REGIONAL TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS (TSMO) PLAN

A regional approach to reliable transportation systems.

Version 20190206

TSMO PLAN

THE TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO) PLAN OUTLINES HOW TO GROW TSMO COLLABORATION AND ACTIVITIES IN THE REGION.

ACKNOWLEDGMENTS

The plan was completed through feedback from the Transportation Systems Management and Operations (TSMO) steering task force made up of members from Wichita Area Metropolitan Planning Organization, Federal Highway Administration, City of Wichita, City of Derby, Kansas Turnpike Authority, Sedgwick County and the Kansas Department of Transportation. Funding for the plan was through a grant from the Federal Highway Administration and the Kansas Department of Transportation. **Thank You** to all task force members and designees for their input through the process.

Common Acronyms

Acronym	Literal Interpretation	Definition
ATMS	Automated Traffic Management System	A central software used to communicate with field devices to perform various tasks, from posting DMS messages to changing signal timings.
ATSPM	Automated Traffic Signal Performance Measures	ATSPMs modernize traffic signal management by providing high-resolution data to support objectives and performance-based maintenance and operations strategies that improve safety and efficiency while reducing congestion and cost.
AV	Autonomous Vehicle	A vehicle which can drive itself without human interaction (other than inputting destination) using various in-vehicle technologies and sensors.
CMM	Capability Maturity Model	Development model created from data collected from an organization. Maturity relates to the degree for formality and optimization of processes, from ad hoc to formal defined steps to managed results.
CV	Connected Vehicle	Connected vehicles enable safe, interoperable networked wireless communications among vehicles, the infrastructure, and passengers' personal communications devices.
DMS	Dynamic Message Sign	Roadway signage which written messages can change to inform drivers of changing conditions, typically from a remote location such as the TMC, especially helpful with TIM applications.
FHWA	Federal Highway Administration	The FHWA provides stewardship over the construction, maintenance and preservation of the Nation's highways, bridges and tunnels. FHWA also conducts research and provides technical assistance to state and local agencies in an effort to improve safety, mobility, and livability, and to encourage innovation.
ICM	Integrated Corridor Management	ICM consists of the operational coordination of multiple transportation networks and cross network connections comprising a corridor, and the coordination of institutions responsible for corridor mobility. The goal of ICM is to improve mobility, safety, and other transportation objectives for travelers and goods. ICM may encompass several activities, such as cooperative and integrated policy among stakeholders, concept of operations for corridor management, communications among network operators and stakeholders, improving the efficiency of cross network junctions and interfaces, mobility opportunities, including shifts to alternate routes and modes, real time traffic and transit monitoring, real time information distribution (including alternate networks), congestion management (recurrent and non recurrent), incident management, travel

		demand management, public awareness programs, transportation pricing and payment, access management, and growth management.
ITS	Intelligent Transportation Systems	The application of advanced electronics, computers, communications, and sensor technologies, in an integrated manner, to increase the efficiency and safety of the surface transportation network.
KDOT	Kansas Department of Transportation	Department responsible for the management, safety, planning, operation and administration of all programs relating to the maintenance and development of the state highway system for Kansas. See www.ksdot.org for more information.
KTA	Kansas Turnpike Authority	The Kansas Turnpike Authority (KTA) maintains 236 miles of user-fee supported roadway from the Oklahoma border to Kansas City. The KTA doesn't receive state or federal tax funds. KTA's mission is to provide safe, economical, high-quality transportation service to its customers. See www.ksturnpike.com for more information.
MOU	Memorandum of Understanding	A MOU is typically signed by agencies to ensure that data sharing and other agreements are identified and transcend individuals as growth occurs within organizations.
MPO	Metropolitan Planning Organization	See WAMPO for detailed description of the local Metropolitan Planning Organization.
MTP	Metropolitan Transportation Plan	MTP is a list of transportation projects which must encompass an approximate 20 year planning horizon and be fiscally constrained.
SOP	Standard Operating Procedures	A set of guidelines that identify specific procedures to follow when an event happens.
TAC	Transportation Advisory Committee	WAMPO committee responsible for analysis and recommendations of transportation alternatives for the region. The TAC is the technical committee of WAMPO that advises the TPB.

TPB	Transportation Policy Body	WAMPO committee of local elected officials and Kansas Department of Transportation officials responsible for the adoption of policies such as the TIP, TPB, work plan, etc. The TPB is the policy committee and ultimately is responsible for WAMPO actions.
TIM	Traffic Incident Management	The systematic, planned, and coordinated use of human, institutional, electrical, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders. These resources are also used to increase the operating efficiency, safety, and mobility of the surface transportation network by systematically reducing the time to detect and verify an incident occurrence; implementing the appropriate response; and safely clearing the incident, while managing the affected flow until full capacity is restored.
TIP	Transportation Improvement Program	Each metropolitan planning organization is required to develop a TIP (a list of upcoming transportation projects) that covers at least four years, and is consistent with the MTP and is fiscally constrained.
TMC	Traffic Management Center	The hub of a transportation management and control system. The TMC brings together human and technological components from various agencies to perform a variety of functions.
TSMO	Transportation Systems Management and Operations	An integrated program to optimize the performance of existing infrastructure through the implementation of systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.
WAMPO	Wichita Area Metropolitan Planning Organization	Wichita's regional planning body, required in urbanized areas with a population over 50,000, and designated by local officials and the governor of the state. Responsible, in cooperation with the state and other transportation providers, for carrying out the metropolitan transportation planning requirements of federal highway and transit legislation. Formed in cooperation with the state, develops transportation plans and programs for the metropolitan area. The Wichita Area Metropolitan Planning Organization (or WAMPO, for short) serves 22 cities and all or part of three counties in south central Kansas including the City of Wichita, City of Derby, Sedgwick County, KTA and KDOT. WAMPO along with its federal, state, and local planning partners, is responsible for transportation planning in its metro area. See www.wampo.org for more information.

