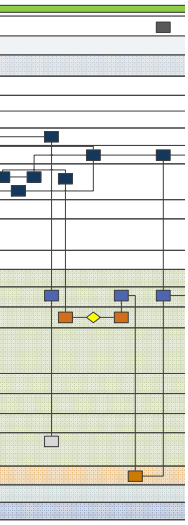
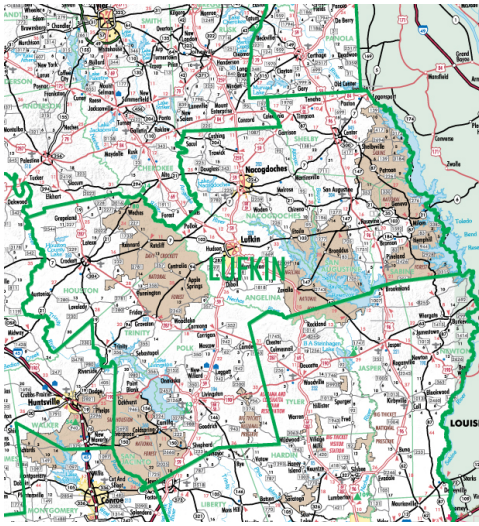
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)





LUFKIN DISTRICT PROGRAM PLAN

March 2021

Texas Department of Transportation

Document Control

Version	Date	Description of Change	Author
0.1	10/02/2020	Outline for review by Working Group	DKS Associates team
0.2	10/30/2020	Incorporated 10/16/2020 Working Group Meeting Comments	DKS Associates team
0.3	12/18/2020	Initial full draft for review by Working Group	DKS Associates team
1.0	03/26/2021	Incorporated Working Group and workshop review comments	DKS Associates team

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List of Acronyms

Acronym	Definition
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
AE	Area Engineer
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
ArDOT	Arkansas Department of Transportation
BP	Business Processes
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
CO	Collaboration
CRIS	Crash Records Information System
CU	Culture
DE	District Engineer
DMS	Dynamic Message Sign
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DPS	Department of Public Safety
DSS	Decision Support System
EA	Engineering Assistant
EOC	Emergency Operations Center
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FTE	Full Time Equivalent (referring to full-time staff position)
FY	Fiscal Year
GHz	Gigahertz
HCRS	Highway Condition Reporting System
IT	Information Technology
ITS	Intelligent Transportation System
La DOTD	Louisiana Department of Transportation and Development
LFK	Lufkin District
LOTTR	Level of Travel Time Reliability
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
N/A	Not Applicable

Acronym	Definition
NHS	National Highway System
NPMRDS	National Performance Management Research Data Set
NWS	National Weather Service
O&M	Operations & Maintenance
OW	Organization and Workforce
PCMS	Portable Changeable Message Sign
PIO	Public Involvement Office
PM	Performance Measurement
SHRP	Strategic Highway Research Program
ST	Systems and Technology
SWZ	Smart Work Zone
TCEQ	Texas Commission on Environmental Quality
TIM	Traffic Incident Management
TMA	Truck Mounted Attenuator
TMS	Traffic Management System
TP&D	Transportation Planning & Development
TRF	Traffic Division (Central Office)
TSMO	Transportation Systems Management & Operations
TTI	Texas A&M Transportation Institute
TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation

Executive Summary

The Lufkin District Transportation Systems Management and Operations (TSMO) Program Plan documents the Lufkin District's strategic vision, mission, and goals; current TSMO processes; and recommended actions to implement data-driven decisions to make the transportation network safer, more efficient, and reliable.

The TSMO Plan includes recommendations to improve workforce development, business practices, systems and technology, collaboration, and performance management to support, streamline, and institutionalize TSMO projects and practices.

WHAT IS TSMO?

TSMO is "an integrated set of 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." (United States Department of Transportation)

This Executive Summary highlights:

- Example TSMO strategies in use
- TSMO benefits
- TSMO vision, mission, and goals
- The business case for TSMO
- Proposed early actions
- Plan update process

EXAMPLES OF TSMO STRATEGIES CURRENTLY IN USE

TSMO Benefits

TSMO provides agencies with the tools to manage and operate their existing transportation infrastructure more efficiently and effectively before making additional investments. It benefits every step of the project delivery life cycle.

TSMO BENEFITS

Provides the most cost-effective means to improve:

- *Safety*
- *Congestion*
- *Mobility and reliability*
- *Multimodal connectivity*
- *Emergency response*
- *Maintenance of overall system*
- *Optimization of existing infrastructure*
- *Customer service*

Mitigates the negative impacts on traffic from:

- TRAFFIC INCIDENTS
- WORK ZONES
- ADVERSE WEATHER CONDITIONS

Benefits many areas of the project life cycle:

TSMO Vision, Mission, and Goals

The district's TSMO vision, mission, and goals support those of TxDOT's statewide TSMO program (TxDOT, 2018). For each goal, targeted objectives, many of them measurable, are included in the main body of the report.

STATEWIDE TSMO VISION

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

STATEWIDE TSMO MISSION

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

STATEWIDE TSMO GOALS AIM TO IMPROVE:

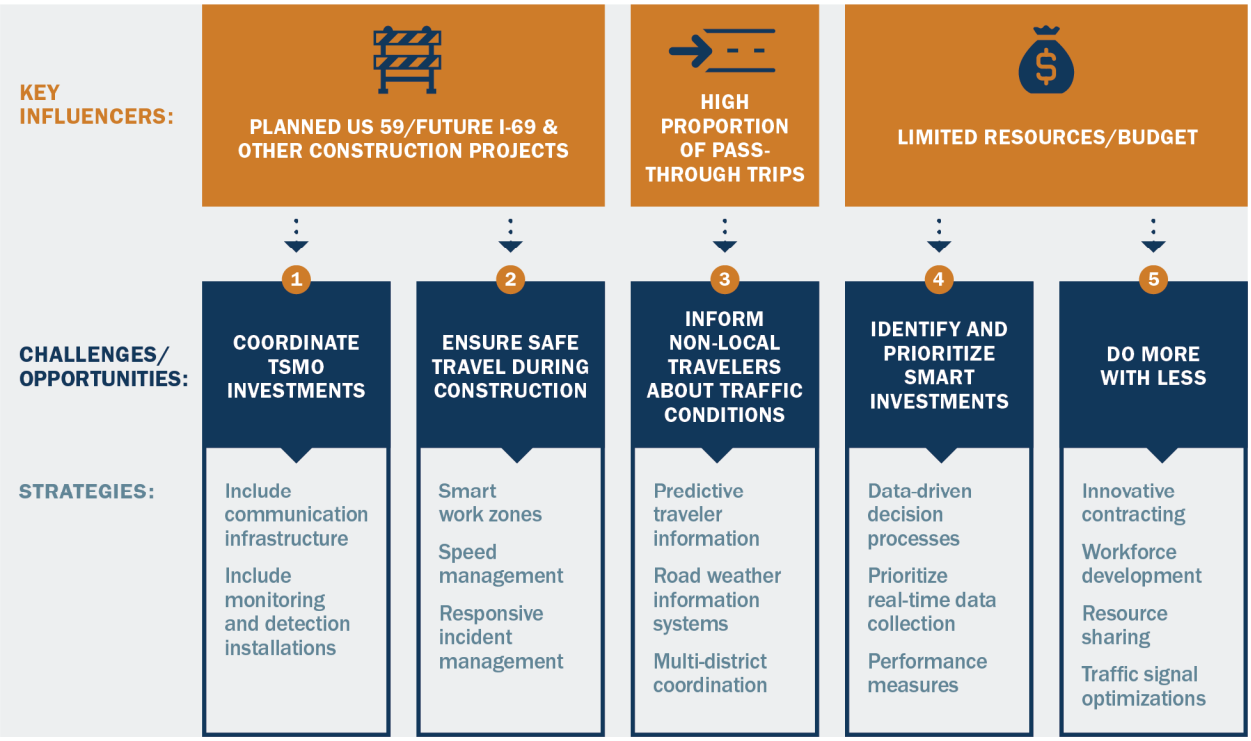
- SAFETY
- RELIABILITY
- EFFICIENCY
- CUSTOMER SERVICE
- COLLABORATION
- INTEGRATION

BY TAKING ACTION IN THESE AREAS:

- BUSINESS PROCESSES
- SYSTEMS & TECHNOLOGY
- PERFORMANCE MEASUREMENT
- ORGANIZATION & WORKFORCE
- CULTURE
- COLLABORATION

The Business Case for TSMO

The Lufkin District has successfully used TSMO strategies to mitigate the impacts of work zones, weather events, and traffic incidents in the region. The strategies in this TSMO plan are aimed at the current key influencers shown below.



Proposed Early Actions

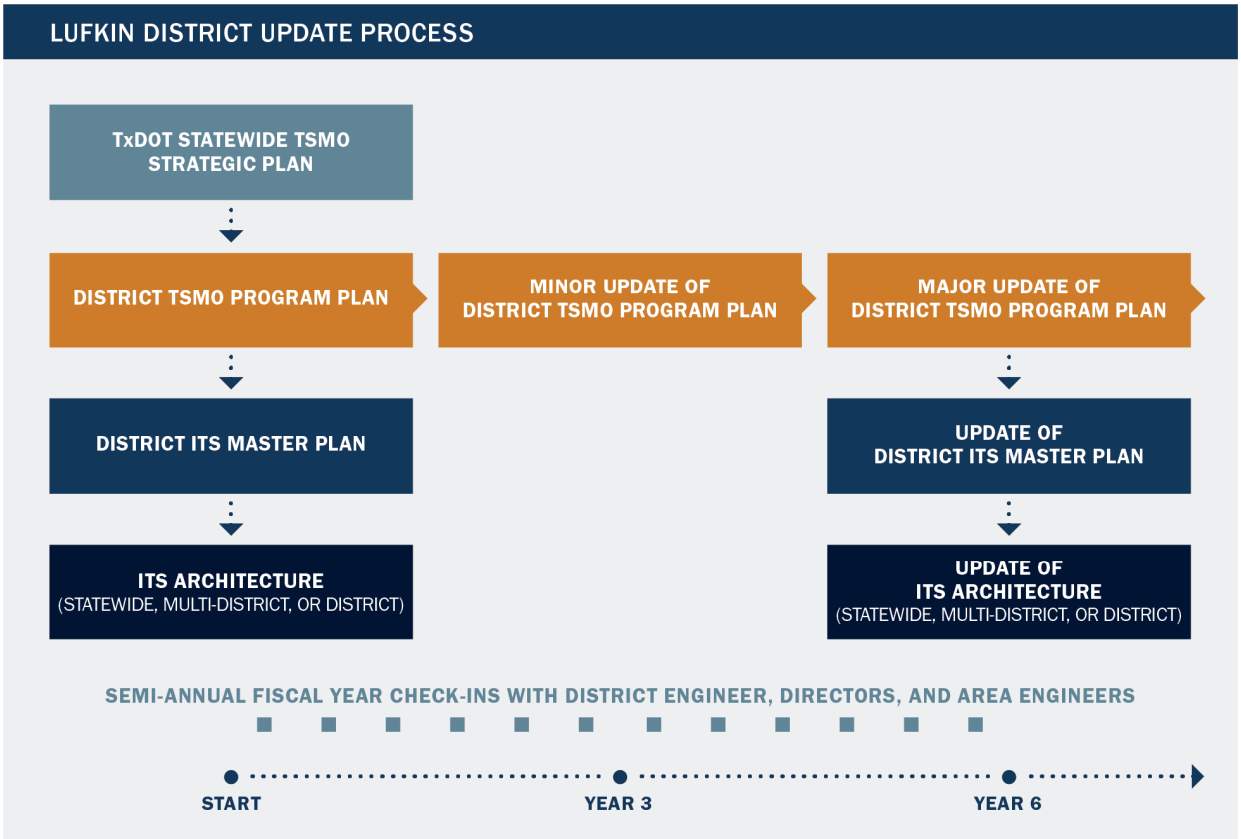
Action items identified for implementation by the Lufkin District within the next 12 to 18 months:

	Business Processes (BP)
BP-01	Develop a Traffic Signal Management Plan to efficiently manage, update, and maintain traffic signals in the district. Collaborate with external stakeholders and consider incorporating third party data sources.
BP-02	Develop standard operating procedures (SOPs) to support business processes and organization and workforce. Including consideration for developing an operational changes/troubleshooting tracking system.
BP-03	Develop a Traffic Incident Management (TIM) Program. Identify and engage internal and external stakeholders. Conduct after action review and develop formal data sharing processes with external agencies.
	Systems and Technology (ST)
ST-02	Consider how technology can support goals for improvement in the district's four-year safety plan.

	Performance Measurement (PM)
PM-01	Develop a Performance Measurement Plan for districtwide traffic management. Formalize the "informal" performance metrics. Identify and explore the available data to measure performance. Consider the need for additional staff support to coordinate performance measurement as more infrastructure is deployed.
	Organization and Workforce (OW)
OW-01	Establish a core group for traffic management that includes staff for key roles requiring redundancy. Identify a career path for operations within TxDOT
OW-02	Increase the number of district staff who have completed the Strategic Highway Research Program 2 (SHRP2) traffic incident management training.
	Collaboration (CO)
CO-01	Develop/update contact lists and distribute regularly, taking into consideration: ▪ Lufkin District points of contact for external stakeholders ▪ Lufkin District liaison(s) for Emergency Operations Centers (EOCs) ▪ Key contacts at local jurisdictions and law enforcement agencies ▪ Key stakeholders for work zone design and traffic management plan development

The Update Process

The Lufkin District plans to review TSMO action item implementation status on a semi-annual basis during the District Engineer's Staff/Area Engineer (AE) Meeting, which includes directors and supervisors.



Introduction

The Lufkin District Transportation System Management and Operations Plan (Lufkin TSMO Plan) prioritizes reliable strategies for operations and management of the existing transportation infrastructure to utilize it at its full potential. The Lufkin TSMO Plan supports the TxDOT TSMO Statewide Strategic Plan (TxDOT, 2018) by providing a district-level approach. Strategies including traffic incident management, traveler information, work zone management, and freight management will help transportation engineers and planners to proactively manage the system in real time and improve system efficiency. As such, they are key tools to support weather and incident response, work zones, limited funding, and the expanding role of technology in the transportation network.

