# NOCoE
National Operations Center of Excellence

# Peer Exchange Report

## Sustaining TSMO Peer Exchange

# Overview

The National Operations Center of Excellence hosted the Sustaining TSMO Virtual Peer Exchange to share information between a cross section of agency leaders and principal staff from states, MPOs, and cities with experience in developing and implementing TSMO plans, programs, strategies, and policies in their jurisdictions. This peer exchange benefited from the interaction among organizations of different sizes, breadth, and experience.

The goal was to share successful real world strategic and tactical experience from agencies that have moved into organizationally sustaining of TSMO with those who are looking to advance or expand programs as well as the opportunity to familiarize staff and agencies new(er) to TSMO implementation. There was a thematic emphasis on transferability of successful strategies that can be adapted and applied to other organizations and how these topics related to the best practices found in resources such as the Federal Highway Administration's (FHWA's) Business Process Frameworks for Transportation Operations, the (American Association of State Highway and Transportation Officials (AASHTO) TSMO Guidance Capability Maturity Model (CMM) example(s), and in the AASHTO Transportation Operations Manual.

The participants were encouraged to actively participate by sharing their questions, comments, and best practices among each other. Attendees were asked to consider the actions their agency may need to take to align desired goals and objectives of their community and their agency to advance in capability and maturity aligned with the agency's strategic and operational plans. Participants are able to reach out to presenters for further information or assistance, and were asked how the NOCoE, its partner associations, and FHWA help them in their journey to sustain and advance their TSMO programs.

# Discussion Topics

**Session 1 – What Does Sustaining TSMO Mean?**

- Agency Executive, Scott Marler, Director, Iowa DOT

- State Representative, Todd Szymkowski, Statewide Traffic Systems Engineer, Wisconsin DOT

- Regional Representative, Ray Webb, Director of Traffic Operations,

- Mid-America Regional Council

- City Representative, Brad Freeze, Deputy Director, Nashville Department of Transportation

- FHWA Resources, Tracy Scriba, Team Leader, Operations Planning/Organizing and Tolling/Pricing, FHWA

**Session 2 – Incorporating TSMO Program into Organization Planning**

- Eric Hill, Director of Transportation System Management & Operations, MetroPlan Orlando

- Sal Cowan, Senior Director of Transportation Mobility, New Jersey DOT

**Session 3 – Data Sources and Metrics to Support Program Reporting**

- Brian Kary, TSMO Director, Minnesota DOT

- Christeen Pusch, Management Analyst, Traffic Safety Division, Texas DOT

- Daniela Bremmer, Chief Innovation Officer, Cooperative Automated Transportation & Technology, and Pamela Vasudeva, Statewide TSMO Development Engineer, Washington State DOT

**Session 4– Roundtable on Asset management, Budgeting, Programming, Contracting/Procurement**

Discussion and identification of current and near future issues in:

- Topic 1 – Asset Management and Life Cycle Costing

- Topic 2 – Budgeting and Programming

- Topic 3 – Contracting and Procurement Methods

**Session 5 – Intra-Organization and Regional Collaboration**

- Oregon TSMO Collaborations in the Portland Metropolitan Area

- Niagara International Transportation Technology Coalition

**Session 6– Do Without Doing: From TSMO Champion(s) to TSMO Organizations**

Remarks regarding the movement to TSMO organization(s) vs. champion driven activities by:

- Greg Byres, State Engineer / Deputy Director, Arizona DOT

- Paul Szatkowski Assistant Division Administrator, Traffic Operations Division and Mena Lockwood, Assistant State Traffic Engineer, Virginia DOT

- Tracy Larkin-Thomason, Director, Nevada DOT

- Scott Marler, Director, Iowa DOT

# Summary

## *Session 1 – What Does Sustaining TSMO Mean?*

### Agency Executive

As Director of the Iowa DOT, Scott Marler outlined the key reasons his agency sustains TSMO. Post-pandemic traffic has returned and exceeded pre-pandemic levels, demanding more efficient and effective transportation solutions. Despite improvements, traffic fatalities remain unacceptably high in Iowa emphasizing the need for continued safety enhancements. The rise of digital infrastructure, software-as-a-service, and mobility-as-a-service requires adapting to new technologies and operational models. In response to these issues TSMO is crucial for ensuring the safe and efficient movement of people and goods, including the growing importance of e-commerce and home deliveries.

