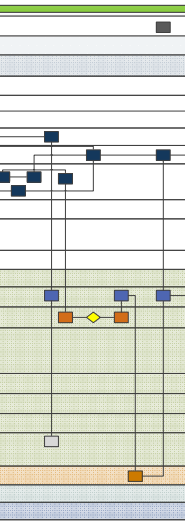
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)



CHILDRESS DISTRICT PROGRAM PLAN

January 2021

Texas Department of Transportation

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List of Acronyms

Acronym	Definition
AASHTO	American Association of State Highway and Transportation Officials
ATMS	Advanced Traffic Management System
ATSPM	Automated Traffic Signal Performance
CCTV	Closed Circuit Television
CMF	Capability Maturity Frameworks
CMM	Capability Maturity Model
DMS	Dynamic Message Signs
DOT	Department of Transportation
DPS	Department of Public Safety
ESS	Environmental Sensor Stations
FHWA	Federal Highway Administration
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
PIO	Public Information Officer
RWIS	Road Weather Information Systems
RSU	Road Side Units
RWM	Road Weather Management
SEA	Systems Engineering Analysis
SHRP2	Strategic Highway Research Program
TIM	Traffic Incident Management
TRF	Traffic Safety Division
TMS	Traffic Management System
TP&D	Transportation Planning and Development
TSMO	Transportation Systems Management and Operations
TxDOT	Texas Department of Transportation
UTP	Unified Transportation Program
WZM	Work Zone Management

Executive Summary

Relieving non-reoccurring congestion, maintaining Intelligent Transportation Systems (ITS) infrastructure, Traffic Incident Management (TIM), and reducing fatal crashes are the Childress District's top priorities. Transportation Systems Management and Operations (TSMO) helps the District manage these priorities by optimizing existing infrastructure through planning and design processes, increasing operations, and improving maintenance practices.

Since 2017, the Texas Department of Transportation (TxDOT) continuously improved Traffic Management Systems (TMS) through the state. Chief Engineer, William Hale, and the Director of Traffic Safety Division (TRF), Michael Chacon, have issued memos outlining the expectation that each District will be improving their TMS through implementing TSMO practices. TSMO has already improved safety, mobility, operations, and maintenance challenges in many districts within TxDOT. Before TSMO implementation, the Childress District used its TMS solely to track asset uptime performance metrics. The overarching goal for the District is to optimize the operations of their TMS. This can be achieved by incorporating TSMO strategies and practices within the District's current processes and creating new TSMO orientated systems to accomplish new objectives.

Figure 1. Memo's Issued by William Hale and Michael Chacon

TSMO strategies will broaden the District's TMS capabilities to achieve the performance targets set by executives at TxDOT. These activities will be implemented by integration through existing initiatives and with consideration during the project development process. TxDOT commenced a statewide TSMO planning initiative in 2016 using Federal Highway Administration (FHWA) guidance and American Association of State Highway and Transportation Officials (AASHTO) guidance. Formalizing TSMO in the Childress District will improve the agency by:

- Improving the project delivery process to by enhancing the integration of traffic operations in a collaborative manner
- Maximizing the reliability of existing and future operational assets
- Providing opportunities to manage regional mobility and safety holistically through innovative methods

The Childress District is taking steps to implement TSMO throughout the District by developing the Childress Program Plan. Following the TxDOT Statewide TSMO Strategic Plan from 2017, the Program Plan aims to set the framework for how TSMO will be conducted and to identify action items for implementation. At the time this report (October 2020) was prepared the TxDOT Statewide TSMO Strategic Plan was updated. The purpose of the Childress District TSMO Program Plan is to identify improvement opportunities in the following key elements:

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

The Childress District TSMO Program Plan follows the guidance provided in the Statewide TSMO Strategic Plan and provides further details and implementation action items. Currently TSMO activities within the District occur on an ad hoc basis, this plan identifies how to mainstream TSMO in the district so that activities occur in a more systematic manner.

Introduction

The TxDOT Childress District, shown in **Figure 2**, is implementing a TSMO program, which is a holistic approach to manage congestion for existing and future infrastructure through traditional and innovative operations and management strategies. The implementation of the District's plan is in coordination with on-going statewide TSMO development. However, TxDOT is a decentralized agency, meaning that governing policies and regional needs vary throughout the state. To fit the decentralized structure, TxDOT designed a three-step hierarchical approach for the TSMO program planning initiative, through which the Childress District will coordinate with on-going statewide TSMO efforts shown in **Figure 3.**

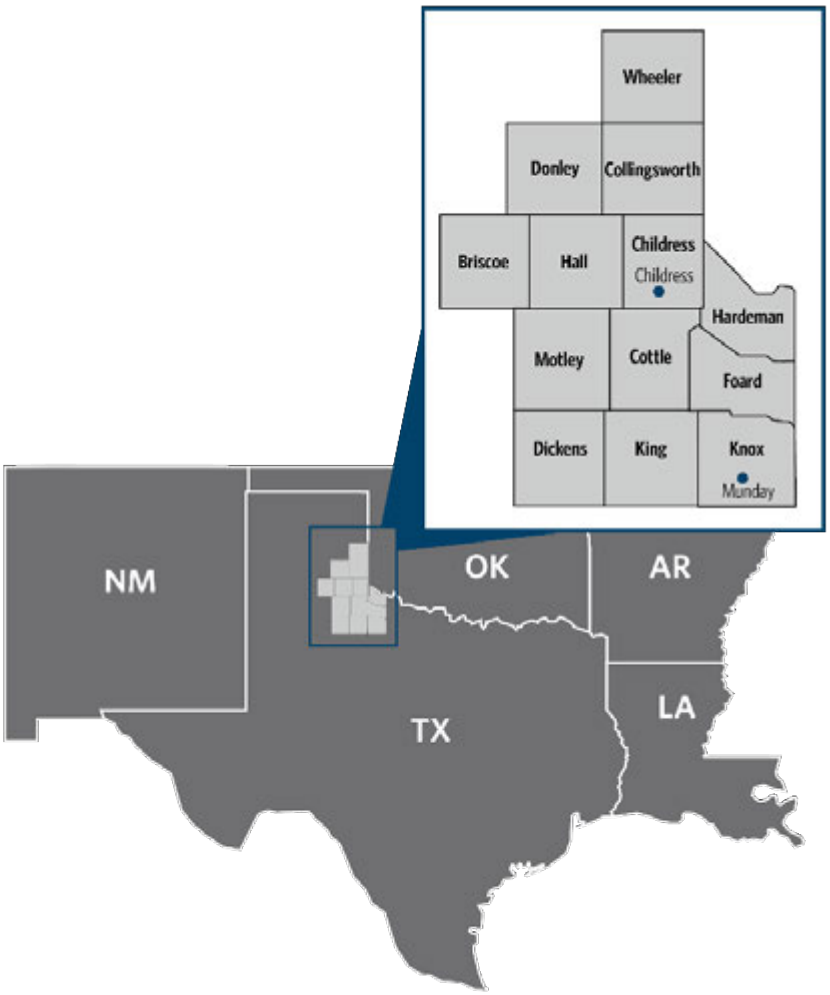


Figure 2. TxDOT Childress District Area

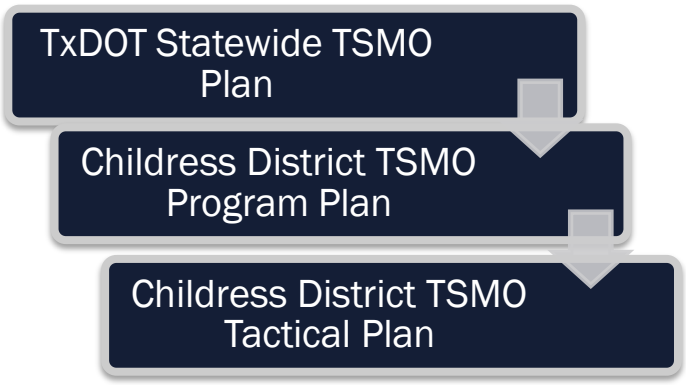


Figure 3. TxDOT TSMO Three-Step Hierarchical

TSMO Statewide Strategic Plan

TxDOT developed the Statewide TSMO Strategic Plan in August 2017 to establish the statewide vision, mission and goals for TSMO. It should be noted, at the time this program plan was prepared TxDOT was updating the Statewide TSMO Strategic Plan (October 2020). The Statewide TSMO Strategic Plan serves as a framework for districts and regions to establish TSMO programs. The document defines the processes and agreements to maintain consistency throughout the state for TSMO implementation.

District TSMO Program Plans

District TSMO Program Plans provide district-specific details on TSMO goals, responsibilities, and institutional arrangements for implementation. The program plans provide district-specific details on TSMO goals, responsibilities, and institutional arrangements for implementation. The Childress District is one of 25 districts developing a TSMO Program Plan. As adjacent districts may have the similar mobility needs, transportation infrastructure, transportation systems, formal processes, or connecting corridors, the Childress District TSMO Program Plan may be interconnected with other district program plans.

District TSMO Tactical Plans

For details and procedures regarding specific TSMO strategies, Districts can develop TSMO Tactical Plans that provide details to deploy the specific TSMO strategies. When considering a cross-regional corridor's needs, the Childress District's tactical plans may interconnect with other district tactical plans.

Stakeholder Meeting and Outcomes

A TSMO State of the Practice Report was developed to document the existing conditions of TSMO activities within the District. Information compiled for this report was gathered from three workshops with internal and external stakeholders from various practice areas within the Childress District. The workshops were held to provide TSMO training and collect essential feedback regarding the District's TSMO program through a capability maturity model (CMM) assessment and specific TSMO program areas through capability maturity framework (CMF) assessments.

The CMM assessment framework evaluates six capability dimensions of a TSMO program:

- Business Process
- Performance Measure
- Organization and Workforce
- Systems and Technology
- Culture
- Collaboration

Stakeholders were asked to review each of the six CMM capability dimensions and rate themselves based on the scale of Level 1 (performed ad hoc) to Level 4 (optimized and reviewing new opportunities).

Stakeholders were asked to participate in the CMF assessment for the six TSMO program areas:

- Traffic Management
- Work Zone Management
- Planned Special Events
- Traffic Signal Management
- Road Weather Management
- Traffic Incident Management (TIM)

The assessments were based on a similar set of questions developed by the FHWA for CMF for each of six TSMO program areas.

The findings of the CMM and CMF assessments were presented to the District on August 28, 2020. Recommendations were developed based on the findings of the CMM and CMF assessments. These recommendations were compiled and are included in this report and serve as the basis to develop the TxDOT Childress District's TSMO Program Plan. The Childress District TSMO Program Plan is meant to be a "living document" and should be updated as technologies and District capabilities evolve.

Business Case for TSMO

TSMO strategies support safe, reliable, and efficient transportation, which positively impacts economic growth within the District. By integrating activities already underway in the District with additional strategic TSMO strategies, TSMO will foster increased collaboration, maximize project outcomes, and result in cost-effective transportation improvements. Potential TSMO action items that would complement these business cases are listed in **Table 1**.

Table 1. Business Case TSMO Action Items

Business Case	Potential Action Steps for Advancing TSMO
Collaboration	• Improve linkage between the road weather management (RWM) program and other planning activities in the district or within TxDOT. Obtain management buy-in / support of the use of a decision support system to affect / alter operations on the system as a result of specific weather triggers.
Maximize Project Outcomes	• Create Regional Traffic Operations Forum where agencies can build consensus and plan operational improvements from a regional perspective. Establish preventive maintenance program for ensuring maximum performance for not only equipment but also operational settings (e.g., timing plans). • Develop a performance management/monitoring plan. Establish processes and procedures for identifying and addressing operational and safety deficiencies based on regular assessment of intersection and arterial performance. • Consider traffic incident management during planning efforts for construction and work zones. • Develop and maintain a schedule of PSE for the region / district.
Cost Effective Improvements	• Increase funds specifically allocated for traffic incident management on a regional / district basis. • Determine methods and data that will be used for agency determination of innovative contracting decisions.

Collaboration

To further advance the mobility goals of the District, TSMO can be leveraged to advance the safety, efficiency, and reliability of the multi-jurisdictional transportation system. TSMO consolidates transportation operations and managements activities currently underway in the District, building connections with stakeholders (between various divisions) and regional partners (first responders, cities, counties, weather service, etc.) to optimize the operation of transportation infrastructure.

Collaboration for planning, design, construction, operation, and maintenance of transportation facilities with the counties shown in **Figure 4** will enhance mobility within the District.