WICHway	Wichita's Traffic Management System	Wichita's TMC, which is co-located with Sedgwick County 911 and emergency management. See www.wichway.org for additional information.

Definitions

ITS Architecture	An ITS architecture defines a framework within which interrelated systems can be built that work together to deliver transportation services. It defines how systems functionally operate and the interconnection of information exchanges that must take place between these systems to increase efficiency in transportation services.
Non-recurring Congestion	Non-recurrent congestion results from a decrease in capacity, while the demand remains the same. This kind of congestion usually results when one or more lanes are temporarily blocked due to a crash, disabled vehicle, weather events, etc.
Recurring Congestion	Recurrent congestion occurs when demand increases beyond the available capacity. It usually is usually associated with the morning and afternoon work commutes, when demand reaches such a level that the freeway is overwhelmed and traffic flow deteriorates to unstable stop-and-go conditions.

Contents

1 Executive Summary

The Transportation Systems Management & Operations (TSMO) Plan for the Wichita region provides a framework to establish the strategic direction for TSMO activity advancement in the region. TSMO is the practice of implementing operational strategies to cost-effectively improve the safety, reliability and capacity of the transportation system. It brings together multiple practices and crosscuts many public sectors. As such, the language used to describe TSMO can be a barrier to understanding the concept. To help, a glossary of terms and acronyms is included at the beginning of this report.

The intent is to explain the concept, demonstrate efficiencies and make the business case for improving TSMO. In addition, the plan defines the organization structure and additional, more detailed service layer plans which are necessary to support TSMO activities. Through the planning process, a project steering task force was developed and identified the following ten service layer areas:

- TSMO Task Force
- WICHway TMC
    - Freeway Management
    - Active Arterial Management
- ITS & Communications
    - ITS Architecture
    - Deployment Plan
- Traffic Incident Management (TIM)
- Work Zone Management
- Public Communications
- Performance Measurement

- *Connected and Autonomous Vehicles*
- *Multi-Modal Transportation*
- *Training and Education*

The TSMO task force stressed that particular emphasis should be placed within the first seven areas, although interaction between each service layer is necessary for the success of the program (e.g. TMC will depend on ITS & Communications; Performance Measures may drive deployments, etc.). It also should be noted, there is overlap between service layers and identified Workplan tasks for the same reason. The majority of the plan is summed up in the Program Matrix in the last section of the report. The Program Matrix identifies immediate, near and long term goals for the area, broken down by service layer. The TSMO Task Force is responsible for the implementation of the plan.

2 Introduction

2.1 Need for TSMO

Imagine a mother who works downtown, and is up against a deadline to complete a key project for her company. She works past 5 pm because of the deadline, even though her daughter has a dance recital at 6:30 that evening. When she finally leaves, it is at 5:15 and she thinks to herself that there is still plenty of time to pick her daughter up from daycare, eat dinner at home and prepare for the recital.

As she leaves work, and enters the ramp onto Kellogg; she is immediately in stop and go traffic. A rear-end crash that just occurred created the congestion. As she drives, she is shuffling her schedule in her head to ensure her daughter will be able to have a quick dinner and still prepare for the recital. She clears the crash scene and is driving near the speed limit around 5:30. She finally picks up her daughter, having incurred a late pickup fee from the daycare which will cost her an additional $50.

After arriving home, she realizes that in order to make the recital, she isn't going to be able to prepare dinner, and will instead have to snack in the car. She rushes her daughter out the door to the recital and makes it just on time.

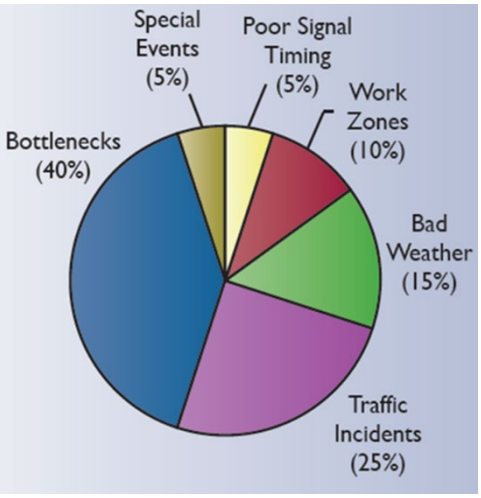


Figure 1: Causes of Congestion (FHWA).

