



# TxDOT DFW TSMO Capability Maturity Framework – Traffic Signal Management November 2020

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## Summary Report

Kimley-Horn

Othon, Inc.

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## List of Abbreviations & Acronyms

ATSPMs	Automated Traffic Signal Performance Measures
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
DART	Dallas Area Rapid Transit
DFW	Dallas-Fort Worth
DMS	Dynamic Message Sign
FLIR	Forward Looking InfraRed
IMSA	International Municipal Signal Association
ITS	Intelligent Transportation System
NCTCOG	North Central Texas Council of Governments
TIM	Traffic Incident Management
TRB	Transportation Research Board
TSM	Traffic Signal Management
TSMO	Transportation Systems Management and Operations
TxDOT	Texas Department of Transportation
UTA	University of Texas at Arlington

## Introduction

Texas Department of Transportation's (TxDOT) Dallas and Fort Worth Districts are in the process of assessing the region's transportation systems management and operations (TSMO) capabilities to support the Dallas-Fort Worth (DFW) TSMO Program Plan. The development of the DFW TSMO plan seeks to increase safety, reduce congestion, and improve transportation reliability in the DFW region by identifying cost-effective improvements in how the region operates and maintains the transportation system. In October 2020, TxDOT hosted a series of workshops to help determine a set of actions to support effective TSMO solutions and strategies. The process engaged both TxDOT staff and decision makers at stakeholder and partner agencies that regularly collaborate to manage and operate the roadway network. A previous series of Capability Maturity Model (CMM) workshops had focused on the six dimensions of CMM: culture, organization and workforce, business processes, performance measurement, systems and technology, and collaboration. Following those workshops, the Capability Maturity Framework (CMF) workshops focused on specific program areas and potential actions to advance operations.

These workshops were originally planned to occur as in-person workshops, however due to meeting restrictions related to the Coronavirus pandemic, they were conducted as virtual workshops. There were two separate workshops held for Traffic Signal Management (TSM); one focused on stakeholders in the TxDOT Fort Worth District, and one focused on stakeholders in the TxDOT Dallas District. Each workshop introduced participants to the CMF process and provided examples of regional and national practices and programs. The workshop provided discussion time for stakeholders as well as time for questions and answers, as attendees reviewed the current practices and desired improvements in each respective district.

The two workshops, coincidentally, had the same number of participants. The dates and number of participants for each workshop are listed in **Table 1**.

*Table 1: CMF Traffic Signal Management Workshops*

	Date	Number of Participants
Fort Worth District	October 6, 2020	22
Dallas District	October 14, 2020	22

### *Virtual Workshop Overview*

The CMF workshops aimed to provide information about TSM strategies employed within Texas and across the United States, determine current strategies being applied within the districts, identify areas for improvement or roadblocks for implementation of TSM activities, and identify which areas of TSM the districts would like investigated further. The presentations for the Fort Worth District and the Dallas District workshops can be found in **Appendix A** and **Appendix B**, respectively.

Attendees were provided an overview of TSMO and TSM. TSMO is defined as integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional

systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system. TSM is defined by the Transportation Research Board (TRB) as the planning, design, integration, maintenance, and proactive operation of a traffic signal system in order to achieve policy-based objectives to improve the efficiency, safety, and reliability of signalized intersection operations. The TSM overview focused on regional practices and programs, coordination needs and examples, and detection types and their advantages.

## Individual Workshop Summaries

The following subsections contain summaries of the two individual virtual workshops. A summary of key discussion and takeaways and a table of actions to advance are included for each district's workshop.

### *Workshop 1: TxDOT Fort Worth District; Traffic Signal Management*

#### Overview

On October 6, 2020, twenty-two participants joined in the TxDOT Fort Worth District virtual workshop (held via Teams). **Table 2** summarizes the participants, role, and representing organization.

