and actions were developed to help the Department begin to address gaps and support its broader TMSO goals and objectives. Strategies, tactics, and actions are proposed for the near- (0–3 years) and mid-term (3–5 years) and align closely with the planning horizons of the Department's 2021–2025 Iowa DOT Business Plan and 2022 TSMO Plan.

Figure 2 shows an illustration of the ATDM SLP development process.

Figure 2: ATDM SLP Development Process

Input from a wide range of Department stakeholders who have a role in managing Iowa's transportation network was essential to this process. This included:

- Traffic Operations Bureau
- Field Operations Division – Districts
- Location and Environment Bureau
- Systems Planning
- Traffic and Safety Bureau
- Traffic Operations Division Leadership

Throughout the process, there were several opportunities for stakeholders to identify strengths, challenges, and needs they believe could be managed more effectively by actively managing Iowa's transportation network. The feedback provided valuable input for setting a course of action and recommending a set of near- and mid-term actions for the next five years to fulfill Iowa's ATDM approach.

1.4 Document Contents and Organization

The remainder of this ATDM SLP is organized into the following sections:

Section 2: Understanding Active Transportation and Demand Management – Explains the ATDM concept, summarizes specific approaches and strategies that fall under the ATDM umbrella, and describes indicators and considerations to help staff understand if ATDM approaches are applicable to their unique situations.

Section 3: Challenges Facing Iowa Transportation – Provides a summary of transportation challenges faced in Iowa, focusing on those that impact travel significantly and can be addressed through ATDM strategies.

Section 4: ATDM Capability Maturity Framework Self-Assessment – Summarizes the results of a half--day capability maturity framework (CMF) self-assessment workshop. The self--assessment results helped define the ATDM vision and goals and led to the identification of priorities on which the Department will focus its efforts to advance its ATDM program.

Section 5: ATDM Vision and Goals – Provides Iowa DOT's ATDM vision and goals.

Section 6: ATDM Priorities and Gaps – Summarizes stakeholder feedback to identify the gaps between the existing state of and vision for ATDM.

Section 7: ATDM Strategies, Tactics, and Actions – Provides recommendations for ATDM strategies, tactics, and actions that can help the Department reach its goals and objectives. This section also provides a schedule and roles and responsibilities for implementing selected ATDM strategies as well as a rough order of magnitude budgetary cost estimate for each.

Section 8: 5-Year Service Layer Budget Estimates and Next Steps – Estimates the financial support the Department anticipates being necessary to carry out the identified strategies, tactics, and actions. Further, it establishes next steps to operationalize the SLP.

Appendix A: ATDM Outreach Material – Provides the awareness fact sheet (and survey) shared with Iowa's Metropolitan Planning Organizations and Regional Planning Affiliations to gather input on the need for and receptiveness of partners external to the Department for ATDM deployment.

Appendix B: ATDM Strategic Planning and Analysis – Describes a federally adopted planning process the Department and partner agencies can follow to identify corridors that have operating conditions that are supportive and feasible for ATDM application.

Appendix C: CMF Workshop Notes and Scores – Detailed notes and scores for each CMF dimension discussed.

2 UNDERSTANDING ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT

The Federal Highway Administration's (FHWA) definition of ATDM is as follows:[1]

> *ATDM is the dynamic management, control, and influence of travel demand, traffic demand, and traffic flow of transportation facilities. Through the use of available tools and assets, traffic flow is managed and traveler behavior is influenced in real-time to achieve operational objectives, such as preventing or delaying breakdown conditions, improving safety, promoting sustainable travel modes, reducing emissions, or maximizing system efficiency. Under an ATDM approach the transportation system is continuously monitored. Using archived data and/or predictive methods, actions are performed in real-time to achieve or maintain system performance.*

ATDM's principal aspect is to use and integrate related strategies to ***dynamically manage and control*** travel, parking demand, and multimodal traffic flow. This implies an approach that uses available technology to ***make changes before conditions deteriorate*** versus in response to them.

2.1 ATDM Approaches

Using ATDM to meet the Department's TSMO goals and objectives will require an assessment of what Iowa DOT can accomplish currently versus what will be needed to fulfill the department's strategic goals and objectives in the future. To begin this assessment, the department must understand how well the system is operating, where issues are occurring, and the reasons why these issues occur. Following this assessment, the Department must then understand the full range of available tools and strategies it can leverage, where these tools and strategies are best applied, and the various factors that may impact successful outcomes. This process is illustrated in the ATDM continuous improvement cycle shown in Figure 3. Since ATDM is relatively new to Iowa DOT and the state, a measured, incremental approach focused on the state transportation network may best serve as a foundation for building momentum and demonstrating benefits.

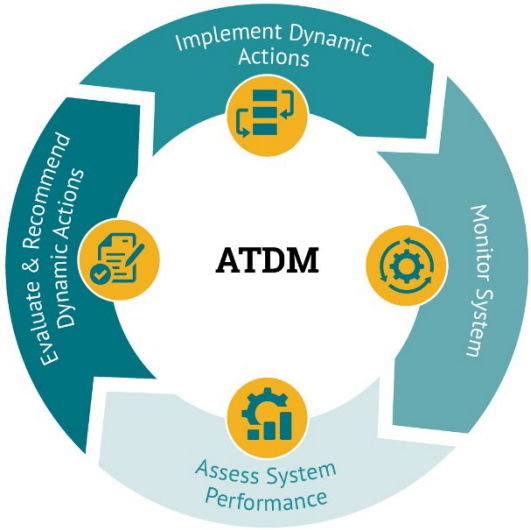


Figure 3: ATDM Continuous Improvement Cycle. Source: FHWA

ATDM approaches can be categorized into three groups: active traffic management (ATM), active demand management (ADM), and active parking management (APM). While strategies within each group play an important role in active operations, some cross jurisdictional boundaries and require

[1] https://ops.fhwa.dot.gov/publications/fhwahop12032/index.htm

greater multi-agency coordination, which leads to longer deployment horizons. Therefore, for the purposes of this 5-year SLP, the Department may find greater levels of success implementing strategies they can manage and implement effectively within their jurisdiction (i.e., state transportation network). Many of these types of strategies will fall under the ATM umbrella.

2.1.1 Active Traffic Management

ATM is the ability to manage recurrent and non-recurrent congestion dynamically based on prevailing and predicted traffic conditions. Focusing on trip reliability, it maximizes the facility's effectiveness and efficiency. It increases throughput and safety using integrated systems with new technology, including automation to optimize performance quickly and without the delay that occurs when operators must deploy operational strategies manually. ATM approaches focus on influencing travel behavior with respect to lane/facility choices and operations. ATM strategies can be deployed singularly to address a specific need, such as using adaptive ramp metering to control traffic flow, or can be combined with other ATM or ATDM strategies to meet system-wide needs of congestion management, traveler information, and safety resulting in synergistic performance gains.

2.1.2 Active Demand Management

ADM concepts focus on traditional demand management and apply an active element that varies based on transportation facility demand. ADM strategies use information and technology to manage demand dynamically, which could include redistributing travel to less congested routes or times of day or reducing overall vehicle trips by influencing mode choice. ADM supports other ATDM approaches by redistributing or reducing overall traffic levels to prevent and mitigate congested conditions, thus becoming an integral part of an overall management philosophy to actively manage a facility or system.

2.1.3 Active Parking Management

APM focuses on applying parking management and pricing policies, technologies, and systems to address the problems associated with both on-street and off-street parking. APM strategies can reduce demand searching for available parking or can distribute it across a wider network. For example, parking wayfinding systems may reduce the time cars circulate as drivers look for available parking. Additionally, pricing schemes may be implemented to price available parking based on real-time demand. Pricing schemes can also encourage mode shift and greater use of multi-occupant forms of travel, which would reduce demand on Department owned and managed networks. To that end, APM strategies can work together with other ATDM approaches and thus can deliver greater synergies and benefits than if applied separately from other ATM and ADM strategies. However, it is recognized that in most instances the Department does not own or manage available parking, thus it may not be as influential in APM strategy implementation. Therefore, the Department plays a coordination role in educating private parking entities on the benefits of APM and the synergy of aligning APM with ATM and ADM strategies.

2.1.4 Examples of ATDM Strategies

Actively managing traffic flow and transportation demand can include multiple approaches spanning demand management, traffic management, parking management, and efficient use of other transportation modes and assets. The Department can deploy a single ATDM approach to capitalize on a specific benefit or can deploy multiple active strategies in combination to gain

additional benefits across the entire transportation system. Because these strategies are relatively new to the Department, it may be best to start with an individual strategy and add strategies incrementally over time to understand the performance of individual strategies and evolve operations with organizational capabilities and resources. Examples of ATDM strategies are shown in Table 3 and provided as part of Appendix A for awareness regarding a selection of key ATDM strategies.

The FHWA Office of Operations provides additional information on ATDM approaches, research, and outreach materials on their ATDM **website.**

Table 3: Examples of ATDM Strategies

Active Traffic Management	Active Demand Management	Active Parking Management
Dynamic Lane Use Control	Dynamic Ridesharing	Truck Parking Information Management System
Dynamic Speed Limits/Advisories	On-Demand Transit	Dynamically Priced Parking
Queue Warning	Dynamic Pricing	Dynamic Parking Reservation
Adaptive Ramp Metering	Predictive Traveler Information	Dynamic Way-Finding
Adaptive Traffic Signal Control	Dynamic Routing	Dynamic Parking Capacity

2.2 Role of ATDM in Transportation Systems Management and Operations

ATDM builds on the Department's existing capabilities and assets to enhance operations and deliver greater levels of customer service. Through ATDM, the Department can leverage its existing investments to create a more efficient and effective system and extend the service life of existing capital investments.

ATDM approaches will allow the Department to do more with technology and existing assets and programs by making a strategic commitment to manage the transportation system actively. Active management applies more "hands on" and dynamic approaches through real-time and predictive analyses. ATDM creates an environment where problems and their effects can be reduced.

The demand management element of ATDM presents a new approach to systems management and operations in that it seeks to integrate measures to enhance travel choices, including mode, time, and route choices. Using traditional (e.g., vanpooling) and dynamic (e.g., dynamic pricing) demand management strategies, ATDM seeks to reduce or redistribute travel demand to maximize system efficiency and person throughput.

While active management can be applied to any part of our transportation system—such as implementing dynamic pricing on a facility to manage congestion or informing travelers of specific or compatible transit operations for their trip—it is most beneficial when the relationships to and synergies with other parts of the system are considered. For example, the Department could apply adaptive ramp metering to improve freeway traffic flow. However, if the effect of ramp metering

on connecting arterials is not considered, or if dynamic actions to manage overall demand are not implemented, some of the system-wide performance gains may be compromised.

2.3 Relationship with Other Service Layer Plans

The ATDM SLP is the last of eight SLPs completed as part of Iowa DOT's TSMO program. ATDM approaches touch on elements of each plan. Figure 4 describes the relationships between the ATDM SLP and each of the other SLPs. Part of the relationship connection between the other SLPs and ATDM is the resources and staffing required from other areas to support ATDM. For examples, ATDM strategies may require additional attention and staffing from the TMC and additional ITS deployments for implementation.

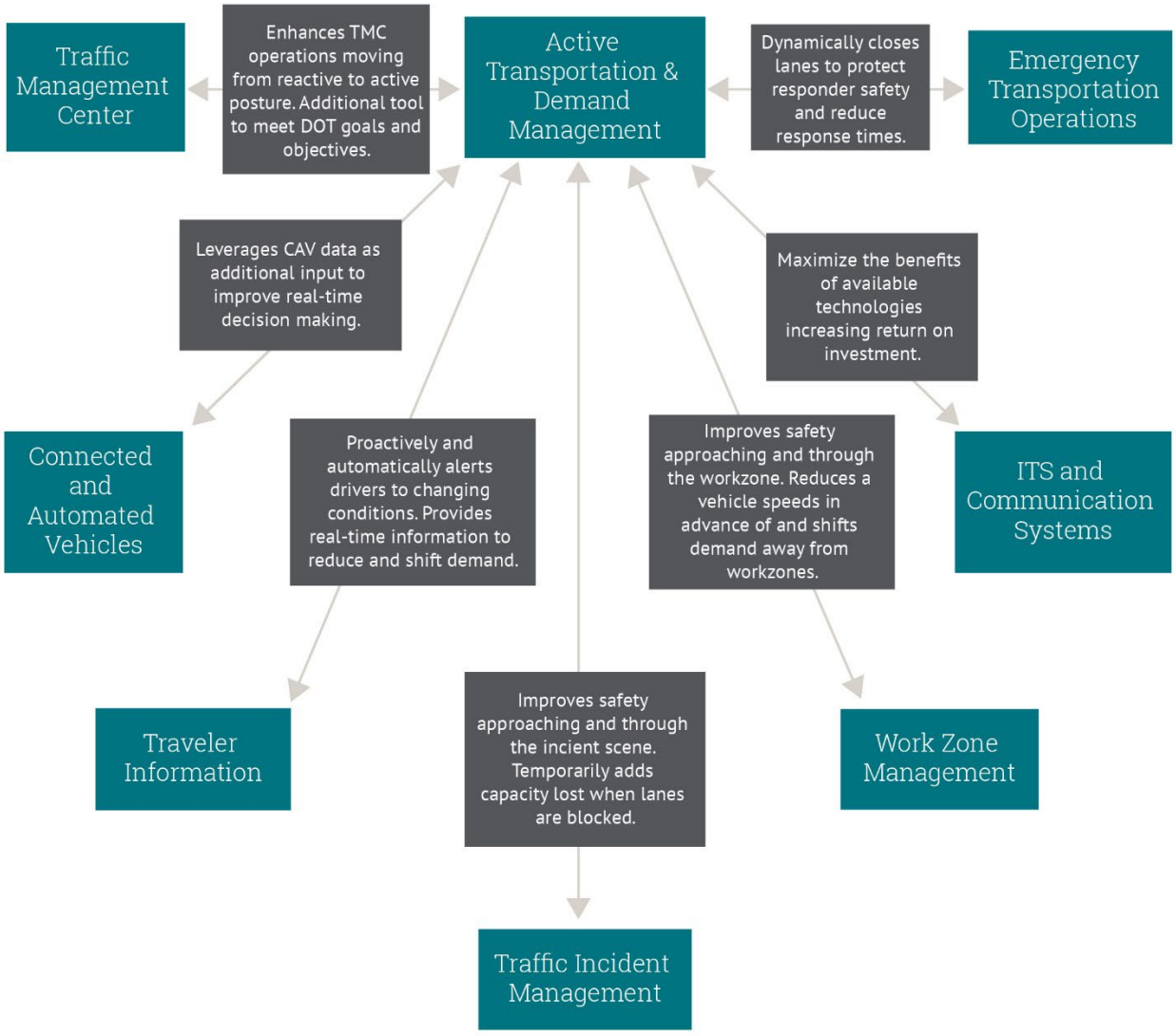


Figure 4: Relationship of the Iowa DOT ATDM Service Layer to Other TSMO Service Layers

2.4 Indicators and Considerations for ATDM Deployment

ATDM is one of many tools Iowa DOT has in its toolbox to meet agency goals and objectives. As the Department considers ATDM approaches among other traffic management tools, there are several indicators that can be used to help determine if transportation system issues can be addressed through ATDM. Furthermore, there may be other factors that should be considered before the decision is made to implement ATDM approaches as they may lead to more successful outcomes.

2.4.1 Indicators for ATDM Deployment

There are several indicators for determining if issues occurring at a specific location may be suitable candidates for ATDM approaches. Each issue or challenge will require a fresh assessment of the contributing factors and range of measures through which the problem could be resolved. Observed issues should be examined to arrive at a strategy or set of strategies that could address them effectively. However, these indicators can serve as a high-level screen for determining if ATDM approaches should be considered further.

2.4.1.1 High Prevalence of Crashes

High-crash locations are often ideal candidates for ATDM. The higher number of crashes may result from changes in the prevailing condition, recurring congestion patterns, incident patterns, or some other reason. The nature of the crashes occurring at identified locations should be studied to determine their reasons. The ATDM approach will likely vary depending on the prevalence and type of crashes occurring at these locations. For instance, dynamic queue warning or dynamic speed limits/advisories may be appropriate to reduce rear-end or lane-change crashes. Ramp metering may be appropriate for sideswipe collisions or rear-end collisions at or immediately downstream of entrance ramps during certain times of day. Dynamic shoulder use, while designed to be temporary, can decrease nearly all types of congestion-related collisions during the hours it operates.

2.4.1.2 High Traffic Volumes and Congestion

Roadway segments with high traffic volumes that often approach capacity or persist for long durations may benefit from ATDM. This is especially true if the Department is limited in its ability to add physical capacity and because Departmental policies favor alternatives to physical capacity expansion. In these situations, certain ATDM approaches may offer a means to free up unused capacity temporarily and/or shift demand from peak travel periods. Roadway segments where traffic volumes exceed peak period capacity, and for longer durations, may be the best candidates for ATDM approaches, as the observed benefits will exceed those of segments where congestion occurs during a relatively small period.

Bottlenecks, like lane reductions or those caused by other geometric factors, can reduce capacity and make travel unreliable. ATDM approaches, including dynamically controlled shoulders may increase capacity temporarily and prevent or delay the onset of congestion. This strategy is especially beneficial along segments where traffic speeds are subject to high variability. Strategies like dynamic lane use control, dynamic speed limits/advisories, and queue warnings may provide additive benefits by helping to reduce stop and go driving behavior and alerting traffic to downstream queues. Such strategies would smooth traffic flow before it reaches the queue, improving operations through the bottleneck.

2.4.1.3 Limitations in Capacity Expansion

The Department's focus and priorities have shifted as the highway system has matured and due to financial constraints. This shift, combined with growing travel demand and associated congestion in some locations, will require the Department to make the best use of existing resources and infrastructure to improve mobility and safety. ATDM may allow the Department to invest in tools that help manage transportation networks actively. Strategies like dynamic shoulder use allow the Department to make better use of existing pavement and gain efficiencies by reallocating the use of the pavement.

Even if funding is available to add new capacity, the physical ability to do so may be restricted because of existing infrastructure or environmental concerns. Existing infrastructure, including structures associated with bridges, overpasses, tunnels, and retaining walls, may prevent transportation agencies from physically widening roadways to accommodate the construction of new infrastructure. Furthermore, ATDM approaches may serve as cost-effective options to constructing new lanes.

2.4.1.4 Changes in Prevailing Conditions

Locations where prevailing conditions change suddenly or unexpectantly may also benefit from ATDM approaches. Locations that experience sun glare, localized fog, or intermittent flooding are just a few examples of changing situations that motorists often do not expect. Horizontal and vertical curves may be other examples that can impact driver behavior. Because these conditions can occur without notice, the change in prevailing condition may lead to traffic slowdowns and an increased chance of collisions. ATDM approaches that provide drivers advance warning of these situations may smooth the traffic flow upstream of where conditions change helping to reduce sudden slowing. Specifically, dynamic lane control and dynamic speed limits/advisories can help in these conditions.

2.4.1.5 Adverse Weather

Adverse weather conditions may result in large speed differentials and risk for collisions. Speed differentials are often caused by a different view of the "safe" speed under particular conditions. Dynamic speed limits/advisories provide drivers with a better idea of the safe speed. Cautious drivers feel more comfortable driving at a displayed speed if the system provides good feedback. These systems also provide feedback to drivers who may be driving too fast because they are unaware of the safe speed. Congested urban and rural areas that are subject to significant weather events and elevated bridge structures are examples of locations where dynamic speed limits/advisories and queue warnings improve safety under adverse weather conditions.

2.4.1.6 Work Zones and Special Events

Construction and maintenance activity and special events often cause congestion. ATDM may help reduce congestion and improve safety under construction and special event conditions. This may involve dynamic shoulder use during peak periods or rerouting traffic around work zones. Lane control and speed displays can be cornerstones of work zone traffic control or traffic plan maintenance. Public agencies should investigate the possibility of coordinating the permanent installation of ATDM strategies while construction activities are occurring if such strategies are planned.

2.4.2 Considerations for ATDM Deployment

While the factors discussed in the previous section may be used to determine potential locations where ATDM approaches could be most beneficial, there are several other considerations that may affect the decision to implement ATDM approaches or the ways they can be rolled out successfully. While the list is comprehensive, it is not exhaustive, and engineering judgement should be applied when considering and ultimately making the decision to implement strategies.

2.4.2.1 Deployment Costs

Although implementing ATDM is less expensive than constructing new lanes, the cost of implementing some strategies can still be significant. Therefore, considerable analysis needs to be given to the benefits of these strategies and weighed against their estimated costs before they are implemented. Deployment costs should factor in capital, operating, and maintenance costs.

Capital Costs

Capital costs associated with certain strategies include gantries, cameras, lighting, detection, signage, communications, software, etc. Conceptual capital costs can be estimated roughly using a variety of sources, including FHWA's Intelligent Transportation System (ITS) Deployment Evaluation Cost Database, Tool for Operations Benefit Costs Analysis (TOPS-BC), and product manufacturers (many costs may be found on their corporate websites). If receiving a capital cost estimate from another public agency, be aware that costs cannot be applied directly to analyzed corridors without consideration of roadway factors, such as:

- Number of lanes
- Presence and condition of shoulders
- Presence and capacity of existing fiber/communications and electricity
- Impact of structure, walls, or soil conditions
- Cost savings achieved through coordination with other planned and on-going construction activity.

Despite associated capital costs, the ATDM approach can represent a less expensive and more strategic alternative to traditional pavement construction projects.

Operations Costs

ATDM approaches should only be implemented if Departmental budgets can support effective and continuous operations. Operations costs include labor costs tied to the operation of ATDM strategies. For some strategies, operations costs may be associated with part-time operation. However, other strategies may necessitate 24/7 operations. Even if strategies only need to be operated on a part-time basis, additional operations costs may be required to retain the ability to activate ATDM strategies for situations where they could be beneficial (e.g., special events).

Besides the additional labor costs associated with operations, there are other costs tied to operating certain strategies. These include the development of standard operating procedures and training. Procedures are needed to provide staff (whether contracted or DOT staff) with the information needed to do their job—which includes personnel procedures or both technical and human resources. Procedures should be developed for operating, monitoring, and maintaining all strategies employed. On-the-job training is an additional expense that needs to be considered.

Maintenance Costs

Similar to operations costs, if agency budgets cannot support consistent, preventative, and reactive maintenance, ATDM approaches may not be feasible. Besides the cost of performing the maintenance activity, the cost of training maintenance personnel on how to maintain equipment and the cost to develop training materials must also be considered. In some cases, this cost may include additional hardware and software to track maintenance activities, such as those associated with a maintenance decision support system. Additionally, the systems associated with ATDM approaches may have much shorter life cycles than traditional transportation improvements; therefore, maintenance must be a larger part of on-going funding programs. Also, implementing selected ATDM strategies, like variable speed limits and lane control, represent significant additions to existing ITS inventories that must be maintained continually. This will likely require additional maintenance staff so that devices can continue to be maintained and operated properly.

Implementing ATDM strategies that include roadside equipment can also lead to increased costs to maintain the adjacent roadway infrastructure; e.g., additional challenges to remove snow, and ITS equipment that may need to be relocated during future roadway construction or maintenance.

2.4.2.2 Performance Management

Before implementing new ATDM approaches, consideration should be given to establishing a performance measurement program to determine the effectiveness of a considered strategy and the degree to which it satisfies program goals and objectives. By monitoring, evaluating, and reporting performance, the Department will be transparent in its decision-making, ultimately helping to secure confidence in ATDM. In turn, this will help to improve or strengthen the Department's public perception. Effective performance management also builds the case for allocating future investment toward ATDM approaches that deliver the greatest returns.

