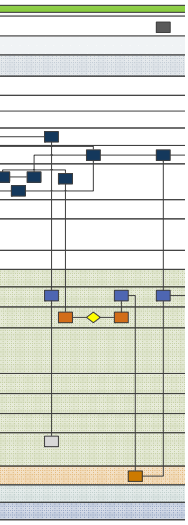
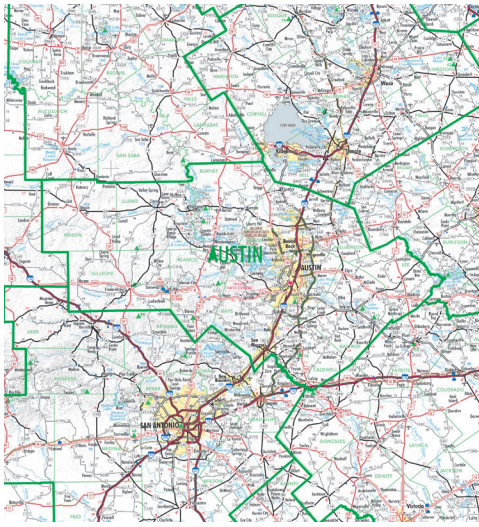
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)





AUSTIN DISTRICT PROGRAM PLAN

June 2018

Texas Department of Transportation

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ACVB	Austin Convention and Visitor's Bureau
AIM High	Austin area Incident Management for Highways
ATMS	Active Traffic Management Systems
ATSPM	Automated Traffic Signal Performance Measures
AWWS	Automated Wind Warning System
CAMPO	Capitol Area Metropolitan Planning Organization
CMM	Capability Maturity Model
ConOps	Concept of Operations
CTECC	Combined Transportation, Emergency, & Communications Center
DOT	Department of Transportation
FAST	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
HERO	Highway Emergency Response Operator
I-35	Interstate 35
ICM	Integrated Corridor Management
IMD	Information Management Division
ITS	Intelligent Transportation System
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
MPPM	Modernize Portfolio and Project Management
NHI	National Highway Institute
NOCoE	National Operations Center of Excellence
ODOT	Oregon Department of Transportation
RTCC	Regional Transit Coordination Committee
RTP	Regional Transportation Plan
SEA	Systems Engineering Analysis
SLRTP	Statewide Long-Range Transportation Plan
TIM	Traffic Incident Management
TIP	Transportation Improvement Program
TMC	Traffic Management Center
TMS	Traffic Management Systems
TRB	Transportation Research Board
TRF	Traffic Operations Division
TRF-TM	Traffic Operations Division—Traffic Management Section
TSDC	Texas State Data Center
TSMO	Transportation Systems Management and Operations
TTI	Texas Transportation Institute
TTP	Texas Transportation Plan
TxDOT	Texas Department of Transportation
UTP	Unified Transportation Plan

1. Executive Summary

Relieving congestion on Texas roadways has been one of Governor Greg Abbott's priorities during his administration. Several of Austin's roadway facilities are listed among the most congested roadways in the state, resulting in user delay, inefficient travel time reliability, and safety concerns. For example, the average commute from Austin to Round Rock (approximately 19 miles) is 45 to 60 minutes during peak periods. The population of the Austin District continues to grow and mobility is only expected to get worse. System reliability for local commuters is affected greatly by both recurring and non-recurring congestion.

Transportation Systems Management and Operations (TSMO) is an approach to improving mobility for all modes of transportation by integrating planning and design with operations and maintenance to manage the transportation network holistically and optimize existing and future infrastructure.

The Texas Department of Transportation (TxDOT) has worked continuously to improve processes that address safety, mobility, operations, and maintenance challenges. Chief Engineer William Hale's memo from April 2017 places an emphasis on using Traffic Management Systems (TMS) and associated operations metrics to improve system performance. The TMS performance metrics that the Austin District regularly tracks include:

- Asset uptime
- Incident clearance time
- Travel time reliability
- TMS system coverage completion

TSMO activities will help achieve performance targets for TMS through integration with existing initiatives and consideration during the project development process. Mobility strategies such as smart work zones, road weather management, and traffic incident management also will be enhanced through TSMO integration because the TSMO process guides communications; institutionalizes funding, technical, and business processes; permeates established arrangements; and enhances regional partnerships.

Using the guidance provided by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO), TxDOT commenced a statewide TSMO planning initiative in 2016. Formalizing TSMO in TxDOT will enable the agency to manage the transportation network by:

- Optimizing the project delivery process to be more innovative, collaborative, and efficient
- Maximizing the reliability of existing and future operational assets
- Providing opportunities to manage regional mobility and safety holistically through unconventional methods

TxDOT completed the Statewide TSMO Strategic Plan in 2017 to set the framework for how TSMO will be conducted throughout the state and to identify action items for implementation. The Austin District is taking the next step to implement TSMO district-wide through the development of the Austin District TSMO Program Plan. The purpose of the Austin District TSMO Program Plan is to identify improvement opportunities in the following key elements:

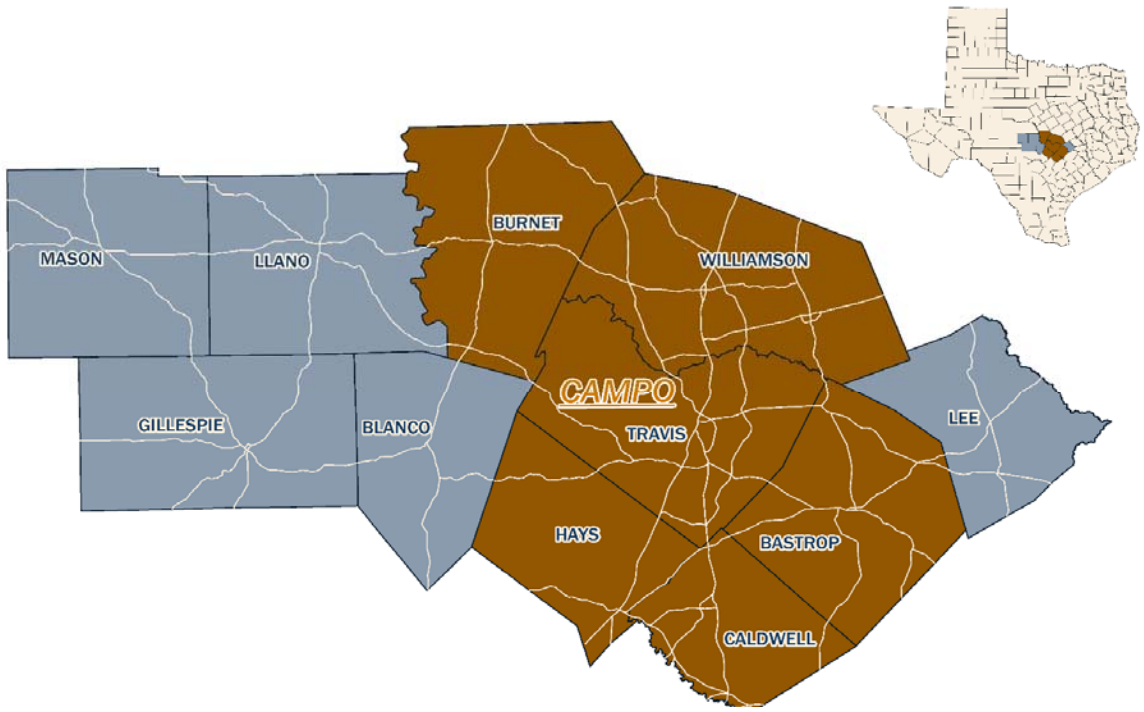
- Strategic—The foundation of a TSMO program. Opportunities include setting regional goals and performance measures, developing TSMO program vision and mission, and defining a business case.
- Programmatic—These elements define how TSMO planning is included in the agency. Opportunities involve, but are not limited to, defining the internal roles and responsibilities for TSMO, institutionalizing business processes, and formalizing internal and external collaboration.
- Deployment—Addresses specific priorities for the region. This element can include specific mobility strategies, use of technology in project planning and construction, corridor-specific issues, maintenance operations, multimodal solutions, and more.

The Austin District TSMO Program Plan follows the guidance identified in the Statewide TSMO Strategic Plan and provides details and action items for implementation. Within the District, TSMO activities currently are taking place, although they are not specifically named as such. Instead, activities often are completed on an ad-hoc basis or are led by a small group of champions. The Austin District TSMO Program Plan is a communications document. It solidifies these actions by documenting them as standard operating procedures and identifying opportunities for additional improvements.

2. Introduction

The TxDOT Austin District, shown in Figure 1, is implementing a TSMO program in coordination with ongoing statewide TSMO efforts. TSMO is an approach to improve mobility for all modes of transportation by integrating planning and design with construction, operations, and maintenance to manage the transportation network holistically and optimize existing and future infrastructure.

Figure 1: TxDOT Austin District



Examples of TSMO activities include, but are not limited to:

- Alternative design analysis at project inception
- Inclusion of TMS and Intelligent Transportation Systems (ITS) in project construction
- Asset management

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.

TSMO is strongly encouraged by the FHWA, which states that it "… encompasses a broad set of strategies that aim to optimize the safe, efficient, and reliable use of existing and planned transportation infrastructure for all modes." Several state departments of transportation

MAP-21 defines TSMO as "integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system."
(Source: https://ops.fhwa.dot.gov/plan4ops/focus_areas/integrating/operations_strategies.htm)

(DOT)—including Nevada, Colorado, Florida, Iowa, and others—have developed or are in the process of developing their own TSMO plans to improve operational efficiency of their respective transportation networks.

In comparison with other states, Texas is largely decentralized. This means that some of the governing policy and regional needs vary throughout the state. Based on this structure, as well as research done regarding the state of the practice for TSMO around the country, it has been found that state DOT TSMO program planning elements include three essential components, which are interrelated. The first element is statewide in scope. The second and third elements are district/regional in scope, and are guided by the first element.

1. TSMO Strategic Plan/Guidance—Provides the statewide vision and strategy, and a framework for the regions/districts for TSMO program planning.
2. TSMO Program Plan—A more specific and customized district/region-level plan that defines the goals, resources, performance measures, and institutional arrangements that will enhance TMS in the respective district/region.
3. TSMO Tactical Plans—These plans go into a deeper analysis of current strengths and opportunities to improve mobility strategies (e.g., Integrated Corridor Management (ICM), Traffic Incident Management (TIM), Active Traffic Management Systems (ATMS), etc.). They will serve as a deployment plan by providing additional details, responsibilities, and cost estimates to further the integration and prioritization of mobility strategies with existing efforts.

This framework was identified to bring the most value to TxDOT's decentralized structure and the TxDOT Statewide TSMO Strategic Plan, which 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, so the TxDOT Statewide TSMO Strategic Plan defines processes and agreements to conduct TSMO consistently across the state, and also identifies the roles of the central offices and the districts for implementation.

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 is the first of the 25 TxDOT districts to develop a TSMO Program Plan, either individually or as a region with multiple districts. This TSMO Program Plan provides details with specific steps and responsibilities for institutionalizing TSMO within the District. The Austin District TSMO Program Plan may interconnect with other district program plans as adjacent districts may have the same mobility needs, formal processes, or shared corridors.

The third component of the TxDOT TSMO planning initiative will be tactical plans, which are uniquely determined based on the district's needs. Tactical plans identify district- or corridor-specific mobility strategies that will be implemented, including the operational procedures,

roles, and responsibilities required for implementation. Tactical plans will vary among districts because they are built on specific regional or corridor needs and challenges. Austin District tactical plans also may interconnect with other district tactical plans when considering the needs of a cross-regional corridor. Some existing initiatives have been identified as regional tactical plans and are discussed later in this document. The structure of the Austin District TSMO planning initiative is shown in Figure 2.

Figure 2: Austin District TSMO Structure

To develop the Austin District TSMO Program Plan, a TSMO State of the Practice Report was completed, which included a literature review and a capability maturity model (CMM) assessment to identify the existing condition of TSMO activities in the District. These analyses were supplemental to findings made during development of the Statewide TSMO Strategic Plan. Outreach was conducted with both internal and external stakeholders. One-on-one interviews and group workshops were conducted to gather feedback to develop a plan that would be most effective for all contributors in the region. This Austin District TSMO Program Plan is a “living document” and should be revised as innovation and capabilities within the District evolve.

3. Business Case for TSMO

TxDOT Mission Statement
"Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods."

The Austin/Round Rock Metropolitan Area is home to 13 of the top 100 most congested roadways in Texas. Congestion in this region is responsible for an annual delay of 632,708,537 person-hours (Texas Transportation Institute, 2017). Adding capacity and optimizing available funding have become increasingly challenging as the region's population continues to grow. Mobility demands also have a great impact on safety concerns throughout the region.

Both nationally and statewide, an emphasis has been placed on 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 TMS, as well as leveraging resources among regional partner agencies and private sector data providers. Chief Engineer William Hale's Memo from July 1, 2016, states "… it is critical that Traffic Management Systems (TMS) be included on new roadway construction projects. Including TMS at the earliest stages of project development planning will maximize investments by leveraging comprehensive project construction cost at the earliest stages when TMS can be included for a fraction of total project cost." TSMO integrates TMS into the planning, design, and construction of new and improved facilities to achieve this objective.

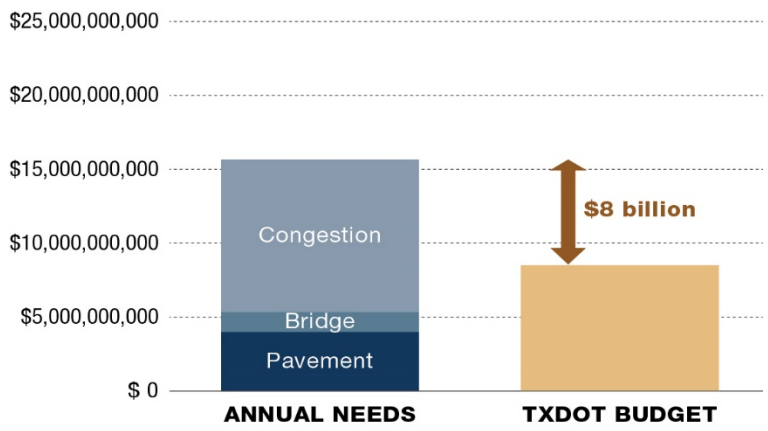
Mainstreaming TSMO integration in planning processes addresses regional mobility needs in the following areas:

- Funding
- Congestion
- Safety

3.1. Funding

Operational improvements to increase mobility have a higher benefit-cost ratio than infrastructure projects to build lane miles of capacity. With transportation demand growing, integrating TSMO into existing TxDOT processes will help transportation professionals identify and prioritize cost-efficient operations and systems management methods to improve system reliability and safety, thus optimizing available capacity. A TSMO-influenced approach to planning, project development, system completion, and system maintenance will enable solutions that provide an alternative to conventional construction through technology and innovation. It will support projects that help bridge the gap between needs and available funding, as shown in the TxDOT annual transportation needs and budget in Figure 3.

Figure 3: TxDOT Annual Transportation Needs and Budget



Source: Texas Transportation Plan 2040

Agencies that place importance on TSMO in long-range planning, project development, system completion, and system maintenance have a strong basis for devoting funding to these strategies because operations and management activities can improve congestion while minimizing or delaying the need for physical capacity improvements. Applying a TSMO approach in the early stages of project development can help establish procedures that lead to efficient and cost-effective implementation of management and operational strategies. Funding for TMS and mobility strategies can be lower if they are considered early in project development rather than added on or performed separately. Operational improvements can be made through cost-effective coordination among separate organizational units or separate agencies. Figure 4 provides an example of a project that used a TSMO approach to plan for and mitigate mobility challenges collaboratively and cost-effectively.

Figure 4: Example of TSMO in Practice, Dallas, TX

The Dallas Integrated Corridor Management Project used TSMO strategies, such as deploying ITS infrastructure, combining stakeholders into a single Traffic Management Center, route and mode diversion, smart parking systems at transit stations, and advancing traveler information systems. Through these efforts, travel time reliability improved 3 percent, approximately 1 million gallons of fuel was saved annually, and travel time was reduced 740,000 person-hours per year. These results were all achieved with a project benefit-cost ratio of about 20:1.

Source: www.rees.com

The TxDOT Austin District recently has applied TSMO to identify the level of congestion caused by incident management and then to select a management and operational approach to accommodate this need. They have invested in traffic management by coordinating a traffic incident management initiative through the regional Traffic Management Center (TMC). The Highway Emergency Response Operator (HERO) Program aims to improve congestion issues by responding to and preparing for traffic incidents, which expedites the time it takes for the network to return to normal after an incident. To date, the HERO Program has been largely successful in identifying and tracking regional incidents. Investments to further improve TMC capabilities should continue. Additional information on the Austin District's HERO Program can be found here: https://www.txdot.gov/inside-txdot/district/austin/hero-program.html.

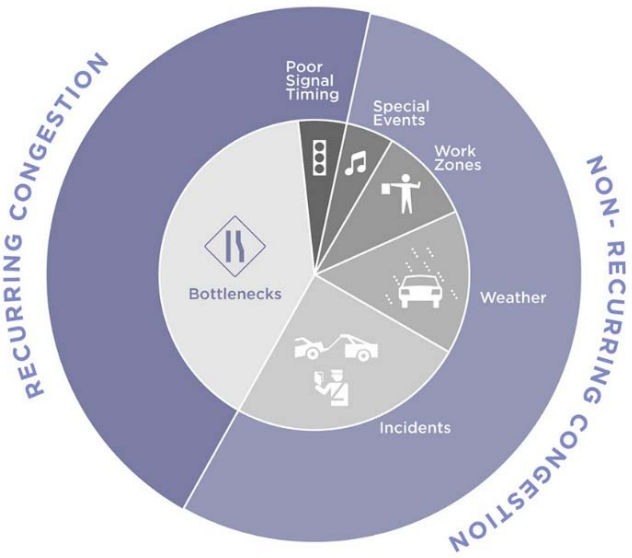
TSMO addresses funding constraints by placing an emphasis on maximizing the efficiency of existing and future transportation facilities versus traditional construction. TSMO facilitates the required culture shift to modify the way projects are funded and the transportation network is enhanced and maintained. Through TSMO planning, funding is reserved to include TMS in conventional construction, asset management techniques, upgrades to existing infrastructure, workforce resources, and other operational strategies.

3.2. Congestion

A primary function of TxDOT is to provide safe and reliable transportation to the system's end users. Approximately 74 percent of area residents feel that transportation, including congestion and road quality, is one of the top three problems facing Austin today (Zandan Poll, 2017). Mobility strategies, such as combined TMCs, asset management, and road weather management, can help to reduce congestion.

Congestion can be broken down into two separate categories (see Figure 5):

- Recurring
- Non-Recurring



Source: https://ops.fhwa.dot.gov/publications/fhwahop14034/ch1.htm?]

Figure 5: FHWA Causes of Congestion

3.2.1. Recurring Congestion

Recurring congestion occurs on a regular basis and typically is associated with roadway capacity and demand. The Texas State Data Center (TSDC) reports the population of the Austin Metropolitan Statistical Area will increase approximately 31.6 percent over the next 20 years (Texas State Data Center, 2014). Currently, about 55 percent of peak-hour traffic into Austin is comprised of travelers who live outside of the Austin city limits (U.S. Census Bureau, 2015). In addition to local commuters, the Austin region is visited by an estimated 25.6 million tourists annually (Austin Convention and Visitors Bureau, 2017). As regional vehicle miles traveled continues to increase, congestion also will grow unless innovative, proactive actions are taken.