The Lufkin TSMO Plan includes recommendations to improve various process and institutional dimensions within the district:

- Business processes
- Systems and technology
- Performance measurement
- Culture
- Organization and workforce
- Collaboration (both internal and external)

Implementing the Lufkin TSMO Plan will improve project delivery processes by integrating mobility-focused solutions throughout planning, programming, design, construction, operations, and maintenance phases of project life cycles. By continuing to collaborate with partner agencies and implementing data-driven decisions, the transportation network will be safer, more efficient, and more reliable for all users.

Program Plan Format

Key components of the Lufkin TSMO Plan:

- An introduction to TSMO and description of the Lufkin District boundaries and key stakeholders
- The business case for why TSMO is needed in the Lufkin District
- The TxDOT statewide mission, vision, goals, and objectives on which the Lufkin TSMO objectives were developed to form the foundation of the action items in the implementation plan
- A discussion of the capability maturity model (CMM) dimensions with the successes and challenges of the district identified in each of the six dimensions
- A TSMO Implementation Plan of actions including priority, timeline, Lufkin District lead, resources, and partners (e.g., adjacent districts, Traffic Safety Division (TRF), external agencies); A maintenance plan is also included for continuous implementation between plan updates
- Considerations for future tactical plans

Why Develop a TSMO Program Plan?

Traditionally in many transportation agencies, roadway capacity expansion has been the primary tool for managing transportation congestion and operations. However, capacity expansion does not adequately address the needs of the modern transportation system. While the Lufkin District is a rural district and does not experience the types of recurring congestions found in urban areas, travel time reliability is impacted by work zone operations, major weather events (e.g., flooding, hurricane evacuations), and major traffic incidents. Other fundamental issues that argue for TSMO-based solutions include:

- **Limited funding**, which often requires departments to choose between maintaining the system they have or adding more capacity
- **Expanding capabilities of technology**, which can be leveraged to address future mobility needs including connected and automated vehicles, traveler information, system maintenance, and safety improvements

Implementing a TSMO plan encourages the Lufkin District and its partners to evaluate a broad range of options to solve safety, mobility, and reliability challenges.

TSMO PROGRAM BENEFITS

"TSMO programs incorporate skills and capabilities of project delivery with effective systems management, traffic operations, technological innovations, and other activities that improve travel safety and reliability, enhance traveler information and user experience, and maximize the agency's return on capital investments."
(FHWA, 2017)

The Lufkin TSMO Plan supports district Traffic Management Systems (TMS) performance measures, a priority identified by TxDOT's Chief Engineer. Initial metrics identified include TMS asset operational uptime, incident clearance times, level of travel time reliability, and TMS coverage. The Chief Engineer's memos are included in the appendix of the TxDOT TSMO Statewide Strategic Plan (TxDOT, 2018).

TSMO will be integrated into existing plans, programs, and business processes as much as possible. Like the Lufkin District, each TxDOT district is developing a District TSMO Program Plan.

TSMO BENEFITS

Provides the most cost-effective means to improve:

- *Safety*
- *Congestion*
- *Mobility and reliability*
- *Multimodal connectivity*
- *Emergency response*
- *Maintenance of overall system*
- *Optimization of existing infrastructure*
- *Customer service*

Mitigates the negative impacts on traffic from:

- TRAFFIC INCIDENTS
- WORK ZONES
- ADVERSE WEATHER CONDITIONS

Benefits many areas of the project life cycle:

Current Lufkin District TSMO State of the Practice

The TxDOT Lufkin District is responsible for planning, programming, design, construction, operations, and maintenance of transportation projects within the district. Within each of these areas, the TxDOT Lufkin District is already applying TSMO tools at varying levels and consistency.

Table 1 provides an overview of current TSMO activities districtwide, and at the divisions within TxDOT Lufkin District: Transportation Planning and Development (TP&D), Construction, and Operations. The district's maintenance functions fall under the Operations section. Additional details and supporting documents are provided in the Lufkin District State of the Practice Report (TxDOT Lufkin District, 2020). The current TSMO activities were reviewed as part of the Capability Maturity Model, described later in this Plan.

TABLE 1. LUFKIN DISTRICT TSMO CURRENT STATE OF THE PRACTICE

Group	TSMO Activity
Districtwide	▪ Developed four-year District Safety Plan to support statewide Road to Zero initiative (TxDOT Lufkin District, 2020) ▪ Junior Engineering Assistant (EA) staff rotation program provides cross-training between sections ▪ Robust traveler information program through the district's Public Information Office (PIO) using traditional and social media (@TxDOTLufkin, DriveTexas.org, HoustonTranStar.org, etc.) ▪ Well-established collaboration across sections within the district and across district boundaries for inter-jurisdictional project coordination ▪ Strong relationship with law enforcement agencies and local jurisdictions
TP&D	▪ Beginning to include intelligent transportation system (ITS) technologies in project development phase (planning, programming, and design) ▪ Prioritizing investments on six hurricane evacuation routes; this includes US 59, which is established as a contraflow emergency evacuation route
Construction	▪ Statewide tools used to determine use of law enforcement and speed reduction in construction zones ▪ Temporary speed monitoring system, one of the six TxDOT Smart Work Zone (SWZ) systems, is used to measure vehicle speeds and alerts drivers; The district's construction projects have not met thresholds in the statewide decision tool for other SWZ systems ▪ Portable changeable message signs (PCMSs) are used for traveler information and truck mounted attenuators (TMAs) are used for safety
Operations	▪ Houston District actively manages the district's existing cameras. In the process of transitioning camera maintenance from the Houston District to the Lufkin District ▪ Currently adding cellular communications to signals and upgrading controllers in preparation for a statewide central signal control system ▪ Currently expanding ITS infrastructure (e.g., dynamic message signs (DMSs), cameras, detection systems) and supporting communications network with ongoing and upcoming construction projects, such as the I-69 conversion project ▪ ITS Master Plan is currently under development to prioritize TMS investments
Maintenance (group within the Operations section)	▪ Monthly illumination night rides, semi-annual night rides for roadway inspections, and annual district rides to inspect signs, illumination, signals, pavement markings, pavement issues and other roadside elements ▪ Maintains and follows a four-year Pavement Management Plan ▪ Assist law enforcement agencies and local jurisdictions on an as needed basis in response to traffic incidents ▪ Developed a Snow and Ice Control Plan that includes a tiered response plan for treating roadways during extreme winter weather ▪ Participates in an annual winter weather planning meeting with adjacent districts and state departments of transportation

Lufkin District Boundaries

The TxDOT Lufkin District is shown in Figure 1 and includes nine counties. Figure 1 also highlights the three Area Offices within the district. No metropolitan planning organizations (MPOs) are located within the district.

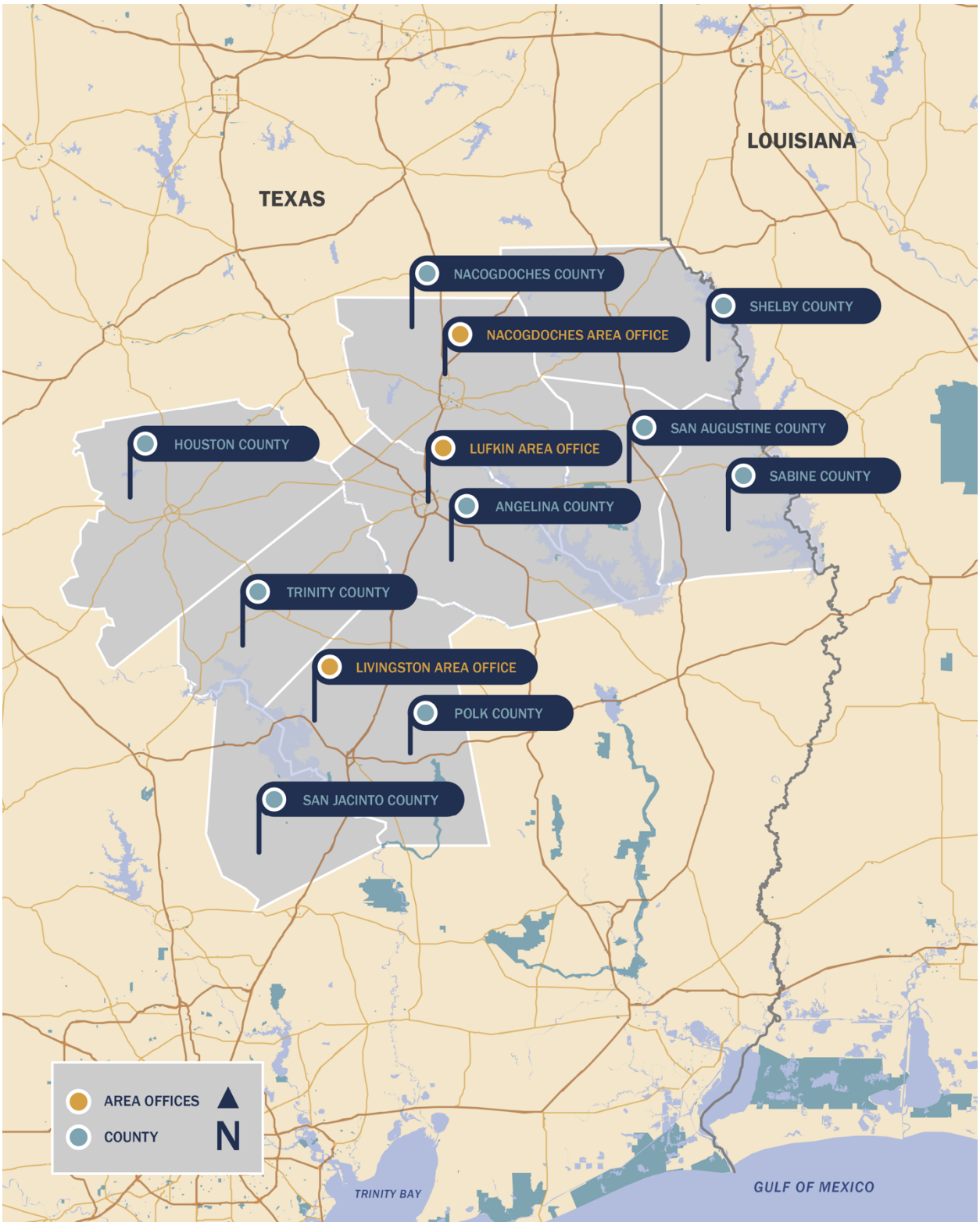


FIGURE 1. LUFKIN DISTRICT AREA MAP

Stakeholder Involvement

Stakeholders from a variety of practice areas within the Lufkin District were engaged in the development of the Lufkin TSMO Plan through a series of meetings, workshops, and phone calls between April 2020 and March 2021. Representatives from each practice area participated on a Working Group that guided the development of this plan.

The workshops included participation from numerous external stakeholders such as cities, counties, and law enforcement. The stakeholder process is shown in Figure 2 and stakeholders are listed in Appendix A.

The Lufkin TSMO Plan effort was led by the district's Operations section. The District Engineer (DE) actively participated throughout the development of this Plan, which helped accelerate district leadership consensus.

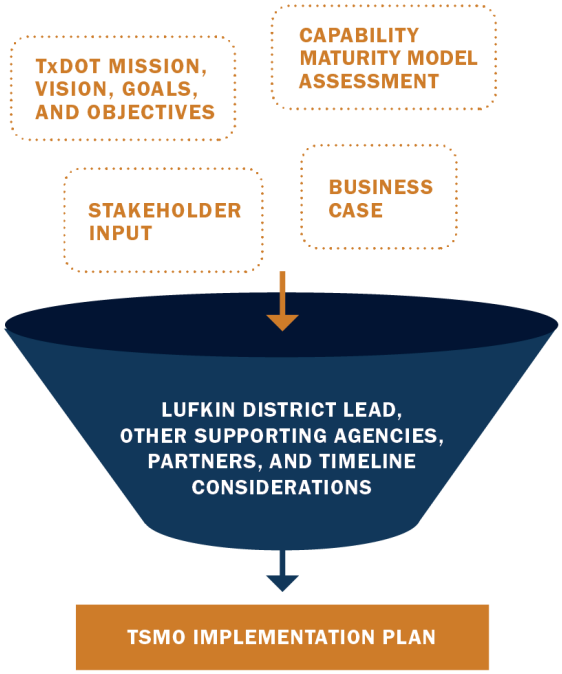


FIGURE 2. STAKEHOLDER OUTREACH PROCESS

Business Case for TSMO in the Lufkin District

The Lufkin District plans, designs, builds, operates, and maintains the state transportation system in nine counties: Angelina, Houston, Nacogdoches, Polk, Sabine, San Augustine, San Jacinto, Shelby, and Trinity. The district is responsible for two major corridors, US 59/Future I-69 and US 69. Other key corridors include US 84, US 259, US 287, US 190, and SH 146. Several construction and design projects are underway to upgrade US 59 throughout the district to I-69 standards. The district spends an average of $10.5 million annually to seal coat roadways. Due to the district's proximity to the Gulf of Mexico, hurricane evacuation planning is a critical function of the Lufkin District. Many state highways throughout the area have been designated as hurricane evacuation routes. The district has a strong history of implementing safety-focused projects (i.e., improving skid, metal beam guard fence upgrades, speed limit reductions, and safety treatments/widening). The district has programmed safety improvements in the next four fiscal years such as turn lanes, intersection improvements, and mitigations for run-off-road crashes.

In light of the district's profile, the business case of TSMO stems from the ability of TSMO strategies to support travel reliability, economic activity, and transportation safety in the region. TSMO brings together many disparate activities currently underway in the district under a unifying umbrella that builds connections both within the Lufkin District (between various sections in the district – planning, design, construction, operations, maintenance) and with regional partners (law enforcement, cities, counties, weather service, etc).

Figure 3 below summarizes the business case for TSMO in the Lufkin District, highlighting the key influencers in the district, challenges and/or opportunities resulting from these influencers, and relevant TSMO strategies to address them. The sub-sections that follow provide additional discussion about the business case.