*Table 2: TxDOT Fort Worth District Workshop Attendees*

Attendee	Title	Agency
Matt McCarty	Intelligent Transportation Systems (ITS) Analyst IV	TxDOT Fort Worth District
Kimberley Clarida	Contract Management Specialist	TxDOT Fort Worth District
John Forbes	Traffic Systems Specialist	TxDOT Fort Worth District
Theresa Poer	Director of Transportation Operations	TxDOT Fort Worth District
Mohammed Quadeer	Transportation Engineer	TxDOT Fort Worth District
Dicky White	Transportation Engineer	TxDOT Fort Worth District
Joe Hunt	Traffic Management Section Director	TxDOT Traffic Safety Division
Barbara Russell	Engineering Manager	TxDOT Traffic Safety Division
Larry Wright	City Engineer	City of Colleyville
Matthew Hotelling	Traffic Engineer	City of Flower Mound
David Stallings	Traffic Operations Manager	City of Flower Mound
Rajnish Gupta	City Traffic Engineer	City of Fort Worth
Yang Jin	Engineering Manager	City of Fort Worth
Aziz Rahman	Sr. Professional Engineer	City of Fort Worth
Caryl DeVries	Traffic Engineer	City of Grand Prairie
Walter Shumac	Director of Transportation	City of Grand Prairie
Duane Hengst	Managing Director of Engineering and Construction	City of Hurst
Abed Abukar	Director of ITS	DART
Todd Plesko	Vice President of Service Planning and Scheduling	DART
Natalie Bettger	Senior Program Manager	NCTCOG
Gregory Masota	Transportation Planner III – ITS	NCTCOG
Marian Thompson	Transportation System Operations Supervisor – ITS	NCTCOG

## Workshop Focus Questions

To generate discussion, the facilitators posed the following questions to workshop attendees.

- How would you rate your knowledge of and involvement with North Central Texas Council of Government's (NCTCOG) Regional Traffic Signal Timing Program?
- Does your agency use Automated Traffic Signal Performance Measures (ATSPMs)?
- Is training an issue?
- What TSMO areas interest you?

## Key Discussion and Takeaways from the TxDOT Fort Worth District TSM Workshop

The presentation and discussion centered on five areas: regional programs, signal performance measures, coordination efforts, detection, and training. Below is a summary of the discussion that occurred during the workshop.

- **Re-timing Activities:** Various agencies provided input on their current signal re-timing processes and activities. The City of Fort Worth re-times their signals in three-year intervals or approximately 300 locations per year. The signal re-timing activities are currently on-hold due to the reduced traffic volume as a result of the COVID-19 pandemic. Regular re-timing activities are anticipated to resume as traffic volumes increase. The City of Colleyville's signals along SH 26 are currently being maintained by TxDOT during a construction project but will be turned over to the City of Colleyville upon project completion. At that point, the City of Colleyville intends to maintain the signal timings through an agreement with another municipality or with a consultant. The City of Hurst participates in the NCTCOG's Regional Timing program.
- **Automated Traffic Signal Performance Measures (ATSPMs):** Several agencies expressed interest in ATSPMs, however they do not have the technical expertise or equipment to implement them. Only one agency, the City of Fort Worth, is currently using ATSPMs. The City's focus is on four parameters: travel times, stop delay, number of stops reduction, and emission reduction. The City of Fort Worth has identified detection faults and receives flash and preemption alerts from its existing system. The City of Fort Worth is currently working with the University of Texas at Arlington (UTA) to develop a program based on Purdue diagrams to process system failure identification and weather condition information alongside other ATSPMs. The UTA dashboard will acquire detector data from all participating municipalities. However, a couple concerns with the dashboard have not been sorted-out yet:
  - It will be open-sourced; who will maintain it?
  - How will the data be shared?
- **Incident Management:** The City of Fort Worth mainly coordinates with TxDOT for TSMO activities, including planned special event management, and work zone management. NCTCOG is currently developing a corridor traffic incident management (TIM) signal timing program and its implementation has been completed in City of Irving, City of Dallas, and Grand Prairie. One goal of the TIM program is to determine the traffic signal equipment needs for study corridors and priority locations to implement this technology.
- **Planned Special Event Management:** TxDOT does not have a group focused on planned special event management. Currently NCTCOG is the agency that provides the greatest coordination for the Texas Rangers and Dallas Cowboys sporting events. NCTCOG coordinates with TxDOT for dynamic message sign (DMS)

messages. For larger special events, such as the Super Bowl, College Football Playoffs, Final Four, etc., a regional transportation group is established to develop traffic management plans for each event.