Performance reporting should ultimately tie back to the Department's goals and objectives. The performance measurement results should answer the question, "How well are ATDM approaches meeting their intended goals and objectives?" An important consideration is the collection of before and after data—particularly the "before" data as this is often overlooked during the project development stage.

2.4.2.3 Active vs Reactive Management

ATDM necessitates that the Department shift from a primarily reactive posture to one that is more proactive. This means that operators must actively monitor and manage operations, monitoring and managing ATDM strategies to continuously fine-tune parameters to optimize desired outcomes. Therefore, ATDM strategies will require trained staff to be on duty when these strategies are operational, especially when the strategy is first implemented at a new location or within a new time window. Once operators become familiar with typical operations, the hours that certain strategies are allowed to operate may be extended beyond peak periods. This may impact staffing requirements and necessitate that staff with experience operating these strategies be on duty during periods when strategies may be used.

2.4.2.4 Future Roadway Maintenance and Construction

Strategy deployment should consider how future maintenance and construction activities will be accommodated. While some maintenance and construction activities can be accomplished outside of peak hours, special consideration should be given to tasks that will require long-term lane

closures. Lane closure impacts of maintenance and construction need to be weighed against the cost of ATDM and any added physical infrastructure requirements of selected ATDM strategies. Queue warning and ramp metering are strategies that may significantly improve worker safety and can be deployed with portable equipment – so these strategies could be used more routinely. Hardening a shoulder and equipping a dynamic lane management system have much more significant costs and impacts – those strategies make less sense to deploy with respect to roadway maintenance and construction except for rare cases.

2.4.2.5 Staffing Needs

Most ATDM approaches present unique challenges and add a level of complexity to existing traffic management center (TMC) operations. Because most ATDM approaches have not been deployed in Iowa, TMC operators may not be familiar with their applications and/or the procedures to operate them effectively. While most ATDM strategies will be automated, operators with the knowledge, skill, and ability to control equipment effectively and safely should be on-duty to intervene, as needed, to ensure optimal operation. ATDM implementation may require changes in TMC staffing arrangements, operational procedures, and training to ensure skill sets are updated and trained staff are available during their hours of operation.

Operators will require training on the intent of each strategy, the procedures for effective operation, and the relatively advanced equipment associated with each strategy. Furthermore, additional or temporary staff may be required to assist in operations during training periods or at additional times of day relative to existing operations. It is important to remain cognizant of operator workloads and allocate new funding to address the additional burdens that ATDM approaches present.

2.4.2.6 Legislation

Many ATDM approaches have not been implemented in Iowa previously, and therefore may not have the appropriate legal provisions to support their use. For example, the implementation of specific ATM strategies, such as ramp metering, dynamic shoulder use, and dynamic speed limits, may require that legislation be revised and/or approved before they can be implemented. The Des Moines ICM project performed a review of the applicable state legislation and codes for these ATM strategies. A brief description of the required authority is provided below.

- Ramp metering – Requires authority to install a traffic control device on a traditionally free-flow freeway ramp.
- Dynamic shoulder use – Requires authority to permit use of freeway shoulders for travel under given circumstances.
- Dynamic speed limits – If regulatory, requires authority to modify posted speed limits based on short-term events.

Additionally, dynamic lane use may need legislative or FHWA approval to use non-standard signage or messaging.

2.4.2.7 Enforcement

Enforcement is a key consideration to many ATDM approaches, particularly ramp metering, dynamic shoulder use, and dynamic speed limits. Without steady and consistent enforcement, driver disregard may adversely impact the effectiveness of the strategy in managing traffic. In cases where violation rates are high, an increased law enforcement presence may be needed and

combined with increased public education. Enforcement needs should be designed into the system from the start. The initial issue with variable speed limit enforcement is having the legal authority to vary speed limits (i.e., will speeds be regulatory or advisory). Second, is the need to assess the feasibility of the legal authority to enforce strategies. For instance, one should determine whether there is support from law enforcement and legislative parties to enforce strategies. Once implemented, officers will need to know what the legal speed limit is. Variable speed limit systems should document the displayed speed limit by location and time of day. Other considerations include identifying locations where law enforcement can be stationed safely to view compliance and where vehicles can be pulled over safely without adversely affecting traffic operations. Considerations such as these need to be discussed with law enforcement agencies during the planning and design phases of the project.

2.4.2.8 Partner Agency Communication and Coordination

ATDM approaches may require additional communication and coordination with regional partners (e.g., local cities, transit, emergency responders) to achieve desired outcomes effectively and to prevent issues from adversely impacting partner agency operations. At a minimum, regional partners need to be alerted to state-system conditions that may impact their operations so they can implement a timely response to prepare for and mitigate any adverse impacts on their networks. Regional partners do not usually have staff available to monitor the state's 511 website or information feeds and, therefore, do not receive timely notification of incidents or other events occurring on the Interstate system. As such, partner agencies are often not notified until their networks are affected, which is often too late to implement an effective response. Thus, regional partners may need to be included earlier in planning efforts to understand their needs and to design effective strategies to accommodate them.

2.4.2.9 Public Outreach and Education

Public information and awareness are other elements of successful operations. The public needs to know the definition of ATDM approaches, which ATDM strategies are being considered, and how they may operate. The public also needs to know how to adjust their driving in response to the strategies. Public outreach should detail the reasons for, anticipated benefits of, and intended use of individual ATDM strategies. Public information and awareness activities should occur before individual strategies are implemented and be coordinated with media outreach efforts. To this end, the Department will need resources to develop, deploy, and disseminate public outreach and media materials. This includes the initial development of these materials as well as sustained efforts into the future to periodically update materials and to report observed benefits.

2.4.2.10 Driver Workload and Distraction

The implementation of some ATDM strategies, like dynamic lane use and dynamic speed limits/advisories, may require a significant number of signs and equipment relative to other ATDM approaches and existing freeway management strategies. If deployed along urban segments, this additional equipment may need to be installed alongside existing signs and equipment further adding to driver workload as drivers travel through instrumented corridors.

Consideration should be given to sign spacing, message content, driver familiarity, and existing signs so the driver is not overwhelmed with various visual stimuli. This will be somewhat mitigated with a good public information campaign. However, application of ATDM approaches should be recognized as being new to the driver. Therefore, locations where ATDM approaches can

be rolled out without adding to driver workload may be prioritized during implementation as this presents the opportunity to allow drivers to incrementally and gradually familiarize themselves with the operations of certain strategies.

Driver workload may be lessened by limiting the number of sign structures used along the corridor. Where possible, consideration should be given to removing existing sign structures and moving static signing to new structures needed to support ATDM strategies, or vice versa, where existing sign structures are large enough to support dynamic message signs in combination with needed static signing.

2.4.2.11 Roadway Geometry

Roadway geometry (horizontal and vertical curvature) may affect the design or feasibility of specific ATDM strategies. For example, sign bridges associated with variable speed limits and lane control systems are most effective when at least one set of signs remains in the driver's visibility range, which helps maintain system continuity and increases driver compliance. Horizontal and vertical curves may prevent clear line of sight and impact the driver's ability to change driving behavior in enough time. Roadway geometry may also impact other strategies, including dynamic shoulder use and ramp metering.

3 CHALLENGES FACING IOWA TRANSPORTATION

In developing the ATDM SLP, an analysis was completed to identify corridors throughout the state with baseline operating conditions that are supportive and feasible for ATM application (as ATM strategies are the most relevant to review for applicability along corridors). The first part of the analysis focused on understanding existing conditions. More specifically, the analysis focuses on two questions: (1) does ATM achieve regional goals or objectives and (2) are ATM strategies applicable to the roadway network. The first question regarding regional goals and objectives was investigated during a literature review. Through consideration of Iowa DOT's Statewide Long-Range Transportation Plan (SLRTP), Iowa in Motion, and review of the metropolitan planning organization (MPO) long-range plans, there is a clear opportunity to use ATM strategies to better steward existing transportation capacity, enhance accessibility, improve safety for major roads, and increase commuter and freight flow reliability and efficiency. The second question, are ATM strategies applicable to the roadway network, is answered through an assessment of corridor deficiencies in safety and mobility. This assessment can be found in Appendix B. The remainder of this section generally describes Iowa's existing challenges that can be addressed through ATDM.

3.1 Safety

Crashes impose a heavy burden on Iowans. The aspiration to see zero fatalities on Iowa roads is a vision from which everyone could benefit. The loss of life, limb, and property on high-demand corridors is significant and can be explained partially by poor driver choices in stressful driving conditions. The use of enhanced management strategies to mitigate underlying risks to safety in traffic, such as congestion and high-speed differentials, can pay tangible benefits to Iowans' safety.

In Iowa, several factors impose safety concerns, including adverse weather (particularly winter weather), construction activity, and bottlenecks. Proactively anticipating conditions and actively managing traffic upstream of impacted areas can alter driver behavior and enhance safety for all users. Improving operations on high-speed facilities can prevent incidents which also reduces the risk of secondary, or "back-of-queue" crashes which can be severe due to speed differentials.

3.2 Mobility and Accessibility

People and goods need to reach their destination. Iowans need to travel to reach their place of work, place of education, and destinations in their community. Transportation needs to be a basic right for all—including those who are disadvantaged by lack of access to car, limited by age, heritage, disability, or financial means. The provision of transportation options that enhance choice are vital to Iowa and its economy. Actively managing demand, whether pre-trip or en-route, can reduce instances of congestion and travel delay. Furthermore, actively directing users away from single-occupant vehicles toward modes with available capacity can further reduce demand leading to more reliable trips for all users. ATDM approaches provide travelers with choices throughout the trip chain leading to network performance optimization and increased mobility and accessibility.

3.3 Sustainability

The next generation of Iowans need thoughtful management of the current transportation system. In most cases, the system requires primarily maintenance and rehabilitation. However, in some instances, the anticipated community growth exceeds the capacity of major transportation corridors. The mindset for potential expansion can often tend toward widening the roadway, but major corridor expansions pose a risk to disturbing community areas important to cultural, social, and environmental resources. The development of alternative corridor solutions that optimize the transportation system within its existing footprint is crucial to managing the long-term cost to Iowa residents and businesses.

ATDM approaches can maximize efficiency and return on existing investment by maximizing use of existing infrastructure. This includes directing traffic to routes and modes with available (i.e., unused) capacity.

3.4 Travel Reliability

Iowa travelers need to be able to make efficient trips with reliable travel times to engage in key community activities, like home life, work, school, shopping, and service. Travelers on commute trips and freight operators can risk significant, late-arrival consequences due to travel delays. The concept of travel reliability focuses on limiting user delays and associated costs, where possible. Strategies to synchronize traffic signals, manage roadway crashes and stalled vehicles, and pre-emptively address bad weather and work zone impacts all benefit travel reliability. Iowa needs additional design strategies that promote flow—particularly for corridors and urban communities that have high levels of travel demand compared to what the system has capacity to handle.

3.5 Resiliency

Resiliency is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover quickly from disruptions. The frequency of extreme weather and natural disasters has increased and can lead to devastating consequences for the transportation system. ATDM approaches can improve resiliency by reducing the effects of unforeseen events on the transportation system.

3.6 Congestion and Operational Issues

Iowa has a mature and reliable transportation system. There is little congestion or delay on the system as a whole. When issues are experienced, they are typically confined to specific locations and peak hours. While there may be instances where building additional capacity is the necessary solution to a congestion issue, this is becoming the exception rather than the rule. Strategies that better use existing infrastructure are preferable to adding lanes to the highway system, which results in increased right-of-way needs, construction costs, and long-term maintenance commitments.

4 ATDM CAPABILITY MATURITY FRAMEWORK SELF--ASSESSMENT

On November 29, 2022, Iowa DOT conducted a half-day CMF self-assessment workshop in Ankeny, Iowa. The purpose of the workshop was to develop a consensus evaluation of the current state of ATDM in Iowa and identify next steps in advancing the effectiveness of statewide efforts. The workshop objectives were to:

- Assess Iowa DOT's business processes and institutional elements to advance ATDM
- Identify actions that could improve those capabilities
- Provide information to:
  - Benchmark current practices
  - Inform SLP recommendations

Workshop participants identified current capability levels regarding key processes, organization, staff, and collaboration issues that may assist the state in defining priorities among an array of possible actions to improve statewide ATDM efforts. The self-assessment results helped identify gaps in ATDM capabilities that the SLP may be able to address.

4.1 CMF Workshop

The CMF Workshop conducted for the ATDM SLP was based on the FHWA traffic management CMF that was applied to ATDM. The framework focuses on an organization's internal processes and how well they support the strategies the agency is interested in pursuing. Three foundational capability dimensions are important for success in any endeavor: culture, organization and staffing, and collaboration. On that foundation, there are three dimensions that support effective TSMO strategies in general and ATDM strategies in particular: business processes, systems and technology, and performance measurement. This relationship is illustrated in Figure 5.

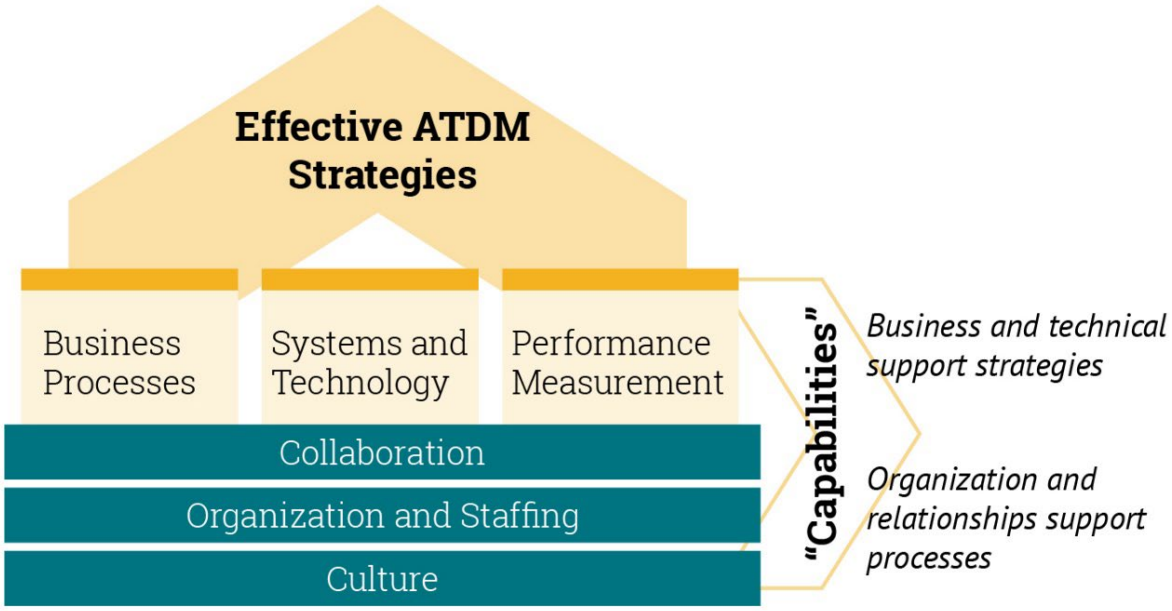


Figure 5: CMF Dimensions Supporting ATDM Strategies. Source: FHWA

The dimensions can be described as:

- Business processes including formal scoping, planning, programming, and budgeting (resources)
- Systems and technology including use of systems engineering, systems architecture standards, interoperability, and standardization
- Performance measurement including measures definition, data acquisition, and use
- Culture including technical understanding, leadership, outreach, and program legal authority
- Organization and staffing including programmatic status, organizational structure, staff development, and recruitment and retention
- Collaboration including relationships with public safety agencies, local governments, MPOs, and the private sector

The self-assessment workshop provided a facilitated discussion to support attendees in identifying the level of maturity in each of the capability dimensions. There are four levels of maturity in the self-assessment.

- **Level 1 Performed –** Activities and relationships largely ad hoc, informal and champion-driven, substantially outside the mainstream of other DOT activities
- **Level 2 Managed –** Basic strategy applications understood; support requirements for key processes identified and key technology and core capacities under development, but limited internal accountability and uneven alignment with external partners
- **Level 3 Integrated –** Standardized strategy applications implemented in priority contexts and managed for performance; ATDM technical and business processes developed, documented, and integrated into DOT; partnerships aligned

- **Level 4 Optimized –** ATDM as full, sustainable core DOT program priority, established on the basis of continuous improvement with top level management status and formal partnerships

Figure 6 illustrates the self-assessment process.

PROCESS IMPROVEMENT AREAS	WHAT IS IT	CAPABILITY AREAS			
Dimensions or Process Areas	Plans, Programs, Budgets	**LEVEL 1** Ad-Hoc, Low Level of Capability	**LEVEL 2** Managed, Medium Level of Capability	**LEVEL 3** Integrated, High Level of Capability	**LEVEL 4** Optimized, Highest Level of Capability
Business Process	Plans, Programs, Budgets				
Systems & Tech	Approach to Building Systems				
Performance Measurement	Use of Performance Measures				
Workforce	Improving Capability of Workforce				
Culture	Changing Culture and Building Champions				
Collaboration	Improving Working Relationships				

Figure 6: CMF Self-Assessment Process

Participants identified Iowa DOT's strengths and weaknesses for each dimension. At the end of the discussion, the participants came to consensus on Iowa DOT's level of maturity for each dimension. The results of the self-assessment were:

- Business processes: Level 2 – Managed. The Department implements a nominally systematic approach to traffic management to address immediate concerns. Traffic management approaches are operator driven and either static or based on time of day.
- Systems and technology: Between Level 2 (Managed) and Level 3 (Integrated)
  - Level 2 – Managed. The systems engineering process and ITS architecture are applied consistently within the traffic management context. The Department has advancements and technologies in spot locations.
  - Level 3 – Integrated. The Department applies advanced technologies but with a limited level of automation. Traffic management systems are replicated and integrated within operations, with standardized documentation.
- Performance measurement: Level 2 – Managed. The Department employs performance measurement assessments of traffic management strategies to primarily analyze impacts post deployment.
- Culture: Level 3 – Integrated. Traffic management is recognized as a core program that coordinates with other programs on an ongoing basis.
- Organization and staffing: Level 3 – Integrated. Traffic management staff members and their related knowledge, skills, and abilities are identified and established on a broad basis and within individual groups.
- Collaboration: Level 3 – Integrated. The Department collaborates on traffic management at a high level via regional stakeholder engagement.

4.2 Workshop Takeaways

Workshop participants identified potential actions to improve the dimensions assessed at the lowest levels: business processes, systems and technology, and performance measurement. These were all assessed at a level lower than 3. They also wanted to identify potential actions for collaboration, specifically to identify a mechanism to improve collaboration with local agencies. The actions identified are presented below. Not all actions listed were carried through as priorities.

4.2.1 Business Processes

Participants identified the following actions related to business processes:

- Determine funding stream for traffic management projects (capital funds and ongoing operations)
- Asset management system could help show a need for funding stream
- Create category of work to delineate within the program
- Build from recently established budget line item for highway helper and TMC operating costs
- Determine approach to convey the benefits of traffic management projects to decision-makers
- Use traffic management benefit/cost ratios to show project benefits
- Incorporate TSMO strategies in project concept development
- Evaluate changes to the State Transportation Improvement Program (STIP) to encourage cross-agency collaboration in funding priority initiatives

4.2.2 Systems and Technology

Participants identified the following actions related to systems and technology:

- Develop/procure traffic management asset management plan/system
- Long term: integrating with existing DOT-wide asset management system and plan

4.2.3 Performance Measurement

Participants identified the following actions related to performance measurement:

- Involve data scientists
- Use Iowa State University resources
- Maximize existing DOT resources by publicizing, training, and managing the use of dashboards and decision tools
- Determine key performance indicators (KPI)
- Align KPIs to identified department system objectives
- Engage a facilitator to be a catalyst to develop an initial set of KPIs
- Consider benefits of using an economist for market research, bigger picture look at project benefits
- Institutionalize and share project scoping tools

4.2.4 Collaboration

Participants identified the following actions related to collaboration:

- Traffic management collaboration meetings among metro agencies

- Technical committee within MPO has access to local engineers
- Monthly meetings as an initial frequency to build informal working relationships
- Focus on identifying/addressing issues; avoid general status updates

The full notes from the CMM workshop for each category are listed in Appendix C.

5 ATDM VISION AND GOALS

Iowa's ATDM vision was derived from the Department's Business Plan and Updated TSMO Plan. It was also derived from the priorities identified through stakeholder outreach. This includes Iowa DOT's State traffic operations engineer, each District's TSMO engineer, and representatives from Systems Planning, Location and Environment, and Traffic and Safety Bureaus. The CMF workshop results were a key driver for setting the ATDM direction, including the areas identified for improvement, which were: collaboration, business processes, systems and technology, and performance measurement.

5.1 ATDM Vision

Iowa DOT has adopted the following vision for ATDM in Iowa:

> *ATDM will support Iowa DOT in providing Iowans with an efficient transportation system. ATDM strategies can be utilized in key areas throughout the state to improve safety, reliability, accessibility, sustainability, and efficiency of the transportation system. ATDM can improve travel through interagency collaboration, a focus on sustainable infrastructure investments, and the use of innovative, effective technologies.*

5.2 ATDM Goals

The project team collaborated on goals that could help accomplish the ATDM vision. The process outlined in Figure 7 was introduced as a method to advance from high-level ideas down to actions that are assignable. Based on the areas identified for improvement, the Department developed the four goals shown in Table 4 to help make progress toward the ATDM vision. The intuitive way to chart progress was to define the goals so they aligned with the capability maturity areas identified as needing improvement. A strategic planning workshop was then held with Iowa DOT representatives to refine the definition of goals and further identify potential goal areas and objectives for each. Multiple goals were identified for each area, and informal objectives and strategies were created to support those goals. To refine the possible objectives to the plan's ultimate objectives, the Department needed to refine this work through the lens of priorities (Section 6). Once formalized, priorities provided the structure for developing specific ATDM strategies, tactics, and actions, which are identified later in the SLP (Section 7).

Figure 7: Strategic Planning Process

Table 4: ATDM Goals and Corresponding Rationale

Goal	Rationale
Collaboration Increase traffic management collaboration among Iowa DOT and partner agencies	When implementing ATDM, the effectiveness of most strategies is dependent on improving the coordinated performance of staff with and among multiple agencies, other transportation professionals, and public users. Engagement and sharing among stakeholders create a foundation for stronger business processes, improved systems and technology, and effective performance measurement.
Business Processes Implement enabling processes and funding for traffic management projects and ATDM activities	Steps and systems within transportation agencies need adaptation to consider system management strategies equally to traditional strategies, like roadway widening. Agency processes primed for enhancement include the identification and monitoring of system needs, development and assessment of alternatives, and financial programming and prioritization.

Goal	Rationale
Systems and Technology Improve ATDM systems and technologies	A focus on systems and technology enables strategic use of corridor ITS and management techniques that promote consistency to stakeholders and interoperability with partners. Further, corridor planning that leverages a systems-and-technology mindset benefits the agency by enabling monitoring and management in corridors with ATDM deployments. Finally, thoughtfulness in systems and technology eases the consideration of new and beneficial ATDM strategies when they emerge and become proven.
Performance Measurement Use performance management for ATDM	Performance measurement enables multiple users to assess how the transportation system is providing for its targeted users. A performance measurement mindset establishes key operating targets or characteristics and plans and deploys adequate capabilities to detect and synthesize those metrics. An emphasis on performance measurement also creates support for consideration and selection of strategies with a strong potential for performance improvement—especially those strategies that are lower cost, like ATDM strategies.