3.2.2. Non-Recurring Congestion

Non-recurring congestion is not typical and occurs as a result of incidents, such as crashes, disabled vehicles, work zones, adverse weather conditions, and planned special events. It contributes to roughly half of overall congestion. Non-recurring congestion reduces the available capacity and reliability of the transportation system. Non-local commuters, including vacationers and freight travel, often are affected greatly by non-recurring events.

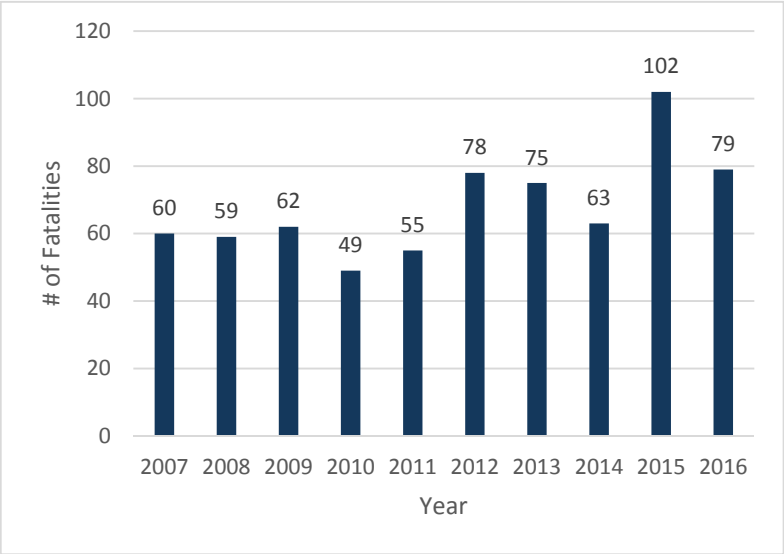
As an example of how TxDOT already is applying TSMO approaches to activities, opportunities as part of statewide freight projects have begun to be identified in the *Texas Freight Mobility Plan* to implement TMS or ITS devices. For more information on the *Texas Freight Mobility Plan*, refer to: http://ftp.dot.state.tx.us/pub/txdot/move-texas-freight/studies/freight-mobility/2017/plan.pdf.

Project development with a TSMO approach leads to inclusion of operations and management strategies that can result in the controlled management of incidents, work zones, weather, and special events and can reduce the impacts 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.

3.3. Safety

Safety is a major concern on Texas roadways. As shown in Figure 6, there were 79 fatalities in 2016, a 23 percent decrease from the previous year, as recorded by the Austin Police Department in 2017.

Figure 6: Fatal Crashes by Year (Austin Police Department, 2017)



By improving mobility and reliability, safety is enhanced by reducing the likelihood of primary and secondary crashes. FHWA defines a primary incident as "… any non-recurring event that causes a reduction of roadway capacity or an abnormal increase in demand." This can include vehicular crashes, special events, construction, disabled vehicles, debris in the road, or other non-recurring events that affect traffic flow. Secondary incidents are defined by the FHWA as occurring because of the primary incident. The chance of secondary incidents occurring increases 2.8 percent for each minute the initial, or primary, incident continues to pose a hazard (Federal Highway Administration, 2018). Operational strategies identified through TSMO integration, such as ITS in work zones and TIM plans, allow TxDOT to prepare for, track, respond to, and mitigate roadway incidents, thereby enhancing safety and mobility.

Improving safety for all modes of transportation is critical for a resilient transportation network. In 2016, 38 percent of fatal crashes included pedestrians and bicyclists, a 5 percent increase from the previous year (see Figure 7). When TSMO activities are considered in project development, such as during planning for roadway maintenance, solutions to improve safety for other modes of transportation can be identified and implemented.

Figure 7: Types of Fatal Crashes (Austin Police Department, 2017)

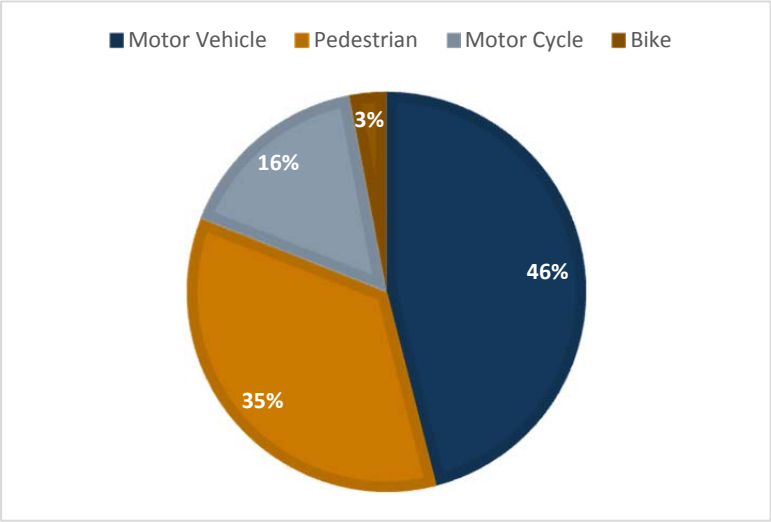
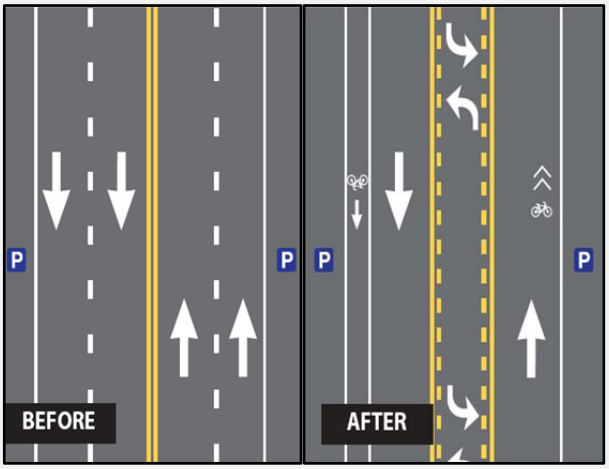


Figure 8 provides an example of using TSMO planning to improve safety for other modes of travel. The roadway upgrades were planned for during a standard resurfacing maintenance project.

Figure 8: Example of TSMO in Practice, Seattle DOT



Seattle Department of Transportation used a TSMO approach to improve pedestrian safety and increase driver compliance with the speed limit. Using the existing roadway cross-section, the striping configuration was modified to reduce the number of vehicular travel lanes and increase the number of pedestrian/bicycle lanes. This reconfiguration alongside curb bulb outs and pedestrian islands resulted in:

- 23 percent decrease in collisions
- 90 percent drop in top end speeders
- No significant diversion of vehicular traffic to parallel routes

Source: https://safety.fhwa.dot.gov/road_diets/case_studies/roaddiet_cs.pdf

3.4. Mainstreaming TSMO

Building the necessary infrastructure and maintaining it have been the core attributes of the planning process historically, while operating and managing the infrastructure have not been prioritized as highly. TSMO helps to justify 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.

In his Memo from April 2017, Chief Engineer William Hale states that "… each district will be expected to ensure TMS is included in each project's planning, development, design, construction, maintenance and operation, and provide specific TMS projects where gaps exist between typical road and bridge projects."

TSMO planning fosters the cultural shift required to prioritize the use and dedicated funding of operational improvements and TMS in project planning, per the Chief Engineer's memo. Many agencies lack a well-defined plan of action on how to develop and sustain the processes and resources that support TSMO. This excuse will no longer suffice as congestion grows, funding becomes more limited, and roadway users increasingly expect innovative solutions for managing their travel. The action of 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."

4. TSMO Vision, Mission, Goals, and Objectives

The Austin District principles for TSMO were based on the statewide TSMO vision, mission, and goals. An interactive workshop with District stakeholders was held in December 2017 at the Austin District headquarters, and it was determined that the District TSMO vision, mission, and goals should be the same as the statewide TSMO vision, mission, and goals. However, technology was added as a goal to show the District's commitment to innovation. Program objectives were developed to expand on the strategic objectives identified in the TxDOT TSMO Strategic Plan and provide additional context based on the Austin District's needs.

4.1. 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.

4.2. 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.

4.3. Austin District TSMO Goals and Objectives

The goals and objectives for the Austin District TSMO Program Plan identified in Table 1, below, are based on the TxDOT agency goals and objectives.

Table 1: Austin District TSMO Program Plan Goals and Objectives

Goal	Strategic Objective	Program Objectives
Safety	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.	Encourage safety as a collaborative effort. Consider safety in the project prioritization and development process.
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.	Optimize travel time reliability. Promote data-driven decision-making to improve mobility.
Efficiency	Implement projects that optimize existing transportation system capacity and vehicular throughput.	Maximize existing and proposed infrastructure to increase roadway throughput. Consider all modes of transportation in the project development process.
Customer Service	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	Provide traveler information to all transportation modes. Promote mobility-based decisions, focusing on the end user.
Collaboration	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	Promote data-sharing across transportation jurisdictions. Deliver projects with coordination from all stakeholders.
Integration	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	Identify opportunities to fund TSMO activities. Empower TSMO culture by training throughout the organization. Implement TSMO activities in day-to-day operations.
Technology	Institutionalize use of technology for strategic mobility and operations opportunities.	Encourage initial deployment or implementation for emerging technology that can provide safety and mobility benefits. Advance the TMS initiative through TSMO efforts. Comply with FHWA funding requirements for Systems Engineering Analysis.

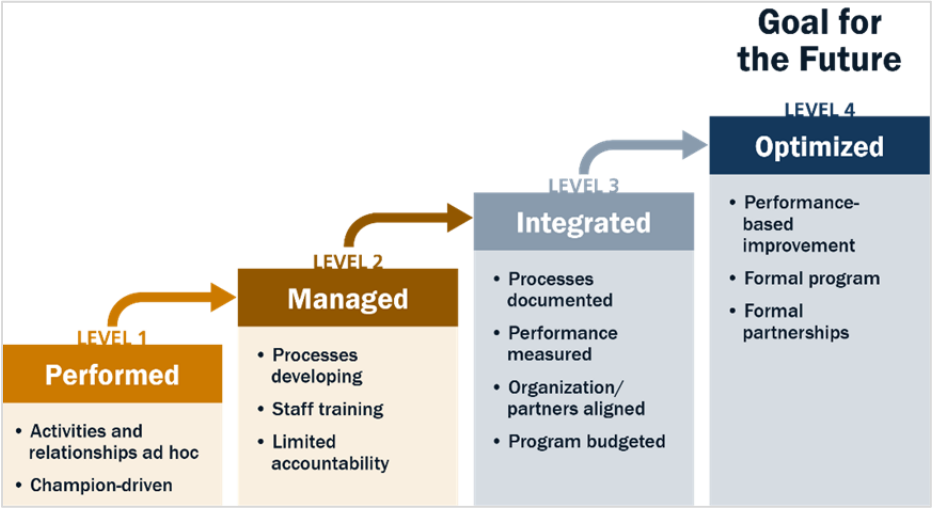
5. Capability Maturity Model

A CMM is a systematic methodology, originating in the information technology field, in which a program or organization is evaluated to determine a level of achievement for a specific attribute. AASHTO adopted the CMM system as an effective way to help agencies identify opportunities to improve how they approach TSMO. AASHTO identified six TSMO capabilities by which to evaluate their maturity, including:

- Business Processes
- Systems and Technology
- Performance Measurement
- Culture
- Organization and Workforce
- Collaboration

Each of the TSMO capabilities evaluated in the CMM assessment are classified as one of four levels. The base level, or Level 1, is the Performed level. The top level, or Level 4, is the Optimized level. As shown in Figure 9, Level 1, Performed, means the TSMO capability is completed on an ad-hoc basis and one or two individuals champion the activity without integrating with the team. 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 and budgets are coordinated around the activity. When an organization has achieved Level 4, Optimized, the program dimension is continuously improved based on performance measures, and activities are organized with local partners.

Figure 9: CMM Levels of Maturity



Source: Creating an Effective Program to Advance Transportation System Management and Operations, FHWA, Jan 2012

Each of the capabilities were evaluated for the Austin District at a CMM workshop held during development of the Statewide TSMO Strategic Plan in November 2016 at the Austin District Office. They were refined later through a literature review and interviews with Austin District staff. Figure 10 shows where the Austin District ranked itself for each of the TSMO capabilities. The CMM assessment is not meant to be a scorecard. Its purpose is to identify opportunities for improvement and support setting goals that are achievable.

Figure 10: TxDOT Austin District CMM Assessment

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
	Performed	Managed	Integrated	Optimized
Business Processes		✓		
Systems & Tecnology		✓		
Performance Measurement	✓			
Culture	✓			
Organization & Workforce		✓		
Collaboration	✓			

Based on the CMM assessment, the Austin District currently identifies itself as a Level 2 in all CMM capabilities except Performance Measurement, which it identifies as between Level 1 and Level 2, and Collaboration and Culture, which it identified as Level 1.

The District has established an initial goal to elevate each capability by one level to ensure TSMO processes and activities are integrated effectively. The Austin District TSMO Program Plan identifies action items and resources needed to progress the Austin District to its goal of a strong Level 2 and moving toward Level 3 after the items are completed. Through a higher level of maturity in TSMO, the District will experience benefits in safety and mobility.

6. Mobility Challenges and Strategies

The national causes of congestion identified by FHWA, as shown in Figure 5, are similar to the causes of congestion in the Austin District. TxDOT, both statewide and in the Austin District, has developed programs and initiatives to address these challenges. Implementing a TSMO program alongside these existing efforts can enhance and integrate these activities, making them even more successful at improving safety and mobility in the region.

Similar to the overall TSMO assessment using the CMM framework, FHWA has developed an assessment for each of these mobility challenges using the CMM model to identify opportunities and action items that can improve an agency's capabilities. The following sections provide an overview on how the primary causes of congestion nationwide impact the Austin District, current countermeasures TxDOT divisions and the Austin District are working on, and opportunities for TSMO to further improve these challenge areas. These topics should be considered by the TSMO regional committee and included, as appropriate, in its actions to advance TSMO in the Austin District. The FHWA CMM frameworks are described in further detail at:
https://ops.fhwa.dot.gov/tsmoframeworktool/cmf_overview.htm

6.1. Traffic Incidents

Traffic incidents negatively affect travel and impact delay and travel time reliability. Data regarding how much delay is caused by traffic incidents is not currently available for the Austin District; however, through the vendor-operated TMC, that information will be tracked more closely. These data will support the TMS performance measure tracking requirements, such as incident clearance time. Furthermore, the TMC supports the identification of crashes and dispatches first responders. Through TSMO processes, these data can be distributed to District stakeholders to inform data-driven, planning-level decisions.

The TxDOT HERO Program is a vendor-operated incident and emergency response program to improve incident identification and clearance from the highway. This program helps traffic return to normal conditions faster after an incident has occurred. This mobility solution can achieve greater benefits by staging HERO responders at locations where incidents frequently occur that cause significant delays.

The Traffic Operations Division (TRF) recently hired a Statewide TIM Coordinator to work with all the districts to establish best practices for incident response, after-action reviews, etc. The TIM Coordinator is organizing the delivery of FHWA's second Strategic Highway Research Program (SHRP2) First Responder Training to first responders in the Austin area. The TIM Coordinator can encourage further collaboration through TSMO activities and can help implement best practices statewide to enhance their benefits to each region.

In collaboration with the Austin District, the Capitol Area Metropolitan Planning Organization (CAMPO) is leading the development of a Regional Incident Management and Operations Plan. The plan will propose opportunities to improve and expand existing operations, identify funding, provide cost-to-benefit ratios of programs, and improve public recognition for regional incident management. Based on the action items identified by the plan, the Austin District could use TSMO processes to identify organization and workforce needs, such as HAZMAT clean-up or other roles and responsibilities.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance traffic incident management are:

- Complete the FHWA CMM framework for incident management
- Use TMC data to inform data-driven, planning-level decisions
- Stage HERO operators near areas causing the greatest delay when incidents occur
- Allow the TIM Coordinator to collaborate with districts and states to share best practices
- Identify TIM staffing needs, such as HAZMAT clean-up, and incorporate these needs into the TSMO Program Plan

Case Study: *The Pennsylvania DOT implemented Incident Response Management, which reduced incident response times by 8.7 minutes, incident clearance times by 8.3 minutes, and hours of delay by 547,000 hours per year, with a total monetary savings of $6.5 million per year (Pennsylvania Department of Transportation).*

6.2. Work Zones

Work zones are common throughout Texas; on average, a motorist in Texas can expect to encounter a work zone every 60 to 70 miles, which can reduce travel time reliability. Work zones also can affect safety. In 2016, a total of 1,484 crashes occurred in work zones in the Austin District (Texas Department of Transportation, 2016).

The statewide TMS performance measure requirements for asset uptime will help improve work zones by increasing the ability to provide traveler information. The TMS Status Reports also can be used to understand where traveler information gaps are located. With TSMO, these performance measures can be leveraged to prioritize smart work zone locations.

The Smart Work Zones Needs Assessment Plan has been developed to identify work zone needs within the District. This plan is a good example of internal collaboration, which is key for a TSMO program. The Assessment Plan notes the deficiency that occurs when stakeholders frame their traffic control on project-specific requirements, yet do not consider what the end user is experiencing. Travelers often do not recognize gaps between work zones; therefore, improvements in mobility rarely are seen since the average traveler does not attribute the inconvenience on a project-by-project basis. This is an opportunity for TSMO

to improve collaboration and communication between projects to improve the traveler experience. It also is important to consider all modes of transportation during work zone planning and how their different needs can be addressed.

The Work Zone ITS Standards currently are under development to implement smart solutions in work zones statewide. Several strategies are being reviewed for advance traveler information, incident management, and speed monitoring. Along with the Work Zone ITS Standards, guidelines will be created to explain when and how to use the standards and how to maintain ITS operations in work zones. By considering the cost of work zone ITS strategies early in the project development process, through implementation of the TSMO business process, funding for work zone ITS can be allocated and prioritized.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance work zone management are:

- Complete the FHWA CMM framework for work zone management
- Use TMS reports to prioritize smart work zone needs to areas with ITS gaps
- Improve collaboration and communication between neighboring projects to coordinate closures
- Collaborate with bicyclist and pedestrian stakeholders to ensure accommodations during construction
- Discuss and allocate funding for work zone ITS on projects early in the project development process

Case Study: *The Iowa Department of Transportation evaluated ITS in work zones, including speed sensors, travel time sensors, queue detection trailers, and dynamic message signs. Between congestion and crash reductions, the smart work zone resulted in a benefit-cost ratio of 2.1:1 when new equipment was purchased and 6.9:1 without equipment costs (Edara, 2013).*

6.3. Adverse Weather

Heavy rainfall events or winter weather with icy conditions on the roadway leads to crashes and reduction in travel time reliability. The Combined Transportation Emergency Communications Center (CTECC) acts as an emergency operations center for local partner agencies to coordinate maintenance and first responders during major inclement weather events. Through TSMO collaboration activities, the stakeholders at CTECC could review the adverse weather planning documents to make necessary updates.

The TxDOT Austin District is beginning to install Flood Warning System devices, planned with remote communications. This information can be distributed to travelers to revise their route to avoid the flooded areas. By integrating this system and other road weather sensor technologies that TxDOT is currently researching with TxDOT's existing systems and

technologies, TxDOT can improve TSMO capabilities and improve mobility and safety during adverse weather events.