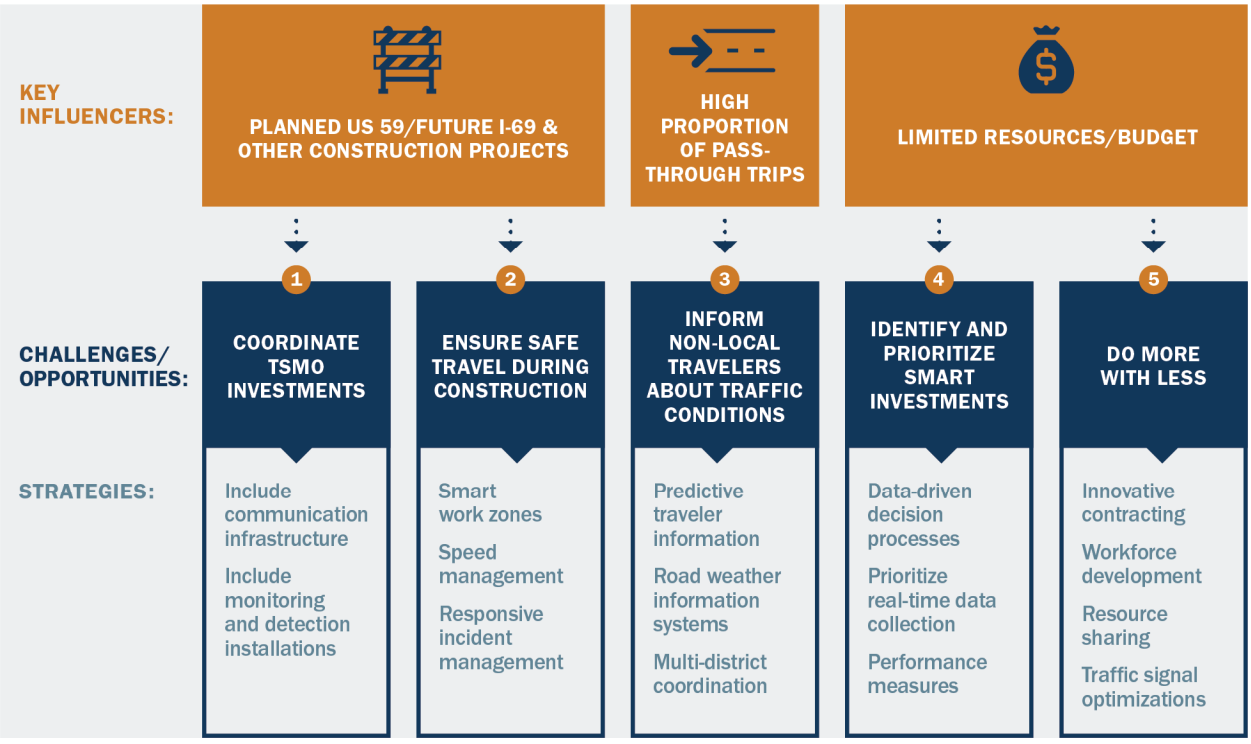


FIGURE 3. LUFKIN DISTRICT BUSINESS CASE FOR TSMO — INFLUENCERS, CHALLENGES/OPPORTUNITIES, AND STRATEGIES

Planned US 59/Future I-69 Construction Projects

Traffic volumes continue to increase on US 59/Future I-69, which needs upgrades to bring sections up to interstate standards. Additionally, US 59 is established as a contraflow hurricane evacuation route activated as needed. To most efficiently and effectively implement TSMO strategies in the district, the construction projects to upgrade sections of roadway to interstate standards can be viewed as opportunities to integrate TSMO strategies focused on improving safety and reliability. As the highway is upgraded to interstate standards, the Lufkin District can prioritize opportunities to incorporate DMSs and cameras to provide information to travelers and allow quicker incident response. The Lufkin District currently has a four-year District Safety Plan that includes a strong focus on reducing work zone fatalities, and there is an opportunity to incorporate TSMO strategies during construction. Strategies such as work zone management (e.g., smart work zones), speed management, and traveler information can reduce queues, reduce overall delays, improve safety of travelers and responders, and support overall freight movement.

Supporting Long Distance Travel and Efficient Freight Movement

Decisions about travel, especially for freight and long-distance through travel are made outside the district boundaries. As a consequence, travelers and truck traffic arriving in the Lufkin District may not be aware of work zones, lane closures, or weather-related capacity restrictions. TSMO strategies like predictive traveler information, especially for long-distance travel on US 59/Future I-69, might be particularly useful in combination with statewide resources as well as when used in conjunction with the Houston District. Road weather information systems can reduce traveler delay and lower crash rates by seven to 83 percent.

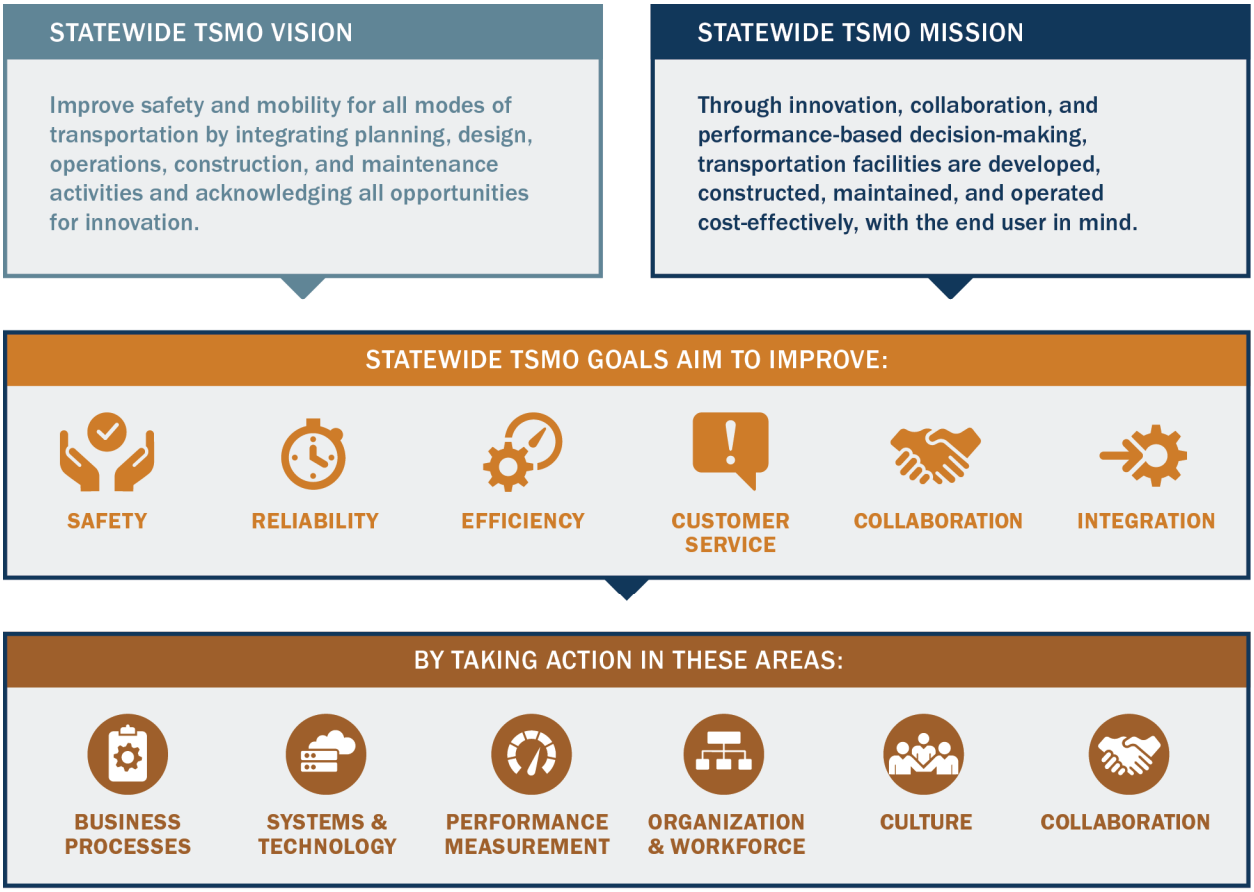
Limited Resources / Budget

TSMO strategies are generally low-cost compared to capacity investments. More importantly, they are extremely cost-effective in terms of the impacts produced. By using the data generated by TSMO and combining it with existing TxDOT resources, investments for both TSMO and other transportation investments can be based on performance. TSMO is a catalyst to establish and ensure the availability of reliable real-time data sources, expert staff, and clear performance measures to effectively collect, report, and share data and to monitor performance for the district. Traffic signal optimization can decrease delay substantially (13 to 94 percent) while improving safety at a fraction of the cost of infrastructure capacity expansion.

Compared to large urban and metro districts, the region has less resources (in terms of workforce, funding, and systems) to devote to TSMO. Limited TSMO asset management tools and practices make it difficult to plan for system maintenance, upgrades, and replacement. This creates an onus on the district to integrate TSMO into transportation planning, programming, scoping, and in particular engineering, with more collaboration between highway design and operations. The case to creatively address operations & maintenance (O&M) and information technology (IT) issues associated with TSMO assets (ITS infrastructure, back-office systems, traffic signal infrastructure, and priority treatments) through innovative contracting, workforce development, resource sharing (with other districts) are critical to TSMO in the district.

TSMO Vision, Mission, Goals, and Objectives

The Lufkin District supports the statewide TSMO vision, mission and goals and has developed district-specific objectives to support the statewide goals as described in this section.



Lufkin District TSMO Goals and Objectives

The Lufkin District supports each of the six statewide TSMO goals (safety, reliability, efficiency, customer service, collaboration, and integration) and has developed objectives for the district under each goal to support ongoing monitoring of the effectiveness of the TSMO Plan. Measurable objectives have been set where baseline data is available to track performance. Other objectives are aspirational and should be re-visited with future TSMO Plan updates once the district has established more performance metrics and data sources. The Lufkin District objectives are listed in Table 2 along with the corresponding statewide goals.

TABLE 2. STATEWIDE AND LUFKIN DISTRICT TSMO GOALS AND OBJECTIVES

Goal	Strategic Statewide Objectives	Strategic Lufkin District Objectives
Safety 	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.	▪ Reduce 5-year rolling average fatalities by half by 2035. ▪ Reduce fatalities to zero by 2050. ▪ Reduce severe injury crashes (both incapacitating and non-incapacitating). ▪ Reduce work zone crashes.
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.	▪ Improve travel time reliability of person-miles traveled on US 59/Future I-69. ▪ Increase TMS assets in use for incident and emergency detection/response on hurricane evacuation routes. ▪ Reduce delay caused by work zones or system maintenance. ▪ Reduce average incident clearance time on highways.
Efficiency 	Implement projects that optimize existing transportation system capacity and vehicular throughput.	▪ Maintain a program of evaluating 100 percent of signals for retiming every three years.
Customer Service 	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	▪ Increase number of repeat visitors to Lufkin District section of DriveTexas.org during major events (e.g., flooding, tornadoes, hurricanes, crashes where roads/lanes are closed). ▪ Increase number of subscribers to Lufkin District social media platforms by at least 10 percent by the end of Fiscal Year 2022.
Collaboration 	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	▪ Meet once or twice per fiscal year with representatives from the three core sections and the three Area Offices to review TSMO implementation status. ▪ Hold after-action review meetings with attendance from the majority of the agencies involved in the response to a major incident/emergency or adverse weather event.
Integration 	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	▪ Maintain 90 percent TMS asset operational uptime annually. ▪ Expand network monitoring to 100 percent of traffic signals by 2030. ▪ Conduct joint training exercises in the district and/or region that support shared implementation of TSMO strategies.

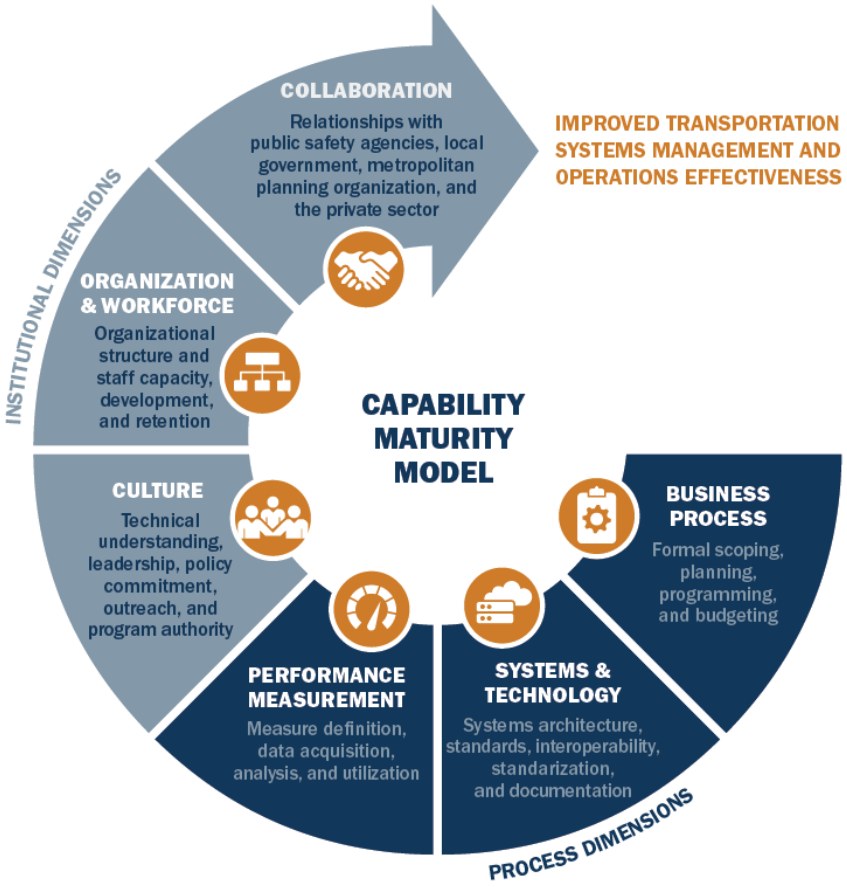
Capability Maturity Model

This section includes an introduction to the Capability Maturity Model (CMM) process and summarizes the assessment of how each of the six dimensions applies to the Houston District: 1) business processes, 2) systems and technology, 3) performance measurement, 4) organization and workforce, 5) culture, and 6) collaboration (FHWA, 2020).

Introduction to the CMM Process

Existing capabilities, gaps, and needs for TSMO in the Lufkin District were identified through a combination of interviews and workshops. Tools used to gather capabilities were the TSMO Capability Maturity Model and Frameworks. The CMM self-assessment framework is comprised of six dimensions of capability, three process-oriented dimensions and three institutional dimensions, shown in Figure 4. The Capability Maturity Frameworks (CMFs) are based on the same dimensions but are focused on specific aspects of TSMO such as work zone management.