6 ATDM PRIORITIES AND GAPS

Chapter 6 documents a major workshop focused on linking ATDM Vision and Goals to current Iowa DOT priorities. Chapter 6 introduces all the priorities worth pursuing to affect the ATDM Vision and Goals and introduces gaps in the present agency and transportation system that could be addressed by this plan. Chapter 7 discusses the process to narrow the broader list of priorities to targeted strategies. Readers are encouraged to jump to Chapter 7 if they are just interested in the strategies being advanced.

The Department and project team worked from the goals of Chapter 5 to craft a five-year action plan. The first step of this action planning was to prioritize within the ATDM goals the specific desired accomplishments. The prioritization was achieved through a strategic planning workshop and leveraged a synthesis of agency planning priorities, strategic planning discussions, and consideration of industry best practices to focus and plan next steps in a resource-efficient manner. Upon considering the highest priority areas of focus, the team also needed to translate the goals from the broader industry terminology to better communicate within the Department what accomplishments were needed, and which agency resources would be needed. Table 5 connects and distills the ATDM goals with the preferred terminology in the Department to four ATDM priority areas: collaboration, funding, freeway management and arterial management.

Table 5: ATDM Goals and Priorities

ATDM Goal (Agency-Development Focused)	ATDM Priority Area (Agency Staff Activity Focused)	Rationale
Collaboration	Collaboration	Collaboration was selected due to its relevance and foundational nature to the CMF that enables agency readiness for effective usage of transportation system management. Activities in the collaboration priority area easily translate to the growth envisioned in the ATDM goal area.
Business Processes	Funding	Funding was selected for having effects on the maturation of each aspect of ATDM. Despite funding traditionally being assessed in the business processes area of the ATDM CMF, a main takeaway from the Department's CMF workshop was that funding is involved in each of the six capability areas, such as funding for staff and projects (both capital and ongoing operations costs). Department staff can be more easily assigned to

ATDM Goal (Agency-Development Focused)	ATDM Priority Area (Agency Staff Activity Focused)	Rationale
		actions/activities under funding labels than they would to business processes
	[Split into a piece of the priority areas Freeway Management and Arterial Management]	Business processes consider formal scoping, planning, programming, and budgeting (resources). Of that list, programming has significant differences between freeways and arterials. As staff resources address the freeway management and arterial management priorities, the ATDM goal for business processes will see the Department grow in capability maturity.
Systems & Technology	[Split into a piece of the priority areas Freeway Management and Arterial Management]	Systems and technology have many nuances between freeway and arterial systems. The arterial network in Iowa is heavily operated by local agencies, so Iowa DOT staff will take actions that are more supportive than leading in nature. Management of freeway systems and technologies are already a relative strength of Iowa DOT through their TMC, and growth in that priority area would be through standardizing new practices with staff and operators. Advancements in freeway management and arterial management priorities will contribute toward the goal of stronger system and technology performance.
Performance Measures	[Split into a piece of the priority areas Freeway Management and Arterial Management]	Performance measures are a key capability area, but they are also viewed by the Department as a sub-component of the work agency staff perform focused on arterial management and freeway management. As actions are deployed in the Arterial Management and Freeway management areas, the goal of using performance measures to advance ATDM will be increasingly satisfied.

Arterial management was the prominent need in the performance management dimension. This is based on the tremendous opportunity that exists to improve traffic signal efficiency throughout the state using advances in signal management and Iowa DOT's dedication to system optimization and

customer service. Freeway management was chosen to replace the dimension of systems and technology due to the advances already gained through the Department's Des Moines ICM study and the early identification of potential ATDM strategies on Iowa freeways. Specific priorities have been identified within these larger priority areas. Some of these priorities overlap with multiple priority areas, as shown in Figure 8. This section explains each priority area and the priorities/gaps associated with them.

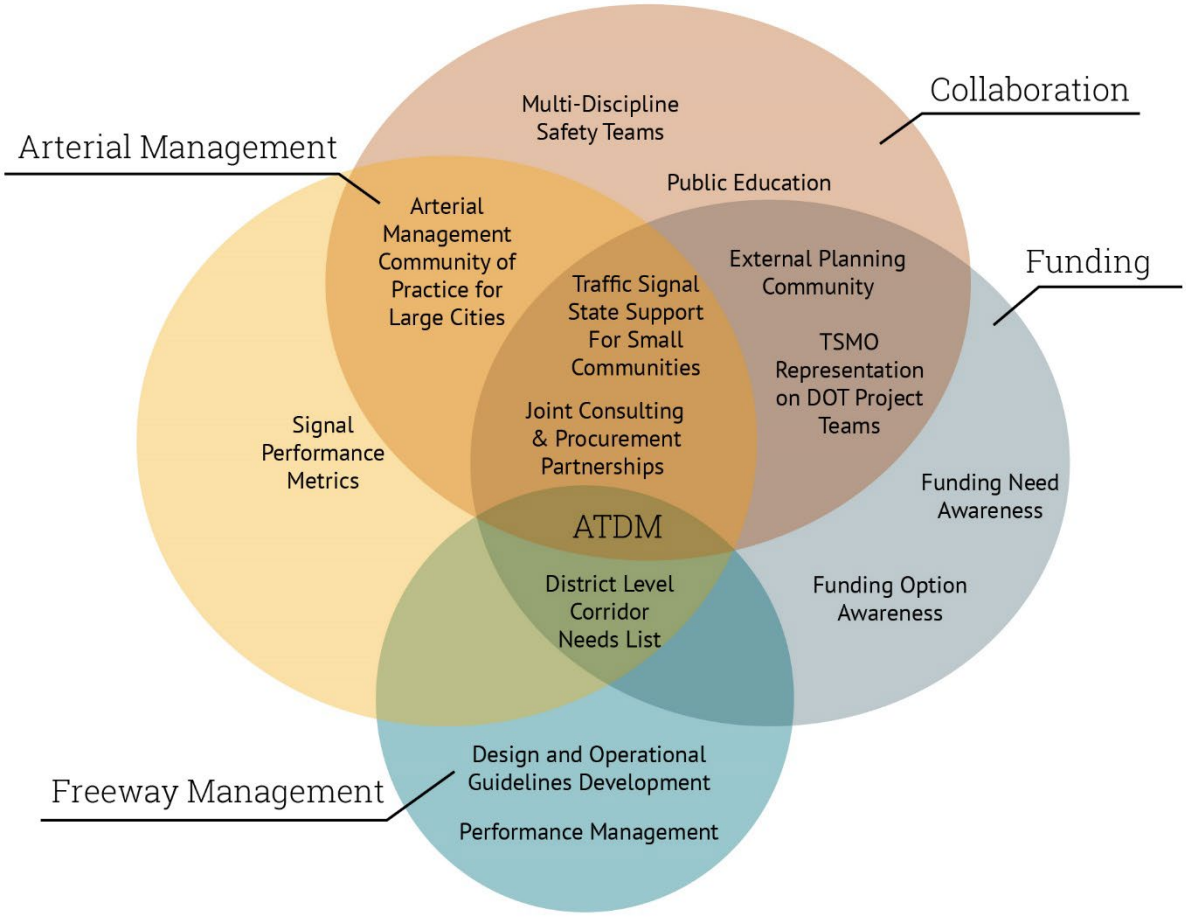


Figure 8: Identified Priority Areas and Associated Priorities

The four priority areas guided the development of strategies, tactics, and actions. This included an assessment of the level of staff and financial commitment to reduce gaps. Finally, through the strategy, tactic, and action selection process, a connection will be developed between those actions and the goal to increase capability maturity in key dimensions of collaboration, business processes, systems and technology, and performance measurement.

Each priority includes the rationale for being selected, a detailed description of the priority, and the gap(s) associated with pursuing the priority.

6.1 ATDM Priority Area #1: Collaboration

Collaboration is seen as the foundation for broader ATDM strategy implementation. When implementing ATDM, the effectiveness of most strategies is dependent on improving the

coordinated performance of each partner. Multiple collaboration areas were identified to advance ATDM and TSMO in general, including external agencies, internal DOT staff, and the public. Each area of collaboration requires a different approach with unique priorities and gaps. The Department will continue to expand collaboration in efforts documented in the 2022 TSMO Plan Update, but the following are highlighted for their criticality to identifying, funding, implementing, operating, and maintaining ATDM strategies.

6.1.1 Priority: Multi-Discipline Safety Teams (MDST)

Rationale: Many ATDM deployments rely on strong relationships with local agencies. These agencies are knowledgeable about local conditions and can help throughout the ATDM implementation process, from identifying ATDM needs to operations after implementation. Iowa DOT staff identified MDSTs as a valuable avenue to build these relationships as the groups already exist and focus on operational issues.

Description: MDSTs are a critical avenue for DOT staff to build relationships with local agencies. MDSTs focus on resolving local crash causes and enhanced crash response practices. The MDSTs have been in operation for several years. Twelve MDSTs have been formed and are in various states of activity. With ATDM strategies being most applicable to urban areas, this priority would focus on MDSTs that cover urban areas. The MDSTs cater to disciplines ranging from engineering to planners, law enforcement, emergency management, emergency responders, and education. Anecdotally, the MDSTs that have been the most engaging across disciplines have been associated with large construction programs given the dynamic conditions and heightened focus associated with work zone safety.

By attending and engaging in these groups, Iowa DOT will have the opportunity to discuss ATDM strategies and learn what the traffic management needs are from locals. The strategy fits with collaboration foremost because the agency—particularly Districts and the District TSMO engineers—gather information that will yield opportunities to enhance customer service. In time, especially after key relationships have grown through this type of collaboration, Iowa DOT will be able to seek partnerships with these collaborators to use ATDM to address safety and system reliability.

Gap: Districts are connected to MDSTs now, but the level of collaboration varies. The state TSMO and District TSMO engineers need to track Iowa DOT's level of engagement with the MDSTs and increase their level of engagement as ATDM strategies become an option for specific geographic areas. Actions in this priority over the next 5-year planning cycle should document existing engagement, assess geographies where increased engagement is appropriate, and plan staff to attend and track progress. Iowa DOT staff that regularly attend meetings will be able to promote issues to Department management. In turn, Department management can attend meetings selectively to market ATDM strategies as potential options to address the identified issues.

6.1.2 Priority: District-level, by Corridor, Traffic Management Needs List

Rationale: To plan ATDM deployments, traffic management deficiencies need to be identified at the local level.

Description: ATDM strategies are a significant investment into post-implementation operations and management, so localized evidence of recurrent traffic management needs supports the case for appropriate staffing levels. The current operation at Iowa DOT focuses on a reactive approach to

operational needs, but tracking corridors proactively would increase the agency's responsiveness to safety and reliability issues and improve service to customers ranging from municipalities to first responders and the public. The traffic management needs list is envisioned to be tracked at the district level, utilizing the District TSMO Engineer position as a responsible party or champion. The input to identify needs could come from a variety of sources, including qualitative and observational data from local operators and the public, and more quantitative Iowa DOT performance tools like ICE-Ops, Inrix, the Potential for Crash Reduction tool, and incident reporting from the TMC. Once compiled, the TSMO Process Guide can be used to help coordinate a multidisciplinary team and serve as a resource on common ATDM strategies that recommends actions to address the identified deficiencies. This priority overlaps with both the Collaboration and Funding priority areas.

Gap: The traffic management corridor needs list is a new initiative proposed by the ATDM SLP. The district-level list of corridor operational and management needs is likely to show most operational issues in larger cities and metropolitan areas and on the freeway system. A potential 5-year target is to have developed six district-level traffic management needs lists with an annual update cycle for at least the larger cities and metropolitan areas.

6.1.3 Priority: TSMO Representation on DOT Project Teams

Rationale: For ATDM to be implemented systematically, ATDM strategies will need to be included on larger projects that have traditionally relied on capacity expansion. Those project teams will need TSMO/ATDM representation to integrate these strategies effectively.

Description: ATDM strategies should be considered for every capacity, safety, weather resiliency, and other construction focused project. Iowa DOT's Iowa in Motion plan is clear that an agency focus is the stewardship and rightsizing of transportation infrastructure. ATDM (and more broadly TSMO) strategies are adaptable and can increase efficiency due to lower capital cost and fewer impacts than widening projects. For these strategies to be considered, TSMO representation must be included on DOT project teams from the project study phase to final design. In particular, the State TSMO engineer and District TSMO engineers can increase ATDM and TSMO adoption by being involved in more assignments to develop and review project concept statements, which represent a key pre-programming and project development step. A longer-term strategy is collaborating with other groups (such as Location and Environment) to train and develop a TSMO mindset, enabling them to serve as TSMO ambassadors/advocates, reducing the need for direct project team representation while allowing for ATDM strategies to still be considered. Implementation of this strategy requires collaboration among Iowa DOT staff crossing divisions, bureaus, and districts. In modifying this collaboration practice, ATDM strategies are likely to advance in more cases as part of larger projects when those that best understand and can represent those strategies are represented on project teams. This priority overlaps with the Funding priority area.

Gap: State and District TSMO engineers are involved in the project development phase of some projects. Additional data is needed to determine the extent of TSMO representation. Additionally, clarification of this gap should consider the recommendations developed for TSMO inclusion by the Project Development Division.

6.1.4 Priority: External Planning Community

Rationale: Collaborating with MPOs is critical to institutionalize ATDM in Iowa, given their involvement with long range planning and federal funding distribution.

Description: MPOs create Long-Range Transportation Plans (LRTP) and fiscally constrained Transportation Improvement Programs (TIP) that identify all federally funded projects and funding sources across all owning and operating agencies in the region. Collaboration among Iowa DOT and MPO staff is needed to integrate ATDM into LRTPs and TIPs. Collaboration may take the form of technical support at the long-range planning stage, increased interagency collaboration in corridor studies, and joint development and upkeep of ITS architectures. The 2022 TSMO Plan update noted a policy-level committee could be formed to increase focus on steps that may lead to broader TSMO (and thus ATDM) consideration by planning partners, like the Iowa Advisory Council on Automated Transportation. This priority overlaps with the Funding priority area.

Gap: Iowa has 9 metropolitan planning organizations and 18 regional planning affiliations. Each MPO must develop an update to their long-range transportation plan every 5 years. There is currently a disconnect in these plans between identifying traffic management needs and considering non-capacity solutions when assigning projects and funding to address those needs. Further assessment into current MPO plans is needed to determine a reasonable 5-year focused target of planning partners to include ATDM/TSMO projects in planning outcomes.

6.1.5 Priority: Public Education

Rationale: Public support is needed for ATDM strategies to be implemented. Many ATDM strategies are new to Iowa, and public education is needed before support can be achieved.

Description: Public education is most effective when the public will have a near-term opportunity to either experience the strategies or to contribute to a stage of implementation—even just the development of a plan or milestone of a corridor design. A communication strategy should be developed that targets opportunities, such as ATDM projects that advance to programming originating from the Des Moines ICM study, for developing public campaign materials. Materials developed from these more focused campaigns can then be shared selectively with the public to increase awareness of ATDM as a future option in their community.

Gap: Public education campaigns have limited opportunity at this time with no ATDM projects programmed. Additional development on ATDM project programming will dictate future opportunities for public education campaigns. Materials can also be developed so they are on-hand when needed. Materials can be rather basic initially, and developed further as strategies are considered prior to implementation. These materials can be shared easily at MDST meetings or used internally to help integrate ATDM strategies within traditional construction projects. Later on, they can be used as the basis for developing public outreach materials and sharing with the media. See Appendix A for an ATDM awareness handout that was developed as part of this SLP development.

6.2 ATDM Priority Area #2: Arterial Operations

Active traffic management strategies for arterials can consider a variety of strategies targeted at improving corridor operations. More immediate strategies involve improving operations at

signalized intersections. These strategies include traffic signal timing optimization, adaptive traffic signal control, and transit signal priority. Improving the traffic signal performance has been identified by Iowa DOT as a priority strategy to catalyze ATDM implementation in Iowa. There are applications for both small and large cities that operate signals on state routes and on key routes that parallel and cross the state system. As Iowa DOT increases focus on transportation performance, customer service, and innovation, traffic signal enhancements can represent a low-cost investment with high return. A major limitation is that Iowa DOT does not own or operate traffic signals in most situations, so Iowa DOT has not focused resources toward signal operation. However, Iowa DOT can leverage significant resources in capital funding, operations--focused workforce, support contracts, and partnerships with university researchers to advance traffic signal performance. Iowa DOT SLP team members focused heavily on opportunities to leverage the use of Automated Traffic Signal Performance Measures (ATSPM) to address a significant perceived need for traffic signal operational support to small cities and counties. Priorities in this priority area focus on financial and technical support.

6.2.1 Priority: State support for small communities' traffic signals on state routes

Rationale: Throughout the state, small communities do not have the resources to manage their traffic signals actively. For the signals that are on state routes, Iowa DOT support would help enhance their performance.

Description: A part of this support would be helping to monitor signal health and decrease the down time of signals that need repair. Additionally, Iowa DOT can explore the option of operating signals located within unincorporated areas, easing the burden on local counties. Collaboration will be essential to ensure local communities see this opportunity as a partnership and not the DOT overstepping. This priority overlaps with both the Collaboration and Funding priority areas.

Gap: A support program does not exist currently. Iowa DOT will need to assess the partnering process and identify ways Iowa DOT can support local communities. With multiple avenues of support available, it could vary based on specific community needs and desires.

6.2.2 Priority: Signal Performance Metrics

Rationale: To increase signal performance statewide, metrics need to be identified to define what success is and how to measure it.

Description: Creating signal performance metrics would allow for signal performance to be compared throughout the state and identify signals in most need of improvements. ATSPMs allow for real-time signal health and performance monitoring.

Gap: Consistent signal performance standards do not exist. Iowa DOT can leverage the working relationship with Iowa State University's Institute for Transportation (InTrans) to develop these standards.

6.2.3 Priority: Arterial management community of practice for large cities

Rationale: Large cities have more resources to manage their signals actively but could benefit from peer exchanges with other communities and Iowa DOT to increase signal performance and explore innovative technologies.

Description: This community could be statewide or smaller groups could be formed for larger metro areas. Meetings could include sharing feedback on products used in local communities and, vendors sharing new technologies/products that are available. Iowa DOT would facilitate the group(s), which could be an avenue to get local feedback and build relationships. This priority overlaps with the Collaboration priority area.

Gap: No community of practice exists currently. Outreach would be needed with large cities to pitch the idea and gauge interest.

6.2.4 Priority: Joint consulting and procurement partnerships

This priority overlaps with both the Funding and Collaboration priority areas.

Rationale: By partnering together, economies of scale can bring down the costs for individual agencies and improve efficiency when working with vendors and consultants.

Description: Partnerships would be advantageous for projects that cross jurisdictional boundaries. These partnerships could grow out of Iowa DOT support with smaller communities and the community of practice with large cities. Iowa DOT could assist in a facilitation role to establish these partnerships and, for technical support opportunities, could serve as lead agency, as with the TEAP program.[2] Opportunities for on-call consultant support to advance arterial management priorities could leverage the existing Traffic and Safety On-Call or Traffic Operations On-Call with additional funding or through a new on-call contract.

Gap: Iowa DOT's Traffic and Safety On-Call operates in a limited fashion to address this priority but may be underfunded depending on the level of buy-in from partnering communities. No procurement partnerships exist currently. Iowa DOT would need to collaborate on what the partnerships would look like and how the financial aspect of the partnership would work.

6.3 ATDM Priority Area #3: Freeway Management

While traffic signals on state-route arterials have been a large focus of the project team, Iowa DOT has already taken steps to implement freeway ATDM strategies, and that progress should be integrated with ATDM strategic planning. In the area of freeway-focused ATDM, Iowa DOT has studied and implemented a few strategies. Ramp metering and dynamic shoulder use have been studied through the Des Moines ICM project, and a simplified form of lane management is a potential opportunity in Council Bluffs as part of the dual divided system's redundancy and full color DMS for dynamic route guidance. Other potential freeway strategies include dynamic speed advisories/limits and queue warnings. This priority is focused on building on work completed previously in developing a systematic approach for statewide deployment. Freeway management strategies depend on collaboration, but that collaboration is heavier on internal Iowa DOT teams and less with external organizations given the nature of freeway operations. However, collaboration with local agencies is still important. The corridor needs list would be developed in part from local agency input as well as collaboration on freeway strategies that need to operate smoothly between local and state systems, such as ramp metering. Partnerships with responders will be key to successful implementation. The two priorities in this area, design/ operational standards development and performance management, aim at doing the groundwork to be

[2] Iowa Traffic Engineering Assistance Program (TEAP) | Iowa DOT

prepared for ATDM freeway implementation. These priorities were selected because they can be pursued before projects even get programmed, removing execution barriers.

6.3.1 Priority: Design and Operational Guidelines Development

Rationale: Design and operational guidelines would make systematic ATDM freeway strategy deployment easier and more efficient. This priority focuses on thoughtful development of guidelines from lessons learned as ATDM strategies are studied and implemented. The guidelines can change over time but allow for easier supplementary deployments in other areas of the state.

Description: Design and operational guidelines would build on current Iowa DOT efforts in the ATDM space and consolidate best-practices and lessons learned along the way. As an example, Iowa DOT uses robust manuals to lead the design practice in disciplines like roadway and bridge design. These manuals allow for a large community of practice and consistency in approaches. Yet, few in the agency (or its supporting consultant and vendor community) apply this level of consistency for ATDM in Iowa because a limited number of Iowa DOT staff have been exposed to the design and operational concepts developed in Des Moines and Council Bluffs ATDM efforts. However, with the right tools, Iowa DOT may be better equipped to consider freeway management concepts more readily, like dynamic shoulder use for major freeway sections such as Interstate 80 and Interstate 380. Agency staff looking at those future projects could begin with a Concept of Operations and System Requirements template common to all Iowa projects, as well as design guidance developed through initial Iowa deployments.

Gap: Standards for ATDM freeway strategies do not exist in Iowa. ATDM freeway strategies are just emerging in Iowa and so guidance only exists as project-level reports. With freeway ATDM strategies being implemented throughout the country, peer exchanges could be beneficial to draw on standards from other states as a starting point.

6.3.2 Priority: Performance Management

Rationale: It is important to track the performance of deployed ATDM strategies to know if changes are needed. It also helps track the effectiveness of ATDM strategies over time. For example, tracking performance for ramp meters allows for awareness of prevailing conditions and identifies when signal timing modifications are needed.

Description: Standard performance measures for ATDM deployments should be determined, while recognizing that specific strategies could need different measures based on their unique qualities. Performance measures should be tied to operations objectives and provide valuable information to management and operators, taking the “few good measures” approach. These measures should be able to both determine if there is a need for ATDM in the area (pre-implementation) and the effectiveness of the strategy (post-implementation). For example, to answer the question of whether freeway operations provide adequate mobility, an appropriate measure may be average corridor speed. The measure of average corridor speed compared to the contextual information of the average speed over the last month would help operating staff assess if conditions meet the agency standard for mobility and identify potential next steps if operations are unsatisfactory.

Gap: A performance management plan for ATDM freeway strategies does not exist currently. A strategic planning approach is recommended to developing such a plan, leveraging key organization stakeholders to discern and prioritize which measures are most valuable to Iowa DOT

operations. Industry review, as conducted in the Des Moines ICM study, and peer exchanges would be beneficial for this priority to learn how agencies that have implemented ATDM freeway strategies are tracking performance.

