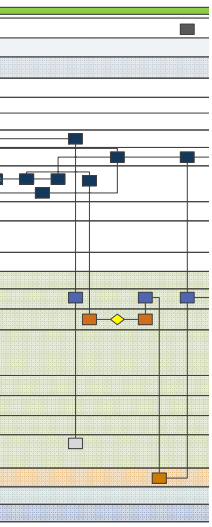
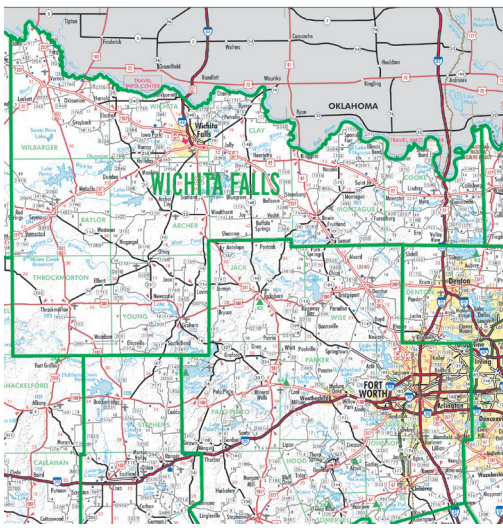
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)





WICHITA FALLS DISTRICT PROGRAM PLAN

January 2021

Texas Department of Transportation

Document Control

Date	Version	Description
October 23, 2020	1.0	Draft TSMO Program Plan – for District Review
November 30, 2020	1.1	Draft-Final TSMO Program Plan – District Comments Incorporated
February 22, 2021	Final	Final TSMO Program Plan for Publication to TSMO Website

Table of Contents

List of Tables

List of Figures

List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ATMS	Advanced Traffic Management System
CCTV	Closed-Circuit Television
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
CMV	Commercial Motor Vehicle
CRIS	Crash Record Information System
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Texas Department of Public Safety
EMS	Emergency Medical Services
FAST	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
ICS	Incident Command System
IH	Interstate Highway
ITS	Intelligent Transportation Systems
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
NWS	National Weather Service
PSE	Planned Special Events
RWM	Road Weather Management
SH	State Highway
SOP	Standard Operating Procedures
SWZ	Smart Work Zone
TDEM	Texas Department of Emergency Management
TIM	Traffic Incident Management
TM	Traffic Management
TMC	Traffic Management Center
TMS	Traffic Management Systems
TSM	Traffic Signal Management
TSMO	Transportation Systems Management & Operations
TTI	Texas Transportation Institute
TxDOT	Texas Department of Transportation
TxDOT DAL	Texas Department of Transportation - Dallas District
TxDOT FTW	Texas Department of Transportation - Fort Worth District
TxDOT TRF	Texas Department of Transportation - Traffic Safety Division
TxDOT WFS	Texas Department of Transportation - Wichita Falls District
WZM	Work Zone Management

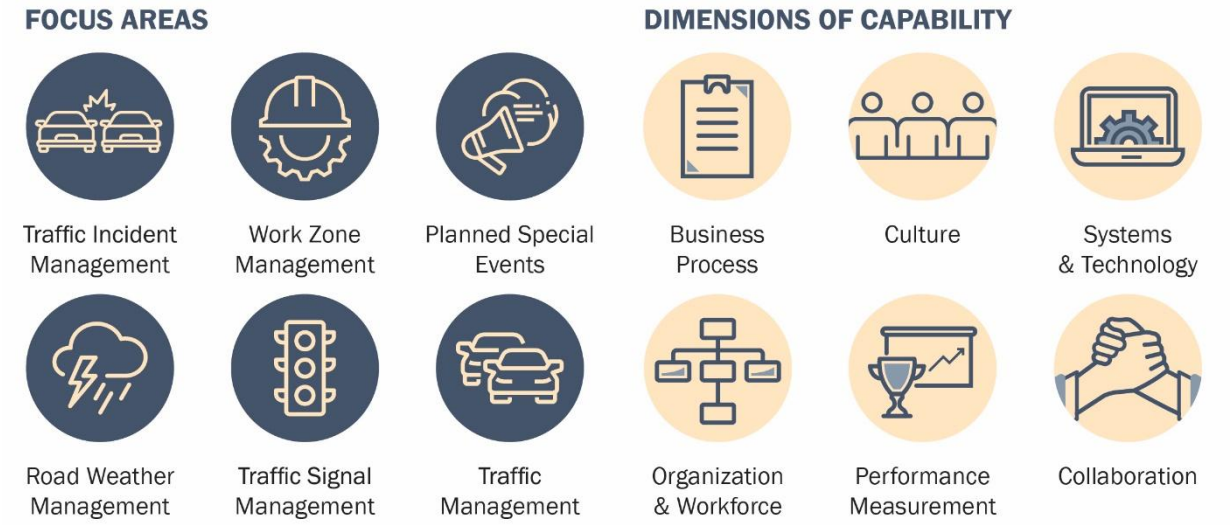
Executive Summary

What is a TSMO Program Plan?

Transportation Systems Management and Operations (TSMO) is an approach to improve mobility for all modes of transportation using integrated strategies that are designed to optimize the performance of existing infrastructure by preserving capacity and improving the security, safety, and reliability of the transportation system. The TxDOT Wichita Falls District has developed this TSMO Program Plan to identify actions that District staff can implement over the next five years to improve traffic operations.

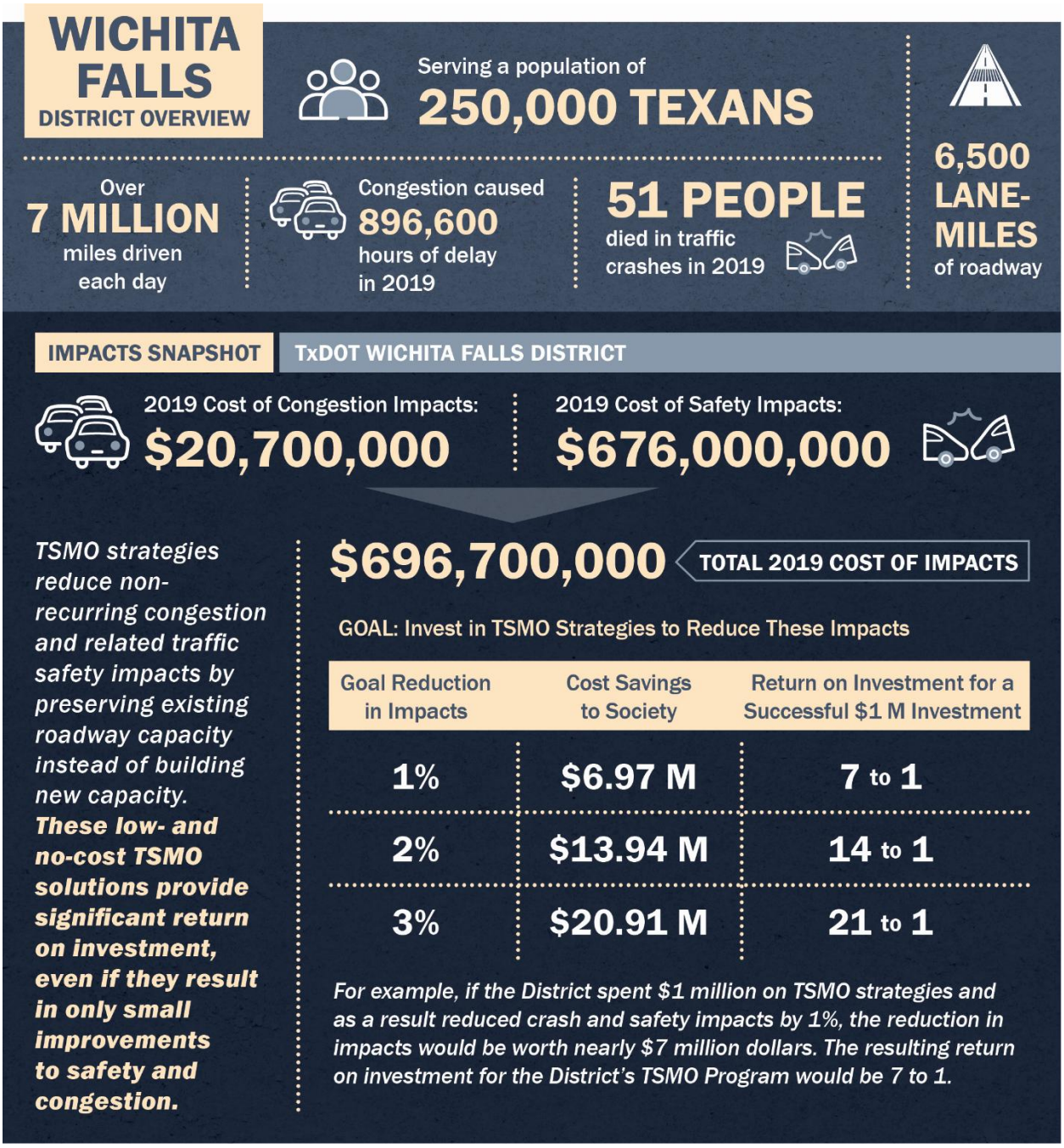
Stakeholder engagement for this TSMO Program Plan effort began in December 2019 and included outreach to District staff, local agency partners, the Oklahoma Department of Transportation, and neighboring TxDOT Districts. Each phase of stakeholder engagement and key deliverables submitted to stakeholders for review are all summarized in the timeline below.

To develop this plan, the District reviewed existing data and engaged with both internal and external stakeholders through a series of meetings and workshops to identify strengths and needs related to six TSMO **Focus Areas.** From these strengths and needs, the District identified and refined a list of potential action items that could be implemented to build on existing strengths and address persistent needs. These action items were grouped into six TSMO **Dimensions of Capability.** These TSMO focus areas and dimensions of capability are listed in the figure below, and the icons for each appear throughout the document alongside related action items and discussion.



Why Invest in TSMO Actions?

A review of congestion and safety impacts in the TxDOT Wichita Falls District revealed that traffic and crashes within the District's boundaries cost society nearly $700 million in 2019. TSMO actions have been proven to reduce congestion and crash rates at levels of investment far lower than would be required for capacity-building projects. The primer below shows how investing in TSMO actions to reduce these societal costs can provide a significant return on investment for the TxDOT Wichita Falls District. More detail is provided in the **Business Case for TSMO** section of this TSMO Program Plan.



How Should the District Invest in TSMO?

Below are four groups of recommended action items that serve as starting points for the District's TSMO activities over the next five years. A full list of recommended action items is in the **TSMO Implementation Plan** section of this TSMO Program Plan, and areas that could benefit from further study are included in the **TSMO Tactical Plan Assessment** section. These action items are also summarized in greater detail in **Appendix A.**

Recommended TSMO Actions That Support Previously Planned District Efforts

The action items listed in the table below support the District's planned efforts to upgrade signal communications technology and install ITS devices along Interstate 35. Implementing these actions would help the District get the most out of its planned investments.

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
Action Items That Support Planned Efforts				
ST-03	Continue the deployment of cellular modems at traffic signal locations and develop systems that provide rapid notification of signal equipment outages	40		
ST-05	Deploy planned ITS devices along I-35 as part of planned reconstruction and update the Regional ITS Architecture accordingly	42		
OW-02	Establish a 24-hour ITS device coverage plan among the Wichita Falls District and metro district TMCs	53		

High Cost, High Impact Recommended TSMO Actions

The action items in this table each have the potential to markedly improve traffic operations and traffic safety in the District; however, these action items would either immediately or eventually require a fiscal commitment from the District to make successful implementation possible.

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
High Cost & High Impact Action Items				
BP-02	Develop strategies to reduce response and clearance times for major traffic incidents	32		
ST-02	Analyze road weather detection and warning systems to identify ones requiring minimal maintenance	39		
PM-03	Track and report road weather management data to inform the public and establish estimates of annual expenses	46		

Low Cost, High Impact Recommended TSMO Actions

The action items in this table each have the potential to markedly improve traffic operations and traffic safety in the District. While these actions can be completed without significant fiscal support, each one will require sustained effort from a District staff member or a small group of District staff for successful implementation.

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
Low Cost & High Impact Action Items				
BP-01	Implement a more formalized traffic incident management program, including increased incident detection capabilities	31		
ST-04	Improve real-time travel time information dissemination to travelers throughout the District	41		
CO-04	Conduct quarterly regional operations meetings with staff from TxDOT and ODOT	57		

"Easy Win" Recommended TSMO Actions

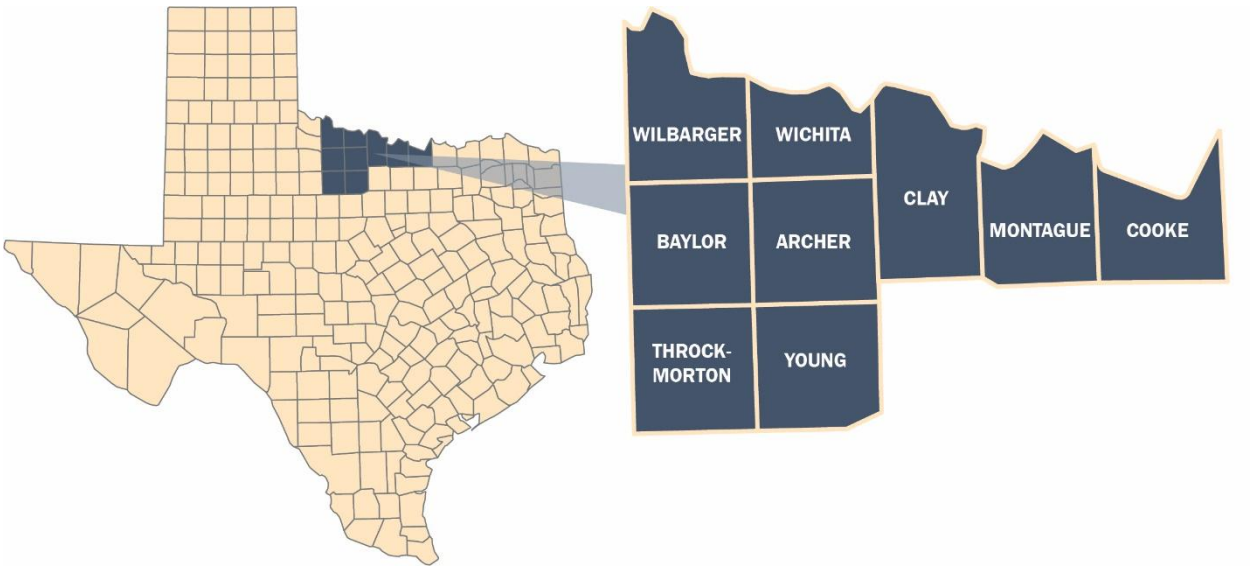
The action items in this table will most likely not be as impactful as those listed above, but they provide opportunities for the District to improve traffic operations and traffic safety with relatively little required fiscal commitment or staff effort.

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
"Easy Win" Action Items				
BP-03	Standardize payment contract language with local law enforcement for work zone support	33		
PM-04	Begin to measure and track Districtwide traffic operations data, including travel time reliability	47		
CO-03	Partner with third-party providers to share traffic operations data	57		

Introduction

The TxDOT Wichita Falls District, shown in Figure 1, is developing and implementing a Transportation Systems Management and Operations (TSMO) program. TSMO is an approach to improve mobility for all modes of transportation using integrated strategies that are designed to optimize the performance of existing infrastructure by preserving capacity and improving the security, safety, and reliability of the transportation system.

Figure 1: TxDOT Wichita Falls District Map



TSMO is defined specifically in federal legislation, including the Moving Ahead for Progress in the 21st Century Act (MAP-21), as well as the Fixing America's Surface Transportation (FAST) Act. Several state departments of transportation (DOTs)—including those in Nevada, Colorado, Florida, and Iowa—have developed or are in the process of developing Statewide TSMO plans to improve the operational efficiency of their respective transportation networks.

In comparison to other state DOTs, TxDOT is largely decentralized. Each of TxDOT's 25 districts has a unique set of operational challenges and constraints. As a result, each TxDOT district is developing its own TSMO Program Plan which will reference and conform to the Statewide TSMO Strategic Plan and related guidance that was finalized by the TxDOT Traffic Safety Division (TxDOT TRF) in 2017. Even with consistency across each of the District TSMO plans, the business case, roles and partnering approaches, and implementation strategies will be uniquely tailored to the individual district's transportation challenges and needs.

The Federal Highway Administration (FHWA) generally recommends that state DOT TSMO planning elements include the three levels of planning components listed below. This report corresponds to the second level of TSMO planning in this hierarchy:

1. TSMO Strategic Plan/Guidance – This plan is statewide in scope. It provides the overarching statewide vision and strategy for TSMO, and it establishes a framework for each district to conduct its own TSMO program planning efforts.
2. TSMO Program Plan – This plan is developed for a specific district or region within a state. In Texas, a TSMO Program Plan will be developed for each TxDOT district. A district's TSMO Program Plan defines the goals, resources, performance measures, and institutional arrangements that will enhance traffic operations in the respective district.
3. TSMO Tactical Plans – These plans are developed for a specific operational focus area within a district. The TSMO Program Plan may include recommendations to develop one or more TSMO Tactical Plans. These plans include a deeper analysis of current strengths and opportunities to improve a specific operational focus area such as Work Zone Management (WZM), Traffic Incident Management (TIM), Road Weather Management (RWM). Tactical Plans function as deployment plans by providing additional details, responsibilities, and cost estimates to further the integration and prioritization of specific mobility strategies with existing district efforts.

The TxDOT Statewide TSMO Strategic Plan was completed in 2017 as the first component of the TxDOT TSMO planning initiative. TSMO activities have been taking place throughout the state on an ad-hoc basis for decades. The TxDOT Statewide TSMO Strategic Plan defines processes to conduct TSMO consistently across the state. It also identifies the roles and responsibilities of each TxDOT Division and of individual TxDOT Districts for implementation of a statewide TSMO program.