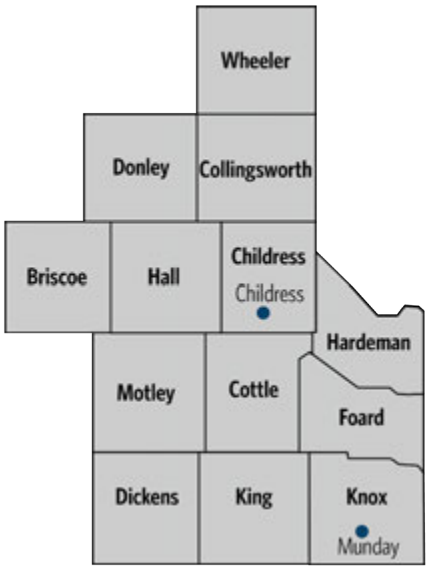


Figure 4. TxDOT Childress District County Map

The four major transportation corridors shown in **Figure 5** are operated and maintained by the District. First responders, the weather service, and adjacent agencies have an impact on how they operate. Collaboration with partner agencies will enhance the performance of these corridors and result in a positive effect on commerce (specifically industrial and agricultural), tourism, and commuting traffic.

Figure 5. Childress Major Transportation

Maximize Project Outcomes

There are currently three major transportation projects underway in the District.

- $6.5 million rehab project along US 82 in Knox County.
- $11.2 million project to add passing lanes to promote safety along US 83 in Childress / Collingsworth
- Counties $9.8 million project to add passing lanes along SH 152 in Wheeler County.

The District also has other planned projects along the US 287, FM 268, and FM 94 to improve safety. These projects will straighten several horizontal curves, raise the existing grades of two bridges along US 287, and widen the existing pavement along FM 268 and FM 94.

Currently, the District spends just over $70 million in construction and maintenance costs annually, $7 million of that amount is used for seal coating roadways.

TSMO strategies should be considered during the planning, design, and construction of these projects to maximize the operation and safety of the District's transportation infrastructure. Incorporating TSMO on planned and future projects will enable the District to promote improved communications, monitoring, and operations, which will enhance the safety and reliability of travel. For example, by simply adding infrastructure to inform the public about traffic incidents and inclement weather, the District could see a significant reduction in delays and crashes. If TSMO strategies were implemented during construction, the District might reduce queuing, delays, and support for freight movement and first responders during traffic incident management.

Cost-Effective Improvements

TxDOT is regularly tasked with making limited budgets go a long way. Compared to larger urban districts, rural districts, like Childress, have fewer resources (in terms of workforce, funding, and systems) to construct, maintain, and operate the transportation infrastructure.

TSMO tactics are typically low-cost compared to capacity investments. They are also cost-effective in terms of the impacts produced. Considering TSMO strategies in lieu of or as part of capital improvements allows the district to address immediate safety and operational needs while maximizing available resources for critical infrastructure investments.

Integrating TSMO into the project development process, with more collaboration between planning, programming, design, operations, and maintenance, will allow the District to take advantage of the cost savings benefits of TSMO. The performance-based aspects of TSMO can also be integrated with existing evaluation strategies to enhance the identification and prioritization of transportation improvements, resulting in better allocation of limited resources.

TSMO Vision, Mission, and Goals

The Childress District TSMO principles are based on TxDOT Statewide vision, mission, and goals. During a workshop with District stakeholders on August 28, 2020, it was determined that the Childress District would adopt the Statewide TSMO principles. However, to reduce crashes and fatalities, the District's TSMO safety objective also includes roadway operational enhancements as a category for continuous improvement.

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.

Childress District TSMO Goals and Objectives

The Childress District goals and objectives are defined in Table 1 are based on the TxDOT statewide agency TSMO goals (safety, reliability, efficiency, customer service, collaboration, and integration) and objectives.

Table 2. TxDOT Childress District TSMO Goals and Objectives

Goal	District TSMO Objectives	Strategic Childress District Objectives
Safety	Reduce crashes and fatalities through continuous improvement of roadway operational enhancements, traffic management systems, and procedures.	• Reduce 5 year rolling average fatalities by half by 2035. • Reduce fatalities to approach zero by 2050. • Establish processes and procedures for identifying and addressing operational and safety deficiencies based on regular assessment of intersection and arterial performance.
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.	• Reduce delays caused by work zones or system maintenance. • Reduce average incident clearance time on highways. • Establish well-documented procedures for archiving system and operational information.
Efficiency	Implement projects that optimize existing transportation system capacity and throughput.	• Evaluate signals for retiming every 3 years. • Identify the output and outcome measures useful for determining agency efficiency in traffic management strategies.
Customer Service	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	incident/emergency verification and posting an alert to traveler • Further PIO involvement and identify new ways of communicating messages to the public.
Collaboration	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	• Hold regular agency meetings to establish the groundwork for shared facilities, personnel, and resources. • Develop a post-event facilitated review, including operations and maintenance staff on performance during recent weather events.
Integration	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	• Develop an outreach plan to promote and raise awareness of transportation technology capabilities actively. • Increase the number of ITS-related assets in use for incident and emergency detection/response.

Capability Maturity Model

Introduction to the CMM Process

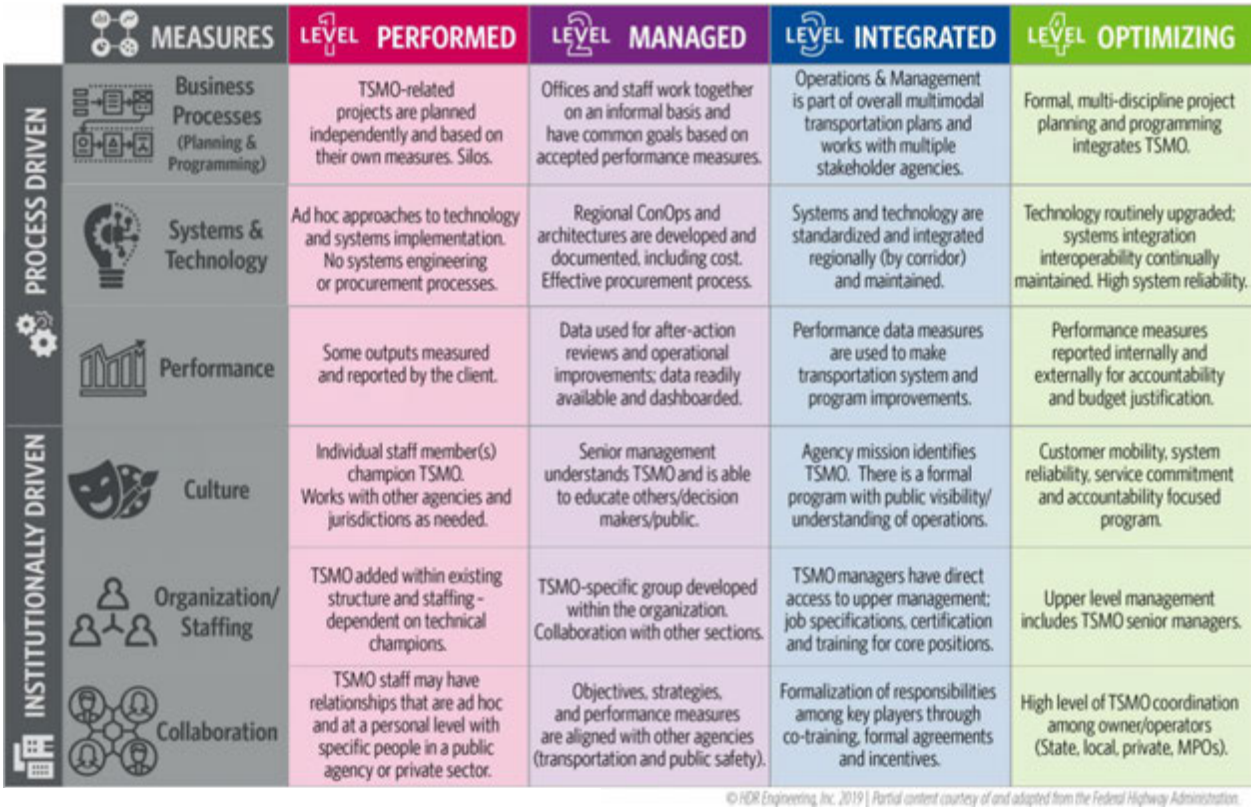
AASHTO adopted the CMM methodology to provide agencies guidance to understand where current TSMO processes stand and how they can be improved. CMM self-assessment framework evaluates the maturity of each TSMO capabilities and is grouped into six dimensions:

1. Business Processes (e.g., planning, programming, budgeting)
2. Systems and Technology (e.g., systems engineering, interoperability, technology)
3. Performance Measurement (e.g., measures definition, data acquisition, analytics, utilization)
4. Culture (e.g., technical understanding, leadership, outreach)
5. Organization and Workforce (e.g., organizational structure, staff development, recruitment, retention)
6. Collaboration (e.g., a partnership among levels of government, public agencies, and the private sector)

Consistent with the Strategic Highway Research Program 2 (SHRP2) guidance, each dimension's capabilities are described as a matrix that defines the process improvement areas and levels. These four levels are as follows:

- Level 1 – Activities and relationships are ad hoc
- Level 2 – There is some collaboration, staff training, and accountability.
- Level 3 – Further integration, processes throughout the organization/agency.
- Level 4 – Optimizing processes and looking at new opportunities

A CMM self-assessment was performed by the District and stakeholders during an online workshop meeting in May of 2020. Participants were asked to review each of the six CMM capability dimensions and rate themselves based on the scale of Level 1 (performed ad hoc) to Level 4 (optimized process and reviewing new opportunities). For each dimension, input was provided by two groups in the self-assessment. One group represented TxDOT Childress District staff, and the other a local representative from the Texas DPS. A summary of the results is provided in the subsequent sections, and a detailed report of the workshop can be found in the **Appendix C.**



	MEASURES	LEVEL 1 PERFORMED	LEVEL 2 MANAGED	LEVEL 3 INTEGRATED	LEVEL 4 OPTIMIZING
PROCESS DRIVEN	Business Processes (Planning & Programming)	TSMO-related projects are planned independently and based on their own measures. Silos.	Offices and staff work together on an informal basis and have common goals based on accepted performance measures.	Operations & Management is part of overall multimodal transportation plans and works with multiple stakeholder agencies.	Formal, multi-discipline project planning and programming integrates TSMO.
	Systems & Technology	Ad hoc approaches to technology and systems implementation. No systems engineering or procurement processes.	Regional ConOps and architectures are developed and documented, including cost. Effective procurement process.	Systems and technology are standardized and integrated regionally (by corridor) and maintained.	Technology routinely upgraded; systems integration interoperability continually maintained. High system reliability.
	Performance	Some outputs measured and reported by the client.	Data used for after-action reviews and operational improvements; data readily available and dashboarded.	Performance data measures are used to make transportation system and program improvements.	Performance measures reported internally and externally for accountability and budget justification.
INSTITUTIONALLY DRIVEN	Culture	Individual staff member(s) champion TSMO. Works with other agencies and jurisdictions as needed.	Senior management understands TSMO and is able to educate others/decision makers/public.	Agency mission identifies TSMO. There is a formal program with public visibility/ understanding of operations.	Customer mobility, system reliability, service commitment and accountability focused program.
	Organization/ Staffing	TSMO added within existing structure and staffing – dependent on technical champions.	TSMO-specific group developed within the organization. Collaboration with other sections.	TSMO managers have direct access to upper management; job specifications, certification and training for core positions.	Upper level management includes TSMO senior managers.
	Collaboration	TSMO staff may have relationships that are ad hoc and at a personal level with specific people in a public agency or private sector.	Objectives, strategies, and performance measures are aligned with other agencies (transportation and public safety).	Formalization of responsibilities among key players through co-training, formal agreements and incentives.	High level of TSMO coordination among owner/operators (State, local, private, MPOs).

Table 3 presents a graphical summary of the levels at which the workshop participants by the agency assessed the District for each dimension. When looking holistically, results indicate that stakeholders feel operations within the district are between Level 1 and 2.

Table 3. Capability Maturity Model Findings.

Dimension	Level 1	Level 2	Level 3	Level 4
Business Processes				
Systems and Technology				
Performance Measures				
Organization and Workforce				
Culture				
Collaboration				

Legend: TxDOT DPS

Further discussion, including a self-assessment breakdown of each dimension and recommendations to improve the agency to a higher level, is described below. These recommendations will be converted to action items that will help the District during implementation.

Business Processes

Business Processes are one of the six dimensions of capability that refers to the planning, programming, budgeting, project development, and implementation required for TSMO programs. Results from the CMM assessment indicate that the Childress District is currently operating at Level 1 and their business processes are on as-needed bases. The District currently does not have formal plans; however, the sections below identify key elements within the Business Processes dimension that helped narrow down specific action items to improve the District.