- **Training:** Most agencies participating in the workshop expressed training of signal operations and maintenance personnel (or lack thereof) is an area of concern. This lack of available training has been an issue when recruiting new staff and has impacted the ability to retain existing staff. Training needs range from basic signal technician training to more technical intelligent transportation systems (ITS) and TSMO training needs. One potential training program mentioned was International Municipal Signal Association (IMSA). The City of Fort Worth provides ISMA Level 2 training.
- **Dynamic Lane Control Signal:** A brief discussion on the use of lane control signals occurred. TxDOT is interested in the topic of dynamic lane assignment, however, it is not significantly utilized within the region. A current construction project on SH 161 will allow the use of shoulders during the peak hours. It was not open for public use at the time of the workshop.
- **Detection Types:** The City of Fort Worth uses multiple types of detection including a hybrid stop bar and radar system. For small intersections, fisheye detectors are used. The City of Fort Worth has some bicycle detection. The City of Grand Prairie currently uses detection loops but is no longer installing them on new construction projects; they are moving to video detectors. TxDOT has advanced detection at some locations within the City of Grand Prairie limits. The City of Hurst is almost exclusively using video detection. TxDOT's preferred method of detection is radar. TxDOT is installing pan, tilt, zoom cameras at major intersections with stop bar detection at all four approaches.
- **Signal Preemption:** The City of Fort Worth currently uses Opticom for signal preemption for fire department personnel. A need for additional funding has been identified to upgrade the system.



## Actions to Advance

Several action items resulted from the TxDOT Fort Worth District TSMO discussion on Traffic Signal Management. Specific action items are provided in **Table 3**.

Table 3: TxDOT Fort Worth District Actions to Advance

Action	Owners	Dimension
Develop a training program and/or develop material to address the lack of available training for signal technicians.	All agencies	Organization & Workforce
Develop a formal process for the implementation and use of ATSPMs.	All agencies	Performance Measurement
Invest in technologies and equipment to implement ATSPMs.	TxDOT	Systems & Technology
Evaluate use of dynamic lane assignment on applicable projects.	TxDOT, City of Fort Worth	Systems & Technology
Implement a more formalized TIM program, including increased incident detection capabilities.	All agencies	Business Processes
Formalize coordination and communication guidelines between traffic incident responders.	All agencies	Collaboration
Create a standard operating procedure for coordinating with neighboring jurisdictions for identifying construction projects and messaging opportunities near planned special event locations.	All agencies	Business Processes

## Workshop 2: TxDOT Dallas District; Traffic Signal Management

### Overview

On October 14, 2020, twenty-two participants joined in the Dallas District virtual workshop (held via Teams). **Table 4** below summarizes the participants, role, and representing organization.

Table 4: TxDOT Dallas District Workshop Attendees

Attendee	Title	Agency
Chris Blain	Transportation Engineer & Supervisor	TxDOT Dallas District
Craig Burgan	Traffic Systems Administrator	TxDOT Dallas District
Chris Flanigan	Director of Engineering	City of Allen
Kevin Pike	Public Works Manager	City of Carrollton
John Romberger	Transportation Engineer	City of Carrollton
Robert Woodbury	City Engineer – Public Works	City of Cedar Hill
Ghassan Khankarli	Assistant Director – Transp. Planning, Engineering & Operations	City of Dallas
Joseph Marchione	Senior Traffic Engineer	City of Dallas
Srinivasa Veeramallu	Senior Program Manager	City of Dallas
Wayne Kurfees	Transportation Operations Administrator	City of Garland
Monsur Ahmed	Traffic Engineering Manager	City of Irving
Curt Cassidy	Assistant Director of Public Works	City of Mesquite
Sam Hudson	Senior GIS Analyst	City of Mesquite
Toar Schell	GIS Manager	City of Mesquite
Justin Stoker	Assistant City Engineer	City of Mesquite
Robert Saylor	Senior Transportation Engineer	City of Plano
Rama Dhanikonda	Transportation Program Manager	City of Richardson
Mark Nelson	Director – Transportation & Mobility	City of Richardson
Abed Abukar	Director of ITS	DART
Natalie Bettger	Senior Program Manager	NCTCOG
Gregory Masota	Transportation Planner III – ITS	NCTCOG
Marian Thompson	Transportation System Operations Supervisor – ITS	NCTCOG