Following the development of this framework, the second component of the TxDOT TSMO planning initiative is to develop District-level TSMO program plans. The Austin District was the first of the 25 TxDOT Districts to develop a TSMO Program Plan, which was completed in June 2018. All other TxDOT Districts began development of their TSMO Program Plans in 2019 and 2020. Each District's TSMO Program Plan focuses on strategies that can be implemented within the next five years, after which the Program Plan should be updated to assess progress and to identify new focus areas and strategies. Potential TSMO Tactical Plans are identified for the TxDOT Wichita Falls District as a part of this TSMO Program Plan. The structure of the TxDOT Wichita Falls District TSMO planning initiative is shown in Figure 2.

Figure 2: Wichita Falls District TSMO Structure

The development of this TxDOT Wichita Falls District TSMO Program Plan involved individual agency outreach meetings and group workshops with both internal TxDOT stakeholders and external local and regional agency partners. These partners included city transportation staff, law enforcement and emergency response officials, and staff from neighboring TxDOT districts or State DOTs such as the Oklahoma Department of Transportation (ODOT). These partners were asked to provide initial input on regional operational challenges, to give feedback on existing regional capabilities to address those challenges, and to participate in work sessions to develop strategies to improve those regional capabilities. The stakeholder engagement timeline for this effort is shown below in Figure 3, and a detailed list of participants is included in Appendix B. Due to travel restrictions related to the Coronavirus outbreak, all outreach completed after February 2020 was conducted virtually.

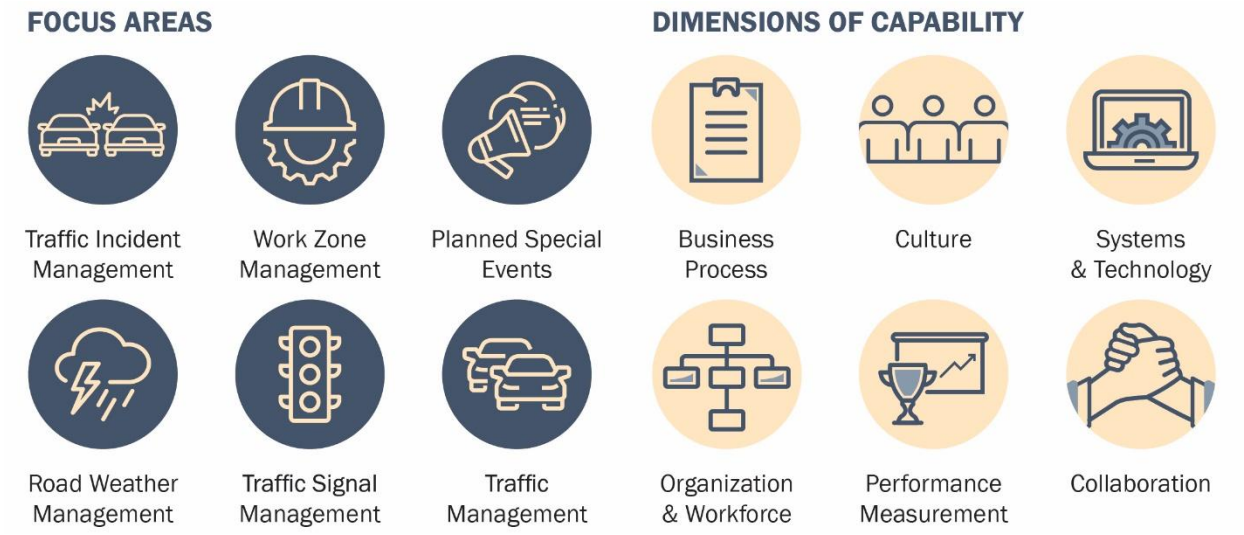
Figure 3: Wichita Falls District TSMO Stakeholder Engagement Timeline

Program Plan Format

Beginning on page 9, the TxDOT Wichita Falls District TSMO Program Plan establishes a business case for adopting TSMO priorities throughout the District. This business case reviews available metrics on congestion and safety to assess existing societal costs related to delay and crashes within the District. This information is analyzed alongside available funding sources and some of the regional operational challenges that TxDOT Wichita Falls District staff and external partners identified. Finally, the business case describes how TSMO strategies might reduce societal costs and address funding and operational challenges that the TxDOT Wichita Falls District has identified as a priority. The following section introduces the Statewide TSMO Vision and Mission, both of which were developed as part of the 2017 TxDOT TSMO Strategic Plan. The section then lists the TSMO goals and objectives that were specifically developed for the TxDOT Wichita Falls District as part of this program planning process.

The Capability Maturity Model (CMM) section provides an overview of the self-assessment process and the assessment results that TxDOT Wichita Falls District and partner agency stakeholders reported for six standard capability dimensions: Business Processes, Systems and Technology, Performance Measurement, Culture, Organization and Workforce, and Collaboration. The section describes how each of these results and related stakeholder feedback showed the TxDOT Wichita Falls District's existing capabilities in responding to six of the most typical TSMO focus areas: Traffic Management (TM), Traffic Signal Management (TSM), Road Weather Management (RWM), Work Zone Management (WZM), Planned Special Events (PSE), and Traffic Incident Management (TIM). These capability dimensions and focus areas are shown below in Figure 4. Detailed descriptions of TSMO action items and relevant case studies of best practices from other TxDOT Districts and state DOTs are included below, and the icons shown are used to relate the recommended action items to each TSMO capability dimension and focus area.

Figure 4: TSMO Focus Areas and Dimensions of Capability

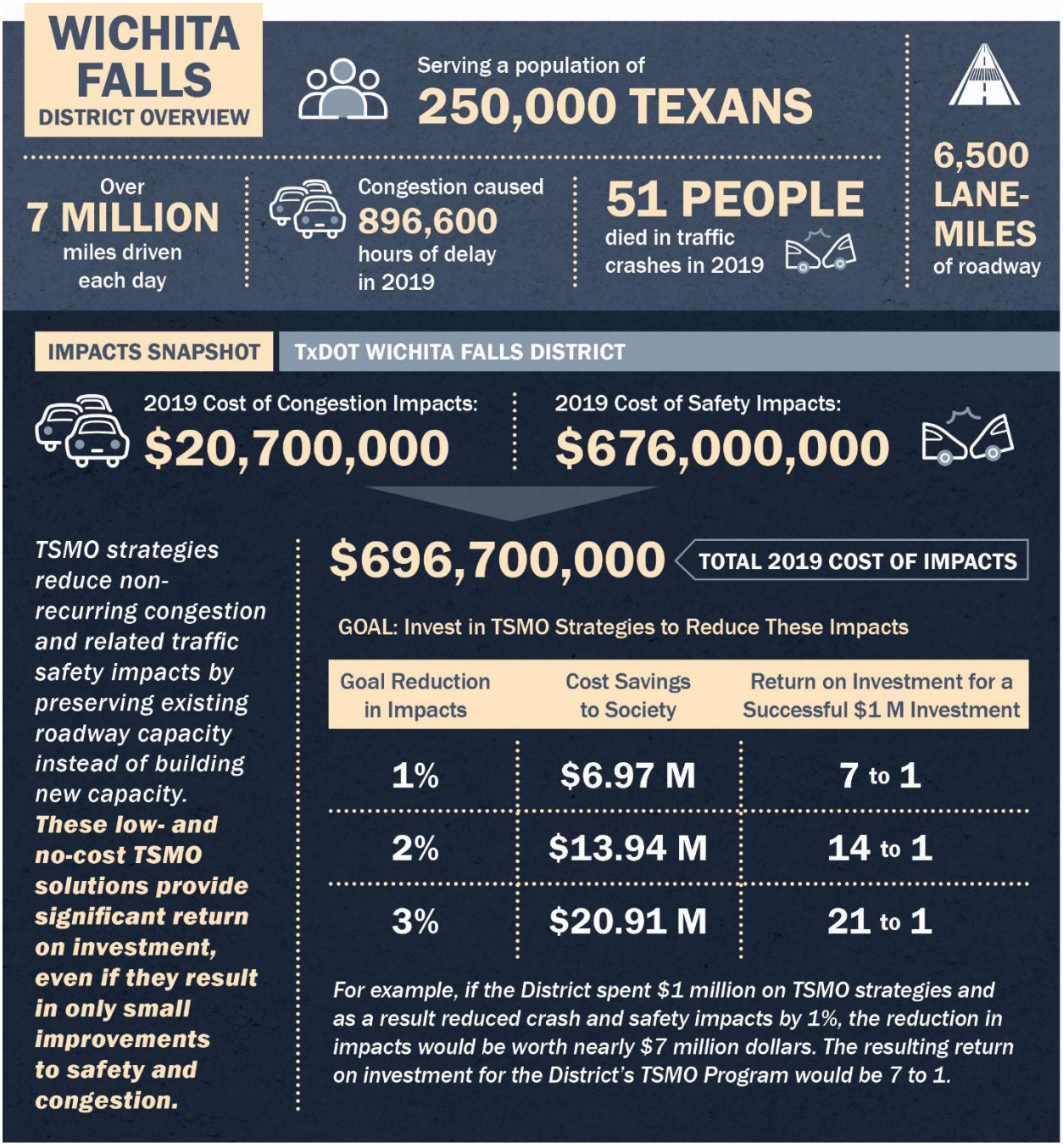


The results of the CMM process feed into the TSMO Implementation Plan, which provides an implementation schedule of recommended TSMO action items for the TxDOT Wichita Falls District to undertake for the next five years. Finally, focus areas and action items that would benefit from further planning or development are described in the TSMO Tactical Plan Needs Assessment section.

Business Case for TSMO

Figure 5 below summarizes the business case for investing in TSMO strategies in the Wichita Falls District. A more detailed analysis and discussion is provided on the pages that follow in this section.

Figure 5: Wichita Falls District Overview and Impacts Snapshot



Funding Impacts

The number of people living in Texas has increased by more than 15 percent in the last ten years. Adding transportation network capacity and optimizing available funding have become increasingly challenging as the population of Texas continues to grow. As a result, TxDOT has emphasized transitioning transportation funding and resources from conventional capacity-adding methods to a focus on managing and operating the transportation network through investing in technology and Traffic Management Systems (TMS), as well as leveraging resources among regional partner agencies and private sector data providers.

The 2050 Texas Transportation Plan goal to **Sustainably Fund and Effectively Deliver the Right Projects** corresponds closely with the District's goal of addressing funding challenges using TSMO strategies.

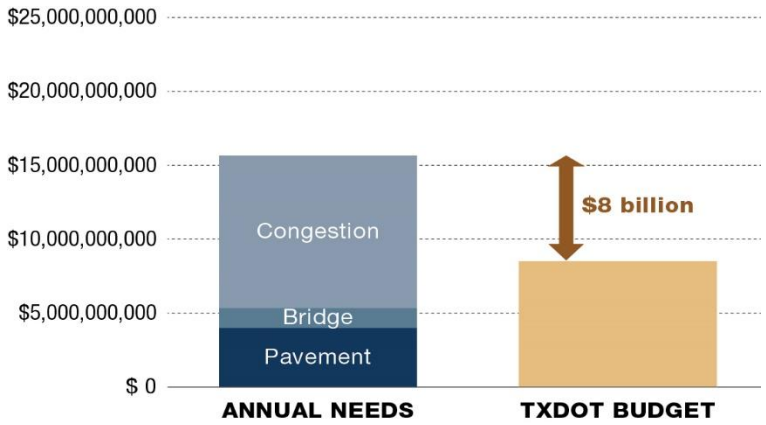
TxDOT Goal: Sustainably Fund and Effectively Deliver the Right Projects

Detailed objectives include:

- Reduce user costs
- Identify and maintain reliable funding
- Improve analytic capabilities to maximize the value of investments
- Fairly distribute transportation benefits and costs
- Strategically deploy innovative technology to increase effectiveness and efficiency of the system (keeping pace)

FHWA studies have shown that operational improvements to increase mobility typically have a higher benefit-cost ratio than infrastructure projects to build additional lane miles of capacity, especially when life-cycle costs are considered for both project types. With transportation demand growing, integrating TSMO into existing TxDOT Wichita Falls District processes will help TxDOT staff identify and prioritize cost-efficient operations and systems management methods to improve system reliability and safety, thus optimizing available capacity. TSMO will support projects that can bridge the gap between existing needs and available funding. The existing TxDOT $8 billion annual gap is shown in Figure 6, which is taken from the 2040 Texas Transportation Plan.[1]

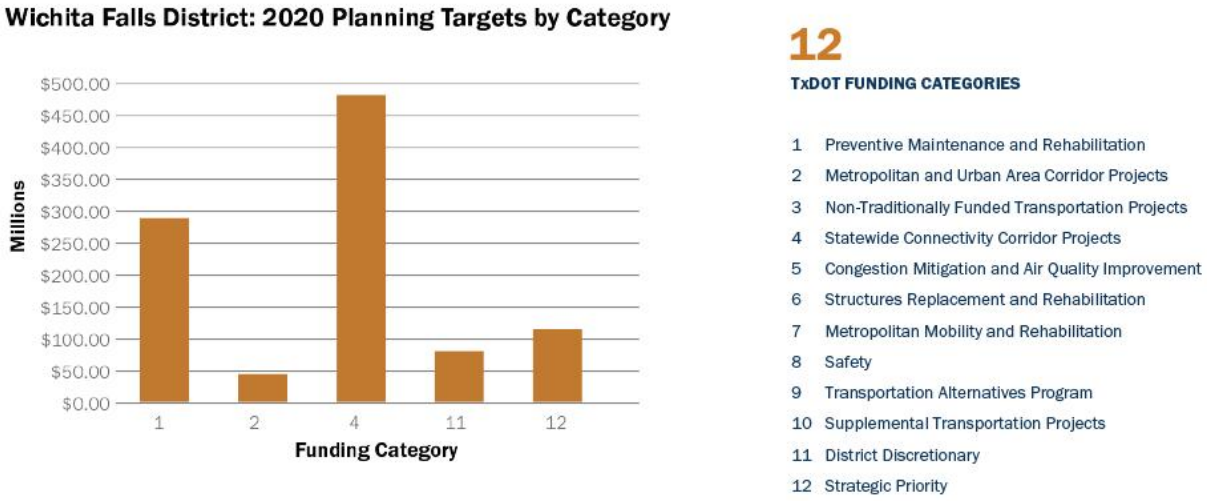
Figure 6: TxDOT Annual Transportation Needs and Budget



The Texas 2020 Unified Transportation Program (UTP) established a planning target of $1,116,290,000 in project funding for the TxDOT Wichita Falls District over the next 10 years.[2] A breakdown of these planning targets over the next 10 years for the TxDOT Wichita Falls District from the UTP divided by funding category is shown in Figure 7. Based on these planning targets, both preventive maintenance and rehabilitation, as well as statewide connectivity are key investment areas that the TxDOT Wichita Falls District will focus on over the next 10 years. TSMO strategies can be applied to both investment areas, specifically to improvements focused on statewide connectivity. Several of the key projects related to these investment areas are:

- IH 35 - Widen Freeway - Cooke County
- US Route 82 - Widen Non-Freeway - Montague County
- US Route 82 - Add Passing Lanes (Super 2) - Baylor County
- SH 114 - Add Passing Lanes (Super 2) - Young County

Figure 7: TxDOT Wichita Falls District 10-Year Planning Targets by Category



Agencies that place importance on TSMO in long-range planning, project development, system completion, and system maintenance have a strong case for devoting funding to these strategies because operations and management activities can improve congestion issues while minimizing or delaying the need for physical capacity improvements. Through TSMO planning, funding is set aside for TMS in conventional construction, asset management techniques, upgrades to existing infrastructure, workforce resources, and other operational strategies.

Congestion Impacts

The 2050 Texas Transportation Plan goal to **Optimize Movement of People and Goods** can be addressed using TSMO strategies.

TxDOT Goal: Optimize Movement of People and Goods

Detailed objectives include:

- Reduce congestion through both traditional and alternative strategies
- Improve travel time reliability
- Increase travel options and connections across modes
- Ensure freight can move efficiently
- Increase access to jobs, services, and activity centers
- Leverage transportation assets to support economic growth and vitality

TSMO planning identifies strategies beyond typical capacity enhancements that reduce congestion. Since TSMO strategies are mostly focused on non-recurring congestion, they are typically more effective at improving travel time reliability when compared to capacity enhancements.

Quantifying Congestion-Related Impacts

The Texas State Data Center reports the population of the TxDOT Wichita Falls District has been growing slowly since 2010, with an approximate population increase of 0.06 percent over the past 10 years. [3] In addition to local commuters, the City of Wichita Falls is visited by an estimated 2.6 million tourists annually, and the segment of IH 35 through Cooke County serves more than 50,000 vehicles on a typical weekday. [4,5]

One of the keys to maintaining economic vitality within the TxDOT Wichita Falls District is effective management of commute times. The United States Census Bureau tracks average commute time data through its Journey to Work questionnaire as part of the American Community Survey. Over the past ten years, the average commute time for residents of Wichita county within the TxDOT Wichita Falls District has increased by 11.1 percent, from 14.4 minutes to 16.0 minutes.[6]

One potential cause of an increase in average commute times is an increase in traffic congestion within the TxDOT Wichita Falls District. In 2019, the Texas Transportation Institute (TTI) estimated an annual total delay of approximately 896,600 passenger-hours along major thoroughfares within the District. This total is inclusive of an estimated annual freight vehicle delay of 90,500 driver-hours along those same major thoroughfares. Using state-specific user cost values, TTI estimated that this congestion resulted in a societal cost of approximately $20,700,000 within the TxDOT Wichita Falls District in 2019.[7]

TSMO allows for the inclusion of operations strategies that result in the improved management of incidents, work zones, weather events, and planned special events, thereby reducing the impacts and related societal costs of these interferences on the transportation network. TSMO helps ensure congestion-related mobility challenges are mitigated through emphasizing integration of innovative strategies that maximize existing and future throughput.

Safety Impacts

The 2050 Texas Transportation Plan goal to **Enhance Safety** corresponds with many TSMO strategies.

TxDOT Goal: Enhance Safety

Detailed objectives include:

- Design and build infrastructure to reduce crashes and lessen crash severity
- Improve incident response times
- Promote safe driving, bicycling, and pedestrian activities
- Enhance coordination with first responders

TSMO planning identifies technologies or systems that can be incorporated into existing or planned infrastructure to improve the safety of road users, whether they be drivers, cyclists, or pedestrians. In addition to the objectives outlined in the 2050 Texas Transportation Plan, the Texas Transportation Commission adopted a Road to Zero Goal in 2019. The goal is the elimination of all deaths on Texas roadways by 2050, with a midway goal of halving the number of deaths on Texas roadways by 2035. The implementation of TSMO strategies will be essential in reducing and eventually eliminating the number of deaths on Texas roadways.