6.4 ATDM Priority Area #4: Funding

Sustainable funding is critical to make ATDM implementation a reality in Iowa. Funding needs and sources are the two main aspects to prioritize. Funding needs come from potential ATDM projects and their estimated costs (including operational costs), which can be tied to the corridor needs list mentioned in the Collaboration priority area. Funding sources help locate funding to meet the corridor needs lists and thus get projects programmed. These can be from state or federal sources and include relevant grant programs. This funding area includes both capital funds and operations and maintenance funding. The 2022 program was the first to create an operations line item for operating costs like the TMC and highway helper. Compiling funding needs and options for operational costs would make on-going reporting of the return on investment of these funds easier. This reporting is critical to support proper funding in this category and potentially open the door for increased funding allocations to operational spending.

6.4.1 Priority: Awareness of Funding Needs

Rationale: To identify funding for ATDM, cost estimates are required to determine how much funding is needed for potential deployments, as well as operations and maintenance costs related to both current and future ATDM deployments.

Description: As part of funding needs awareness, the role of the ICE-OPS tool should be considered. The needs can take the form of rough order of magnitude costs for ATDM strategies and transition to estimated costs for priority strategies that are identified through the district-level traffic management needs list.

Gap: No Iowa-specific rough order of magnitude costs for ATDM strategies exist. Deployments from other states and the research associated with them offer great resources to estimate costs but would need to be adapted for the specific applications that Iowa wants to pursue. To do this effectively, it would be beneficial to have an idea of what ATDM strategies would be proposed in Iowa.

6.4.2 Priority: Awareness of Funding Options

Rationale: By increasing funding option awareness, individual funding sources can be evaluated for the potential to increase funding levels if shortfalls are present.

Description: An exhaustive and relevant list of ATDM funding sources would help analyze where funding could come from and the amount of funding available from each source. Iowa DOT receives funding from several federal sources that are typically used for more traditional highway or bridge projects but can also be used for ATDM related projects. Non-ATDM funding sources should also be analyzed as Iowa DOT spends heavily on major interstate capacity projects. If ATDM deployments can meet the need at lower costs, then the money saved can go to other program priorities. Funding options to include are discretionary grant programs, local funding sources, and environmental/carbon reduction programs. One option is to create a table that has all potential funding sources listed on the vertical axis and potential ATDM strategies listed on the horizontal

axis. In organizing the funding opportunities with strategies in that manner – its far easier for agency staff and external partners to identify (or spot) the right opportunity. In some areas of industry this type of quick reference for easy selection of opportunities is called a spotting guide – and that's the term adopted here. The spotting guide would indicate which sources could be used to fund potential strategies.

Gap: No exhaustive and relevant list of ATDM funding sources (state and federal) exists. There is information available for funding sources, but it would need to be compiled into a coordinated, comprehensive list (or table graphic as mentioned above).

7 ATDM STRATEGIES, TACTICS, AND ACTIONS

Strategies presented in Chapter were created to progress the goals and objectives Iowa DOT has set for ATDM. Implementation of strategies, tactics, and actions will be conducted on an as-needed basis to focus resources on the most impactful strategies at the time. The timeline at the end of the chapter provides the order of tactics needed to implement each strategy but the durations are subject to change.

Using ATDM priorities as a guide, the Department sought to identify specific ATDM strategies, tactics, and actions to address them. A strategy is a high-level approach for working toward meeting specific ATDM service layer goals and priorities. ATDM strategies were developed to address each of the ATDM priorities. A total of five ATDM strategies were developed, with at least one mapping to each ATDM priority (Table). Each strategy is intended to be a broad and long-term approach that guides decision-making and resource allocation.

Table 6: Mapping of ATDM Priority Areas, Priorities and Strategies

ATDM Priority Area	ATDM Priority	ATDM Strategies
1. Collaboration	Multi-Disciplinary Safety Teams	Strategy 1: Increase ATDM Collaboration, Awareness
	TSMO Representation on Iowa DOT Project Teams	
	External Planning Community	
	Public Education	
	District-Level Traffic Management Needs List	Strategy 2: Identify Locations Where ATDM Can Address Needs and Deficiencies
2. Arterial Management	State Support for Small Communities' Traffic Signals (State Routes)	Strategy 3: Enhance State Support for Local Agency Traffic Signal Operations
	Signal Performance Standards	
	Community of Practice on Signals for Large Cities	
	Joint Consulting and Procurement Partnerships	
3. Freeway Management	Design and Operational Standards Development	Strategy 4: Develop Frameworks for Freeway-Based ATDM Strategy Implementation and Evaluation
	Performance Management	
4. Funding	Awareness of Funding Needs	

ATDM Priority Area	ATDM Priority	ATDM Strategies
	Awareness of Funding Options	Strategy 5: Develop Awareness of ATDM Funding Needs and Opportunities

7.1 ATDM Strategies, Tactics, and Actions Details

This section describes the identified ATDM strategies and their corresponding tactics and actions. Initially, each strategy is described. Following this description, associated tactics are described. For each tactic, associated actions are listed to give more clarity on the types of activities that may need to be undertaken to complete the tactic and work toward completing each strategy. Similarly, after each tactic is discussed, attributes of each strategy are presented to help staff understand the estimated timing and resources that may be required to execute the strategy. The following attributes are provided:

- Strategy phasing: ATDM strategies may be initiated individually or in combinations, and undertaken consecutively or concurrently, as prioritized by Iowa DOT.
- Strategy champion(s): For each strategy, an Iowa DOT champion(s) is identified to oversee its completion. Iowa DOT champions may need to identify and task specific individuals, who have the required knowledge and skills, with completing associated tactics and actions.
- Progress indicator(s): Project champions will need to understand when strategies are complete and/or to assess whether resources should be allocated toward continuing strategies. Progress indicators provide context to better understand when strategies will be complete so decisions regarding resources can be made effectively.
- Rough order of magnitude cost: Estimated costs to complete each strategy have been provided. Costs are presented in the following ranges: low (estimated to be less than $100K), mid (estimated to be more than 100K but less than 250K), and high (estimated to be greater than 250K). Actual cost will be dependent on the final scope of each strategy (and associated tactics and actions).

7.1.1 Strategy 1: Increase ATDM Collaboration, Awareness, and Understanding

This strategy seeks to increase awareness of ATDM strategies, their benefits, and applications among a wide range of stakeholders. This includes individuals and entities responsible for planning and programming projects as well as those who may be impacted by them. The goal is to increase awareness levels to foster a collaborative environment where ATDM strategies can be considered equally among other alternatives. The tactics associated with this strategy are aimed at specific audiences. Depending on the audience and desired outcomes, the timelines for completing each tactic will likely vary starting with internal collaboration and awareness, then external agency, and then public outreach and education.

Implementation details for Strategy #1 are shown in Table 7.

7.1.1.1 Tactic #1.1: Increase Internal Agency Collaboration and ATDM Awareness

This tactic seeks to increase awareness of ATDM concepts, their benefits, and applications among Iowa DOT staff. It also includes greater collaboration among TSMO staff and staff associated with

other disciplines. The purpose of this tactic is to integrate understanding of TSMO concepts during concept development and project planning so they can be considered among potential project alternatives. The goal is to increase awareness of how TSMO strategies can support projects, increase cost-effectiveness, and help deliver agency goals and objectives. This tactic will begin prior to the other tactics associated with this strategy to prepare the Department effectively for subsequent efforts to increase awareness with external agencies and the public. Specific actions that may be required to implement this tactic include:

- Action #1.1.1: Identify TSMO staff to serve as the internal (Iowa DOT) ATDM champion(s).
- Action #1.1.2: Train TSMO champion(s) on ATDM philosophies and concepts.
- Action #1.1.3: Develop ATDM awareness/marketing materials for internal consumption.
- Action #1.1.4: Invite TSMO champion(s) to participate on Iowa DOT Project Teams during project planning and programming phases.
- Action #1.1.5: Recognize new TSMO ambassadors as they begin adopting TSMO in their projects.

7.1.1.2 Tactic #1.2: Increase External Agency Collaboration and ATDM Awareness

This tactic seeks to increase awareness of ATDM concepts among parties outside Iowa DOT that may not be familiar with related concepts. This includes external partners such as municipalities, MPOs, regional planning affiliations, law enforcement and other emergency response agencies, etc. Iowa's Statewide Multi-Discipline Safety Teams (MDST) are comprised of individuals from several of these agencies and may represent an effective forum through which Iowa DOT can initially collaborate with external agencies and increase ATDM awareness.

This tactic can be performed by the same TSMO staff identified in Tactic #1.1 or by district planners, depending on staff availability and workload. For the purposes of this plan, it is assumed that all TSMO staff will be trained on ATDM concepts and have the required ATDM understanding to serve as external agency ATDM advocates. Awareness/marketing materials developed in Tactic #1.1 can be leveraged and tailored to external audiences. Specific actions that may be required to implement this tactic include:

- Action #1.2.1: Identify meetings where issues/concerns can be addressed using ATDM and have ATDM champions attend.
- Action #1.2.2: Build relationships with external agencies and individuals, particularly those participating on MDSTs throughout the state.
- Action #1.2.3: Develop ATDM awareness/marketing materials for external agency consumption.
- Action #1.2.4: Increase efforts to collaborate with MPOs and regional planning affiliations (RPAs).
- Action #1.2.5: Pilot working with one or more MPOs on a TSMO project list in the region's TIP or LRTP.

7.1.1.3 Tactic #1.3: Increase Public Understanding of ATDM

This strategy seeks to increase awareness of ATDM strategies among the public. This includes educating the public on the reasons for ATDM, how strategies are implemented, how to comply with the strategies, and potential consequences for non-compliance. The timing of this tactic is dependent on timeframes for when specific ATDM strategies are anticipated to be implemented.

Ideally, this tactic should begin no later than 1 year prior to the rollout of the specific ATDM concept.

- Action #1.3.1: Develop a public communications strategy that identifies the types of users that may be impacted by ATDM strategies, the specific communication needs of each type, and a tailored approach for disseminating information.
- Action #1.3.2: Develop ATDM awareness/marketing materials for public consumption.
- Action #1.3.3: Disseminate information to the public following the public communications strategy developed in Action #1.3.1.

Table 7: Strategy #1 Implementation Details

Strategy #1: Increase ATDM Collaboration, Awareness, and Understanding			
Champion	Statewide and District TSMO Staff and Strategic Communications		
Progress Indicators	Iowa DOT can assess the progress of this strategy by documenting the number of meetings that District TSMO staff attend, number of informational materials developed by year, or number of Iowa DOT interactions with the media. Progress of Tactic #1.2 can also be measured in the number of planning bodies that have adopted ATDM into funded projects.		
	Tactic 1 Increase Internal Agency Collaboration and ATDM Awareness	Tactic 2 Increase External Agency Collaboration and ATDM Awareness	Tactic 3 Increase Public Understanding of ATDM
Phasing	Near-Term (0–3 years)	Near-Term (0–3 years)	Near-Term (0–3 years)
Rough Order of Magnitude Costs	Low <$100K	Low-Medium ~100K	Medium $100K–$250K

7.1.2 Strategy 2: Identify Locations Where ATDM Can Address Needs and Deficiencies

This strategy will improve the process of identifying locations where specific ATDM applications can be implemented to deliver greater efficiencies. This strategy leverages efforts to increase collaboration among internal and external stakeholders in Strategy 1. Through greater collaboration on operational issues and concerns, TSMO staff can serve as better ATDM advocates and enhance understanding of how ATDM can be applied, leading to more successful and cost-effective outcomes. This includes working with internal and external entities to raise awareness of operational issues and traffic management needs. This strategy will help integrate ATDM understanding and concepts into more traditional planning processes. More specifically, it will help identify locations and forums through which they can be implemented and discussed, respectively.

Implementation details for Strategy #2 are shown in Table 8.

7.1.2.1 Tactic #2.1: Develop District Level Traffic Management Needs Lists

This tactic will establish and maintain separate traffic management needs lists for each DOT district. The feasibility and screening process and its results—discussed in Appendix B—can be a good starting place to identify specific ATDM applications and needs. The needs lists will be developed and maintained by a designated staff member within the district. The list will be updated periodically, on at least an annual basis. Lists for each district can be rolled up into a master list for inclusion into other Iowa DOT planning efforts. TSMO staff can review and recommend actions to address identified deficiencies. Lists can also be a tool for closer collaboration with external agencies, particularly if needs and issues cross jurisdictional boundaries. Traffic management needs lists would focus on issues big and small and may not represent specific projects. The needs list could be a precursor to decisions regarding application of on-going statewide projects (e.g., signing and striping). It could also be the source for new concept statements or enhancements to projects in development as they move toward inclusion in the Iowa DOT STIP through existing processes.

- Action #2.1.1: TSMO staff will coordinate with District management to introduce the idea of a traffic management needs list and explain its intended use and importance.
- Action #2.1.2: TSMO and District staff will coordinate to identify existing traffic management needs that are either known or documented in regional and state plans.
- Action #2.1.3: Formalize the process by which traffic management needs are documented, shared, and organized.

Table 8: Strategy #2 Implementation Details

Strategy #2: Identify Locations Where ATDM Can Address Needs and Deficiencies	
Champion	TSMO Staff and District Leadership
Progress Indicators	This tactic will be complete once a formal district-level traffic management needs lists is developed for each district. However, performance should be monitored every year to verify that (1) the lists are updated and (2) their value and benefit are assessed.
	Tactic 1 Develop District Level Traffic Management Needs Lists
Phasing	Near-Term with Annual Updates (0–3 years)
Rough Order of Magnitude Costs	Low <$100K

7.1.3 Strategy 3: Enhance State Support for Local Agency Traffic Signal Operations

This strategy seeks to better understand how Iowa DOT can support local agency traffic signal operations. The strategy identifies local agency traffic signal operational needs and determines how DOT resources can be leveraged strategically to support their efforts. The overarching goal of this strategy is to develop and strengthen local agency partnerships and work collaboratively to identify low-cost methods for identifying operational issues and develop approaches to resolve

them. Initial efforts covered by this SLP will be limited to a small number of local agencies to determine potential value and benefit of partnering to support local agency traffic signal operations. Local agencies to be targeted initially may be ones where improved traffic signal operations can support not only local agency operations, but operation of state highways as well. For example, signalized corridors where traffic may be diverted a result of special events, construction, or other events on the state highway system.

Implementation details for Strategy #3 are shown in Table 9.

7.1.3.1 Tactic #3.1: Determine DOT Support for Small Community Traffic Signal Improvement Needs

This tactic seeks to answer the question, how can Iowa DOT support small community traffic signal needs? This tactic will identify a relatively limited set of small communities that operate traffic signals on the state transportation system, but struggle to maintain the signals due to a lack of resources. Once small communities are identified, Iowa DOT can collaborate with each to better understand their traffic signal operational needs. Formal interviews will be conducted to assess the types of resources each agency has, how they manage their traffic signal programs, including how they are notified of issues, and the timelines for addressing them. Each interview will be focused on understanding local issues and identifying methods the DOT can use to support these needs.

- Action #3.1.1: Map small communities that own/operate traffic signals on state highways or other major corridors that connect with Interstate highways.
- Action #3.1.2: Collect information on the safety and operational issues of the signals that were mapped
- Action #3.1.3: Select a small set of communities (3 to 5) to interview.
- Action #3.1.4: Review feedback collected from interviews to assess how DOT can support community traffic signal needs.
- Action #3.1.5: Coordinate with applicable communities to identify an approach for working together and identifying potential solutions.

7.1.3.2 Tactic #3.2: Develop a Set of Consistent Traffic Signal Performance Metrics

This tactic will develop unique sets of traffic signal performance metrics that can be used statewide and applied consistently among similar types of agencies. It is acknowledged that success means different things to different communities, and success may be influenced by a range of attributes inherent to each community, such as available resources, available staffing and workloads, and each signal program's level of sophistication. Therefore, this tactic will be, in part, informed by the results of the small community needs identified in Tactic #3.1, but is intended for communities of all sizes. The goal is to develop a targeted set of performance metrics tailored to an agency's level of sophistication that can be applied consistently to evaluate traffic signal performance of similar signal programs. It is envisioned that at least three targeted sets of traffic signal performance metrics will be developed, one for each of the following three groups of traffic signal operators.

- Low sophistication – Communities in this category may not have the resources to actively monitor and maintain their traffic signals on a daily basis or in response to events that may

impact traffic signal performance. For example, metrics in this category may be useful for justifying updates to outdated equipment or the need for engineering assistance.

- Growing sophistication – Communities in this category may have some resources to actively monitor and maintain their traffic signals but may be challenged in how they respond to certain events. Communities in this category may be taking steps to advance the level of sophistication of their traffic signal programs but have yet to reach their desired state of operations. Metrics in this category may be useful for determining locations where additional resources should be applied (e.g., hot spots) and for prioritizing allocation of limited resources to maximize benefits.
- Advanced level of sophistication – Communities in this category have ample resources to actively monitor and maintain their traffic signals. Communities in this category may still be looking to improve signal operations but, for the most part, have mature signal programs that have dedicated staff to monitor and respond to issues and/or embraced advanced technologies to alter traffic signal operations for a range of issues and events that may impact traffic signal performance. Metrics in this category may help enhance visibility into real-time issues and conditions for continuous improvement.

Metrics will be developed to help agencies determine their traffic signal performance. A limited number of performance metrics are envisioned to keep related efforts simple and straight forward while reducing the agency's required level of effort and encouraging greater adoption. Performance results will help Iowa DOT determine where to apply resources in support of community efforts to improve traffic signal performance.

- Action #3.2.1: Conduct a literature review to document the range of traffic signal performance metrics and inherent attributes of each (e.g., data required, technologies for collecting required data, etc.).
- Action #3.2.2: Disseminate the literature review results among a limited set of traffic signal operators (roughly 9 traffic signal operators; 3 operators within each of the identified classifications) and document the feedback received.
- Action #3.2.3: Define clear and measurable objectives for signal programs within each category (3 sets). Objectives should be specific, measurable, achievable, relevant, and time-bound (SMART).
- Action #3.2.4: Investigate how Iowa DOT's partnership with Iowa State University (InTrans) can be leveraged to support performance metric development and the requirements that may be needed to monitor them effectively.
- Action #3.2.5: Develop tailored metrics (up to 5 metrics) for each classification of signal operators based on the results of the prior actions.

7.1.3.3 Tactic #3.3: Establish Traffic Signal Community of Practice

This tactic aims to share traffic signal lessons learned and effective practices among participating local agencies. The traffic signal performance metrics identified in Tactic #3.2 would be leveraged and act as a base for developing and understanding other effective practices. Similarly, efforts to increase awareness of ATDM among external agencies, particularly participation in the MDST meetings, may help increase awareness of this tactic and solicit interest to participate within the community of practice. However, it should be noted that the purpose of this tactic is to conduct a more comprehensive scan of industry practices and to raise awareness of a broad range of effective

traffic signal operational practices. Furthermore, this tactic can leverage the small community traffic signal needs identified in Tactic #3.1 to focus research efforts. The goal of this tactic is to establish a community of practice among all interested traffic signal operators in Iowa.

- Action #3.3.1: Leverage DOT staff participation in local, regional, and state operational forums to promote the idea of a formalized traffic signal community of practice and solicit participation.
- Action #3.3.2: Invite interested agencies to participate in a regularly scheduled, periodic workshop to solicit traffic signal issues and concerns, develop a listing of topics for research, and present effective practices.
- Action #3.3.3: Develop case studies and informational briefs based on feedback generated in the regularly scheduled, periodic meetings that can be shared more broadly among participating and non-participating members.

7.1.3.4 Tactic #3.4: Develop Cross Jurisdictional Traffic Signal Partnerships

This tactic will break down barriers between multiple agencies that operate traffic signals on common corridors. The primary goals are to identify best practices for developing these partnerships, implement improvements to deliver greater operational efficiencies, and realize cost efficiencies through cooperation and coordination. The tactic also seeks to better understand Iowa DOT's role in supporting these activities and to encourage cooperation and communication among agencies.

- Action #3.4.1: Identify/prioritize signalized corridors that span multiple jurisdictions.
- Action #3.4.2: Coordinate with traffic signal owners/operators along signalized corridors.
- Action #3.4.3: Use information gathered to assess Iowa DOT's role in fostering partnerships.

Table 9: Strategy #3 Implementation Details

Strategy #3: Enhance State Support for Local Agency Traffic Signal Operations				
Champion	TSMO Staff			
Progress Indicators	The first progress indicators would be the resulting map and interview notes from Tactic #3.1. Following the initial community outreach, the next major progress indicator would be the completed sets of traffic signal performance measures. The mid-term tactics would show progress through counting the meetings and attendance of the community of practice and counting the participants in traffic signal partnerships. Improvements in this foundation of proactive signal management would lead to an increase in measurable benefits, such as reduced delay, fewer stops, reduced vehicle emissions, and fewer detection failures.			
	Tactic 1 Determine DOT Support for Small Community Traffic Signal Needs	Tactic 2 Develop a Set of Consistent Traffic Signal Performance Metrics	Tactic 3 Establish Traffic Signal Community of Practice	Tactic 4 Develop Cross Jurisdictional Traffic Signal Partnerships
Phasing	Near-Term (0–3 years)	Near-Term (0–3 years)	Near-Term (On-Going)	Mid-Term (3–5 years)

Strategy #3: Enhance State Support for Local Agency Traffic Signal Operations				
			(0–3 years)	
Rough Order of Magnitude Costs	Medium $100K–$250K	Medium $100K–$250K	Low <$100K	Medium $100K–$250K

7.1.4 Strategy 4: Develop Frameworks for Freeway-Based ATDM Implementation and Evaluation

This strategy seeks to be proactive in developing formal frameworks for individual ATDM concepts (e.g., ramp metering) that the Department is planning to implement or study further. These frameworks will serve as annotated outlines or boilerplate templates for planning-level documentation that may be required by ATDM projects. The outlines and/or content included within each individual ATDM concept framework will be consistent among potential projects regardless of where they will be implemented within the state. This will allow practitioners the ability to jump start planning their respective projects and will raise awareness of the types of information that may be required, or questions that need to be raised, when developing individual projects.

Anticipated frameworks include (1) concept of operations and (2) system requirements. Frameworks may also include other aspects that may need to be considered prior to project implementation, such as (3) design criteria and (4) performance measures. This strategy seeks to develop these frameworks with as much information that is known at the time projects are being considered, but the intent is to develop the frameworks prior to the time projects are identified. Project champions can begin with a standardized framework and then apply them in a one-to-many fashion to multiple projects. This will provide a level of consistency between ATDM planning documentation while reducing the time and effort that each project champion must spend to develop required documentation. The primary purpose of these frameworks is to gain efficiencies in planning and implementing projects by developing content well in advance of when projects may be implemented.

Implementation details for Strategy #4 are shown in Table 10.

7.1.4.1 Tactic #4.1: Develop Annotated Templates for ATDM Project Documentation

This tactic will develop a framework for systems engineering documentation that may be required to plan for individual ATDM concepts. This may include frameworks for completing concept of operations and requirements documentation for individual ATDM concepts. It may also begin to identify preferred design-level details for ATDM concepts. The purpose of this tactic is to begin to standardize the approach by which individual ATDM strategies are planned and designed to reduce redundant practices and establish consistency in practices statewide. It is anticipated that work to develop ATDM concepts in the Des Moines Metropolitan Area ICM templates will be leveraged to develop the annotated outlines and templates to be created in this tactic.

- Action #4.1.1: Identify near-term ATDM concepts for which ATDM frameworks will be developed.
- Action #4.1.2: Identify the subject matter common to Concept of Operations that is not likely to change with specific ATDM projects.

- Action #4.1.3: Document understanding specific to the common subject matter and include in the annotated template.