Project Development Process

The District project development process follows the steps outlined in the TxDOT Project Development Manual. The project development process is mainly used for traditional capital improvement projects; however, it also supports developing projects that integrate TSMO strategies. Each District is responsible for planning, programming, designing, constructing, operating, and maintaining projects within its area. Responses from the TSMO workshops indicated that TSMO development activities or improvements are not considered in the District's project development process. However, discussions about TSMO do occur in the planning and programming phase on an informal basis. To integrate TSMO in the project development process, the project team concluded that the following three recommendations would improve the overall process.

1. Formalize a TSMO Project Development Checklist – This checklist should focus on improving the existing project development process by incorporating TSMO considerations. For example, the checklist can contain goals such as increasing stakeholder involvement during the project development process or add more items to the checklist.

2. Create standard scoping language for TSMO considerations – This scoping language should be used in all projects. The standardization will provide consistency for all projects and allow the District to tailor the language to match performance-based planning requirements. For example, "Require that all ITS and TMS devices are easily accessible for maintenance personnel" or "Require End-to-End testing of ITS Architecture once constructed."

3. Follow the timeline outlined in the TSMO Implementation Plan listed in the TSMO Implementation Plan section – The Implementation Plan focuses on the feedback gathered from the stakeholder workshops, CMM and CMF surveys, and lists various action items that support the District's TSMO Goals. The action items provide in detail the following:
    a) Frequency the District will have to revisit the action item
    b) The task lead responsibility
    c) Department oversight
    d) Tracking and reporting metrics
    e) Timeline for implementation

Programming, Budgeting, and Funding

In April 2017, Chief Engineer William Hale issued a memo stating,

> *"A strategic statewide TMS that includes strong Intelligent Transportation System (ITS) practices and traffic signal operations provides the most cost-effective means to address safety, mobility, connectivity, maintenance, and emergency response available."*

When comparing the options between expanding facilities or TSMO mobility strategies, TSMO implementation cost can be comparatively low and often takes less time to execute. The comparison approach provides an opportunity to use cost-effective and time-saving methods to improve the existing transportation network. Still, competition from other projects can limit the implementation of these strategies. However, the District can leverage the Unified Transportation Program (UTP), a 10-year plan that defines twelve authorized funding categories to guide the distribution of construction dollars:

- Category 1- Preventive Maintenance and Rehabilitation
- Category 2- Metropolitan and Urban Corridors
- Category 3- Non- Traditionally Funded Transportation Projects
- Category 4- Statewide Connectivity Corridor Project
- Category 5- Congestion Mitigation and Air Quality Improvement
- Category 6- Structures Replacement and Rehabilitation
- Category 7- Metropolitan Mobility and Rehabilitation
- Category 8- Safety
- Category 9- Transportation Alternatives Program
- Category 10- Supplemental Transportation Projects
- Category 11- District Discretionary
- Category 12- Strategic Priority

TMS deployment has primarily been funded through Category 1 for roadway construction projects. With the recent growth in ITS technology and TMS, TSMO projects can be integrated into any of the twelve categories. However, the categories that prioritize TSMO projects in selection criteria are Category 2, 4, 5, and 7. To support its budgetary needs, the District should expand the funding categories to include categories 1, 2 4, 5, and 7. There is a draft funding report that provides additional funding information.

Continuous Improvement

As the District continues to integrate TSMO strategies, the following activities are recommended to maintain improvement and optimization of business processes:

- Review and update the District TSMO Program Plan and Implementation Plan every three years
- Conduct a CMM assessment every six years to evaluate the progress of the District Program Plan and to identify opportunities for future improvement
- Complete regular reviews to document TSMO accomplishments and lessons learned
- Reevaluate TSMO goals and objectives consistently
- Create a Childress Regional Traffic Operations Forum where the District and partner agencies can build consensus and plan operational improvements from a regional perspective
- Establish processes and procedures for identifying and addressing operational and safety deficiencies based on regular assessment of intersection and arterial performance
- Determine methods and data that will be used for agency determination of innovative contracting decisions
- Additional formal TSMO training to promote involvement in the project development process to include TSMO components into traditional projects and to advance TSMO specific projects

Systems and Technology

Technical infrastructure is crucial to implementing TSMO strategies and the tactical action items. It creates a means to collect data and analyze it, giving agencies the ability to develop performance threshold goals to ensure that operations are improving. This technical infrastructure usually contains, but is not limited to:

- Dynamic Message Signs (DMS)
- Closed-Circuit Television cameras (CCTV)
- Vehicle Detectors (radar and loop-based)
- Road Weather Information Systems (RWIS)
- Visibility Monitoring Systems
- High Wind Warning Systems
- Road Side Units (RSU) for connected and autonomous vehicle applications
- Traffic Signals
- Fiber Optic Communications
- Adaptive Traffic Signal Control Systems
- Wireless Communication Radios
- Solar-powered Systems

In addition to technology applications, the District is encouraged to use modern design elements to increase safety and efficiency along roadways. Rumble strips, signing, and striping are examples of these types of design elements. This approach enhances safety along the agency's roadways while being cost-effective and easy to maintain.

During the CMM self-assessment, it was determined that the District is currently around a Level 1, with some stakeholders giving the operations within the District a Level 2. This maturity level was decided because the District does not follow a formal procurement process; instead, the District uses an ad hoc approach to technology and system implementation. The District has a formal ITS Regional Architecture report and ITS Implementation Plan, however, the last time both documents were updated was 2003.

Systems Engineering Analysis Process

The FHWA defines Systems Engineering Analysis[1] as "… an interdisciplinary approach and means to enable the realization of successful systems." The analysis is a collaborative method for executing ITS projects efficiently and cost-effectively. Other benefits include more resilient systems, shorter project cycles, and improved system management. The value of systems engineering is realized by professionals from various businesses, including the FHWA. Some funding sources, such as the Highway Trust Fund, require that a SEA is completed for ITS-related projects. The advantage that SEAs can bring to the District, whether through funding or project efficiency, should be considered on all applicable projects.

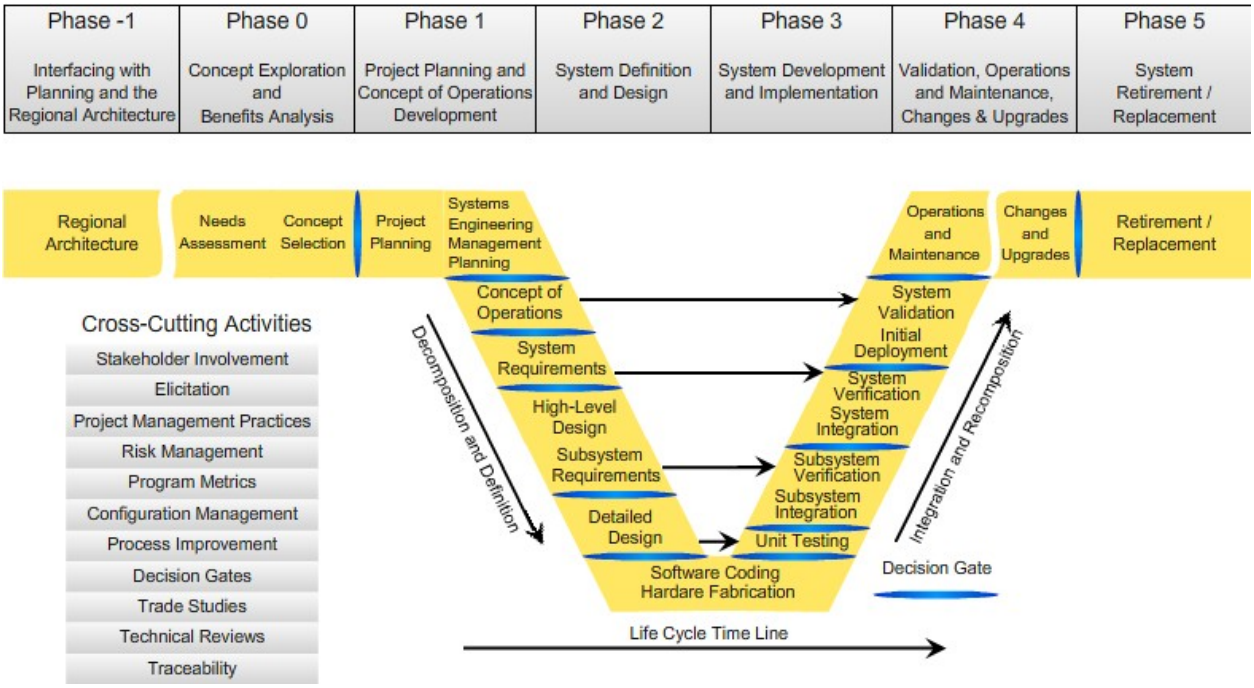


Figure 7. Systems Engineering Process for ITS Projects (Source: FHWA)

[1] https://www.fhwa.dot.gov/cadiv/segb/views/flash/veediagram.jpgh

Processes to Vet Innovative Technologies

Currently, the District is not engaged in a process to vet advanced ITS technologies. It is not recommended for the District to create a process to do this during the initial phase of implementation. As the agency moves forward with TSMO integration, consideration should be given to creating a system or method to review innovative technologies for application.

Regional ITS Architecture

The Childress District has a Regional ITS Architecture website that provides documentation for the Childress District's Regional ITS Architecture report and Regional ITS Deployment Plan. The Regional ITS Architecture serves as a roadmap for future transportation system integration within the District by guiding ITS integration within the TMS. These ITS devices are a means to provide data to analyze operations and to distribute traveler information to both stakeholders and users. Formal agreements between stakeholders are also offered in the architecture to maintain data sharing. These agreements include identifying roles and responsibilities assigned to each stakeholder and are provided in the Collaboration section of this document. It is recommended to the District to update the ITS Regional Architecture report and website every 5-10 years to accommodate changes in technology and to ensure the District's operational needs are met.

Existing and Planned Tools

The State of the Practice Report outlined systems and technology tools currently being used by the District. These tools range from existing processes within each department to physical existing ITS devices, such as DMS and CCTV cameras. Existing strategies within each department and technical inventory are provided in Sections 4 and 6 of the State of the Practice Report. Results of the CMM self-assessment taken during the initial stakeholder workshops indicated the District's systems and technology currently operates around a Level 1 with the desire of improving to a Level 2 or 3. The following planned tools are recommended for improving the District to a Level 2 or 3.

Districtwide ITS Planning Documents

Currently within the District, devices are installed on an ad-hoc basis and are controlled by a central system. It is recommended to create formal ITS planning documents to ensure the TMS meets the needs of the District and provides a means to expand the ITS infrastructure further. Preparing and updating ITS planning documents such as; Concept of Operations, ITS Architectures, and ITS Implementation Plans will give guidance to the District when new systems or devices are implemented. The goal of the Concept of Operations is to set expectations and reveal user needs of the TMS to the developer or entity who is building upon the system. For the planning of ITS device deployment, the ITS architecture will provide a conceptual framework or guidelines for integration and operations. During device deployment, the ITS Implementation Plan will provide detailed direction on how the device should be implemented into the existing system.

Development of a Formal Procurement Process

It is recommended to follow TxDOT's statewide procurement procedures rather than bidding and letting projects on an ad-hoc basis. TxDOT's procurement process managed by TRF and is legislatively bound.

TRF approved vendor products and material producer lists are available to assist the District in purchasing ITS elements. A recommended action items for ITS implementation include:

- Develop regional plans and processes for project planning and selection processes
- Procuring system hardware and technology to provide remote management of monitoring of traffic signal operations

Addition of ITS Devices

Statewide there are various ITS construction standards and specifications that have been developed to further device integration. These documents have been and are continually being developed by TRF. Standards and specifications that have been developed for ITS devices at support TMS include:

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

As TRF develops new construction standards and specifications for emerging ITS devices, updated documents are posted online for coordination within the District. It is recommended to the District to develop an outreach plan to actively promote and raise awareness of transportation capabilities of ITS devices. Further actionable items can be found in the implementation plan matrix in **Section 5** and in **Appendix A**.

Advanced Traffic Management System (ATMS)

The Childress District uses TxDOT's statewide ATMS system Lonestar for ITS device management. The ITS applications managed by the District through Lonestar include CCTV cameras, DMS, and System Administration Application. Lonestar manages live CCTV videos and still images from the District's TxDOT roadways and presents traveler information to motorists through DMS. The Childress District utilizes Lonestar's System Administration Application, which allows administrative control of CCTV cameras and DMS. There is an option for the District to expand upon neighboring districts ATMS, such as Amarillo. This would require collaboration with the agency to add devices.