Quantifying Safety-Related Impacts

In 2019, there were 4,751 reported crashes in the TxDOT Wichita Falls District.[8] In those crashes, 51 people died and 133 people suffered an incapacitating injury. A summary of 2019 crashes in the TxDOT Wichita Falls District, including crash types that could be targeted by strategies related to a TSMO focus area for reduction, is shown below in Table 1. Using state-specific user cost values, these crashes and associated damages resulted in a societal cost of approximately $676,000,000 in 2019.[9]

Table 1: 2019 Summary of Crashes by Type Within the TxDOT Wichita Falls District

	Fatal (K)	Serious Injury (A)	Minor Injury (B)	Possible Injury (C)	No Injury (O)	Unknown Severity
Total crashes	**45**	**104**	**388**	**521**	**3,398**	**295**
Total persons affected	**51**	**133**	**549**	**742**	**8,684**	**295**
Inclement Weather - Rain or Fog	6	10	33	58	380	16
Inclement Weather - Winter	0	0	3	6	40	1
Work Zone Crashes	2	5	2	7	72	1
Intersection Crashes	4	26	149	213	1106	29
Commercial Vehicle Crashes	1	19	31	39	314	6

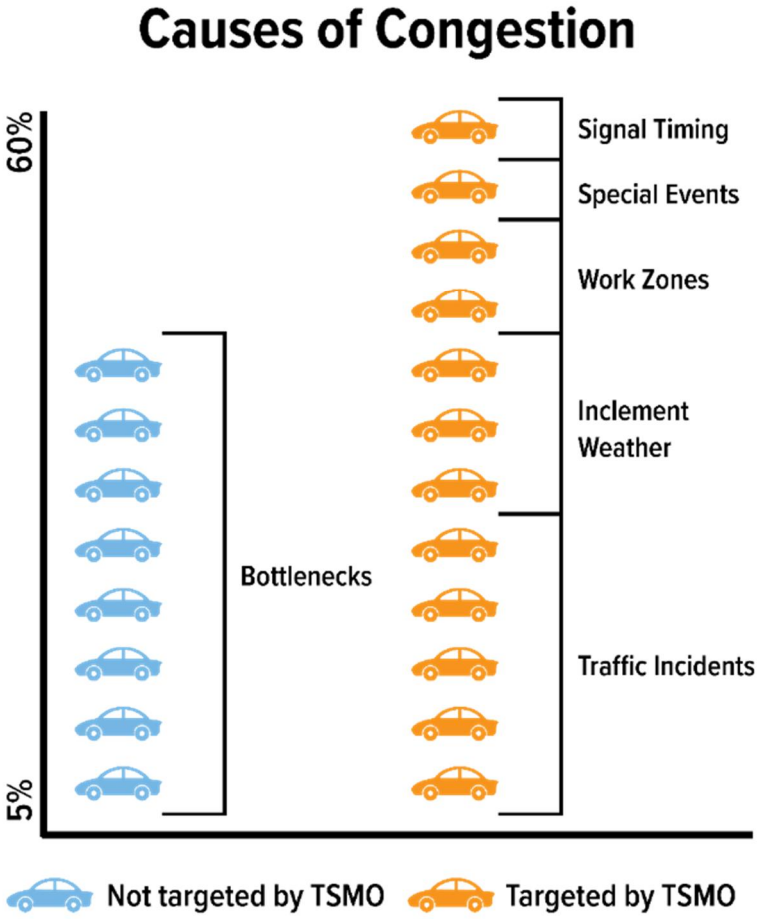
When TSMO activities are considered in project development, such as during planning for roadway maintenance, solutions to improve safety for all modes of transportation can be identified and implemented.

Furthermore, TSMO strategies aimed at reducing non-recurring sources of congestion and improving traveler information can improve driver expectancy and improve driver awareness of conditions that increase their crash risk when on the road. Finally, TSMO strategies can help protect those who spend time working in the roadway, including TxDOT employees and contractors, public safety officers, and emergency responders.

The Value of Mainstreaming TSMO

The business case for TSMO is grounded in the fact that funding for the TxDOT Wichita Falls District to solve existing congestion challenges through capacity enhancements alone is not readily available. FHWA congestion research shows that most of the congestion that road users experience in the United States is not a result of capacity bottlenecks. Instead, most congestion occurs due to non-recurring shocks to the network such as traffic incidents, inclement weather, or work zones. FHWA's breakdown of these congestion sources is shown below in Figure 8 at a nationwide level.[10]

Figure 8: Nationwide Causes of Congestion



TSMO strategies integrate TMS into the planning, design, and construction of district facilities. One group of strategies, the use of Intelligent Transportation Systems (ITS) deployments such as closed-circuit television (CCTV) cameras or dynamic message signs (DMS), has been used by TxDOT for decades. An example of a DMS unit currently deployed in Wichita Falls is show below in Figure 9. The use of ITS as well as other TMS and

TSMO strategies allows for more nimble operation and maintenance of the facilities once they are constructed. Successful integration of TMS allows agencies who maintain the transportation network to respond more quickly and to better mitigate the adverse effects of many sources of non-recurring congestion, thereby reducing congestion and making roads safer.

Figure 9: Existing DMS Unit Along US Route 82 in Wichita Falls (Google Earth Image)

Building the necessary infrastructure and maintaining it have historically been the core attributes of the planning process, while operating and managing the infrastructure have traditionally not been prioritized as highly. TSMO justifies investment in technology and TMS infrastructure to facilitate the integration of management and operations into the transportation system. Promoting and formalizing TMS deployment and maintenance ensures operational asset uptime, which in turn enables regional transportation agencies to provide greater traveler information, traffic incident management, road weather management, safer work zones, and more.

TSMO planning fosters the cultural shift required to prioritize the use and dedicated funding of operational improvements and TMS in project planning. Many agencies lack a well-defined plan of action on how to develop and sustain the processes and resources that support TSMO. All the while, congestion grows, funding becomes more limited, and roadway users increasingly expect innovative solutions for managing their travel. TSMO planning establishes a framework for performance measurement and continuous improvement to enhance safety and mobility throughout the district. Ultimately, this brings TxDOT closer to achieving the TxDOT mission statement: “Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods.”

TSMO Vision, Mission, Goals, and Objectives

The TxDOT Wichita Falls District TSMO Program mission, vision, goals, and objectives were based on similar items developed for the statewide TxDOT TSMO Strategic Plan. District project leadership chose to adopt these statewide items, and from them developed District-level program objectives. These program objectives were developed to provide additional context based on the TxDOT Wichita Falls District's needs, specifically related to maintaining traffic operations on the IH 35 corridor during and after upcoming planned construction, and with improving interagency coordination with local agency staff and ODOT.

Statewide TSMO Vision

Improve safety and mobility for all modes of transportation by integrating planning, design, operations, construction, and maintenance activities and acknowledging all opportunities for innovation.

Statewide TSMO Mission

Through innovation, collaboration, and performance-based decision-making, transportation facilities are developed, constructed, maintained, and operated cost-effectively, with the end user in mind.

Wichita Falls District TSMO Goals and Objectives

The goals and objectives for the TxDOT Wichita Falls District TSMO Program Plan identified in Table 2 on the next page are based on the TxDOT statewide TSMO goals and objectives. The TxDOT Wichita Falls District TSMO program objectives reflect areas of focus that are locally significant.

Table 2: TxDOT Wichita Falls District TSMO Program Plan Goals and Objectives

TxDOT Statewide TSMO Goals	TxDOT Statewide TSMO Strategic Objectives	TxDOT Wichita Falls District TSMO Program Objectives
Safety	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.	Continually track system safety performance and prioritize projects that include safety benefits.
Reliability	Optimize travel times on transportation systems in critical corridors to ensure travelers are reaching their destinations in the amount of time they expected for the journey.	Continually measure and seek to maintain travel time reliability throughout the District.
Efficiency	Implement projects that optimize existing transportation system capacity and vehicular throughput.	Implement systems and technology that preserve system capacity along key corridors, including Interstate 35.
Customer Service	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	Promote mobility-based decisions through clear messaging that travelers can access conveniently and interpret easily.
Collaboration	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	Coordinate with local agencies and ODOT to more effectively respond to regional operations challenges.
Integration	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	Identify opportunities to fund TSMO activities and to incorporate them into the District's day-to-day operations. Incorporate TSMO program elements into the upcoming Interstate 35 reconstruction projects that are letting in Cooke County over the next few years.

Capability Maturity Model (CMM)

A Capability Maturity Model (CMM) is a systematic methodology in which a program or organization is evaluated to determine a level of achievement for specific attributes. The American Association of State Highway Transportation Officials (AASHTO) adapted the CMM approach, originally developed for the information technology industry, so that it could be used to gauge a transportation agency's capabilities in addressing various operational challenges related to TSMO. The CMM is a self-assessment and relies on direct input from internal and external stakeholders to assess the strengths and weaknesses across a range of different program perspectives.

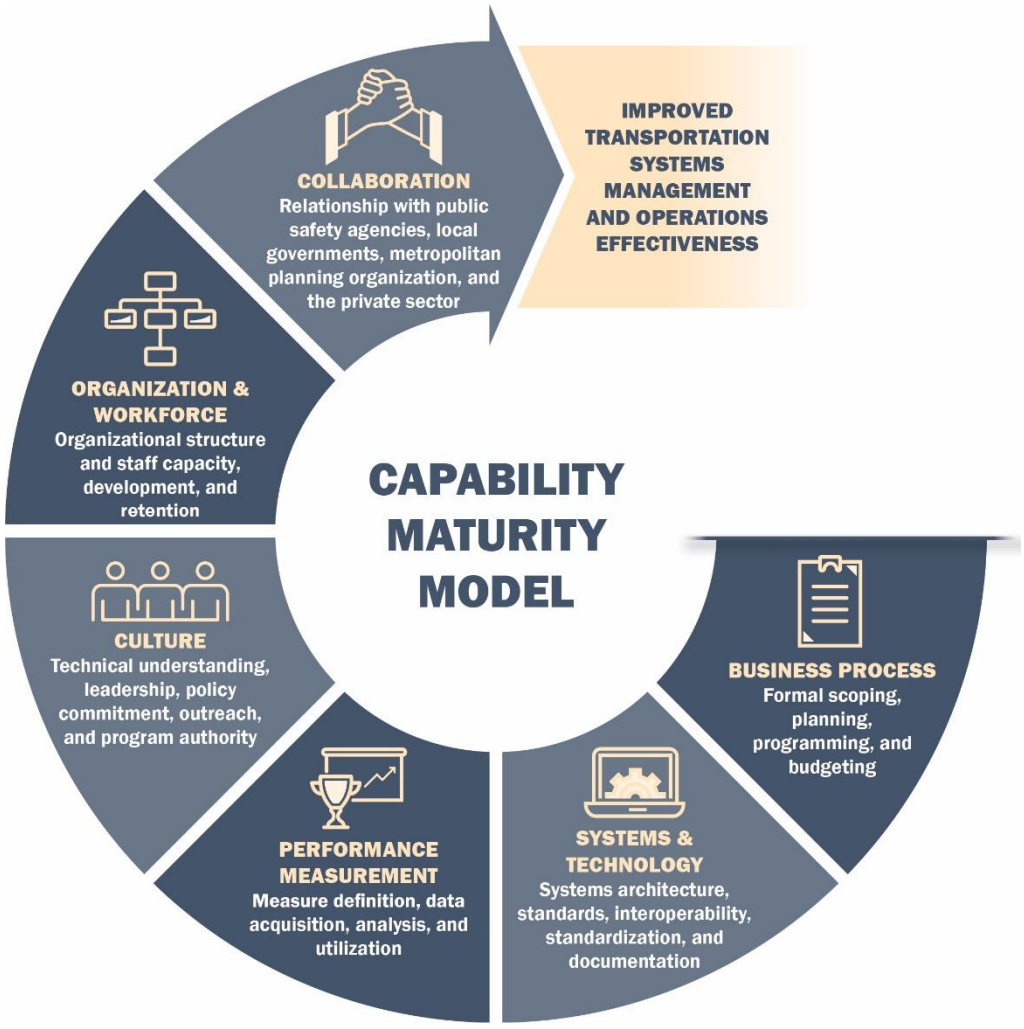
Dimensions of TSMO Capability

The CMM is based on the concept that there are six core areas, referred to as 'dimensions' that are critical for improving program efficiency and effectiveness. These dimensions, as well as processes and activities within TxDOT that correspond to each one, are shown below in Table 3 and on the next page in Figure 10.

Table 3: CMM Dimensions of TSMO Capability (Adapted from AASHTO)

CMM Dimension	Typical Related TxDOT Activities	
Business Processes	• Project Scoping • Planning	• Programming • Budgeting
Systems and Technology	• Systems Engineering • ITS Architectures	• Technology Inter-operability • System Standardization
Performance Measurement	• Defined Measures and Targets • Performance Reporting • Data Acquisition	• Data Use • Informing Operations Decisions
Culture	• Technical Understanding • Leadership • Support for Improving Processes	• Outreach • Program Legal Authority
Organization and Workforce	• TSMO Program Status • Organizational Structure	• Training and Staff Development • Recruitment and Retention
Collaboration	• Relationships with: o Public Safety Agencies o Local Governments	• Relationships with: o Metropolitan Planning Organizations (MPOs) o Private Sector Providers

Figure 10: CMM Dimensions of TSMO Capability



TSMO Focus Areas

The AASHTO CMM assessed the TxDOT Wichita Falls District capabilities across the six dimensions listed in Table 3 for six different focus areas (often referred to as Capability Maturity Frameworks). These focus areas are:

- **Traffic Incident Management (TIM):** The institutional capability to detect, respond to, and clear traffic incidents so that normal operations can be restored safely and quickly.
- **Work Zone Management (WZM):** The institutional capability to assess and mitigate work zone impacts.
- **Road Weather Management (RWM):** The institutional capability to respond to adverse weather conditions through both maintenance and operations activities.
- **Planned Special Events (PSE):** The institutional capability to manage traffic impacts generated by events at permanent multi-use event venues, temporary venues, or ones that occur on the road network itself.
- **Traffic Signal Management (TSM):** The institutional capability to effectively design, operate, and maintain traffic signals.
- **Traffic Management (TM):** The institutional capability to manage the movement of traffic on roadways within a region, including through corridor management.

The CMM Process

Each of the TSMO capabilities evaluated in the CMM assessment are classified as one of four levels of organizational maturity by stakeholders through a facilitated self-assessment process. The base level, or Level 1, is the Performed level. The top level, or Level 4, is the Optimized level. It is important to note that the levels are not grades, they merely reflect where the organization currently stands within a TSMO capability dimension.

As shown in Figure 11, Level 1, Performed, means the TSMO capability is completed on an ad-hoc basis, usually by one or two individual champions. Level 2, Managed, may involve more individuals on a team performing the activity and beginning to integrate into other processes; however, there is little accountability for achieving performance measures.

At Level 3, Integrated, the program dimension is part of a more formalized process, there are established performance measures, and activities are structured to work toward those performance objectives. At this stage, processes are more clearly defined and there is some recognized, organizational support for the activities, including budgets. When an organization has achieved Level 4, Optimized, the capability is largely institutionalized and formalized, with strong collaboration and recognition of roles and responsibilities by agency staff and partners. At this level, there is also a more formal commitment for performance-based improvements.

Each of the capabilities were evaluated for the TxDOT Wichita Falls District at a CMM workshop held with both TxDOT and partner agency staff in April 2020 via webinar. Capability responses were refined later through individual interviews with TxDOT staff. Figure 12 shows where the TxDOT Wichita Falls District ranked itself for each of the TSMO capabilities. Based on the CMM assessment, the district currently sees itself operating at CMM Level 2 (Managed) in all CMM capability dimensions except Performance Measurement, which it identifies as currently operating at Level 1 (Performed).

Figure 11: CMM Levels of Maturity

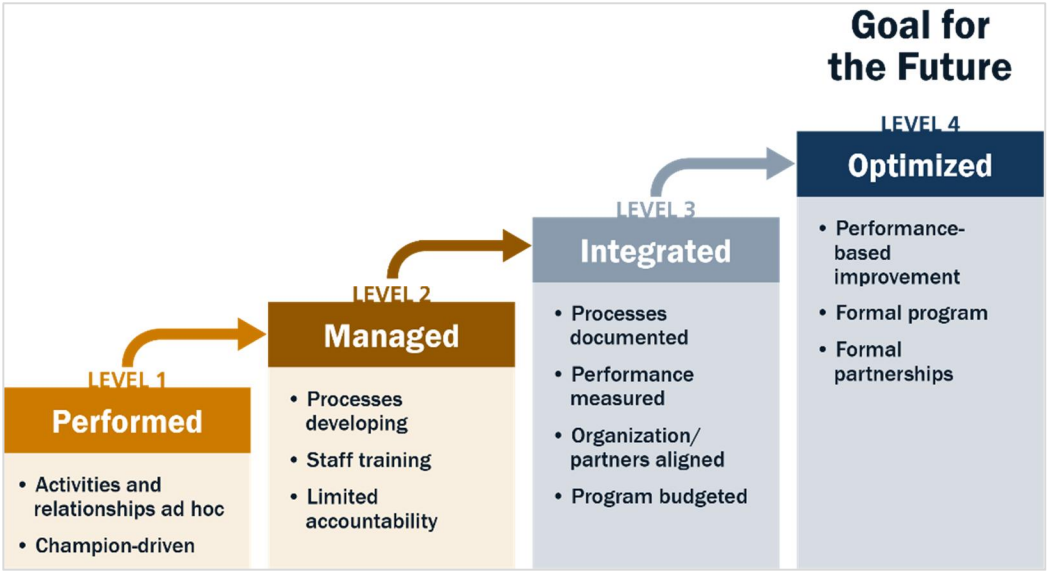


Figure 12: TxDOT Wichita Falls District CMM Assessment

Overall Capabilities				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes		✓		
Systems & Technology		✓		
Performance Measurement	✓			
Culture		✓		
Organization & Workforce		✓		
Collaboration		✓		

Detailed CMM Assessment Results

Through outreach and CMM workshops and stakeholder interviews held virtually during the second quarter of 2020, the TxDOT Wichita Falls District identified regional needs and assessed its CMM capabilities for each of the six TSMO focus areas. Following completion of the CMM assessment, district TSMO leadership selected two of the focus areas as the subject of Capability Maturity Framework (CMF) workshops. These workshops provided an opportunity for interested stakeholders to meet and identify action items that would allow the TxDOT Wichita Falls District to advance in the CMM assessment for each capability dimension within a given TSMO focus area. The focus areas that the District chose for CMF workshops were Traffic Incident Management and Road Weather Management.