Congestion has many effects. For commuters, it often means schedules are disrupted. For businesses, it means deliveries (and employees) are delayed. For the Wichita region, it means greater difficulty providing what people expect: safe, reliable and efficient travel.

The story told could be one of thousands of people driving Wichita roadways every day. Some stories may be more extreme than the above (e.g. the woman could have been killed or injured in a crash or lost her job because she was not able to get to it on time), but in the relatively "ordinary" story above the driver incurred both quantifiable user delay costs and also more nebulous societal impacts (they were not able to have dinner and incurred extra stress of the situation). Even in the simpler "ordinary" case, roadway operations have great impacts to people's lives.

Some of our region's major roads are congested every day. Rock Road and Kellogg (US-54), I-135 & I-235 (North Junction) and US-54 at Seneca and Sycamore exits are local examples of the same congestion problem that is faced nationally. It takes money and time to add new lanes to any major road. New roadway paving and bridge expansion projects can take more than 10 years to plan and implement, and cost millions of dollars. Regionally, WAMPO and its member agencies are looking for ways to make travel safer and more reliable with or without adding capacity to these congested areas.

Innovations in transportation technology also provide strategies for more effectively responding to incidents, including traffic control centers, such as WICHway, that monitor heavily used roads. Staff at these centers can respond immediately to changing conditions and traffic incidents—coordinating with police and other emergency responders, adjusting DMS and website feeds to the public.

Technology is a big part of this effort but every driver can make a difference through their actions. Driving defensively without distractions as well as embracing pre-trip checks of routes for anticipated delays are key elements available to all users. New technologies and management strategies allow drivers to play an active role in reducing congestion. With access to real-time information, from DMS, the WICHway website (www.wichway.org), WAZE, Google or other trip information applications, travelers can adjust their routes to avoid congested areas.

Congestion also occurs as a result of unexpected events (e.g. winter storms, road construction, special events (such as a concert at Intrust Bank Arena) and traffic crashes). Such situations can cause severe traffic congestion and delay. Using technology and certain management strategies to improve the operation of existing roads and highways offers a faster and more cost-effective solution to easing traffic congestion. This can mean less congestion, reduced travel delays, improved driver safety, faster incident response, and better air quality. These benefits can be realized at a substantially lower cost and be implemented more quickly than by adding additional capacity to highways.

Individually, and especially when combined, these road management and technological solutions empower both transportation officials and travelers to keep traffic moving.

2.2 Business Case

With limited financial resources and increased demands for transportation improvements from the public, TSMO is becoming an essential function of departments of transportation and metropolitan planning organizations. Specific TSMO strategies have long been used to fix targeted locations, but only in the last few years has TSMO emerged as its own specific discipline. One of the easiest ways to visualize TSMO is to remember the story about the working mother and ask yourself:

- What could transportation professionals do to help her?
- How can it be done?
- Can these tools reduce the public cost of congestion?

A number of strategies may come to mind, such as the traditional answer of increasing the roadway capacity so we have excess capacity if there is a crash, but that tends to be expensive and not very timely. Generally, one of the next ideas is, "What if we could decrease the incident clearance time (or prevent the incident entirely)?"

TIM (Traffic Incident Management) strategies such as service patrols, quick clearance laws and actions are strategies that could help. In 2013, the WICHway center reported an average incident clearance time greater than two hours. Through concerted training efforts developed by the FHWA TIM program, first responders within the region now have resources and strategies to more effectively respond to incidents. In 2017, the data showed that incident clearance times cleared in an average of 30 minutes. There are a number of other strategies that may be beneficial and each have their own tangible benefits and associated costs. Weighing these in the form of a benefit to cost ratio is often a good first evaluation of potential recommended strategies. A sample of TSMO strategies and associated benefit to cost ratios is shown in Figure 2.