Design Elements

Increasing safety, reliability, and operations don't only include the integration of ITS devices and systems. It includes incorporating modern design elements, such as rumble strips, additional signing, and pavement marking. An example of non-technology driven TSMO practice is the implementation of roadway cross-section improvements or road-diets[2]. This includes assessing the existing roadway lane configuration to improve the cross-section of the roadway to fit multiple modes of transportation (bikes and pedestrians) and the reduction in the number of vehicle lanes. This has proven to be an effective TSMO method for increasing safety along roadways. These are direct and cost-effective ways to implement TSMO strategies within the District. The DOT staff should make efforts to maintain continuing education for ITS and TSMO to implement new design elements in projects. This includes, but not limited to, consistently referring to current FHWA and AASHTO literature for design project implementation.

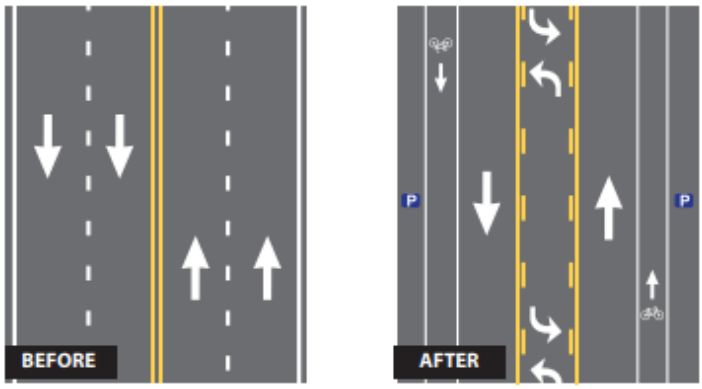


Figure 8. TSMO Road Diet Example
(Source: https://safety.fhwa.dot.gov/road_diets/case_studies/roaddiet_cs.pdf)

Performance Measures

Performance measures are essential for a successful TSMO program. Performance measurements track the progress of TSMO integration. They are a process-oriented dimension used to assess mobility strategies' effectiveness to confirm the progress towards program goals. The District monitors performance measures for traffic incident management and operational asset uptime, which directly correlates to the workshop participants rating their performance measures at a Level 2. However, the participants desired to be at a Level 3. The following sections describe agency, district-wide, and project-based activities to elevate from Level 2 to Level 3.

Agency Performance-Based Initiatives

TxDOT created a Performance Measure Dashboard to provide insight to the public on how TxDOT's roads measure up to TxDOT's vision, mission, and goals. The TxDOT dashboard will serve as the basis for the District identifying future improvement opportunities during the planning process.
The information and performance values provided are categorized under the following goals:

- Optimize system performance
- Deliver the Right Project
- Promote Safety

[2] https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/ch1.cfm#s11

- Preserve our Assets
- Focus on the Customer
- Value our Employees
- Foster Stewardship

Also, to promote safety goals, a statewide "Road to Zero" initiative, also known as #EndTheStreakTX, was adopted by TxDOT, which advocates reducing state highway fatalities by half by 2035 and zero by 2050. The goal of improving TMS is part of this performance measure.

District-Wide Performance Measures

In April 2017, Bill Hale, TxDOT Chief Engineer, issued a memo requiring all districts to track and report performance metrics for TMS asset operation uptime, incident clearance times, travel time reliability, and TMS system coverage as part of the monthly TMS Status Report. The memo also required districts to submit their TMS's current status with an implementation plan for the next twelve months to TRF semi-annually. This directive intends to help the Districts monitor TSMO related activities while also promoting internal collaboration and business processes.

Further integrating District-Wide performance measures into TSMO processes promotes mobility-targeted performance measures. Recommended action items to supplement existing performance measure include:

- Identifying output and outcome measures useful for determining agency efficiency in traffic management strategies
- Conducting a quality-of-service assessment of arterial/corridor-level timing plans at regular intervals (e.g., every three years)
- Defining basic outcome measures like level of service and speeds during weather events and developing a procedure to report them for the duration of the event

District-Wide Incident Performance Measures

Currently, performance measures used in the District include an informal post-incident management discussion and an assessment of the operational asset uptime. After a major traffic incident, the District collaborates with DPS to determine what procedures were successfully executed and where adjustments can be applied to improve overall response times to increase operational asset uptime. To help assist with TIM tracking, the District added four additional fields to DPS' crash records. Those fields include identifying secondary crashes, the time it took to clear the roadway, the time it took to clear the scene, and the time the investigation was completed. Evaluation methods to classify crash records helps to better understand the incident and improve the District's transportation safety and efficiency. A recommendation to improve performance measures is to formalize this process by creating a tactical plan specifically for incident management. This will institutionalize the process and help the District with its current TIM processes.

District-Wide Project-Specific Performance Measures

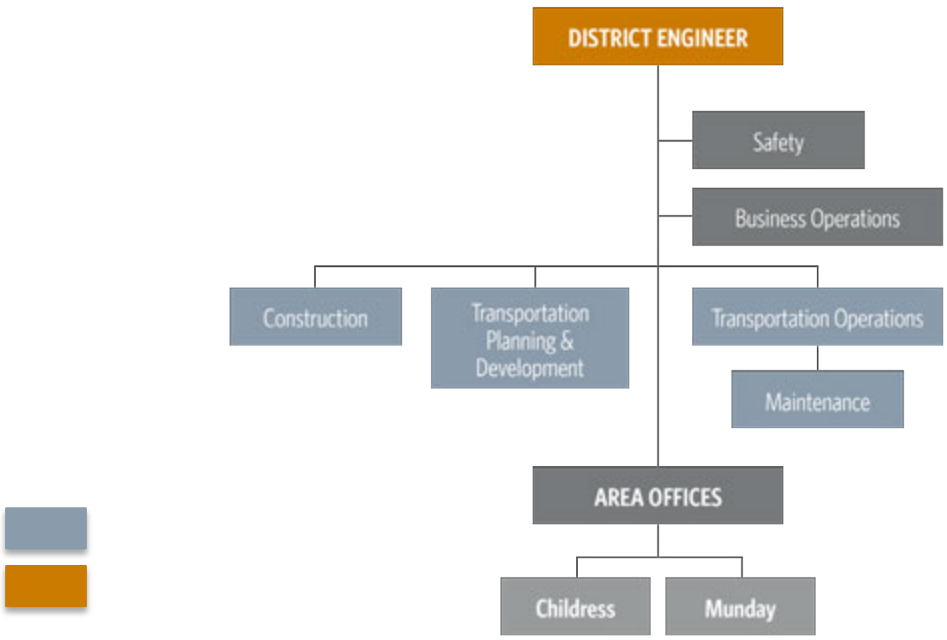
The District currently does not have project-specific performance measures in place. A recommendation to the District is:

1.) Develop performance measures essential to the Agency and FHWA
2.) Define performance objectives aligned with the TSMO goals
3.) Ensure reporting is consistent with statewide and FHWA reporting requirements
4.) Add staff to monitor the additional TSMO performance measure

These recommendations will be used to identify available data sources and data collection methods needed for performance measure tracking.

Organization and Workforce

For TSMO to be most effective within the District, it is crucial to structure the organization and workforce to support continuous TSMO efforts. When completing the CMM self-assessment, the District identified as a Level 1 for Organization and Workforce. The organization of the District currently is not systematized to support TSMO, and no staff members are implementing TSMO strategies at this time. As a goal, the District would like to improve to Level 2. The existing organizational chart of the District, provided in the State of the Practice Report, was reviewed to determine what is expected from each department from a TSMO perspective. To improve to Level 2 it's recommended to incorporate TSMO within the organization. As a TSMO support leader, the District Engineer should provide high-level guidance to the District to ensure that TSMO is implemented. The Departments of Construction, Transportation Planning & Development (TP&D), and Transportation Operations roles are to complete TSMO activities consistently, dedicate specific TSMO roles to staff, and to receive on-going TSMO training.



Other DOTs have found it beneficial to designate a TSMO champion, coordinator, and liaisons within with the TSMO Champion and Coordinator to lead TSMO teams within the departments to ensure implementation of the overall TSMO plan. Depending on the amount of TSMO responsibilities within the District, this could be done by one individual or on a part-time basis. Critical responsibilities for these roles are outlined as described below:

TSMO Champion — This position is intended to be held by an individual with a current leadership or administrative role within the District; for example, the District Engineer. The responsibilities of the TSMO Champion are:

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

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

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

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

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

Employee turnover is a hurdle that many agencies face. Trained technical staff is essential for the Childress District's TSMO success. The District is encouraged to schedule an annual offering of high-level training as a function of personnel turnover. This training will improve the District's organizational structure by teaching staff consistently and systematically, resulting in increased staff morale. Another recommendation to counter employee turnover is to develop an immediate action plan to address vacancies in critical traffic management

program roles. The staffing plan development will help the District identify current staff involved in TSMO operations and plan for future staffing needs.

Culture

The basis of a robust TSMO culture within the District starts with an understanding of the District's TSMO objectives by key operational staff. There are no designated TSMO staff roles other than the District TSMO Champion, TSMO Coordinator, and Public Information Officer (PIO), and the District ranked themselves at a Level 1 maturity for culture. Workshop participants noted that before the stakeholder engagement workshops, District staff did not have experience with TSMO.

To grow the TSMO culture, the District should focus on engagement opportunities. These opportunities can come in the form of the addition of a District TSMO Coordinator and a TSMO Champion. These roles can assist the growing culture within the District by being a point of contact for TSMO questions and activities. Also, creating a centralized hub containing available TSMO resources is recommended, which can be shared amongst the District staff. Developing a strong TSMO culture within existing staff members is essential for program success. The District should identify managers within key agency groups and encourage them to coordinate and lead traffic management projects and efforts. This action item will facilitate coordination throughout the District, while helping managers become comfortable with TSMO responsibilities.

An annual report that assesses the progression of TSMO is recommended. The report should include the year's TSMO accomplishments, opportunities, and progress. It also serves as a resource to document revisions to the Program Plan. The annual report may also be used as a marketing tool that showcases the District involvement of TSMO to help advocate for additional funding for TSMO projects within the District.

Collaboration

In addition to implementing systems and technology, TSMO is also about stakeholders within the District working together to improve operations. Currently, within the District, internal and external partners coordinate often to streamline project development and maintain efficiency. Stakeholder communications are commonly exercised when implementing traffic incident management or work zone management applications. During the CMM self-assessment, the District rated themselves at a Level 2 with the goal of reaching a Level 3. To improve the District to a Level 3 it is recommended to enhance current partnerships further. These enhancements include:

- Identifying and publishing a list of internal and external stakeholders with contact information
- Establishing a consistent working relationship with the regional Metropolitan Planning Organization (MPO) in Amarillo, Wichita Falls, and Lubbock
- Conducting TSMO training with internal and external stakeholders, for example, Pathfinder and Strategic Highway Research Program (SHRP2)
- Creating plans to collaborate with non-reoccurring partners
- Holding regular agency meetings to establish the groundwork for shared facilities, personnel, and resources
- Solicit input from other districts, DOTs, emergency responders, and transit agencies on traffic management planning, operations, and projects

Internal partners mainly coordinate during the project development process. This process follows what is typical throughout TxDOT. As described in the Austin District TSMO Program Plan, "During design development, designers from different disciplines collaborate to make sure the design is constructible. Designers also meet with planners during design concept meetings and site visits." It is recommended that the District looks to this document to ensure that they are implementing what is recommended in the Austin District TSMO Program Plan.

TSMO Implementation Plan

Implementation of tactics and strategies identified in this plan can be broken down into actionable items that can be applied in chronological order. These action items can also aid in tracking the progress of TSMO application within the District. As TSMO capacities improve, the District is expected to revise the implementation plan and action items to expand their TSMO goals. These action items follow the CMM and Capability Maturity Framework (CMF) self-assessments completed by the District during the creation of this plan. A report detailing the CMM and CMF self-assessment is provided in the **Appendix B.** A list of action items in order of each TSMO capability dimension can be found in **Table 4**.

The TSMO strategies included in the Implementation Plan are comprehensive solutions to further align operations within the District to the six CMM dimensions and CMF frameworks. Detailed descriptions of the action items to be implemented in 2021 are provided in one-page summaries that can be found in the **Appendix A**.