Input from each of these individual stakeholder meetings and CMM and CMF workshops is presented in this subsection, organized by focus area. Case study examples from other TxDOT districts and other transportation agencies across the United States are included to provide examples of successful TSMO-related deployments elsewhere that could be similarly implemented within the TxDOT Wichita Falls District to meet the District's identified action items in each area.

Traffic Incident Management District Assessment

Traffic incident management (TIM) involves the District and partner response to traffic incidents, which can reduce congestion, improve travel reliability, and improve safety. The TxDOT Wichita Falls District generally performs TIM response activities on an ad hoc basis when required. No formal TIM program exists within the District, no funding is allocated for TIM, and TIM performance data is not collected. The TxDOT Wichita Falls District generally incorporates TIM considerations only in construction and work zone planning efforts.

Figure 13: TxDOT Wichita Falls District CMM Assessment for Traffic Incident Management

Focus Area: Traffic Incident Management				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes	✓			
Systems & Technology		✓		
Performance Measurement	✓			
Culture		✓		
Organization & Workforce	✓			
Collaboration		✓		

The TxDOT Wichita Falls District has established safety-oriented TIM guidelines including ones for safe vehicle positioning, emergency lighting, and high-visibility safety apparel. The District promotes the statewide Authority Removal Law and Driver Removal Law. The District also utilizes the Incident Command System (ICS). Post-incident after-action reviews are conducted at the end of each month, and these reviews involve both TxDOT and Texas Department of Public Safety (DPS) staff. Lessons learned from these after-action meetings are applied to future responses. The District has an existing written agreement with the City of Wichita Falls Police Department to share camera feeds and incident detection capabilities.

The TxDOT Wichita Falls District has self-identified a need for improved incident detection capabilities especially outside of standard business hours. They have a need for better utilization of existing resources for clearing major wrecks including ones that involve commercial vehicles or hazardous material spills, and for improved coordination with partner agencies. Key partner agencies include ODOT, TxDOT Dallas District (DAL), TxDOT Fort Worth District (FTW), and other surrounding jurisdictions. Partners of the TxDOT Wichita Falls District have also requested a more streamlined process to share TxDOT resources, like portable DMS boards, between partners for severe incidents and events. Currently, the TxDOT Wichita Falls District has an informal agreement with local law enforcement partners regarding TIM, and rural incident response leaders often have different TIM priorities than TxDOT.

The TxDOT Wichita Falls District would benefit from the following action items.

- Implement a more formalized traffic incident management program, including increased incident detection capabilities
- Formalize coordination and communication guidelines between traffic incident responders
- Measure and track TIM performance, including roadway and incident clearance time and occurrence of secondary crashes
- Develop strategies to reduce response and clearance times for major incidents

Work Zone Management District Assessment

Work Zone Management (WZM) involves the TxDOT Wichita Falls District and partner agency management of planned construction events, which can reduce congestion, improve travel reliability, and improve safety. The TxDOT Wichita Falls District generally performs WZM activities in an integrated fashion with other processes. The TxDOT Wichita Falls District regularly coordinates multiple projects along key corridors, informs partner agencies of road work plans, seeks to apply new and existing technologies to work zones, and considers innovative technology, but the District does not formally quantify or measure WZM performance.

Figure 14: TxDOT Wichita Falls District CMM Assessment for Work Zone Management

Focus Area: Work Zone Management				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes			✓	
Systems & Technology		✓		
Performance Measurement	✓			
Culture		✓		
Organization & Workforce	✓			
Collaboration			✓	

The TxDOT Wichita Falls District acknowledges the benefits of effective WZM and trains staff to improve their understanding of the importance of WZM. Following previous communication challenges, the District has begun to coordinate internally with its construction and maintenance personnel and with neighboring jurisdictions to avoid multiple closely-located work zones along a single corridor. The District understands the benefit of law enforcement presence at work zones and requests police or DPS assistance at work zones. Sometimes these requests are not fulfilled. The District also reaches out to contractors and affected businesses during its work zone and construction planning activities.

Work zone impacts are predicted in the District based only on prior closure experience. The TxDOT Wichita Falls District does not provide courtesy patrols due to the rural nature of the District. Work zone public outreach is limited. The Public Information Office manages outreach only for short term events, and the District only has smart work zone (SWZ) units and a limited number of permanent DMS units along major corridors to relay information. The TxDOT Wichita Falls District has self-identified a need for a better payment structure and liaison between TxDOT work zone events and local law enforcement presence, as law enforcement often declines to have a presence at work zones. The District has also self-identified a need to improve the existing work zone entry alarm systems used on some construction projects.

The TxDOT Wichita Falls District would benefit from the following action items.

- Standardize payment contract language with local law enforcement for work zone support
- Measure and track work zone performance data
- Invest in technology and processes to maintain the safety of road workers

Road Weather Management District Assessment

Road weather management (RWM) involves the TxDOT Wichita Falls District and partner agency response to anticipated major weather events. The TxDOT Wichita Falls District has developed a formal process for many RWM activities, including a standardized road pretreatment program ahead of anticipated winter weather events. The TxDOT Wichita Falls District has a good line of communication with the National Weather Service (NWS) and public. They have a high level of strategic planning, and a seasonal allocation of RWM roles for existing staff, though the District does not formally report RWM event outcomes to the public. Local municipalities tend to pre-treat their own roads with little coordination between jurisdictions or with the District.

Figure 15: TxDOT Wichita Falls District CMM Assessment for Weather Management

Focus Area: Road Weather Management				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes		✓		
Systems & Technology			✓	
Performance Measurement	✓			
Culture		✓		
Organization & Workforce			✓	
Collaboration			✓	

The TxDOT Wichita Falls District has a good line of communication with the NWS to receive advance warnings of major weather events. The District additionally communicates effectively among Area Offices and Maintenance Sections in the District during road weather response. After each major weather event, the District conducts an after-action review with a focus on strategic planning for an improved response in future events. Two staff members are tasked to oversee winter weather events and interface with the NWS.

The TxDOT Wichita Falls District has self-identified a need for improved winter weather safety detection, including ice detection and high wind warning for bridges along IH 35. The District has identified a need for deployed detection technologies that require less ongoing maintenance to preserve device functionality. Partners of the TxDOT Wichita Falls District have provided feedback that the district can better coordinate resources and efforts between TxDOT and cities during flooding events that require road closures, and the City of Gainesville requested improved response times from TxDOT when responding to weather events after hours.

The TxDOT Wichita Falls District would benefit from the following action items.

- Track and report RWM data to inform the public and establish estimates of annual expenses
- Analyze RWM detection and warning systems to identify ones requiring minimal maintenance
- Work with municipalities to increase institutional understanding of the existing resource request processes during emergency events
- Improve emergency weather event response times and lines of communication after hours
- Create a program to train staff on how to operate and maintain future RWM equipment deployments

Planned Special Event District Assessment

Planned special events (PSE) involve the TxDOT Wichita Falls District and partner agency response to preplanned special events, like local holiday events or major sports events. The TxDOT Wichita Falls District generally collaborates with external partners for PSE activities. For local events, TxDOT generally is not centrally involved in event operations and instead holds more of a general role of approver of event traffic plans. The TxDOT Wichita Falls District regularly tasks specific agency staff with formal PSE job functions for events occurring within the District and assesses needs for planned events, but no formal budget is allocated to PSE planning and no PSE-specific operations data is captured or shared.

Figure 16: TxDOT Wichita Falls District CMM Assessment for Planned Special Events

Focus Area: Planned Special Events				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes		✓		
Systems & Technology		✓		
Performance Measurement	✓			
Culture	✓			
Organization & Workforce		✓		
Collaboration			✓	

Regularly occurring special events are typically handled at the local level, with TxDOT providing general assistance and oversight through event permitting and traffic control guidance. The TxDOT Wichita Falls District coordinates with local agencies largely through informal channels. The District has self-identified a need for inter-district information sharing about construction zones along planned special event routes, as well as a need for DMS coordination with ODOT and other TxDOT districts for planned special events with regional impacts, such as events at the Winstar Casino along IH 35 north of the Oklahoma border or major football games held in the region. For example, the Red River Rivalry football game between the Universities of Texas and Oklahoma is hosted each year in Dallas, and those traveling to the game add significant traffic volumes to IH 35 throughout the weekend of the event.

The TxDOT Wichita Falls District would benefit from the following action items.

- Formalize TxDOT's processes for coordinating with affected municipalities ahead of PSEs
- Involve ODOT, TxDOT DAL, and TxDOT FTW when developing PSE messaging approaches
- Create a standard operating procedure for coordinating with other TxDOT Districts and jurisdictions for identifying construction projects and messaging opportunities near PSE locations

Traffic Signal Management District Assessment

Traffic signal management (TSM) involves the TxDOT Wichita Falls District management of its traffic signal system, which includes all signals in the District except those operated by the City of Wichita Falls. The TxDOT Wichita Falls District generally incorporates TSM activities into everyday District operations. The District links TSM planning with other TxDOT planning, allows flexibility in technology procurement, and uses complex operational concepts when they are deemed beneficial to operations, but no TSM data is captured and no performance measures have been identified.

Figure 17: TxDOT Wichita Falls District CMM Assessment for Traffic Signal Management

Focus Area: Traffic Signal Management				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes			✓	
Systems & Technology			✓	
Performance Measurement	✓			
Culture		✓		
Organization & Workforce		✓		
Collaboration		✓		

The TxDOT Wichita Falls District links its traffic signal management planning to other TxDOT planning, design, operation, and maintenance goals and objectives. The District has a flexible technology procurement process which allows for upgrades of various pieces of signal equipment; for example, in 2019 the District focused on installing cellular modems to allow for signal communications back to the District office in Wichita Falls. The District has processes in place that allow for technicians to temporarily change signal timings for construction events. This operation could be completed remotely with the addition of cellular modems to allow for communications to all signals in the future.

The TxDOT Wichita Falls District is concerned about the cost of replacing signal controllers and cabinets as crashes or standard wear-and-tear cause them to go out of service. The District has self-identified a need for a connection from all TxDOT signals throughout the District back to the District Office and is currently updating signal technologies throughout the district to allow for this communications connection via cellular modems at each signal.

The TxDOT Wichita Falls District would benefit from the following action items.

- Continue the deployment of cellular modems at traffic signal locations and develop systems that provide rapid notification of signal equipment outages

Traffic Management District Assessment

Traffic Management (TM) involves the TxDOT Wichita Falls District management of road traffic conditions throughout the region. The TxDOT Wichita Falls District generally performs TM activities through ongoing supervision of deployed ITS devices from the District Office, but many duties are still completed on an ad hoc basis. The TxDOT Wichita Falls District considers TM strategies in construction and maintenance budgets, but the District does not collect or track TM data such as travel time reliability unless requested. Additionally, the District's Regional ITS Architecture is outdated, being most recently updated in 2005.

Figure 18: TxDOT Wichita Falls District CMM Assessment for Traffic Management

Focus Area: Traffic Management				
TSMO Capability Dimensions	Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimized
Business Processes		✓		
Systems & Technology		✓		
Performance Measurement	✓			
Culture	✓			
Organization & Workforce		✓		
Collaboration		✓		

The TxDOT Wichita Falls District supports the funding of traffic management technologies and strategies in its capital projects areas of maintenance and construction to ensure budget is available. Additionally, the District has a formal succession plan to ensure TM knowledge is maintained within the district despite occasional staff turnover. The TxDOT Wichita Falls District manages the existing Traffic Management Center (TMC) setup at the District Office which allows staff to passively monitor traffic conditions in locations where cameras are deployed. The District has a formal agreement with the City of Wichita Falls to share camera feeds for incident detection. The TxDOT Wichita Falls District has expressed interest in improving its management philosophy regarding recurring and nonrecurring congestion as it plans to deploy CCTV and DMS units along IH 35. The District is also interested in emerging technologies which may assist in regional traffic management. The District has expressed interest in improving performance measurement as part of the TSMO planning effort.

The TxDOT Wichita Falls District would benefit from the following action items.

- Improve real-time travel time information dissemination to travelers throughout the District
- Partner with third-party providers to share traffic operations data
- Conduct quarterly regional operations meetings with staff from TxDOT and ODOT
- Improve communication between TxDOT and ODOT by sharing updates via staff email and phone lists
- Establish a 24-hour ITS device coverage plan among the Wichita Falls District and metro district TMCs
- Begin to measure and track Districtwide traffic operations data, including travel time reliability
- Apply results of ongoing Freight Movement Study to improve regional traffic management practices
- Deploy planned ITS devices along IH 35 as part of a planned reconstruction and update the Regional ITS Architecture accordingly

Summary of Recommended Action Items

Table 4 summarizes action items included as part of the TSMO Program Plan. These action items were developed based on the needs demonstrated by the TxDOT Wichita Falls District and other regional stakeholders. These action items build upon the existing TSMO capabilities that the region's stakeholders shared as a part of the CMM survey.

Table 4: Summary of Recommended Action Items

TSMO Focus Area	Action Item Description	CMM Capability Dimension
Traffic Incident Management 	Implement a more formalized traffic incident management program, including increased incident detection capabilities	Business Processes
	Develop strategies to reduce response and clearance times for major incidents	Business Processes
	Measure and track traffic incident management performance, including roadway and incident clearance time and occurrence of secondary crashes	Performance Measurement
	Formalize coordination and communication guidelines between traffic incident responders	Collaboration
Work Zone Management 	Standardize payment contract language with local law enforcement for work zone support	Business Processes
	Invest in technology and processes to maintain the safety of road workers	Systems & Technology
	Measure and track work zone performance data	Performance Measurement
Road Weather Management 	Analyze road weather detection and warning systems to identify ones requiring minimal maintenance	Systems & Technology
	Track and report road weather management data to inform the public and establish estimates of annual expenses	Performance Measurement
	Work with municipalities to increase institutional understanding of the existing resource request processes during emergency events	Culture
	Improve emergency weather event response times and lines of communication after hours	Culture
	Create a program to train staff on how to operate and maintain future road weather equipment deployments	Organization & Workforce

TSMO Focus Area	Action Item Description	CMM Capability Dimension
Planned Special Events 	Formalize TxDOT's processes for coordinating with affected municipalities ahead of planned special events	Business Processes
	Create a standard operating procedure for coordinating with other TxDOT Districts and jurisdictions for identifying construction projects and messaging opportunities near planned special event locations	Business Processes
	Involve ODOT, TxDOT DAL, and TxDOT FTW when developing planned special event messaging approaches	Collaboration
Traffic Signal Management 	Continue the deployment of cellular modems at traffic signal locations and develop systems that provide rapid notification of signal equipment outages	Systems & Technology
Traffic Management 	Improve real-time travel time information dissemination to travelers throughout the District	Systems & Technology
	Deploy planned ITS devices along IH 35 as part of planned reconstruction and update the Regional ITS Architecture accordingly	Systems & Technology
	Begin to measure and track Districtwide traffic operations data, including travel time reliability	Performance Measurement
	Apply results of ongoing Freight Movement Study to improve regional traffic management practices	Culture
	Establish a 24-hour ITS device coverage plan among the Wichita Falls District and metro district TMCs	Organization & Workforce
	Partner with third-party providers to share traffic operations data	Collaboration
	Conduct quarterly regional operations meetings with staff from TxDOT and ODOT	Collaboration
	Improve communication between TxDOT and ODOT by sharing updates via staff email and phone lists	Collaboration

Business Processes

Within the CMM, business processes refer to an agency's activities and tasks that allow it to meet its TSMO goals. Considerations include how an agency plans, programs, and budgets for TSMO projects. Business processes may also refer to how an agency follows its internal protocol to implement specific TSMO projects.

Existing District Practices

The TxDOT Wichita Falls District has successfully incorporated ITS devices that will assist with network operations into designs for major road construction projects. The District has begun designing the reconstruction of IH 35 through Cooke County, and from the early design stages this project included the installation of CCTV cameras and DMS units along the corridor. Through a successful grant application, the District was able to secure funding for the installation of a fiber optic communications backbone along the corridor to connect these ITS assets back to the nearby Gainesville Area Office. District operations staff have shown a sustained interest in pursuing grants to fund other TSMO related programs and activities.

Many facets of operations already have well-documented standard operating procedures (SOPs) that are well-understood by staff throughout the District. For example, the District has a procedure for preventatively applying a de-icing solution on state routes throughout the District in advance of anticipated winter weather events. Similarly, the District has processes in place to share certain maintenance yard resources with local jurisdictions and neighboring TxDOT Districts in preparation for severe weather events. District staff also meet with Texas DPS officers each month to review and debrief on fatal crashes that have occurred within the District.

Recommended Action Items

Table 5 shows the recommended Business Processes action items for the TxDOT Wichita Falls District.

Table 5: TxDOT Wichita Falls District Action Items - Business Processes

CMM Capability Dimension	Action Item Number	Action Item Description
Business Processes 	BP-01	**Formalize Traffic Incident Management Program:** Implement a more formalized traffic incident management program, including increased incident detection capabilities
	BP-02	**Implement Major Incident Response Strategies:** Develop strategies to reduce response and clearance times for major incidents
	BP-03	**Standardize Work Zone Support:** Standardize payment contract language with local law enforcement for work zone support
	BP-04	**Formalize Special Event Coordination:** Formalize TxDOT's processes for coordinating with affected municipalities ahead of planned special events
	BP-05	**Coordinate Special Events with Construction Efforts:** Create a standard operating procedure for coordinating with other TxDOT Districts and jurisdictions for identifying construction projects and messaging opportunities near planned special event locations

Action Item BP-01: Formalize Traffic Incident Management Program

Steps for success:

1. **Expand after-action crash reviews:** Invite local agency police and fire to existing monthly crash after-action reviews with Texas DPS.
2. **Conduct outreach with responders:** Meet individually with police, fire, and emergency medical services (EMS) agencies throughout the TxDOT Wichita Falls District to promote the District's goals for quick clearance of incidents, existing state laws supporting these goals, upcoming training opportunities, and feedback from first responders across the region.
3. **Develop regional TIM training opportunities:** Engage with the TxDOT Statewide Incident Management Coordinator to collaboratively organize a regional TIM training opportunity for internal and external partners.
4. **Gauge interest for TIM working group meetings:** Gauge interest for organizing and hosting regularly scheduled regional traffic incident management working group meetings with TxDOT staff and responders.