### Poll Results

To generate participation beyond abbreviated answers, four polls were conducted during the virtual workshop to gauge the knowledge and interest level of the participants. **Table 5** below summarizes the poll questions and

results. The number of responses provided for each question is included. Most poll questions only allowed one response, however the fourth question allowed participants to answer more than once, resulting in more responses than participants. Poll questions were added for the TxDOT Dallas District workshop following feedback from the earlier TxDOT Fort Worth District workshop.

Table 5: TxDOT Dallas District Poll Results

Poll Question	Possible Answers	Responses	Number of Responses
How would you rate your knowledge of and involvement with NCTCOG's Transportation Systems Management program?	A) No awareness of the program B) I am aware of the programs but have not participated C) I am aware and have participated in the program D) The program needs to be expanded	A) 38% B) 31% C) 31% D) 0%	13
Does your agency use Automated Traffic Signal Performance Measures (ATSPMs)?	A) No knowledge of ATSPMs B) I understand ATSPMs but my agency doesn't use them C) My agency is in the process of implementing ATSPMs D) My agency uses ATSPMs	A) 18% B) 45% C) 27% D) 9%	11
Is training an issue?	A) No training is provided B) Training is available upon request C) My agency is interested in providing training, but has not found appropriate training D) Adequate training is provided	A) 0% B) 0% C) 100% D) 0%	7
What TSMO areas interest you?	A) Regional Programs B) Signal Performance Measures C) Coordination Efforts D) Detection E) Training	A) 20% B) 24% C) 20% D) 8% E) 28%	25

### Key Discussion and Takeaways from the TxDOT Dallas District TSM Workshop

The presentation and discussion centered on five areas: regional programs, signal performance measures, coordination efforts, detection, and training. The items below summarize the discussion that occurred during the workshop.

- Re-timing Activities:** The City of Plano indicated that the Georgia Department of Transportation's (DOT) Regional Traffic Operations Program is a great example of a regional program. The City also indicated NCTCOG is currently working to establish minimum signal system technology guidelines and would like to see a regionally coordinated system. The City of Dallas suggested NCTCOG provide input on jurisdictional

traffic signal collaboration efforts and that traffic demand should not be the only factor for financial decision making when it comes to allocating funding for traffic signal investments. Additionally, it was suggested there is a need for NCTCOG to review how funding is distributed within the region to ensure fair distribution.

- **Automated Traffic Signal Performance Measures (ATSPMs):** The City of Irving utilizes an ATSPM application called MaxView for new equipment installations. One challenge the City of Irving is having is that the existing signal cabinet hardware deployed in many locations does not support the collection of ATSPMs. The City of Irving noted that the MaxView application is extremely resourceful and helps identify detection failures. The City of Dallas is currently testing MaxView and has found not having the appropriate type of detection required by the application to be an issue. The City of Dallas uses Wavetronix devices for both presence and advance detection. The City of Dallas has identified detection as a potential roadblock for implementing MaxView. MaxView uses the Utah DOT's ATSPMs system, which can give information on arrivals on green, approach volumes, and turning movements. The City of Frisco is in the process of employing ATSPMs like the system used by Utah's DOT.
- **Planned Special Event Management:** The City of Dallas coordinates planned special events, including sporting events, with TxDOT and Dallas Area Rapid Transit (DART). DMS messages and lane closures are routinely used for planned special events. The City of Dallas utilizes both contraflow and two-way operations for event traffic, depending on the event and the facilities that are impacted. Two-way operations occur before and during many events; contraflow operations occur often during the end of special events as traffic is exiting the event location.
- **Training:** Most agencies participating in the workshop expressed that recruiting, retention, and training of qualified personnel is an area of concern. The City of Dallas has issues finding qualified signal technicians and conducts in-house training. The City of Richardson participates in International Municipal Signal Association's (IMSA) training and finds it very helpful. Staff promotions are linked to IMSA certification levels. In addition to IMSA training, the City of Richardson also provides in-house training for signal technicians. The City of Plano has noted that IMSA training seems geared towards electricity expertise, and includes two groups: controller experts and installation experts. The training does not meet the City of Plano's needs and with the low signal technician pay rate compared to ITS related jobs, contributes to retention issues at the signal technician position. Several agencies indicated technicians are trained to have electrical knowledge but there is a lack the training on specific devices, including signals, controllers, and communication networks.
- **Lane Control Signals:** A brief discussion on the use of lane control signals occurred. In past years, the City of Dallas utilized dynamic lane signing at a few locations. However, the City of Dallas experienced several issues where drivers did not comply with the signs.
- **Detection Types:** A variety of detection types are in use within the region. The City of Richardson uses radar to detect bicyclists. When detected, additional green time is given to provide enough time for bicyclists to clear the intersection. The City of Richardson is starting to evaluate Forward Looking InfraRed (FLIR) camera and radar systems. FLIR uses thermal traffic sensing and includes bicycle detection. One issue the City of Dallas has with its deployed detection systems is having enough load switches in the cabinet due to limited