The use of the capability maturity concepts provides an approach to review common barriers to adoption and success of TSMO and allows agencies to understand and identify actions for improvement of institutional issues that an agency faces on a continual and consistent basis. The process fosters an agency's ability to develop consensus around needed agency improvements; identify their immediate priorities for improvements; and identify concrete actions to continuously improve capabilities to plan, design, and implement TSMO.



Source: Strategic Highway Research Program (SHRP2), American Association of State and Highway Officials (AASHTO), and Federal Highway Administration (FHWA-HOP-17-017)

FIGURE 4. CAPABILITY MATURITY DIMENSIONS

Consistent with the Strategic Highway Research Program 2 (SHRP2, 2017) guidance and other federal CMM and CMF guidance (AASHTO, 2014; FHWA, 2017), the capabilities for each dimension are described as a matrix that defines the process improvement areas and levels (from Level 1, ad-hoc, to Level 4, optimized level of capability). Table 3 includes this matrix, which shows how each of the six dimensions are assessed for each level. Following a self-assessment process, specific actions are identified to increase capabilities across the desired process areas.

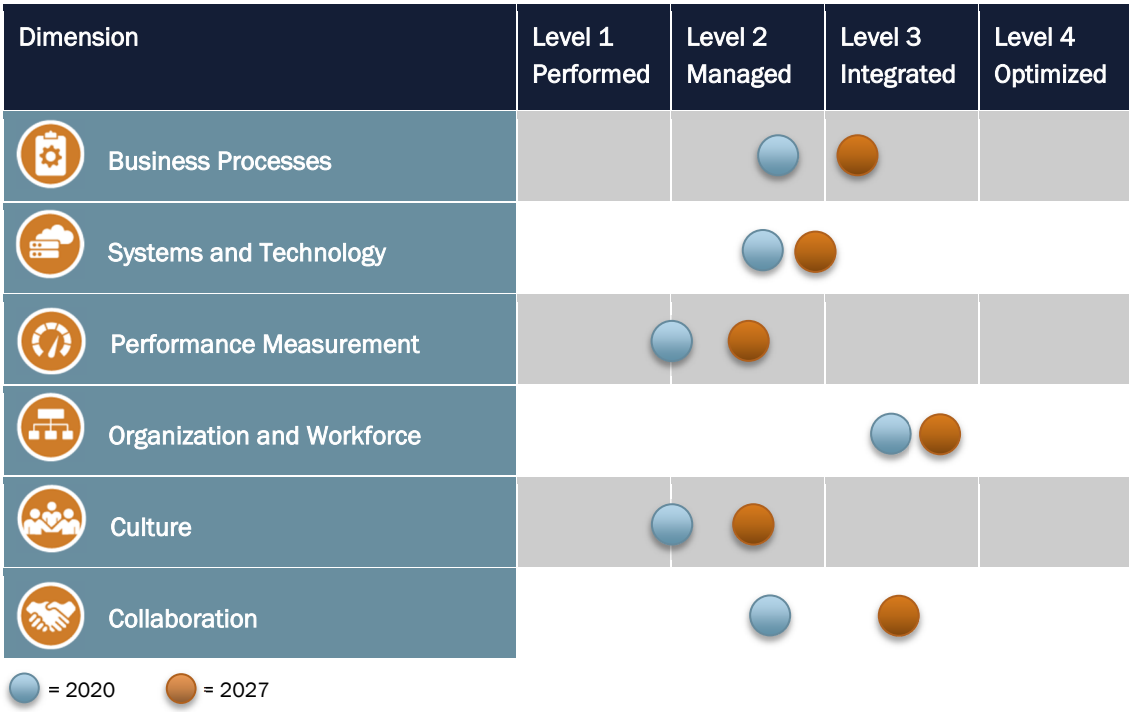
The capability assessment process, tool, and instructions were discussed with stakeholders during the CMM workshop (TxDOT Lufkin District, 2020). The overall assessment of capability provided in Table 3 is based on the input provided during the workshop. Workshop participants rated themselves at a Level 3 for organization and workforce, a Level 2 for business processes, systems and technology, and collaboration, and between Levels 1 and 2 for performance measurement and culture. Table 3 presents the criteria for CMM assessment and Table 4 presents the self-assessment results for the Lufkin District. Table 4 also shows how the capabilities will become more advanced by 2027 as the district implements the actions in this plan over the next six fiscal years.

TABLE 3. CMM ASSESSMENT CRITERIA

Dimension	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes	Processes related to TSMO activities ad hoc and un-integrated	Multiyear statewide TSMO plan and program exists with deficiencies, evaluation, and strategies	Programming, budgeting, and project development processes for TSMO standardized and documented	Processes streamlined and subject to continuous improvement
Systems & Technology	Ad hoc approaches outside systematic systems engineering	Systems engineering employed and consistently used for Concept of Operations, architecture and systems development	Systems and technology standardized, documented and trained statewide, and new technology incorporated	Systems and technology routinely upgraded and utilized to improve efficiency performance
Performance Measurement	No regular performance measurement related to TSMO	TSMO strategies measurement largely via outputs, with limited after-action analyses	Outcome measures identified and consistently used for TSMO strategies improvement	Mission-related outputs/ outcomes data routinely utilized for management, reported internally and externally, and archived
Organization & Workforce	Fragmented roles based on legacy organization and available skills	Relationship among roles and units rationalized and core staff capacities identified	Top level management position and core staff for TSMO established in central office and districts	Professionalization and certification of operations core capacity positions including performance incentives
Culture	Value of TSMO not widely understood beyond champions	Agency-wide appreciation of the value and role of TSMO	TSMO accepted as a formal core program	Explicit agency commitment to TSMO as key strategy to achieve full range of mobility, safety and liveability/ sustainability objectives
Collaboration	Relationships on informal, infrequent and personal basis	Regular collaboration at regional level	Collaborative interagency adjustment of roles/ responsibilities by formal interagency agreements	High level of operations coordination institutionalized among key players – public and private

Source: Strategic Highway Research Program (SHRP2), American Association of State and Highway Officials (AASHTO), and Federal Highway Administration (FHWA-HOP-17-017)

TABLE 4. CAPABILITY MATURITY ASSESSMENT BY WORKSHOP STAKEHOLDERS



The following sections breakdown the existing capabilities and needs among the six dimensions.

Business Processes

This section describes the Lufkin District organization and incorporation of TSMO into the project delivery process.

Lufkin District Organization

The TSMO program at the Lufkin District is championed by the District Engineer. Directors of the Transportation Planning and Development (TP&D), Construction, and Operations sections report to the District Engineer (DE) and conduct TSMO practices in their domain. Maintenance functions fall within the Operations section. As TSMO is related to all three sections across the district, the three Directors practice TSMO to varying degrees. The three Area Offices in Livingston, Lufkin, and Nacogdoches coordinate the TSMO process at the field level. The Area Engineer (AE) for each Area Office reports directly to the District Engineer but also coordinates TSMO efforts with the Directors and support staff of the three core sections. The Safety Coordinators and PIO support all districtwide functions, including TSMO.

Figure 5 provides a high-level overview of the Lufkin District's organizational chart. Staff at the district may find the current detailed organizational chart with additional sub-sections, names of district leadership, and full-time equivalent (FTE) numbers at any time on TxDOT's Intranet.

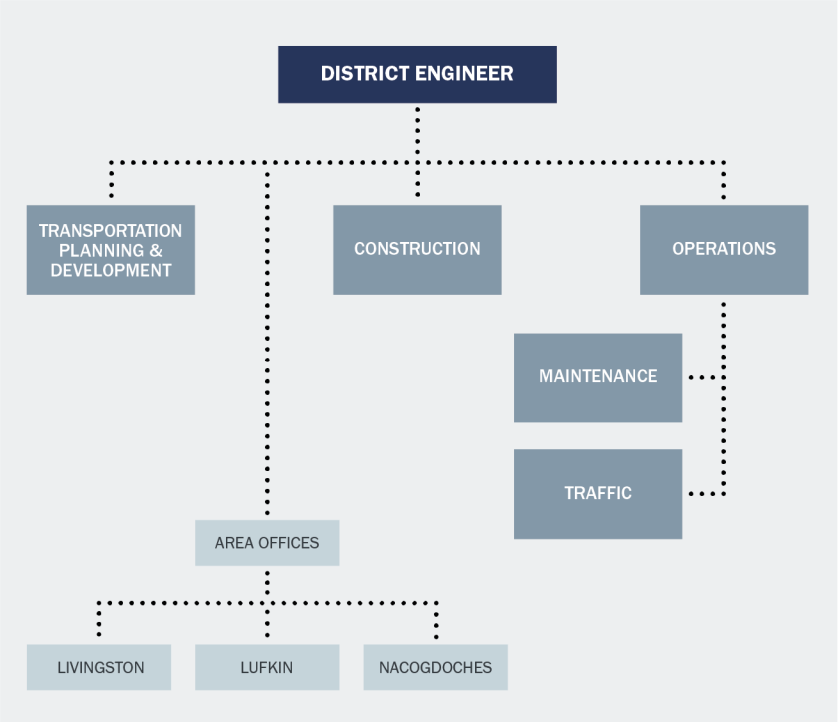


FIGURE 5. LUFKIN DISTRICT ORGANIZATIONAL CHART

Project Delivery Process

The Lufkin District is responsible for planning, programming, design, construction, operations, and maintenance of projects within the district. Within each of these areas, the Lufkin District is already applying TSMO strategies at varying levels and consistency. At the CMM workshop, participants rated the business processes at a Level 2. The Lufkin District has many four-year planning processes, and the district meets with each Area Office to discuss projects and priorities. The Lufkin District has a documented process in place for programming and budgeting. They noted that their small size and good communication makes it easier for the district to be flexible and to adapt to arising needs. The Lufkin District has been successful in adding DMS and cameras to projects when funding is available. DMS and cameras have been incorporated into the plans for US 69 widening and the upgrade of US 59 to I-69. The district recently completed a four-year safety plan, which will support prioritized project development as well as integrating TSMO strategies.

The project development process at the TxDOT Lufkin District comprises of six steps: Planning, Programming, Design, Construction, Operations, and Maintenance. While this process has typically been used to develop more traditional capital improvement projects, it also supports the development of projects that use TSMO strategies. Projects are identified through the planning process and prioritized projects progress through the process as funding and resources permit. Figure 6 illustrates that successes or challenges experienced in the process are communicated back to groups responsible for earlier stages so that practices are improved. Some performance metrics are also used to support the project development cycle. In the Lufkin District, staff wear many hats and are often involved in multiple or all steps within the project development process. This allows TSMO to be more easily integrated throughout all steps.

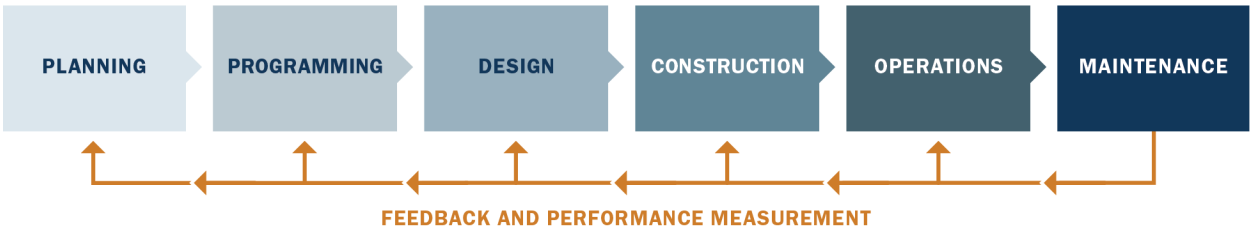


FIGURE 6. PROJECT DEVELOPMENT PROCESS AND FEEDBACK LOOP

Implementation of the following recommended actions by fiscal year 2027 will advance capability maturity for business processes:

- Formalize operations agreement with the Houston District for active management of ITS infrastructure.
- Continue to work with the Traffic Safety Division to roll out statewide initiatives and emerging technologies into the project delivery process.

Systems and Technology

This section describes the district's ITS Master Plan, ITS architecture, processes to vet innovative technologies, and the systems engineering analysis process.

Lufkin District ITS Master Plan and Architecture

The Lufkin District is developing an ITS Master Plan concurrently with this Plan and plans to pursue funding for implementation (TxDOT Lufkin District, 2021). This document will help the district decide where and how to implement TSMO strategies and feed into the planning and programming part of the project development process. The Lufkin District will track the implementation of the ITS Master Plan and update the plan as needed on the same planning cycle as the TSMO Plan.

The district noted a preference for a multi-district (e.g., southeast districts) or statewide ITS architecture that the district provides input on but not one they maintain. Although the use of ITS is relatively new to the Lufkin District, the ITS regional architecture developed in 2005 is documented online (ConSysTec, 2005). The 2005 architecture was created in Turbo Architecture.

Any updated district, multi-district, or statewide architecture would need to use the new Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) (USDOT, 2019). ITS devices currently used by the Lufkin District include cameras (8), dynamic message signs (10 currently programmed), and detection (6 radar stations), traffic signals (122), and school zone flashers (170+). More of these devices are being installed or upgraded with current or upcoming construction projects. Proposed ITS devices include the addition of 13 cameras along freight and evacuation routes along with the intersections of major highways; 7 DMSs – 1 on US 59, 2 on US 69, 1 on US 259, 1 on US 96, and 2 on SH 103; 5 PCMSs to be assigned to the maintenance offices and the Area Offices; 32 radar detection systems – 15 districtwide, 11 in and around the City of Lufkin, and 6 in and around the City of Nacogdoches; 28 overheight vehicle warning systems – 6 at previously struck bridges, 1 for bridges with less than 14-foot vertical clearance, and 21 for bridges with vertical clearance between 14 and 16 foot; upgrade 21 intersection traffic signal controllers; and upgrade 170+ school zone flashers with cellular communications.

The Lufkin District currently uses radio (5.8 GHz) communication to communicate with its traffic signals and ITS devices. The district's primary backbone is radio communication due to the large number of rural assets. Because of the vast rural assets and the cost of fiber optic installation, the district continues to utilize radio communication and/or cellular communication on its upcoming and future construction projects.