TxDOT supports the travel information website, www.drivetexas.org, which provides highway condition information to the public. This website is valuable for construction and traffic information; however, it is also a great resource during adverse weather. Based on this information, travelers can make route planning decisions prior to beginning their journeys. If the historical data were compared with safety and reliability information, the Austin District could better understand the scope and resources needed to improve performance measures during adverse weather.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance road weather management are:

- Complete the FHWA CMM Framework for road weather management
- Review adverse weather planning documents with stakeholders to make updates, as necessary
- Integrate road weather sensor technology into existing systems and technologies to share information quickly with stakeholders and improve traffic management during weather events
- If historical data is made available, quantify safety and reliability metrics associated with weather events to understand scope and potential countermeasures
- Develop budget of resources and business case for improving safety and reliability during adverse weather

Case Study: *The Oregon Department of Transportation (ODOT) implemented Automated Wind Warning Systems (AWWS) connected wind gauges with message signs and flashers to alert drivers when wind speeds met threshold levels. Through the prioritization of ITS solutions, ODOT experienced a benefit-cost ratio of 22.8:1 through reducing closures from this system (Lawrence, et al., 2015).*

6.4. Special Events

Travel time reliability metrics indicate that Austin freeways experience significant variations in travel conditions, often from special events; the buffer time index, a measure of how unreliable a system is or how much extra time travelers need to plan for their commute, is 1.25. This type of non-recurring congestion often can surprise travelers; however, it can be planned and prepared for through TSMO collaboration activities, unlike many other types of non-recurring congestion (Texas Transportation Institute, 2014).

The staff at the TMC can track a wide range of event types, which can be used for understanding performance metrics related to special events, after they are defined. With

these data, a working group can be developed through TSMO collaboration activities, to coordinate with first responders and event planners to prepare for system unreliability.

The Information Management Division (IMD) is supporting the development of a Traffic Information System Dashboard that will help staff monitor traffic conditions. This will help all districts dynamically react to special events and other challenges to improve travel reliability. By integrating this system with existing technology at the Austin District, it will institutionalize improving operations dynamically and optimizing available capacity.

TxDOT has recently developed statewide standard operating procedures, released by Chief Engineer Bill Hale in May 2018, for the use of dynamic messaging for special events based on the projected number of people to attend the event. This formalized guidance further promotes proactively planning for special events. Furthermore, TxDOT can collaborate through outreach to the public and event planners to encourage active transportation and transit when attending events.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance planned special event management are:

- Complete the FHWA CMM Framework for planned special event management
- Develop working group with first responders and event planners to prepare for and improve upon system reliability during events
- Integrate Traffic Information System Dashboard into existing Austin District systems and technology
- Collaborate with the public and event planners to encourage active transportation and transit to and from events

Case Study: *The Ohio Kentucky Indiana Regional Council of Governments implemented the Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) program, which yielded a cost-benefit ratio of 12:1. Capacity-adding improvements would have had a cost-benefit ratio of only 1.1:1. Additionally, the ARTIMIS program cost was 1/20 the cost of the capacity-adding project. By considering operations prior to adding capacity, the Council of Governments was able to collaborate and save funding for other projects (Lawrence, et al., 2015).*

6.5. Poor Signal Timing

TxDOT Austin District operates 338 signals on the state highway system (33.2 percent of the total number of signals on the state highway system in the District); however only 11.2 percent of signals have remote communication. This can make it challenging to quickly and dynamically improve signal timing. The TMS initiative requires monitoring traffic signal connectivity, which could improve connectivity going forward (Texas Department of Transportation, Austin District, 2018). With these performance measures, locations without

communication can be cross-referenced with projects nearby to prioritize locations for adding communications in collaboration with existing projects through TSMO business processes.

The IMD will pilot automated traffic signal performance measures (ATSPM) in several districts. This will help districts identify signal timing issues to resolve them faster. The districts could use this information to integrate with maintenance and ticketing processes through TSMO collaboration activities.

The City of Austin is monitoring traffic during peak congestion periods and dynamically adjusting signal timing. This will improve flow on arterials to maximize available capacity. Through TSMO's collaboration and training activities, TxDOT could enhance dynamically improving signal timing to achieve benefits outside of Austin city limits or during shoulder periods, in addition to the peak hours.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance traffic signal management are:

- Complete the FHWA CMM framework for traffic signal management
- Use TMS reports to identify locations without communication and cross-reference with projects nearby to prioritize locations for adding communications
- Integrate findings from ATSPMs with maintenance ticketing processes
- Provide training and collaboration opportunities between the City of Austin, TxDOT, and other stakeholders to extend benefits of dynamic signal timing improvements

Case Study: *The City of Gresham, Washington, converted fixed-time signals to an adaptive signal system, resulting in a 16 percent decrease in the travel times along the corridor for all automobiles, trucks, and buses. Using adaptive signal timing, the City of Gresham also improved workforce capabilities, allowing algorithms—instead of staff—to adjust signal timing based on current conditions (Lawrence, et al., 2015).*

6.6. Bottlenecks

Between 2015 and 2016, Austin roadways became more congested, increasing the most congested facilities in the state from 11 segments to 13 segments. Congestion also impacts the local economy because of delays for freight. Based on trucking delays, a segment of Interstate 35 (I-35) through central Austin has the worst annual truck congestion in the state (Texas Transportation Institute, 2014). By integrating mobility solutions through TSMO activities, these bottlenecks can be mitigated and existing capacity can be maximized.

With I-35 being the primary north-south facility in Austin, it is one of the most congested roadways in Texas. Mobility35 is an initiative to improve mobility on the facility through the Capital area. A project list has been prioritized to address bottlenecks, enhance existing

capacity, and manage traffic. More information can be found at www.my35.org. The Mobility35 initiative is changing the culture of project managers to focus on improving operations. This can be enhanced through the development of training and work aides to institutionalize this culture district-wide.

A Concept of Operations (ConOps) for the Austin I-35 ICM Project was completed in November 2016. The I-35 ICM ConOps reveals the existing traffic operations for various stakeholders in the region and provides insight on how to better align these operations into one unified system. The I-35 ICM ConOps is intended to provide strategies for improving these mobility-related objectives, but not to give specific system requirement details. It establishes the framework to create this cross-network travel management for the Austin area. Several scenarios have been identified to be analyzed, modeled, and simulated to evaluate the benefits of those strategies. Stakeholder coordination and refinement of system requirements is continuing as the project evolves through the project development life cycle. The Austin District could use the I-35 ICM ConOps to identify organization and workforce needs using the TSMO framework, and to make this effort successful and determine how lessons learned from the initiative can be shared with others, both internal and external to TxDOT.

The Austin District ITS Master Implementation Plan has identified ITS needs and support planning efforts. This document, along with the TMS initiative, will support the implementation of ITS devices to improve bottlenecks without adding lanes of capacity.

The TMS initiative will implement drill-down metrics in the future to inspect data related to challenge areas. This will help District staff identify gaps and causal factors for mobility and safety concerns. The Austin District can leverage TSMO collaboration capabilities to discuss the causal factors with additional stakeholders to prioritize which locations to mitigate first.

TxDOT's Texas Clear Lanes (www.texasclearlanes.com) has identified congested facilities and supports projects to address gridlock across the state. Texas is funding these projects through two statewide propositions to provide $1.3 billion to metro areas to address congestion. Texas Clear Lanes projects in the Austin District are located along I-35. The Austin District could leverage projects like this, as well as TSMO best practices, to apply for federal grants to improve bottlenecks.

In summary, the opportunities for the Regional TSMO Committee to consider for TSMO to enhance bottleneck mitigation are:

- Complete the FHWA CMM framework for traffic management
- Use TMS dashboard to identify locations with frequent asset downtime and cross-reference with locations with safety and operational needs to prioritize improvement locations with local stakeholders
- Establish training to institutionalize the lessons from Mobility35 district-wide
- Identify organization and workforce needs to implement I-35 ICM and share best practices, both internally and externally
- Leverage TSMO best practices on federal grant applications and identify how TSMO activities will support the proposed project

Case Study: *The Minnesota Urban Partnership Agreement implemented a series of projects—including building park-and-ride lots, new transit lines, advanced traffic management signing, and more. The I-35W corridor experienced travel time savings, safety improvements, and fuel and emissions savings resulting in a benefit-cost ratio of 6:1. These projects were successful due to the integration of mobility strategies and the collaboration of stakeholders through TMSO activities (Lawrence, et al., 2015).*

7. Program Plan Format

The Austin District TSMO Program Plan was developed using the framework defined in the TxDOT Statewide TSMO Strategic Plan. TxDOT is a decentralized agency, meaning that regional decisions are made more frequently at a district level. Because of this agency structure, the Statewide TSMO Strategic Plan defined the three-pronged approach to TSMO planning in the state:

1. Statewide TSMO Strategic Plan: This plan provides the statewide vision and mission, and sets the framework for the regions or districts for TSMO planning and implementation of TSMO activities statewide. The plan also defines the districts' and central support's action items for promoting TSMO throughout the state.
2. District or Regional TSMO Program Plans: These plans establish TSMO goals, develop processes for how TSMO will be conducted, determine funding and resource needs to implement TSMO, and identify opportunities for tactical plans within the respective district or region.
3. District or Regional Tactical Plans: These plans progress mobility strategies to meet specific needs identified by the region or district and support Program Plan goals and objectives. They provide the technical details to deploy specific mobility strategies and operational procedures and also identify roles and responsibilities for implementation.

Before transportation management strategies—for example, traffic incident management, ITS in work zones, and traffic management centers—can be put in action, formal operational processes must be established and practiced in daily activities and existing operations. These operational processes include, but are not limited to:

- Project Development
- System Maintenance
- Staffing Resources
- Technology Procurement

This TSMO Program Plan provides recommendations and action items for the Austin District to formalize TSMO activities and processes in each of the key elements discussed below, in Section 8, Capability Components, and provides an implementation plan that outlines the timeline and task leads for each action item listed throughout this plan. Then, the plan identifies potential tactical plans to address the specific mobility needs of the Austin District.

8. Capability Components

The capability components of this TSMO Program Plan are based on the six capability dimensions determined by AASHTO:

- Business Processes
- Systems and Technology
- Performance Measurement
- Culture
- Organization and Workforce
- Collaboration

These dimensions were used as the framework for identifying opportunities to institutionalize TSMO within the Austin District and identify action items for implementation. A systematic approach was taken to develop this Program Plan by evaluating the existing conditions and future opportunities of TxDOT internal processes within the six key dimensions.

8.1. Business Processes

Business processes refer to the planning, budgeting, procurement, and process development that is required for TSMO programs. For TSMO to be mainstreamed within the Austin District, specific activities must be performed to advance TSMO both at an administrative level and at an active project level. Coordinating, budgeting, and planning for TSMO on future projects and programs is essential to the success of the TSMO Program Plan.

Within the Austin District, there are multiple initiatives in progress to improve regional mobility and engage stakeholders; however, additional steps must be taken to formalize these practices. The following recommendations identify steps to elevate the District's maturity in the business processes dimension from a Level 2 to a Level 3, including incorporating TSMO activities in project execution and delivery, planning for TSMO, programming and budgeting, and creating a culture of continuous improvement.

8.1.1. Project Execution and Delivery

Project development processes and checklists are defined by the *TxDOT Project Development Process Manual*. Existing and recommended project development tasks from the *TxDOT Project Development Process Manual* have been highlighted in Appendix A to provide opportunities for the District to mature TSMO capabilities by optimizing the existing project development process. Notable additions include interdisciplinary collaboration at various milestones during project development, alterations to existing ITS processes, and increasing stakeholder involvement. Various actions already are being performed by TxDOT staff and design consultants. These actions are noted with an asterisk (*). Figure 11 provides a sample of what can be found in more detail in Appendix A. Tasks identified to achieve different levels of maturity build upon preceding tasks. As the project planning and design teams perform Level 3 tasks, they also should be completing tasks for Levels 1 and 2. Additional resources may be required to carry out some of the recommended tasks.

Figure 11: Excerpt from Appendix A: TSMO Opportunities for the Project Development Process Manual

Maturity Level	Level 1 Ad-Hoc	Level 2 Processes Developing, Staff Training, Limited Accountability	Level 3 Processes Documented, Performance Measured, Partners Aligned, Program Budget	Level 4 Performance Based Improvement, Formal Program, Formal Partnerships
Plan				
Needs Identification	*Coordinate with area stakeholders to ensure compatibility with regional transportation plans.	Ensure scoping language includes the testing of ITS devices immediately after construction. Coordinate with Design, Maintenance, Traffic, and Construction to identify opportunities or issues within the evaluated area, *considering all transportation modes, the need for multimodal alternatives, and the intermodal freight transport.	Use Traffic Management Center data to identify network improvement opportunities for ongoing or planned construction projects.	Employ region-wide interagency historical traffic data and highlight future corridor improvements based on regional mobility and safety performance goals
Study Alternatives, Impacts, and Costs	*Consult regional transportation plans to identify design alternatives.	*Obtain traffic data, evaluate existing mobility strategies in place, and determine the need for feasibility (route/corridor) study.	Analyze and evaluate mobility strategies against conventional methods using cost-effective tools related to mobility, safety and economic development. Consult with maintenance to ensure operations are maintenance of ITS devices is practical and feasible.	Identify successful, performance based mobility strategies from completed project's performance and value and analyze them against conventional solutions.

** Denotes task is already included in TxDOT* Project Development Process Manual

Additionally, a TSMO Project Development Checklist has been provided in Appendix D that documents additional tasks the project team can perform. The checklist includes tasks for Level 2 and 3 maturities, which is the current maturity goal for the District. This checklist only highlights tasks that are not included currently in the *TxDOT Project Development Process Manual* and should be updated as the District advances its TSMO capabilities. TSMO forms and processes, as provided in Appendix A and Appendix D, should merge with existing TxDOT forms and processes eventually to ensure TSMO is streamlined into the agency's daily work flow.

Many TxDOT projects are delivered by engineering consultants. The District should develop a scoping language to be used in all projects to ensure TSMO considerations are made in every project. Examples of items that could be added to consultant scope of work include:

- Require that all ITS and TMS devices are easily accessible for maintenance personnel
- Require consultation with regional ITS Architecture and Plans
- Perform Systems Engineering Analysis (SEA) before including ITS
- Follow TxDOT TSMO Checklists

- Encourage multi-discipline collaboration to identify opportunities for improving mobility and safety
- Require ITS testing after project construction

8.1.2. Planning for TSMO

Traditional transportation planning has focused primarily on long-range mobility issues faced by specific corridors and roadways through planning for roadway or capacity construction. As metropolitan congestion and population continue to increase, transportation agencies are increasingly implementing operations strategies—for example, incident management, integrated corridor management, and evaluating alternative construction methods—to mitigate mobility issues in the short-term, maximize the utility of infrastructure, reduce capital costs, and take the greatest advantage of capital investments. TSMO activities provide the tools necessary to enhance long-range planning, including the operation and management of transportation infrastructure, which maximizes existing facilities and enables funding to be spent on areas where there is the most need. As these short-term operations and management mobility solutions are implemented and integrated, more funding will be made available for other long-range planning efforts.

The TxDOT 2015–2019 Strategic Plan identifies TxDOT's operational goals and strategies, which include:

1. Develop an organizational structure and strategies designed to address the future multimodal transportation needs of all Texas.
2. Enhance safety for all Texas transportation system users.
3. Maintain the existing Texas transportation system.
4. Promote congestion relief strategies.
5. Enhance system connectivity.
6. Facilitate the development and exchange of comprehensive multimodal transportation funding strategies with transportation program and project partners.

These objectives set the framework for the development of TxDOT's Unified Transportation Plan (UTP), the Statewide Long-Range Transportation Plan 2035 (SLRTP), the Texas Transportation Plan (TTP), and the Rural Transportation Improvement Program.

"The UTP is a listing of projects and programs that are planned to be constructed and/or developed within the first 10 years of the 24-year SLRTP. Project development includes activities such as preliminary engineering work, environmental analysis, right-of-way acquisition, and design. Despite its importance to TxDOT as a planning and programming tool, the UTP is neither a budget nor a guarantee that projects will or can be built."

The SLRTP 2035 is structured to support the goals of the TxDOT Strategic Plan and has identified three strategies to achieve the established goals:

1. Maximize Available Resources: This strategy includes revising the way TxDOT prioritizes projects, working with the Metropolitan Planning Organization (MPO), and investing in low-cost ITS solutions.
2. Manage Demand: Promote multimodal options, implement active traffic management, develop land use patterns, collect real-time information and use it for dynamic pricing, and advance traveler information.
3. Leverage Partnerships: This strategy seeks to enhance relationships through available transportation investments in existing active programs.

The TTP 2040 uses performance-based methods to select improvements for the existing transportation network by aligning UTP objectives with the goals of the TxDOT Strategic Plan previously discussed.

In addition to statewide planning documents, regional transportation stakeholders, such as TxDOT Divisions and Districts, Transit Agencies, Regional Mobility Authorities, City Transportation Agencies, and MPOs, prepare regional transportation plans for both rural and metropolitan transportation improvements.

CAMPO is responsible for producing the long-range Regional Transportation Plan (RTP) and the short-range Transportation Improvement Program (TIP). Through these plans, CAMPO identifies which regional projects are qualified to be funded through federal funds by aligning performance measures with plan goals. CAMPO scores projects based on three elements:

1. Project Readiness: Preliminary engineering and design, public involvement, environmental compliance, right-of-way acquisition, utility relocation, financial requirements, coordination, and agreements
2. Planning Factors: Varies
3. Cost-Benefit Analysis: Varies

The criteria for each of these elements varies among the following six types of projects:

- Roadway
- ITS/Operations
- Transit
- Active Transportation
- Transportation Demand Management
- Other

Criteria for ITS/Operations projects can be seen in Table 2 and Table 3.

Table 2: Planning Factors for ITS/Operations Project Selection

Criteria	Value	Performance Measure
Planning	10	The project has undergone a comprehensive planning process or is identified as a priority in a local or regional transportation plan.
Redundancy	10	The project will provide system redundancy and ensure continuity in operations.
Expandability	10	The project will expand the regional transportation ITS network.
Integration	10	The project will use technology compatible with other relevant systems.
	10	The project will tie into a centralized operations center.
	10	The project will collect and provide data available to the public.
Incident Management	10	The project is part of an incident management system.
	10	The project will be used for management of special events or emergencies.
Lifecycle	10	The project lifecycle is greater than five years.
Maintenance	5	The project has a formal maintenance program in place.
Funding	1-5	The project's local cost share is overmatched. (5% = 1 point)
Total Points	100	

Source: Capital Area Metropolitan Planning Organization: 2019-2022 Project Call, Project Selection Criteria, 2017.