In rural areas, as much as 50 percent of congestion that occurs on roadways can be attributed to traffic incidents. Hastening detection of and response to incidents reduces the length of time that freeway operations are impacted and reduces the likelihood of secondary crashes in the incident influence area. While TxDOT meets with DPS each month to review fatal crashes that occurred within the District, most agency coordination regarding traffic incidents currently occurs during the response itself.

Strategy and Best Practice

In the Dallas-Fort Worth Region, the North-Central Texas Council of Governments (NCTCOG) provides a free Traffic Incident Management (TIM) training course. The multi-disciplinary course initiates a common, coordinated response to traffic incidents that builds partnerships, enhances safety for emergency personnel, reduces upstream traffic accidents, improves the efficiency of the transportation system, and improves air quality in the Dallas-Fort Worth region by shortening response and clearance times. Specific courses have been designed for first responders, traffic managers, and executive level policy makers. These training opportunities are offered on a statewide basis through the TxDOT Traffic Safety Division and TxDOT's Statewide TIM Coordinator.

Including local first responders along with DPS in after-action crash reviews will allow for the scope of these reviews to expand beyond crash reconstruction to include a discussion of incident response and management procedures and to identify future actions to allow for the reduction of clearance times. The District can conduct direct outreach with many of these local police and fire agencies through stakeholder discussions, multidisciplinary training opportunities, and working group meetings with the goal of improving working relationships and incident clearance procedures for the entire region.

Action Item BP-02: Implement Major Incident Response Strategies

Steps for success:

1. **Determine regional availability of private providers:** Survey regional availability and reliability of private service providers for heavy wrecker and spill cleanup, both within and adjacent to the District.
2. **Host forum with stakeholders typically managing major incidents:** Engage with private towing service providers, first responders, and freight carriers in a forum to discuss TxDOT's goals of rapid clearance, review existing state laws supporting these goals, and build relationships among those involved in response.
3. **Identify how and where to focus major incident response resources:** Review Freight Movement Study data and CRIS crash data to identify commercial motor vehicle (CMV) key corridors, crash hotspots, high-volume times of day, and priority road segments on which to focus major incident clearance resources and efforts.
4. **Track and revisit major incident response performance:** As CMV crashes occur, track and log response activities from the Wichita Falls District Office or adjacent District TMC to maintain a record of the response, and then conduct post-crash reviews with all involved response agencies to review how each incident was handled.

While incident responders in the region can respond and clear minor crashes without difficulty, incidents that involve large commercial vehicles or hazardous spills can often linger on the road for several hours. In these cases, responders must often source specialized equipment for effective and safe incident clearance from locations outside of the TxDOT Wichita Falls District.

The TxDOT Wichita Falls District should modify its business processes to place a heightened priority on reducing incident clearance times for major incidents that occur on freeways within the District. District staff should consider funding programs or pursuing partnerships that hasten the arrival of needed equipment and expertise to clear these incidents when they occur. Different solutions may work best for different locations within the District. For example, streamlined clearance of major incidents along IH 35 in Cooke County may be best achieved through a corridor-based program in partnership with the TxDOT Dallas District. Identifying potential solutions should include engaging directly with representatives from the freight and towing industries. Wichita Falls District Office staff should also begin to log response activities for major incidents using the Lonestar Advanced Traffic Management System (ATMS) and review this data as a part of after-action reviews that are conducted.

Strategy and Best Practice (1 of 2)

Georgia's Towing and Recovery Incentive Program (TRIP) incentivizes quick clearance of large commercial vehicles incidents in the Metro Atlanta area. As a result, the cost of commercial vehicle traffic incidents has reduced by 71% and roadways are cleared 165 minutes sooner on average (GDOT). The companies attend an after-incident review (AIR) for each TRIP activation. This review is used as an after-event learning process to achieve continuous improvement by building on successes while correcting mistakes.

Action Item BP-03: Standardize Work Zone Support

Steps for success:

1. **Develop contract language from existing statewide best practice:** Consult with construction staff in other TxDOT Districts to develop general notes and contract language specifying presence of off-duty law enforcement for significant construction activities.
2. **Determine candidate projects for requiring work zone support:** Incorporate this provision as part of the decision processes in existing District work zone decision tools.

When the TxDOT Wichita Falls District conducts road construction activities, project managers will often request support from off-duty law enforcement to increase work zone visibility and discourage reckless driving through the work zone. This request is sometimes not fulfilled, either due to lack of officer availability or lack of provisions in construction general notes that are provided to contractors completing the work.

The TxDOT Wichita Falls District should update its business processes by developing language for construction document general notes specifying requirements for off-duty law enforcement support to maintain a safer work

zone. Existing work zone decision tools should be modified to show when this support should be provided. The District should also identify and maintain a list of available subcontractors to provide this service for the benefit of staff or contractors completing the work. Examples of sample general note language exist in other TxDOT Districts throughout the state.

Strategy and Best Practice

TxDOT Austin District typically includes a line item for squad car support in TxDOT bid projects where companies submit their services. This allows quick payment reimbursement for contractors once they submit the force account documents which includes the force account form and the approved officer's timesheet. An example of one of these companies is TAAP Public Safety who were hired for the current I-35 at US 183 project.

TxDOT Austin District contact: Darnley Davis, Mobility35 Project

Action Item BP-04: Formalize Special Event Coordination

Steps for success:

1. **Develop standard operating procedures (SOPs) based upon existing Hotter'N Hell Hundred practices:** Review annual event coordination activities and processes for the Hotter'N Hell Hundred bike ride and use these activities to develop a framework for coordinating ahead of other significant events.
2. **Review and update existing SOPs for minor special events:** Review these coordination activities to determine whether any items could be incorporated to improve the District's standard review and approval process for coordinating minor special events and related lane closures.
3. **Communicate updates to cities and event managers:** Communicate any changes to special event request and approval processes to all internal TxDOT staff and partners at local public works departments.

When municipalities or organizers within the TxDOT Wichita Falls District plan and organize special events, TxDOT typically provides general assistance through either the local area office or maintenance section. Any coordination between TxDOT and the event organizer is largely informal unless the event is a regularly reoccurring one (such as the Hotter'n Hell Hundred bike ride) and previous experience has led to the development of standardized coordination activities in preparation for the event each year.

The TxDOT Wichita Falls District should examine the activities it follows in preparation for the Hotter'n Hell Hundred bike ride each year, and from that analysis should develop a framework for formal coordination activities ahead of other higher-impact events occurring in the District to assess potential impacts and identify points of contact. While some events may not be impactful enough to warrant use of this planning framework, others may benefit from improved event operations as a result of these more formal planning activities.

Strategy and Best Practice

The City of Austin has created the program ACE (Austin Center for Events), which manages permitting and planning for hundreds of planned special events each year. ACE is an interdepartmental team consisting of representatives from multiple city departments, including Austin Police, Austin Fire, Austin-Travis County Emergency Medical Services, Austin Transportation, Austin Water Utility, Economic Development Department's Music & Entertainment Division, Parks and Recreation, Austin Public Health, Code Compliance, and Austin Resource Recovery.

Action Item BP-05: Coordinate Special Events with Construction Efforts

Steps for success:

1. **Include construction staff in special event reviews:** Formalize the inclusion of the District Construction office in review of special event requests for TxDOT District approval.
2. **Develop SOPs to support construction project operations coordination:** Develop planned special event construction coordination SOPs with input from District Construction and Operations staff.

Certain planned special events, some of which occur outside of the District boundaries, add significant amounts of traffic to key routes operated and maintained by the TxDOT Wichita Falls District. When these events occur, agencies throughout the region can benefit by coordinating their event messaging to provide consistent direction to travelers. With the need to preserve roadway capacity during these traffic-generating events, TxDOT and its partners also need a formal approach for communicating details regarding planned construction events that may limit capacity on certain facilities as these major planned special events occur.

To allow for this coordination to occur, TxDOT Wichita Falls District should involve District construction staff in the special event operations review process. As a part of the framework identified in Action Item BP-04, TxDOT should develop an event-specific messaging plan that considers capacity limitations posed by concurrent planned road construction activity. As these processes are formalized, the TxDOT Wichita Falls District should also reach out to neighboring agencies to establish lines of communication regarding each one's messaging assets and plans as well as planned construction event data.

Strategy and Best Practice

The Washington State Department of Transportation has a formal published process for Planned Special Events on State Highways, with elements similar to TxDOT's existing process. Step one includes an online application that is then reviewed by the WSDOT department. If approved the regional contact then works with the event planner to ensure a safe event. If denied, there is an appeal process for the applicant. This process also allows different regions within WSDOT to coordinate events in collaboration.

Detailed Recommendations – Systems & Technology

Systems and technology refer to an agency's systems engineering, regional ITS architectures, and procurement processes that allow the agency to increase the value and functionality of a high-technology project, service, or system. Considerations include how an agency integrates ITS components regionally so that TSMO projects and services are deployed in an organized manner.

Existing District Practices

The TxDOT Wichita Falls District currently has CCTV cameras deployed along several freeways in Wichita County, within and around the city of Wichita Falls. The District has also deployed two DMS units along IH 35 through Cooke County. Reconstruction plans along IH 35 show the replacement of existing DMS and installation of CCTV cameras along IH 35 to provide visual confirmation of displayed messages and real-time travel conditions along that corridor. Operations staff recently installed a nine-screen video wall in an open working space at the District Office. The video wall allows staff working in the room to passively monitor conditions along freeways in the District that have CCTV coverage. In some instances, the video wall has allowed the District to rapidly verify traffic incidents and to hasten the District's response in limiting traffic impacts stemming from the incident. The video wall is shown below in Figure 19.

The District's regional ITS Architecture Document was last updated in 2005, and since then the District has deployed and continues to deploy new ITS devices. For the planned ITS deployment along IH 35 within the District, the operations staff has followed FHWA's systems engineering process in developing a concept of operations document that shows how the proposed system would function and identifies system needs and objectives.

Figure 19: TxDOT Wichita Falls District Office Video Wall

The TxDOT Wichita Falls District operates 59 traffic signals and has begun to install cellular modems at signal locations to allow for communication of signal status back to the District office. After experiencing past difficulties with stationary road weather field equipment, the District has deployed truck mounted road weather sensors with greater success. District staff have shown interest in developing tools to make use of the newly available signal modems and truck-mounted sensors by improving detection of issues, increasing availability of information to the public, and assisting with the District's performance measurement and decision making.

Recommended Action Items

Table 6 shows the recommended Systems & Technology action items for the TxDOT Wichita Falls District.

Table 6: TxDOT Wichita Falls District Action Items – Systems & Technology

CMM Capability Dimension	Action Item Number	Action Item Description
Systems & Technology 	ST-01	**Invest in Road Worker Safety Technology:** Invest in technology and processes to maintain the safety of road workers
	ST-02	**Identify Low-Maintenance Road Weather Detection:** Analyze road weather detection and warning systems to identify ones requiring minimal maintenance
	ST-03	**Continue Traffic Signal Communications Upgrades:** Continue the deployment of cellular modems at traffic signal locations
	ST-04	**Disseminate Real-Time Traveler Information:** Improve real-time travel time information dissemination to travelers throughout the District
	ST-05	**Complete IH 35 ITS Deployment:** Deploy planned ITS devices along IH 35 as part of planned reconstruction and update the Regional ITS Architecture accordingly

Action Item ST-01: Invest in Road Worker Safety Technology

Steps for success:

1. **Review work zone crash data to identify issues:** Review work zone flagged crash data and interview law enforcement and work zone personnel regarding incidents and near misses to identify the most common issues and possible technology-related countermeasures.
2. **Survey available safety technologies:** Survey and identify candidate technologies to address identified common safety issues and enhance road worker safety.
3. **Update work zone decision tools with safety enhancements:** Update work zone decision tools with new points to incorporate use of road worker safety devices based on known area-specific risk factors and situations.

In recent years, the construction industry has relied more on technological innovations and applications in safety management; and road work zone safety is no exception. Studies have found benefits associated with implementing safety technologies in work zones, since high vehicle speed and inattentive driving are both primary causes of collisions within work zones. Technologies and processes aim to mitigate these causes to improve the overall safety of road workers.

Texas has one of the highest levels of work zone fatalities in the country. To lower the number of collisions and fatalities, the District should review responder experience and data available through the Crash Records Information System (CRIS) database to identify the most common causes of work zone crashes in the Wichita Falls District. The District could then use this input to evaluate proven technologies for mitigating each cause. For example, technologies such as drone radar, radar speed displays, and speed enforcement are effective highway work zones speed enforcement measures. Moreover, emerging automated technologies such as autonomous truck mounted attenuators and automated intrusion detection systems can be incorporated into a smart work zone system to enhance decision making around the work zone and provide workers with valuable real-time information. The Wichita Falls District should ultimately update work zone decision tools with new points to incorporate use of road worker safety devices based on area-specific risk factors and situations.

Strategy and Best Practice

Maryland State Highway Administration deployed sport-utility vehicles with Automated Speed Enforcement (ASE) in work zones in October 2009. Maryland ASE systems use lidar instead of radar to measure speeds, which ensures that the speed measurement is of a particular vehicle, especially valuable in high traffic volume locations. The fine for speeding is $40 and is considered a civil infraction. The use of ASE systems contributed to a 54% reduction in the number of motorists exceeding the speed limit by more than 10 mph. The ASE Systems also reduced speed disparity between vehicles, resulting in more uniform flow through the work zone.

Action Item ST-02: Identify Low-Maintenance Road Weather Detection

Steps for success:

1. **Prioritize locations for road weather deployments:** Conduct an assessment to prioritize locations throughout the Wichita Falls District for deployment of road weather detection and warning systems.
2. **Identify low-maintenance road weather technology options:** Engage with vendors and staff in other TxDOT Districts to identify candidate low-maintenance detection and warning technologies to enhance detection of flooding conditions at low water crossings, road surface ice conditions, and high wind conditions at exposed bridge locations.
3. **Budget for road weather detection in priority areas:** Incorporate consideration of road weather technology deployments into District budgeting processes and designs in determined high-priority locations.

Road weather detection and warning systems are beneficial for identifying dangerous weather events and alerting drivers of less safe driving conditions. Many TxDOT Districts use road weather detection systems for identifying high winds, flooding, or ice on pavement. The TxDOT Wichita Falls District has installed ice detection sensors in the past, but the sensors would often sound false alarms and were not easily maintained. Reliability of road weather equipment is essential to provide drivers with accurate safety information while alerting operations and maintenance staff on weather events that require the dispatch of service vehicles.

The TxDOT Wichita Falls District should review past weather event experience and crash and volume data to identify the locations most in need for road weather detection and warning systems and prioritize these locations for future technology deployment. Concurrently, the District should engage with vendors to identify candidate detection and warning technologies that have been shown to require minimal maintenance while remaining reliable.

Strategy and Best Practice

The TxDOT San Antonio District installed 26 High Water Detection Systems (HWDS). The district installed one system in the San Antonio metro area, while the other units have been installed in the rural areas surrounding San Antonio, which are subject to flash flooding due to the region's topography. The unit cost is typically $75,000. The water level is transmitted to a cabinet near the stream crossing which activates flashers on warning signs. The device also transmits system status and water elevation to the central software application at the traffic operations center.

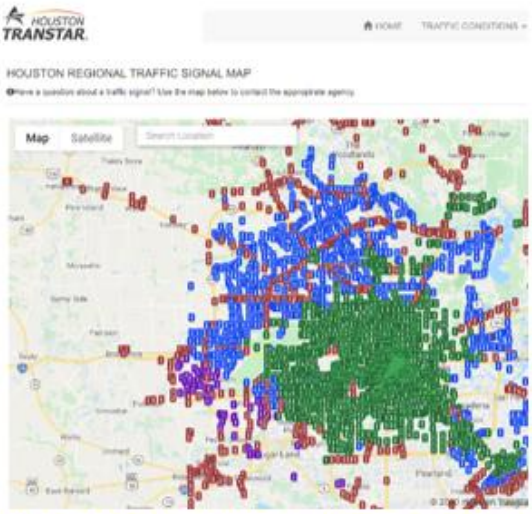
Action Item ST-03: Continue Traffic Signal Communications Upgrades

Steps for success:

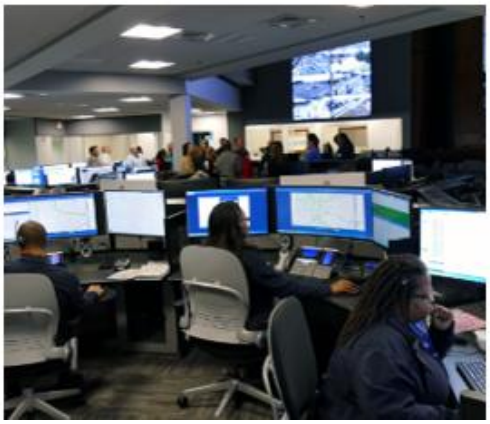
1. **Complete systemwide traffic signal modem deployment**: Continue and complete systemwide deployment of cellular modems at TxDOT Wichita Falls District traffic signal locations.
2. **Set up a signal status dashboard for operations staff**: Plan for and set up quick-access controls at TxDOT Wichita Falls District Office TMC to view systemwide signal status as additional controllers come online.
3. **Set up automated notifications for malfunctions:** Set up automated notifications to District Operations staff and Maintenance Supervisors to send alerts whenever signal communications are lost or signal malfunctions are detected.