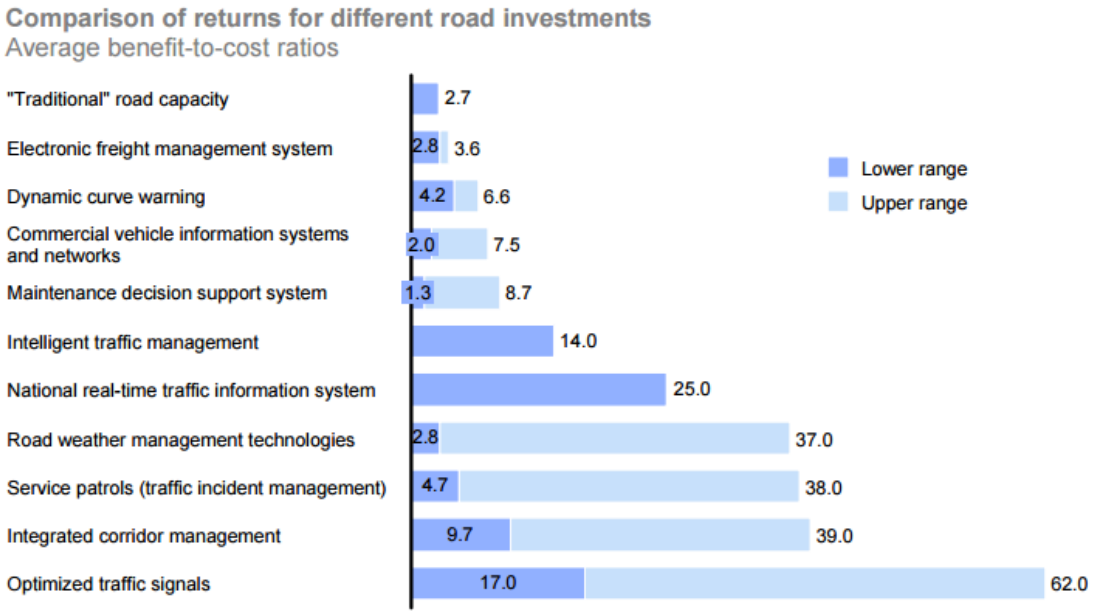


Figure 2: Average Benefit-Cost Ratios for different road investments.

Since the system deployment costs are generally significantly less expensive than traditional roadway capacity but still reap large benefits, there is a very large return on investment. WICHway recently completed a

benefit to cost ratio using FHWA's "TOPS" tool and the analysis showed a 12:1 ratio considering all of the TMC activities. The majority of the benefits are associated to actual roadway users. By providing better route data to roadway users, better route information can be used decreasing user delay costs.

2.3 TSMO in Action – Existing TSMO activities

Many TSMO strategies have been around for a number of years but have mostly been associated under other programs. Only recently has TSMO initiative's been identified under its current heading and a more holistic application and approach to initiating them been undertaken.

2.3.1 Background Plans and Studies

There are a number of associated documents influencing the development of this plan that have shaped the plan in a number of ways. Some of these studies may be found at www.wichway.org, and are listed below:

1. CMM Workshop – Using a capability maturity model assessment of six dimensions of the system, key stake holders identified how the region was doing with TSMO.
2. WICHway SOP – Standard Operating Procedures – Governs the WICHway center's current practices and approach to operations.
3. Wichita Traffic Incident Management Reference Manual & Diversion Routes – Developed the first plan for incident management in the area and how to divert traffic for major incidents.
4. Wichita ITS Early Deployment Study – Identified ITS locations and deployment strategies for the region (is the backbone the current ITS system)
5. MOU's- Many MOU's exist governing WICHway, State and local government entities and their interaction.
6. MTP- Identifies the projects for funding for the WAMPO planning horizon.
7. TIP – This is the four year plan of funded improvements for the WAMPO region.
8. City Signal timing plans – Various corridors and timing plans have been studied and adopted by the city of Wichita and other MPO cities. These documents are too numerous to publish, but are the basis of many timing patterns and corridor travel patterns.

2.3.2 ITS Architecture

The ITS Architecture is essentially how the region is setup to use technology, and how it should be reasonably implemented. It provides the opportunity set up interoperability other regional approaches to technology use. WAMPO is responsible for developing and updating the ITS architecture for the region, and KDOT is responsible for the statewide ITS architecture. The current WAMPO architecture is located at:

http://www.wampo.org/Work/OW%20Documents/Wichita%20ITS%20Architecture.pdf

The current statewide plan is located at:

http://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/burovr/pdf/Vol_1_KS_Statewide_ITS_Architecture_Plan_2_01_June_2016.pdf

2.3.3 WICHway TMC

The WICHway TMC was constructed in 2010 and is co-located in the Sedgwick County 911 center to aid in providing real-time traffic information. The data center serves as the hub where regional traffic information is collected, processed and transmitted. It is complemented by the public facing website www.wichway.org.

3 Organizing for TSMO

The Wichita TSMO steering task force identified the formation of a TSMO task force as a key effort in identification, development and leadership of future TSMO projects and solutions in Wichita. Since WAMPO is already serving the regional transportation needs, the most logical location for the task force is a sub-committee under the WAMPO Transportation Advisory Committee (TAC). The TAC's main function is to set the technical programming of the TIP and LRTP for approval by the Transportation Policy Body (TPB).