7.1.4.2 Tactic #4.2: Develop an ATDM Performance Management Plan Framework

This tactic will develop an ATDM performance management plan or framework using the general ATDM concept goals and objectives developed/documented in Tactic #4.1. The plan will identify typical performance measures and targets specific to individual ATDM concepts. The plan will also identify the types of data that will need to be collected, the timelines for collecting this information, and the type of strategies or technologies that may be available to collect the data. Lastly, the plan will identify how data will be collected, stored, analyzed, and reported. The framework plan established by this tactic will be applicable for all individual ATDM concepts and is not intended to include project specific details. Practitioners can use the plan framework to begin developing performance plans for their specific projects. It is assumed that the ATDM concepts for the Performance Management Plan Framework will be the same as those for which the templates were developed in Tactic #4.1.

- Action #4.2.1: Define clear and measurable objectives for each ATDM concept. Objectives should be specific, measurable, achievable, relevant, and time-bound (SMART).
- Action #4.2.2: Develop performance targets.
- Action #4.2.3: Document data collection technologies (both available and required).
- Action #4.2.4: Define data collection procedures.
- Action #4.2.5: Update the ATDM Performance Management Plan Framework as needed. This may include modifying elements of the content including, but not limited to, performance metrics, targets, data collection techniques, etc.

Table 10: Strategy #4 Implementation Details

Strategy #4: Develop Frameworks for Freeway Based ATDM Strategy Implementation and Evaluation		
Champion	Traffic Operations Bureau	
Progress Indicators	This strategy's progress will be measured by the initial development and use of templates and framework documents. Progress will also be measured by an initial plan and procedure for monitoring ATDM performance and updates to the plan and procedures, as needed.	
	Tactic 1 Develop Annotated Templates for ATDM Project Documentation	Tactic 2 Develop an ATDM Performance Management Plan Framework
Phasing	Near-Term and On-going (0–3 years)	Near-Term and On-going (0–3 years)
Rough Order of Magnitude Costs	Low-High Varies (dependent on level of effort)	High >250K

7.1.5 Strategy 5: Enhance Understanding of ATDM Funding Needs, Costs and Opportunities

This strategy seeks to better understand funding needs, costs, and opportunities for ATDM concepts. This information will help ATDM project champions better scope projects and estimate related costs. This will also help allocate resources more effectively, anticipate future expenses, and avoid cost overruns. The information developed by this strategy will help communicate funding needs and costs more clearly with external stakeholders and upper management. Information can also be reflected and used to update content in the stakeholder outreach materials developed in Strategy 1.

Implementation details for Strategy #5 are shown in Table 11.

7.1.5.1 Tactic #5.1: Identify and Document ATDM Project Funding Needs

This tactic focuses on identifying and formally documenting funding requirements of individual ATDM concepts. The purpose of this tactic is to better understand the range of variables that may impact the cost of an individual ATDM project. By doing so, the Department can better plan for required resources, seek partnerships to share resources and costs, and reduce risks that may be overlooked while planning, designing, implementing, operating, or maintaining ATDM projects. Funding needs may include costs related to hardware, software, personnel, and other resources required to implement, operate, and maintain the project. The tactic will produce a list of funding needs identified through research, including internet searches, peer agency interviews, and coordination with FHWA. The primary purpose is to develop a thorough listing of the types of costs so they can be estimated in Tactic #5.2.

- Action #5.1.1: Research domestic ATDM deployments to determine equipment associated with ATDM concepts.
- Action #5.1.2: Interview peer agencies that have implemented ATDM strategies to determine other types of funding requirements (e.g., staff, space needs, utilities) and how these agencies addressed them.
- Action #5.1.3: Seek FHWA assistance in determining the types of costs associated with ATDM projects.
- Action #5.1.4: Document findings and incorporate them into project planning.

7.1.5.2 Tactic #5.2: Identify ATDM Project Costs

This tactic builds on the comprehensive list of funding needs—identified in Tactic #5.1—by assigning a cost to each funding need. Using this list, this tactic estimates typical costs so they can be better understood until such time that actual costs are known. Cost information can be documented and shared to help project champions develop more accurate project scopes and budgets. It is envisioned that, as projects are implemented, project costs would be updated/modified to derive more accurate costs over time. This includes documenting operations and maintenance costs to accurately reflect lifecycle costs.

- Action #5.2.1: Conduct research to determine ATDM equipment costs associated with ATDM concepts (e.g., FHWA's Tools for Operations Benefit Cost Analysis [TOPC-BC]).
- Action #5.2.2: Solicit requests for information among equipment manufacturers to determine the types, quantities, and estimated cost ranges to complete anticipated projects.

- Action #5.2.3: Document findings and incorporate into project planning.

7.1.5.3 Tactic #5.3: Identify ATDM Project Funding Opportunities

This tactic will identify potential funding opportunities that can support the ATDM funding needs identified in Tactic #5.1. This may include, but will not be limited to, federal and state funding programs, grants, and public-private partnerships. The purpose of this tactic is to conduct a thorough search for potential funding programs, document their funding requirements, and identify those that may be applicable to ATDM projects. This includes closer examination of commonly used funding programs to better understand how they may support capital, operations and/or maintenance costs for ATDM strategies. This information will be particularly helpful for project champions seeking to fund potential projects, including traffic management needs identified by district staff.

- Action #5.3.1: Conduct a literature review of federal funding programs that can support ATDM strategies.
- Action #5.3.2: Interview peer agencies that have implemented ATDM strategies to determine how their ATDM projects were funded. Interviews can be concurrent to Action 5.1.2.
- Action #5.3.3: Research and document state funding programs that can support ATDM strategies.

7.1.5.4 Tactic #5.4: Document Actual ATDM Project Costs

This tactic updates the typical ATDM funding needs and costs in Tactics #5.1 and #5.2 with actual costs the Department incurs implementing ATDM projects. The goal of this tactic is to develop more accurate and realistic project costs that can be shared internally with project champions. This will help them develop project scoping documents and reduce the risks of project costs exceeding the project budget. As additional projects are implemented, the accuracy of ATDM funding needs and costs will become increasingly more accurate.

- Action #5.4.1: Document unit costs for completed projects and use in future planning efforts.
- Action #5.4.2: Update project funding needs (Tactic #5.1) and typical project costs (Tactic #5.2) with actual costs.
- Action #5.4.3: Update Action #1.1.3 ATDM, awareness/marketing materials for Iowa DOT, and potentially Action #1.2.3 external agency ATDM awareness/marketing materials.

Table 11: Strategy #5 Implementation Details

Strategy #5: Develop Awareness of ATDM Funding Needs and Opportunities				
Champion	Traffic Operations Bureau			
Progress Indicators	Document findings for each topic			
	Tactic 1 Identify and Document ATDM	Tactic 2 Identify ATDM Project Costs	Tactic 3 Identify ATDM Project Funding Opportunities	Tactic 4 Document Actual ATDM Project Costs

	Project Funding Needs			
Phasing	Near-Term (0–3 years)	Near-Term (0–3 years)	Near-Term (0–3 years)	Mid-Term (3–5 years)
Rough Order of Magnitude Costs	Low <$100K	Low <$100K	Low <$100K	Low <$100K

7.2 Strategy and Tactic Implementation Approach

A summary of ATDM strategies and tactics is shown in Figure 9. A phased approach for implementing strategies and tactics is shown with respect to the near-term (0–3 years) and mid-term (3–5 years). Strategies and tactics phased for the near-term are representative of activities that would occur prior to the identification and/or implementation of specific ATDM projects. Whereas those slated for the mid-term would be phased beyond the implementation of ATDM projects.

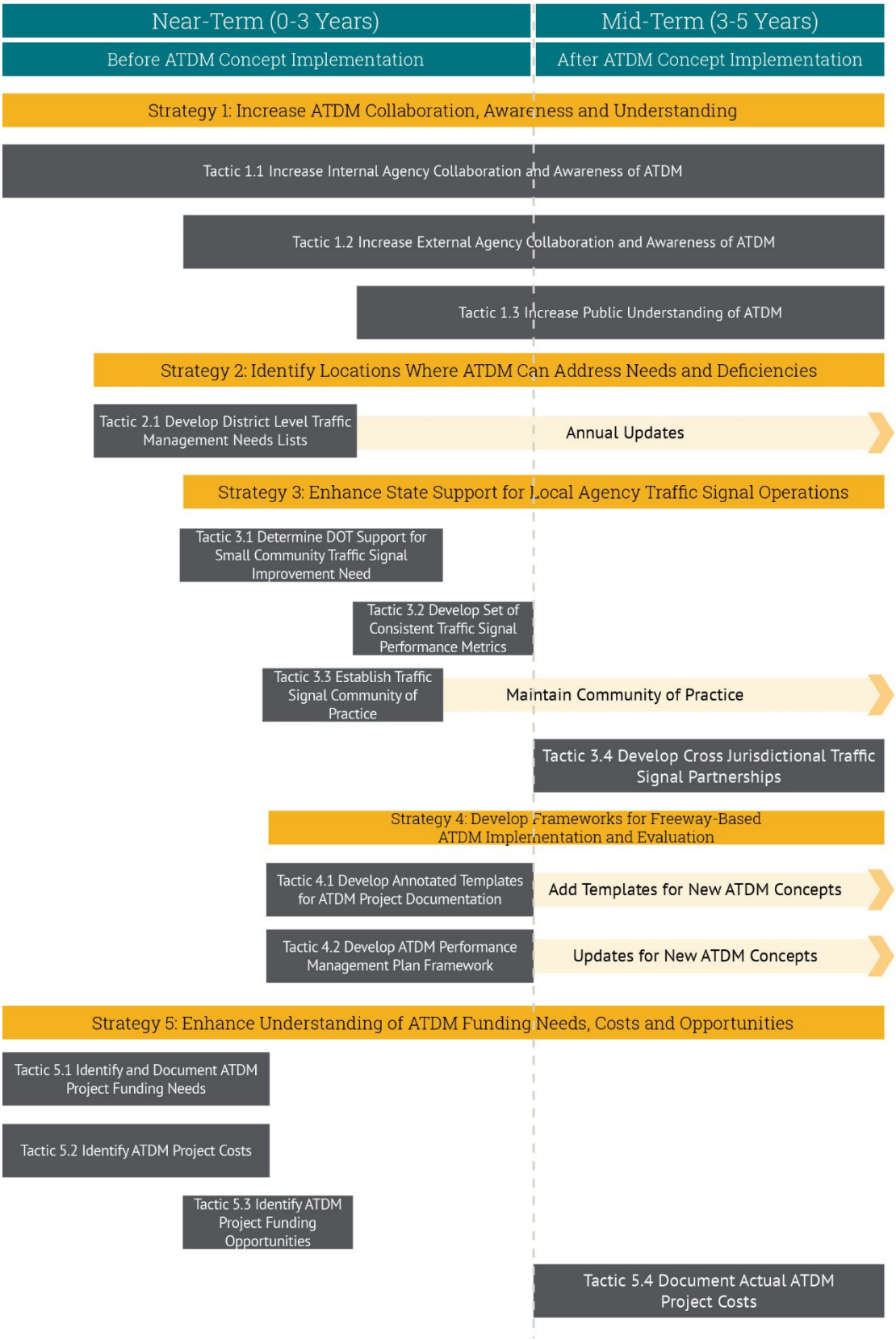


Figure 9: Proposed Phasing of ATDM Strategies and Tactics

8 FIVE-YEAR SERVICE LAYER BUDGET ESTIMATE AND NEXT STEPS

The budget presented in this chapter is tentative and provides an order of magnitude projection of the level of effort to implement all plan strategies fully. Over the five-year plan horizon, DOT will select the strategies that make the most sense to implement as opportunities arise both internal to the agency and externally. Next steps are generalized and will be unique for each strategy implemented, with the common theme of coordinating with strategy champions to track progress for the chosen strategies.

8.1 Budget Estimate

The actions recommended in this SLP are all high-level, which makes developing budgetary estimates challenging. However, a rough order of magnitude cost has been estimated using the expected level of effort for each action presented. These individual costs are estimated using the values from the cost ranges provided in Chapter 7 that were classified as low (less than $100K), medium (more than $100K but less than $250K) and high (more than $250K). A conservative and optimistic scenario is presented to give a range of potential budget estimates. For the conservative scenario, the values for each action were as follows: low ($100K) medium ($250K), and high ($400K). For the optimistic scenario, the values for each cost range were as follows: low ($50K), medium ($150K), and high ($300K). Under these assumptions, the budget impact of the recommended actions over the next 5 years is estimated to be $1.1–2.5 million.

8.2 Next Steps

The ATDM SLP documents how Iowa DOT went from big picture strategic planning to setting specific actions that can be executed over time. The next steps will be communicating, implementing, and monitoring the actions in this plan. With the actions being assigned to a variety of champions, an approach to oversee the kick-off of actions and impart situational awareness to champions will be required. Progress will be tracked, and check-ins will be held as needed. This tracking will make sure the work that was put into the creation of the plan is carried forward and progress is made on advancing ATDM in Iowa.

APPENDIX A AWARENESS MATERIALS

A.1: ATDM Factsheet

What is ATDM?

Active Transportation and Demand Management (ATDM) is the dynamic management, control, and influence of travel demand and traffic flow of transportation facilities. Through the use of available tools and assets, traffic flow is managed, and traveler behavior is influenced in real-time.

How does ATDM work?

ATDM will support Iowa DOT in providing Iowans with an efficient transportation system. ATDM strategies can be utilized in key areas throughout the state to improve safety, reliability, accessibility, sustainability, and efficiency of the transportation system. ATDM can improve travel through interagency collaboration, a focus on sustainable infrastructure investments, and the use of innovative, effective technologies.

Why use ATDM?

ATDM strategies do so much more than just improve travel for all Iowans. They also:

- **Improve transportation systems, safety, and performance**
- **Enhance customer service**
- **Provide stability and sustainability**
- **Amplify innovation**

How do we know when to use ATDM strategies?

Every community is different, so there is no easy way to know when to deploy ATDM. However, some things to consider before selecting an ATDM strategy include:

- High traffic volumes
- Capacity bottlnecks
- Changes in prevailing conditions
- High prevalance of crashes
- Variability in trip reliability
- Construction impacts
- Adverse weather
- Roadway geometry
- Limitations in capacity expansion

According to the recent Iowa DOT Active Transportation and Demand Management survey, the most common issue facing Iowa travelers is peak hour congestion.

DID YOU KNOW?

90% of transportation representatives who participated in this survey responded that they agree or strongly agree that peak hour congestion is an issue in their area

What are the ATDM strategies?

DYNAMIC SHOULDER LANES
Dynamic Shoulder Lanes allow drivers or buses to travel on the shoulder when traffic congestion is heavy. These can help ease slow-moving traffic and congestion during peak travel periods.

DYNAMIC SPEED ADVISORIES
Dynamic Speed Advisories display a recommended speed ahead based on congestion or weather conditions. These can improve the safety and mobility of a corridor during peak travel hours or during adverse weather.

ACTIVE DEMAND MANAGEMENT
Active Demand Management uses information and technology, like route-mapping apps, to direct and incentivize travelers to use uncongested routes at specific times of day. This can help distribute traffic and improve highway reliability and performance.

TRANSIT SIGNAL PRIORITY
Transit Signal Priority provides a green signal for equipped buses to limit transit delays to bus stops. This can improve the speed and reliability of the transit system.

ADAPTIVE SIGNAL CONTROL
Adaptive Signal Control enables the real-time adjustment of the green light and pedestrian walk signal length and timings to improve travel. This can help improve the flow of traffic.

ADAPTIVE RAMP METERING
Adaptive Ramp Metering is the use of traffic signals for freeway on-ramps to limit entering traffic to one vehicle at a time. This can smooth the flow of traffic merging onto the freeway.

ACTIVE PARKING MANAGEMENT
Active Parking Management provides dynamic directions and pricing for travelers to balance parking availability and demand. This can help travelers find parking more easily and improve local traffic flow.

Where could we use ATDM?

Transportation representatives indicated particular areas that could be made better by implementing various ATDM strategies, including:

- Corridors in metropolitan areas and inter-city connections between the metros
  - Ames, Cedar Falls/Waterloo, Cedar Rapids, Council Bluffs, Des Moines, Dubuque, Iowa City, Sioux City, and the Quad Cities
- Interstates and state highways

Many places are already successfully using technology that would allow for improved active management:

Adaptive Traffic Signal Use in West Des Moines

Downtown Des Moines ramp signage showing parking location and spot availability

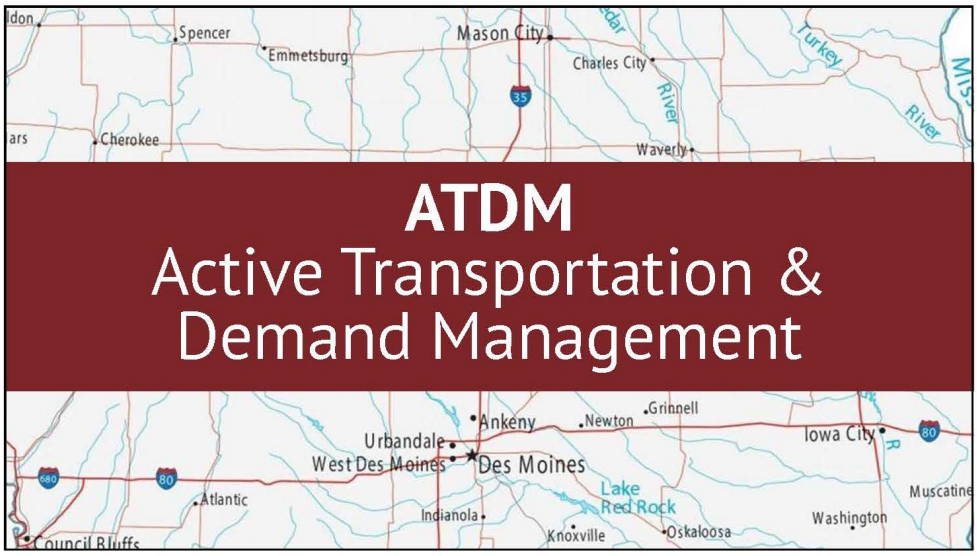
Council Bluffs Dual divided freeway

WHO SHOULD WE CONTACT FOR MORE INFORMATION?

Tim Simodynes -Iowa DOT State Traffic Operations Engineer
Phone: 515.239.1606
Email: tim.simodynes@iowadot.us

Contact District Rep
https://iowadot.gov/tsmo/Contact-us

A.2: ATDM Introduction Presentation



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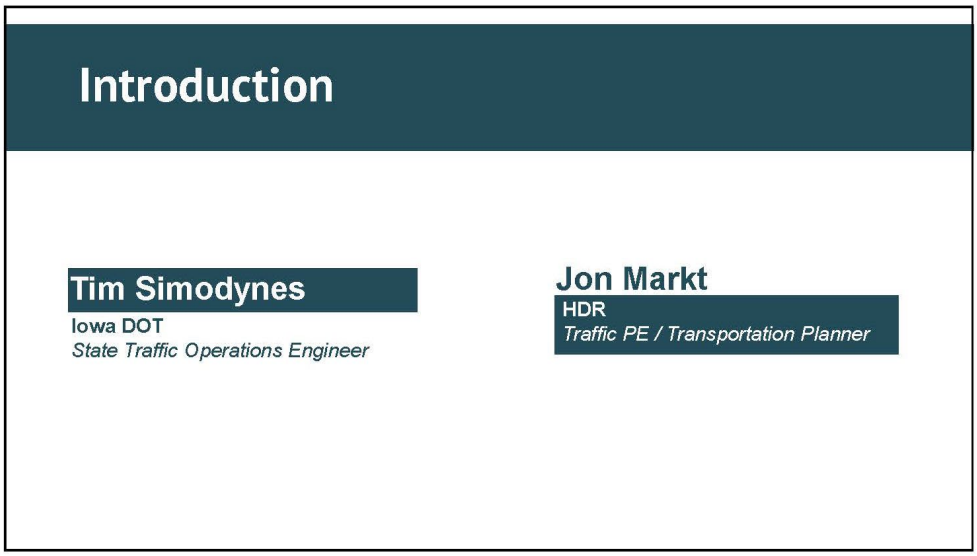

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1

Introduction

ATDM

Active Transportation & Demand Management

ATDM is the dynamic management, control, and influence of travel demand, traffic demand, and traffic flow of transportation facilities. Through the use of available tools and assets, traffic flow is managed, and traveler behavior is influenced in real-time.

3

Introduction

The principal aspect of ATDM is to **dynamically manage and control** travel and parking demand and traffic flow using and integrated strategies.

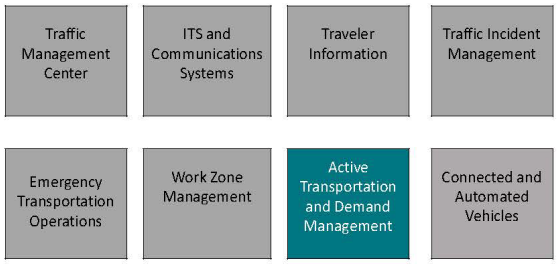
Use available technology to make changes before conditions deteriorate

The transportation system is continuously monitored.