Table 3: Cost/Benefit Analysis for ITS/Operations Project Selection

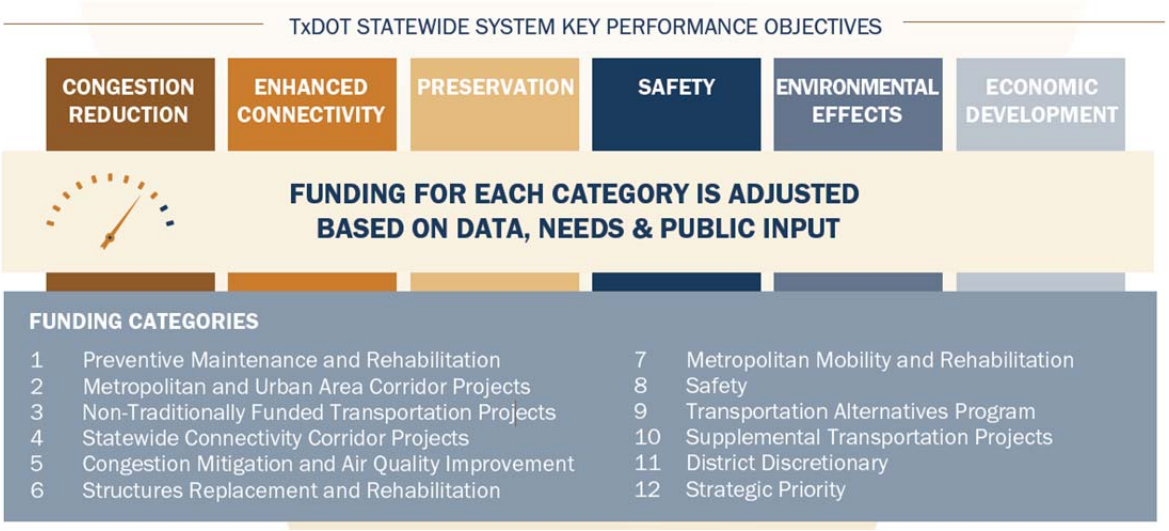
Project Type	Data	Source	Methodology
Traffic	Peak period modeling network output, project development detail.	Tool for Operations Benefit/Cost (TOPS-BC) Model (FHWA)	1. VHT total decrease, travel time reliability valuation using TOPS-BC model 2. 2020-2040 VHT benefits monetized and discounted to 2016.

Source: Capital Area Metropolitan Planning Organization: 2019-2022 Project Call, Project Selection Criteria, 2017.

Additional information about the CAMPO selection criteria can be found here: https://www.campotexas.org/tip/2019-2022-project-call/

Each of the identified planning documents compare the needs of the state or region with available funding and uses a prioritization process to determine which projects to add to the respective plan(s). Currently, there are 12 funding categories, shown in Figure 12, from which projects can be funded. These funding categories are a mixture of federal funds, controlled by the MPO, and state funds, controlled by TxDOT.

Figure 12: Funding Categories for TxDOT Projects



Source: Unified Transportation Plan 2018, TxDOT

Including TSMO processes in project prioritization, planning, and design enables the production team to identify collaborative, cost-effective, and innovative strategies at project inception. Using the action items provided in this document, the Austin District will be able to better streamline project selection with available funding mechanisms. The District should use the interagency action items discussed further in this document to optimize project selection for the above discussed transportation plans to align project goals and strategies with statewide strategic goals.

8.1.3. Programming, Budgeting, and Funding

The Traffic Operations Division, with support from the IMD, is working to improve and grow TMS statewide. A directive from Chief Engineer William Hale is to continue considering ITS needs early in project development, design, and construction.

In William Hale's April 2017 memo, he states, "A strategic statewide TMS that includes strong Intelligent Transportation System (ITS) practices and traffic signal operations provides the most cost-effective means to address safety, congestion, mobility, connectivity, maintenance and emergency response available." A TSMO approach to existing processes will help all districts realize opportunities early in project development to include ITS and TMS in projects and provide operational needs to maintain and optimize use of these investments.

Historically, deployment of TMS has been funded through roadway construction projects under Category 1 funds. TMS must compete with other needs of each district—for example, highway expansion and maintenance—which often can be so costly that funding is no longer available for TMS and these systems will be removed from the project. The directives from Chief Engineer William Hale encourage the districts to begin prioritizing TMS solutions over

conventional construction solutions and balancing their funds accordingly. TSMO formalizes activities such as collaborative discussions, alternative design reviews, benefit-cost scenarios, and identifying service gaps to implement the prioritization process needed to achieve this goal.

The capabilities of ITS technology and TMS have increased greatly over the years. Because of this growth, more funding categories can support the design and deployment of these systems. Table 4 illustrates who controls the 12 funding categories and how the funding categories can support TMS. The Austin District is encouraged to use this information to supplement its existing budget when applicable.

Table 4: Control of the 12 Funding Categories

Category	Description	Opportunities for ITS Funding in Projects		
		Sole ITS	Flexible Use	Roadway Construction
1	Preventive Maintenance and Rehabilitation			
2	Metropolitan and Urban Area Corridor Projects			
3	Non-Traditionally Funded Transportation Projects			
4	Statewide Connectivity Corridor Projects			
5*	Congestion Mitigation and Air Quality Improvement			
6	Structures Replacement and Rehabilitation			
7	Metropolitan Mobility and Rehabilitation			
8	Safety			
9	Transportation Alternatives Program			
10*	Supplemental Transportation Projects			
11	District Discretionary			
12	Strategic Priority			

Legend
- Controlled by MPO
- Controlled by TxDOT Districts
- Controlled by TxDOT Commission

**Denotes funding may not apply in all TxDOT districts*

Sources for these funding categories can be found here: [Transportation Funding in Texas (https://ftp.dot.state.tx.us/pub/txdot-info/fin/funding-sources.pdf)](https://ftp.dot.state.tx.us/pub/txdot-info/fin/funding-sources.pdf)

When TMS and ITS are deployed, the effective management and operations of these systems is critical to ensure optimized performance of the transportation system. A budget should be developed to identify operational funding gaps and needs to position the Austin District to achieve the action items and objectives recommended in this TSMO Program Plan and the TMS Statewide initiative. The following items should be considered for the resources budget:

- Dedicated staff to manage and improve TSMO activities, as outlined in the Organization and Workforce section
- Staff or contracted support for ITS research and development, as outlined in the Systems and Technology section
- Internal staff and external stakeholder engagement activities, as outlined in the Culture section
- Internal staff training, as outlined in the Organization and Workforce section
- Data acquisition, as outlined in the Performance Measures section
- Staff or contracted support for tactical plan, as outlined in the Tactical Plan Assessment section

8.1.4. Continuous Improvement

To maintain a continuous cycle of improvement and growth in TSMO activities, the following activities should be performed:

- The Austin District TSMO Program Plan should be reviewed on an annual basis. This can be completed in coordination with one of the Traffic Management Section's biannual TMS reports to TxDOT administration.
- A CMM assessment should be completed every five years. This formal, in-depth review of processes and practices will help identify opportunities for improvement and quantify the progress of the Austin District's TSMO program.

Through the development of the Austin District TSMO Program Plan, a concept was considered to enhance the Business Process capability in the District. This element was identified as out of scope for the current needs of the District, but it is captured below for future consideration to optimize the business process capability.

When projects have been constructed and in use for at least six months, performance-based audits should occur to quantify the effectiveness of implemented mobility strategies. Selection of projects to be audited could occur randomly and could be based on criteria defined in the performance measure tool box discussed in this document. Responsive, quantifiable metrics with innovative mobility strategies will be used for future planning purposes. Audits will verify whether the TSMO Project Development Checklist is implemented and if use of the checklist improved cost-benefit ratios. The audits will support understanding the impact that TSMO has made within the District and will raise the capabilities of the District to a Level 4 maturity.

8.2. Systems & Technology

The effective and optimized use of systems and technology for management and operational needs is essential to integrate TSMO within TxDOT. Systems and technology are the vehicle to ensure the activities identified in the Program Plan are carried out in an efficient and seamless manner.

The Austin District identified their systems and technology as Level 2 in maturity due to the integration and District-wide awareness of the ITS Architecture Update and the ITS Implementation Plan. The District is actively engaged in projects to improve the maturity of this dimension, including the development of a vetting process for ITS devices and updating the ITS Implementation Plan. The following sections describe activities to continue to improve the Austin District's technology capabilities.

8.2.1. Systems Engineering Analysis Process

The FHWA defines Systems Engineering Analysis as, "… an interdisciplinary approach and means to enable the realization of successful systems." The analysis is a collaborative method for executing ITS projects in an efficient and cost-effective manner. Other benefits include more resilient systems, shorter project cycles, and improved system management. The value of systems engineering is realized by professionals from a wide variety of businesses, including the FHWA. Some funding sources, such as the Highway Trust Fund, require that an SEA is completed for ITS-related projects. The advantage that SEAs can bring to the District, whether through funding or project efficiency, should be considered on all applicable projects. Recommendations for including an SEA in the project delivery process can be found in Appendix A.

8.2.2. Processes to Vet Innovative Technologies

District Traffic Operations is engaged in a process to vet ITS technology. This information will be incorporated into the TSMO Program Plan when it is completed.

8.2.3. Regional ITS Architecture

The Austin Region ITS Architecture Update provides a systematic approach to accommodate regional needs. It is a framework for TMS and ITS integration in project planning. It also defines the ITS needs and existing inventory of the region. As noted in the Austin District TSMO State of the Practice Report, ITS architecture directly encourages intelligence sharing among the area's stakeholders to execute the most efficient ITS plan for the region. It also provides guidance that lists the roles and responsibilities of each stakeholder regarding various transportation services. These formal agreements are discussed in further detail below in the Collaboration Section of this document. Technology-based processes should be developed to ensure the ITS architecture evolves at the same rate as emerging

technologies. The Regional ITS Architecture Update should be evaluated every 5 to 10 years, as needed, to ensure regional service gaps and mobility needs continue to be tracked.

The Austin Region Intelligent Transportation System Implementation Plan defines existing ITS capabilities and current strategies and projects to improve traffic management via existing or proposed ITS devices. Currently, District planners and designers refer to the ITS Implementation Plan to identify opportunities for ITS deployment in upcoming projects. The ITS Implementation Plan will be updated after needs established in the document are met, on a project-by-project basis. The report should be reviewed every two years to ensure the document's goals and strategies continue to align with statewide mobility goals.

8.2.4. Existing and Planned Tools

Traffic Management Systems

As directed by Chief Engineer William Hale, the Austin District is required to provide bi-annual updates on the District's TMS. In collaboration with the Information Management Division, a new system, Tableau, was developed to monitor and report the required performance measures. Tableau will summarize the available data, develop graphics for data visualization, and enable drill-down metrics to help districts identify needs and challenges regarding TMS.

The Traffic Operations Division provides support to the districts with development of statewide ITS construction standards and specifications to further progress the statewide TMS initiative. Standards and specifications have been developed for ITS devices that support TMS, including:

- Solar-powered systems
- Fiber optic cable installations
- Traffic signals
- Adaptive traffic signal control systems
- Wireless communications radios
- Vehicle detection
- Dynamic message sign systems
- Closed-circuit television

More recently, Traffic Operations has been working to develop standards for the use of ITS in work zones. It should continue supporting the development of construction standards and specifications as new TMS and ITS devices emerge.

Starting in 2017, the District began connecting TxDOT-operated traffic signals via wireless radios or cellular modems to the communications network. Each signal is given an IP address that enables the District to run diagnostic reports and update signal timing. This initiative improves the efficiency of both signal operations and management and maintenance operations.

The CTECC is the region's primary TMC. To improve interoperability, the District has entered into agreements with the Cities of Round Rock, Austin, and San Marcos through wireless and fiber connections, enabling the cities to view and obtain data from traffic signals and cameras within Travis and Williamson Counties through systems located in the CTECC.

The Information Management Division supports operations statewide with emerging IT and strategic resource planning. IMD has numerous initiatives that support TMS, including:

- Network monitoring prototype
- Asset management
- Fiber mapping and fiber asset management
- End of life network equipment upgrades
- Lonestar redundancy
- Improvements to traveler information
- 4G cellular deployment
- Video sharing
- Advanced traffic signal performance measures
- Modernize portfolio and project management

Planning and Project Development

A TSMO Evaluation was developed as part of the statewide TSMO Strategic Plan to provide project managers with questions early in the project delivery process to encourage a holistic and innovative approach to project development. Project managers will answer questions regarding the project in planning or scoping phases to determine if any mobility solutions or TSMO activities can be incorporated to improve effectiveness and efficiency of the project. This evaluation is incorporated with the Modernize Portfolio and Project Management (MPPM) initiative, which is slated to replace up to 40 legacy engineering operations systems, reducing not only the number of systems and systems maintenance costs, but standardizing and automating manual processes and providing transparency in performance measurement. Among these are the workflows related to the project development and delivery process, which are optimal for TSMO integration. The TSMO Evaluation guides project managers through questions about the following categories:

- Coordination and collaboration
- Safety
- Operations—including a mobility toolbox with a wide array of mobility strategies
- Technology
- Project closeout

Recommendations for when to initiate the TSMO Evaluation are discussed in the Project Development Checklist in Appendix D.

8.3. Performance Measurement

Agency-wide and District-wide performance measures enable management of safety and mobility strategies to ensure work efforts are contributing to the improvement of the program. To successfully integrate TSMO activities into agency processes, performance measures should be developed to continually track progress. These metrics should align with objectives established by TxDOT's mission, vision, and goals.

Currently, the Austin District monitors performance measures during planning phases, at construction delivery and cost review, when evaluating road surface conditions, and during bridge quality reviews. The Traffic Management Section of TRF (TRF-TM) also has identified performance measures for the District to track, discussed below. Further integrating performance measures into ongoing transportation management and operations processes promotes informed decisions and mobility-targeted performance measures. These sections, below, describe the activities required to improve TxDOT's performance measurement capability from a Level 1/2 to a Level 3 through District-wide and project-based activities.

8.3.1. Agency Performance-Based Initiatives

TxDOT recently has deployed a Performance Measures Dashboard to provide the public with information. This dashboard provides information and performance values for:

- System performance
- Efficient project completion
- Annual fatalities and fatality rates
- Asset preservation
- Focus on the customer (in progress)
- Value of employees (in progress)
- Fostering stewardship

TxDOT aims to use this information in the planning process and focuses on performance values that will identify opportunities for improvement in the future. The Performance Measures Dashboard can be found online here:
http://www.dot.state.tx.us/dashboard/index.htm

Some values in the performance dashboard relate directly to another agency-based performance value initiative. The TxDOT division offices require the districts to monitor and report on specific performance measures through the TMS program.

These items are mandated by two memos from Chief Engineer William Hale to improve the transportation network system-wide and include:

- Incident clearance time
- Travel time reliability
- Asset uptime
- TMS system coverage

Additionally, the IMD is currently working to pilot automated traffic signal performance measures in six districts of TxDOT. IMD is working with TRF, the districts, and the Texas Transportation Institute (TTI) to evaluate connectivity options and performance measures.

Nationally, MAP-21 and the FAST Act require that State DOTs and MPOs report operations performance metrics to FHWA annually, beginning in June 2018. These include performance measures in categories such as

- Travel Reliability
- System Performance
- Safety
- Assets
- Environmental

While there is no current national requirement to use these performance measures outside of reporting to FHWA, they promote and motivate a performance driven approach to transportation planning and management. Improving TSMO culture within TxDOT will facilitate the process of effectively measuring performance and including this data into planning, maintenance, and project delivery.

For more information on MAP-21 and FAST Act performance measures, please visit FHWA's Transportation Performance Measurement Implementation Page at https://www.fhwa.dot.gov/tpm/rule.cfm.

8.3.2. District-Wide Performance Measures

The performance measures that the Austin District already monitors are required by federal guidance or to receive federal funding, and they include:

- Crashes and fatalities
- Project delivery status
- Air quality
- Freight reliability
- Road surface conditions

The Austin District monitors and reports on specific performance measures through the TMS program:

- Incident clearance time—the time to clear an incident; this measures mobility on our system, driven by the District incident management process in collaboration with regional partners
- Travel time reliability—an FHWA MAP-21 recommendation, to measure impact on the public from traffic management strategies applied to on-system roads (e.g., work zone management, dynamic message signs, etc.)
- Asset uptime—how districts maintain their traffic management equipment
- TMS system coverage—measure and understand what portion of on-system roadways are adequately covered with ITS equipment and communications, or where coverage needs to be expanded

To determine if TSMO has been effective in the Austin District, operations and reliability data can be gathered. Using probe data, performance measures such as the travel time index, planning time index, and buffer index for TxDOT facilities can be gathered. This information will inform stakeholders if the mobility strategies and TSMO activities are effective in reducing congestion.

The Austin District also can measure what percent of projects complete the TSMO Evaluation (through the MPPM initiative), the TSMO Checklist (in Appendix D), and the recommended TSMO performance measures (in Appendix B). This will provide an understanding of how widespread TSMO culture is throughout the District and how much the Austin District TSMO Program Plan is being followed.

8.3.3. Project-Based Performance Measures

For projects to be included in the UTP, they are evaluated and scored to understand how the project will impact system performance. The criteria for assessing each project are shown in Table 5.

Table 5: UTP Project and Portfolio Evaluation Performance Metric Criteria

Project and Portfolio Evaluation Performance Metric Criteria

Portfolio Objective	Performance Metric Criteria	Metric Subcriteria
Safety	Crash count	Fatal and incapacitating injury crashes
		Total crashes
	Crash rate	Fatal and incapacitating injury crashes
		Total injury crash rate
	Safety Project Classification	–
	Hurricane Evacuation Route	–
Preservation	Bridge condition	Structurally deficient deck area addressed
		Good deck area maintained (by sufficiency rating)
	Pavement condition	Poor or worse lane miles addressed (by Ride Score)
		Good or better lane miles addressed (by Ride Score)
		Poor or worse lane miles addressed (by Distress Score)
		Good or better lane miles addressed (by Distress Score)
Congestion Reduction	Lane miles of current congestion addressed	–
	Lane miles of future congestion addressed	–
	Intermodal connector	–
	Lane miles of new connectivity	–
Enhance Connectivity	Lane miles of current congestion addressed	–
	Lane miles of future congestion addressed	–
	Trunk system route	–
	Intermodal connector	–
	Lane miles of new connectivity	–
Effects on Economic Development	Economic importance	National Highway System (NHS) route
		National Highway Freight Network (NHFN)
	System usage	Base ADT
		Base percent trucks
		Energy sector route
Effects on the Environment	–	Category 5 (Congestion Mitigation and Air Quality) projects
	–	Hazardous paint removal and landscape and scenic enhancement projects
	–	Environmental work (e.g. wetland mitigation)

For projects to go into the STIP, there are additional criteria based on the MPO, as discussed in the Business Processes section.

When the project is in preliminary design stages, a focus on performance of the project must be maintained. Each project should implement performance measures to monitor what the project is expected to accomplish and identify the measures of success. After the project is completed, the performance measures can be reviewed to identify if the objectives of the project were accomplished. If the TSMO goals are evaluated for each project, they can be continuously improved upon and mobility strategies can be identified to support targeted, effective efforts.

To support this process, a worksheet has been developed and is included in Appendix B. The project manager will complete the worksheet during schematic stages, as identified by the Project Development Checklist in Appendix D. To institutionalize the process of completing before-and-after analyses, the first two years of implementation will require only a brief qualitative analysis. For example, in terms of safety, the project manager will answer the following questions:

- Is the project expected to improve safety needs?
- What crash types do you expect to address with this project?
- What modes will experience safety benefits?
- How is safety being considered during construction?

When the project is complete, the project manager will review these questions to identify if these elements were accomplished and provide any lessons learned. This will help institutionalize the process of considering performance measures at a project level.

As collecting, monitoring, and archiving data becomes more accessible in the District through ITS devices and data services, before-and-after studies will transition to quantitative responses. It is expected that this will take place in the next two years. The quantitative performance measures that can be used for project before-and-after studies are documented in the performance measure recommendations provided in Appendix B.

Additional long-term strategies to strengthen performance measure capabilities in the District have been identified. These actions should be considered when the District begins implementing processes to obtain a Level 4 maturity in performance measures. They are captured here for future use:

- Use performance measures for auditing projects to ensure TSMO activities are being followed.
- Incorporate performance measures resulting from tactical plans into potential project performance measures.
- Use performance measures to support prioritization and selection of projects and implementation plans.
- Use historical performance measures to develop mobility strategy benefit-cost ratios.