Houston TranStar actively manages the Lufkin District's ITS devices/systems. The district's maintenance staff currently works with Houston TranStar maintenance on minor device and system issues and is in the process of transitioning camera maintenance from the Houston District. It is a high priority to formalize an agreement between the two districts for continued ITS device management and maintenance.

The Lufkin District looks to use the proposed PCMSs to enhance its incident response along the district's vast rural highway systems and aid in coordination with local authorities while providing valuable information to the travelling public. Coordination and use of the PCMSs will also be key in managing traffic during hurricane evacuation incidents.

The Lufkin District currently uses one of the six TxDOT Smart Work Zone (SWZ) systems: the temporary speed monitoring system. The district's construction projects have not met thresholds in the statewide decision tool for the other SWZ systems. The district will continue to use the SWZ decision tool to determine the need for enhanced SWZ on all district construction projects as they can be used to improve public safety and mobility. The district also coordinates construction projects across district boundaries and with local jurisdictions and requires multiple coordination partners. PCMSs are used for traveler information and TMAs are used for safety. The use of law enforcement and the lowering of the posted speed limit are determined through the statewide decision tool.

The CMM workshop participants rated systems and technology between Levels 1 and 2. Key activities to advance Systems and Technology to a solid Level 2/3 over the next six years:

- Implement the projects in the Lufkin District ITS Master Plan as funding allows.
- Continue to assess the use of SWZ in future district projects.
- Identify district liaison for the Emergency Operations Center (EOC) (who to call and for what).
- Establish relationship with National Weather Service (NWS) to incorporate a direct weather feed to Lufkin District and Area Offices for earlier access to weather data.
- Consider how technology can support goals and improvements of Safety Plan.
- Incorporate future statewide plans for video brokerage, asset systems, signal control, and third-party data (e.g., INRIX, WAZE).
- Document process, including roles and responsibilities for reporting incidents to Houston TranStar.
- Consider formalizing the "informal" district performance metrics, and possibly use a shared metrics platform.
- Add FTE for coordinating performance management, especially as more TMS infrastructure is deployed.

Processes to Vet Innovative Technologies

Although open to innovative technologies, the Lufkin District relies heavily on the Traffic Safety Division and metropolitan districts, such as Houston, to vet innovative technologies first before considering them for use. Pilot projects and a thorough use of the systems engineering analysis process will be considered for any innovative technologies.

Systems Engineering Analysis Process

As applied to ITS, systems engineering assesses the value and functionality of a high-technology project, service, or system from inception to end of life and considers what the system requires operationally throughout its lifespan. The systems engineering approach defines project requirements before technology choices are made and the system is implemented.

Systems engineering results in better project cost and schedule adherence, ensures that stakeholder needs are met, reduces the risk of schedule and cost overruns, and increases the likelihood that the implementation will meet the user's needs. A detailed systems engineering process gives ITS program managers the information to identify life cycle costs for near-term and long-term budget preparation.

Systems engineering is an interdisciplinary approach to enable the realization of successful systems that:

- Focus on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem
- Integrate all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation
- Consider both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs

In 2002, the United States Department of Transportation (USDOT) established requirements for a systems engineering analysis for any ITS project that uses funds from the Highway Trust Fund (USDOT, 2002). Currently the systems engineering process is a mature process. USDOT policy specifies that the systems engineering process should include seven requirements:

1) Identification of portions of the regional ITS architecture being implemented
2) Identification of participating agencies' roles and responsibilities
3) Requirements definitions
4) Analysis of alternative system configurations and technology options to meet requirements
5) Procurement options
6) Identification of applicable ITS standards and testing procedures
7) Procedures and resources

Benefits of the systems engineering process:

- Improved stakeholder participation
- More adaptable, resilient systems
- Verified functionality and fewer defects
- Higher level of reuse from one project to the next
- Better documentation
- Cost efficiencies

The systems engineering process represented by the "V" (or "Vee") model shown in Figure 7 has been broadly adopted in the transportation industry (FHWA California Division, 2009). On the left side of the V, the system definition progresses from a general user view of the system to a detailed specification of the system design. Here, the regional ITS architecture, feasibility studies, and concept exploration that support initial identification and scoping of an ITS project based on regional needs. A gap follows the regional architecture step because the regional architecture is a broader product of the planning process that covers all ITS projects in the region. The system is then parsed into distinct subsystems, and the subsystems into components. As the distinct

subsystems are identified, the requirements for each subsystem requirements that are allocated to the system components, and documented baselines are established.

The central core of the V shows the project definition, implementation, and verification processes. The system hardware and software are implemented here.

The right wing shows the operations and maintenance, changes and upgrades, and ultimate retirement of the system. Here, the components of the system are integrated and verified in an iterative fashion. Ultimately, the completed system is validated to measure how well it meets the agency's needs.

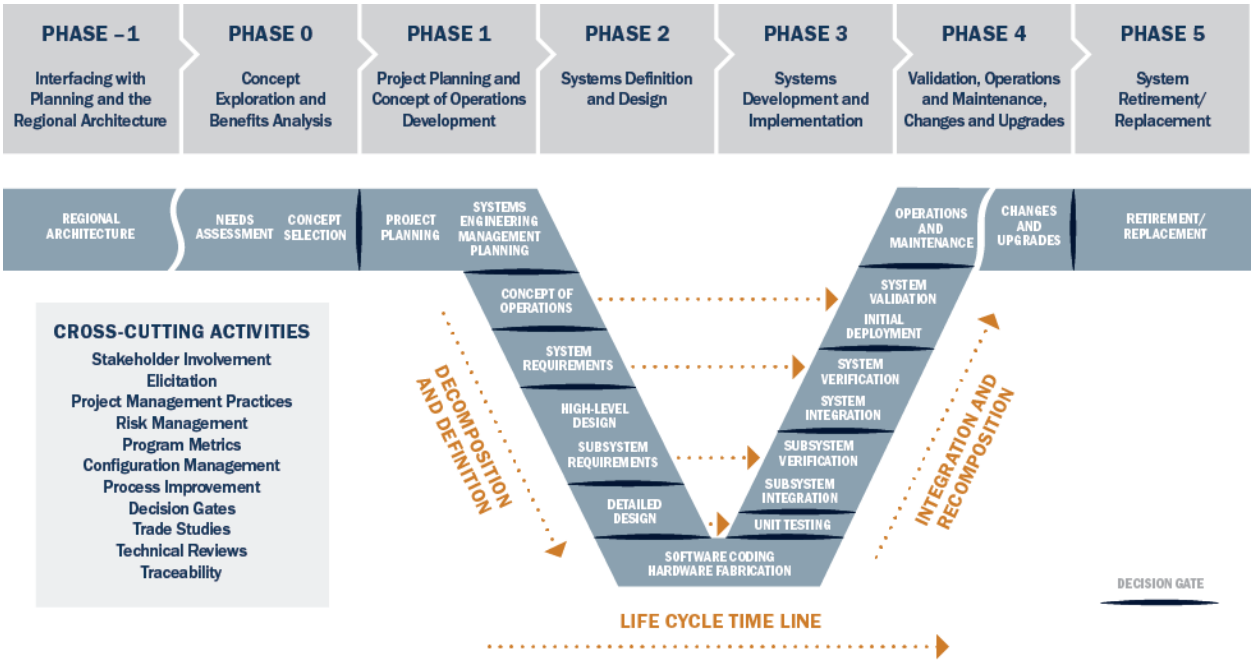


FIGURE 7. SYSTEMS ENGINEERING "V" DIAGRAM

Performance Measurement

This section provides an overview of national performance measurement, Lufkin District performance measure capability, and a performance measurement assessment.

National Performance Measurement

The Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012 established performance-based planning and management to improve the transparency and accountability of investment decisions for Federal-aid highway programs. A performance-based approach ensures transportation investments are linked to agency goals and objectives through structured performance evaluation, monitoring and reporting methods. MAP-21 requires State DOTs and MPOs to establish performance targets and track progress made toward seven national performance goals: safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. The Fixing America's Surface Transportation (FAST) Act of 2015 continues this approach and requires States to invest in projects that collectively make progress toward national goals (USDOT, 2015).

TxDOT Agency-Wide Performance Measures

TxDOT launched a Performance Dashboard in 2018 to quantitatively track statewide performance and targets relative to its core mission, goals, and objectives (TxDOT, 2018). The dashboard is grouped according to seven goal areas and includes 19 performance measures, as summarized in Table 5. TxDOT's goals related to system performance and safety include TSMO-oriented performance measures (denoted in italics).

TABLE 5. TxDOT AGENCY-WIDE PERFORMANCE DASHBOARD GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

TxDOT Goal	Objectives	Performance Measures (*Italics denote TSMO-oriented measures*)
Optimize System Performance	▪ Mitigate congestion ▪ Enhance connectivity and mobility ▪ Improve the reliability of our transportation system ▪ Facilitate the movement of freight and international trade ▪ Foster economic competitiveness through infrastructure improvements	▪ *Congestion and Reliability Indexes* o *Urban Congestion* o *Urban Reliability* o *Rural Reliability* o *Truck Reliability* ▪ Vehicle Miles Traveled ▪ *Annual Delay per Person*
Deliver the Right Projects	▪ Use scenario-based forecasting, budgeting and resource-management practices to plan and program projects ▪ Align plans and programs with strategic goals ▪ Adhere to planned budgets and schedules ▪ Provide post-delivery project and program analysis	▪ Percent of Highway Infrastructure Contracts Completed on Time ▪ Percent of Highway Infrastructure Contracts Completed on Budget

TxDOT Goal	Objectives	Performance Measures (*Italics denote TSMO-oriented measures*)
Promote Safety 	▪ Reduce crashes and fatalities by continuously improving guidelines and innovations along with increased targeted awareness and education ▪ Reduce employee incidents	▪ *Annual Fatalities & Fatality Rate* ▪ *Annual Serious Injuries & Serious Injury Rate* ▪ *Fatality Emphasis Areas involving:* o *Run off the road* o *Distracted driving* o *Driving under the influence* o *Intersections* o *Pedalcyclist* o *Pedestrian* ▪ Employee Injury Rate
Preserve Our Assets 	▪ Maintain and preserve system infrastructure to achieve a state of good repair and avoid asset deterioration ▪ Procure, secure, and maintain equipment, technology, and buildings to achieve a state of good repair and prolong life cycle and utilization	▪ Percentage of Lane Miles in Good or Better Condition ▪ Bridge Condition Score
Focus on the Customer 	▪ Be transparent, open, and forthright in agency communications ▪ Strengthen our key partnerships and relationships with a customer service focus ▪ Incorporate customer feedback and comments into agency practices, project development, and policies ▪ Emphasize customer service in all TxDOT operations	▪ Percentage of Customer Complaint Cases Closed on Time ▪ Customer Complaint Case Type (Top 5) ▪ Average TxTag Call Wait Time ▪ Average TxTag Call Handle Time
Value our Employees 	▪ Emphasize internal communications ▪ Support and facilitate the development of a successful and skilled workforce through recruitment, training and mentoring programs, succession planning, trust, and empowerment ▪ Encourage a healthy work environment through wellness programs and work-life balance	▪ Employee Engagement Score
Foster Stewardship 	▪ Use fiscal resources responsibly ▪ Protect our natural resources ▪ Operate efficiently and manage risk	▪ Disadvantaged Business Enterprise (DBE) Attainment ▪ Historically Underutilized Business (HUB) Attainment ▪ Direct Transportation Funding

Lufkin District Performance Measure Capability

This section describes the Lufkin District's performance measurement capability with regards to the TMS program and the TxDOT's Road to Zero initiative. TxDOT division offices require districts to monitor and report on specific performance measures through the TMS program. Table 6 summarizes the performance measures mandated in Chief Engineer William Hale's memos, along with the Lufkin District's current capabilities with regards to each measure. In the future, the District Engineer's performance for the Lufkin District may include an assessment of TMS asset operational uptime.

TABLE 6. LUFKIN DISTRICT TMS PERFORMANCE MEASURE CAPABILITY

TMS Program Performance Measure	Lufkin District Capability
TMS system coverage – Measure the portion of interstates and other key highways adequately covered with ITS equipment and communications	This plan includes an objective to increase ITS-related assets on US 59/Future I-69 to 100-percent coverage by 2030. The Lufkin District defines 100-percent coverage as the inclusion of ITS infrastructure at major highway junctions.
TMS asset operational uptime – Measure the percent of time ITS equipment is operational	Asset uptime for district ITS devices are currently measured through Lonestar through the Houston District. Signal connectivity efforts are underway. Once complete, traffic signal asset uptime will be measured.
Travel time reliability – MAP-21 measure to assess the reliability of travel times on the interstate or non-interstate National Highway System (NHS)	Not currently measured at the Lufkin District. The Traffic Division is working on a statewide approach to help urban and rural districts measure travel time reliability.
Incident clearance time – Measures the time to clear incidents	The Lufkin District does not currently measure incident clearance time, since first responder agencies receive these calls and respond to incidents. TxDOT does assist when requested by first responders. The Traffic Safety Division is working on a statewide approach to help urban and rural districts measure incident clearance time.

TxDOT has adopted a statewide "Road to Zero" initiative to reduce fatalities on state highways by half by 2035 and to zero by 2050. The public messaging for this initiative is *#EndtheStreakTX*. The Lufkin District currently has a four-year District Safety Plan (TxDOT Lufkin District, 2020) to support this initiative and recently received TxDOT Road to Zero funding to install DMSs in order to post safety-focused public service announcements. The Lufkin District's goal is to incorporate safety as an integral part of every project. The Texas A&M Transportation Institute (TTI) is developing a new safety-driven data tool to support safety analysis statewide.

Performance Measurement Assessment

The CMM workshop participants rated performance measurement between Levels 1 and 2. The TxDOT Houston District reports asset uptime for cameras within the Lufkin District because the Houston District operates and monitors those devices that were originally installed to support hurricane evacuations. The Lufkin District noted that their current performance measurement is informal or qualitative. As the district deploys more ITS infrastructure, the ability to manage performance will improve.

At a district level, few TSMO-related measures are used on a day-to-day basis. The Lufkin District intends to work toward formalizing a process to access data to understand what information is readily available so that TSMO-related performance measures can be considered. The Traffic Safety Division has some agreements with third-party data providers and are exploring options to expand that coverage for use by all the districts.