Strategy and Best Practice (1 of 2)

Houston's TranStar, a partnership between TxDOT, Harris County, and the City of Houston, is an ITS system which coordinates transportation operations in a centralized TMC. As a part of TranStar, more than 3,000 traffic signals from throughout the region were incorporated using wireless modem communication into a Regional Computerized Traffic Signal System (RCTSS) to allow for management of all signals within each jurisdiction. RCTSS provides TranStar with the ability to modify arterial signal timings in response to incidents and planned special events, coordinate signals on a network level, and prioritize transit operations. Through the traffic signal modernizations and the ability to modify signal timings in real-time to improve traffic flow, RCTSS is estimated to have saved the region $20-38 per dollar spent on the system.



https://www.houstontranstar.org/about_transtar/docs/Annual_2004_TranStar.pdf



Strategy and Best Practice (2 of 2)

The Georgia DOT TMC implemented an ITS system called NaviGAtor to operate 24 hours a day, 365 days a year. The TMC provides real-time traffic signal operations at all state DOT signals as well as nearly thirty Regional Traffic Operations Program (RTOP) corridors. Signals along the RTOP corridor connect back to the TMC via a fiber optic backbone. As a result of the NaviGAtor system, GDOT saw a reduction in travel delay and monetary savings due to delay reduction. The annual benefit-cost ratio of the system was estimated to be 4.4:1.

Traffic signals with remote communication capabilities allow for traffic managers to operate those signals efficiently through both the active management of traffic progression and the ability to quickly identify signal outages to minimize congestion and maintain a higher level of safety. Communication is a critical part of a traffic management system to deliver traffic data and video from intersections back to the District Office TMC where the management and operation activities take place.

The TxDOT Wichita Falls District is in the process of deploying cellular modems at all its traffic signal locations. As this deployment continues, the District should establish a virtual dashboard at the District Office TMC that will allow operators to quickly assess the state of signals districtwide and identify issues involving power outages or loss of communications. Such a system can also be set to automatically notify staff of signal outages, resulting in timely dispatch of maintenance crews. Quick response times can greatly reduce user-delay cost, reduce user complaints to TxDOT, and limit signal dark time and associated safety risks.

One consideration for the future of cellular modems deployed at traffic signals is the implementation of 5G, the fifth generation of technology for wireless cellular networks. 5G is expected to have much greater bandwidth than the previous generation, allowing for higher data download speeds, though upload speeds do not experience a substantial boost. Commonly cited implications for 5G technology in transportation engineering include new capabilities for autonomous vehicle technologies and improved traffic signal operations capabilities from a network management perspective. One drawback of 5G technology for traffic signal management is the shorter communications range for the technology when compared to the current network. 5G communications are more easily interrupted by physical obstructions like vegetation or walls and require a higher density of towers and other communications infrastructure. These drawbacks mean that initial 5G applications will most likely be focused in urban settings, so the District's planned cellular modem deployment project will likely not be substantially impacted by the new 5G technology.

Action Item ST-04: Disseminate Real-Time Traveler Information

Steps for success:

1. **Work with TxDOT TRF to improve institutional knowledge:** Engage with TxDOT Traffic Safety Division to improve District knowledge of capabilities available through the existing agency partnership with third-party probe-based traffic data providers.
2. **Incorporate probe data into Lonestar ATMS:** Update Lonestar ATMS functionality to incorporate probe-based data feeds and display real-time travel time links on key corridors throughout the District.
3. **Identify DMS units and develop travel time messaging strategy:** Identify DMS units and an associated messaging strategy to schedule and begin display of probe-based real-time travel time data along District freeways.
4. **Make real-time travel time data easily available to the public:** Integrate and then publicize availability of travel-time information on the public-facing TxDOT ITS website.

Real-time traveler information provides a valuable source of information for the travelling public. If the traveling public has accurate information provided to them, then they can make informed decisions on the routing of their trip or on their expected arrival time. Real-time travel time information can be disseminated through DMS or through online platforms. Travel time information is respected by drivers and found to be effective in inducing trip behavior changes that have a positive effect on road network congestion.

The TxDOT Traffic Safety Division has contracted with INRIX, a third-party provider, to make probe-based travel data available to all TxDOT Districts. The TxDOT Wichita Falls District should engage with TxDOT TRF staff to learn more about the data that is available and to secure technical assistance with integrating this data source into Lonestar ATMS. Once this integration is complete, the District will be able to display live travel time estimates on DMS units and on TxDOT's interactive online travel maps.

Strategy and Best Practice

The Waco District of TxDOT partnered with the Texas Transportation Institute to use Bluetooth data to determine travel time data along corridors. Travelers' devices, including cell phones, laptops, and in-vehicle GPS systems, are anonymously pinged at two points, and the time between the two pings is estimated to be the travel time from the first to the second point. Other TxDOT Districts use third-party data partnerships with companies such as INRIX, which pulls from similar data sources, to collect this real-time travel time data.

Action Item ST-05: Complete IH 35 ITS Deployment

Steps for success:

1. **Update District ITS Architecture**: Update the TxDOT Wichita Falls District Regional ITS Architecture to accurately reflect new ITS plans and deployments since the document was last updated in 2005.
2. **Complete systems engineering analysis for planned deployments**: Use updated ITS architecture diagrams to develop systems engineering analysis documents that increase the likelihood that ITS deployments will be fully compatible and meet all agency needs once they are operational.
3. **Design and implement IH 35 ITS Cooke County corridor:** Complete design and deployment of ITS devices and a fiber communications backbone along IH 35 through Cooke County.

The District plans to deploy CCTV cameras and DMS units along the IH 35 corridor through Cooke County as part of a planned freeway reconstruction. Design for this effort has begun, and a concept of operations document has been developed to recommend configurations for the deployment of these CCTV and DMS assets along the corridor.

The Wichita Falls District should update its Regional ITS Architecture to show this new project deployment and to document how the deployed devices will send information back to District offices and traffic management centers throughout the region. The District should also adhere to FHWA's systems engineering analysis process as it plans for, designs, and installs devices along the corridor. Adhering to this process reduces the risk of cost overruns during construction and, through documenting all intended use cases and requirements, reduces the likelihood of needing to modify the system once installed. Key steps include identifying functional requirements of the system and a device testing and system verification plan to confirm that all elements are operating as intended once installed.

Detailed Recommendations – Performance Measurement

TSMO programs are tracked by agencies through performance measures that assess effects and benefits of implemented projects and processes. Effective performance measurement helps agencies make informed decisions and prioritize projects. Performance measures drive the success of TSMO programs by allowing agencies to realize and quantify improvements in the short-term through the effective use of TSMO strategies.

Existing District Practices

The TxDOT Wichita Falls District does not routinely track and report on performance with respect to traffic operations, and staff have identified this as a need to be addressed in this TSMO Program Plan. Existing performance measurement actions include tracking and reviewing crash rate and pavement condition metrics in support of the District's ongoing safety plans and maintenance programs. District staff have shown an interest in more broadly tracking safety metrics on a Districtwide basis, and in using TxDOT's new probe-based data partnership to begin more closely tracking and reporting on traffic operations metrics such as travel time reliability along key routes.

Recommended Action Items

Table 7 shows the recommended Performance Measurement action items for the TxDOT Wichita Falls District.

Table 7: TxDOT Wichita Falls District Action Items – Performance Measurement

CMM Capability Dimension	Action Item Number	Action Item Description
Performance Measurement 	PM-01	**Measure and Track Traffic Incident Management Performance:** Measure and track traffic incident management performance, including roadway and incident clearance time and occurrence of secondary crashes
	PM-02	**Measure and Track Work Zone Performance:** Measure and track work zone performance data, including safety and traffic impact data
	PM-03	**Track and Report Road Weather Data:** Track and report road weather management data to inform the public and establish estimates of expenses
	PM-04	**Measure and Track Districtwide Traffic Operations Data:** Begin to measure and track Districtwide traffic operations data, including travel time reliability

Action Item PM-01: Measure and Track Traffic Incident Management Performance

Steps for success:

1. **Log TIM performance data in Lonestar:** Log TIM performance measures for incidents that are verified via CCTV camera and monitored from a TMC.
2. **Establish TIM data baseline from DPS data review**: Begin regular reviews of CRIS data submitted by Texas DPS to establish a historical database of TIM performance data.
3. **Track and summarize TIM performance annually**: Begin to compile annual summaries of Districtwide TIM data to track performance and identify areas for improvement.

Measuring and tracking metrics such as incident clearance time, roadway clearance time, and secondary crash occurrences is necessary to assess effectiveness of regional strategies aimed at improving TIM and reducing related impacts to the public. The District has several tools currently available to begin collecting much of this data.

The Lonestar ATMS allows for TxDOT staff to start an incident log whenever incidents occur on the roadway. Incident log capabilities include recording timestamps for different instances along the incident clearance timeline as well as descriptions of incident details and management activities. Establishing the habit of logging these incidents when verified via the video wall at the District office will allow the District to begin tracking incident response and clearance times. Furthermore, Texas DPS currently reports to the CRIS database incident management data which includes clearance time, roadway clearance time, and secondary crash information. Regular collection and review of these reports will provide additional response time data, which will allow the District to begin tracking and reporting regional incident management performance over time.

Strategy and Best Practice (1 of 2)

Maryland Department of Transportation has a program called Coordinated Highways Action Response Team (CHART). CHART staff maintain a database that tracks "Received Time", "Dispatched Time", "Arrival Time", "Cleared Time" and "Confirmed Time" for each incident. Through performance measurement and related resulting action items, CHART achieved a reduction of 13% to 41% in incident duration for each incident evaluation period, demonstrating the value of tracking performance and its emphasis resulting in significant percentage reductions in incident clearance time.

https://chart.maryland.gov/about/overview.asp

Strategy and Best Practice (2 of 2)

The Texas Department of Public Safety (DPS) logs incident clearance time, roadway clearance time, and secondary crash information as part of the agency's existing processes for submitting records to the Texas Crash Record Information System (CRIS). Agencies can add up to five additional CRIS data reporting fields at no charge, and Texas DPS chose to begin reporting this data. In separate efforts, TMCs across the state of Texas use Lonestar to enter timestamp and log data for incidents verified via CCTV.

Action Item PM-02: Measure and Track Work Zone Performance

Steps for success:

1. **Determine work zone crash frequencies and locations:** Begin regular reviews of CRIS data to analyze crash frequencies and locations in TxDOT work zones.
2. **Begin to track persons and lane miles impacted by construction events:** Begin regular reviews of work zone location schedules to track lane miles impacted and use nearby count station data to estimate and track persons impacted.

With the help of modern transportation information systems, agencies can collect, manage, and archive significant amounts of transportation related data, including work zone performance data. Work zone performance data can be used to improve work zone safety and operations and help agencies schedule and design work zone closures to minimize traffic impacts. Much of this data can be gathered using probe-based data, SWZ units, and queue detection systems.

The Wichita Falls District should record the number and nature of incidents that occur in work zones, and where SWZ technology is deployed or probe-based data is available through TxDOT's INRIX partnership, the District should begin to track user delay. This activity will allow the District to summarize weekly or monthly delay and cost-related information and to share this information with the public. It will also allow the District to strategically schedule future road work during windows when impacts will most likely be minimized.

PeMS Lane Closure Delay Map
Source: PeMS

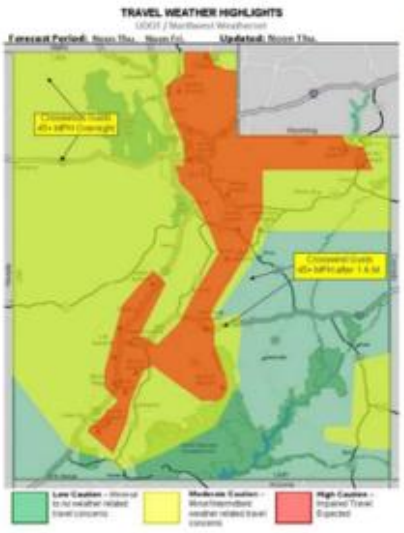
Strategy and Best Practice

The California Department of Transportation (Caltrans) uses its Performance Measurement System (PeMS) as the key platform for monitoring and managing work zone performance. PeMS is a comprehensive roadway performance monitoring system consisting of roadway sensors for data collection, a web-based data warehouse, and a data analytics suite. Caltrans planners and engineers use PeMS to proactively manage work zone impacts across all project stages. Similarly, the TxDOT Waco and TxDOT Austin Districts use SWZ units equipped with sensors that send data back to TMC operators who can monitor performance in real time as needed. In the Waco District, this data is also shown on a public-facing website along with updated closure information.

Action Item PM-03: Track and Report Road Weather Data

Steps for success:

1. **Formalize maintenance office reporting of weather response activities**: Formalize a reporting framework to allow maintenance offices to regularly communicate quantities or instances of materials or equipment use back to the District office.
2. **Enhance TxDOT weather-related communications to media:** Enhance weather-related preparation communications between the District public information office and local media outlets.
3. **Integrate field sensor readings and reports into public dashboard:** Integrate existing and planned winter weather sensor data inputs and maintenance office performance data into dashboard available via a public-facing website.
4. **Publicize weather dashboard and website:** Publicize availability of this information via website to citizens and other TxDOT Districts.



Strategy and Best Practice (1 of 2)

The Utah Department of Transportation (UDOT) has started the Traveler Information (TI) Weather program to provide the public with high quality road-specific forecasts before weather events, and timely road condition observations during and after events. The TI Weather program consists of three contracted meteorologists located in UDOT's Traffic Operations Center (TOC). TI meteorologists distribute working hours among themselves to fully cover hazardous weather events. They work alongside the TOC's maintenance and operations weather forecasters (who are also contractors) but serve public motorists specifically. At less than $140,000 per year, the cost of providing this service is relatively minimal for the important public service.

https://ops.fhwa.dot.gov/weather/best_practices/casestudies/026.pdf

Strategy and Best Practice (2 of 2)

Michigan Department of Transportation (MDOT) started installing automatic vehicle location (AVL) devices on its winter road maintenance equipment in 2013. These systems report where each truck is, and they gather data from other sensors. MDOT feeds that information, plus additional pavement and weather data and forecasts, into its maintenance decision support system (MDSS). The snowplow tracker is also provided on a website, called MiDrive, for the general public which shows where snowplows are and when they plowed each road.

The public availability of road weather information improves the public's understanding of driving conditions and enables them to make safer choices regarding travel. The District has begun to deploy mobile sensors on winter road maintenance vehicles with the goal of eventually sharing up-to-date road condition information via a public-facing website. The District also maintains communication with NWS to receive advance warnings of major weather events. Incorporating this NWS reporting data as well as data on TxDOT's resources deployed in response to weather events into a public-facing platform will keep the public aware of ongoing road conditions and help to manage expectations regarding winter road maintenance activities such as pre-treating and plowing.

In addition to developing a road weather management dashboard and public-facing website, the TxDOT Wichita Falls District should invest in publicizing the website and increasing awareness of this valuable public information resource once it is made available. The District should also focus on communicating winter road preparation activities and weather-related road conditions information via traditional outlets, such as local print and news media.

Action Item PM-04: Measure and Track Districtwide Traffic Operations Data

Steps for success:

1. **Work with TxDOT TRF to improve institutional knowledge:** Engage with the TxDOT Traffic Safety Division to train operations staff on performance measurement capabilities related to existing agency agreements with probe-based traffic data providers.
2. **Set operations goals from baseline data**: Establish baseline traffic operations data from the past five years on routes of interest to set reasonable performance goals.
3. **Assess state of District mobility quarterly**: Begin quarterly measurement of traffic operations performance compared to baseline or previous year data to assess state of mobility on key District routes.

Through a statewide contract, the TxDOT Wichita Falls District will soon have access to probe-based traffic operations data and related analysis metrics, including vehicle speeds, travel times, and travel time reliability and planning indices. The TxDOT Traffic Safety Division is offering support to Districts looking to learn how to use this data to assist with traffic management, provide better traveler information, and track traffic operations performance.

The District should partner with the TxDOT Traffic Safety Division to better understand how to use this data to support operations activities. For performance measurement, the District can identify baseline traffic conditions along key routes that can help with the establishment of performance goals that target limiting user delay within reasonable bounds and maintaining predictable travel times throughout the day. Once these goals are established, the District will be able to identify locations within the region where goals are not being met and use this feedback to focus investments.

Detailed Recommendations – Culture

TSMO culture within an agency is dependent on engaged staff who adhere to and implement TSMO goals. Staff can positively improve TSMO culture by critically analyzing daily activities to adhere to and meet program objectives. Considerations involved in creating a TSMO culture include a technical understanding, strong leadership, outreach, and buy-in of program authority.

Existing District Practices

The District has identified staff roles to support and lead TSMO initiatives throughout the District, and these staff have contributed heavily to the development of this TSMO Program Plan. The District has a Director of Operations who serves as a TSMO Champion, as well as a District Traffic Engineer who serves as a TSMO Coordinator. Throughout the development of this plan, staff at many levels within the District have dedicated time to providing input on the District's existing operations and needs. The TSMO Coordinator and Champion have briefed the District Engineer on ongoing TSMO efforts and have involved staff from the District Advance Planning & Development Office, Area Engineer Offices, and Maintenance Sections from throughout the District to provide input to the plan.

Recommended Action Items

Table 8 shows the recommended Culture action items for the TxDOT Wichita Falls District.

Table 8: TxDOT Wichita Falls District Action Items – Culture

CMM Capability Dimension	Action Item Number	Action Item Description
Culture 	CU-01	**Increase Understanding of Emergency Resource Request Process:** Work with municipalities to increase institutional understanding of the existing resource request processes during emergency events
	CU-02	**Improve After-Hours Weather Response:** Improve emergency weather event response times and lines of communication after hours
	CU-03	**Apply Freight Movement Study Operations Recommendations:** Apply results of the ongoing Freight Movement Study to improve regional traffic management practices

Action Item CU-01: Increase Understanding of Emergency Resource Request Process

Steps for success:

1. **Develop multiagency emergency contact list**: Develop a contact list of external emergency management agency, public works agency, and municipal and county administration staff to streamline communications during emergency events.
2. **Develop external memo outlining resource request processes**: Develop an informational memo to share with external public works and municipal/county administration staff outlining established state and District processes for requesting resources to assist with emergency event response.
3. **Engage directly with municipalities to discuss guidelines**: Host brief webinars or meetings ahead of each winter weather season and typical flood season to communicate emergency resource request policies and procedures, as well as any related updates.