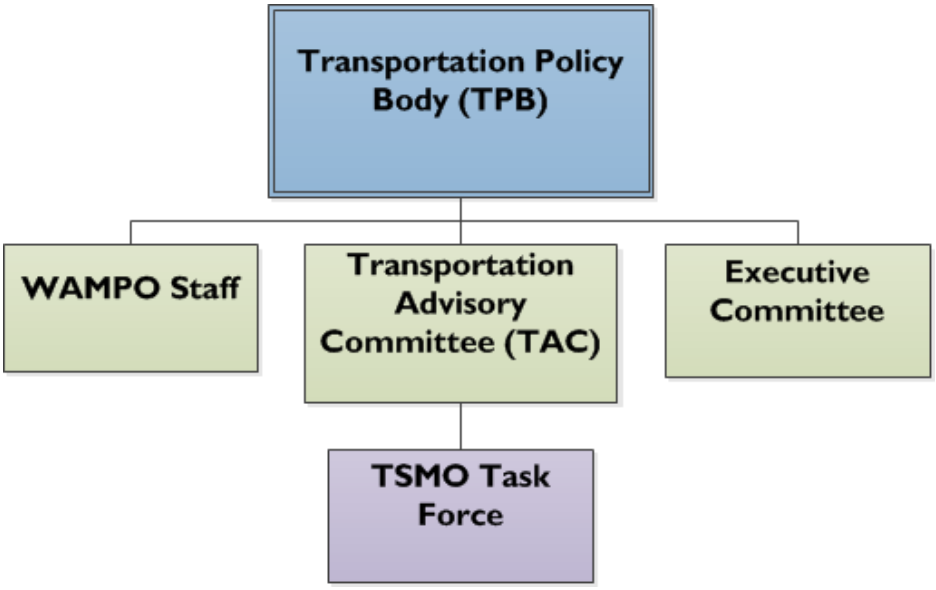


Figure 3: Proposed TSMO task force relationship with WAMPO.

The TSMO Task Force will identify potential projects that should include TSMO strategies and solutions in addition to stand-alone TSMO projects. The second charge of the task force is to support TSMO planning and programming for the region through the development of service layer plans as identified in Section 5. Since TSMO activities encompass many of the different traditional transportation disciplines that organizations are typically split into, the TSMO task force should be flexible in membership but at a minimum includes the following core membership:

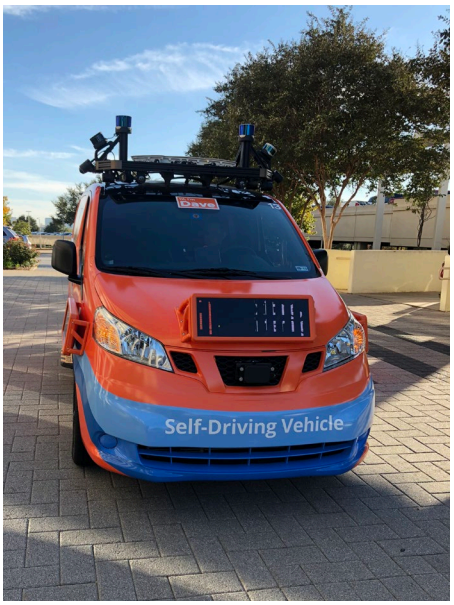
- WAMPO staff representative
- City of Wichita representative
- Sedgwick County representative
- Smaller City representative
- KDOT ITS representative
- KDOT Bureau of Transportation Safety and Technology representative
- WICHway TMC manager
- Wichita - KDOT Metro Engineer

- KTA representative
- Law Enforcement
- FHWA
- Multi-Modal Representation

In addition, consultant or industry (suppliers, contractors, etc.) could be included in advisory roles, but at this time remain outside of the responsibility of setting the program. The Task Force has a designated Service Layer attributed to outline its own responsibilities in further implementing the plan.

4 Service Layer Organization

Service Layer organization is a subset of TSMO oriented plans identified to support and implement TSMO initiatives. The service layer plans will steer implementation of the TSMO activities. See Workplan for implementation timeline. Although like the task force, the service layer organization will be dynamic, initially it will include documents relating to:



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The task force's primary focus will be on the first seven service layers. Through those plans, it is anticipated that secondary plans for the last three will be developed to support the primary service layers. A description of the concept of operations of each service layer the Workplan Tasks follows.

4.1 TSMO Task Force

The task force makeup and duties have been identified in Section 4 - Organizing for TSMO. The current Task force identified the continued meeting of such importance, the Task force will have its own Service layer that identifies their Workplan Tasks, and main goals.

4.1.1 Identified Workplan Tasks

1. Formalize TSMO evaluation worksheet – The TSMO evaluation worksheet will be used to identify projects that should include TSMO components and could be used as an evaluation tool for all projects.
2. Identify Future Needs – Early Deployment Study installations are nearly complete, so the next phases of the system need to be developed.

3. Develop TSMO Task Force Membership – WAMPO has established the TSMO task force, but further work integrating and planning for TSMO work needs to be completed. Developing members in TSMO disciplines is key to enabling a self-sustaining Task Force.
4. Update Wichita Regional ITS Architecture – With some of the initiatives such as autonomous vehicles and signalized system work, the ITS Architecture needs continued maintenance. Define schedule for revisions as well as roles and responsibilities for updating the architecture.
5. Pilot collaboration projects – Identify cross jurisdictional projects that will allow agencies to develop better specifications and standard designs.
6. Establish dedicated programming and funding – Based on the work above (e.g. new regional ITS Plan and Architecture) identify funding mechanisms for projects.
7. Develop agreements for regional traffic signal database – by regionalizing all signals into a single database, corridor interoperability will be possible and ICM strategies can be better implemented.
8. Establish regional ITS standards – These will support ICM and other strategies and to better align with state standards.
9. Establish regional signal standards – For ICM and traffic signal database standardization projects, signal standardization is key to easing integration.

4.2 TMC

The TMC has been responsible for real time "management" of the roadway network based on given demands and constraints since 2010. Detection, response and monitoring of traffic incidents and non-recurrent congestion are the focus of the TMC. Co-location with Sedgwick County 911 is key to keeping non-recurrent congestion issues minimized and incident clearance time low through the close coordination of the first responders and traffic management personnel.