Table 4. Implementation Plan Action Items Matrix

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
Business Processes	Create a Childress Regional Traffic Operations Forum where the District and partner agencies can build consensus and plan operational improvements from a regional perspective.	Annually	TSMO Champion	Childress Transportation Planning & Development Department	Webinar/In-person meeting with department heads	January 2021
	Establish preventive maintenance program for ensuring maximum performance for not only equipment but also operational settings (e.g., timing plans).	Quarterly	Project Managers	Childress Transportation Operations Department	Create checklist for determining functionality	January 2021
	Determine methods and data that will be used for agency determination of innovative contracting decisions.					
	Improve linkage between the road weather management program and other planning activities in the Childress District.	Continuous	Project Managers	Childress Transportation Operations Department	Set thresholds or parameter to trigger processes to inform drivers of dangerous weather events or mobilized District maintenance.	August 2021
	Obtain management buy-in / support of the use of a decision support system to affect / alter operations on the system as a result of specific weather triggers.	As needed	Project Managers	Childress Maintenance Department	Have project managers review thresholds before implementation	September 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Develop a performance management/monitoring plan.	Once	Project Managers	Childress Transportation Operations Department	Create project dashboard that reviews datasets and compare them to thresholds	January 2022
	Establish processes and procedures for identifying and addressing operational and safety deficiencies based on regular assessment of intersection and arterial performance.	Annually	Project Managers	Childress Transportation Planning & Development Department	Review performance results and prioritize roadways by operation and safety deficiencies.	February - March 2022
	Review Childress District Program Plan for updates and revisions	Review every 3 years; minor updates every 3 years and major update every 6 years.	TSMO Champion	Childress Transportation Planning & Development Department	Review and update program plan prepared for the District	January 2024
	Reassess CMM and update program plan and tactical plans as necessary	Every 6 years	TSMO Champion	Childress Transportation Planning & Development Department	Review tactical plan that was prepared for the District. Remove action items that have been completed and add new items.	January 2027
Systems & Technology	Use regional traffic management plan in project planning and project selection process.	Continuous	TSMO Coordinator	Childress Transportation Planning & Development Department	Publish plan internally so employees have access.	January 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Develop a formal process for incorporating systems engineering into project planning.	Once	TSMO Liaison	Childress Transportation Operations Department	Provide process documents and information on how to incorporate system's engineer. Also provide system's engineering training	January 2021 - December 2021
	Procure system hardware and technology to provide remote management and monitoring of traffic signal operations (i.e., communications infrastructure, closed-loop system).	Once	TSMO Liaison	Childress Transportation Operations Department	District should expand use of the Lonestar Statewide ATMS.	March 2021- March 2022
	Incorporate decision processes on how to integrate new Work Zone Management (WZM) technology and procedures in TMP development process.	Once	Project Managers	Childress Transportation Operations Department	Develop a formal process through a tactical plan for incorporating new technologies and procedures	June 2021
	Develop an outreach plan to actively promote and raise awareness of transportation technology capabilities.	Once	TSMO Liaison	Childress Transportation Planning & Development Department	Create outreach plan that includes recommendations for training and awareness of technology capabilities	June 2021
	Prepare a living cost estimate as a companion document to the roadmap for traffic management project planning and production.	Annually	Project Managers	Childress Construction Department	Prepare a cost estimate file that can be referenced by project managers within the District.	July 2021
	Develop an ITS master implementation plan to guide future ITS investment strategies	Once and update every 6 years	TSMO Liaison	Childress Transportation Planning & Development Department	Develop an ITS master plan to identify ITS solutions and implementation strategies	October 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Provide automatic notification of system interruptions from field devices.	Once	TSMO Liaison	Childress Transportation Operations Department	Within the Lonestar ATMS create automatic notifications of system interruptions	April 2022-October 2022
	Establish timeliness thresholds of weather and road weather observations for decision-making.	Once	Project Managers	Childress Transportation Operations Department	Develop a list of thresholds and protocols for weather related decision making	May 2023
Performance Measurement	Identify the output and outcome measures useful for determining agency efficiency in traffic management strategies.	Once	TSMO Coordinator	Childress Transportation Planning & Development Department	Create a list of District-wide performance measures that identify specific measures and data acquisition tactics	January 2021
	Determine number of projects to include in assessment and select projects for which measures will be computed.	Annually	TSMO Coordinator	Childress Transportation Planning & Development Department	Create a list of eligible projects that can incorporate TSMO elements	February 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Conduct quality-of-service assessment of arterial/corridor-level timing plans at regular intervals (e.g., every three years).	Every 5 years	TSMO Liaison	Childress Transportation Operations Department	Optimize signal timings along corridors that experience poor operations.	March 2021
	Review current output data collection and archiving activities and identify initial steps to produce useful archiving data on a continuing basis.	Continuous	TSMO Liaison	Childress Transportation Planning & Development Department	Review current and future data feeds. Procure data repository for analysis.	August - December 2021
	Define corridor/arterial-level performance measures.	Once	TSMO Liaison	Childress Transportation Operations Department	Define how performance will be measured along corridors. Use data repository to give output files that show performance measures.	March 2022
	Define basic outcome measures like level of service and speeds during weather events and develop a procedure to report them for the duration of the event.	Once	TSMO Liaison	Childress Transportation Operations Department	Use data repository to provide reports during weather events	July 2022
	Identify available data sources and data collection methods needed to develop the performance measures of interest to the agency.	Every 2 years	TSMO Liaison	Childress Transportation Operations Department	Review existing data and collection methods to input in to the data repository	July 2022
	Expand internal dashboard for performance reporting.	Once	TSMO Liaison	Childress Transportation Operations Department	Build off of data repository to expand internal dashboards used by the District	August 2022 - February 2023

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
Organization & Workforce	Develop a post-event facilitated review including operations and maintenance staff on performance during recent weather events.	As needed	TSMO Liaison	Childress Maintenance Department	Conduct meetings after weather events with internal staff to discuss the Districts response.	As needed
	Schedule an annual offering of high-level training as a function of personnel turnover.	Annually	TSMO Liaison	Childress Transportation Operations Department	Provide annual TSMO training to account for turnover	January 2021 - On going
	Develop an immediate action plan to address vacancies in critical traffic management program roles/capabilities.	Annually	TSMO Coordinator	Childress Transportation Operations Department	Conduct annual meeting with supervisors to discussion TMS personnel needs.	January 2021 - On going
	Establish professional requirements for staff to gain training on surface transportation weather management.	Once	TSMO Liaison	Childress Transportation Operations Department	Create a list of training requirements needed for staff working on weather management	February 2021
	Develop a formal and ongoing training program on WZM that is offered and supported by TRF.	Continuous	TSMO Liaison	Childress Construction Department	Work with TRF to develop training programs for WZM.	July 2021
	Provide funding to support formalized training and professional capacity building for professional traffic signal operations and ITS staff.	Continuous	TSMO Coordinator	Childress Transportation Operations Department	Develop a budget to identify funding gaps	September 2021
Culture	Identify managers within key agency groups and encourage them to coordinate and lead traffic management projects / efforts.	As needed	TSMO Coordinator	Childress Transportation Operations Department	Create a list of managers and contact information for coordination	February 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Create a WZM steering committee of key agency champions and WZM core staff.	Once	TSMO Liaison	Childress Construction Department	Develop a WZM team within the District. The team should hold regular meetings.	February 2021
	Hold regular meetings of the steering committee to ensure an ongoing dialogue that sets the agency's WZM agenda.	Quarterly	TSMO Liaison	Childress Maintenance Department	Hold regular meetings with WZM team	February 2021 - On going
	Identify and engage the public information officer / communications specialist from the agency (all operations entities).	Annually	TSMO Liaison	Childress Transportation Operations Department	Further Public Information Officer (PIO) involvement to provide public with information. Identify new ways of reaching the public.	March 2021
	Conduct a strategic planning exercise across the Childress District to develop a road weather management plan that is consistent between jurisdictions.	Bi-annually	TSMO Coordinator	Childress Maintenance Department	Work with neighboring Districts and first responders to develop a tactical plan to manage weather events within the region.	August 2021 - October 2021
	Establish a process for reporting critical performance measures to key staff within the organization.	Once	TSMO Coordinator	Childress Transportation Operations Department	Within the data repository develop an alert system to inform necessary staff of critical changes in performance	March 2023
	Adopt real-time traffic operations dashboard.	Once	TSMO Liaison	Childress Transportation Operations Department	Adopt ATSPM dashboard for reviewing operations of signal systems	July 2023
Collaboration	Establish well-documented procedures for archiving system and operational information.	Once	TSMO Liaison	Childress Transportation Operations Department	Prepare procedure documents for data repository	March 2021

Category	Action Item	Frequency	Task Lead Responsibility	Oversight Responsibility	Evaluation Metric	Recommended Initiation Timeframe
	Hold regular agency meetings to establish the groundwork for shared facilities, personnel, and resources.	Quarterly	TSMO Champion	Childress Transportation Operations Department	Hold quarterly meetings with all stakeholder to determine what resources to share	March 2021 - On going
	Ensure that agency staff members are requesting law enforcement for WZM systematically, effectively, and in accordance with developed policies.	Annually	TSMO Liaison	Childress Transportation Operations Department	Conduct meeting to inform staff members of the involvement of law enforcement in WZM	May 2021
	Develop criteria for determining when and how to use law enforcement for WZM purposes.	Once	TSMO Liaison	Childress Construction Department	Conduct meeting to discuss WZM criteria with Law Enforcement	July 2021
	Solicit input from other districts, DOTs, emergency responders, and transit agencies on traffic management planning, operations, and projects	Annually	TSMO Coordinator	Childress Transportation Operations Department	Regularly hold stakeholder meetings to stay current with operations around the region	January 2022 - On going

TSMO Tactical Plan Assessment

Tactical Plans are district-specific high-level detailed procedures for the implementation of specific mobility strategies. These plans are the final component of the TSMO program planning structure. The purpose of the District Program Plan is to identify improvement opportunities for TSMO implementation through strategic and programmatic elements. Tactical plans, in contrast, are developed to determine the tactical elements for the implementation and deployment of district-specific prioritized services.

Tactical Plan Criteria

The TxDOT Traffic Safety Division developed tactical plan criteria based on qualitative attributes. The objective is to perform quantitative analysis such as cost estimates, detailed schedules, and benefit-cost analysis as tactical plans progress to the implementation phase. The criteria for tactical plan development include:

- Goal alignment with TSMO vision and mission (i.e., safety, reliability, mobility asset uptime);
- Cost (i.e., low, medium, high for initial and recurring cost);
- TxDOT Childress District staff effort (i.e., low, medium, high);
- Stakeholder partnerships (i.e., internal, external);
- Return-on-investment (i.e., low, medium, high).

Tactical Plan Components

The following components should be included in each tactical plan:

- A detailed description of the prioritized service, activities, and projects including a gap analysis to review existing processes and identify how it supports the District's TSMO principles
- An identification of the key implementation guidelines and policies
- A financial plan including cost estimates for implementation, operations, and maintenance
- An annual action/implementation plan outlining integration with existing District processes
- Performance measures used to monitor and evaluate the effectiveness of tactics

Recommended Tactical Plans

The Tactical Plans recommended for the Childress District are based on the feedback from stakeholder engagement meetings that identified current transportation challenges within the District. The following recommended tactical plans include:

- Traffic Incident Management – The Childress District currently has informal procedures in place with DPS for incident management. During an event, District maintenance crews coordinate with DPS and neighboring districts. The District uses temporary traffic control devices to help protect responders while

conducting incident clearance. Post-incident discussions typically include an evaluation of what was done well and what could be improved. Additional evaluation fields were added to DPS' crash records to help assist with TIM tracking. A TIM tactical plan will formalize the District's existing TIM process and identify new opportunities to implement new strategies. Recommended TIM action items for the development of a tactical plan include:

- Deploy additional CCTV to detect incidents
- Formalize communications and interagency coordination through the creation of TIM best practice documents
- Review current output data collection and archiving activities and identify initial steps to produce useful archiving data on a continuing basis.
- Implement traffic incident management considerations during planning efforts for construction and work zones.

- **Work Zone Management**- To reduce traffic congestion, ensure motorist and worker protections, and complete roadwork efficiently, WZM is a planned and organized process to control traffic during construction. Similar to TIM, The Childress District has informal processes for WZM. The District uses portable message signs to alert drivers of work zones and occasionally coordinate with highway patrol to drive through the work zone to regulate traffic flow. The Childress District will find value in creating a WZM tactical plan to formalize these existing procedures, improve safety and mobility in work zones. Recommended action items included in the Implementation Plan to assist the District in developing a WZM tactical plan include:
  - Create a WZM steering committee of key agency champions and WZM core staff
  - Hold regular meetings of the steering committee to ensure an ongoing dialogue that sets the agency's WZM agenda
  - Incorporate decision processes on how to integrate new WZM technology and procedures in TMP development process
  - Document a formal process outlining the criteria for determining when and how to use law enforcement for WZM purposes
- **Road Weather Management -** Inclement weather events directly impact roadway mobility and safety. Winter weather storms are common in the Childress District, making road weather management a top District priority. The District's existing process starts with monitoring the weather forecast. Coordination with neighboring districts, Lubbock and Amarillo, and the State of Oklahoma typically occur a few days before the storm. The District PIO communicates information regarding upcoming winter weather storms to the public through social media and radio. DMS are also used as a communication tool to inform motorists of inclement weather and detours. During a winter weather storm, the District will send out crews to visually inspect pavement conditions to determine if ice has accumulated on roadways. The development of a RWM tactical plan is recommended to progress and institutionalize the District's existing practice while identifying gaps to implement new technology and procedures.