TSMO forms and processes, as provided in Appendix B, should merge with existing TxDOT forms and processes eventually to ensure TSMO is streamlined into the agency's daily work flow.

8.3.4. Regional Performance-Based Initiatives

Traffic Incident Management

The TxDOT HERO Program is a performance-based, vendor-operated incident and emergency response program. The fundamentals of this program require the vendor to monitor local roadways and respond to any congestion occurrence that is caused by unforeseen circumstances. A few key performance indicators are as follows:

- Total number of incidents managed by HERO operators
- Average number of incidents per eight-hour shift
- Light tow truck roadway clearance times—collected by TMC
- Heavy tow truck roadway clearance times—collected by TMC
- Incident clearance times—collected by TMC
- Current versus previous HERO performance
- Satisfaction with HERO performance among TMC operators, first responders, and other TIM partners based on annual survey

For more information on TxDOT's HERO Program, refer to HERO Roadside Assistance Program.

CAMPO is leading the development of a *Regional Incident Management Strategic Plan*. CAMPO anticipates the plan will propose opportunities to improve and expand existing operations, identify funding, provide cost- benefit ratios of programs, and bring a higher social acceptance for incident management. CAMPO has a three-tier approach for performance measures. Tier 1 performance measures included with this initiative are:

- Roadway clearance time
- Incident clearance time
- Number of secondary crashes

Tier 2 and 3 performance measures still are being determined through stakeholder workshops.

8.4 Organization & Workforce

To further maximize the efficiency of TSMO in the District, daily operations and the activities included in them should be formalized to promote mobility strategies.

Operationally, some members of the District already are performing TSMO activities during planning, design, and maintenance. However, these positions are not formalized and tend to be carried out on an ad-hoc or discipline-specific basis.

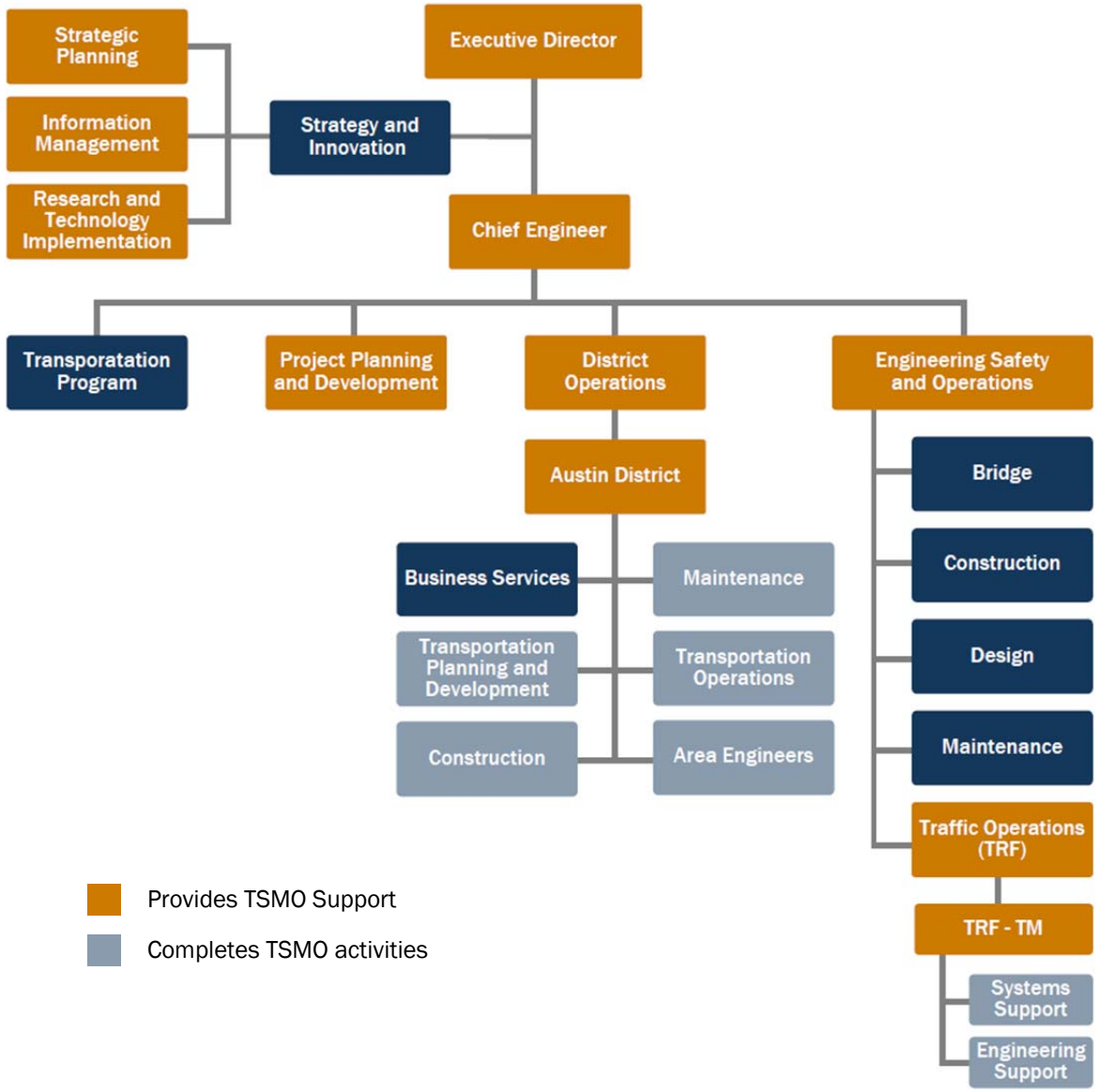
In the CMM assessment, the Austin District identified as Level 2 for Organization and Workforce. There are many opportunities to engage a wider, more-collaborative group in TSMO activities. The following sections provide recommendations for the District to improve TSMO capabilities by defining organizational roles and the training needed to fulfill them.

8.4.1. Existing Organization Structure

An existing organizational structure with roles related to TSMO activities can be seen in Figure 13. This existing organizational structure is beneficial to implementing TSMO in that each division, district, section, or area is comprised of subject matter experts and has the skill set required to support the needs of the District. Roles and responsibilities of each are clearly defined within the groups, respectively. Full organizational charts for TxDOT and the Traffic Operations Division can be found in Appendix E.

The TRF reports to TxDOT's Chief Engineer and is organized to oversee the design and placement of traffic control devices and items; it is responsible for planning highway safety programs and initiatives. TRF also provides support to all 25 districts of TxDOT with development of statewide standards, specifications, and policy guidance. TRF works closely with the IMD to develop statewide technology solutions that support TMS and TSMO. TRF-TM assigns a TRF-TM Engineer and a TRF-TM ITS Analyst as division-level points of contact to the Austin District for engineering and technical guidance. It will benefit the Austin District to provide an additional ITS Analyst for support if ITS capabilities within the District are expected to grow.

Figure 13: Combined Organization Roles Related to TSMO



District Operations, such as the operations of the Austin District, also report to the Chief Engineer. The existing structure of the Austin District is comprised of members from business, operations, planning and development, construction, and maintenance. As noted, many of these District employees already perform TSMO activities. For example, during the staff interviews held in 2017, the program plan development team noted that internal and external collaboration takes place during project development on a project-by-project basis. Standardizing collaboration in all projects will promote TSMO, and defining the person responsible for ensuring this activity is carried out further enables the success of TSMO in the District. Additionally, the continual maintenance of deployed ITS devices is noted to be a challenge for the area. The Austin District only has one ITS maintenance technician. The District is highly encouraged to acquire and train a minimum of three supplemental

maintenance technicians. Increased maintenance support will improve asset uptime and allow the District to close service gaps.

TxDOT initiated a vendor-managed regional TMC at the CTECC to augment existing staff in managing Austin's transportation system. In 2018, the CTECC has six TxDOT operators and 15 vendor-supplied operators, bringing the TMC staff total to 21 operators. The vendor expects to add an Operations Manager, Training Manager, Shift Supervisors, and ITS Operators. The staff at the TMC is responsible for the following operations:

- Traffic/roadway monitoring
- Event management
- Event response coordination
- HERO dispatch
- Traveler information
- Special situations
- Traffic management

The investment made by TxDOT to procure these services increases the capabilities for TSMO in the District. As ITS and TMS devices are deployed in future projects, the District should acquire and train additional TMC support staff.

8.4.2. Key TSMO Roles

Organizational roles to ensure implementation of TSMO must be established. As recommended in the Statewide TSMO Strategic Plan (August 2017), the Austin District selected a TSMO Champion and a TSMO Coordinator for the region. To complement these roles, several teams could be established, under the guidance of a liaison(s), to ensure necessary actions for success are being carried out. These liaison responsibilities could be performed initially by existing TxDOT staff. As TSMO matures within the organization, it may be necessary to hire additional staff to fulfill these roles.

Based on the Austin District TSMO goals, responsibilities for key roles are outlined below.

TSMO Champion—The TSMO Champion position is held by someone currently at the leadership or administrative level within TxDOT. The responsibilities of the TSMO Champion are:

- Representing TSMO activities during leadership meetings
- Advocating for funding and resources
- Promoting the value of mobility strategies and high-benefit cost

TSMO Coordinator—The TSMO Coordinator position is held by someone in the District involved with day-to-day operations, traffic, and technology elements. The responsibilities of the TSMO Coordinator are:

- Being the point of contact for TSMO questions and activities
- Acting as a link from the liaisons to the Champion
- Acting as a liaison to other districts and sharing best practices and current activities
- Managing the development and continuous improvement of the TSMO Program Plan
- Leading revision recommendations to project development manual
- Organizing the regional TSMO committee meeting
- Attending the statewide TSMO committee meeting
- Leading tactical plan development efforts

TSMO Planning Liaison(s)—A TSMO Planning Liaison has vast knowledge of the project development process from inception to letting, fully understands processes of transportation planning, and realizes the required environmental and ROW day-to-day operations. This liaison(s) will oversee and delegate the following TSMO activities:

- Collaborating among disciplines to ensure that all requirements provided in the TSMO project development checklist are completed, during and after project development
- Ensuring all projects have considered alternative mobility strategies using technological advances in planning and design, during and after project development
- Ensuring all projects comply with regional performance measure criteria
- Facilitating project development milestone meetings during planning and preliminary design
- Continuously verifying that the most current available traffic data are used in project development

TSMO Project Design Liaison(s)—A TSMO Project Design Liaison has vast knowledge of the project development process from inception to letting, fully understands the construction process, and realizes the required maintenance involvement after a project has been constructed. This liaison(s) will oversee and delegate the following TSMO activities:

- Collaborating among disciplines to ensure that all requirements provided in the TSMO project development checklist are completed, during and after project development
- Collaborating with Technical Services to ensure that all projects have considered alternative mobility solutions using technological advances in planning and design, during and after project development
- Facilitating project development milestone meetings during design
- Ensuring all projects have considered mobility mitigation solutions for adjacent roadways or other corridors affected by project construction

TSMO Construction Liaison(s)—A TSMO Construction Liaison is someone with vast knowledge of project construction processes. This liaison(s) will oversee and coordinate the following TSMO activities:

- Collaborating among disciplines to ensure that all requirements provided in the TSMO project development checklist are completed, during and after project development
- Encouraging the use of ITS in work zones and making an effort, when possible, to bring traffic data back to the TMC
- Ensuring all projects have considered mobility mitigation solutions for adjacent roadways or other corridors affected by project construction
- Providing lessons learned for consideration in project development planning stages

TSMO Traffic Management Center (TMC) Liaison(s)—A TMC Liaison should be well versed in common traffic and ITS engineering. He/she should be familiar with data management and data archiving strategies. This liaison(s) will oversee and coordinate the following TSMO activities:

- Collecting and documenting mobility and safety data
- Supporting ICM initiatives by alerting agency planners and designers of opportunities discovered through collected TMC data
- Supporting Incident Management initiatives by alerting agency planners, designers, and maintenance staff of opportunities discovered through collected TMC data
- Encouraging system upgrades to communication equipment that promotes collection and documentation of mobility and safety data region-wide
- Identifying opportunities to elevate transportation management

TSMO Transportation Systems and Technical Services Liaison(s)—This Liaison(s) will oversee and delegate the following TSMO activities:

- Collaborating among disciplines to ensure that all requirements provided in the TSMO project development checklist are completed, during and after project development
- Overseeing all interactions with equipment vendors
- Overseeing all technology testing and relaying recommendations for additional product testing
- Providing opportunities and lessons learned to the TSMO Project Development Liaison to optimize the use of technological devices in planning and design

TSMO Maintenance Liaison(s)—This Liaison(s) will oversee and delegate the following TSMO activities:

- Collaborating among disciplines to ensure that all requirements provided in the TSMO project development checklist are completed, during and after project development
- Working with regional planners and traffic engineers to ensure ITS deployments are practical and can be maintained
- Complying with regional performance measures for asset uptime
- Facilitating discussion on additional maintenance workforce needs

TSMO Connections Liaison(s)—A TSMO Connections Liaison should be well versed in engagement activities. This person also should understand the daily operations of the project development process. This liaison(s) will oversee and delegate the following TSMO activities:

- Assisting TRF in initiating and facilitating TSMO learning opportunities both internally and externally, and helping to engage agency staff of all backgrounds into discussions about TSMO
- Carrying out activities as defined in the engagement plan
- Coordinating and engaging with Area Engineers and Area Offices

TSMO Regional Stakeholder Liaison(s)—This Liaison(s) will oversee and delegate the following TSMO activities:

- Acting as the primary contact for all stakeholder collaboration, including initiation of formal agreements, facilitating meetings and discussions to better align cross-agency goals and transportation initiatives, and initiating project planning meetings
- Identifying regional initiatives TxDOT can support through project development
- Attending the bi-monthly AIM High meetings to ensure TxDOT goals are achieved

These TSMO-specific roles and how they fit into the existing Austin District Organizational Chart is illustrated in Figure 14.

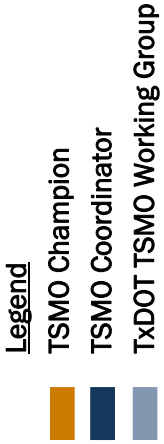


Figure 14: Austin District Organization Chart

TxDOT Austin District TSMO Working Group—The working group will be comprised of the District's executive leadership, the appointed District TSMO Champion, and the appointed Liaisons. Additional qualified staff also should be included, as necessary. The working group will meet regularly to discuss opportunities for including TSMO activities in existing TxDOT processes. The working group will define strengths and weaknesses of the TSMO program and funnel challenges and opportunities to executive leadership through the TSMO Coordinator. Potential topics for the committee to discuss are as follows:

- Progress on TSMO activities and implementation plan
- FHWA's CMM frameworks for mobility strategies
- Opportunities for external collaboration
- Updates to TSMO Program Plan and Tactical Plans
- Addressing TMS performance metrics

8.4.3. Staffing Plan

From the staff interviews conducted during development of the Program Plan, it is apparent that many TSMO activities currently are being performed. However, these activities are completed on an ad-hoc basis and are not streamlined into common practices across the District.

Each of the liaison roles identified in the organization structure should be carried out by existing TxDOT staff. Because of the deeply integrated and dynamic responsibilities, which will grow as the District increases the program's level of maturity, it is recommended that each liaison select a group of staff members to support his or her responsibilities. Each focus group will report their activity status to be included in the bi-yearly TRF-TMS Status Report.

As noted above in Section 8.4.1, Existing Organization Structure, the Austin District is encouraged to acquire and train, at a minimum, one additional ITS Analyst and three additional ITS maintenance technicians. If additional maintenance staff is not desirable, this support also could be obtained through District-wide ITS maintenance contracts. As TMS capabilities within the District grow, additional TMC support staff also will be required. Recommended timing to obtain this additional staff can be found below in Section 10: Implementation Plan.

8.4.4. Training Plan

Technically trained staff are essential to the success of TSMO within an agency. Day-to-day tasks and operational responsibilities rely on the expertise and capabilities of the agency's staff. Table 6 provides recommended training for both leadership and support roles.

Table 6: Recommended Austin District Training

Training Subject Matter	Facilitator	Required Participants	Frequency
TSMO District Training: *Participants will be trained on the key elements of the Statewide Strategic Plan and the Austin District TSMO Program Plan. This will include TSMO goals and definitions, Program Plan contents for each of the six capability components, staff expectations, TSMO Champion, Coordinator, and Liaison roles, District action items, and future tactical plans. The information in this training can be included in existing TxDOT training courses.*	TSMO Connections Liaison(s)	All agency employees (external stakeholders welcome)	Once per year
TSMO Project Development Process Training: *Participants will learn about TSMO activities within the Project Development Process and the role they each play to implement these revisions in their daily activities. The information in this training can be included in existing TxDOT training courses.*	TRF-TM	Planning, Design, Construction, Maintenance	Every three months for first two years of TSMO implementation
TxDOT Austin District TSMO Working Group Responsibilities: *The TxDOT Austin District TSMO Working Group will receive training on TSMO goals, responsibilities, and action items.*	TSMO Coordinator & Champion	TxDOT Austin District TSMO Working Group	As needed for new group members
Liaison Responsibilities: *Each individual liaison will receive training on TSMO goals, responsibilities, and action items.*	TSMO Coordinator	TSMO Liaisons	As needed for new TSMO Liaisons

In the future, the Austin District can elevate TSMO training by establishing a TSMO certification process for employees. In this certification process, certain roles within the agency could be required to obtain a level of TSMO certification to fulfill their daily responsibilities; or incentives could be offered for personnel with higher levels of mobility-related credentials.

In addition to internal District training, several programs are facilitated by external agencies to promote TSMO-related activities. Agencies such as the National Highway Institute (NHI) and the Transportation Research Board (TRB) provide online transportation management training. Also, the National Operations Center of Excellence (NOCoE) has several

publications, webinars, TSMO roundtable discussions, case studies, and research that all provide insight for developing and implementing TSMO-related activities.

8.5. Culture

A TSMO culture within an agency is contingent on the realization of the agency's objectives by engaged operational staff and how the staff considers and improves daily activities to meet these objectives. Raising awareness through institutionalized processes is crucial to successfully integrating TSMO in day-to-day operations. This includes TxDOT staff who are directly involved in implementing TSMO activities, as well as representatives from tangential departments or local agencies.

In 2016, TRF worked with the Enterprise Systems Office and the districts to evaluate the state of TxDOT traffic management during 2015. The assessment covered five broad topics:

- Spending
- Data and Performance Management
- Traffic Management Centers
- Assets and Operations
- Organization

Strengths and deficiencies were noted for each of the topics and best practices were provided.

As research and lessons learned became available during the evaluation, Chief Engineer William Hale released a memo explaining the importance of TMS in project planning and design. He discussed how TMS solutions are a more cost-effective approach to managing congestion.

William Hale's memo resulted in raised awareness throughout the districts on the importance of TMS. TSMO facilitates this culture shift by outlining the processes and action items to enhance the way all districts view, plan for, and use mobility strategies and TMS.

In the Austin District, there are several initiatives that encourage a mobility-focused culture, such as Mobility35 and ICM. These efforts are led by a primary champion and are not pervasive throughout the District. The Austin District rated themselves a Level 1 in terms of TSMO culture in the CMM assessment. These sections, below and in Table 7, describe activities and responsibilities for institutionalizing TSMO into mainstream interactions and gaining a wide range of participation in TSMO activities.