One local agency interviewed during the outreach process of the TSMO planning effort expressed frustration at being unable to request and obtain items such as barricades or portable message signs from the District in response to emergency weather events. In many cases, the District may not be able to share these resources. The Texas Department of Emergency Management (TDEM) has established processes by which local agencies can request these emergency resources, and the TxDOT Wichita Falls District should work with TDEM to make local partners aware of these existing procedures. Brief webinars or meetings with these agencies ahead of typical severe weather seasons can reinforce institutional knowledge of these processes throughout the region.

Action Item CU-02: Improve After-Hours Weather Response

Steps for success:

1. **Distribute key contact lists to maintenance sections**: Distribute external agency key contact lists to area engineers and maintenance supervisors throughout the District and request that maintenance supervisors check their lists annually and communicate any updates back to their area and District offices.
2. **Engage directly with municipalities to resolve response concerns:** Engage with local agency stakeholders to set reasonable time-based goals for TxDOT's after-hours response to emergency events and to better understand "hot-button" issues specific to individual agencies.
3. **Streamline distribution of weather forecast data**: Establish the habit of passing county-specific forecasts and other District-level communications with NWS and other emergency managers along to potentially impacted maintenance offices.
4. **Develop a decision tool for emergency weather response**: Establish a decision tool and related SOPs to use forecast data to determine whether an in-person or on-call presence is needed for an anticipated weather event and communicate these decisions to external agency key contacts as events occur.

When weather emergencies occur outside of standard working hours, responses in the TxDOT Wichita Falls District can sometimes take several hours, meaning that potentially hazardous roads remain open until emergency responders or TxDOT staff arrive to close the facility. Improving response times in these situations reduces the public's risk of exposure to hazardous conditions like flooded low-water crossings or iced-over bridges.

TxDOT should seek to manage expectations with local agencies requesting a TxDOT response in their community, engaging with them individually to better understand area-specific hot button issues, and to build relationships with area engineer and maintenance section staff. The District should also consider developing a formal decision process that uses weather forecast data to identify if staff should remain on-call after hours in anticipation of weather impacts.

Action Item CU-03: Apply Freight Management Study Operations Recommendations

Steps for success:

1. **Identify TSMO-related study recommendations**: Once the ongoing regional study is complete, review the Freight Management Study to identify recommendations that relate to TSMO.
2. **Vet recommendation list with District staff**: Meet with District department heads to review recommendations and identify candidates for implementation or incorporation into District activities

The Wichita Falls MPO is currently completing a regional Freight Management Study that will likely include recommendations that focus on traffic operations. The District should review the study once it is complete to identify TSMO-related recommendations to implement that would support the movement of freight through the region.

Detailed Recommendations – Organization & Workforce

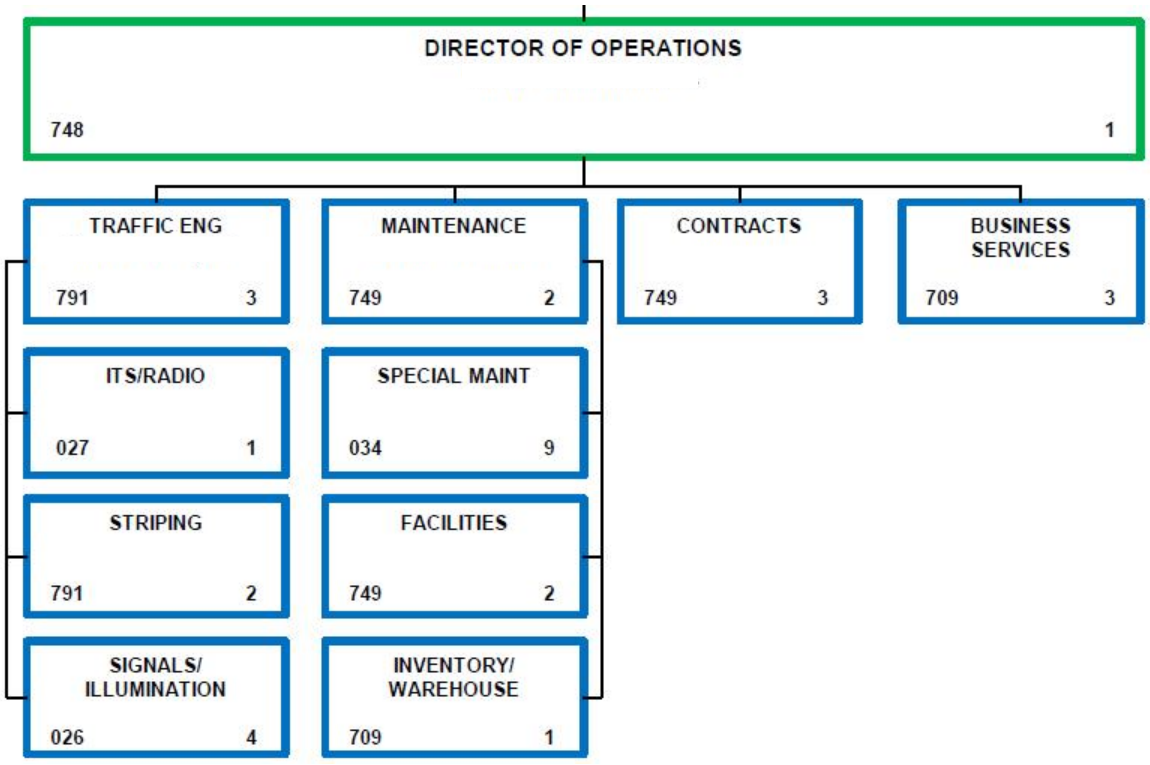
The organization and workforce component of TSMO planning addresses how the program can be better delivered through institutional and organizational changes. There are many ways to structure TSMO and not all agencies will require major changes to existing organization and staffing. Considerations include organizational structure, workforce capability, staff development, and recruitment and retention.

Existing District Practices

In the TxDOT Wichita Falls District, the Director of Operations oversees staff responsible for traffic engineering, maintenance, contracts, and business services. In total, the District's Operations Department is comprised of 31 staff, including professional engineers, engineering technicians, and other support personnel. The TxDOT Wichita Falls District Operations Department organizational chart is shown below in Figure 20.

The District has an existing agreement in place with the TxDOT Fort Worth District TransVision TMC so that staff in that District are able to manage and operate the TxDOT Wichita Falls District ITS devices when the video wall at the Wichita Falls District Office is not staffed outside of standard business hours. District staff have also begun initial conversations with staff at the TxDOT Dallas District DalTrans TMC to eventually have TMC staff in that location manage and operate ITS devices that would be deployed along IH 35 in the Wichita Falls District.

Figure 20: TxDOT Wichita Falls District Organizational Chart - Operations



Recommended Action Items

Table 9 shows the recommended Organization & Workforce action items for the TxDOT Wichita Falls District.

Table 9: TxDOT Wichita Falls District Action Items – Organization & Workforce

CMM Capability Dimension	Action Item Number	Action Item Description
Organization & Workforce 	OW-01	**Develop Training for Road Weather Deployments:** Create a program to train staff on how to operate and maintain future road weather equipment deployments
	OW-02	**Establish 24-Hour ITS Device Coverage:** Establish a 24-hour ITS device coverage plan among the Wichita Falls District and metro district TMCs

Action Item OW-01: Develop Training for Road Weather Deployments

Steps for success:

1. **Incorporate support requirements into equipment procurement**: Seek out equipment-specific training services and technical support as part of the procurement process for road weather sensing devices.
2. **Assign technology-specific roles and responsibilities**: As road weather equipment is selected for systemic deployment across the region, assign roles and responsibilities to specific District staff for equipment operation and upkeep, sensor monitoring, and data-driven decision making.
3. **Identify District experts and enable training**: Identify specific District staff as technical experts regarding specific road weather equipment deployments and direct them to lead ongoing training of others who may need to operate the same equipment as it is deployed throughout the District.

The TxDOT Wichita Falls District plans to investigate and identify road weather equipment with minimal maintenance, as shown in action item ST-02. As road weather equipment is deployed, the District should establish an ongoing program to train staff on how to interpret results and maintain these devices.

Equipment manufacturers will often offer training, maintenance and support services, and the District should specify that some level of this vendor-provided service be included as part of equipment procurement. The District's maintenance plans for deployed road weather equipment should assign roles and responsibilities to staff throughout the District, and the District should identify staff with experience operating and maintaining the equipment to lead ongoing equipment training throughout the District as new staff join TxDOT.

Action Item OW-02: Establish 24-Hour ITS Device Coverage

Steps for success:

1. **Establish Inter-District communications connection along IH 35:** Design and install a communications connection along IH 35 between the Wichita Falls District and Dallas District DalTrans TMC as ITS equipment is installed along the corridor.
2. **Determine operational requirements for 24-hour coverage:** Determine necessary device and system operational requirements to allow for cooperative management of newly deployed devices along IH 35.
3. **Modify and maintain Inter-District TMC operations agreement:** Expand the formal October 2020 Inter-District agreement between the TxDOT Wichita Falls and Dallas Districts establishing resource sharing schedules and appropriate device controls to include deployed CCTV cameras along IH 35 in Cooke County.

As part of the deployment of CCTV and DMS devices along IH 35 through Cooke County (action item ST-05), the TxDOT Wichita Falls District will need to consider how the new devices will be operated. Currently, the TMC at the Wichita Falls District Office is staffed only during standard business hours, and the existing and planned levels of device deployment in the District do not currently warrant in-house 24-hour staffing. Instead, the District has identified the TxDOT Dallas District DalTrans TMC as a potential operating partner to provide after-hours support, since the IH 35 corridor immediately to the south of Cooke County is currently monitored by DalTrans. District staff met with the TxDOT Dallas District in July 2020, and staff there were open to incorporating after-hours operation of ITS devices on the Cooke County IH 35 corridor into DalTrans' duties.

The TxDOT Wichita Falls and Dallas Districts will need to determine the operational requirements for this TMC coverage agreement and will need to incorporate device communications to the DalTrans TMC into the ITS design of the corridor. Operational details should be formalized in an inter-District written agreement. The TxDOT Wichita Falls District has maintained an agreement with the TxDOT Fort Worth District TransVision TMC that allows that TMC to monitor and operate ITS devices deployed along freeways in Wichita County.

On October 2, 2020, an agreement was completed between the TxDOT Wichita Falls and Dallas District Engineers and the Director of the TxDOT Traffic Safety Division establishing a resource-sharing agreement for the TxDOT Wichita Falls District DMS signs. This new agreement replaces the existing agreement with the TxDOT Fort Worth District, so that now the Dallas District DalTrans TMC will be supporting the Wichita Falls District with monitoring DMS assets instead of the Fort Worth TransVision TMC. This transition is dependent on Southwest Research Institute establishing a data connection between the Wichita Falls and Dallas Districts. It is still recommended that the Districts amend the October 2020 agreement to provide for 24-hour monitoring of CCTV cameras and the remaining ITS equipment that will be deployed along IH 35 in Cooke County once reconstruction is complete.

Detailed Recommendations – Collaboration

The TSMO collaboration dimension emphasizes the importance of partner agencies and stakeholders to work together to meet regional transportation goals. Collaboration should take place in every aspect of TSMO programming: from early on when developing TSMO strategic elements such as vision, mission, goals, and objectives through the implementation of projects, programs, and services. Considerations should include partnerships among TxDOT and municipal agencies, partnerships with public safety agencies, internal agency collaboration, and partnerships with the private sector.

Existing District Practices

TxDOT Wichita Falls District staff actively collaborate to improve the state of traffic operations by working with other District staff, adjacent TxDOT Districts, municipal and county agencies, the Wichita Falls MPO, ODOT, and the private sector. Internally, the District's operations staff collaborates with Transportation Planning & Development staff to confirm that ITS devices are incorporated into the designs of freeway reconstruction efforts and that funding has been identified to allow the devices to be deployed as designed. Operations staff also collaborate with Area Office and Maintenance Section staff when responding to traffic incidents, traffic signal outages or malfunctions, and severe weather events.

Externally, TxDOT informally coordinates with local municipalities and ODOT when operational challenges are deemed to potentially impact facilities that fall under the jurisdiction of those other agencies. Often, this coordination is completed via phone call from an area office or maintenance section to the other agency's counterpart. In the past, the TxDOT Wichita Falls District has shared winter weather management equipment with the neighboring TxDOT Paris District as weather events require. TxDOT also collaborates more formally with the City of Wichita Falls transportation staff and police department: the two agencies developed a formal camera-sharing agreement that provides Wichita Falls Police Department staff access to TxDOT camera feeds to assist with incident verification and response.

Recommended Action Items

Table 10 shows the recommended Collaboration action items for the TxDOT Wichita Falls District.

Table 10: TxDOT Wichita Falls District Action Items – Collaboration

CMM Capability Dimension	Action Item Number	Action Item Description
Collaboration 	CO-01	**Formalize Incident Response Coordination Guidelines**: Formalize coordination and communication guidelines between traffic incident responders
	CO-02	**Involve Neighboring Transportation Departments in Messaging**: Involve ODOT, TxDOT DAL, and TxDOT FTW when developing planned special event messaging approaches
	CO-03	**Partner with Third Parties to Share Traffic Operations Data**: Partner with third-party apps and service providers to share traffic operations data
	CO-04	**Conduct Quarterly Operational Meetings with ODOT**: Conduct quarterly regional operations meetings with staff from TxDOT and ODOT
	CO-05	**Improve Informal Information Sharing with ODOT**: Improve communication between TxDOT and ODOT by sharing updates via staff email and phone lists

Action Item CO-01: Formalize Incident Response Coordination Guidelines

Steps for success:

1. **Develop contact lists at District and area office levels**: Develop and maintain current local public safety/emergency response point-of-contact lists at the District and area level.
2. **Develop incident response SOPs for TxDOT roles:** Develop incident detection and response coordination SOPs for District office staff, area engineers, and maintenance supervisors.

Responding to traffic incidents in a rapid and coordinated manner can save lives, reduce secondary crashes, and reduce traffic congestion. Incident management training already occurs within agencies for DPS, EMS, and police and fire staff, so roles and responsibilities for incident response are well-understood at the agency level. Understanding how those roles interact with one another when at an incident involves the region undertaking efforts already described in action item BP-01.

The TxDOT Wichita Falls District can contribute to the regional traffic incident management coordination effort by continuing to develop and maintain public safety and emergency response contact lists that are available to staff both at the District Office TMC and locally at the area offices throughout the District. In addition to these contact lists, the District should develop standard operating procedures that instruct TxDOT staff at all organizational levels how they should coordinate with and assist emergency responders in traffic incident management scenarios.

Action Item CO-02: Involve Neighboring Transportation Departments in Messaging

Steps for success:

1. **Compare messaging requirements between states**: Meet with ODOT, TxDOT DAL, and TxDOT FTW to compare messaging guidance and requirements as well as messaging capabilities between the two states.
2. **Develop unified regional messaging approaches for events**: As needed, develop unified messaging approaches for regional special events as part of quarterly operations meetings and communicate these approaches to TMC staff in both states.

ODOT and neighboring TxDOT Districts each have permanent and portable message signs that the agencies use to convey information to travelers related to traffic incidents, special events, road work, or public service announcements. While TxDOT standardizes some public service announcement messaging and provides guidelines for crafting other DMS messages, various operating entities publish differing messages for the same event, resulting in a disjointed messaging approach. Consistency in messaging has been shown to positively influence driver behavior, so a corridor-based messaging approach for planned events can assist in minimizing traffic-related issues when these events impact capacity or demand on the road network.

TxDOT and ODOT representatives should meet to compare each state's messaging requirements and identify opportunities for corridor-based or regional messaging approaches for events such as the Red River Rivalry football game or events at the Winstar Casino along IH 35, as well as planned major construction activities related to IH 35 road work. The resulting discussions should be shared with TMC operators in both states ahead of each planned event.

Strategy and Best Practice

The Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) provides congestion and traffic management for 66 miles in Ohio and 22 miles in Kentucky. The two agencies coordinate directly to manage the ITS equipment. More than 80 closed-circuit television cameras are placed along key segments of the freeway system. Information is then distributed to motorists via changeable message signs. Forty signs are located before the major freeway interchanges to advise motorists of traffic problems, special event information and potential alternate routes.

Action Item CO-03: Partner with Third Parties to Share Traffic Operations Data

Steps for success:

1. **Establish "trusted provider" status**: Establish "trusted information provider" status with third-party navigation applications (such as Waze, through their Connected Citizens Program).
2. **Assign staff roles for pushing updates out**: Update staff roles to designate responsibility for pushing details about construction events and planned special events that impact travel lanes to partner third-party apps.

Third-party navigation apps continue to claim an increasing share of the traveler information market as smart phones become tools used by everyone across the country. Several of the largest apps by market-share, including Google Maps, Apple Maps, and Waze, have established "trusted provider" programs that allow transportation agencies to communicate planned impacts to the road network so that these apps can broadcast that information to their users. Several TxDOT Districts have already established these connections and have assigned roles to staff to share construction-related or special event-related closure information. Once shared, users navigating via these apps will have closures show up on the app's map, and the app will route users around scheduled road closures. The District should establish this connection with third-party navigation apps and should instruct staff to pass along closure information related to construction and special events.

Strategy and Best Practice

TxDOT's Mobility35 construction management program in central Texas has partnered with the crowdsourced navigation app Waze on its Connected Citizens Program. TxDOT Mobility Coordinators reach out to Waze the day before a closure to share location and duration information, and Waze sends push notifications to its users informing them of the route closure. Additionally, Waze shares information with local agencies about real-time traffic delays, which allows the Austin TMC to make beneficial traffic signal timing adjustments.

TxDOT Austin District contact: Darnley Davis, Mobility35 Project Mobility Coordinator

Action Item CO-04: Conduct Quarterly Operational Meetings with ODOT

Steps for success:

1. **Identify target attendees from both agencies**: Schedule and identify target attendees for regional operations meetings between TxDOT Wichita Falls District staff and ODOT staff.
2. **Meet quarterly to discuss corridor and regional operations**: Begin meeting on a quarterly basis with TxDOT and ODOT staff to discuss operational challenges along highways and freeways between states as well as upcoming events with potential regional traffic impacts.