The following action items and strategies are recommended to the District to assist the development of a RWM tactical plan:

- Install additional DMS to alert drivers of upcoming inclement weather
- Install environmental sensor stations (ESS) and a road weather information system (RWIS) to provide real-time information about road conditions
- Define basic outcome measures like level of service and speeds during weather events and develop a procedure to report them for the duration of the event.
- Conduct a strategic planning exercise across the Childress District to develop a road weather management plan that is consistent between jurisdictions.

Appendix A:

One Page TSMO Strategy Summary Sheets

FOCUS AREA:
Business Processes

STRATEGY NO. 1
Create a Childress Regional Traffic Operations Forum where the District and partner agencies can build consensus and plan operational improvements from a regional perspective.

Currently, within the District, there are informal communications between the different agencies and stakeholders. These communications occur on an ad hoc basis without regularity or formal procedure. Although this form of communication is random, agencies within the region are very aware of the need to communicate and have demonstrated that ability under the current process.

To further enhance the regions' ability to coordinate operations and plan, a regional Traffic Operations Forum should establish a collaborative entity to discuss operation and traffic management concepts across multiple agencies within the region. This effort aims to continue capability maturity for traffic management practices through sharing peer experiences. This forum could come in many forms; perhaps a reoccurring quarterly in-person meeting, phone call, or online archive.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Low

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Business Processes

STRATEGY NO. 2
Establish a preventative maintenance program for ensuring maximum performance for not only equipment but also operational settings (e.g., timing plans).

Equipment and operations within the District are maintained on an ad havoc basis. There have been recent attempts to set up maintenance programs for signal timing optimization, but no formal (annual or quarterly) maintenance programs have been established.

The intended program will examine various operational settings and developing a continuous improvement approach. Operational settings should be set during the system's implementation and regularly reviewed to ensure operations are maintained. Performance measures will be created as a threshold to determine if operations are effective. It is the operating agency's responsibility to ensure proper performance measures are being met since the system is dependent on operating in terms of performance. It is critical that these settings are maintained to drive the performance of traffic management. Equipment should also be evaluated on a routine basis to verify proper operation. The program can promote routine maintenance on a regular schedule (monthly, quarterly, or yearly)

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No	Efficiency:	Yes		
	Collaboration:	Yes			
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Medium	Recurring:	Medium

TXDOT STAFF EFFORT (Low, Medium, High)
High

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)
Mid-term

RETURN ON INVESTMENT (Low, Medium, High)
Medium

FOCUS AREA:
Business Processes

STRATEGY NO. 3
Determine methods and data that will be used for agency determination of innovative contracting decisions.

Contracting decisions within the District that incorporate innovative technologies are made when necessary. The District currently contracts innovative technologies for work zone management projects when it is estimated that there is a need during work zone management projects.

Innovative contracting practices should be applied based on needs resulting in data collection. Under this process, the Work Zone Management office is expected to lead efforts to incorporate these contracting mechanisms into the agency toolbox for improving work zone management.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No	Efficiency:	Yes		
	Collaboration:	Yes			
Reliability:	Yes	Customer Service:	No	Integration:	No

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High) Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Mid-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Business Processes

STRATEGY NO. 4
Improve linkage between the road weather management program and other planning activities in the Childress District.

Ice and snow are common in the region of Texas the District is located in. As a result, road weather management is a priority within the District. Currently, the District manages the roadways during weather events at inclement weather rather than implementing proactive policies.

Increased linkage with a Statewide or Regional TSMO plan allows an agency to prioritize projects and funding (i.e., for the STIP). This action increases the ability to leverage new sources of transportation funding for road weather programs and projects. For example, opportunities to leverage construction projects for road weather systems or adding weather-responsive components to traffic management projects are ways that the road weather management program can leverage other activities in the agency. The use of a DSS is recommended in this action, but the nature of the decision-support system may vary based on the region. Some regions might focus decision support on maintenance (like MDSS), and other agencies may require weather-responsive traffic management.

Greater linkage with other plans and activities allows the road weather management program to take advantage of ongoing investments at an agency and supplement current road weather management capabilities. These actions help an agency move towards proactive operations during adverse weather.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes		
	Collaboration:	Yes			
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High) Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Long-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Systems & Technology

STRATEGY NO. 5
Use regional traffic management plan in project planning and project selection process.

Projects within the District are currently planned and selected on an as-needed or impromptu basis. The District should establish a regional traffic management plan, with the help of regional stakeholders, as a core communication, project planning, and selection tool for agencies deploying traffic management solutions. This document will record and formalize future needs to relate them to specific deployments.

A formal process for incorporating systems engineering into project planning should also be established. The use of a DSS is recommended in this action but the nature of decision-support system may vary based on the region. Some regions might focus decision support on maintenance (like MDSS) and other agencies may require it for weather-responsive traffic management.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No	Efficiency:	Yes	Collaboration:	No
Reliability:	Yes	Customer Service:	Yes	Integration:	No

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Low

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Systems & Technology

STRATEGY NO. 6
Incorporate decision processes on how to integrate new Work Zone Management (WZM) technology and procedures in the Transportation Management Plan (TMP) development process.

With growing demand and congestion on Texas roadways, work zones play an essential role in maintaining and upgrading roadway infrastructure. TxDOT has put a strong emphasis on implementing Smart Work Zones to prioritize technology improvements while enhancing safety and reliability in work zones. Since TSMO is a new initiative in the District, new technology implementation or innovative strategies are often not considered while developing TMPs.

This TSMO strategy focuses on ensuring new technology and procedures are considered during the Childress District's TMP project development process. Creating a WZM tactical plan will help the District analyze existing practices to help identify areas in the TMP development process where implementing WZM technology can be a benefit. Applying this consideration early in the project development phase helps develop innovative WZM strategies that are efficient and cost-effective. FHWA's "Developing and Implementing Transportation Management Plans for Work Zones" (https://ops.fhwa.dot.gov/wz/resources/publications/trans_mgmt_plans/trans_mgmt_plans.pdf) can help guide the District in creating, deploying, and assessing TMPs. A formal process for incorporating WZM considerations in the TMP development process should be developed to ensure implementation. The Childress District's Operations Department project managers will serve as the task lead for this strategy.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Systems & Technology

STRATEGY NO. 7
Develop an outreach plan to actively promote and raise awareness of transportation technology capabilities.

With TSMO being a new initiative in the Childress District, it is essential to inform and educate stakeholders about available transportation technology and ongoing TSMO activities in the District. Outreach events serve as an opportunity to share the benefits and capabilities of TSMO and innovative technology, helping the District generate interest and support for TSMO projects.

Developing a stakeholder outreach plan will open a formal and consistent communication line between the District and District stakeholders. This outreach plan should include how the District will provide stakeholders with updates throughout the year about the status of TSMO initiatives and new technology/systems that are available and applicable to the District. The District should focus on highlighting projects that incorporate TSMO, sharing success stories and lessons learned.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No Yes	Efficiency:	Yes	Collaboration:	
Reliability:	No	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Systems & Technology

STRATEGY NO. 8
Prepare a living cost estimate as a companion document to the roadmap for traffic management project planning and production.

Implementing the Childress District's TSMO Program Plan will progress existing traffic management procedures and increase transportation technology deployments throughout the District. A living cost estimate should be developed to serve as a foundation for TSMO implementation cost forecasts and projections. This cost estimate will help the District understand funding needs by evaluating costs associated with potential strategies and future device deployment. The District can also use the cost estimate as a prioritization tool by determining the expected return on investment for implementation strategies and technology deployments.

It is essential to update the cost estimate periodically to ensure that all costs associated with TSMO implementation are created, updated, and integrated into the Childress District's planning process. Classifying this cost estimate as a living document will help the District account for fluctuation in technology and labor costs over the duration of the Implementation Plan timeline.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No	Efficiency:	Yes	Collaboration:	No
Reliability:	No	Customer Service:	No	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Performance Measurement

STRATEGY NO. 9
Identify the output and outcome measures useful for determining agency efficiency in traffic management strategies. Determine the number of projects to include in the assessment and select projects for which measures will be computed.

TSMO defined performance measures are critical to monitoring and optimizing the Childress District's transportation network. Performance measures are key quantitative indicators used to monitor and track internal TSMO program progress, allowing agencies to identify gaps for improvements using TSMO strategies.

Output performance measures should be developed to define the progress and efficiency of TSMO activities. FHWA's document "Organizing for TSMO" (https://ops.fhwa.dot.gov/publications/fhwahop19065/fhwahop19065.pdf) defines the steps necessary to develop output performance measure and are listed as follows:

1. Identify the strategic goals and objectives that align with regional transportation plans with internal and external stakeholders
2. Evaluate data acquisition, analytics, and utilization capabilities
3. Identify performance measures that align with the Childress District's TSMO goals and objectives

The output of these identified performance measures will be used to track the Childress District's progress. Well-defined measures will help the District identify the cost and level of effort required to obtain the measures. It is important to note that the District should consider actionable measures like travel time impacts of traffic incidents and travel time reliability through work zones.

To maximize the value of performance measures, strategically selecting which projects will be included in assessing measures is essential. This strategy will provide an overview of the District's performance specific to WZM. Conducting before and after work zone studies will help evaluate the effectiveness of strategies used in the field.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	No	Efficiency:	Yes	Collaboration:	No
Reliability:	No	Customer Service:	No	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term) Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Performance Measurement

STRATEGY NO. 10
Conduct a quality-of-service assessment of arterial/corridor-level timing plans at regular intervals (e.g., every three years).

Quality-of-service assessments are necessary procedures to evaluate the effectiveness of implemented strategies on roadways. These assessments are specific for signal timing plans will help determine how well the plans operate and serve the public.

This strategy focuses on performing regular assessments of signal timing plans to ensure that District goals and objectives are met. The District's quality-of-service assessment should include measuring the level of service, delay, travel speeds, and travel times at intersections to evaluate signal timing plans. These measures can be gathered by collecting turning movement counts, travel time runs, and vehicular speed detection. Other evaluation techniques include conducting before and after travel time or delay studies, fielding signal timing change request phone calls and documenting complaints from the public. Once output data from these evaluations are assessed, the District can define specific performance measures that optimize signal timing strategies' effectiveness on arterials and corridors.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	No

COST (Low, Medium, High)

Initial:	Medium	Recurring:	Medium

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Performance Measurement

STRATEGY NO. 11
Review current output data collection and archiving activities to identify initial steps to produce useful archiving data on a continuing basis. Establish well-documented procedures for archiving system and operational information.

With TSMO being an objective-driven, performance-based initiative, data collection techniques and archiving systems are incredibly essential. Archiving data is gathering and storing information to manage and improve the transportation system. FHWA developed a primer, "Applying Archived Operations Data in Transportation Planning," (https://ops.fhwa.dot.gov/publications/fhwahop16082/fhwahop16082.pdf) to spread awareness to agencies about the benefits and opportunities for archived data.

This strategy aids the District's performance measure dimension by analyzing and optimizing existing data collection strategies and archiving functions. The District should start by identifying the operations data currently being collected and how it is stored. Examples of common types of archived operations data from FHWA's primer are listed below:

- Traffic volume, speed, class, and occupancy from a point and probe data sources
- Event, work zone, and incident information
- Weather data
- Signal status and timing plans

The development of a documented formal procedure for archiving system and operations data allows the Childress District to standardize the data collection and archiving process. This strategy also helps the District develop baseline performance metrics based on collected operational data.

GOAL ALIGNMENT (Check appropriate areas)

Safety:		No	Efficiency:	No	Collaboration: No
Reliability:	Yes	Customer Service:	No	Integration:	Yes

COST (Low, Medium, High)

Initial:	Medium	Recurring:	Medium

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Organization & Workforce

STRATEGY NO. 12
Schedule a regular offering of high-level training as a function of personnel turnover.

It is necessary to provide ongoing training in the TSMO arena not only as a refresher for experienced transportation engineers, but to accommodate personnel turnover within the District, promotions to new operations-related positions, and to introduce new TSMO strategies and initiatives. For personnel new to the TSMO world, a pre-recorded set of TSMO trainings should be available in order to cover the basics and introduce them to how TSMO may be applied. Recurring live training should be conducted on a set schedule (annually, semi-annually, or quarterly) and as a topic at monthly District meetings. The training can be related to seasonal issues such as winter maintenance or work zones or based on topics of interest or other strategies within the Childress District TSMO Program Plan.