4.2.1 Freeway Management

Freeway management is the real-time management of the freeway system using WICHway by displaying messages on DMS message boards, designing Smart Work Zones and providing information to the WICHway traveler website. Completing the build out of the system and continuing to "manage" incidents on the freeway are keys to mitigating non-recurring congestion.

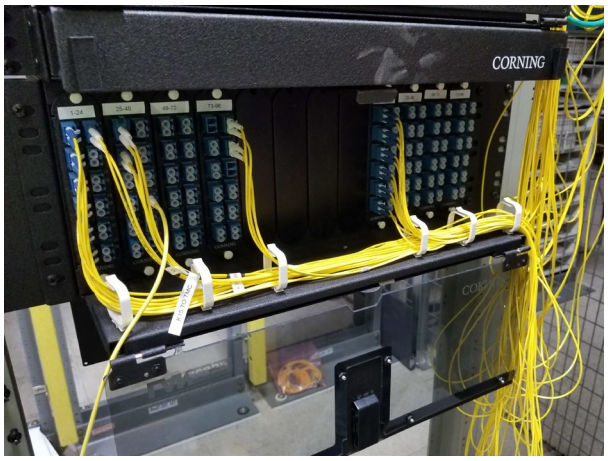
4.2.2 Active Arterial Management

Active Arterial Management is an expansion of the current functions for the TMC to address arterial operations, and a secondary support function of both the incident management and freeway management systems further enhancing WICHway's offerings to Wichita. Being able to support both an active arterial management program through use of signal timings and incident management programs is a key step toward further mitigating non-recurring congestion.

4.2.3 Identified Workplan Tasks

1. Update ATMS software –Include better packages for updating and interfacing with other software and platforms.
2. Develop data exchange (e.g. XML) feed for incidents – This can be made available to WAZE, Google, news agencies, etc.
3. Incorporate Google, WAZE into TMC – By using crowd source data to supplement existing incident detection methods to improve incident detection.
4. Update Diversion Plan Guide - Current guide should be updated to include new freeway construction and other improvements.

4.3 ITS & Communications



With the initial deployment for the region in its final stages, future phases of the ITS System development should be assessed. Additionally, a regional assessment of communications needs should be completed to help support future activities. MOU's regarding sharing for fiber/communications as well as MOU's to share data need to be defined, negotiated and maintained as a regional resource. The Wichita Regional ITS Architecture and Standards should be updated and maintained to further support these initiatives.

4.3.1 Identified Workplan Tasks

1. Establish shared fiber agreements - By sharing fiber, duplication of infrastructure will be minimized, and overall better system redundancy can be achieved.
2. Design/implement new City of Wichita (and others) city signal network – Replace existing city wireless system with more reliable system.
3. Launch ATMS software for arterial signal control – Existing system has reached its useful life and is difficult to adjust and add to the system.
4. Create Regional Fiber Plan – Identify the needs of all regional stakeholders and develop a project plan to build out as funding is available.
5. Update Signal Controllers to allow ATSPM's – ATSPM's will ease maintenance and allow better real time traffic data to be used to complement ICM strategies.
6. Develop cross network/firewall agreements between regional stakeholders, which allows computer aided dispatch systems to work in conjunction with ATMS system(s) as well as ease information sharing between entities.

4.4 Traffic Incident Management (TIM)

TIM is a function that has a strong base, but further buy-in and training needs to be completed to continue to advance TIM in the region. Steps such as adding TIM training for all first responders as well as additional development of traffic response management plans for incidents, including incident signal timing adjustments need to be implemented for certain "levels" of incident.

4.4.1 Identified Workplan Tasks

1. Engage WPD Traffic Unit – The newly created unit is the primary patrol agency on the largest volume roadway in Wichita. Engaging them is key to continued freeway operation improvement.
2. Reach out to surrounding cities – Build on the existing base by increasing TIM practice regionally.
3. Establish Incident Review Committee – Currently this is done on key incidents in the bi-monthly TIM meeting, but often getting everyone to each meeting is problematic. Having an established committee made up of professionals from each category of first responder to grade operations on key incidents and take back to their respective organizations to continuously train personnel.
4. Review Accident Reporting Form – Crash form information is vital to identify safety and crash related issues. Making sure key issues such as location and streamlining the process as much as possible is key to developing good performance measures.

5. Identify Regional Incident Commander – Having a local Incident Commander is an approach many urban areas have taken to ensure the reliability of TIM measures being implemented. The regional incident commander generally is former law enforcement what is available to take charge of the scene (safety, staging, etc.).
6. Expand TIM training to all first responders through the region- Currently the training is not mandatory but has been unofficially adopted into the area Law Enforcement and Fire Department Training Centers.

7. Improve Integration of Systems – By integrating dispatch with the ATMS software better data can be pushed to first responders in the field, improving incident response time.
8. Salvage Legislation – By enacting salvage and "remove it" legislation to prevent salvage operations on major crashes (e.g. salvaging a load from a heavy vehicle trailer after a crash) will save clearance time on major incidents. Typically the salvage cost is minimal and delay cost is high in a freeway setting.