From a practical standpoint, the Lufkin District will require additional staffing capabilities to develop, collect, and monitor performance measures for TSMO. The district would also have to rely on statewide efforts at performance measure definition to ensure that its measures are consistent with statewide needs. This is particularly important for traffic incident management, federal MAP-21 reporting, reliability, and safety-related measures.

Performance measurement is a critical activity to test and improve how TSMO is advancing progress toward state and district goals of Safety, Reliability, Efficiency, Customer Service, Collaboration, and Integration. The implementation plan identifies Performance Measures action items to formalize processes to access data and to develop metrics for asset uptime, incident clearance time, and evacuation-related congestion management. Suggested performance measures are provided over the next few pages in Table 7 and will advance performance measurement for the Lufkin District to a solid Level 2 by 2026.

TABLE 7. TSMO PLAN PERFORMANCE MEASURES

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Ref.
Safety					
Number of fatalities	5-year rolling average $\frac{K_n+K_{n-1}+K_{n-2}+K_{n-3}+K_{n-4}}{5}$ where: K = number of fatalities N = year of calculation	▪ Total number of deaths in reportable motor vehicle traffic crashes each calendar year for the past five years on all public roads in the Lufkin District	TxDOT Crash Records Information System (CRIS)	Annually	(1)
Number of serious injuries	5-year rolling average $\frac{A_n+A_{n-1}+A_{n-2}+A_{n-3}+A_{n-4}}{5}$ where: A = number of incapacitating injuries N = year of calculation	▪ Total number of incapacitating injuries in reportable motor vehicle traffic crashes each calendar year for the past five years on all public roads in the Lufkin District	CRIS	Annually	(1)
Number of work zone crashes	5-year rolling average $\frac{C_n+C_{n-1}+C_{n-2}+C_{n-3}+C_{n-4}}{5}$ where: C = number of work zone crashes N = year of calculation	▪ Total number of work zone crashes each calendar year for the past five years on all public roads in the Lufkin District ▪ Work zone crash defined using the following CRIS crash database table codes: Crash Road Construction Zone Flag ID = “Y”, or Crash Road Construction Zone Worker Flag ID = “Y”, or OTHR_FACTR = 49 or 50 or 51 or 52	CRIS	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Ref.
Reliability					
Percent of person-miles travelled on the Interstate System that are reliable	▪ Determine 80th and 50th percentile travel times for all reporting segments ▪ Calculate Level of Travel Time Reliability (LOTTR) as the ratio of longer travel times (80th percentile) to a normal travel time (50th percentile); LOTTR is calculated for each reporting segment of the Interstate system for each of four time periods for an entire year: AM peak 6am-10am weekdays; midday 10am-4pm weekdays; PM peak 4pm-8pm weekdays, and weekends 6am-8pm ▪ Determine if reporting segment is included in measure calculation (reliable person miles). A segment is reliable if the LOTTR is less than 1.5 for *all four* time periods. If one or more time periods has a LOTTR of 1.5 or above, that segment is unreliable. ▪ Calculate person miles travelled that are reliable as Segment Length × Annual Traffic Volume × Average Vehicle Occupancy for all Interstate reporting segments with LOTTR < 1.50 for all four time periods ▪ Calculate total person-miles of travel as Segment Length × Annual Traffic Volume × Average Vehicle Occupancy for all Interstate reporting segments ▪ Calculate measure as the ratio of person-miles of travel that are reliable to total person-miles of travel	▪ Reporting segment length ▪ Travel time on segment (all vehicles) in 15-minute intervals for the hours of 6 AM to 8 PM each day for an entire year ▪ Highway type (Interstate NHS) ▪ Annual Average Daily Traffic (AADT) for each segment ▪ Average vehicle occupancy for all vehicles	FHWA's National Performance Management Research Data Set (NPMRDS) or TxDOT-approved equivalent	Biennially	(2)

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Ref.
TMS coverage	▪ Divide the number of US 59/Future I-69 major highway junctions equipped with ITS equipment by the number of major highway junctions on US 59/Future I-69	▪ Total number of major highway junctions on US 59/Future I-69 in the district ▪ Total number of major highway junctions on US 59/Future I-69 equipped with ITS-related assets	District maps and ITS asset inventory	Annually	N/A
Average incident clearance time	▪ For each incident, calculate the time between first recordable awareness of the incident and the time the last responder leaves the scene ▪ Calculate the average incident clearance time for all incidents of interest in the region for an entire year	▪ Incident notification time and time last responder leaves the scene for each incident of interest in the region	Public safety/first responders (police, fire, medical), Lufkin District Area and Maintenance Offices	Annually	(3)
Efficiency					
Percent of traffic signals retimed	Divide the number of traffic signals retimed by the total number of traffic signals on TxDOT maintained roadways in the Lufkin District.	▪ Number of traffic signals on TxDOT maintained roadways retimed ▪ Total number of traffic signals on TxDOT maintained roadways in the Lufkin District	Lufkin District Operations technicians	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Ref.
Customer Service					
Repeat visitors to Lufkin section of DriveTexas.org	▪ For each major event, pull the number of unique visitors to the Lufkin section of the DriveTexas.org website during a one-year period ▪ Compare unique visitors to other major events to track increases or decreases in visitors	▪ Unique visitors that click on information within the Lufkin District during major events ▪ List of major events that occurred each year	DriveTexas.org database	Annually	N/A
Number of subscribers to Lufkin District social media platforms	▪ Lufkin PIO uses Hootsuite, a social media management tool, to automatically calculate social media metrics	▪ Number of subscribers across all district social media platforms	Hootsuite	Monthly	N/A
Number of complaints received and resolved	▪ Use the statewide system TRACK to record the number of complaints received ▪ Calculate percentage of complaints that are resolved and closed within 10 days	▪ Number of complaints received ▪ Number of complaints resolved within 10 days	TRACK	Monthly	N/A
Collaboration					
Number of TSMO implementation status meetings	▪ Number of meetings with representatives from the four core departments (TP&D, Construction, and Operations) and the three Area Offices to review TSMO implementation status	▪ Number and dates of TSMO implementation status meetings	Lufkin District Traffic Engineer	Annually	N/A
Number of after-action review meetings	▪ Number of after-action review meetings with attendance from at least 90 percent of agencies involved in the response to a major incident/ emergency or adverse weather event	▪ Number, date, and percent of responder agencies represented at after-action review meetings	Lufkin District Traffic Engineer	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Ref.
Integration					
Percent TMS asset operational uptime	▪ For each TMS asset of interest, divide the number of hours (or other time increment) the asset is operational by the total number of hours (or other time increment) in a calendar year ▪ Calculate the average percent TMS asset operational uptime across all TMS assets.	▪ Number of hours (or other time increment) each TMS asset is operational	Lonestar, Central signal system	Annually	N/A
Percent traffic signals monitored through the network and equipped with automatic failure alerts	▪ Divide the number of traffic signals monitored through the network and equipped with automatic failure alerts by the total number of traffic signals	▪ Number of traffic signals monitored through the network and equipped with automatic failure alerts ▪ Total number of traffic signals	District Traffic Engineer	Annually	N/A
Number of joint training exercises conducted	▪ Number of joint training exercises in the region that support shared implementation of TSMO strategies	▪ Number and dates of joint training exercises in the region	Lufkin District Traffic Engineer	Annually	N/A

References:

(1) Safety Performance Measures Fact Sheet. https://safety.fhwa.dot.gov/hsip/spm/docs/safety_pm_fs.pdf

(2) Overview of Performance Measures: Travel Time Reliability (NHPP) and Annual Hours of Peak Hour Excessive Delay (CMAQ), September 2017. https://www.fhwa.dot.gov/tpm/workshop/az/reliability.pdf

FHWA Computation Procedure for Travel Time Based and Percent Non-Single Occupancy Vehicle (non-SOV) Travel Performance Measures. FHWA HIF-18-024. May 2018. https://www.fhwa.dot.gov/tpm/guidance/hif18024.pdf

(3) FHWA Traffic Incident Management Performance Measurement Presentation. https://ops.fhwa.dot.gov/publications/fhwahop10010/tim_pm_pres.ppt

Organization and Workforce

The existing organizational structure of the Lufkin District is comprised of members from TP&D, Construction, Operations, and Area Offices. Many of these district employees already perform some TSMO activities; however, 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. The Lufkin District has identified potentially new and expanded staff positions for consideration:

TSMO Coordinator – Coordinate district progress toward mainstreaming TSMO including integrating TSMO into all stages of project development and delivery, funding requests, training, and interagency coordination. This position may only require a partial FTE and will become important as more ITS infrastructure is constructed and as traffic signals are brought online and connected to a central signal system. With current mindset shifts in the positive direction regarding teleworking, this could be an opportunity to share a TSMO Coordinator that supports more than one district. In the near term, the role of TSMO Coordinator primarily falls under the responsibility of the District Traffic Engineer.

Traffic Technician -The Lufkin District ITS Master Plan identified the need for one additional FTE traffic technician (TxDOT Lufkin District, 2020). This additional FTE is needed to operate and maintain new ITS infrastructure under design and construction or programmed for future installation. The exact timing of the additional FTE will need to be monitored and assessed.

Currently, TSMO activities are diffused across many positions within TxDOT. To promote retention, a career path for operations within TxDOT could be identified more broadly across TxDOT.

The Lufkin District implements a program that rotates Engineering Assistants (EAs) into the core discipline areas and Area Offices. This allows staff to cross-train and collaborate between sections, which is critical to successful TSMO practice and supports the implementation of TSMO across program areas. However, some improvements such as teleworking options may help strengthen the program due to staff members living in geographically diverse areas within the district.

Overall, workshop participants rated organization and workforce as a Level 3. The Lufkin District plans to focus on internal training to develop a TSMO-competent workforce that continues beyond individual champions and grows roots in the organization. Actions that will advance organization and workforce to a high Level 3 include making improvements to the EA rotation program, train younger staff on planning and budgeting process, train staff on multiple types of equipment and technologies, and developing succession plans to prepare for retirements or unexpected staff turnover.

Culture

The Lufkin District has a strong relational culture, and it is important to supplement the personal communication with technology. Workshop participants rated the district's culture as between a Level 1 and a Level 2. In many cases, the Lufkin District implements some TSMO measures informally, and these practices can be formalized through this Program Plan. Additionally, as noted under Organization and Workforce, the Lufkin District has identified the need for potential new and expanded staff positions to support TSMO. Given the statewide focus on TSMO, the Lufkin District expects to improve the culture in the context of TSMO. To advance capability maturity to a solid Level 2 during the six-year program plan cycle, the following actions are recommended:

- Identify the relationship between the Lufkin District's current activities and TSMO.
- Gain an understanding of what activities fall under TSMO and what tools are available to the Lufkin District.
- Promote TSMO successes and benefits and highlight the teamwork across the district to achieve the successful results.

Collaboration

The Lufkin District and regional stakeholders, including city and county governments, the Department of Public Safety (DPS), and local emergency responders have strong personal working relationships. They collaborate across district boundaries for emergency management and applicable projects. These relationships support coordinated construction traffic management planning, traffic control, and strategic assistance by law enforcement. Workshop participants rated the district's collaboration as a Level 2. They noted that the Lufkin District has some formal agreements, such as municipal maintenance agreements. The district also noted that documenting contact points, especially for the smaller municipalities, would improve collaboration.

Additionally, Lufkin District maintenance crews assist law enforcement agencies and local jurisdictions on a routine basis in responding to traffic incidents. This includes activities such as helping protect a crash scene with temporary traffic control devices, clearing debris, and checking flood conditions during heavy rainfall events.

Recommended collaboration actions will advance the Lufkin District's capability maturity to a Level 3 during the six-year program plan cycle:

1. Develop contact lists and update them annually to capture:
    - Lufkin District contacts for district functions to be shared with stakeholder agencies
    - Stakeholder agency contacts to support the Lufkin District's external communication.
    - Identify District Liaison for Emergency Operations Centers (EOCs). Focus on communication and knowing whom to call. Resources are not always available to have a decision-maker present at an EOC, particularly when multiple counties' EOCs are activated simultaneously.
2. Develop relationship with National Weather Service (NWS) to have earlier access to weather data to support emergency operations and DPS.
3. Develop a process to transmit information to local jurisdictions as TxDOT deploys new equipment or systems (e.g., DMSs or portable changeable message signs [PCMSs]).

Capability Maturity Framework

During the capability workshop series, stakeholders also assessed each of the six dimensions for four of the six CMF frameworks. The road weather management CMF was assessed by the Operations section and planned special events within the district have minimal impact on traffic operations. Table 8 includes the overall assessment and a detailed assessment report and survey are included in the CMF Assessment (TxDOT Lufkin District, 2020). The following subsections briefly describe the Lufkin District's capabilities for each of the six frameworks.

TABLE 8. CAPABILITY MATURITY FRAMEWORK ASSESSMENT BY WORKSHOP STAKEHOLDERS

Framework	Capability Level	Framework Description
Traffic Management	2	Ability to monitor and control traffic and the roadway network to coordinate traffic information
Traffic Signal Management	2	Planning, design, integration, maintenance, and proactive operation of a traffic signal system
Work Zone Management	2	Assessment of work zone impacts and implementing strategies to minimize or mitigate impacts
Traffic Incident Management	2	Planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents
Road Weather Management	1 – 2	Management of traffic flow and operations before and during adverse weather conditions
Planned Special Events	1	Advanced operations planning, stakeholder coordination, resource sharing, and public awareness of potential travel impacts

Traffic Management

The Lufkin District's most formal business processes are in this program area. TP&D has a process to evaluate how to add ITS to construction projects. The Lufkin District is working toward connected signals to be able to measure uptime and perform remote diagnostics. They have programmed DMSs and cameras as part of future construction projects. The district has limited staff availability for traffic management and noted the benefit of technology to reduce field time.

Traffic Signal Management

The Lufkin District has noted the need to develop a traffic signal management plan to identify a path for improvement. They are currently limited by the lack of connectivity and communication with signals. In addition to funding to implement signal communication, funding is also needed to maintain communications infrastructure and to support formalized training and professional knowledge building for professional traffic signal operations staff.

Work Zone Management

The Lufkin District focuses on continuous improvement in work zones. They discuss lessons learned from previous projects when planning work zones and typically incorporate those lessons into the general notes of the plan sheets for similar, future projects. The district includes a safety contingency in construction contracts to account for potential additional safety measures to support work zones, which reduces the need for change orders. The Lufkin District has a four-year safety plan and is focused on reducing work zone fatalities. They deploy PCMSs where feasible and driver speed feedback trailers in strategic locations. Additionally, the Lufkin District PIO provides daily communications to regional partners and the public through social media and e-mail blasts.