Training should be conducted at the TxDOT Childress District office location. Speakers can be TxDOT officials, Federal officials, consultants, or other subject matter experts. Depending on the frequency of the training, a shorter time frame, 1 to 2 hours, is recommended. Trainers should get feedback from attendees immediately after the session concludes to get feedback on ways to enhance the training experience in the future. The timeframe for this training to start is in early 2021.

Online TSMO Training Resources:
FHWA: Planning for Operations Training (https://ops.fhwa.dot.gov/plan4ops/resources/traing.htm)
ITS Heartland: TSMO University (https://itsheartland.org/tsmo-university/)

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Organization & Workforce

STRATEGY NO. 13
Develop an immediate action plan to address vacancies in critical traffic management program roles/capabilities.

There are current staffing shortages within the Childress District with respect to transportation and traffic management roles and their will likely be future staffing shortfalls. The District should create a strategic staffing and management plan for addressing these shortages. Potential actions will include development of position descriptions and required education/experience for each position to have the information ready to go when an advertisement is authorized.

As a first step, the District should identify what they consider to be critical positions with respect to transportation operations and traffic management. This should be done in conjunction with determining how many positions can be filled if there are hiring restrictions. If there are shared responsibility positions or positions that can meet multiple needs, these should be given higher priority. The benefit of this strategy is that the District will be prepared to take action to fill open positions in a shorter time frame and be able to fill them strategically.

Transportation and TSMO Position Description Resources:
NOCoE: Model TSMO Position Descriptions (https://transportationops.org/workforce/model-tsmo-position-descriptions)
NCHRP: Transportation Workforce Planning and Development Strategies (http://www.trb.org/Main/Blurbs/179878.aspx)

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Low

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Organization & Workforce

STRATEGY NO. 14
Establish professional requirements for staff to gain training on surface transportation weather management.

Having a knowledgeable and skilled workforce to mitigate road weather issues and manage the transportation system when inclement weather arises is of vital importance to the mission of TxDOT. Engaging employees to improve their knowledge, skills and abilities provides a clear path for advancement within the agency and improves employee retention. Better training builds a highly trained and continually improving workforce for road weather management within an agency and leads directly to a safer and more reliable transportation system overall.

The Childress District should start by identifying the knowledge, skills and abilities (KSA) it considers of greatest importance in the employees that play the largest role in weather mitigation activities. An evaluation should be conducted of District personnel as it relates to these KSAs and determine the area in which the greatest training need exists. Training can be accomplished in several ways including online, self-study, in-person classes and through field training and demonstration of applied knowledge. A determination of the applicable training and availability, online or in-person, should be evaluated and costs of training determined, both in terms of cost to conduct training as well as District personnel time, for budgeting purposes. Potential training sources include the Road Weather Management Certification available through CITE https://www.citeconsortium.org/cite-courses/certificate-programs/road-weather-management/ as well as FHWA resources at https://ops.fhwa.dot.gov/weather/index.asp.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Medium	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Organization & Workforce

STRATEGY NO. 15
Develop a formal and ongoing training program on WZM that is offered and supported by the Childress District and TRF.

Work Zone Management (WZM) is an essential strategy and practice that all transportation agencies should undertake. WZM has many advantages to both the agency as well as the driving public. A good WZM strategy has the following goals:

- Minimize traffic delays
- Maintain motorist and worker safety
- Complete roadwork in a timely manner
- Maintain access for businesses and residents

Training on good WZM strategies and practices is necessary to maintain knowledge of agency personnel and informs stakeholders about the WZM efforts undertaken and why. The Childress District should coordinate with the TxDOT Traffic Division (TRF) on scheduling WZM training on a regular basis with all personnel and stakeholders. WZM training resources include coursework from the FHWA Office of Operations (https://ops.fhwa.dot.gov/wz/outreach/outreach.htm) and the National Highway Institute (https://ops.fhwa.dot.gov/wz/outreach/nhi_wz_courses.htm). Possible ways to formalize the training program is to create a District-wide WZM committee comprised of TxDOT personnel, as well as external stakeholders (contractors, business owners, etc.), and have that committee meet on a quarterly basis at a minimum to discuss current and upcoming roadway projects and lessons learned from past projects. The WZM lead from the Childress District should chair the committee and coordinate training activities with TxDOT TRF.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Organization & Workforce

STRATEGY NO. 16
Provide funding to support formalized training and professional capacity building for professional traffic signal operations and ITS staff.

Proper traffic signal operation is one of the most visible services provided by TxDOT to the traveling public. Traffic signal operations is the active prioritization of traffic management objectives and the collection of data to efficiently manage traffic signal infrastructure to maximize safety and throughput while minimizing delays. Signal timing must address the needs of all users including, pedestrians, bicycles, and vehicles, and in some cases must specifically accommodate, freight, transit, railroad and emergency vehicles.

Traffic signal operations requires specific knowledge, skills and abilities. The depth of knowledge needed varies by staff position and subject matter. Positions must have knowledge related to the application of sophisticated electronics and data communications technologies to traffic control applications, and be knowledgeable of new technologies applied to both new and old traffic control applications, including the variety of brands, models, types of equipment, systems and software that are available. Changes in traffic control technology and the greater use of telecommunications require increasingly more knowledge of electronics and greater computer literacy. The training links below support advancement of knowledge in traffic signal operations. Many training programs are fee based and all require personnel time to complete. Supportive funding of these programs and providing time for Childress District staff to attend is necessary.

- FHWA: Arterial Management (https://ops.fhwa.dot.gov/arterial_mgmt/training.htm)
- CITE: Traffic Signal Operations (https://www.citeconsortium.org/course/traffic-signal-timing/)
- ITE: ITE Learning Hub (https://www.pathlms.com/ite/courses/8945)

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Medium	Recurring:	Medium

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	No

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Culture

STRATEGY NO. 17
Identify managers within key agency groups and encourage them to coordinate and lead traffic management projects / efforts.

Identification of project champions is critical to the success of newer programs like TSMO and developing leaders amongst those champions now is important as they are the future leaders of TxDOT and other transportation agencies in the region. The Childress District should identify TSMO leaders within the District and seek out those interested in furthering the TSMO discussion within TxDOT or other agencies in the region, including the MPO, cities and counties. Encouragement of younger staff to get involved in projects and pursue their interests is another way to cultivate future leaders.

Providing a TSMO-based perspective when discussing solutions to an operational issue provides an opportunity for the Childress District to be the operational leader in the region. TSMO is all about doing more with less and providing less expensive alternatives to capacity or infrastructure buildouts requires leadership and confidence to overcome traditional thinking. This is where training, collaboration and a culture shift all meet to develop TSMO leaders and ultimately provide a safer, more reliable and more efficient transportation system.

Workforce Development Resources:
NOCoE: TSMO Workforce Development (https://transportationops.org/workforce)
NOCoE: TSMO Workforce Webinar Series (https://www.youtube.com/watch?v=fg-PZYqjLnw)

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Culture

STRATEGY NO. 18
Create a Work Zone Management (WZM) steering committee of key agency champions and WZM core staff, and hold regular meetings to ensure an ongoing dialogue that sets the agency's WZM agenda.

Work Zone Management (WZM) is an essential strategy and practice that all transportation agencies should undertake. WZM has many advantages to both the agency as well as the driving public by creating safer and more efficient work zones.

To enforce the strategy of WZM and make any adjustments to an ongoing training program, the Childress district should identify several stakeholders who are involved in work zone implementation throughout the District. The steering committee is a critical element to increase the success and longevity of WZM and membership should include, but not be limited to, Transportation and Planning Director, Traffic Engineering, sign shop, and first responders.

The meetings should take place at least once a quarter and shall use the six dimensions of the Capability Maturity Model (CMM) to develop work zone design principles. The meeting shall also include review of current work zone plans being implemented and review of accidents that have occurred during construction.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Culture

STRATEGY NO. 19
Identify and engage the public information officer (PIO)/communications specialist from the agency.

To improve the impact of the TSMO strategies to the traveling public, there needs to be a clear and direct message using various forms of medium that include radio, tv, and social media. As new initiatives are pushed to the public, this messaging can limit the amount of negative feedback that may be received.

Engagement of the agency's PIO is critical to a successful deployment of the TSMO strategies. During the initial phase of the strategy engagement, a meeting with PIO should be scheduled to come up with a plan to engage the community. For example, when traffic control plans will impact traffic patterns, the PIO can be included to start a campaign in advance of those transitions and provide updates as the project progresses. Additionally, the PIO can also engage the various stakeholders to develop a communication plan that can be applied to various scenarios. The District currently uses the PIO to communicate information regarding upcoming winter weather storms through social media and radio.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Medium

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

FOCUS AREA:
Collaboration

STRATEGY NO. 20
Hold regular agency meetings to establish the groundwork for shared facilities, personnel, and resources.

Understanding internal resources and external resources is crucial to maintaining efficiency within the District. The ability for each unit within the Childress District to know key facilities, personnel, and resources assists in efficiency and collaborations. This applies to external stakeholder agencies that routinely assist TxDOT as well. During these meetings each unit/agency is encouraged to inform the entire District of changes in availability to facilities, turnover of personnel, and accessibility of other resources. Some examples may be heavy machinery for moving debris or wrecks off of the highway, hazmat specialists within the local fire department, or knowing who to call form the city for traffic signal malfunctions.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Low

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

Medium

FOCUS AREA:
Collaboration

STRATEGY NO. 21
Establish a plan to involve law enforcement for work zone management applications.

Stakeholder collaboration currently occurs within the District during work zone management applications. Because the District is located within a small rural community, communication between stakeholders is informal and requires little effort. The associations between stakeholders in the District can be referred to as a relationship between neighbors. Coordination, although it is occurring ad hoc, should follow a plan that is agreed upon by each stakeholder.

The plan should include coordination with stakeholders, specifically law enforcement, to help maintain the flow of traffic within work zones while encouraging safety. Expectations within the plan should be shared and agreed upon by TxDOT and law enforcement to ensure that the goal of efficiency and safety are achieved. Include first responders in incident management teams and the work zone management steering committee formed within the District.

GOAL ALIGNMENT (Check appropriate areas)

Safety:	Yes	Efficiency:	Yes	Collaboration:	Yes
Reliability:	Yes	Customer Service:	Yes	Integration:	Yes

COST (Low, Medium, High)

Initial:	Low	Recurring:	Low

TXDOT STAFF EFFORT (Low, Medium, High)

Low

STAKEHOLDERS (Yes or No)

Internal:	Yes	External:	Yes

TIMEFRAME (Near-term, Mid-term, Long-term)

Near-term

RETURN ON INVESTMENT (Low, Medium, High)

High

Appendix B:

List of Stakeholders

Texas Department of Transportation

TxDOT Childress District Engineer
TxDOT Childress District, TSMO Coordinator
TxDOT Childress District, TSMO Champion
TxDOT Childress District Operations
TxDOT Childress District Maintenance
TxDOT Childress District Construction
TxDOT Childress District Transportation Planning and Development
TxDOT Amarillo District, TSMO Coordinator
TxDOT Amarillo District, TSMO Champion
TxDOT Amarillo District Operations
TxDOT Lubbock District, TSMO Coordinator
TxDOT Lubbock District, TSMO Champion
TxDOT Wichita Falls District, TSMO Coordinator
TxDOT Wichita Falls District, TSMO Champion
TxDOT Abilene District, TSMO Coordinator
TxDOT Abilene District, TSMO Champion
TxDOT Traffic Division (TRF)
Briscoe County
Childress County
Collingsworth County
Cottle County
Dickens County
Donley County
Foard County
Hall County
Hardeman County
King County
Knox County
Motley County
Wheeler County

Federal

FHWA, Texas Division

State of Texas

Texas Division of Emergency Management
Texas Disaster Medical System
Texas Highway Patrol, District 5A
Texas Highway Patrol, District 5B

State of Oklahoma

Oklahoma DOT HQ
Oklahoma DOT Division 5

Appendix C:

Capability Maturity Model Survey Results

Childress District Transportation Systems Management and Operations (TSMO) Program Plan Development

Capability Maturity Model (CMM) Summary

1. Introduction

Transportation Systems Management and Operations (TSMO) is an integrated program to optimize the performance of existing multimodal infrastructure through implementation of specific systems, services, and projects designed to preserve capacity and improve the security, safety, and reliability of the transportation system. On May 20th, 2020, representatives of the Texas Department of Transportation (TxDOT) Childress District (CHS), its contractors, and external stakeholders from the Childress district attended a web conference to assess the district's current capabilities through a Capability Maturity Model (CMM) self-assessment. Subjects discussed within the self-assessment were related to business processes, systems and technologies, performance measurement, culture, organization and workforce, and collaboration in the Childress district. The purpose of the assessment is to begin the development of an action plan for targeted improvements that can be recommended within the Childress District TSMO Program Plan.