The agency has adopted a multi-faceted approach with strategic, programmatic, and tactical elements to guide TSMO planning and implementation. A steering committee engages stakeholders to focus efforts and develops an annual action plan to guide TSMO initiatives. The agency integrates TSMO concepts into new employee orientation to raise awareness and understanding which, in turn, fosters a culture of TSMO and innovation within the agency. Iowa DOT established regional TSMO engineer positions to provide leadership and focused support at the district level and allocated specific dedicated funding for TSMO projects within the five-year transportation program. Operational considerations are integrated into project planning and design processes. The agency encourages creative and innovative solutions to operational challenges (e.g., work zone improvements) and uses the Transportation Operations Manual as a core resource for operations best practices.

Director Marler emphasized the importance of collaboration, innovation, and leveraging available resources as crucial to sustaining effective TSMO programs. He observed that continuous improvement and adaptation are essential to address evolving transportation challenges.

### State Representative (Todd Szymkowski, Wisconsin DOT)

Todd Szymkowski, the statewide traffic systems engineer for the Wisconsin DOT, shared about the three core programs that sustain TSMO at the agency:



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- Transportation Systems Management and Operations - Traffic Infrastructure Process (TSMO-TIP)

- Signals and ITS Standalone Program (SISP)

- ITSNet Fiber Appropriations
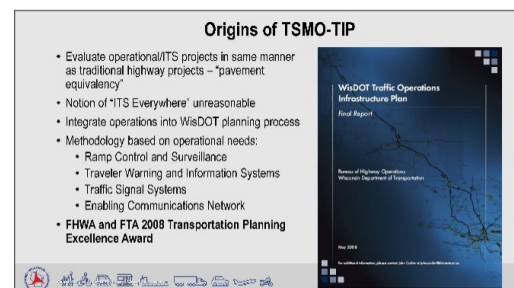
The TSMO-TIP is a strategic process to identify and prioritize locations for ITS deployments across the state in a structured framework aligned with the department's funding program for ITS improvements. The objective of the process is to sustain a traffic infrastructure deployment process focused on continuous performance improvement, current and short-term needs, decision making support, process documentation, and to support federal requirements. Following submission of applications by regional traffic engineers, a needs analysis tool evaluates potential locations based on factors including traffic volume, truck percentage, level of service, weather impacts, and special events. Then, a second process

tool quantifies the potential benefits of specific ITS projects, such as cameras, communications, ramp control, etc.

The SISP provides $10 million annually for ITS projects, including those submitted through the TSMO-TIP process. State and local agencies are both eligible for funding, allowing for collaborative projects. The SISP supports a wide range of ITS projects, from modernizing traffic signal systems to exploring advanced technologies like connected and automated vehicles (CAVs).

Wisconsin DOT has built over 1,100 miles of fiber network, with two-thirds of the network built through partnerships with public and private entities. The agency uses revenue from fees on telecommunications companies using department right-of-way and from term leases with various entities. These revenue streams help sustain the ongoing maintenance and expansion of the fiber network. Building and maintaining a robust fiber network is crucial for supporting advanced transportation technologies supporting TSMO and improving operational efficiency.

Wisconsin DOT implemented a multi-faceted approach to sustaining TSMO, including strategic planning, dedicated funding, and leveraging partnerships. Innovative funding mechanisms have been and will continue to be essential for sustaining long-term investments in TSMO.