Traffic Incident Management

When incidents occur, law enforcement notifies the Lufkin District if traffic control is needed. The Lufkin District has a district-specific flow chart that serves as a guideline for their traffic incident management process. The district has guidance for the management of hazardous materials spills. Ideally, the responsible party cleans the area; however, the district has a contract with a hazardous materials clean-up company in Houston that can be used, as needed, as well as a procedure to recover costs from the responsible party. The district's strong relational culture and collaboration with the Lufkin police department and DPS, as well as strong communication by the PIO, support traffic incident management.

Road Weather Management

Flooding and icing are the most common weather events that impact Lufkin District roadways. Hurricane evacuation routes bring travelers into the district during extreme weather. The district has a Snow and Ice Control Plan (TxDOT Lufkin District, 2020) that guides their winter road weather management. The Lufkin District also participates in an annual winter weather preparedness meeting with the TxDOT Tyler and Atlanta Districts, the Arkansas Department of Transportation (ArDOT), and the Louisiana Department of Transportation and Development (La DOTD). The Lufkin District conducts annual hurricane preparation meetings. Their strong relationships with law enforcement support the management of detours and road closures.

Planned Special Events

The Lufkin District's planned special events do not typically require management by TxDOT, as most events are either not on TxDOT facilities or are in rural areas that do not require traffic management. However, if planned special events were to occur on TxDOT facilities, the Lufkin District's strong regional relationships would provide the necessary foundation to support these events.

TSMO Implementation Plan

This section includes a prioritized implementation plan for advancing TSMO in the Lufkin District over the next six years. Based on the discussions and action needs for the Lufkin District brought forward in the Working Group meetings, stakeholder meetings within the district, and then further discussed through the Capability Maturity Model (CMM) and Capability Maturity Framework (CMF) surveys and workshops, numerous action items were identified. This Plan narrows the actions down to the highest priorities.

This section summarizes TSMO strategy action items for implementation within the next six years, statewide TSMO initiatives, and the process for implementing and updating the TSMO Plan.

Lufkin District Six-Year Action Plan

Table 9 includes the following information as it relates to each of the TSMO strategy action items identified for implementation by the Lufkin District:

- **Action Number:** Provides a number for identification and tracking of the action. The initials stand for the related CMM dimension: business processes (BP), systems and technology (ST), performance measurement (PM), culture (CU), organization and workforce (OW) and collaboration (CO).
- **Action Description:** Provides a brief description of the action, which may include multiple steps.
- **Supports District TSMO Goals:** Identifies which of the TSMO goals the action supports. Some actions may not directly support a goal but their implementation will help in achieving the goal. The six statewide TSMO goals supported by the district are described in Table 2: safety, reliability, efficiency, customer service, collaboration, and integration.
- **Timeline:** A target fiscal year (FY) has been identified within the next six years. TxDOT's fiscal year runs from September 1st through August 31st. These targets were set based on the time it will take to implement an action, the urgency of the action, whether there are dependencies on other actions, or available resources. Priorities may shift as major events occur or staffing and funding resources change.
- **TxDOT Lufkin District Lead:** Identifies the individual at the Lufkin District who will take ownership of the action and will oversee that implementation progresses as planned.
- **Partners:** Identifies TxDOT Districts or Divisions or external stakeholders needed for coordination or resources for successful action implementation.
- **Resources:** Identifies staff, funding, and other tools needed to support the action.
- **Measures of Success:** Provides performance metrics that will help action tracking and reporting.

This Lufkin TSMO Plan includes actions to advance the TSMO program within the district. The Lufkin District ITS Master Plan includes a prioritized project list of field devices or systems (e.g., signal upgrades, DMSs) and equipment (e.g., PCMSs, TMAs) (TxDOT Lufkin District, 2021).

TABLE 9. LUFKIN DISTRICT TSMO IMPLEMENTATION PLAN ACTIONS

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS: SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION	TIMELINE	TXDOT LUFKIN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
BUSINESS PROCESSES (BP)												
BP-01	Develop a **Traffic Signal Management Plan** (some efforts already underway), including: ▪ Conduct quality-of-service assessment of arterial/corridor-level timing plans at regular intervals (e.g., least every three years) ▪ Develop traffic signal maintenance logbook ▪ Develop a process for the police to override signals ▪ Work with TRF to use third party data for signal timing ▪ Participate in regional traffic signal operations/traffic signal timing programs ▪ Develop a concept of operations for regional traffic signal operations, including defining corridor operating objectives ▪ Develop and implement a policy for identifying traffic signal priority for transit and emergency vehicles ▪ Develop a regional Signal Phase and Time (SPaT) deployment plan ▪ Develop criteria for different signal operating modes, including flashing operations, traffic responsive, and dynamic timing ▪ Establish special timing plans for alternate routes for incident management, special events, and construction activities ▪ Develop criteria for automatic notification of equipment outages and service interruptions.	✓	✓	✓	✓	✓	✓	FY22	District Traffic Engineer	Cities of Lufkin and Nacogdoches, TRF	Staff hours	% complete until finalized
BP-02	Consider documentation of standard operating procedures (SOPs) to support business processes and organization and workforce. ▪ Implement a system for tracking requests for operational changes/troubleshooting ▪ Identify needs and develop formal processes to support operators' responses to spot-specific road weather conditions	✓	✓	✓	✓			FY23	District Traffic Engineer	LFK TMS Technicians, TRF	Staff hours	% complete until finalized
BP-03	Develop a **Traffic Incident Management** (TIM) Program, including considerations for: ▪ Identify the steps needed and the external stakeholder agencies that should be involved in the development of a formal traffic incident management program. Document existing and proposed processes. Include lessons learned from past efforts. ▪ Work with those stakeholders to identify roles and responsibilities and establish a regular meeting schedule. Consider structuring meeting groups to cover a two- or three-county geographic area. ▪ Identify and understand the applicability of "Quick Clearance Laws" (e.g., Move Over Laws, Driver Removal Laws, Authority Removal Laws). ▪ Identify a process to establish after-action reviews that are related to traffic incident management. Consider combining the review of critical incidents with a potential semi-annual or annual meeting of the key stakeholders (e.g., law enforcement, TxDOT). ▪ Consider how and when to involve external agencies or private parties (e.g., towing, hazmat) in after-action reviews. ▪ Understand what data can be shared between DPS and the Lufkin District. ▪ Identify a process to improve communication with the DMV for alerts with oversize or wide load operations around incidents.	✓	✓	✓	✓	✓	✓	FY23	Director of Operations	District Engineer, Statewide TIM Coordinator, DPS, Local Law Enforcement, Fire Departments, County Judges, TCEQ, Towing Operators, DMV	Staff hours	% complete until finalized
BP-04	Develop a **Work Zone Management Plan**, including: ▪ Consider a mechanism (e.g., check box) in the work zone design development process to consider lessons learned from similar projects. ▪ Ensure that district staff members are requesting law enforcement for work zone management systematically, effectively, and in accordance with developed policies. ▪ Conduct and document debriefings after major projects to obtain input on successes, lessons learned, etc., regarding work zone management efforts, including critiquing the effectiveness of traffic management plans. ▪ Identify a process to improve the synchronization of permits with work zone information.	✓	✓	✓	✓	✓		FY24	Director of Construction	Director of Operations	Staff hours	% complete until finalized
BP-05	Formalize and document collaboration with the Houston District and Houston TranStar, including: ▪ Define roles and responsibilities for reporting incidents to Houston TranStar ▪ Formalize ITS operations and maintenance agreement ▪ Formalize DMS message dissemination procedure during hurricane evacuations to make sure DMS messages are consistent		✓	✓	✓	✓		FY25	District Traffic Engineer	Houston District, Houston TranStar	Staff hours, legal documentation	% complete until finalized
BP-06	Develop a standards-based regional communications architecture/plan, including a network security plan.		✓			✓		FY25	District Traffic Engineer	Director of Operations	Staff hours	% complete until finalized

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						TIMELINE	TXDOT LUFKIN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
SYSTEMS AND TECHNOLOGY (ST)												
ST-01	Incorporate future statewide plans for video brokerage, asset systems, signal control, and third-party data use (e.g., INRIX, WAZE) ▪ Identify options to receive alerts and advisories from third-party data (e.g., INRIX, HERE, WAZE) ▪ Identify opportunities to use third-party data to develop travel times for detours.		✓	✓	✓	✓	✓	Ongoing	District Traffic Engineer	TRF	Staff hours, workstations that can link to systems	% complete until finalized
ST-02	Consider how technology can support goals for improvement in the district's four-year safety plan.	✓			✓		✓	Annually	District Traffic Engineer	LFK District Engineer, Director of Operations, TRF	Staff hours, CRIS data	% complete until finalized
ST-03	Develop a Systems Engineering approach to identify functional requirements for traffic signal system infrastructure. Conduct risk assessment of traffic signal system technologies and infrastructure. ▪ Identify system technologies needed to provide an on-demand assessment of traffic signal performance. ▪ Implement a system with TRF to collect traffic signal data.		✓	✓	✓			FY23	District Traffic Engineer	TRF	Staff hours, funding for signal infrastructure	% complete until finalized
ST-04	Develop and implement a decision support system (DSS) architecture that assembles roadway information (weather, incidents, third-party data), operations responses, and maintenance strategies. Considerations: ▪ Establish support systems to ensure data quality and to resolve conflicting information between weather sources. ▪ Identify a process to increase the use of driver warning systems (DMS, PCMS, etc.).	✓	✓		✓			FY24	Director of Operations	LFK District Engineer, Director of Maintenance	Staff hours	% complete until finalized
ST-05	Update regional ITS architecture or participate in a multi-district or statewide ITS architecture. (The Lufkin District prefers a multi-district or statewide ITS architecture.)		✓	✓		✓	✓	TBD	District Traffic Engineer	Director of Operations	Staff hours, knowledge of ARC-IT software	% complete until finalized
PERFORMANCE MEASUREMENT (PM)												
PM-01	Develop a **Performance Measurement Plan** for districtwide traffic management. Considerations: ▪ Formalize the "informal" performance metrics. ▪ Identify and explore the available data to measure performance. ▪ Consider the need for additional staff support to coordinate performance measurement as more infrastructure is deployed (e.g., shared ITS analysts across districts or outside support, such as the Texas A&M Transportation Institute (TTI)). ▪ Work with local academic institutions to create a shared metrics platform. ▪ Identify target corridors, including possible nearby arterials (where the impacts of traffic management are expected), to be included in performance management. ▪ Develop an organizational approach for assessing changes in system performance for routes of regional significance. ▪ Analyze peak-period operations at the district's most congested intersections. ▪ Review the data and performance measures used by the Houston District to determine if they could be applied to the Lufkin District.	✓	✓	✓	✓	✓	✓	FY23	District Traffic Engineer	TRF, Houston District, Academic Institutions	Staff hours, data sources	% complete until finalized
PM-02	Develop performance metrics relevant to traffic signal management, including safety related performance metrics. Considerations: ▪ Establish reliability thresholds for traffic signal system infrastructure. ▪ Establish baseline criteria for a minimum level of equipment performance (i.e., state of good maintenance) that is agreeable to all regional agencies		✓		✓			FY24	District Traffic Engineer	Director of Operations	Staff hours, traffic signal data from central system	% complete until finalized
PM-03	Define outcome-based performance measures needed to evaluate high interest work zone management strategies and traffic management plan effectiveness.	✓	✓		✓			FY25	District Traffic Engineer	Director of Construction	Staff hours, work zone operations data	% complete until finalized

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						TIMELINE	TXDOT LUFKIN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
ORGANIZATION AND WORKFORCE (OW)												
OW-01	Establish a core group for traffic management that includes staff for key roles requiring redundancy. Identify a career path for operations within TxDOT.			✓		✓		FY22	Director of Operations	District Engineer	Staff hours	% complete until finalized
OW-02	Increase the number of district staff who have completed the Strategic Highway Research Program 2 (SHRP2) traffic incident management training.	✓		✓	✓	✓		FY22	Director of Operations	District Engineer	Staff hours	% complete until finalized
OW-03	Include junior staff in planning and budgeting processes.			✓		✓		FY23	Director of TP&D	Directors of Operations	Staff hours	% complete until finalized
OW-03	Ensure that the staff (Lufkin District or consultant) has the knowledge and expertise to accommodate complex integration requirements for the use of new systems and technologies. Provide training for new technologies. ▪ Provide funding to support formalized training and professional knowledge building for professional traffic signal operations staff. ▪ Train work zone designers and operations personnel on how existing technology resources can be used for work zone management.			✓	✓		✓	FY24	Director of Operations	District Engineer	Staff hours	% complete until finalized
OW-04	Provide staffing for real-time performance monitoring during normal work hours once more infrastructure is deployed.		✓		✓			FY27	Director of Operations	District Engineer	Staff hours	% complete until finalized
OW-05	Consider the need for additional or shared full-time equivalent (FTE) operations and maintenance staff to be more proactive once more infrastructure is deployed.		✓		✓			FY27	Director of Operations	District Engineer	Staff hours	% complete until finalized
CULTURE (CU)												
CU-01	Gain an understanding of what activities fall under TSMO and what tools are available to the Lufkin District. Generate an outreach program that provides critical performance measure information across all audiences via diverse platforms for overall agency activities related to TSMO.				✓	✓	✓	Ongoing	District Traffic Engineer	PIO, District Engineer, Directors, TRF	Staff hours	% complete until finalized
COLLABORATION (CO)												
CO-01	Develop/update contact lists and distribute regularly, taking into consideration: ▪ Lufkin District points of contact for external stakeholders ▪ Lufkin District liaison(s) for Emergency Operations Centers (EOCs) ▪ Key contacts at local jurisdictions and law enforcement agencies ▪ Key stakeholders for work zone design and traffic management plan development			✓		✓		Annually	PIO	Directors, Area Engineers, Maintenance Offices, Safety Engineers, stakeholder agencies	Staff hours	% complete until finalized
CO-02	Develop a process to transmit information to local jurisdictions as TxDOT deploys new equipment or systems (e.g., DMSs or portable changeable message signs [PCMSs]).				✓	✓		FY22	PIO/District Traffic Engineer	Directors, Area Engineers, Maintenance Offices, Local Jurisdictions	Staff hours	% complete until finalized
CO-03	Develop relationship with National Weather Service (NWS) to have earlier access to weather data to support emergency operations and DPS.	✓		✓	✓	✓	✓	FY24	Director of Operations	NWS, DPS	Staff hours	% complete until finalized

Advancing Statewide TSMO Actions in the Lufkin District

In addition to efforts led by the Lufkin District, part of the implementation plan includes working with TRF to roll out statewide initiatives at the district or working with other districts who may be leading efforts. Table 10 includes an overview of other TxDOT initiatives and the Lufkin District's role. This list will continue to evolve as more statewide initiatives are rolled out and the Lufkin District continues to collaborate with other districts.