4

Introduction

ATDM is one of 8 service layer plans (SLP) from the Iowa DOT's TSMO (Transportation System Management & Operations) Plan



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Introduction

ATDM strategies will support the DOT's 2025 business plan goals

Goal	Outcomes
Improve Transportation System Safety and Performance	• Zero fatalities in work zones • Total traffic fatalities significantly reduced • Increased efficiency, reliability of transportation system
Improve Customer Service	• Greater levels of customers satisfaction
Advance Workforce for Future Challenge & Opportunities	• Engaged and empowered employees • Increased diversity, equity and inclusion • Steady reduction in turnover rate
Secure Stable & Sustainable Funding	• Diversified funding mechanisms • Reduced technical debt
Grow Innovation	• Adopt smart technologies • Culture innovation • Modernize systems

6

Developmental Process

ATDM strategies are created from the needs and opportunities for areas determined by many stakeholders

Iowa Department of Transportation

- Traffic Operations Bureau
- Field Operations Division – Districts
- Location and Environment Bureau
- Traffic & Safety Bureau
- Systems Planning
- Motor Vehicle Enforcement
- Maintenance Bureau
- Construction & Materials Bureau

External Stakeholders

- MPOs / RPAs
- Cities
- Multi-Disciplinary Safety Teams (MDSTs)
- Public Transportation Agencies
- Iowa State University (InTrans)

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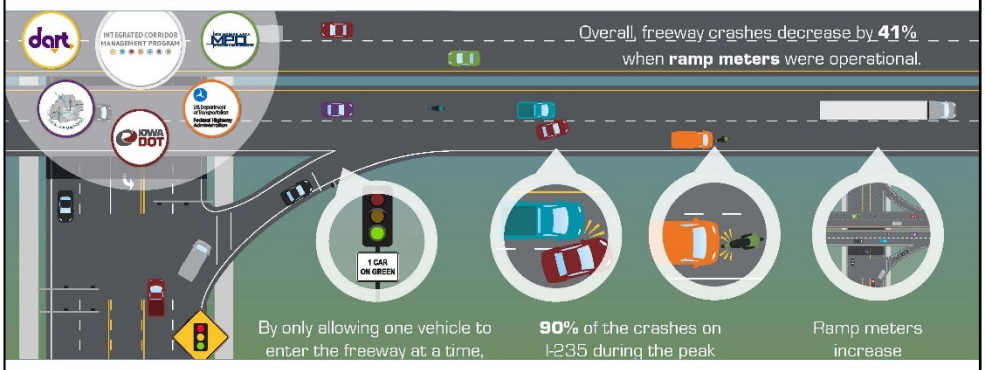
Active Traffic & Demand Management Sample Strategies

8

ATDM Deployment



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ATDM Deployment

Opportunities

- High Traffic Volumes
  Capacity Bottlenecks
- Changes in Prevailing Conditions
- High prevalence of crashes
  Variability in trip reliability
- Construction Impacts
- Adverse weather
- Roadway geometry
  Limitations in capacity expansion

10

ATDM Deployment

Considerations

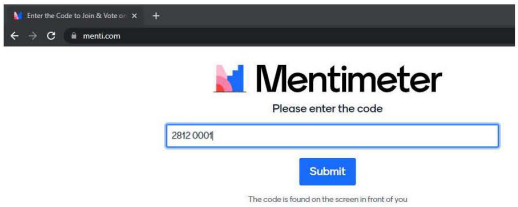
- **Deployment cost**
  Capital costs, Operations costs, Maintenance costs
- **Performance Management**
  Active Reactive Management
- **Staffing Needs**
- **Legislation**
  Enforcement

11

Active Traffic & Demand Management Strategies

Mentimeter Activity

- Open a web browser
- Go to www.menti.com
- Enter Code: 2812 0001



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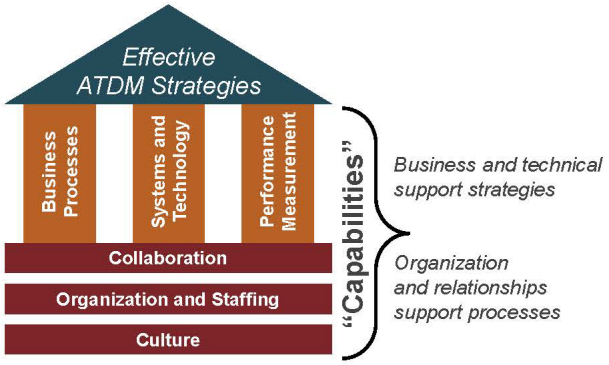
ATDM Agency Readiness



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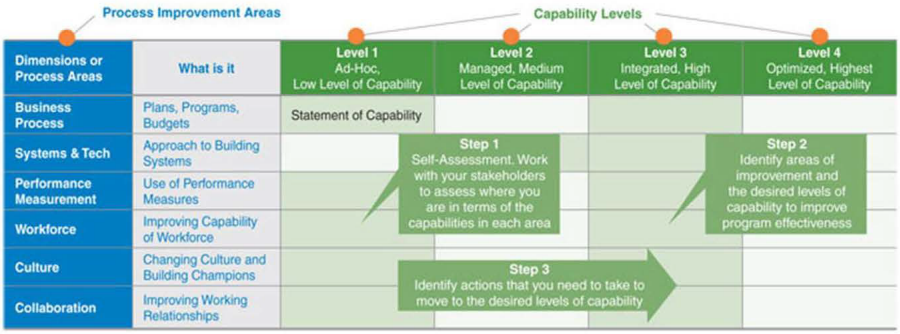
ATDM Agency Readiness



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Next Steps

Schedule

ATDM Deployment Strategies

Goals & Visions
Early 2023

Outreach for Top Strategies
Spring 2023

Plan Publication
Summer 2023

ATDM Agency Readiness Strategies

15

Next Steps

Complete survey to express interest

Use QR code or follow the link below

www.surveymonkey.com/r/YY96QDZ

16

Next Steps

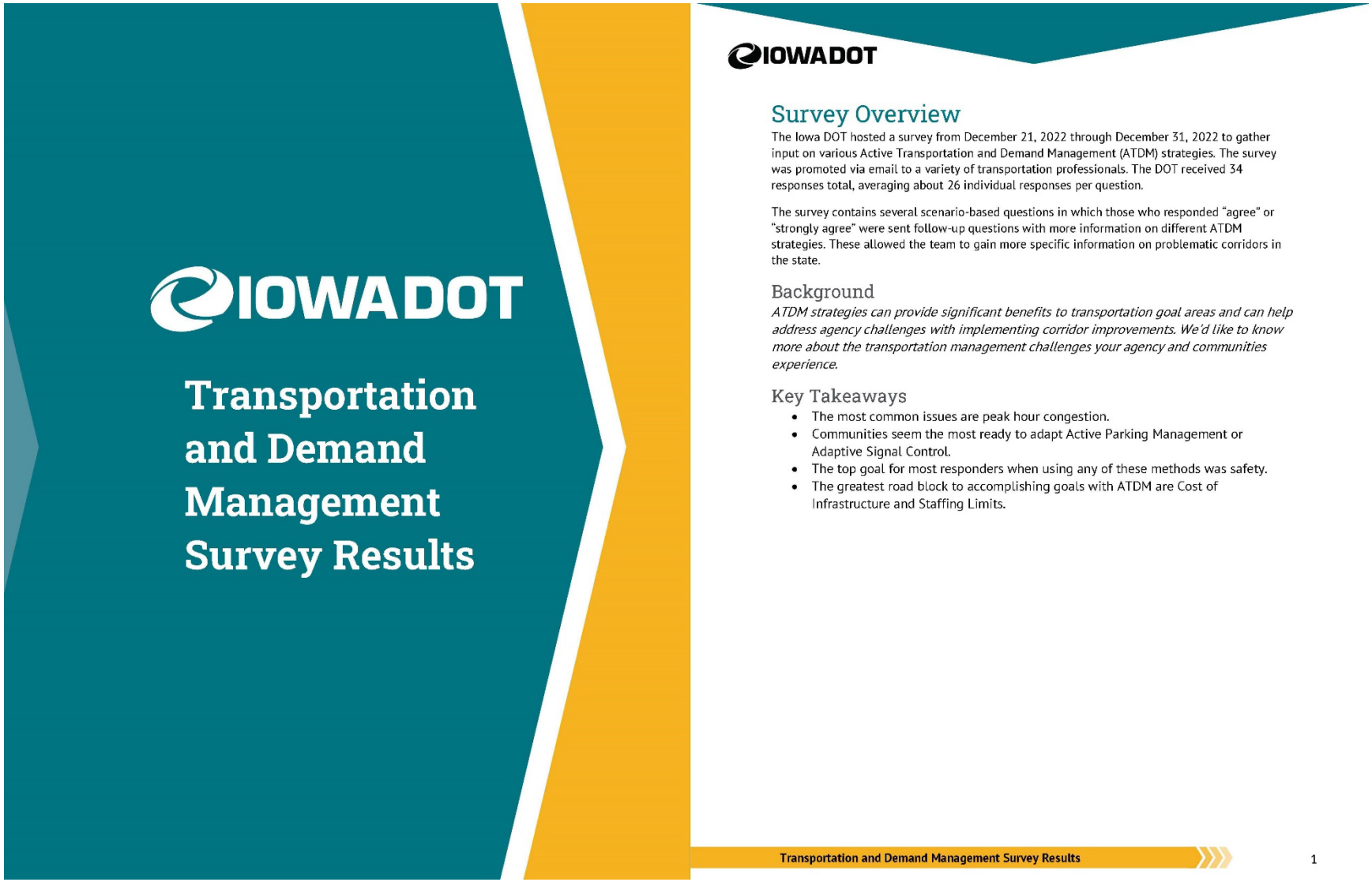
Contact us with questions or to discuss further

Tim Simodynes
Iowa DOT
State Traffic Operations Engineer
Phone 515.239.1606
Email tim.simodynes@iowadot.us

Jon Markt
HDR
Traffic PE / Transportation Planner
Phone 402.399.1080
Email jonathan.markt@hdrinc.com

17

A.3: ATDM Survey Summary



Survey Results

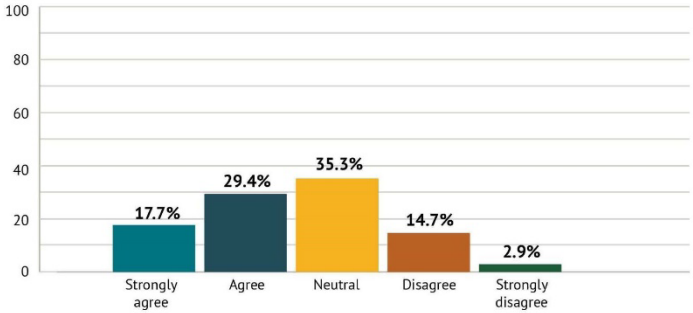
Instructions:

Please answer the following questions about common transportation management issues, based on the impact they have in your community/region. Several questions require you to rank how strongly you agree or disagree with a statement.

Ramp Metering

Ramp metering is the use of traffic signals on freeway on-ramps to limit entering traffic to one vehicle at a time. This can smooth the flow of traffic merging onto the freeway.

Freeway merging leads to operational and/or safety problems due to a lack of gaps in traffic.



Are there corridors in your city/region that should be considered for ramp metering? If yes, please list below.

Responses:
I-235 (both directions)
I-80/I-35/Iowa 141 (Rider Corner/Urban Loop)
I-235 thru downtown
I-235

I-235 (full length) Also, for previous question - General education on proper merging practices (proper spacing, zipper merge protocol, and respect for fellow commuters) are equally problematic to overall traffic flow.
I-35 (Elkhart exit to East Mixmaster)
I-35/80 from Flyover to US-5 interchange
I-235 from the DSM River to the SW Mixmaster
I-35/80 from IA 141 to the SW Mixmaster
I-35/80 from Merle Hay Road to 2nd Ave.
Some of the construction projects are close to the ramps and metering the ramps during peak times could be helpful

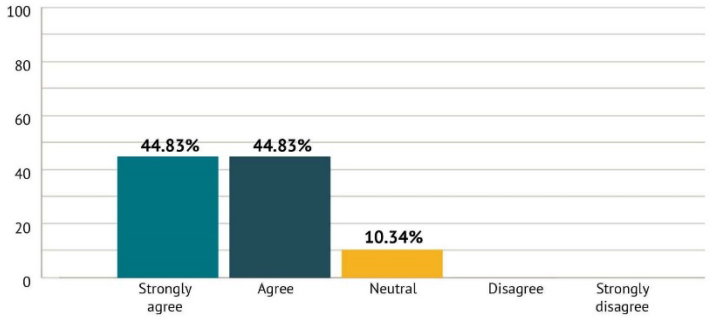
How ready would your city/region be to consider ramp metering for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
3
51
27
48
53
64
46
75
Average: 46 **Average (excluding outlier): 52**

Dynamic Shoulder Lanes

Dynamic Shoulder Lanes allow drivers or buses to travel on the shoulder when traffic congestion is heavy. This can help ease the slow, congested feeling during peak travel periods.

We have corridors that experience peak hour congestion.



Are there corridors in your city/region that should be considered for Dynamic Shoulder Lanes? If yes, please list below.

Responses:
Des Moines Metro - I80 from US 65 to west mixer
I-80/I-35/Iowa 141 (Rider Corner/Urban Loop)
I-235
No, additional lanes will be implemented in the next couple of years. Sufficient funding to alternative modes of transportation (i.e., bus, train, active transportation) on a local and regional level is needed to manage high demand of traffic on major roadways.
I-235 thru downtown
I haven't seen many that need it for a daily use so much as the ability to be utilized during emergency or event management to keep traffic moving.
I-235, I-35/80, and I-35 to from Des Moines to Ames would be excellent ATDM corridors for TRANSIT/EMERGENCY VEHICLES ONLY. I-235 and I-35 are prime corridors in general for Mass Transit improvements!
I-35/80
I-35/80 from IA 141 east to east of the NE Mixmaster
I-235 from Easton Blvd. to MLK/19th St.
I-380 from I-80 to Cedar Rapids
I-29

I feel in my area this would only cause issues, as most of the motoring public disregards these types of signs, leading to issues and accidents for those small portion that do obey

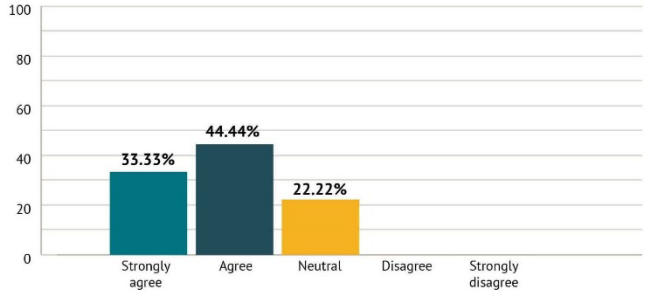
How ready would your city/region be to consider dynamic shoulder lanes for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
62
1
0
30
0
61
31
50
82
89
6
0
45
75
0
35
75
Average: 38
Average (excluding zeros): 49

Active Demand Management

Active Demand Management uses information and technology, like route mapping apps, to direct and incentivize travelers to use uncongested routes and times of day. This can help distribute traffic and improve highway reliability and performance.

We have corridors that experience peak hour congestion leading to slower drives



Are there corridors in your city/region that should be considered for Active Demand Management? If yes, please list below.

Responses
Grimes - IA 141
IA 44 Waukee - US 6
Yes. Use ADM to divert traffic (especially trucks) to the US 65 bypass rather than the I-80/I-35 Corridor, if it is westbound to southbound - or - northbound to east bound - through the Des Moines metro area. The US 65 Corridor is terribly underutilized and for traveler trips that change interstates going through the Des Moines area, it could be better utilized to relieve congestion.
Collins Road
University, Hickman, Douglas, and other key arterials in DSM
In the Des Moines MPO region, there are a variety of corridors that would see benefit for different reasons. Some of the corridors are (not officially) primary diversion corridors for commuters from one of the Interstates but aren't configured to handle diverted traffic. Euclid Avenue for example is the primary east/west route crossing the Des Moines River but does not have the capacity to handle additional traffic influx well. Using ATDM to navigate users to an alternative would be beneficial. In the Delaware/Oralabor area, messaging users to the atypical route (drive north to then access the Interstate and go south) would be beneficial and reduce congestion impacts. Merle Hay, University (full extents), Hickman, Fleur, etc. are more Des Moines MPO examples.

No. Most drivers already have such elements on their phones/gps devices, so such elements would not be as effective. Additionally, if rerouting to "avoid traffic" is required on a corridor, that corridor should be looked at for mass transit improvements - including Bus, BRT, Light Rail, and Regional Rail - with stops that are coordinated to incentivize its use.
Northbound Frontage Rd
IA 141: I-35/80 to Grimes US 6 from 86th St. to West of Waukee I-235 (Mix to Mix) I-35/80 (Mix to Mix) I-80 Grand Prairie Pkwy to the SW Mix I-80 NE Mix to US 65 North I-35 from 36th St. to NE Mix
I-29
US 6 in Iowa City/Coralville. IA 1 between Iowa City and Solon

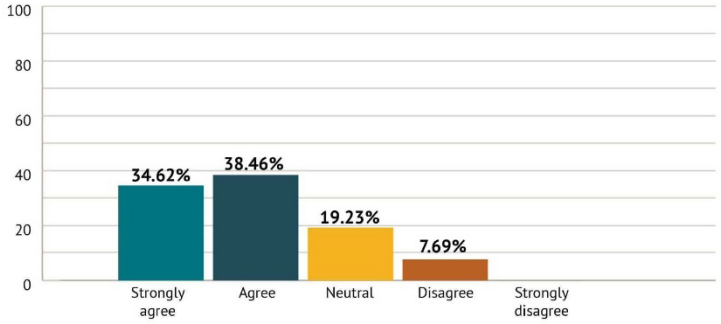
How ready would your city/region be to consider active demand management for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
2
3
25
51
12
100
53
39
29
100
0
46
34
92
55
Average: 43

Transit Signal Priority

Transit Signal Priority would provide a green signal for equipped buses to limit transit delays to bus stops. This can improve the speed and reliability of the transit system

Transit options are slower than driving and the schedules are unreliable.



Are there corridors in your city/region that should be considered for Transit Signal Priority? If yes, please list below.

Responses:
Very few places in Iowa warrant TSP
No/minimal transit exist in Waukee or Grimes, so no corridors would benefit
TSP wouldn't really help. The issue is more about not having enough transit options (number of buses, route coverage, headways)
Yes, 1st Avenue, Blairs Ferry, 6th Street, Kirkwood boulevard, and Center Point road. All of these roads lie on CR Transit routes.
Downtown DSM University BRT route?
Yes, however operator education for system impacts of their driving behavior can add additional value. TSP and queue jumping will add value at lights, but additional value can be realized through operator behavior at bus stops. There are multiple corridors where operators do not use the storage for the bus midblock and will cause additional delays. It appears operators do this during peak periods as finding acceptable gaps to reenter traffic lanes is difficult.
The entire network/coverage area for DART, CyRide, and CIT should be prioritizing transit to the maximum extent possible. Priority signaling on EVERY route, Transit-only lanes on high-capacity corridors/arterials, and increased service frequency. Generally, transit routes are slower

than vehicles, but it's mostly because the route doesn't prioritize that transit option, and/or the transit option does not come frequently enough to justify its use.
University Ave. corridor

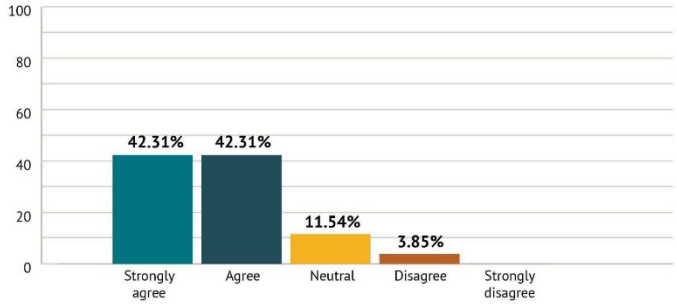
How ready would your city/region be to consider transit signal priority for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
28
3
0
30
58
21
50
65
52
100
27
38
15
42
Average: 38

Adaptive Signal Control

Adaptive Signal Control is the real-time adjustment of the intersection green times to improve travel. This can help improve the flow of traffic during peak travel hours.

We have corridors that could benefit from improved traffic signal performance.



Are there corridors in your city/region that should be considered for Transit Signal Priority? If yes, please list below.

Responses:

Areas by shopping centers and special events that have different peaking characteristics
Grimes - Implementing automated traffic signal performance measures to aid in updating signal timings throughout the community Waukee - implemented ATSPMs and are working on updating signal timings throughout the community. Pleasant Hill - implemented adaptive signal control throughout. Clive/Urbandale - implemented adaptive signal control along US 6
Any of the N/S or E/W minor arterials. Meredith, Aurora, Douglas, Hickman, University, Grand, Merle Hay Road, 86th, SE 14th, Fleur, Hubbell, MLK, Beaver, Mills Civic, Jordan Creek Parkway, 63rd, Highways 65, 141 and 163, to name a few.
Most adaptive signal control platforms do not achieve a proper benefit for the cost associated. There are very few "true" adaptive systems in the market and most that are relatively cost effective are a hybrid between responsive and adaptive. Adaptive Systems to be truly beneficial require staff that are intimately familiar with their system and are able to understand impacts from various parameter adjustments. I do not recommend adaptive signal control for most locations and corridors I've utilized. From my experience with agencies and states utilizing adaptive, they are typically removed or turned off after a 2 to 5 year period and move to a responsive system instead. I think most cities seek adaptive systems because they have limited traffic staff and are hoping to find a simple quick solution.

Yes, 1st Avenue, Blairs Ferry, Collins Road, Edgewood, 6th Street, Williams Boulevard (all are in Cedar Rapids), Highway 151 (in Marion).
Main arterials, especially thru downtown
In Davenport, Kimberly Road, 53rd Street, Locust Street
If the Adaptive Signal Control prioritizes transit and emergency vehicles, it should be done region-wide for maximum effect. Adaptive Signal Control for automobile traffic should ONLY be utilized on specific arterials designed to move vehicles (East-West portion of MLK, and the portion from Fleur to I-235 in Des Moines, is a prime example, Fleur Drive, 63rd St, and US-6 corridor from Altoona to Waukee are others). All other City streets should actually avoid ASC and create congestion (i.e. reduce convenience of automobile use in that area).
Merle Hay Road (Des Moines); 2nd Ave (IA 415 in Des Moines); IA 160 (Ankeny)
IA 141: Brookside Dr. in Grimes to I-35/80 (and then continuing down Urbandale Dr. and 100th St.) US 69 from N. of Ankeny to S. of Des Moines IA 415 from Euclid Ave. to NW 26th St. IA 160 from I-35 to IA 415 IA 28 from I-35/80 to S. of Norwalk IA 163 from E 14th St. to E. of Pleasant Hill Interstates may benefit from improvement of parallel local route corridors as well (Euclid/Douglas Ave.; University Ave.; Ingersoll/Grand Ave.; etc.).
Yes, Sioux City.
I-380/US 218 from US 20 to downtown Waterloo
US 6 and IA 1 in Iowa City

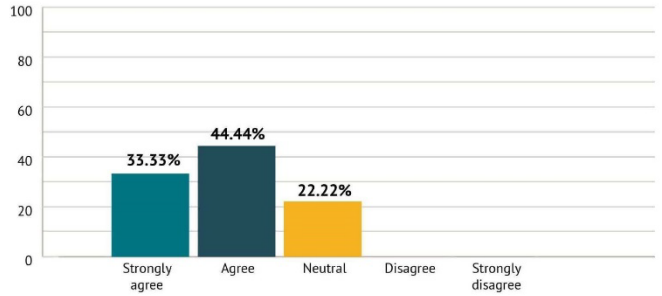
How ready would your city/region be to consider adaptive signal control for the corridor(s) you noted? **(Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")**

Responses
53
55
61
100
22
69
13
11
73
58
10
30
100
48
16
100
83
46
Average: 53

Active Parking Management

Active Parking Management provides dynamic directions and pricing for travelers to balance parking availability and demand. This can help travelers find parking more easily, as well as improve the localized traffic flow.

Searching for parking leads to unnecessary vehicle circulation and adds uncertainty to trip times



Are there corridors in your city/region that should be considered for Transit Signal Priority? If yes, please list below.

Responses
Many, but not all, of the Downtown Des Moines public parking spaces use this already. But it could be more consistent.
I believe most of the areas of the Des Moines MPO area that would find benefit have an older form of Parking Management like the signs for the events center area and hospital areas. I do think there is value in updating the system to provide better information including pricing and number of open spots. With efforts DSM has already made in parking updates, increased communication to those locations would be beneficial.
Downtown DSM. Especially at entertainment destinations (Wells Fargo, Civic Center/Court Ave). Other major destinations such as Jordan Creek Mall or in the East Village

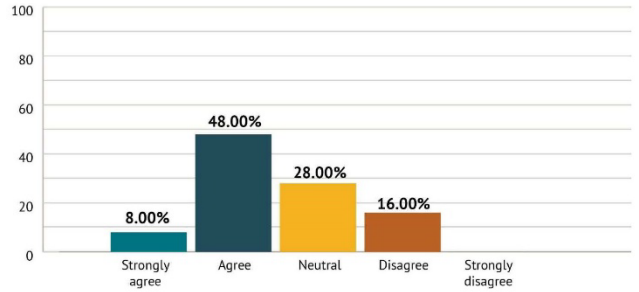
How ready would your city/region be to consider active parking management for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
99
72
100
12
89
27
2
Average: 57

Dynamic Speed Advisories

Dynamic Speed Advisories would display a recommended speed ahead based on congestion or weather conditions. This can improve the safety and mobility of a corridor during peak travel hours or adverse weather conditions.

Traffic flow is unsafe due to vehicles following too close or stopping hard.



Are there corridors in your city/region that should be considered for Transit Signal Priority? If yes, please list below.