8.5.1.1 Engagement Opportunities

Meetings Opportunities

In accordance with the recommended project development procedures, input from all departments and external agencies will be engaged earlier in the project development stages. There also are existing standing meetings held by TxDOT or local agencies where TSMO activities can be discussed to identify opportunities for improvements and to institutionalize TSMO processes. Meetings that are recommended for involvement include, but are not limited to:

- Project-specific stakeholder meetings
- Quarterly District Portfolio Planning meetings
- CAMPO working groups/committees
- Austin-Area Incident Management for Highways (AIM High)
- Design Concept Conference

Case Studies

Case studies may be developed featuring local projects that leveraged TSMO activities or integrated mobility strategies. The case studies can be distributed to administration and all levels of the District easily to provide examples of how TSMO adds value. They could be used during presentations to stakeholders or to help advocate for additional funding or resources by providing examples of successful high-benefit, low-cost improvements.

General Notes

When projects move into construction phases, TSMO activities can be continued through General Notes in the plan sheets. The Austin District can develop template General Notes to be added to every project's design schematics or construction plans. This will allow designers to provide information to the area office, developers, contractors, and other stakeholders involved in construction regarding who to coordinate with during construction, which departments to involve, and any additional feedback identified during design phases to help carry forward lessons learned.

Annual Report

It is recommended that the Austin District develop an annual report to track TSMO accomplishments, opportunities, and the status of achieving activities identified in the Austin District TSMO Program Plan. It also will provide information on potential revisions or additions to the Program Plan, as necessary. This document will be valuable to keep administration informed of the many activities in the District and help advocate for additional funding as necessary.

Table 7: Ways to Institutionalize TSMO

Engagement Activity	Frequency	Point of Contact Responsibility	Oversight Responsibility
Meeting Opportunities	Various, as needed	Project managers & Regional TSMO Stakeholder Liaison	TSMO Connections Liaison
Case Studies	Biannually	TSMO Connections Liaison	TxDOT Austin District TSMO Working Group
TSMO Newsletter	Quarterly	TSMO Connections Liaison	TxDOT Austin District TSMO Working Group
General Notes	Various, as needed	Project Managers	TSMO Connections Liaison
Annual Report	Annually	TSMO Coordinator	TSMO Champion

8.5.2. Available Resources

The District TSMO Coordinator and TSMO Champion are key resources for a successful TSMO program. These roles were discussed previously in greater detail in the Organization and Workforce section.

A template slide deck will be created to be used by the TSMO Coordinator, TSMO Champion, or the TSMO Connections Liaison to explain what TSMO is, the value it has brought to the Austin District, and how to get involved. As described previously in the Organization and Workforce section, the TSMO Connections Liaison is responsible for carrying out the activities described in the engagement plan.

Additional national resources include, but are not limited to:

- National Operations Center of Excellence (NoCOE), https://transportationops.org/
- FHWA's Primer for Program Planning, https://ops.fhwa.dot.gov/publications/fhwahop17017/fhwahop17017.pdf
- AASHTO's TSMO Guidance, http://www.aashtotsmoguidance.org/

8.6. Collaboration

The ability of divisions, districts, partner agencies, and other stakeholders to work together to achieve goals is a defining characteristic for all TSMO programs. Internal collaboration provides input from all disciplines and streamlines the project development process, focusing on efficiency and mobility-specific strategies.

Currently, collaboration between internal departments, as well as external agencies, is on an as-needed basis. These relationships are positive overall, but there are opportunities for improvements through more proactive partnership. The following sections solidify the recommendations made in previous sections to advance the Austin District to Level 3 capabilities.

8.6.1. Internal Partnerships

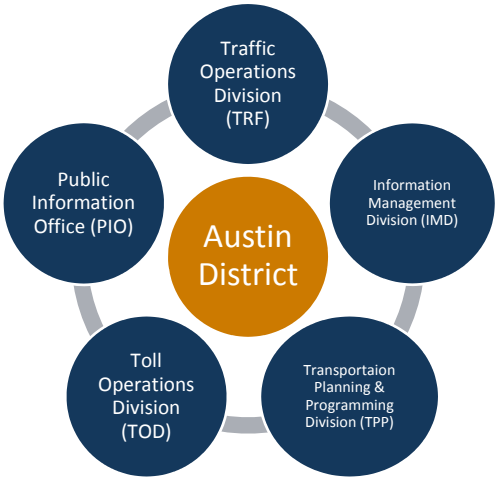
Several subtasks for internal collaboration are included in TxDOT's project development process. These relationships are critical to ensure projects meet the needs of the region and are delivered on time. During design development, designers from different disciplines collaborate to make sure the design is constructible. Designers also meet with planners during design concept meetings and site visits. To improve project delivery and efficiency, opportunities to elevate internal collaboration include:

- Creating 30/60/90/100 Milestone meetings that include all design disciplines, maintenance, and construction
- Engaging multi-disciplinary teams to review value engineering studies
- Engaging project managers from adjacent projects to discover lessons learned
- Collaborating between traffic engineers and planners to identify projects in which congestion can be mitigated without adding capacity

Additional recommendations to further integrate internal collaboration into the project development process are identified in Appendix A.

Internal partnerships from different divisions of TxDOT also are critical to ensure inter-operability and TSMO capabilities within the District. State-level division support should be used to help identify needs and provide solutions for the District. Internal partners can be seen in Figure 15.

Figure 15: Internal TSMO Partners



The Public Information Office is part of the Communications Division of TxDOT and can support the districts by coordinating internal and external communications. They provide news releases and media communications to the public and internal TxDOT employees.

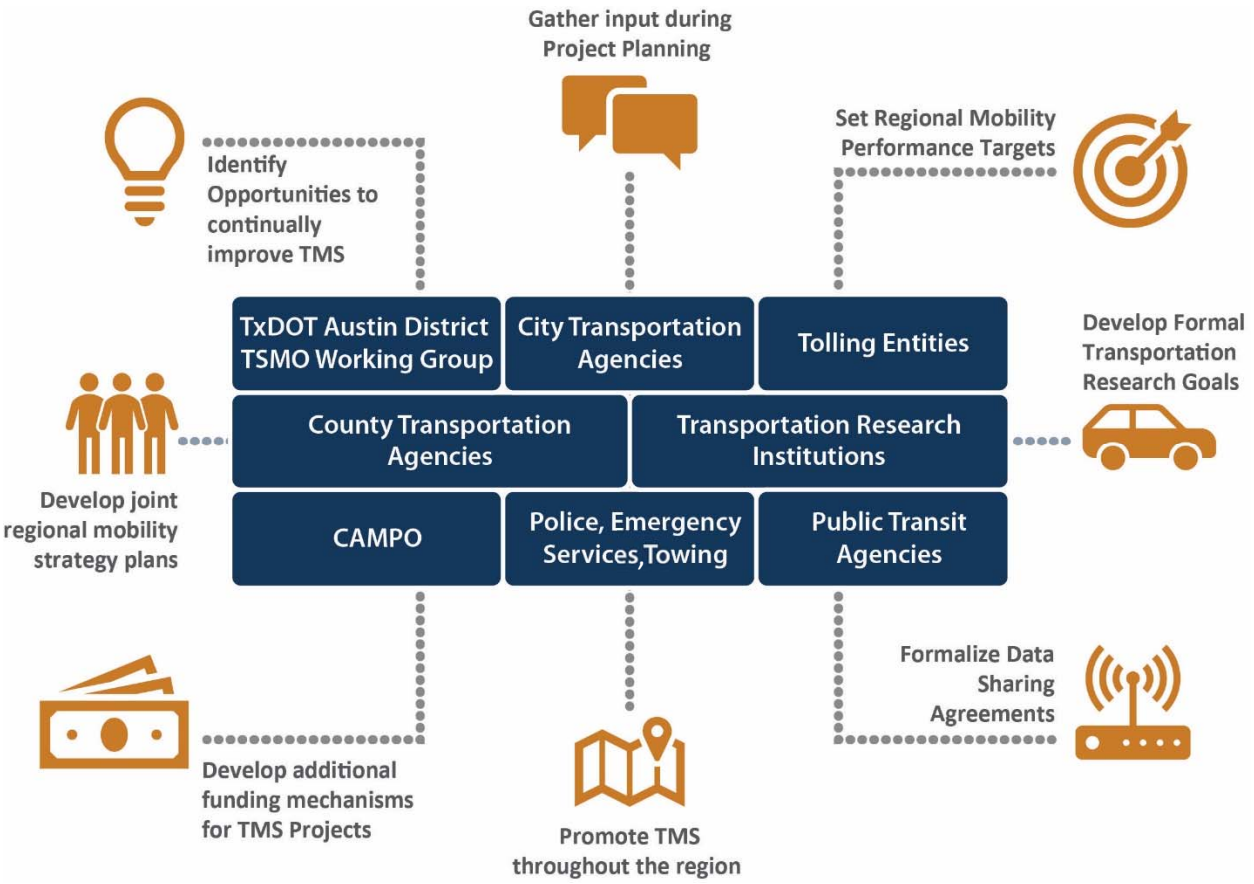
8.6.2. External Partnerships

Many regional stakeholders are responsible for transportation operations, management, safety, and maintenance within the Austin District (see Figure 16). Collaborative activities among these stakeholders is critical to optimizing the existing transportation network. Defined collaboration between TxDOT and other stakeholders promotes the formality of interagency relationships and properly aligns common regional mobility goals between agencies. The Austin District will establish a Regional TSMO Committee that will include representatives from all regional stakeholders. This committee will meet regularly to discuss challenges and lessons learned. The Regional TSMO Committee also will provide support and guidance for mobility strategies discussed previously in Section 6, Mobility Challenges and Strategies.

A key advantage of formal interagency partnerships is the ability to improve project planning, consistent with regional strategies. In the 2040 Regional Transportation Plan delivered by CAMPO, roadway improvement strategies are listed from which CAMPO determines if projects are qualified to receive federal funding. The plan identified mobility strategies that TxDOT can use, including:

- Congestion management
- Transit
- Bicycle and pedestrian facilities
- Access management
- TMS and ITS
- Operational strategies (such as road weather management, traffic monitoring, and enforcement of traffic regulations)

Figure 16: External Collaborative Activities



Formal interagency agreements also can support Austin District Program Plan goals, such as safety. CAMPO's TIM and ATMS initiatives provide opportunities for TxDOT and other stakeholders to become active in plan development. Collaborative activities, such as TMC coordination and transportation data sharing, support the success of these programs.

Additionally, the Regional Transit Coordination Committee (RTCC) has developed several coordination strategies regarding public transit to increase efficiency of transit services, increase awareness of offered transit, expand transit availability, and fulfill other transit-related goals. Formal involvement with the initiatives set forth by the RTCC will present TxDOT with mobility opportunities that the agency typically may not consider and will promote the Austin District Program Plan goal of efficiency.

Other stakeholders in the area include county and municipal governments, law enforcement, and emergency services. TxDOT should continue the interagency collaboration and coordination that currently exists with these agencies during project planning and development. To properly align formal partnership agreements across the District, Table 8 describes opportunities for stakeholder collaboration.

Table 8: Austin District Partnership Opportunities

Stakeholder	Partnership Opportunity
Capitol Area Metropolitan Planning Organization (CAMPO)	Regional Transportation Plans, Mobility Initiatives, Multimodal Initiatives, Data Sharing
City Transportation Agencies (City of Austin, City of Round Rock, City of San Marcos)	Regional Transportation Plans, Multimodal Initiatives, Data Sharing, Public Transit Plans, Project Planning and Development, Traffic Incident Management Initiatives
County Transportation Agencies (Travis, Williamson)	Regional Transportation Plans, Multimodal Initiatives, Data Sharing, Public Transit Plans, Project Planning and Development, Traffic Incident Management Initiatives
Tolling Entities	Regional Transportation Plans, Public Transit Plans, Mobility Initiatives, Data Sharing
Public Transit Agencies	Public Transit Plans, Multimodal Initiatives
Local and Regional Government, Law Enforcement, Emergency Services, Towing	Project Planning and Development, Traffic Incident Management Initiatives, Data Sharing

The Regional Stakeholder Liaison, defined in the Organization and Workforce section previously, is encouraged to include opportunities for active partnerships in Regional TSMO Committee discussions. Additionally, TRF will facilitate statewide TSMO meetings to encourage collaboration across the state.

8.6.3. Public-Private Partnerships

TxDOT is engaged in several public-private partnerships. Due to the confidentiality of the agreements, this item will not be discussed in detail in this document. The Austin District is open to partnerships with data service providers, technology infrastructure, and others. These opportunities will be reviewed by the District on a case-by-case basis.

9. TSMO Tactical Plan Needs Assessment

The purpose of tactical plans is to more deeply analyze current strengths and opportunities for improving mobility strategies. They will serve as a deployment plan by providing details, responsibilities, and cost estimates for specific mobility strategies through the Austin District TSMO Program Plan.

The topics covered in the tactical plans can be mobility strategies that already are in place but need to be institutionalized or progressed, or solutions that are new to the Austin District. They will support data-driven decisions and further the integration and prioritization of mobility strategies with existing efforts.

9.1. Tactical Plan Criteria

Strategies that require a tactical plan should meet the following criteria:

- Addresses the District's TSMO program goals
- Is expected to improve safety and mobility in the District
- Aligns with TxDOT's overall mission
- Includes mobility services or strategies that need additional resources or support
- Includes mobility services or strategies that can be funded, begin implementation, or continue implementation within three years

Tactical plans also can cover a specific corridor where a series of integrated mobility strategies will be used to improve safety and mobility at specific locations.

9.2. Tactical Plan Components

The following details should be included in each tactical plan:

- Detailed account of current activities, including who is responsible, what are the specific activities, a schedule of action items, etc.
- Description of how the implementation plan will be integrated with existing business processes
- Cost estimate for implementation, operations, and maintenance
- Performance measures and measures of success
- A schedule for continuous improvement and updates

Any recently developed plans and documents may be considered as tactical plans, as long as they have all of the components previously described.

9.3. Austin District Recommended Tactical Plans

The mobility challenges and existing strategies discussed previously in Section 6, Mobility Challenges and Strategies, informed the recommended tactical plans. Based on the transportation challenges being faced in the region, and priorities identified by regional stakeholders, the following tactical plans should be developed:

- **Multimodal/active transportation**—Austin residents are increasingly using active transportation—for example, walking, biking, or riding transit—and it is important to provide appropriate facilities for these modes. Processes for considering active transportation or a plan to improve safety and access could be included in a multimodal or active transportation tactical plan.
- **Traffic Incident Management**—The Austin District currently participates in several incident management strategies, as discussed previously in Section 6, Mobility Challenges and Strategies. An incident management tactical plan will formalize existing activities and provide an opportunity to implement new strategies, such as dynamic alternate routing or first responder training.
- **Emerging Technology**—New technology is becoming available continuously to improve mobility. The Austin District will find value in creating an emerging technology tactical plan to identify measures of success and a path for implementing intelligent mobility solutions.
- **Data Integration**—The Austin District has ITS devices throughout the region; however, beyond being used for travel time signs, the data collected are not currently archived to use for operations or planning purposes. The purpose of this tactical plan is to collaborate with IMD to enhance many of the efforts that already are in progress. The data integration tactical plan will develop protocols for entire network monitoring and archiving of data. This will help TxDOT and its partners take advantage of existing sources of data to make informed decisions to improve regional mobility.

It is recommended that these tactical plans be initiated within a year of the finalization of this Austin District Program Plan and that they be distributed as appendixes to the Program Plan. Tactical plans in addition to those recommended in this document may be completed as necessary. The tactical plan development effort will be led by the District TSMO Coordinator, who may choose to complete the plans in-house or through a consultant.

Some tactical plans for the Austin District could be interconnected with tactical plans from other districts based on the needs to successfully implement the plan.

10. Implementation Guide

The following implementation plan includes the action items discussed in this document in chronological order. This implementation plan can be used to track the progress of institutionalizing TSMO within the District. It can be revised as TSMO capabilities improve and as tactical plans are developed.

A comprehensive list of action items in order of each TSMO capability dimension can be found in Appendix F: Implementation Plan

FY 2018 Q4 (June—August)

_____ Release Austin District Program Plan. Facilitate roll-out of training for Austin District Plan to all available District staff. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan—entire document

Task Lead: TSMO Coordinator
Oversight: TxDOT TRF
Evaluation Metric: Training made available to all district staff
Frequency: Once

_____ Complete TMS Status Report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Select TSMO Champion, Coordinator, and Liaisons. This group will form the base members of the TxDOT Austin District TSMO Working Group. The TSMO Coordinator should reach out to this stakeholder group and begin coordination.

Reference: AUS Program Plan 8.5.2

Task Lead: District Executive Leadership
Oversight: TxDOT TRF
Evaluation Metric: Send names for each position to TRF for tracking purposes
Frequency: As needed

_____ Initiate Regional TSMO Committee and hold quarterly meetings. Also attend statewide TSMO committee meetings when initiated.

Reference: AUS Program Plan 8.7.1

Task Lead: TSMO Champion and Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Facilitate and attend Regional TSMO Committee Meeting
Frequency: This is a continuous task

_____ Develop budget for District resource needs based on positions identified in Austin District TSMO Program Plan.

Reference: AUS Program Plan 8.1.3

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send budget to TRF for TSMO tracking purposes
Frequency: Every 2 years

_____ Implement changes to project development process through the TSMO project development checklist. All new projects should use it upon inception of the project.

Reference: AUS Program Plan 8.1.1

Tool: Appendix D: Project Development TSMO Checklist

Task Lead: Project Managers
Oversight: TSMO Project Design Liaison
Evaluation Metric: Use TSMO project development checklist on all projects
Frequency: This is a continuous task

_____ Initiate development of tactical plans. Tactical plans should be completed within on year of finalization of Austin District TSMO Program Plan.

Reference: AUS Program Plan 9.0.0

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Distribute completed tactical plans to Austin District and TRF
Frequency: As needed

_____ Institute TSMO Evaluation on all projects using the MPPM initiative.

Reference: AUS Program Plan 8.2.4

Tool: MPPM/TSMO Evaluation

Task Lead: TSMO Project Design Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Provide progress in annual report
Frequency: This is a continuous task

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Facilitate project-based milestone meetings with all disciplines to resolve potential challenges and pain points early in the project development process.

Reference: AUS Program Plan 8.7.1

Tool: Appendix D: Project Development TSMO Checklist

Task Lead: Project Managers
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide update of progress at Regional TSMO Meeting
Frequency: This is a continuous task

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

_____ Research existing TxDOT forms and processes and make recommendations about where to include TSMO forms and processes.

Reference: AUS Program Plan 8.1.3

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Send recommendations to TxDOT divisions
Frequency: Every year

FY 2019 Q1 (September—November)

_____ Identify list of projects and budgets where operations/TMS improvements can be added over the next 10 years to include in UTP.

Reference: AUS Program Plan 8.1.3

Task Lead: TSMO Project Design Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send projects and budget to TRF for TSMO tracking purposes
Frequency: Every 4 years

_____ Develop template language for project scopes to align with performance-based planning requirements.

Reference: AUS Program Plan 8.1.1

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Implement scoping language on projects
Frequency: As needed

_____ Complete TMS Status Report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Facilitate TSMO discussions during project-specific stakeholder meetings to identify opportunities to integrate and prioritize mobility solutions.