cabinet space. The City of Irving is in the process of upgrading from loops to video detections with and without radar.

- **Signal Preemption:** Several cities within the region have emergency preemption, including the City of Richardson, City of Arlington, City of Plano, and City of Carrollton. These cities only have emergency preemption for fire and/or ambulances. Both the City of Richardson and City of Arlington use Opticom devices, while the City of Plano uses ITS Plus devices partially due to the lower cost. ITS Plus is TxDOT tested and approved and has a detection range of over 800 feet. One major issue with preemption brought up by the City of Plano was unauthorized users obtaining technology that allowed them to make use of preemption systems. To reduce the number of unauthorized users, the City of Plano has implemented a fully encoded signal preemption system. The City of Plano has included neighboring agency fire and ambulance vehicles within their system.

### Actions to Advance

Several action items resulted from the TxDOT Dallas District’s TSMO discussion on Traffic Signal Management. Specific action items are provided in **Table 6**.

*Table 6: TxDOT Dallas District Actions to Advance*

Action	Owners	Dimension
Develop a training program and/or develop material to address the lack of available training for signal technicians.	All agencies	Organization & Workforce
Develop a formal process for the implementation and use of ATSPMs.	All agencies	Performance Measurement
Invest in technologies and equipment to implement ATSPMs.	All agencies	Systems & Technology
Create a standard operating procedure for coordinating with neighboring jurisdictions for identifying construction projects and messaging opportunities near planned special event locations.	All agencies	Business Processes

## Summary of Actions to Advance

**Table 7** includes the actions to advance that resulted from both the TxDOT Fort Worth and Dallas Districts workshops.

*Table 7: DFW Actions to Advance*

Action	Owners	Dimension
Develop a training program and/or develop material to address the lack of available training for signal technicians.	All agencies	Organization & Workforce
Develop a formal process for the implementation and use of ATSPMs.	All agencies	Performance Measurement
Invest in technologies and equipment to implement ATSPMs.	All agencies	Systems & Technology
Evaluate the use of dynamic lane assignment on applicable projects.	TxDOT, City of Fort Worth	Systems & Technology
Implement a more formalized TIM program, including increased incident detection capabilities.	All agencies	Business Processes
Formalize coordination and communication guidelines between traffic incident responders.	All agencies	Collaboration
Create a standard operating procedure for coordinating with neighboring jurisdictions for identifying construction projects and messaging opportunities near planned special event locations.	All agencies	Business Processes

## Appendix A: Fort Worth Virtual Workshop Presentation

Click on the following link to see the Fort Worth District Power Point Presentation.

<https://www.tsmodfw.org/wp-content/uploads/2020/10/DFW-TSMO-Traffic-Signal-Management-Presentation.pdf>

## Appendix B: Dallas Virtual Workshop Presentation

Click on the following link to see the Dallas District Power Point Presentation.

<https://www.tsmodfw.org/wp-content/uploads/2020/10/DFW-TSMO-Traffic-Signal-Management-Dallas-District-Presentation.pdf>