### Regional Representative

Mid-America Regional Council (MARC) operates traffic signals for 28 agencies in the Kansas City metropolitan area, including coordination with the Missouri Department of Transportation and the Kansas Department of Transportation. MARC collaborates closely with Kansas City Scout, the regional traffic management center (TMC), leveraging tools like Teams channels and crowdsourcing to share information and coordinate responses to incidents. MARC operates over 750 traffic signals through the Operation Green Light program, providing signal timing, coordination, and operational support to member agencies. In addition, MARC operates a wireless communication network to support signal operations and data sharing.
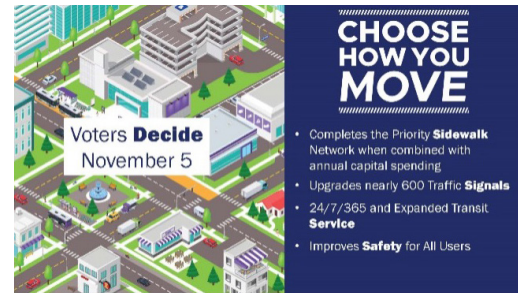


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While MARC has achieved significant progress in signal operations and regional collaboration, they have faced challenges with sustaining TSMO due to the absence of a regional TSMO plan as a coordinating framework for TSMO activities among various agencies and to ensure consistent implementation across the region. There are also difficulties in integrating TSMO considerations into projects undertaken by state and local agencies due to limited communication and coordination. Looking forward MARC plans to update its Operation Green Light strategic plan to incorporate TSMO principles and improve regional coordination. In addition, MARC will be focusing on strengthening relationships and communication with other agencies and to support creation of a regional TSMO plan to address those identified challenges.

### City Representative

Nashville Department of Transportation (NDOT) is a young agency responsible for transportation planning and operations in the City of Nashville and Davidson County in the consolidated city-county government. The city faces challenges in meeting the demands of a growing population and maintaining a safe and efficient transportation system. Sustaining TSMO in Nashville pivots from their Vision Zero program to reduce traffic fatalities and improve safety for all road users. Key TSMO elements of their

services include an incident response program and a new state-of-the-art TMC funded through a Congestion Mitigation and Air Quality Improvement (CMAQ) program grant. The agency provides 24/7 monitoring and coordination of traffic operations and collaborates with Metro Nashville Police, Fire Department, and other agencies. Building and maintaining strong relationships with these agencies is crucial for TSMO implementation in Nashville.



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A voter referendum to provide a dedicated and stable funding source for TSMO initiatives, *Choose How You Move*, was approved to fund transportation improvements, including sidewalk construction, signal upgrades, and transit expansion among other projects. This funding support now allows the agency to improve long-term planning and implementation over a multi-year period. NDOT uses data and analytics to identify operational challenges and prioritize improvements. The data-driven decision making process supports continuous improvement through regular reviews and updates to TSMO strategies and procedures that adapt to changing conditions and emerging technologies. NDOT has found that a focus on safety and enhancing the overall quality of life for residents and visitors has the benefit of sustaining TSMO as well.

**FHWA Resources**

Tracy Scriba from FHWA provided a definition of mainstreaming TSMO as "ensuring that TSMO strategies are readily understood and valued by all agency staff, regardless of their department." In addition, mainstreaming means that TSMO strategies are considered and integrated into all aspects of agency operations, from planning and design to construction and maintenance. Mainstreaming TSMO requires a multifaceted approach with strong leadership support that addresses policies, processes, culture, and data. The approach offers a range of benefits such as safer and more reliable transportation systems, broadening the range of solutions to address transportation challenges, and improved collaboration and efficiency across agency departments resulting in more effective use of taxpayer dollars.
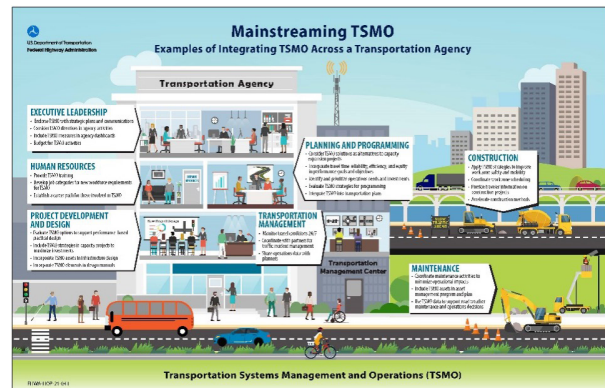