This document provides a summary of the CMM workshop, presents findings from the capability assessments, and identifies a list of follow-up actions to continue the momentum of the May 20th workshop.

2. Capability Maturity Model Overview

The CMM self-assessment framework is comprised of six dimensions of capability – three process-oriented dimensions and three institutional dimensions.

Process-oriented Dimensions:

1. Business Processes: Includes planning, budgeting (resources), procurement, and process development that is required for TSMO programs.
2. Systems and Technology: Includes use of systems engineering, systems architecture standards, interoperability, and standardization, and ensures operational needs are met; and
3. Performance Measurement: Used to evaluate the effectiveness of mobility strategies and whether changes need to be made to achieve mobility or other goals. Includes measures definition, data acquisition, and utilization.

Institutional Dimensions:

1. Culture: Reflects the organizational culture in which TSMO messaging is communicated internally and externally, including technical understanding, leadership, outreach, and program legal authority;
2. Organization and Staffing: Reflects a qualified staff and organizational structure that can unify TSMO activities in project delivery. Includes programmatic status, organizational structure, staff development, and recruitment and retention; and
3. Collaboration: Reflects the ability of divisions, districts, partner agencies, and other stakeholders to work together to achieve TSMO activities. Includes relationships with public safety agencies, local governments, regional planning organizations, and the private sector.

Consistent with the Strategic Highway Research Program 2 (SHRP2) guidance, the capabilities for each dimension are described as a matrix that defines the process improvement areas and levels. These four levels are described further below:

- Level 1 – Activities and relationships are ad hoc
- Level 2 – There is some collaboration, staff training, and accountability.
- Level 3 – Further integration, processes throughout the organization/agency.
- Level 4 – Optimizing processes and looking at new opportunities

Table 1 presents an overview of the relationship between the various dimensions and the capability levels at which agencies could assess their level of performance with respect to those dimensions.

Table 1: CMM Assessment Criteria

Dimensions		Capability Level Criteria			
		Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimizing
Process Oriented	**Business Processes (Planning and Programming)**	Each jurisdiction doing its own thing according to individual priorities and capabilities	Consensus regional approach developed regarding TSMO goals, deficiencies, B/C, networks, strategies and common priorities	Regional program integrated into jurisdictions' overall multimodal transportation plans with related staged program	TSMO integrated into jurisdictions' multi-sectoral plans and programs, based on formal continuing planning processes
	Systems and Technology	Ad hoc approaches to system implementation without consideration of systems engineering and appropriate procurement processes	Regional ConOps and architectures developed and documented with costs included; appropriate procurement process employed	Systems and technology standardized and integrated on a regional basis (including arterial focus) with other related processes and training as appropriate	Architectures and technology routinely upgraded to improve performance; systems integration/ interoperability maintained on continuing basis
	Performance Measurement	Some outputs measured and reported by some jurisdictions	Output data used directly for after-action debriefings and improvements; data easily available and dashboarded	Outcome measures identified (networks, modes, impacts) and routinely utilized for objective-based program improvements	Performance measures reported internally for utilization and externally for accountability and program justification
Institutional Oriented	**Culture**	Individual staff member champions promote TSMO, varying among jurisdictions	Jurisdictions' senior management understands TSMO business case and educates decision makers/public	Jurisdictions' mission identifies TSMO and benefits with formal program and achieves wide public visibility/understanding	Customer mobility service commitment accountability accepted as formal, top level core program of all jurisdictions
	Organization / Staffing	TSMO added on to units within existing structure and staffing – dependent on technical champions	TSMO-specific organizational concept developed within/ among jurisdictions with core capacity needs identified, collaboration takes place	TSMO Managers have direct report to top management; Job specs, certification and training for core positions	TSMO senior managers at equivalent level with other jurisdiction services and staff professionalized
	Collaboration	Relationships ad hoc and personal (public-public, public-private)	Objectives, strategies, and performance measures aligned among major players (transportation and public safety agencies (PSAs)) with after-action debriefing	Rationalization/sharing / formalization of responsibilities among key players through co-training, formal agreements, and incentives	High level of TSMO coordination among owner/operators (State, local, private)

3. Workshop Overview and Participants

A CMM workshop was conducted with Childress district stakeholders on May 20th, 2020. Prior to the CMM workshop, two stakeholder workshops were conducted on May 6th, 2020 and May 13th, 2020 to introduce the concept of TSMO and also to describe the steps of the project that includes the CMM process and the Capability Maturity Framework (CMF). Operational scenarios around traffic incident management and work zone management were discussed to understand how the district responds to certain types of events that can have travel related impacts on the general public.

During the CMM workshop, a CMM self-assessment discussion was facilitated with stakeholders to gauge the levels at which they felt were at with respect to the various process-oriented and institutional capability dimensions.

Appendix A includes the list of workshop participants at the series of stakeholder workshops.

4. CMM Self-Assessment Discussion

Stakeholders were asked to review each of the six CMM capability dimensions and rate themselves based on the scale of Level 1 (performed ad hoc) to Level 4 (optimized process and reviewing new opportunities). For each dimension there were two votes cast in the self-assessment. One vote was with consensus from key TxDOT Childress District staff, and the other vote was cast by a local representative from the Texas Department of Public Safety (DPS).

Process-Oriented Dimensions

Business Processes – **Level 1 (TxDOT) / Level 3 (DPS)**. TxDOT CHS noted their business processes is on an as needed bases and currently do not have a plan in place. District staff noted that they would like to be at a Level 2 or 3 in this dimension, and that creating a maintenance plan for ITS devices could be an action to help get them there since they would like to maintain and expand their system. Texas DPS noted that TxDOT CHS staff do really well with the resources they have available to them.

Systems and Technology – **Level 1 (TxDOT and DPS).** TxDOT CHS noted that the District could get to a Level 2 or 3 with an ITS maintenance plan in place to govern how ITS devices are maintained over time.

Performance Measures – **Level 2 (TxDOT and DPS).** TxDOT CHS noted that there is some collaboration after major roadway traffic incidents to determine where improvements could be made, but they would like to advance to a Level 3. A detailed assessment at all aspects of TxDOT processes could help determine if TSMO strategies can further enhance the district's capability in performance measures to assist with traffic incident reduction.

Institutional Dimensions

Organization and Workforce – **Level 1 (TxDOT) / Level 2 (DPS)**. TxDOT CHS felt they are at a Level 1 since there is often no formal training offered, but the District could get to a Level 2 through offering of training sessions. Texas DPS felt the District is at a Level 2 and also added that SHRP-2 Traffic Incident Management (TIM) training has been offered to Texas DPS in other Districts which has been beneficial. As a statewide

organization, TxDOT central office felt that as an agency TXDOT is at a Level 2. However, this level is not consistent throughout all districts as TxDOT currently does not have statewide implementation of TIM training.

Culture – Level 1 (TxDOT and DPS). TxDOT CHS noted that they do not have prior experience with TSMO and currently do not have designated TSMO staff roles other than the District TSMO Champion and Coordinator.

Collaboration – Level 2 (TxDOT and DPS). Both TxDOT CHS and Texas DPS felt stakeholders in the District are collaborating well at a Level 2. Texas DPS works well with internal District stakeholders and the group also works with external stakeholders in neighboring TxDOT Districts. Both TxDOT and Texas DPS felt by continuing to communicate and attend trainings together the District could get to a Level 3 or Level 4 over time.

Figure 1 presents a graphical summary of the levels at which the workshop participants by agency assessed the District with respect to each dimension.

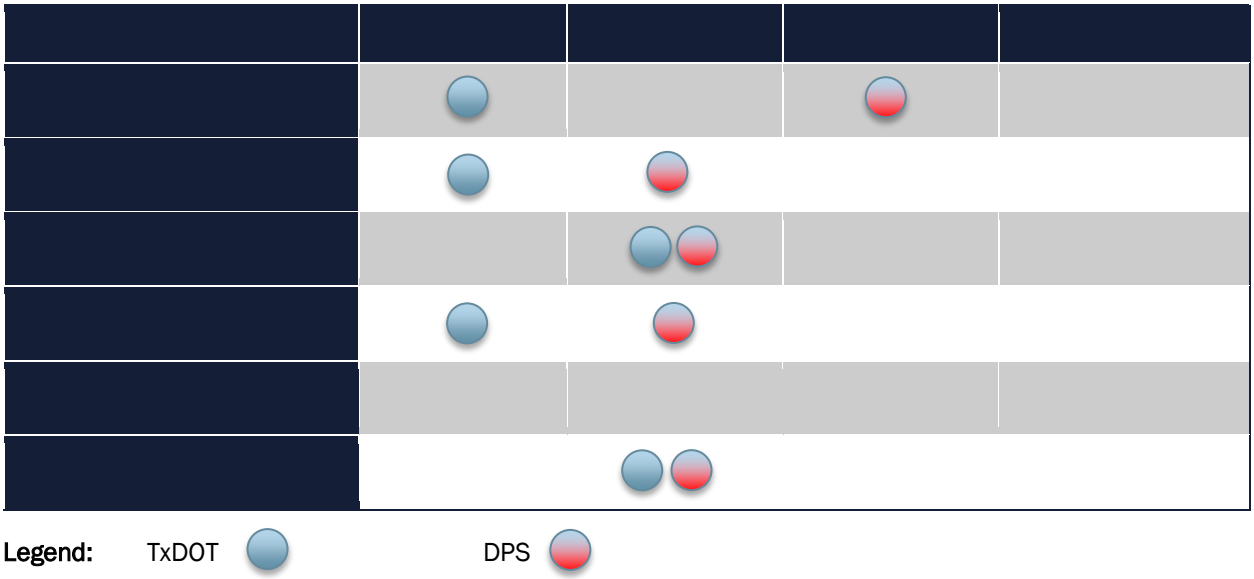


Figure 1: Capability Maturity Model Self-Assessment Levels

5. Identified Actions and Priorities

Based on the results of the capability maturity assessment, workshop participants identified the following actions to improve TSMO effectiveness. Additional actions will be identified through the completion of the Capability Maturity Framework (CMF) survey process for the TxDOT CHS District.

5.1 Process-Oriented Actions

Business Processes

- Develop ITS Device Maintenance Plan for CCTV and DMS within the District.

Systems and Technology

- Develop ITS Device Maintenance Plan for CCTV and DMS within the District.

Performance Measures

- Apply TSMO strategies to identify and collect performance measure data to assist with reductions in major roadway / traffic incidents.

5.2 Institutional Actions

Organization and Workforce

- Offering of training sessions such as SHRP-2 Traffic Incident Management (TIM) training for TxDOT CHS staff and Texas DPS staff.

Culture

- Designate TSMO staff roles at key levels including TSMO Champion, TSMO Coordinator, and other support areas such as Work Zone Management, Traffic Incident Management, and Traffic Management.

Collaboration

- Continuing to communicate internally among TxDOT CHS staff and externally with partner agencies.
- Conduct and / or attend training sessions within and outside the CHS District.

Appendix A

CMM Workshop Attendance (WebEx)

May 6th Attendees:	Barbara Russell – TxDOT Headquarters Charles Tapp – TxDOT Headquarters Chris Reed – TxDOT Childress District Chuck Steed –TxDOT Childress District Darwin Lankford – TxDOT Childress District Jeremy Dearing – TxDOT Lubbock District Millie Hayes – FHWA Shon Crouch – TxDOT Childress District Travis Herrell – TxDOT Wichita Falls District Tiffany Pulliam – TxDOT Amarillo District	Dan Nelson – AECOM Ming Shiun Lee - AECOM Marques Allen – HDR Matt Volz – HDR Jim Hanson – HDR Nicole Sniffen – HDR Taylor McHenry – HDR

May 13th Attendees:	Barbara Russell – TxDOT Headquarters Chris Reed – TxDOT Childress District Chuck Steed - TxDOT Childress District Darwin Lankford – TxDOT Childress District Shon Crouch – TxDOT Childress District Jeremy Dearing – TxDOT Lubbock District	Dan Nelson – AECOM Ming Shiun Lee - AECOM Marques Allen – HDR Matt Volz – HDR Jim Hanson – HDR Nicole Sniffen – HDR Taylor McHenry – HDR

May 20th Attendees:	Barbara Russell – TxDOT Headquarters Chris Reed – TxDOT Childress District Darwin Lankford – TxDOT Childress District Shon Crouch – TxDOT Childress District Tiffany Pulliam – Amarillo District Jason Musick – Department of Public Safety	Dan Nelson – AECOM Ming Shiun Lee - AECOM Marques Allen – HDR Matt Volz – HDR Jim Hanson – HDR Nicole Sniffen – HDR Taylor McHenry – HDR Britnee Adams - HDR

AECOM HDR

Version 1.1

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