Throughout the development of the TxDOT Wichita Falls District TSMO Program Plan, ODOT staff provided valuable input and expressed a desire to remain engaged as the District began to implement some of the TSMO recommendations. During a traffic management workshop, both TxDOT and ODOT expressed an interest

in conducting quarterly meetings with traffic operations staff from the two agencies to allow for more collaborative planning for regional events, upcoming construction, and to share updates that might impact how either organization operates and maintains its transportation system. The TxDOT Wichita Falls District should identify staff internally, as well as from the DalTrans and TransVision TMCs, from ODOT District 7, and from the ODOT statewide TMC to invite to these coordination meetings and should designate a staff member responsible for identifying discussion topics and for leading each meeting.

Strategy and Best Practice

California's Caltrans and Oregon's ODOT formed a partnership called the California Oregon Advanced Transportation Systems (COATS) which addresses ITS technologies in the rural areas of each state near the borders. Since its formation, COATS has completed several regional projects, including the creation of an ITS Architecture Plan and Strategic Deployment Plan, the implementation of several road weather technologies, and an evaluation of the implemented technologies for long-term effectiveness. The two states also share a road information website which shows DMS, CCTV, construction, incidents, and more for both jurisdictions.

Action Item CO-05: Improve Informal Information Sharing with ODOT

Steps for success:

1. **Develop key contact lists for TxDOT and ODOT staff**: Develop key contact lists for TxDOT Wichita Falls District staff, partner District TMC staff, ODOT District 7 staff, and ODOT TMC staff.
2. **Determine when and how to share critical operations updates**: Develop protocol for determining when and how to share operations-related updates among key contacts in both states (in addition to continuing existing informal communication via phone).
3. **Maintain update protocol and contact lists**: Share updates as needed, and review and revise the key contact list annually.

In support of action item CO-04, the TxDOT Wichita Falls District should build on its existing processes of informally sharing emergency-related updates with ODOT staff. While these discussions currently happen, many of them rely on existing working relationships that may be impacted if staff members leave or relocate within either organization. Formalizing this process through the regular maintenance of contact lists for both agencies and sharing these with area engineers and maintenance sections along the state border will help to further establish these existing coordination activities.

TSMO Implementation Plan

This section lays out a plan for advancing TSMO priorities in the TxDOT Wichita Falls District over the next five years. Its contents are based on the existing strengths and needs that the Wichita Falls District and regional stakeholders identified over the course of the TSMO Plan's development. The Implementation Plan is shown in Table 11 and in the schedule on the following pages shown in Figure 21. Table 11 includes the following information for each recommended action item:

- **Action Number:** An identifier for each recommended action item, organized by CMM capability dimension: Business Processes (BP), Systems & Technology (ST), Performance Measurement (PM), Culture (CU), Organization & Workforce (OW), and Collaboration (CO).
- **Action Description:** Provides a brief description of the action, which may include multiple steps.
- **Program Plan Page Number:** A reference to TSMO Program Plan page number with relevant discussion.
- **Action Lead:** Identifies the individual at the TxDOT Wichita Falls District who will take ownership of the action and will oversee that implementation progresses as planned.
- **Supports District TSMO Goals:** Identifies which of the District's TSMO goals the action item supports: Safety, Reliability, Efficiency, Customer Service, Collaboration, or Integration.
- **Partners:** Identifies TxDOT staff and external stakeholders that will contribute to implementation of the recommended action item.
- **Cost:** Provides a semi-quantitative opinion of the level of fiscal resources that TxDOT would need to commit to implement the recommended action item.
- **Effort:** Provides a semi-quantitative opinion of the level of effort that TxDOT would need to dedicate to implement the recommended action item.
- **Related Action Items:** Lists the Action Numbers of related action items that could be implemented either concurrently or subsequently if the District chose to focus on specific program areas or further developing relationships with specific stakeholders.

Separately, the implementation plan schedule provides a year-by-year roadmap for implementing each recommended action item. All action items are shown with recommended timeframes at a half-year level of detail for Fiscal Years 2021 through 2025. A more detailed schedule that breaks down action items into their component sub-actions is provided in Appendix C.

The TxDOT Wichita Falls District TSMO Program Plan is an unconstrained planning document focused on near-term implementation priorities. While all action items listed could potentially be implemented within the next five years, no funding is currently allocated for any of these action items unless otherwise specifically stated in this plan. Action items will be implemented as District resources permit.

Table 11: TxDOT Wichita Falls District Recommended TSMO Action Items

Business Processes (BP)

Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-01	Implement a more formalized traffic incident management program, including increased incident detection capabilities	31	WFS Director of Operations	✓	✓	✓		✓	✓	TxDOT Traffic Safety Division, DPS, Local Law Enforcement, Local Emergency Response, WFS Area Engineers, WFS Maintenance Sections	$			BP-02, PM-01, CO-01
BP-02	Develop strategies to reduce response and clearance times for major traffic incidents	32	WFS Director of Operations	✓	✓	✓	✓	✓	✓	DPS, Local Law Enforcement, Local Emergency Response, Area Engineers, Maintenance Sections, Private Towing Services and Freight Carriers	$$			BP-01, PM-01
BP-03	Standardize payment contract language with local law enforcement for work zone support	33	WFS Director of Construction	✓				✓	✓	Local Law Enforcement	$			
BP-04	Formalize TxDOT's processes for coordinating with affected municipalities ahead of planned special events	34	WFS Public Information Officer					✓	✓	Event Organizers, Local Law Enforcement, WFS Operations Office	$			BP-05
BP-05	Create a standard operating procedure for coordinating with other TxDOT Districts and jurisdictions for identifying construction projects and messaging opportunities near planned special event locations	35	WFS Director of AP&D					✓	✓	TxDOT DAL and FTW Districts, ODOT, Event Organizers, Municipal Transportation Agencies	$			CO-02, BP-04

(Table continued on the next page)

Systems & Technology (ST)

Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
ST-01	Invest in technology and processes to maintain the safety of road workers	37	WFS Director of Construction	✓						WFS District Engineer's Office, WFS Operations Department, TxDOT Traffic Safety Division	$$			PM-02
ST-02	Analyze road weather detection and warning systems to identify ones requiring minimal maintenance	39	WFS Director of Operations	✓	✓	✓			✓	WFS Construction Department	$$			OW-01
ST-03	Continue the deployment of cellular modems at traffic signal locations and develop systems that provide rapid notification of signal equipment outages	40	WFS District Traffic Engineer	✓	✓	✓	✓		✓	WFS Construction Department, WFS Operations Department	$$$			
ST-04	Improve real-time travel time information dissemination to travelers throughout the District	41	WFS Public Information Officer				✓		✓	WFS Operations Department, TxDOT Traffic Safety Division	$			CO-03
ST-05	Deploy planned ITS devices along I-35 as part of planned reconstruction and update the Regional ITS Architecture accordingly	42	WFS Director of Operations		✓	✓			✓	WFS Construction Department	$$$			OW-02

(Table continued on the next page)

Performance Measurement (PM)

Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
PM-01	Measure and track traffic incident management performance, including roadway and incident clearance time and occurrence of secondary crashes	43	WFS Director of Operations	✓				✓	✓	DPS, Local Law Enforcement	$			BP-01, BP-02
PM-02	Measure and track work zone performance data	45	WFS Director of Construction	✓				✓	✓	WFS Construction Department, DPS, Local Law Enforcement	$			ST-01
PM-03	Track and report road weather management data to inform the public and establish estimates of annual expenses	46	WFS Director of Operations	✓	✓		✓		✓	WFS Area Engineers, WFS Maintenance Sections	$$			
PM-04	Begin to measure and track Districtwide traffic operations data, including travel time reliability	47	District Traffic Engineer		✓	✓			✓	TxDOT Traffic Safety Division, WFS Operations Department	$			

(Table continued on the next page)

Culture (CU)														
Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
CU-01	Work with municipalities to increase institutional understanding of the existing resource request processes during emergency events	49	WFS Director of Operations					✓		Municipal Transportation Agencies, TDEM	$			CU-02
CU-02	Improve emergency weather event response times and lines of communication after hours	50	WFS Director of Operations	✓			✓	✓	✓	Municipal Transportation Agencies, TDEM, WFS Area Engineers, WFS Maintenance Sections	$$			CU-01
CU-03	Apply results of ongoing Freight Movement Study to improve regional traffic management practices	50	WFS Director of Operations			✓			✓	WFS District Engineer's Office	$			

(Table continued on the next page)

Organization & Workforce (OW)

Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
OW-01	Create a program to train staff on how to operate and maintain future road weather equipment deployments	52	WFS Director of Maintenance						✓	WFS Operations Department, WFS Area Engineers, WFS Maintenance Sections, Vendors	$			ST-02
OW-02	Establish a 24-hour ITS device coverage plan among the Wichita Falls District and metro district TMCs	53	WFS Director of Operations	✓	✓	✓	✓	✓	✓	TxDOT DAL and FTW Districts, TxDOT Traffic Safety Division	$$			ST-05

(Table continued on the next page)

Collaboration (CO)

Action No.	Action Description	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
CO-01	Formalize coordination and communication guidelines between traffic incident responders	55	WFS Director of Operations	✓				✓	✓	DPS, Local Law Enforcement, Local Emergency Response, WFS Area Engineers, WFS Maintenance Sections	$			BP-01
CO-02	Involve ODOT, TxDOT DAL, and TxDOT FTW when developing planned special event messaging approaches	56	WFS Director of Operations				✓	✓	✓	TxDOT DAL and FTW Districts, TxDOT Traffic Safety Division, ODOT	$			BP-05, CO-04
CO-03	Partner with third-party providers to share traffic operations data	57	WFS Public Information Officer				✓	✓	✓	WFS Operations Department, WFS Construction Department, Vendors	$			ST-04
CO-04	Conduct quarterly regional operations meetings with staff from TxDOT and ODOT	57	WFS Director of Operations					✓	✓	ODOT, WFS Area Engineers, WFS Maintenance Sections	$			CO-02, CO-05
CO-05	Improve communication between TxDOT and ODOT by sharing updates via staff email and phone lists	58	WFS Director of Operations					✓	✓	ODOT, WFS Area Engineers, WFS Maintenance Sections	$			CO-04

TSMO Implementation Schedule

Figure 21: TxDOT Wichita Falls District TSMO Implementation Schedule

Task Name	2021		2022		2023		2024		2025	
	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
BUSINESS PROCESSES										
BP-01: Formalize TIM Program							Ongoing			
BP-02: Implement Major Incident Response Strategies										Ongoing
BP-03: Standardize Work Zone Support										
BP-04: Formalize Special Event Coordination										
BP-05: Coordinate Special Events with Construction Efforts										
SYSTEMS & TECHNOLOGY										
ST-01: Invest in Road Worker Safety Technology										
ST-02: Identify Low-Maintenance Road Weather Detection										
ST-03: Continue Traffic Signal Communications Upgrades										
ST-04: Disseminate Real-Time Traveler Information										
ST-05: Complete I-35 ITS Deployment									Ongoing	
PERFORMANCE MEASUREMENT										
PM-01: Measure and Track TIM Performance							Ongoing			
PM-02: Measure and Track Work Zone Performance									Ongoing	
PM-03: Track and Report Road Weather Data							Ongoing			
PM-04: Measure and Track Districtwide Traffic Operations Data					Ongoing					
CULTURE										
CU-01: Increase Understanding of Emergency Resource Request Process										
CU-02: Improve After-Hours Weather Response										
CU-03: Apply Freight Movement Study Operations Recommendations										
ORGANIZATION & WORKFORCE										
OW-01: Develop Training for Road Weather Deployments									Ongoing	
OW-02: Establish 24-Hour ITS Device Coverage										
COLLABORATION										
CO-01: Formalize Incident Response Coordination Guidelines										
CO-02: Involve Neighboring DOT Jurisdictions in Messaging										
CO-03: Partner with Third Parties to Share Traffic Operations Data										
CO-04: Conduct Quarterly Operational Meetings with ODOT			Ongoing							
CO-05: Improve Informal Information Sharing with ODOT					Ongoing					

TSMO Tactical Plan Assessment

TSMO Tactical Plans allow the TxDOT Wichita Falls District to establish greater detail in how to act upon some of the high priority recommended action items included in the TSMO Program Plan. Tactical Plans can establish project details, assign responsibilities, and include cost and staff estimates for specific initiatives. Often, Tactical Plans establish further direction regarding a specific TSMO capability dimension (for example, Performance Measurement), focus area (for example, Traffic Incident Management), or a service within the scope of a TSMO focus area (for example, winter road management, within the Road Weather Management focus area).

Tactical Plan Criteria

Based on the transportation challenges in the region, and priorities identified by regional stakeholders, several Tactical Plans are recommended for the TxDOT Wichita Falls District. These recommended Tactical Plans are shown below in Table 12. Plans are displayed according to the following criteria:

- Alignment with the TxDOT Wichita Falls District TSMO Goals: Safety, Reliability, Efficiency, Customer Service, Collaboration, and Integration
- Stakeholder partnerships required for successful implementation
- Level of anticipated initial and ongoing costs anticipated for successful implementation
- Level of District staff support anticipated for successful implementation
- Expected return on investment anticipated, pending successful implementation
- Action items from this TSMO Program Plan within the Tactical Plan's scope

Tactical Plan Components

The following components are typically included in TSMO Tactical Plans:

- A detailed account of existing activities within the District and region, including who is responsible, a schedule of when and how the activities are executed, and other considerations
- Recommendations for new activities, or changes to existing activities that would support the aim of the Tactical Plan
- A description of how the recommended activities will be integrated with existing business processes
- A detailed schedule for up-front and ongoing recommended activities
- Up-front and ongoing cost estimates for implementation of recommended activities
- Performance measures that would allow for tracking the progress of recommended activities

Recommended Tactical Plans

Potential TSMO Tactical Plans are included on the next page in Table 12.

Table 12: TxDOT Wichita Falls District Potential TSMO Tactical Plans

Potential Tactical Plan (with Deliverables Listed Below)	Supports District TSMO Goals						Key Internal and External Partners	Expected Ongoing Costs	Expected Ongoing Level of Effort	Expected Return on Investment for District	TSMO Action Items Addressed
	Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
Traffic Incident Management Tactical Plan - Regional Training and Stakeholder Engagement Guidance - Major Incident Response Strategy Guidance	✓	✓	✓		✓		TxDOT Traffic Safety Division, DPS, Local Law Enforcement, Local Emergency Response, WFS Area Engineers, WFS Maintenance Sections	$$		★★★	BP-01, BP-02, PM-01, 0W-02, C0-01, C0-05
Real-Time Traveler Information Deployment Plan - Probe-Based Data Integration Guidance - Implementation Maps and Schedule for Message Deployment	✓			✓			TxDOT Traffic Safety Division, WFS Operations Staff	$		★★★	ST-04, 0W-02
Regional Performance Measurement Tactical Plan - Performance Measure and Data Source Recommendations - Data Collection Framework Development - Data Review and Analysis Guidance	✓	✓		✓		✓	TxDOT Traffic Safety Division, WFS Operations Staff, WFS Maintenance Staff, WFS Construction Staff, DPS, Wichita Falls MPO	$		★★★	PM-01, PM-02, PM-03, PM-04
IH 35 ITS Deployment - Systems Engineering Analysis - Detailed System Requirements Document - Device Testing and System Verification Plan			✓			✓	WFS Operations Staff, WFS Construction Staff	$$		★★	ST-05
Road Weather Technology Deployment Plan - Road Weather Technology Selection Guidance - Winter Weather Data Dashboard Integration Plan	✓	✓	✓	✓		✓	TxDOT Traffic Safety Division, WFS Operations Staff, WFS Area Engineers, WFS Maintenance Sections	$$$		★★	ST-02, PM-03, 0W-01
Regional ITS Architecture Update - Updated TxDOT WFS District ITS Architecture					✓	✓	WFS Operations Staff, Wichita Falls MPO, FHWA	$		★	ST-05

References

1. Texas Department of Transportation. (2015). *Texas Transportation Plan 2040*. Retrieved from https://www.txdot.gov/inside-txdot/division/transportation-planning/statewide-plan/2040/plan.html

2. Texas Department of Transportation. (2019). *2020 Unified Transportation Program (UTP)*. Texas Department of Transportation. Retrieved from http://ftp.dot.state.tx.us/pub/txdot/tpp/utp/2020-utp.pdf

3. Texas Demographic Center. (2018). *Texas Population Projections Program.* Retrieved from https://demographics.texas.gov/Data/TPEPP/Projections/

4. Wichita Falls Convention & Visitors Bureau. (2018). *Annual Report 2018. Retrieved* from http://wichitafalls.org/wp-content/uploads/2019/01/2018-CVB-Annual-Report.pdf

5. Texas Department of Transportation, MS2. (2020). *Traffic Count Database System (TCDS).* Retrieved from https://txdot.ms2soft.com/tcds/tsearch.asp?loc=Txdot&mod=tcds

6. U.S. Census Bureau. (2010, 2018). *Average travel time to work (in minutes) in United States - Commuting Characteristics By Sex* [Data set]. 2019 American Community Survey 1-Year Estimates. Retrieved from https://data.census.gov/cedsci/table?q=average%20commute%20time&tid=ACSST1Y2019.S0801&hidePreview=true

7. Texas A&M Transportation Institute. (2019). *Complete Statewide List: Texas' Most Congested Roadways 2019* [Data set]. Retrieved from https://tti.tamu.edu/documents/umi/most-congested-in-texas-final-2019.xlsx

8. Texas Department of Transportation. (2019). *C.R.I.S. Query – Crash Records Information System*. C.R.I.S. Query. Retrieved from https://cris.dot.state.tx.us/public/Query/app/welcome

9. U.S. Department of Transportation Federal Highway Administration. (2018). *Crash Costs for Highway Safety Analysis (Report No. FHWA-SA-17-071)*, 85. Retrieved from https://safety.fhwa.dot.gov/hsip/docs/fhwasa17071.pdf

10. U.S. Department of Transportation Federal Highway Administration. (2020). *Operations Story*. Retrieved from https://ops.fhwa.dot.gov/aboutus/opstory.htm

Appendices

Appendix A – TSMO Summary Sheets for Key Action Items

Appendix B – Stakeholder Database

Appendix C – Detailed Implementation Schedule