FHWA's recent Mainstreaming TSMO project focused on how an agency can formalize TSMO through policies and procedures, agency manuals, guidance documents, performance management, and integration into project planning, design, and development. An agency culture that values TSMO and recognizes its importance in achieving agency goals is created by ensuring that TSMO is integrated into decision-making and information management systems as well as TSMO-focused training and workforce development. Integrating TSMO into decision support systems, project development tools, and asset management systems establishes the status of TSMO in agency processes. This will support the development and communication of a compelling business case to stakeholders to secure continued support and investment by measuring and quantifying with analytics the benefits of TSMO strategies.

The FHWA website contains numerous resources on mainstreaming TSMO, including webinars, case studies, brochures, toolkits, and white papers. TSMO program plans are a valuable tool for documenting

TSMO activities and measuring progress. The CMM provides a targeted framework for assessing and improving TSMO capabilities within an agency. Developing effective communication strategies to share TSMO information and best practices across the agency.

**Discussion**

The Wisconsin DOT needs assessment tool primarily utilizes existing data from the department's pavement management system (Meta Manager) which includes arterial roadways in addition to free-ways. This data set is familiar to agency staff. Safety measures are a part of the evaluation criteria. The tool helps identify operationally sensitive segments and prioritize ITS investments accordingly. Safety measures, such as crash data, are increasingly incorporated into the needs assessment tool as data availability improves.

Participants discussed the potential need for an update to the AASHTO TSMO Guidance CMM inter-active web page to reflect current challenges and best practices. It was noted that FHWA also offers a number of operations program area focused capability maturity frameworks. The role of other CMMs, such as those developed for data management, was mentioned in the context of influencing the evolu-tion of the TSMO CMM.

There was discussion of challenges to sustaining TSMO in agencies, specifically:

- Funding: Securing consistent and reliable funding for TSMO initiatives remains a significant chal-lenge.

- Organizational Change: Overcoming resistance to change and integrating TSMO into the existing organizational culture can be challenging.

- Staff Turnover: The loss of key personnel with TSMO expertise can disrupt programs and hinder progress.

- Regional TSMO Plans: Participants discussed the role of regional TSMO plans and the increasing importance of regional collaboration in addressing transportation challenges.

The conversation highlighted the importance of integrating TSMO into the agency's normal way of doing business to ensure its sustainability and emphasized the role of policies and procedures in formalizing TSMO within the agency. Core elements of sustaining TSMO are the importance of strong leadership and commitment to TSMO, effective communication and collaboration across agencies and disciplines, data-driven decision-making and performance monitoring and continuous improvement and adaptation to evolving challenges and technologies.

### *Session 2 – Incorporating TSMO Program into Organization Planning*

**MetroPlan Orlando**

Eric Hill shared the origins of the MetroPlan Orlando's TSMO program that began 15 years ago with a traffic signal retiming program which has significantly improved traffic flow and reduced travel times in the metropolitan region. The program uses advanced technologies, data analysis, and performance metrics to optimize signal timing. The

"Why should a Regional TSMO Program exist?"
- Educate Policy Boards
- Messaging on benefits and success of TSMO
- Address non-recurring congestion
- Project prioritization
- Collaboration with FDOT
- Encourage innovation and emerging technologies
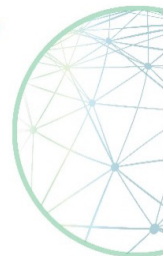
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agency continuously evaluates and refines the program.

The agency created a *TSMO Master Plan* to comprehensively identify key TSMO strategies and projects for the region with a focus on community engagement and stakeholder input. The plan emphasizes leveraging existing infrastructure and exploring innovative solutions. MetroPlan Orlando is collaboratively creating a Regional TSMO Program with other MPOs in Central Florida to advance regional TSMO initiatives through peer exchange(s), knowledge sharing, and the development of a regional TSMO strategic plan.

The agency is involved in two targeted projects: an ongoing electric vehicle supply equipment assessment to identify and address the needs and equitable access to electric vehicle charging infrastructure across the region and a pilot program funded by FHWA to explore the integration of TSMO strategies into the project prioritization process.