Reference: AUS Program Plan 8.6.1

Task Lead: Project Managers
Oversight: TSMO Regional Stakeholder Liaison
Evaluation Metric: Provide update of TSMO discussions at Regional TSMO Committee Meeting
Frequency: This is a continuous task

_____ Facilitate TSMO discussions during quarterly District portfolio planning, CAMPO working groups/committees, AIM High meetings, and other regularly scheduled initiative meetings.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Regional Stakeholder Liaison
Oversight: TSMO Connections Liaison
Evaluation Metric: Provide update of TSMO discussions at Regional TSMO Committee Meeting
Frequency: This is a continuous task

_____ Develop and facilitate training regarding the roles and responsibilities for TSMO Liaisons and their staff.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Hold training for TSMO Liaisons and TxDOT Austin District TSMO Working Group
Frequency: As needed

_____ Acquire one additional ITS Analysts and one Maintenance Technician to support deployment and maintenance of ITS devices.

Reference: AUS Program Plan 8.5.1

Task Lead: TSMO Connections Liaison
Oversight: TSMO Transportation Systems and Technical Services Liaison
Evaluation Metric: Hire full time employee
Frequency: Once

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2019 Q2 (December—February)

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop general notes to be used on project plan sets and develop criteria on when they should be added to plans. Implement general notes on projects.

Reference: AUS Program Plan 8.6.1

Task Lead: Project Managers
Oversight: TSMO Connections Liaison
Evaluation Metric: Provide update to progress in annual report
Frequency: This is a continuous task

_____ Develop and facilitate training for all agency employees and stakeholder to engage them in the TSMO program. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Hold training for all agency employees
Frequency: Every 1 year

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2019 Q3 (March—May)

_____ Review Austin District Program Plan for updates and revisions.

Reference: AUS Program Plan 8.1.4

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send revised Austin District TSMO Program Plan to TRF for tracking purposes
Frequency: Every 1 year

_____ Complete TMS Status Report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Implement project-based performance measurement for before-and-after analysis. Use qualitative information unless consistent and high-quality data is available.

Reference: AUS Program Plan 8.3.3

Tool: Appendix B: Recommended Performance Measures

Task Lead: Project Manager
Oversight: TSMO Planning Liaison
Evaluation Metric: Provide update in annual TSMO Report
This is a continuous task

_____ Track TSMO performance measures: district travel time reliability and implementation plan status.

Reference: AUS Program Plan 8.3.2

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Provide update in TMS Status Report and Annual TSMO Report
Frequency: Every 1 year

_____ Develop TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Every 1 year

_____ Develop annual TSMO Report.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Every 1 year

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2019 Q4 (June—August)

_____ Develop TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Facilitate project-based collaboration between adjacent projects to share best practices.

Reference: AUS Program Plan 8.7.1

Task Lead: TSMO Planning Liaison and TSMO Project Development Liaisons
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide update of progress at Regional TSMO Meeting
Frequency: This is a continuous task

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2020 Q1 (September—November)

_____ Complete TMS Status report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Update regional ITS architecture.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Planning Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Send regional architecture to TRF for tracking purposes
Frequency: Every 5 to 10 years

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY2020 Q2 (December—February)

_____ Develop TSMO case studies based on successful projects with mobility and safety improvements.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group & TRF
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Every 2 years

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop and facilitate training for all agency employees and stakeholder to engage them in the TSMO program. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Hold training for all agency employees
Frequency: Every 1 year

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

FY 2020 Q3 (March—May)

_____ Review Austin District Program Plan for updates and revisions.

Reference: AUS Program Plan 8.1.4

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send revised Austin District program plan to TRF for tracking purposes
Frequency: Every 1 year

_____ Complete TMS Status Report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Track TSMO performance measures: district travel time reliability and implementation plan status.

Reference: AUS Program Plan 8.3.2

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Provide update in TMS Status Report and Annual TSMO Report
Frequency: Every 1 year

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop annual TSMO report.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Every 1 year

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2020 Q4 (June—August)

_____ Develop budget for District resource needs based on positions identified in Austin District TSMO Program Plan.

Reference: AUS Program Plan 8.1.3

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send budget to TRF for TSMO tracking purposes
Frequency: Every 2 years

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Acquire two additional Maintenance Technicians to support construction of ITS projects.

Reference: AUS Program Plan 8.5.1

Task Lead: TSMO Connections Liaison
Oversight: TSMO Transportation Systems and Technical Services Liaison
Evaluation Metric: Hire full time employee
Frequency: Once

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2021 Q1 (September—November)

_____ Complete TMS Status report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Engage multi-disciplinary team to review value engineering studies.

Reference: AUS Program Plan 8.7.1

Task Lead: TSMO Regional Stakeholder Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide update of progress at Regional TSMO Meeting
Frequency: As needed

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2021 Q2 (December—February)

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop and facilitate training for all agency employees and stakeholder to engage them in the TSMO program. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Hold training for all agency employees
Frequency: Every 1 year

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2021 Q3 (March—May)

_____ Review Austin District Program Plan for updates and revisions.

Reference: AUS Program Plan 8.1.4

Task Lead: TSMO Coordinator
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Send revised Austin District program plan to TRF for tracking purposes
Frequency: Every 1 year

_____ Complete TMS Status Report with updated data.

Reference: AUS Program Plan 8.2.4

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Send TMS Status Report to TRF
Frequency: Bi-annually

_____ Track TSMO performance measures: district travel time reliability and implementation plan status.

Reference: AUS Program Plan 8.3.2

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Provide update in TMS Status Report and Annual TSMO Report
Frequency: Every 1 year

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop annual TSMO report.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Every 1 year

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

FY 2021 Q4 (June—August)

_____ Reassess CMM and update program plan and tactical plans as necessary.

Reference: AUS Program Plan 8.1.4

Tool: AASHTO CMM Assessment

Task Lead: TSMO Coordinator
Oversight: TSMO Champion
Evaluation Metric: Hold CMM assessment workshop and distribute results to Austin District
Frequency: Every 5 years

_____ Initiate development of TSMO newsletter to update district staff on TSMO activities, best practices, and next steps.

Reference: AUS Program Plan 8.6.1

Task Lead: TSMO Connections Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Distribute to Austin District staff and TRF
Frequency: Quarterly

_____ Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.

Reference: AUS Program Plan 8.5.5

Task Lead: TSMO Connections Liaison
Oversight: TSMO Coordinator
Evaluation Metric: Hold training for project managers and other agency employees
Frequency: Bi-annually

_____ Track CAMPO's call for projects and provide input for setting the selection criteria.

Reference: AUS Program Plan 8.1.2

Task Lead: TSMO Planning Liaison
Oversight: TxDOT Austin District TSMO Working Group
Evaluation Metric: Provide input for selection criteria
Frequency: Quarterly

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Appendix A:
TSMO Opportunities for the *Project Development Process Manual*

Maturity Level	Level 1 Ad-Hoc	Level 2 Processes Developing, Staff Training, Limited Accountability	Level 3 Processes Documented, Performance Measured, Partners Aligned, Program Budget	Level 4 Performance Based Improvement, Formal Program, Formal Partnerships
Plan				
Needs Identification	*Coordinate with area stakeholders to ensure compatibility with regional transportation plans.	Ensure scoping language includes the testing of ITS devices immediately after construction. Coordinate with Design, Maintenance, Traffic, and Construction to identify opportunities or issues within the evaluated area, *considering all transportation modes, the need for multimodal alternatives, and the intermodal freight transport.	Use Traffic Management Center data to identify network improvement opportunities for ongoing or planned construction projects.	Employ region-wide, interagency historical traffic data and highlight future corridor improvements based on regional mobility and safety performance goals.
Study Alternatives, Impacts, and Costs	*Consult regional transportation plans to identify design alternatives.	*Obtain traffic data, evaluate existing mobility strategies in place, and determine the need for feasibility (route/corridor) study.	Analyze and evaluate mobility strategies against conventional methods using cost-effective tools related to mobility, safety, and economic development. Consult with maintenance to ensure operations and maintenance of ITS devices is practical and feasible.	Identify successful, performance based mobility strategies from completed project's performance and value and analyze them against conventional solutions.
Public Input	Obtain public input during planning phases through outreach events, *and if necessary, consult the MPO's public involvement requirements.	Engage project managers from adjacent project to gather input prior to public outreach events. Engage non-profits and other community organizations.	Employ unique public outreach events by meeting general public at post office, malls, or other attraction centers. Technology and apps could also be used to collect feedback.	Analyze which public involvement strategies and conditions were most successful for previous projects and employ those techniques.
Project Authorization	*Prepare a preliminary project cost estimate to determine funding eligibility.	*Compare preliminary cost estimates to cost per mile on other similar projects in the area.	Use innovate design alternatives identified in the needs assessment and study alternatives sub-tasks to ensure the most cost-efficient solution is selected. Ensure the performance of the selected method can be tracked.	Include documentation from earlier phases that supports construction cost eligibility/ PS&E approval and provide the performance based criteria by which the most efficient solution was selected in the project's authorization request.
Compliance with Planning Rqmts.	*Work with the district planning staff to coordinate with the MPO and other planning entities to ensure compliance with regional planning requirements and goals.	*Consult with district coordinators and local planning staffs for other modes, and assess need to incorporate design features to accommodate other modes (e.g., transit, pedestrian, bike, port, railroad, aviation). Consider any short-medium- and long-term planning documents. Include construction, design, traffic, maintenance in this consultation.	Assess whether the proposed project has considered mobility strategies and implemented recommendations from the ITS Master Implementation Plan or Service Layer Plans.	Ensure regional planning requirements, performance measures, and goals have been met, including multimodal and ITS solutions. Confirm all projects with ITS solutions have performed a Systems Engineering Analysis.
Funding Strategy	*Review the 12 funding categories provided in the UTP and present the project to meet the criteria of selected funds.	Identify opportunities for special grants and additional forms of federal provisions for leading innovative projects and solutions.	Work with the regional MPO to ensure TSMO strategies are considered when classifying funding categories.	Track federal aid programs in ITS, TSMO, and Connected Vehicles regularly to identify evolving areas where federal programs may be seeking regions to pilot programs or other emerging opportunities.

**Denotes task currently included in TxDOT's* Project Development Process Manual

Maturity Level	Level 1 Ad-Hoc	Level 2 Processes Developing, Staff Training, Limited Accountability	Level 3 Processes Documented, Performance Measured, Partners Aligned, Program Budget	Level 4 Performance Based Improvement, Formal Program, Formal Partnerships
Environmental				
Environmental Review	*The District and the Office of Public Involvement should schedule a joint meeting to discuss the project and public involvement strategy	Work with agency and regional planners and engineers to identify opportunities for minimizing the effect construction will have on the environment. Identify strategies for enhancing existing infrastructure instead of adding capacity.	Facilitate a meeting including planners, local agency sponsor representatives, engineers and subject matter experts to implement the scoping process considering environmental constraints.	
Interagency Coordination/ Permits	*Perform early coordination with review/resource agencies.	*Conduct field investigations with resource agencies and discuss issues in the field.	Identify regular meeting schedule for interagency coordination or opportunities to add project to existing meeting agenda??	
ROW/Utilities				
ROW Map and Property Descriptions	*If the project is in PS&E development and ROW planning concurrently, the project manager should encourage clear communication between all engineers and the land surveyor.	Facilitate ongoing meetings with environmental leads, planners, and engineers/designers to discuss alternate project locations or solutions which will require less ROW, until ROW planning is complete.	Identify opportunities to maximize existing infrastructure	
ROW Appraisals and Acquisition		Consider agreements for ROW sharing on all projects if applicable.	Something related to regional meetings?? Could we just combine this line with the one above?	
Develop/Design				
Preliminary Design Concept Conference	*Schedule a field visit to review existing conditions with a team of experienced staff from traffic operations, design, construction, and maintenance prior to the conference.	Facilitate discussions with planners, local agency sponsor representatives, engineers and subject matter experts to implement the scoping process considering all constraints. Establish use of the TSMO Checklist and ensure scoping language includes the testing of ITS devices immediately after construction.	Define anticipated project performance values in the scoping language. Complete the TSMO Checklist on the MPPM platform.	Define required mobility and safety performance values on all projects. Consider ITS Master Plan and Service Layer implementation plans for integration with the project.
Data Collection	*Use conventional and existing methods to review available traffic data.	Obtain additional traffic data from cross streets, regional stakeholders, and ITS infrastructure as available.	Evaluate traffic data in the surrounding areas of the project limits to account for mobility issues occurring during construction or upstream/systemic operational challenges.	Evaluate historical traffic data for the regional network, and through analytic modeling tools, highlight areas which will be strongly affected by construction. Identify opportunities to address operational challenges during construction.
Public Meetings	Obtain public input during design phases through outreach events, *and if necessary, consult the MPO's public involvement requirements.	Engage project managers from adjacent projects to gather input prior to public outreach events. Engage non-profits and other community organizations.	Employ unique public outreach events by meeting general public at post office, malls, or other attraction centers. Technology and apps could also be used to collect feedback.	Analyze which public involvement strategies and conditions were most successful for previous projects and employ those techniques.
Preliminary Schematic	*Select evaluation criteria and measures for comparing alternatives and provide a reasonable alternative route for all modes. Include this information in ongoing public involvement and stakeholder meetings.	Facilitate a meeting to include all design disciplines, ROW, Environmental, maintenance, and construction to identify opportunities to improve the corridor without adding capacity, lessons learned, and environmental and ROW constraints.	Select performance based mobility and safety evaluation criteria and compare innovative solutions when selecting alternative route for all modes.	Use successful, performance based mobility strategies to select constructible corridor improvements for all modes.

**Denotes task currently included in TxDOT's* Project Development Process Manual

Maturity Level	Level 1 Ad-Hoc	Level 2 Processes Developing, Staff Training, Limited Accountability	Level 3 Processes Documented, Performance Measured, Partners Aligned, Program Budget	Level 4 Performance Based Improvement, Formal Program, Formal Partnerships
Develop/Design (continued)				
Geometric Schematic	*Involve multi-disciplinary geometric schematic review relating to functional areas of maintenance, traffic, design, and construction.	Evaluate Intelligent Transportation System (ITS) opportunities, including TMS improvements, on project through consulting the ITS Implementation plan and available technologies.	Identify lessons learned from other mobility and safety improvement projects in other Districts and States. Perform a Systems Engineering Analysis and include respective management and operations solutions on all corridor schematics.	Facilitate a collaborative review of proposed geometric features, considering lessons learned, historical mobility achievements, and required performance based criteria to ensure schematic addresses all constraints.
Value Engineering	*Conduct a value engineering study and revise design based on findings.	*Engage multi-disciplinary team to review value engineering study.	Employ benefit-cost analysis to enhance value engineering study and *develop the selected alternatives into fully supported recommendations.	
PS&E				
Design Concept Conference	*Obtain additional or updated data if project has been inactive for some time. Include this information in the Design Summary Report (DSR).	Hold a multi-discipline review meeting including the PS&E team, schematic design team, construction, and maintenance to ensure all alternatives have been considered.	*Extend additional invitations to offices, areas of expertise, or governmental entities that have become involved since the Preliminary Design Concept Conference.	Ensure all regional mobility and performance based metrics are considered in preliminary design solutions.
Detailed Design	*Plan sequence of construction. Review construction year traffic data to evaluate lane closure impacts.	Consult traffic engineer leads to identify opportunities to improve mobility and safety in work zones. Facilitate a discussion between design and construction to learn site specific conditions such as adjacent property owner preferences.	When developing conceptual detours or road closures, consult the ITS Work Zone Standards and identify opportunities for coordination with signals, ramp meters, & other ITS strategies. Determine methods to send traffic data to the TMC.	Use historical mobility data to identify alternate detour routes and time of construction.
Final Alignments Profiles	*Ensure compliance with basic design criteria.	Confirm that the roadway design engineer has consulted the traffic engineer to identify innovative solutions which affect roadway cross sections.	Ensure design complies with preferred corridor constraints in an effort to meet a desired performance based outcome.	Consult lessons learned from other similar construction projects in the area to ensure construction will meet established performance measures for the corridor.
Design		Operational Design: Submit plans to Traffic Operations and Maintenance Divisions for early review to ensure innovative solutions have been implemented, constructible, and able to maintain.	Roadway Design: When designing pedestrian walkways and bicycle facilities, Identify safe opportunities to locate crosswalks away from congested intersections and plan for connections with public transit.	
PS&E Assembly and District Review		Review team members shall also include all design disciplines, maintenance, construction, & traffic. This team should hold design reviews at 30-60-90-100% completion milestones.		Include TSMO Project Development checklist compliance in *Audits (may occur after project close).

**Denotes task currently included in TxDOT's* Project Development Process Manual

Appendix B:
Recommended Performance Measures

TSMO Project Performance Measures
BEFORE ANALYSIS

This worksheet is designed to initiate the consideration of performance measures **before** the design stages are completed. The categories of performance measures were based on the Austin District TSMO Program Plan goals and objectives. Additional details can be found in Section 8.3.2 in the Austin District TSMO Program Plan.

Project:

Safety

Is the project expected to improve safety challenges?

What crash types do you expect to address?

What modes (example: vehicular, pedestrian, etc.) will safety improve?

How will safety during construction be considered?

If data are available, the following performance measures should be determined:

- Crash rates: rate of crashes, fatalities, and serious injuries
- Specific crash type: rate of each crash type
- Work zone crashes: number of crashes when work zone is in place
- Incident clearance time: the average amount of time to clear an incident. The formal definition is being determined by TRF
- Secondary incidents: the number of secondary incidents occurring using the FHWA definition of a secondary crash

Reliability

Is the project expected to improve travel time reliability?

What modes will be affected?

How is reliability during construction being considered?

If data are available, the following performance measures should be determined:

- Travel time reliability: The dependability and consistency of travel time along a section of roadway.
    - Travel time index: ratio of the period travel time to the free flow travel time
    - Planning time index: ratio of 95 percentile travel time to the free flow travel time
    - Buffer time index: extra amount of time needed to be on-time 95 percent of the time; planning time index minus travel time index
- Bicycle level of service: the level of bicycle comfort based on the facility's geometry and traffic conditions
- Freight travel time reliability: the dependability and consistency of travel time along a section of roadway for freight vehicles
- Delay due to special events: average amount of delay caused by special events
- Delay caused by work zone: average amount of delay caused by work zone

Efficiency

Is this project expected to optimize existing capacity and throughput?

Does the project address a bottleneck?

Does the project improve regional mobility?

Does the project improve systemic mobility?

If data are available, the following performance measures should be determined:

- Peak hour travel time ratio: the amount of travel time required during peak congestion times of the day
- Annual average daily traffic: Total volume of vehicle traffic on the facility for a year divided by 365 days
- Percent of heavy vehicle traffic: the percent of traffic, on average, that is heavy vehicles or trucks
- Transit ridership: total ridership by service, passenger trips, or passenger miles

Customer Service

Does this project improve public's ability to make informed mobility decisions?

Does the project improve accessibility?

If data are available, the following performance measures should be determined:

- Number of active DMS signs: the total number of dynamic message signs providing traveler information. TRF will provide further definition on this time
- Lane miles of new connectivity: number of miles that provide new connectivity
- Availability of traveler information: percent of traveler information prior to decision points
- Availability of alternate routes: the total number of alternate routes available
- Service patrol assist: the total number of vehicles services by the service patrol

Collaboration

Have all appropriate external agencies been engaged in this project?

Have all internal departments been engaged in this project?

If data are available, the following performance measures should be determined:

- Engaged agencies: the total number or percent of potential agencies providing input and feedback on the project
- Engaged departments the total number or percent of potential TxDOT departments providing input and feedback on the project

Integration

Are there tactical plans or implementation plans that should be integrated into this project?

Has the TSMO Evaluation been completed for this project?

Have recommendations from the TSMO Evaluation been implemented into the project?