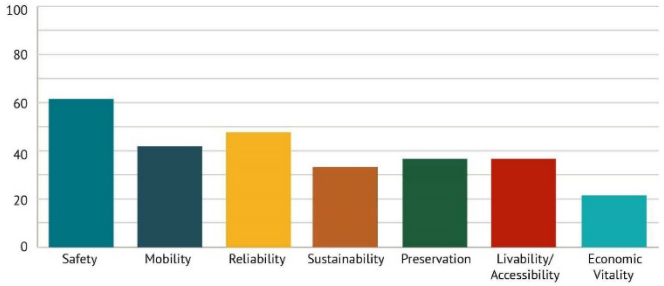
Responses
Advisories are not effective - need regulatory variable speeds limits - Please review MoDOT experience with advisory speeds
River bridges, entry towards frontage roads SB & NB.
I-80, I-35, I-235, and the US 65 Bypass through the Des Moines metro area.
Interstates thru Des Moines
No. Traffic has not reached a level of congestion anywhere in Iowa at any time of day where dynamic speeds would be necessary. Alternatively, priority should be given to educating drivers of proper entrance speeds and merging on highways. Even in the lowest capacity times, drivers entering highways from off-ramps at speeds 10-20mph below highway speed, or drivers who stop at the bottom of the ramp closest to the highway before entering create the most dangerous conditions for highway travel.
I-35/80 from Mix to Mix I-235 from Mix to Mix I-35 from Oralabor Rd. to the NE Mix. I-80 from Jordan Creek to the SW Mix. I-80 from the NE Mix. to US 65

How ready would your city/region be to consider dynamic speed advisories for the corridor(s) you noted? (Scale: 0-100 with 0 being "not ready at all" and "100" being "very ready")

Responses
11
51
99
49
2
32
84
13
70
Average: 46

Needs & Roadblocks

Rank the following transportation goals by how they apply to the needs to the corridor(s) mentioned in previous questions? The average rating given by respondents to each goal is shown below.



Safety - Reduce fatalities and serious injuries on public roads in the region.

Mobility - Provide options to travelers that minimize time spent traveling.

Reliability - Improve efficiency and predictability of travel in the region

Sustainability - Economic, environmental, and societal factors are in harmony—one is not being sacrificed for another

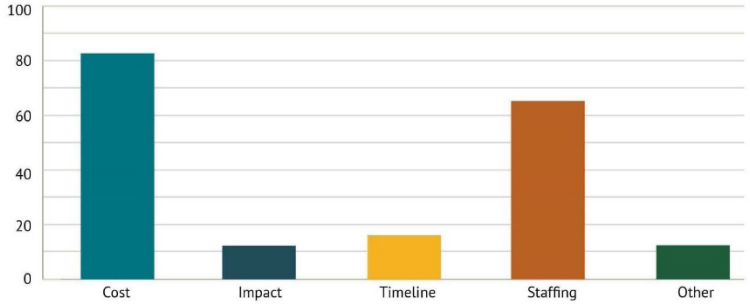
Preservation - Maintain transportation infrastructure in a state of good repair.

Livability/Accessibility - Provide transportation that allows travelers to make efficient and seamless multi-modal trips throughout the region.

Economic Vitality - Use the regional transportation system to foster a thriving, competitive regional economy.

IOWA DOT

What "road block" is your agency facing when trying to improve performance on the corridor(s) you mentioned above?



Cost - Cost of infrastructure enhancements

Impacts - Potential impacts of infrastructure improvements (ROW impacts, noise, etc.)

Timeline - Prolonged project development and/or construction timelines

Staffing- Staffing limitations for monitoring and maintaining the system

Other (please specify)

Other Responses:

Community buy-in for new technologies on roadways.
Political response. DSM/Ames corridor is in a prime position to utilize mass transit (Bus, BRT, Light Rail, and Regional Rail) to effectively and efficiently regional traffic congestion, but politicians on a local and state level require transit to profitable, refuse to make any concessions to auto-orientation, or simply do not believe in transit. Interstates in Des Moines are on the scale of any major U.S. metro outside of Texas, and yet are experiencing congestion with (often) one third to one tenth the metro population. That is the biggest indicator of a larger mass transit need.
interagency/ interjurisdiction coordination

APPENDIX B ATDM STRATEGIC PLANNING AND ANALYSIS

An analysis was completed to identify corridors throughout the state with baseline operating conditions that are supportive and feasible for ATDM application. The analysis focused on the ATM aspect of ATDM. FHWA published the Active Traffic Management Feasibility and Screening Guide, which was used to guide the analysis process. ATM includes advanced TSMO strategies that require basic ITS infrastructure and operation capabilities to be present, which limits its application for some Iowa highways. Further, ATM strategies generally apply to highway segments with high levels of current or future vehicle density or congestion. These strategies maximize existing capacity, reduce crashes, and generally improve operations through cost effective, operational improvements.

Considering both the ITS prerequisite and congestion factors, the analysis was focused on Iowa's urban areas. The analysis resulted in 87 corridors being identified as potential ATM deployment locations, with 39 found as priority corridors. The next phase of this ATDM SLP (beyond this document) will be to conduct outreach to supporters and partners to refine this list of potential corridors to select a few early adoption locations.

B.1 ATM Feasibility and Screening Guide Overview

The FHWA Screening Guide presents a process to identify potential corridors and determine the feasibility of ATM strategies. Figure 10 depicts a broad overview of the screening process. The existing conditions analysis focuses on the first two questions in the process: Does ATM achieve regional goals or objectives and are ATM strategies applicable to the roadway network.

The first question regarding regional goals and objectives was investigated during a literature review. Through consideration of Iowa DOT's SLRTP, Iowa in Motion, and review of the MPO long-range plans, there is a clear opportunity to use ATM strategies to better steward existing transportation capacity, enhance accessibility, improve safety for major roads, and increase the reliability and efficiency of commuter and freight flows.

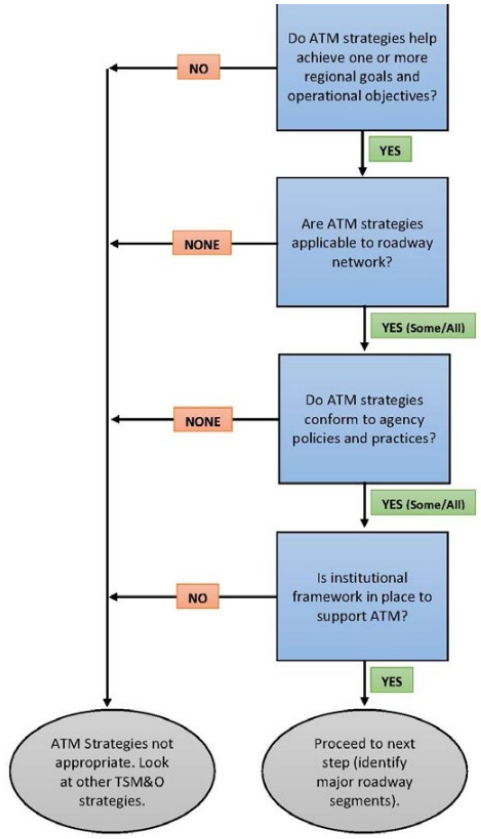


FIGURE 5. FLOWCHART. ASSESSING AGENCY POLICIES AND CAPABILITIES FOR ACTIVE TRAFFIC MANAGEMENT (ATM)

Figure B-1: FHWA ATM Screening Guide (Chapter 3)

The second question, are ATM strategies applicable to the roadway network, is answered through an assessment of corridor deficiencies in safety and mobility areas. Figure 11 shows the question flow chart determining whether a corridor should be analyzed further for a specific ATM strategy.

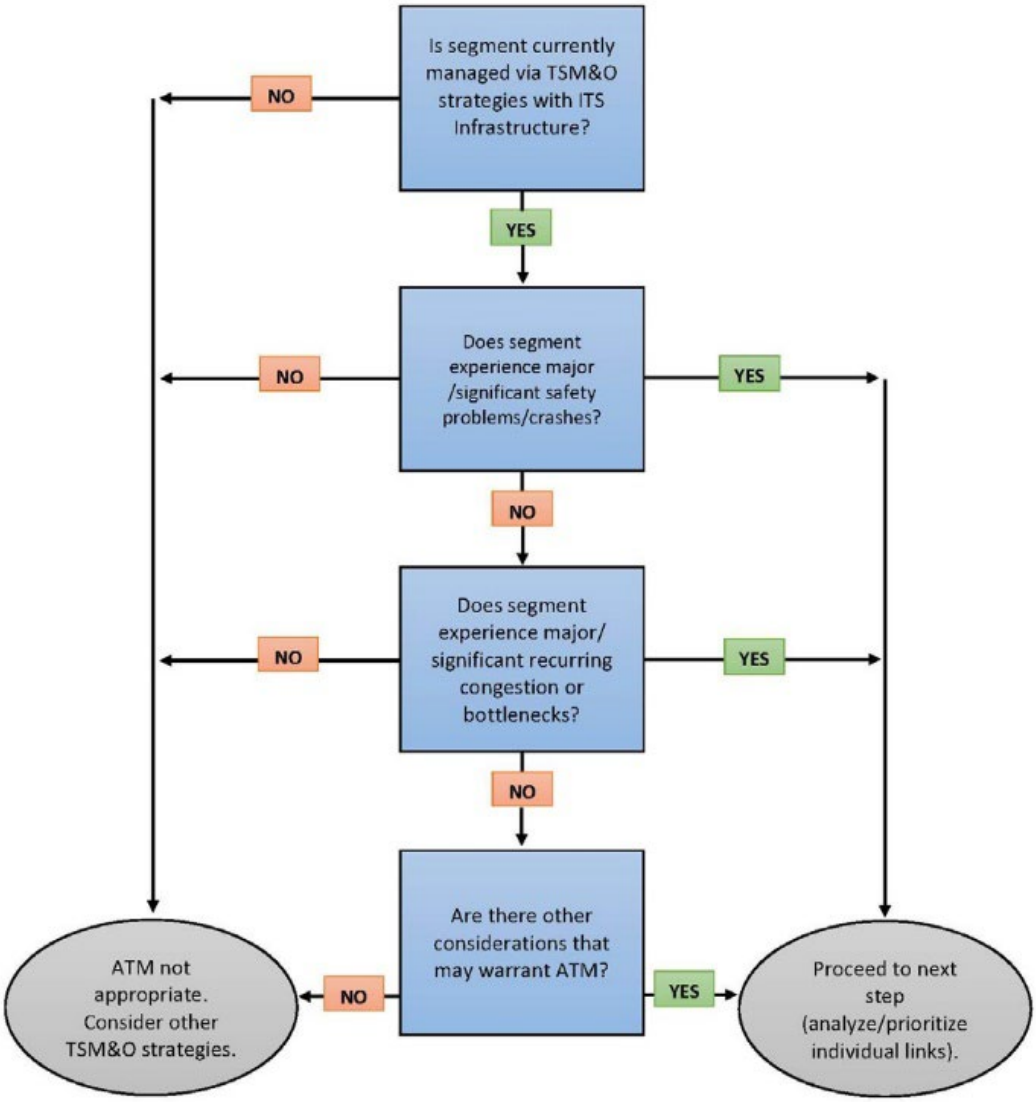


Figure B-2: FHWA ATM Screening Guide for Roadway Segments (Chapter 4)

B.2 Analysis Process and Results

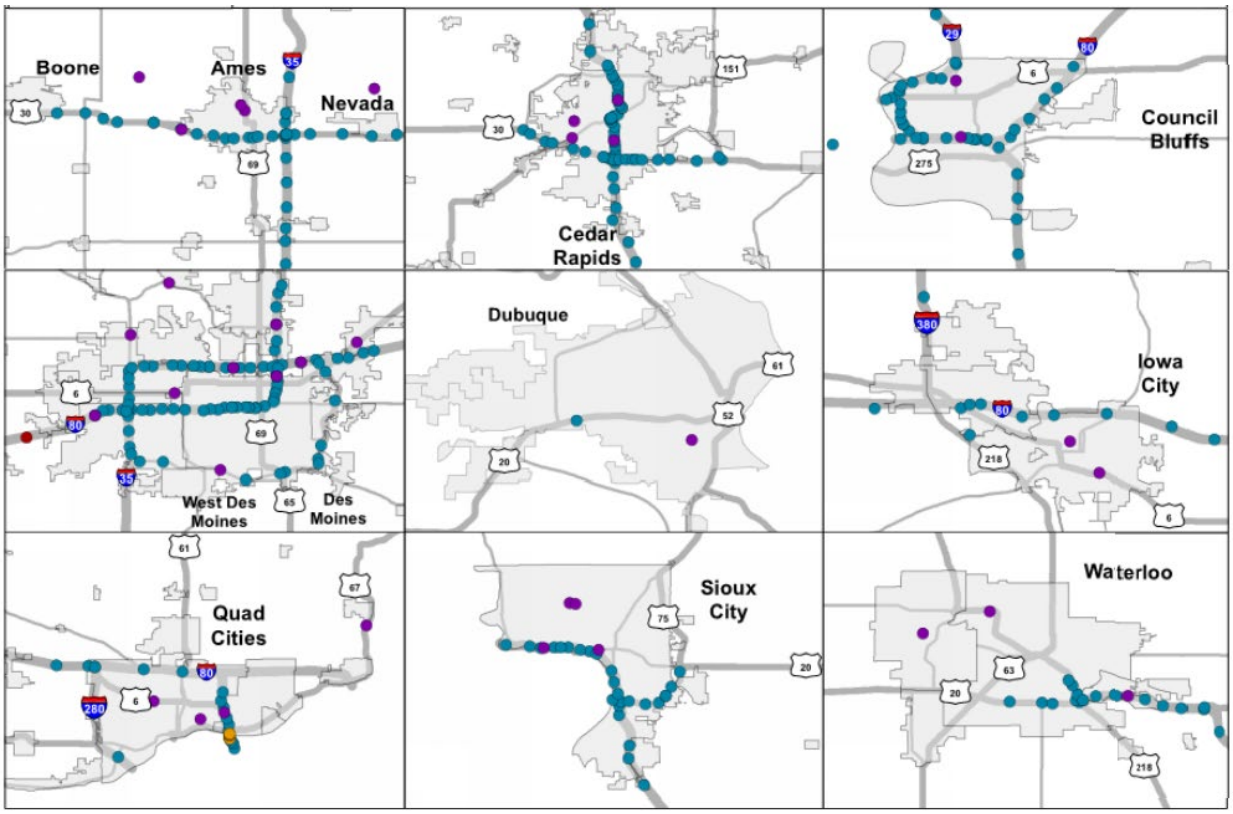
The FHWA ATM Screening Guide presents processes and questions, but a question-answering methodology was needed to complete the analysis. Iowa DOT maps and data from existing Iowa DOT reports were used to create the answering methodology.

Question 1: Is segment currently managed via TSMO strategies with ITS infrastructure?

To evaluate the TSMO strategies and ITS infrastructure asked in question 1, the ITS SLP was used. Coverage maps, like the sensor coverage map shown in Figure 12, gave insight into which areas should be included when compiling corridor data. It was decided to include corridors located in

the planning area boundaries of the nine largest urban areas in Iowa due to the prevalence of ITS infrastructure and anticipated congested-related deficiencies in these areas. In some cases, the ATM analysis area was expanded to cover inter-regional highways that carry heavy commuter and freight flows between multiple urban communities. The added routes include:

- Interstate 380 between Cedar Rapids and Iowa City
- Interstate 80 between Des Moines, Iowa City, and the Quad Cities
- Interstate 35 between Des Moines and Ames



(Source: ITS SLP)

Figure B-3: Existing Statewide and Metropolitan Area Traffic Sensor Inventory

Question 2: Does the segment experience major/significant safety problems/crashes?

Question 3: Does the segment experience major/significant recurring congestion or bottlenecks?

To answer questions 2 and 3 about the segment (corridor) experiencing major safety problems or congestion (listed above), the State Long Range Transportation Plan (SLRTP) was referenced because of the comprehensive data available. The SLRTP presents highway needs and risks that are measurable for all state corridors. Bottlenecks and capacity were the two need categories used, while safety and operations were the risk categories used. These categories were selected because of their relation to the screening guide questions focus areas of safety and congestion. The Plan's Highway Needs and Risks Matrix provides a summary of corridor characteristics statewide (Figure 13). The corridor limits determined in the matrix were replicated for the

analysis. The matrix screened corridors statewide for categories, allowing this analysis to extract the urban corridors and selected categories for ATM specific analysis.

The SLRTP has more details on the thresholds for each category and can be found in Chapter 5. The descriptions of the categories used in this analysis are summarized Table . The color descriptions in the table relate to the category colors found in the matrix above (Figure 13).

Table 5.4: Highway needs and risks matrix, Interstates
(section 1 of 2)

See Table 5.3 for key

Route	Corridor	County	IMFN Networks	CIN Networks	Pavement Condition	Bridge Condition	Bottlenecks	Super-2	Capacity	Safety	Operations	Flood Resiliency	Bicyclists	Pedestrians		
I-29	MO border to IA 2	Fremont													N/A	N/A
	IA 2 to US 34	Fremont, Mills													N/A	N/A
	US 34 to I-80	Mills, Pottawattamie													N/A	N/A
	I-80 to I-480/US 6	Pottawattamie													N/A	N/A
	I-480/US 6 to I-680	Pottawattamie					211								N/A	N/A
	I-680 to I-880	Pottawattamie					21L								N/A	N/A
	I-880 to IA 175	Pottawattamie, Harrison, Monona					14L, 94, (60, 136)								N/A	N/A
	IA 175 to US 20/I-129	Monona, Woodbury					96L, 144L, 149L, 151L, 174L, 176L								N/A	N/A
	US 20/I-129 to SD border	Woodbury						109							N/A	N/A

(Source: SLRTP)

Figure B-4: Excerpt of Highway Needs and Risk Matrix

Table B-1: SLRTP Thresholds for Categories Used in ATDM Analysis (Source: SLRTP Chapter 5)

Category	Description
Bottlenecks	The cell is green if the corridor has one or more bottleneck identified. The numbers are the ranks out of the 114 bottlenecks.
Capacity	The cell is yellow if the corridor has been identified as a capacity need. "Partial" is noted if only a portion of the corridor was identified as a need.
Safety	The cell is red if the corridor has been identified as a corridor to target for safety improvements, meaning it had a potential for crash reduction (PCR) of at least one crash per mile.
Operations	The cell is teal if the corridor has been identified as a corridor to target for operations improvements, meaning it is one or more standard deviation below the statewide average composite score based on the ICE-OPS tool.

The analysis for this ATDM plan looks at both the safety and capacity of corridors, but the approach reverses the order of reviewing these. In this analysis, indicators of a highway's capacity are reviewed first to help confirm that a suitable course of action might include ATM. If a highway corridor had safety issues only, there is a case for applying a traditional geometric safety improvement. For example, consider a corridor like US Highway 20 in northeast Sioux City. Safety is noted as an issue for this corridor but does not show a capacity or bottleneck issue. The corridor is a signalized, divided highway (Figure 14), so this corridor may be better suited to access management or intersection modifications.

Figure B-5: US 20 in Sioux City

Within the nine urban areas, 203 corridors were screened initially for a need flag in either bottlenecks or capacity. In the case of an existing bottleneck, ATM may help in the near- to mid-term by recovering inefficiently used capacity to extend the useful life of the existing system. In the case of a capacity flag, there is an expectation that future operations will have a long-term demand level exceeding the current capacity. ATM can be used in these cases to replace or supplement widening, depending on the intensity of the capacity needed. While long-term capacity needs are important to track, it was decided to focus on corridors with existing issues and only advance corridors with a bottleneck flag. In total, 87 (43%) corridors were advanced; the full results are shown in Table **B-2**.

Table B-2 Bottleneck & Capacity Screening Results

Bottlenecks Only	Both Bottlenecks & Capacity	Capacity Only	Neither Bottlenecks nor Capacity	Total Corridors Analyzed
54	33	29	87	203
87 (43%) Corridors with Bottlenecks Advanced				

Bottleneck only corridors have existing or temporary capacity issues but may be located in developed corridors that are unlikely to see major growth in demand. Bottleneck only corridors are more likely to include access issues (e.g., close ramp spacing) or traffic signalization because both situations can suffer more from traffic breakdowns (i.e., stop-and-go traffic), even when operating below a roadway's expected vehicle capacity.

Capacity only corridors represent a future need based on tools like the statewide and MPO travel demand models. On these corridors, long-term growth is expected to outpace capacity and capacity expansion projects may be needed to address the imbalance. Corridors with both capacity and bottleneck flags have existing capacity issues with projected long-term capacity issues.

After this primary assessment, the corridors with current or expected capacity limitations were assessed for operational and safety risks. The results are shown in Table **B-3**. At this screening stage, the corridors already meet a base consideration of inadequate capacity for ATM

consideration. However, safety and operational issues may lead to a preference for tailoring one or more ATM strategies to address the issues experienced.

Table B-3: Safety and Operations Screening Results

Safety Only	Both Safety & Operations	Operations Only	Neither Safety nor Operations	Total Corridors Analyzed
3	29	7	48	87

For example, the I-29 corridor from US 20/I-129 to the South Dakota (SD) border (bolded in Figure 15) is flagged for bottlenecks (translating to a 1 in the bottlenecks column) and was advanced in the screening process and counted in the "Bottlenecks Only" category since there is no capacity flag. The corridor also has safety and operations flags in the matrix, counting this corridor in the "Both" category of the safety and operations screening results.

Metro	Route	County	Corridor	Bottlenecks	Bottleneck rank	Capacity	Capacity Note	Safety	Operations	Total
Council Bluffs	I-29	Mills, Pottawattamie	US 34 to I-80	0	0	0		0	0	0
Council Bluffs	I-29	Pottawattamie	I-80 to I-480/US 6	0	0	0		1	1	2
Council Bluffs	I-29	Pottawattamie	I-480/US 6 to I-680	0	0	0		1	0	1
Council Bluffs	I-29	Pottawattamie	I-680 to I-880	0	0	0		0	0	0
Council Bluffs	I-29	Pottawattamie, Harrison, Monona	I-880 to IA 175	0	0	0		0	0	0
Sioux City	I-29	Monona, Woodbury	IA 175 to US 20/I-129	0	0	0		0	0	0
Sioux City	**I-29**	**Woodbury**	**US 20/I-129 to SD border**	**1**	**109**	**0**		**1**	**1**	**3**

Figure B-6: Analysis Methodology Excerpt

The 87 corridors with a bottleneck flag were mapped to show the potential ATDM locations and safety and operational screening results throughout the state. The first map (Figure 16) gives a statewide look at the results, and the second map (Figure 17) gives a closer look at the nine urban areas included in the analysis.