Although there have been programmatic improvements in the Orlando metropolitan area securing consistent and reliable funding for TSMO initiatives remains a key challenge. Focusing on effective communication and coordination among agencies and stakeholders is seen as crucial for successful TSMO implementation as well as leveraging emerging technologies, such as artificial intelligence and connected vehicles, to enhance TSMO capabilities. At the foundation of the planning process is the engagement of the public and stakeholders in the planning and implementation of TSMO strategies.

### New Jersey DOT

Sal Cowan started his presentation by sharing some historical perspective highlighting the evolution of TSMO at New Jersey DOT (NJDOT). He discussed the development of a 24/7 TMC, the implementation of the agency's emergency service patrol, and the integration of TSMO considerations into various department activities. The importance of collaboration with other agencies, including FHWA, MPOs, and other stakeholders is an on-going emphasis of the agency.



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The role of partnerships has been vital to advancing TSMO initiatives and leveraging limited resources across the state.

There is a crucial role for data in TSMO planning and implementation at NJDOT that incorporates real-time data, historical data, and performance metrics to inform decision-making and evaluate the effectiveness of TSMO strategies. Importantly, this allows the agency to have justification for integrating TSMO considerations into the department's long-range transportation plan, ensuring that TSMO strategies are aligned with broader transportation goals. NJDOT continues to explore innovative approaches to TSMO, including the use of emerging technologies and the integration of TSMO into other areas of transportation planning, such as freight planning and electric vehicle planning.

### Discussion

The ensuing discussion revolved around the role, timing, and detail of a long-range transportation plan (LRTP). These plans are more of a strategic direction document providing high level goals and objectives showing projects/programs to achieve them. LRTPs are not day-to-day procedural plans. The importance of the LRTP to TSMO programs is that the LRTP ensures that the TSMO voice is heard in the room at the same level as other programs with agency leadership so that those elements with TSMO strate-

gies and associated technologies are recognized as essential to managing the transportation network.

All of the different plans (ITS, safety, freight, comprehensive, strategic, LRTP, etc.) fit together by crafting the message that mobility and TSMO strategies provide value to managing roadways safely and more efficiently. Another element of these plans is their need to be coordinated at a certain level with other agencies internal and external to the jurisdiction.

TSMO programs are different in various parts of the country at the city, county, MPO, and state levels. Some do not have a strong institutional program while others do. The NJDOT team is in the process of authorizing annual work programs for about $40 million for staff and program costs, not necessarily technology. The projects are supportive of large scale special events. If NJDOT had never managed these large scale special events successfully in the past, the requested new projects or programs staffing, would have a poor response in the budgeting process. It is about making the case for TSMO through progressively better performance.

Experience shared from Washington, D.C. and in Los Angeles with large scale special events and national security special events that an agency's successful delivery of those events for the sponsors and lead agencies as well as law enforcement entities makes a big difference in terms of getting that external support.

## Session 3 – Data Sources and Metrics to Support Program Reporting

### Minnesota DOT

Brian Kary shared information on TSMO planning and implementation at the Minnesota Department of Transportation (MnDOT). MnDOT has developed a [TSMO Strategic Plan](#) with three primary goals to provide an underlying framework, 1) enhance safety for all road users, 2) improve mobility through reliability and efficiency approaches, and 3) promote, integrate, and sustain a strong TSMO program within the agency. MnDOT is developing seven [tactical plans](#) to address specific TSMO areas, including traffic