If data are available, the following performance measures should be determined:

- TSMO Evaluation recommendations: the total number of recommendations from the TSMO Evaluation that were implemented into the project
- Benefit to cost ratio: alternatives compared using benefit-to-cost ratio

Technology

Are emerging technologies being considered?

Will this project support TxDOT's TMS goals?

Will technology be implemented to enhance mobility?

Are innovative technology solutions being considered during construction?

If data are available, the following performance measures should be determined:

- Percent of ITS needs addressed: ITS needs from the ITS Implementation Plan incorporated in the project
- TMS System Coverage: TRF will reach agreement on definition of TMS coverage for a corridor; will determine the ultimate centerline miles in the TMS plan; will determine current coverage; percent coverage will be determined using current and ultimate centerline miles
- Asset uptime: the total amount of time, per day, that ITS devices are operational

TSMO Project Performance Measures
AFTER ANALYSIS

This worksheet is designed to initiate the consideration of performance measures **after** the project is constructed. Time for completion of the after analysis will vary between projects as data may not be readily available until some projects have been completed long enough to identify real improvements to the system. The maximum recommended time before completing an after analysis is one year. The categories of performance measures were based on the Austin District TSMO Program Plan. Additional details can be found in Section 8.3.2 in the Austin District TSMO Program Plan.

Project:

Safety

Did this project improve safety?

What are lessons learned in terms of addressing safety on this project?

If data are available, the following performance measures should be determined:

- Crash rates: rate of crashes, fatalities, and serious injuries
- Specific crash type: rate of each crash type
- Work zone crashes: number of crashes when work zone is in place
- Incident clearance time: the average amount of time to clear an incident. The formal definition is being determined by TRF
- Secondary incidents: the number of secondary incidents occurring using the FHWA definition of a secondary crash

Reliability

Did this project meet its travel time reliability objectives?

What are lessons learned in terms of addressing travel time reliability on this project?

If data are available, the following performance measures should be determined:

- Travel time reliability: The dependability and consistency of travel time along a section of roadway.
    - Travel time index: ratio of the period travel time to the free flow travel time
    - Planning time index: ratio of 95 percentile travel time to the free flow travel time
    - Buffer time index: extra amount of time needed to be on-time 95 percent of the time; planning time index minus travel time index
- Bicycle level of service: the level of bicycle comfort based on the facility's geometry and traffic conditions.
- Freight travel time reliability: the dependability and consistency of travel time along a section of roadway for freight vehicles
- Delay due to special events: average amount of delay caused by special events
- Delay caused by work zone: average amount of delay caused by work zone

Efficiency

Did this project optimize existing capacity?

Did this project address a bottleneck?

Did this project improve regional mobility?

Did this project improve facility-wide mobility?

If data are available, the following performance measures should be determined:

- Peak hour travel time ratio: the amount of travel time required during peak congestion times of the day
- Annual average daily traffic: Total volume of vehicle traffic on the facility for a year divided by 365 days
- Percent of heavy vehicle traffic: the percent of traffic, on average, that is heavy vehicles or trucks
- Transit ridership: total ridership by service, passenger trips, or passenger miles

Customer Service

Did this project improve traveler information?

Did this project improve accessibility?

If data are available, the following performance measures should be determined:

- Number of active DMS signs: the total number of dynamic message signs providing traveler information.
- Lane miles of new connectivity: number of miles that provide new connectivity
- Availability of traveler information: percent of traveler information prior to decision points
- Availability of alternate routes: the total number of alternate routes available
- Service patrol assist: the total number of vehicles services by the service patrol

Collaboration

Were external agencies engaged?

Were internal departments engaged?

If data are available, the following performance measures should be determined:

- Engaged agencies: the total number or percent of potential agencies providing input and feedback on the project
- Engaged departments the total number or percent of potential TxDOT departments providing input and feedback on the project

Integration

Were tactical plans integrated?

Were recommendations from the TSMO Checklist implemented?

If data are available, the following performance measures should be determined:

- TSMO Evaluation recommendations: the total number of recommendations from the TSMO Evaluation that were implemented into the project
- Benefit to cost ratio: alternatives compared using benefit-to-cost ratio

Technology

Was technology used to enhance mobility?

What were the lessons learned for the emerging technology that was implemented?

What issues were encountered that involved interoperability of technology across different agencies?

If data are available, the following performance measures should be determined:

- Percent of ITS needs addressed: ITS needs from the ITS Implementation Plan incorporated in the project
- TMS System Coverage: TRF will reach agreement on definition of TMS coverage for a corridor; will determine the ultimate centerline miles in the TMS plan; will determine current coverage; percent coverage will be determined using current and ultimate centerline miles
- Asset uptime: the total amount of time, per day, that ITS devices are operational

Appendix C:
Tactical Plans

The tactical plans will be added to this document as they are developed.

Appendix D:
TSMO Project Development Checklist

TSMO Project Development Checklist

This checklist should be supplemental to existing TxDOT project development checklists. TSMO tasks currently in the existing project development checklists are not highlighted in this document.

Chapter 1. Plan

Section 1: Needs Identification

10100: Identify project need and scope

____Coordinate with Design, Maintenance, Traffic, and Construction to identify opportunities for congestion mitigation or issues within the evaluated area, considering all multimodal alternatives.

____Use Traffic Management Center data to identify network improvement opportunities for ongoing or planning construction projects.

____Ensure scope includes the testing of ITS devices immediately after construction.

10110: Perform Site Visit

____Include construction and maintenance in initial site visit.

Section 2: Project Authorization

10200: Prepare Cost Estimate

____Use innovative design alternatives identified in the needs assessment and study alternatives sub-tasks to ensure the most cost-efficient solution is selected.

____Include mobility based performance criteria in documentation for the project's authorization request.

10215: Project File of Record

____Include TSMO checklist compliance.

Section 3: Compliance with Planning Requirements

10300: Evaluate compliance with planning documents

____Consult construction, design, traffic, maintenance for other modes, and assess need to incorporate design features to accommodate other modes (e.g., transit, pedestrian, bike, port, railroad, aviation).

____Assess whether the proposed project has considered mobility strategies and implemented recommendation from the ITS Master Implementation Plan or developed TSMO tactical plans.

10360: Institutionalization of Coordination and Partnerships in Project Development

____Perform tasks on all projects except preventative maintenance and restoration projects

Section 4: Study Requirements Determination

10430: Obtain Traffic Data

____Obtain additional traffic data from cross streets, regional stakeholders, and ITS infrastructure as available.

____Evaluate traffic data in the surrounding areas of the project limits to account for mobility issues occurring during construction or upstream/systemic operational challenges.

10440: Identify multimodal and intermodal connections

____Consult ITS Implementation Plan to consider provisions for pedestrians and bicyclists on all projects.

10450: Determine conformity with Congestion Management Process requirements

____Consult ITS Implementation Plan

10460: Evaluate inclusion of High Occupancy Vehicle/High Occupancy Toll Lanes

____Consult TxDOT TOD to determine if managed/HOV lanes are desirable/feasible.

____Consult corridor traffic data to identify if managed/HOV lanes would mitigate congestion

Section 5: Construction Funding Identification

10500: Identify potential design and construction funding

____Identify opportunities for special grants and additional forms of federal provisions for leading innovative projects and solutions.

Chapter 2. Preliminary Design

Section 1: Preliminary Design Concept Conference

20100: Conduct a Preliminary Design Concept Conference

____Facilitate discussions with planners, local agency sponsor representatives, engineers, and subject matter experts to implement the scoping process considering all constraints.

____Define anticipated project performance values in the scoping language.

____ Ensure scoping language includes the testing of ITS devices immediately after construction.

____Complete the TSMO Checklist on the MPPM platform.

Section 2: Data Collection/Preliminary Design Preparation

20220: Review traffic data

____Review additional traffic data from cross streets, regional stakeholders, and ITS infrastructure as available.

____Evaluate traffic data in the surrounding areas of the project limits to account for mobility issues occurring during construction or upstream/systemic operational challenges.

20240: Obtain related data, plans, studies and reports

____Evaluate recommendations in the ITS Implementation Plan

Section 3: Public Meeting(s)

20300: Conduct public meeting

____Engage Project Managers from adjacent projects to gather input prior to public outreach events. Engage non-profits and other community organizations.

____Employ unique public outreach events by meeting general public at post offices, malls, or other attraction centers. If applicable, use technologies and applications to collect feedback.

Section 4: Preliminary Schematic

20420: Evaluate route alternatives

____Facilitate a meeting to include all design disciplines, ROW, Environmental, Maintenance, and Construction to identify opportunities to improve the corridor without adding capacity, lessons learned, and environmental and ROW constraints.

____Select performance based mobility and safety evaluation criteria and compare innovative solutions when selecting alternative routes for all modes.

Section 5: Geometric Schematic

20585: Evaluate Intelligent Transportation System (ITS) needs

____Consult ITS Implementation Plan

____Evaluate Intelligent Transportation System opportunities, including TMS improvements

____Coordinate with local stakeholders to determine opportunities for sharing data backbones

____Identify lessons learned from other mobility and safety improvement projects from other districts or states

____Perform Systems Engineering Analysis

Section 6: Value Engineering

20600: Conduct Value Engineering study

____Include benefit-cost analysis in study

Chapter 3. Environmental

Section 1: Preliminary Environmental Issues

30110: Develop and implement scoping process

____Work with regional planners and engineers to identify opportunities for minimizing the effect construction will have on the environment

____Identify strategies for enhancing existing infrastructure versus adding capacity

____Facilitate a meeting to include planners, local agency sponsor representatives, engineers and subject matter experts to implement the scoping process considering environmental constraints.

30130: Collect environmental data

____Facilitate a discovery meeting to provide planners and design leads with details regarding environmental constraints.

Section 2: Interagency Coordination/Permits

____Identify regular meeting schedule for interagency coordination or opportunities to add project to existing meeting agenda

Chapter 4. Right of Way and Utilities

Section 2: Right of Way Map and Property Descriptions

40200: Prepare right of way map and property descriptions

____Facilitate ongoing meetings with environmental leads, planners, and engineers/designers to discuss alternate project locations or solutions which will require less ROW, until ROW planning is complete.

___Identify opportunities to maximize existing infrastructure

Section3: Right of Way Appraisals and Acquisition

40340: Prepare and execute join-use/multiple-use agreements

____Agreements for ROW sharing should be considered on all projects if applicable.

Chapter 5. PS&E Development

Section 1: Design Conference

50110: Conduct Design Concept Conference

____Hold a multi-discipline review meeting including the PS&E team, schematic design team, construction, and maintenance to ensure all alternatives have been considered.

____Ensure all regional mobility and performance based metrics are considered in preliminary design solutions.

Section 2: Begin Detailed Design

50210: Develop conceptual detour/road closure plan

____Consult traffic engineer leads to identify opportunities to improve mobility and safety in work zones. Facilitate a discussion between design and construction to learn site specific conditions such as adjacent property owner preferences.

____When developing conceptual detours or road closures, consult the ITS Work Zone Standards and identify opportunities for coordination with signals, ramp meters, & other ITS strategies. Determine methods to send traffic data to the TMC.

Section 3: Final Alignments/Profiles

50300: Design final controlling conditions

____ Confirm that the roadway design engineer has consulted the traffic engineer to identify innovative solutions which affect roadway cross sections.

____ Ensure design complies with preferred corridor constraints in an effort to meet a desired performance based outcome.

Section 4: Roadway Design

50440: Design pedestrian walkways and bicycle transportation facilities

____Identify safe opportunities to locate crosswalks away from congested intersections

____Plan for connections with Pedestrian/Bicycle facilities and public transit

____Participate in 30%-60%-90%-100% design milestone meetings and reviews.

Section 5: Operational Design

50510: Design Intelligent Transportation System (ITS)

____Submit plans to Traffic Operations and Maintenance Divisions for early review to ensure innovative solutions have been implemented, constructible, and able to maintain.

____Participate in 30%-60%-90%-100% design milestone meetings and reviews.

Section 6: Bridge Design

____Participate in 30%-60%-90%-100% design milestone meetings and reviews.

Section 7: Drainage Design

____Participate in 30%-60%-90%-100% design milestone meetings and reviews.

Section 9: Traffic Control Plan

____Consult traffic engineer leads to identify opportunities to improve mobility and safety in work zones. Facilitate a discussion between design and construction to learn site specific conditions such as adjacent property owner preferences.

____When developing conceptual detours or road closures, consult the ITS Work Zone Standards and identify opportunities for coordination with signals, ramp meters, & other ITS strategies. Determine methods to send traffic data to the TMC.

Section 10: PS&E Assembly/Design Review

51020: Conduct District PS&E review

____Include all design disciplines, maintenance, construction, & traffic in the review.

Appendix E:
TxDOT Organization Structures

Legend

- TSMO Champion
- TSMO Coordinator
- TxDOT TSMO Working Group

Appendix F:
Implementation Plan

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
Business Processes	Release Austin District Program Plan. Facilitate roll-out of training for Austin District Plan to all available District staff. Training can be completed in-person and/or via webinar.	Once	TSMO Coordinator	TxDOT TRF	Training made available to all district staff	June – August 2018
	Develop budget for District resource needs based on positions identified in Austin District TSMO Program Plan.	Every 2 years	TSMO Coordinator	TxDOT Austin District TSMO Working Group	Send budget to TRF for TSMO tracking purposes	June – August 2018
	Implement changes to project development process through the TSMO project development checklist. All new projects should use it upon inception of the project.	Continuous	Project Managers	TSMO Project Design Liaison	Use TSMO project development checklist on all projects	June – August 2018
	Initiate development of tactical plans. Tactical plans should be completed within one year of finalization of Austin District TSMO Program Plan.	As needed	TSMO Coordinator	TSMO Champion	Distribute completed tactical plans to Austin District and TRF	June – August 2018
	Track CAMPO's call for projects and provide input to setting the selection criteria.	Quarterly	TSMO Planning Liaison	TxDOT Austin District TSMO Working Group	Provide input for selection criteria	June – August 2018
	Research existing TxDOT forms and processes and make recommendations where to include TSMO forms and processes.	Annually	TSMO Connections Liaison	TSMO Coordinator	Send recommendations to TxDOT divisions	June – August 2018
	Identify list of projects and budgets where operations/TMS improvements can be added over the next 10 years to include in UTP.	Every 4 years	TSMO Project Design Liaison	TxDOT Austin District TSMO Working Group	Send projects and budget to TRF for TSMO tracking purposes	September – November 2018
	Review Austin District Program Plan for updates and revisions.	Annually	TSMO Coordinator	TxDOT Austin District TSMO Working Group	Send revised Austin District TSMO Program Plan to TRF for	March – May 2019

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
					tracking purposes	
	Reassess CMM and update program plan and tactical plans as necessary.	Every 5 years	TSMO Coordinator	TSMO Champion	Hold CMM assessment workshop and distribute results to Austin District	June – August 2021
Systems & Technology	Complete TMS Status Report with updated data.	Bi-annually	TSMO Coordinator	TSMO Champion	Send TMS Status Report to TRF	June – August 2018
	Institute TSMO Evaluation on all projects using the MPPM initiative.	Continuous	TSMO Project Design Liaison	TSMO Coordinator	Provide progress in annual report	June – August 2018
	Update regional ITS architecture.	Every 5-10 years	TSMO Planning Liaison	TSMO Coordinator	Send regional architecture to TRF for tracking purposes	September – November 2019
Performance Measurement	Implement project-based performance measurement for before-and-after analysis. Use qualitative information unless consistent and high-quality data is available.	Continuous	Project Manager	TSMO Planning Liaison	Provide update in annual TSMO Report	March – May 2018
	Track TSMO performance measures: district travel time reliability and implementation plan status.	Annually	TSMO Coordinator	TSMO Champion	Provide update in TMS Status Report and Annual TSMO Report	March – May 2018
Culture	Facilitate TSMO discussions during project-specific stakeholder meetings to identify opportunities to integrate and prioritize mobility solutions.	Continuous	Project Managers	TSMO Regional Stakeholder Liaison	Provide update of TSMO discussions at Regional TSMO Committee Meeting	September – November 2018
	Facilitate TSMO discussions during quarterly District portfolio planning, CAMPO working groups/committees, AIM High meetings, and other regularly scheduled initiative meetings.	Continuous	TSMO Regional Stakeholder Liaison	TSMO Connections Liaison	Provide update of TSMO discussions at Regional TSMO Committee Meeting	September – November 2018
	Initiate development of TSMO newsletter to update district	Quarterly	TSMO Connections Liaison	TxDOT Austin District TSMO Working Group	Distribute to Austin District staff and TRF	December 2018 – February 2019

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Staff on TSMO activities, best practices, and next steps.					
	Develop general notes to be used on project plan sets and develop criteria on when they should be added to plans.	Continuous	Project Managers	TSMO Connections Liaison	Provide update to progress in annual report	December 2018 – February 2019
	Develop annual TSMO Report.	Annually	TSMO Connections Liaison	TxDOT Austin District TSMO Working Group	Distribute to Austin District staff and TRF	March – May 2018
	Develop TSMO case studies based on successful projects with mobility and safety improvements.	Every 2 years	TSMO Connections Liaison	TxDOT Austin District TSMO Working Group & TRF	Distribute to Austin District staff and TRF	December 2019 - 2020
Organization & Workforce	Select TSMO Champion, Coordinator, and Liaisons. This group will form the base members of the TxDOT Austin District TSMO Working Group. The TSMO Coordinator should reach out to this stakeholder group and begin coordination.	As needed	District Executive Leadership	TxDOT TRF	Send names for each position to TRF for tracking purposes	June – August 2018
	Develop and facilitate training on the TSMO project development checklist. Training can be completed in-person and/or via webinar.	Bi-annually	TSMO Connections Liaison	TSMO Coordinator	Hold training for project managers and other agency employees	June – August 2018
	Develop and facilitate training regarding the roles and responsibilities for TSMO Liaisons and their staff.	As needed	TSMO Coordinator	TxDOT Austin District TSMO Working Group	Hold training for TSMO Liaisons and TxDOT Austin District TSMO Working Group	September – November 2018
	Acquire one additional ITS Analyst and one Maintenance Technician to support deployment and maintenance of ITS devices.	Once	TSMO Connections Liaison	TSMO Transportation Systems and Technical Services Liaison	Hire full time employees	September – November 2018
	Develop and	Annually	TSMO	TxDOT Austin	Hold training for	December

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Facilitate training for all agency employees and stakeholders to engage them in the TSMO program. Training can be completed in-person and/or via webinar.		Connections Liaison	District TSMO Working Group	all agency employees	2018 – February 2019
	Acquire two additional Maintenance Technicians to support construction of ITS projects.	Once	TSMO Connections Liaison	TSMO Transportation Systems and Technical Services Liaison	Hire full time employees	June – August 2020
Collaboration	Initiate Regional TSMO Committee and hold quarterly meetings. Also attend statewide TSMO Committee meetings when initiated.	Continuous	TSMO Champion and Coordinator	TxDOT Austin District TSMO Working Group	Facilitate and attend Regional TSMO Committee Meeting	June – August 2018
	Facilitate project-based milestone meetings with all disciplines to resolve potential challenges and pain points early in the project development process.	Continuous	Project Managers	TxDOT Austin District TSMO Working Group	Provide update of progress at Regional TSMO Committee Meeting	June – August 2018
	Engage multi-disciplinary team to review value engineering studies.	As needed	TSMO Regional Stakeholder Liaison	TxDOT Austin District TSMO Working Group	Provide update of progress at Regional TSMO Meeting	September – November 2020