4.5 Work Zone Management

Work Zone Management (including smart work zones) has been included on some of the major projects in the area, and additional work should be done to identify when to use these specialized managed work zones. Public perception often determines reactions to construction phasing, delay, usability etc. and is often too late in the process to fix issues. The TSMO task force needs to develop local knowledge and input on the question of, "How much delay is okay for a Work Zone?" and look at crash rates for work zones to determine safety impacts of phasing. As part of design an alternate path/diversion analysis to determine where people will divert to if delays are too great. Work to then mitigate projects that do not have alternate paths, and develop a matrix of acceptable regional mitigation strategies such as Smart Work Zones, and Public Involvement.

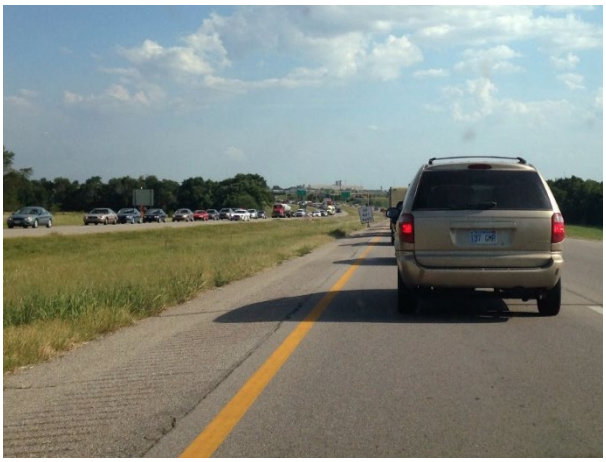
4.5.1 Identified Workplan Tasks

1. Implement Smart Work Zone Management – Continue to develop projects with an idea of the travel impacts of the construction phasing. Continue to identify and use Smart Work Zones to help mitigate construction operational issues.
2. Coordinate Maintenance – By coordinating maintenance and construction project, drivers will have more reliable alternate paths around work zones.
3. TIM training for contractors – By understanding how TIM procedures work, construction work zone crashes may be alleviated and contractor towing more readily used.
4. Determine Targets for Work Zone performance measures – Determine local factors (e.g. how much delay by a work zone is too much?) to use to evaluate driver expectancy issues regarding construction zones.

4.6 Public Communications

Develop inter-agency communications plans to advance the work of WICHway. By collecting traffic data and disseminating the information out to appropriate sources in a timely manner non-recurrent congestion can be mitigated in the region. By streamlining ways to identify construction and project contact information, users will better understand what the impacts are and ultimately make real-time decisions on whether to take an alternate route or keep using the same route.

4.6.1 Identified Workplan Tasks



1. Develop Materials to tell the TSMO story – The good work that is done under the moniker of TSMO often remains untold; simply put, people should know the positive benefits that are occurring.
2. Publicize performance measures –As part of telling the story, use performance measures and targets to show the benefits. Enlist the public to help guide performance based management of the roadway.
3. Publicize the Negative Value of Delay – Often delay savings or delay costs are overlooked when making decisions on construction phasing or lane clearance time. There is an opportunity cost to put ITS equipment and TSMO strategies in place but there is a cost associated to doing nothing as well.
4. Reach out to surrounding cities – Understand the issues and needs they have to help identify projects, performance measures, etc., and help drive the next phases of the TMC expansion.
5. Create one location for construction information – Currently you have to go to KDOT, the cities and county to figure out who is responsible for what project to identify who to talk to. Having a website dedicated to disseminating public information on construction would allow less public frustration regarding projects, and help identify the correct people to talk about any issues.
6. Develop performance measures for public perception – Continue to develop easily understandable graphics and measures to help "tell the story".

4.7 Performance Measurement

Performance Measurement supports many of the other service layers. By making decisions based on performance measures, further benefits to the public can be maintained and improved. Key points (identified by the Task Force) that should be inherent in the produced performance measures are safety and congestion management.

4.7.1 Identified Workplan Tasks

1. Develop Performance Measures for Arterials – While data is available for most freeways in the region, key arterials lack real time data. Exploring performance measures for arterials will help identify and drive reliability projects on arterials.
2. Deliver better data to stakeholders – Easy to understand metrics to aid in decision making and funding of improvements.
3. Align Federal requirements to TSMO performance measures – This will aid in duplicating and developing similar performance measures. Since the reporting has to be completed to meet federal requirements, aligning similar performance measures eases work load.
4. Calculate opportunity costs for projects – Typically only project construction costs are reported; opportunity costs examine the cost of "not" doing the project as well. User delay costs would often justify project expenses.
5. Integrate ATSPM software to regional signals – By using real-time data to drive maintenance and operations of signals, better funding decisions can be made regarding where to spend maintenance dollars.

4.8 Connected and Autonomous Vehicles

Connected and Autonomous vehicles (CAV) are already on the road in one form or another. A clear regional strategy that includes infrastructure needs should be developed. Other identified tasks such as shared communications and fiber optics are key to regionally developing an approach to accommodate these vehicles.