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management systems, signal operations, traveler information, road weather management, traffic incident management, work zone management, and connected and automated vehicles.
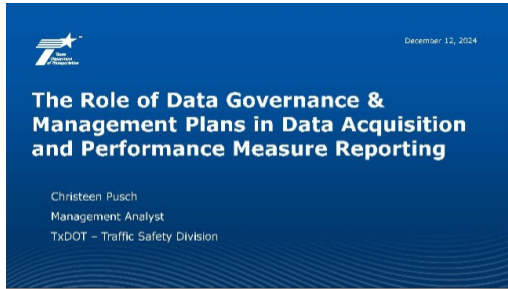
MnDOT is developing a "TSMO Op Score" to prioritize TSMO investments based on various performance measures, such as traffic volume, crash rates, incident frequency, and weather vulnerability. This data is being received from various sources, including Maintenance Decision Support System, National Weather Service, and freight program. MnDOT is also leveraging data to optimize asset management, including developing life-cycle cost analyses for ITS equipment. MnDOT is establishing performance measures for various TSMO strategies, such as signal retiming coverage and traffic incident response times. These targets will be used to support data-driven decision making by tracking progress, evaluating the effectiveness of TSMO initiatives, and demonstrating the return on investment (ROI). In addition, MnDOT is working to integrate TSMO considerations into other planning processes, such as the Transportation Asset Management Plan and the State Highway System Improvement Plan.

The agency continues to face challenges in obtaining consistent funding for TSMO initiatives, including both capital investments and ongoing maintenance, remains a challenge. Effectively integrating data

from various sources and utilizing that data to inform decision-making has required on-going effort and refinement. Adapting to the evolving landscape of transportation technologies, such as connected and automated vehicles, and integrating these technologies into TSMO strategies represent important opportunities. However, they come with challenges as MNDOT needs to ensure that the workforce has the necessary skills and training to effectively implement and maintain TSMO technologies.

**Texas DOT**

Christine Pusch focuses on the data systems and governance that support data-driven decision making for TSMO efforts at Texas Department of Transportation (TxDOT). She shared that the increasing volume and variety of data sources, including connected vehicle data, artificial intelligence (AI), and machine learning, necessitate robust data governance. Data governance is essential to ensuring data quality, consistency, and accessibility, enabling more effective TSMO planning and implementation. She noted the core pieces of data governance to support usability for TSMO applications as a data management plan, the data inventory, the associated metadata and data dictionaries, quality assurance for the data and data governance program, data security, and stakeholder engagement.
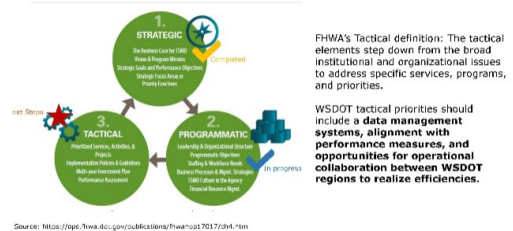


December 12, 2024

**The Role of Data Governance & Management Plans in Data Acquisition and Performance Measure Reporting**

Christeen Pusch
Management Analyst
TxDOT – Traffic Safety Division

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In terms of challenges and opportunities, strong leadership support, resource allocation, and stakeholder engagement are critical for successful data governance implementation. Integrating data from various sources, including internal and external sources, presents significant challenge as well as the critical nature of ensuring the quality and reliability of data from diverse sources. Continuous improvement and adaptation are necessary to leverage new technologies, such as AI and machine learning, to enhance data analysis and decision-making to address the evolving needs of TSMO.

**Washington State DOT**



**TSMO Next Phase: Tactical Planning**

FHWA's Tactical definition: The tactical elements step down from the broad institutional and organizational issues to address specific services, programs, and priorities.

WSDOT tactical priorities should include a data management systems, alignment with performance measures, and opportunities for operational collaboration between WSDOT regions to realize efficiencies.

Source: https://ops.fhwa.dot.gov/publications/fhwahop17017/ch4.htm

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Pam Vasudeva, the TSMO lead at the Washington State Department of Transportation (WSDOT), shared that the agency is actively working to enhance its TSMO capabilities through a combination of strategic planning, data-driven decision making, and partnerships with other agencies. WSDOT emphasizes a three-phase approach to TSMO: strategic planning, programmatic implementation, and tactical execution. The agency is transitioning from a focus on construction to a focus on operating and managing the existing transportation system. TSMO is a core element, with a focus on optimizing system performance and enhancing mobility. Central to this shift is the importance of partnerships with internal and external stakeholders, including other agencies, MPOs, and the private sector.