TABLE 10. IMPLEMENTATION OF TSMO STATEWIDE INITIATIVES

Initiative	Lufkin District Role
TxDOT ITS Design Manual- The development of a statewide manual is underway. TRF has been reaching out to the districts to gather existing practices, standards, and specs.	Provide existing documentation to TRF. Review draft manuals based on experience.
Third Party Data Integration- TRF is currently working with third party data providers to evaluate how to supplement TxDOT mobility data (e.g., volume, speed) to provide coverage where there are currently gaps.	LFK District Traffic Engineer & PIO: Provide input on gaps on system coverage as requested by TRF.
Data Lake- TxDOT is collecting data from several sources (including Lonestar™ and CRIS) to create a repository of unstructured data and also working to develop a Data Mart, which is a structured data platform that can be brokered for specific user needs.	Coordinate with TRF and ITD to incorporate Lufkin District data sources
TSMO Training- TRF has provided and will continue to provide training opportunities for TSMO, including presentations and discussions at the annual Traffic Safety/Operations/ Maintenance Conference and annual Short Course. Other webinars or in-person trainings may also be available. TRF is currently developing approximately 30 TSMO training modules	Participate in available training opportunities. Share new knowledge with applicable Lufkin District staff.
Develop Methodology to Allocate ITS/Signals O&M Funding to Align with TSMO Goals	Provide input and guidance for help allocating more TMS O&M funding.
Develop Statewide Standard Operating Procedures to Improve Operational Interoperability	Consider using SOPs to cover any gaps.
Improve Procurement Processes to Support TSMO Program Objectives	Provide existing procurement processes. Apply new processes as applicable.
Develop Emergency Response Plan to Improve Preparedness, Response, and Recovery	Provide current capabilities and provide feedback on areas to improve within the Lufkin District.
Develop Enhanced Traffic Signal System Implementation Plans	Provide existing enhanced traffic signal implementation plans and work to expand existing program.
Strengthen Traffic Incident Management (TIM) Teams Collaboration with Stakeholders to Safely Reduce Incident Clearance Times	Work with TRF to expand interagency agreements in the region if deemed applicable.

Initiative	Lufkin District Role
Highway Conditions Reporting System (HCRS)- Determine if there is an external interface for district partners (e.g., cities, counties) to enter planned and ongoing construction information into HCRS, which also populates the DriveTexas.org website.	If an external interface is or becomes available, provide outreach and training to stakeholders within the district.

TSMO Implementation Plan Process

The Lufkin District TSMO Implementation Plan is intended to be a living document that is updated as progress on actions gets made or as things change, as illustrated in Figure 8.

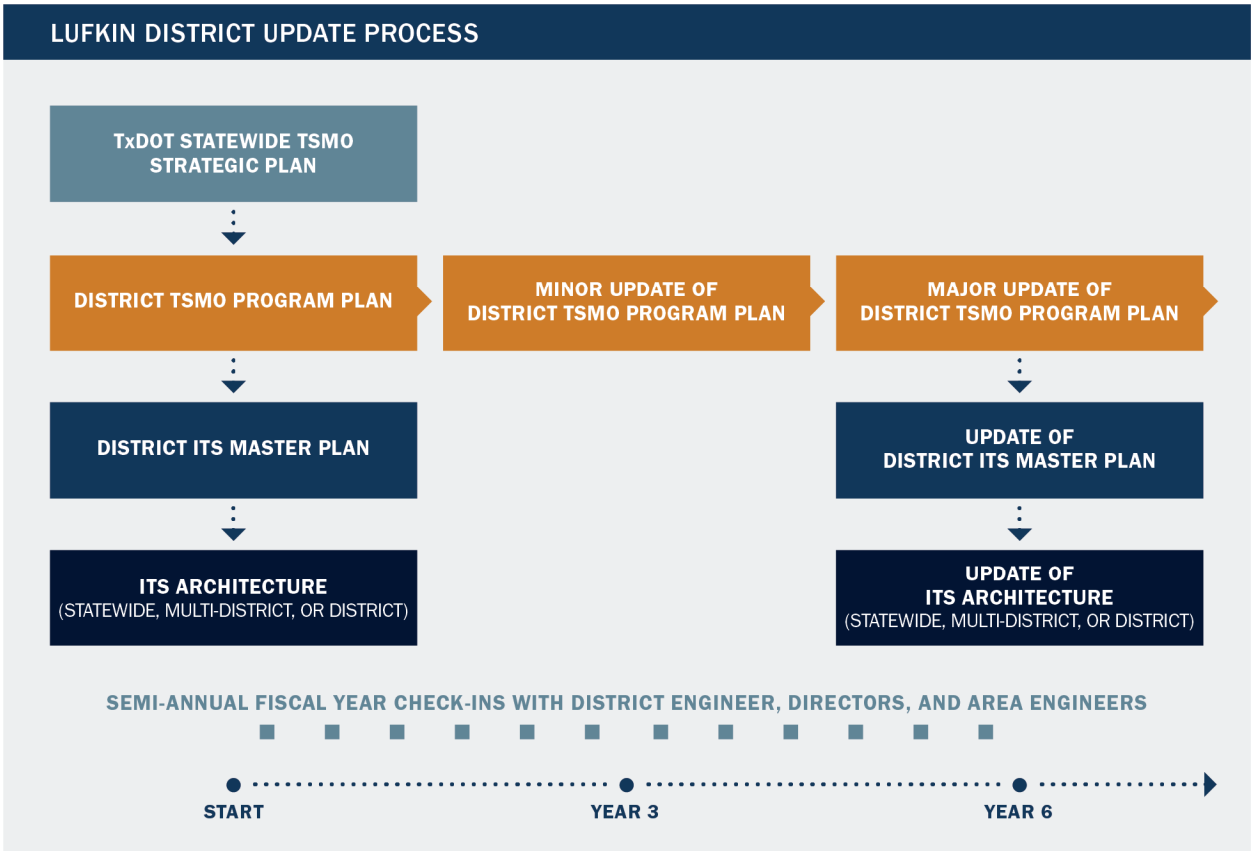


FIGURE 8. LUFKIN DISTRICT TSMO PLAN UPDATE PROCESS

A key activity in maintaining the plan is the semi-annual check-in of progress of the implementation plan. Once per six months, the Director of Operations or District Traffic Engineer will coordinate with the District Engineer to include TSMO Program Plan status as an agenda item on the existing District Engineer's Staff/Area Engineer Meeting. This staff meeting includes the District Engineer; Directors of TP&D, Construction, and Operations; Area Engineers; and other supervisors. This will allow staff to provide status updates on progress made on action items and discuss if any changes are needed to upcoming action items. Part of this check-in will include an ongoing performance assessment using the objectives and measures established as part of this plan. As

the district continues to refine performance metrics and include new data sources, existing and aspirational objectives should be re-visited as part of the TSMO Plan update process.

Overall, the Lufkin District plans to update the TSMO Program Plan (including CMF surveys), ITS Master Plan, and ITS architecture on a six-year cycle with an interim minor update to the TSMO Program Plan every three years as shown in Figure 8. The Lufkin District is currently developing an ITS Master Plan. As discussed previously, the regional ITS architecture has not been updated for some time. The Traffic Safety Division is assessing whether every district needs a separate ITS architecture or if broader architectures should be developed. The Lufkin District noted a preference for a multi-district or statewide ITS architecture on which the district provides input but does not maintain.

TSMO Tactical Plan Assessment

This TSMO Program Plan has established the Lufkin District's *strategic* elements—relating TSMO strategies to the district's mission, vision, goals, and objectives —and *programmatic* elements—organizational structure and business processes necessary to support TSMO implementation. This final section focuses on the *tactical* elements — the actions necessary to operationalize the services, programs, and priorities identified in the Implementation Plan.

A TSMO Tactical Plan should be considered in the future for any Lufkin District prioritized services, activities, or projects that may need additional efforts to advance. This section describes tactical plan criteria, tactical plan components, and recommended tactical plans.

Tactical Plan Criteria

Tactical criteria were developed by TxDOT's Traffic Division using qualitative descriptors with the intent that, as tactical plans advance to implementation, quantitative analyses will be performed (e.g., cost estimates, benefit-cost ratios, funding sources, detailed schedules). Criteria for tactical plans applied at the strategic plan level are as follows:

- Alignment with the district's mission, vision, and goals (safety, reliability, efficiency, customer service, collaboration, and integration)
- Lufkin District staff support (e.g., low, medium, high)
- Stakeholder partnerships (e.g., internal, external)
- Costs (e.g., low, medium, or high for initial and recurring costs)
- Return-on-investment (e.g., low, medium, high)

Tactical Plan Components

The Traffic Division recommends that each Tactical Plan contain these components:

1. A description of the prioritized service, activity, or project
2. An identification of the key enabling implementation guidelines and policies
3. An investment/financial plan
4. An annual action/deployment plan
5. An identification of the performance measures to be used to monitor and evaluate investments

These five tactical plan components are described more fully in the following subsections.

Description of the Prioritized Service, Activity, or Project

Describe the initiative and how it supports the district's TSMO goals and objectives. Describe existing services such as devices and systems, staffing, priorities, and stakeholder coordination. Perform a gap analysis to review how emerging technologies, operating models, data acquisition and utilization, resources and staffing, and business process relate to the initiative. Describe the future of the initiative.

Supporting Implementation Policies and Guidelines

Identify the relevant TxDOT statewide, district, or federal policies and guidelines needed for the specific service or strategy. Examples include standards and specifications for communications technologies, guidelines for

selection or deployment of ITS devices, policies and guidance on public/private data sharing initiatives, decision-making guidelines for implementation, and service levels standards for devices.

Investment/Financial Plan

Effective planning for TSMO involves identifying the costs associated with deployment of services, which may include new infrastructure investments, technology purchases, staff time and resources, or other resources. Use benefit/cost or other criteria analysis methods to support project prioritization and funding requests. Identify current funding resources for the deployment and any potential funding sources that could be matched to the initiative or each action item or project.

Annual Action Plans

Drawing from funding resources and opportunities to integrate TSMO in other activities and projects, develop a set of specific actions for deployment, on an annualized timeframe. These annual plans should be developed in coordination with larger district or agency planning efforts and integrated in standard programs, which often have a four-year timeframe.

Tracking Progress: Performance Assessment

Finally, the TSMO Tactical Plan should address how performance analysis will be conducted to measure the effectiveness of tactics in meeting program objectives. Select from the metrics identified earlier in this TSMO Plan to be used to conduct on-going monitoring of system performance and project evaluation. Clearly identify how to measure progress towards meeting the program's stated objectives. Also identify what data are currently available and what additional data are still needed. Finally, consider ways that data can be used to tell success stories to justify future TSMO investments and to promote a TSMO culture within the district.

Recommended Tactical Plans

Tactical plans are not yet recommended for the Lufkin District. With a heavy reliance on the Houston District for operational and maintenance support, the TSMO action items to develop formal agreements are a high priority. The district's Snow and Ice Control Plan (TxDOT Lufkin District, 2020) already serves as a road weather management tactical plan for winter weather.

The Lufkin District should consider developing tactical plans for:

- Traffic management (once more ITS infrastructure is constructed)
- Traffic incident management (to formalize and advance existing processes)
- Work zone management (to incorporate TSMO strategies and technologies)
- Road weather management for flooding events

References

- TxDOT (2018) *Transportation Systems Management and Operations (TSMO) Statewide Strategic Plan*
- TxDOT Lufkin District (2020) *TSMO State of the Practice*
- TxDOT Lufkin District (2020) *2020 Safety Plan*
- TxDOT Lufkin District (2020) *Snow and Ice Control Plan*
- TxDOT Lufkin District (2021) *ITS Master Plan*
- TxDOT Lufkin District (2020) *Leadership and Stakeholder Outreach Plan*
- Strategic Highway Research Program (SHRP2), American Association of State and Highway Officials (AASHTO), and Federal Highway Administration (2017) *Developing and Sustaining a Transportation Systems Management & Operations Mission for Your Organization: A Primer for Program Planning* (FHWA-HOP-17-017)
- FHWA (2020) *Capability Maturity Frameworks Overview*
- TxDOT Lufkin District (2020) *Capability Maturity Model (CMM) Workshop Summary*
- TxDOT Lufkin District (2020) *Capability Maturity Framework (CMF) Assessment*
- TxDOT (2021) *Unified Transportation Program*
- ConSysTec (2005) *Lufkin Regional ITS Architecture*
- USDOT (2019) *Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)*
- USDOT (2002) *Building Quality Intelligent Transportation Systems Through Systems Engineering*
- FHWA California Division (2009) *Systems Engineering Guidebook for ITS, version 3.0*
- USDOT (2015) *Fixing America's Surface Transportation Act or "FAST Act"*
- TxDOT (2018) *Performance Dashboard*
- FHWA (2016) *Safety Performance Measures Fact Sheet* (FHWA-SA-16-044)
- FHWA (2017) *Overview of Performance Measures: Travel Time Reliability (NHPP) and Annual Hours of Peak Hour Excessive Delay (CMAQ)*
- FHWA (2018) *FHWA Computation Procedure for Travel Time Based and Percent Non-Single Occupancy Vehicle (non-SOV) Travel Performance Measures* (FHWA-HIF-18-024)
- FHWA (2009) *Traffic Incident Management Performance Measurement Presentation* (FHWA-HOP-10-010, Appendix A)
- TxDOT (2018) *Transportation Systems Management & Operations*

Lufkin District TSMO Plan

TSMO Program Plan

APPENDIX

Appendix A: List of Stakeholders and Acknowledgments

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In association with

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