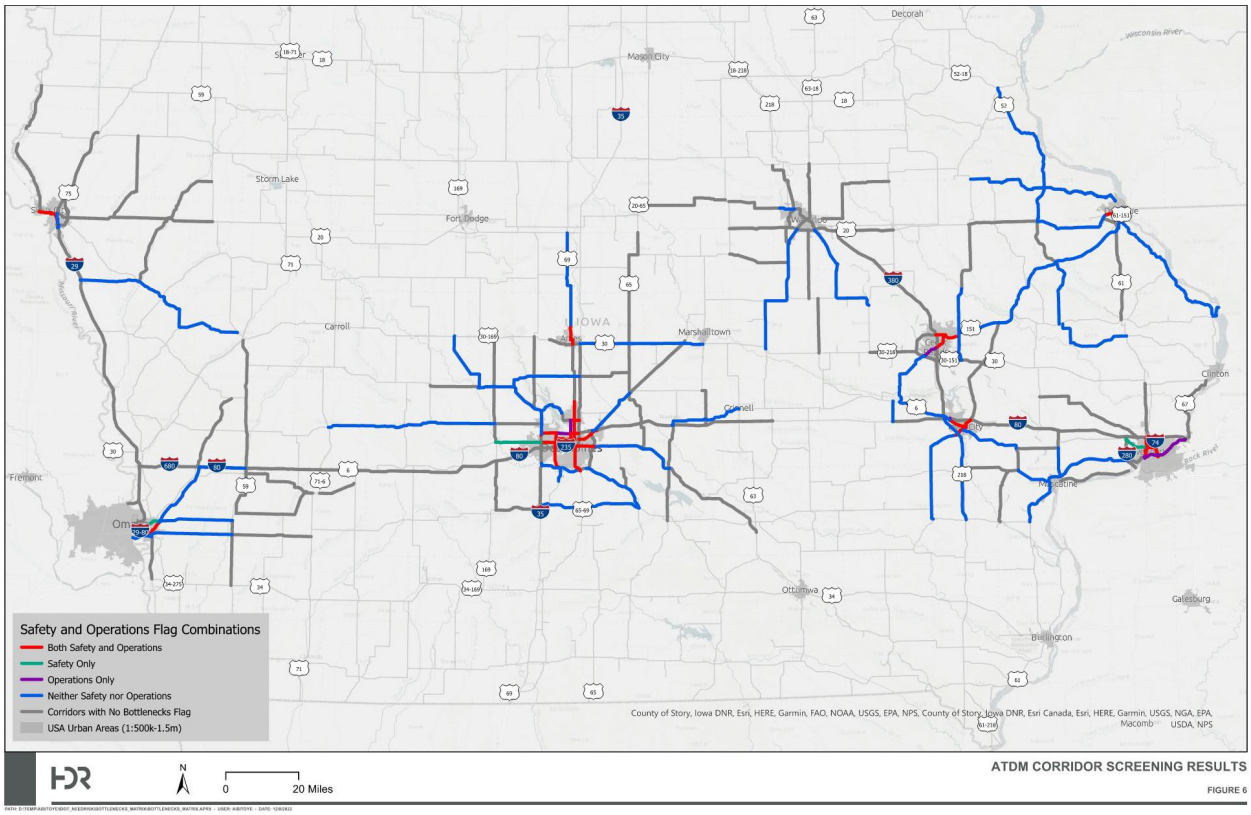


Figure B-7: ATDM Corridor Screening Results (Statewide View)

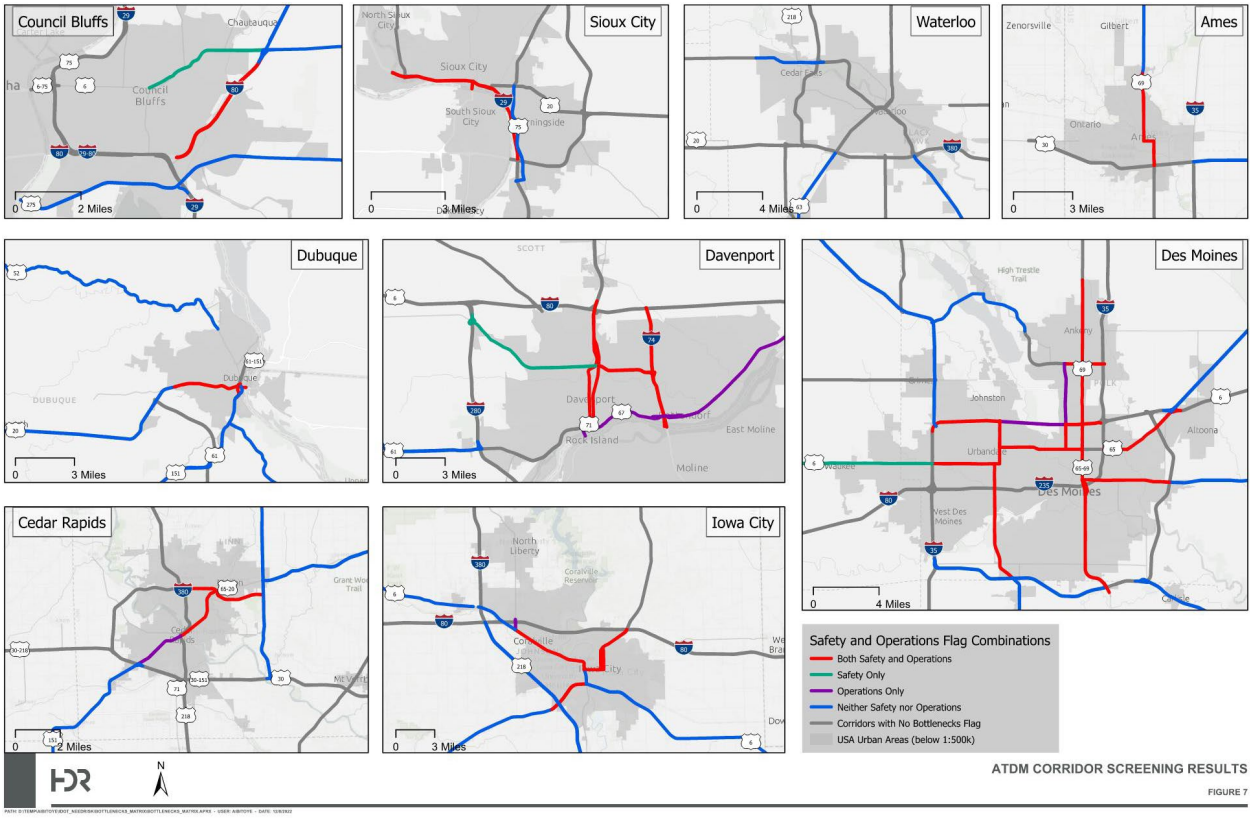


Figure B-8: ATDM Corridor Screening Results (Urban Area View)

The maps above depict the corridors based on the safety and operations screening results. A corridor with neither safety nor operations flagged may have current or anticipated congestion, but it does not appear to lead to frequent crashes or non-crash incidents. A corridor with just safety flagged represents a corridor with a high potential for crash reduction but a relative lack of operational issues, such as frequently stalled vehicles, weather event vulnerability, and special event traffic impacts. These corridors have safety issues that may not be tied to operational challenges. A corridor with just operations flagged represents a corridor with operational issues, such as those noted above, but those issues do not necessarily correlate with a high potential for crash reduction. Corridors with both issues flagged have compounding problems, with safety problems potentially leading to operational challenges and vice versa. As the results table and maps show, it is more common to have neither safety nor operations flagged (48 corridors) or both categories flagged (29 corridors) than it is to have just safety (3 corridors) or just operations (7 corridors). This is most likely due to safety and operational challenges being closely related.

With 39 of the 87 corridors being identified as flagged for either safety or operations, the last step of putting those corridors into tiers was completed to refine the list to corridors that should be the top priority for ATDM strategy screening. The 39 corridors were ordered based on the number of categories present (Figure 18). All four categories were marked for 19 corridors, 13 had three categories marked, and 7 had two categories.

Metro	Route	County	Corridor	Bottlenecks	Bottleneck Rank	Capacity	Capacity Note	Safety	Operations	Total
Des Moines	I-80	Polk	IA 141 to IA 28	1	68	1		1	1	4
Des Moines	I-80	Polk	IA 415 to E mixmaster	1	89	1		1	1	4
Des Moines	US 6	Polk	I-35/80 to IA 28	1	1,11,37,102	1		1	1	4
Iowa City	US 6	Johnson	IA 965 to IA 1	1	2, 30, 81	1		1	1	4
Davenport	US 6	Scott	IA 461 to I-74	1	73	1		1	1	4
Dubuque	US 20	Dubuque	Northwest Arterial to IL border	1	70, 84, 90	1		1	1	4
Des Moines	US 69	Warren, Polk	IA 5 to I-235	1	6, 25, 91	1		1	1	4
Des Moines	US 69	Polk	I-35/80 to Ankeny N CL	1	3, 38	1		1	1	4
Ames	US 69	Story	US 30 to Ames N CL	1	114	1		1	1	4
Sioux City	US 77	Woodbury	NE border to I-29	1	109	1		1	1	4
Iowa City	IA 1	Johnson	Iowa City S CL to US 6	1	26,103	1	Partial	1	1	4
Iowa City	IA 1	Johnson	US 6 to I-80	1	30,104,111	1	Partial	1	1	4
Des Moines	IA 28	Polk	IA 5 to I-235	1	12, 35, 59	1	Partial	1	1	4
Des Moines	IA 28	Polk	I-235 to US 6	1	102	1		1	1	4
Des Moines	IA 28	Polk	US 6 to I-35/80	1	37, 68	1		1	1	4
Cedar Rapids	IA 100	Linn	I-380 to US 151	1	16, 19	1	Partial	1	1	4
Des Moines	IA 160	Polk	IA 415 to I-35	1	13, 38	1		1	1	4
Des Moines	IA 163	Polk	US 69 to US 65	1	5, 24, 31	1		1	1	4
Cedar Rapids	IA 922	Linn	I-380 to IA 100	1	16, 88	1	Partial	1	1	4
Sioux City	I-29	Woodbury	US 20/I-129 to SD border	1	109	0		1	1	3
Davenport	I-74	Scott	IL border to I-80	1	110	0		1	1	3
Council Bluffs	I-80	Pottawattamie	E jct I-29 to US 6	1	99	0		1	1	3
Des Moines	US 6	Polk	IA 28 to US 69	1	15, 37,43	0		1	1	3
Des Moines	US 6	Polk	I-235 to I-80	1	75,78	0		1	1	3
Des Moines	US 69	Polk	I-235 to I-35/80	1	31	0		1	1	3
Des Moines	I-80	Polk	IA 28 to IA 415	1	68,89	1		0	1	3
Des Moines	US 6	Dallas, Polk	US 169 to I-35/80	1	20, 46	1	Partial	1	0	3
Des Moines	IA 415	Polk	I-35/80 to IA 160	1	89	1		0	1	3
Des Moines	IA 415	Polk	US 6 to I-35/80	1	15, 89	0		1	1	3
Davenport	IA 461	Scott	US 67 to US 6	1	73, 107	0		1	1	3
Davenport	IA 461	Scott	US 6 to I-80	1	73	0		1	1	3
Dubuque	IA 946	Dubuque	S jct US 61 to N jct US 61	1	84	0		1	1	3
Davenport	US 6	Scott	I-280 to IA 461	1	73	0		1	0	2
Davenport	US 67	Scott	IL border to I-74	1	93, 107, 110	0		0	1	2
Davenport	US 67	Scott	I-74 to I-80	1	110	0		0	1	2
Iowa City	IA 92	Muscatine	US 61 to IL border	1	55	0		0	1	2
Council Bluffs	IA 906	Pottawattamie	N 6th St to I-80	1	7, 21, 99	0		1	0	2
Cedar Rapids	IA 922	Linn	US 30 to I-380	1	42	0		0	1	2
Iowa City	IA 965	Johnson	US 6 to I-80	1	81	0		0	1	2

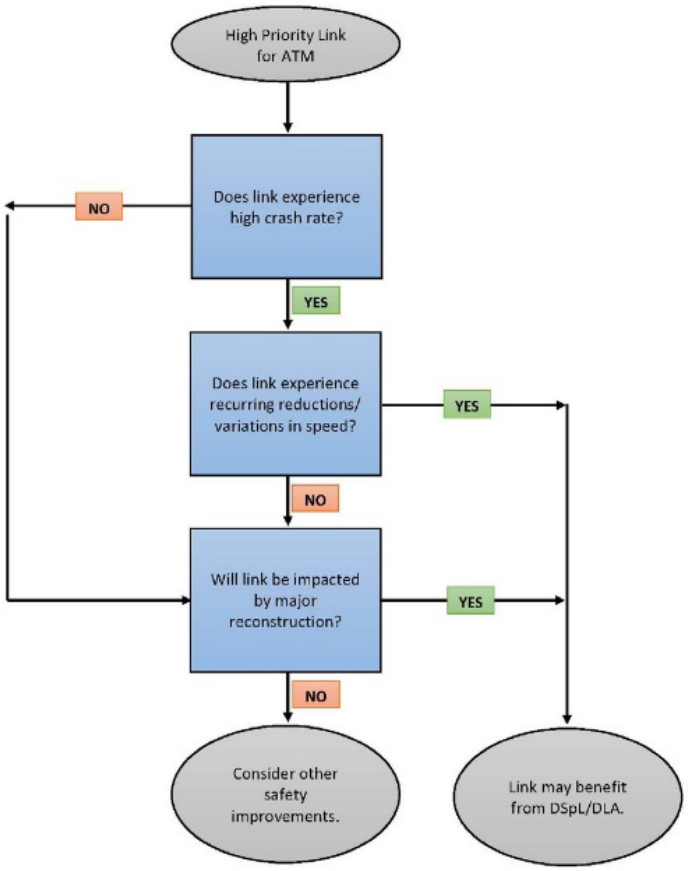
Figure B-9: Potential ATDM Corridors Summarized by Number of Categories Flagged

Seven of the nine metros are represented in the top tier corridors, showing the potential applicability of ATDM throughout the state.

B.3 Screening Corridors for ATM Strategies

With corridors identified as potential ATDM deployment candidates, screening corridors for specific ATDM strategies would be the next step in the feasibility process. The FHWA Screening Guide has flow charts for each strategy to determine if the corridor would be a good fit. At this point, the analysis gets more specific and requires breaking corridors up into links to identify where ATDM implementation would be effective within the corridor. This requires a detailed analysis of corridor level data, such as a congestion scan within a corridor, to determine where the biggest issues are. Once these links are identified, the Screening Guide flow charts can be used to test out different ATM strategies. The flow chart for dynamic speed limit and dynamic lane assignment strategies is depicted as an example in Figure 19. All the strategy screening flow charts are in Chapter 5 of the Screening Guide.

Examining ATM at a corridor level depends heavily on the buy-in of project supporters and partners. The next phase of ATDM SLP development will be to conduct outreach to supporters and partners to refine this list of potential corridors to select a few early adoption locations. A number of these early adoption locations are likely to build on the Des Moines ICM study that was completed recently. The ATDM SLP will concurrently assess and strategize agency capability maturation to allow Iowa DOT to lead and support Iowa agencies in pursuing ATDM, where supported and technically feasible.



Upon setting ATDM SLP objectives and priorities, the project team will work with Iowa DOT and stakeholders to determine if ATM feasibility shall be applied to any specific corridors. A corridor-level feasibility analysis would highlight the purpose and need for such improvements and benefit-cost analysis for proposed strategies to justify the inclusion of ATDM for a corridor in future programming and project development activities.

Figure B-10: FHWA ATM Screening Guide Strategy Flow Chart (Chapter 5)

APPENDIX C CMF WORKSHOP NOTES AND SCORES

Iowa DOT ATDM Business Processes: Planning and Programming / Business Processes

Workshop Outputs

Strengths Cited	Challenges Cited

• Cost/benefit ratios of ATDM projects
• Budget built in for optimizing projects after deployment (Traffic incident management plans)
• Multi-modal approaches are being looked at
  ○ Impact on communities
	• Getting traffic management projects into funding program
	• DOT culture/thinking has historically been around physical infrastructure deployments
	• Integrating with local systems
	  ○ Different processes between local agencies and DOT
	  ○ Locals are interested in their own network, DOT focused on moving traffic through local communities (ramp metering)
	• Interoperability of technology
	  ○ Sharing camera feeds
	• Staffing
	  ○ TMC
	• Selling projects to elected officials
	  ○ No ribbon cutting
	  ○ Need iterative funding
	• Funding conversations with elected officials is focused on infrastructure problems
	  ○ Existing condition ratings look at safety and infrastructure
	• DOT is large organization and difficult to shift culture/processes quickly
	  ○ Need people out of this realm on board

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	Traffic management development and deployment processes are agency specific and ad hoc.	**Agencies implement a nominally systematic approach to traffic management to address immediate concerns. Traffic management approaches are operator driven and either static or based on time of day.**	Traffic management development and deployment processes are standardized and have a more system-wide approach that is well documented.	Development and deployment processes related to traffic management are streamlined across an entire region, and agencies have a continuous improvement process for traffic management.

Consensus	•	• 2	•	•

• Workshop Actions to Advance to the Next Level

- Determine funding stream for traffic management projects (ongoing operations)
    - Asset management system could help show a need for funding stream
    - Create category of work to delineate within the program
    - Establish line item in budget for highway helper and TMC operating cost
- Determine approach to sell traffic management projects to decision makers
    - Use traffic management B/C ratios to show project benefits
- Incorporate TSMO strategies in project concept development
- Program change to encourage cross agency collaboration with funding

Iowa DOT ATDM Systems and Technology

Workshop Outputs

Strengths Cited	Challenges Cited

• Computer aided dispatch (CAD) integration (Des Moines)
  ○ Working to build API to get CAD systems to share feeds
• Fiber backbones being deployed to support technology implementation
• Working with local agencies to integrate cameras
  ○ Unique process needed for each agency
  ○ Sharing software
• Willing to take risks and try new solutions
• Communicating with end users on the front end of projects
• Sharing technology with border states
• Relationship with IT to manage cybersecurity
  ○ Penetration testing of advanced traffic management system (ATMS) and 511
	• Interoperability of technology
	  ○ Sharing camera feeds
	• Dependence on consultants on work zone technology deployments
	• Locals implementing traffic incident management plan during incident
	• Lack of technology asset management program
	  ○ Inventory (knowing age of devices)
	  ○ Problem tracking
	• Mindset of not needing any more DMS deployments
	  ○ Technology planning process
	  ○ Border DMS / major decision points

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	Traffic management approaches are developed on an ad hoc basis independent of the systems engineering process.	The systems engineering process and ITS architecture are consistently applied within the traffic management context. Agencies apply advancements and technologies in spot locations.	**Agencies apply advanced technologies but with a limited level of automation. Traffic management systems are replicated and integrated within operations, with standardized documentation.**	Automation of traffic management processes is based on historical, current, and predicted data. New and emerging technologies are deployed on a continuous basis to improve system efficiency.
Consensus	•	•	• 3-	•

• Workshop Actions to Advance to the Next Level

- Develop/procure traffic management asset management plan/system
  - Long term: integrating with existing asset management system

Iowa DOT ATDM Performance Measurement

Workshop Outputs

Strengths Cited	Challenges Cited

• High amount of data being collected
• Strong relationship with Iowa State for operations data
• Long range transportation plan includes framework to institutionalize performance management
  ○ 4 objectives identified with ways to measure them
  ○ Need to implement
• Internal TMC data being used to make changes
	• Data Rich Information Poor (DRIP)
	  ○ Not using a lot of the data to make decisions
	  ○ Integrating Iowa State resources into business processes
	  ○ Need data to be easily available and easy to ingest by decision makers
	• Performance measurement not coordinated at enterprise level
	  ○ Example: traffic counts from multiple bureaus with different processes
	  ○ Local agency data from intersections on state system
	• Published TMC reports not being used to make changes
	• Need buy in from staff on value of performance measurement

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	Use of performance measurement processes for traffic management is not undertaken on a regular basis.	**Agencies employ performance measurement assessment of traffic management strategies primarily to analyze impacts post deployment.**	Agencies identify desired outcome measures and consistently utilize performance measure analyses to improve strategy deployment and overall operations.	Agency traffic management goals and objectives are mapped to performance measures, which are regularly used to manage systems. Documentation of analyses results is distributed internally and externally and

				is archived for later use.
Consensus	•	• **2**	•	•

• **Workshop Actions to Advance to the Next Level**

• Involve data scientists
  • Iowa State resources
  • Maximize existing DOT resources
• Determine key performance indicators (“a few good measures”)
  • Need a facilitator to be a champion
• Hire an economist for market research, bigger picture look at project benefits
• Share tools with broader audience
• Institutionalize and share project scoping tools
  • ICE-OPS

Iowa DOT ATDM Culture

Workshop Outputs

Strengths Cited	Challenges Cited

• Work zone management
  ○ Knowing what projects to expect work zone challenges on
• District TSMO Engineer positions
  ○ Support from Director
• Outreach with local dispatch centers
• 3 groups focused on traffic management
• Leadership and strategy from top down and bottom up (field staff)
	• Varying levels of traffic management focus with maintenance staff
	• Perspective of public thinking there aren't big congestion problems
	  ○ Makes it harder to focus on traffic operations in planning stages
	  ○ People who don't experience congestion don't think about it
	• Need processes and structure memorialized

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	Traffic management is primarily an assortment of loosely related projects and strategies. Only a few champions lead the efforts.	Traffic management is recognized as valuable and a key role of the agency. Select agency managers lead efforts for traffic management.	**Traffic management is recognized as a core program that coordinates with other programs on an ongoing basis.**	Traffic management is a program that is highly integrated with related core functions, such as planning, design, construction, maintenance, etc. All agency staff members, from leadership to rank and file, embrace the importance and value of traffic management.
Consensus	•	•	• 3	•

• Workshop Actions to Advance to the Next Level

No actions identified

Iowa DOT ATDM Organization and Workforce

Workshop Outputs

Strengths Cited	Challenges Cited

• Consultant resources (new ideas, efficient)
• Recognition of what training is needed
  ○ Resources available for training
• District TSMO Engineers
• Good relationship with administrative services department
•
	• At district level, traffic management structure is lacking
	  ○ Where TSMO engineers fit in
	  ○ Integrating with traffic technicians
	  ○ Hard to choose what to focus on, staffing is lacking
	• TSMO rollout was to narrow audience
	• Reliance on consultants causes turnover and lack of succession planning (knowledge management)
	  ○ Less flexibility
	• TMC staffing is hard because of type of role and hours
	• Training field staff with lack of technology at maintenance garages
	• Losing maintenance staff to county employment

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	In-house personnel have limited traffic management experience with no specialized experience in engineering, traffic analysis, etc. Agency personnel roles are fragmented.	Core staff knowledge, skills, and abilities (KSAs) are identified within the traffic management arena, and roles are linked across various responsible groups.	**Traffic management staff members and their related knowledge, skills, and abilities are identified and established on a broad basis and within individual groups.**	Traffic management program support exists to engage in advancement of knowledge, skills, and abilities. Formal and ongoing training on traffic management is offered and supported by the agency.
Consensus	•	•	• 3+	•

• Workshop Actions to Advance to the Next Level
No Actions identified.

Iowa DOT ATDM Collaboration

Workshop Outputs

Strengths Cited	Challenges Cited

• Statewide Traffic Incident Management Committee
  ○ Local MDSTs
• Quarterly meetings with DPS
• Partnering with law enforcement community to share about TMC
• DOT representation at TMAC meetings
• Know who to contact and that it will be handled
	• Lack of formalized conversations with locals (District 1)
	• Turnover from positions creates gap in participation
	• Finding ways to have effective collaboration, not just meeting to meet
	  ○ Finding right number of meetings
	• The ways to collaborate, in-person vs online
	• Communicating with Governor's staff
	• Collaborating with people from farther away in the state

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimizing
Criteria	Relationships and collaboration between stakeholder organizations are informal and ad hoc.	Collaboration with stakeholders is more formal and related to specific traffic management needs and projects.	**Agencies collaborate on traffic management at a high level via engagement of regional stakeholders.**	Agencies approach traffic management at the regional level, with robust regional collaboration and multimodal decision-making taking place across the entire region.
Consensus	•	•	• 3	•

• Workshop Actions to Advance to the Next Level

- Traffic management collaboration meetings among metro agencies
  - Technical committee within MPO has access to local engineers
  - Monthly meetings to start with

https://ops.fhwa.dot.gov/publications/fhwahop18094/fhwahop18094.pdf