4.8.1 Identified Workplan Tasks

1. Develop CAV strategy in conjunction with KDOT – Exchange and storing of data is going to be a key feature of efficient CV and AV vehicles, as well as subsequent planning and engineering projects associated with the data collected. Developing a plan that will identify how this is going to be collected and stored (and infrastructure needed to do it) is key to the region's development.
2. Incorporate CAV into regional and statewide ITS architecture – No detailed provisions for these types of vehicles are in the existing architecture.

4.9 Multi-Modal Transportation

Freight and Transit are key partners to many TSMO strategies and relationships with these entities need to be developed. Identifying and considering TSMO solutions to corridors involving these modes of travel are suggested to ensure reliability on the roadway.

4.9.1 Identified Workplan Tasks

1. Develop Enforcement and Safety Corridors – By identifying crash locations and/or corridors that necessitate high reliability (e.g. transit or freight corridors) and providing key safety enforcement, crashes may be avoided.
2. Engage WAMPO freight connection – Coordinate with the WAMPO freight roundtable to develop TSMO strategies around freight and freight corridors that are applicable to the region.
3. Interface WICHway into freight vehicle feeds-XML feed of crashes etc. could be harvested by trucking companies.
4. Engage transit – Develop transit-based TSMO strategies that are applicable to the region.

4.10 Training and Education

Training and education are key components to TSMO activities, training maintenance personnel, operators, engineers and planners in effective TSMO techniques is an ongoing activity due to how relatively new the discipline is and the continual staff turnover. A number of resources are available including the National Center for Operations Excellence. Their website at: https://www.transportationops.org/resources/important-industry-links keeps up-to-date information on TSMO. Also available to the region is a new program from ITS heartland (http://www.itsheartland.org/) condensing regional operations topics into one hour webinars focusing on TSMO. Other training through ITE (Central Kansas Institute of Transportation Engineers; CKITE http://ckite.org/) and CITE (http://www.citeconsortium.org/) are also available. FHWA provides deep resources for TSMO training and education with guidebooks, workshops, webinars, and other resources.

Additionally, many agencies have developed vendor-provided training program to stay up-to-date on new technologies. Most vendors will freely present on topics that are important to their industry. Some agencies require the vendor training to maintain a general theory to start which is not vendor specific, followed by

more specific training to their product features, and lastly give the vendor five minutes for a sales pitch at the end. This allows a good training program to be developed economically but does not end up as a sales pitch the entire time.

4.10.1 Identified Workplan Tasks

1. Work with local technical groups (CKITE, ITS Heartland, ASCE, etc.) to integrate TSMO into lunch and learn programs – By spreading the knowledge of TSMO decision making to other groups, better decisions and more meaningful performance will be achieved.
2. Develop Lunch and Learn Program for Field Staff - By using vendor supplied lunch and learns, better educated field staff will be available, further optimizing operations.
3. Develop University Partnerships – Using university programs and researchers to help solve problems, especially for data reduction and processing, is key to more efficiently developing meaningful performance measures.

REGIONAL TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS (TSMO) PLAN

A regional approach to reliable transportation systems

WORKPLAN

	IMMEDIATE PRIORITIES	NEAR TERM PRIORITIES	LONG-TERM PRIORITIES
TSMO Task Force	Formalize TSMO evaluation worksheet Identify future needs Develop TSMO Task Force Membership Launch pilot project (K-15 highway) Update architecture	Establish programming and funding Develop agreements for regional signal database Establish regional ITS standards Establish regional signal standards	
TMC	Update ATMS software Develop XML feed for incidents	Incorporate Google, WAZE, etc. for incidents Update Diversion Plan Guide	Implement Diversion Plan from TMC in field
ITS & Communications	Establish shared fiber agreements Design/implement new city network Launch ATMS software for signal control	Create Regional Fiber Plan Update Traffic Signal Controllers to incorporate ATSPM's	Create cross network agreements/firewalls
Traffic Incident Management	Engage WPD Traffic Unit Reach out to surrounding cities Establish Incident Review Committee Review Accident Reporting Form Engage stakeholders - KHP, Derby, Andover	Identify Regional Incident Commander Introduce salvage legislation for freeway system	Expand TIM training to all first responders throughout region Improve integration of systems (e.g. Dispatch and ATMS)
Work Zone Management	Implement Smart Work Zone Management Coordinate Maintenance, Cities and KDOT Training for TIM contractors	Determine regional targets for work zone performance measures	
Public Communications	Develop materials to tell TSMO story Publicize performance measures Publicize 'value of delay' Reach out to surrounding cities Conduct August operations meeting	Create one location for construction information Develop Performance measures for public perception	
Connected & Autonomous Vehicles		Develop CV/AV strategy	Incorporate into regional, statewide architecture
Multi-Modal Transportation	Develop Enforcement and Safety corridors Engage WAMPO freight connection	Interface WICHway into Freight Vehicle feed Engage transit	Budget, implement opportunity plan
Performance Measurement	Develop Performance Measures on arterials Deliver better data to stakeholders Align MAP-21 requirements to TSMO PM's Determine Work Zone performance measures Calculate opportunity costs for projects	Integrate ATSPM software/15% existing signals	Integrate ATSPM software in 100% regional signals
Training & Education	Work with CKITE, ITS Heartland, others Deliver 'Lunch and Learns' for field staff	Develop university partnerships	