WSDOT has conducted CMM assessments to identify areas for improvement in TSMO implementation. These assessments have highlighted the need to strengthen performance measurement and data utili-

**TSMO in the Project Development Process**
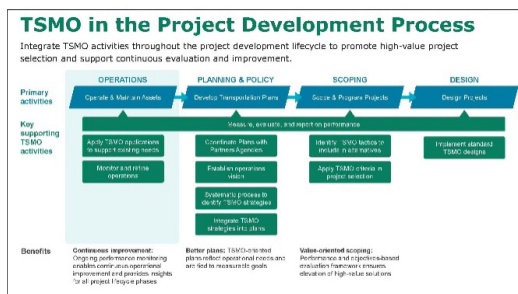
zation. As a result, the agency is prioritizing data-driven decision-making and continuous improvement in TSMO. This includes improving data acquisition, analysis, and utilization to optimize system performance and support informed decision-making. Challenges remain such as the need for improved data integration, enhanced workforce development, and securing adequate funding and re-sources for TSMO initiatives. As part of the overall effort WSDOT is integrating equity and sustainability consider-ations into its TSMO planning and implementation efforts.

In response to a question regarding multimodal performance measures Pamela Vasudeva responded that these measures tend to be pretty high level and often difficult to use for decision making (i.e., more of an indication of direction). The agency currently uses Level of Traffic Stress as part of their complete streets mandate to measure how our facilities support active transportation users.

**Discussion**

Discussion following the session presentations covered a number of threads regarding critical role of data, workforce, and sustaining efforts. The discussion touched upon the importance of assessing the reliability and sustainability of third-party data vendors before purchasing their data. This includes evalu-ating the vendor's financial stability, business model, and long-term viability. The need for a more robust and agency-wide data governance framework was stated as being necessary to ensure data quality, security, and effective utilization across departments. The collaboration between different departments, such as IT and operations, to ensure agency-wide data integration and consistency is important. Robust data quality assurance processes, including ground truthing, data validation, and the use of AI and ma-chine learning techniques is important to address data quality issues proactively to avoid costly errors and inefficiencies.

The need for training and skill development within the transportation agency to effectively utilize and analyze data, particularly with the increasing reliance on new technologies as well as aligning workforce development efforts with these agency goals and priorities.

Demonstrating the ROI of the successful implementation of TSMO strategies is important to secure continued funding and support. Development of compelling narratives based on data and performance metrics to communicate the effectiveness of TSMO initiatives of TSMO to stakeholders, including deci-sion-makers and the public is needed.

## Session 4 – Roundtable on Asset Management, Budgeting, Programming, Contracting/Procurement

For this session, the participants broke out into three groups to focus on one of three topics for discus-sion. A summary of key items from each group's discussion follows.

### Topic 1 – Asset Management and Life Cycle Costing

This discussion covered managing TSMO assets with a particular focus on traffic signals, with key points falling into two categories, challenges and best practices. Many agencies face challenges with decentralized control of signal assets, with varying levels of authority and responsibility across different

districts or regions. There is often a lack of centralized data and information on signal assets, making it difficult to track their location, condition, and maintenance history. Many agencies lack access to or utilize existing asset management software effectively. Ensuring timely access to spare parts for signal maintenance and repair can be a significant challenge, especially with isolated traffic signal in rural areas.

The discussion highlighted the best practice of using centralized databases and mapping systems to track all TSMO assets, including signals. Some agencies, like Idaho, require vendors to maintain physical locations for spare parts, which can improve response times for repairs. Emphasizing preventative maintenance programs can help reduce the frequency and severity of equipment failures. Sharing best practices and lessons learned across different agencies can help address common challenges and improve overall asset management. (Note: The discussion identified two potential webinar topics: 1) Software for Asset Management of ITS and Signal Elements and 2) Leveraging AASHTOWare for ITS and Signal Asset Management.)

**Topic 2 – Budgeting and Programming**

This group's discussion focused on challenges and innovative approaches to budgeting and programming for TSMO. Balancing the need for innovation with the uncertainty of potential benefits can be challenging. Securing funding for innovative projects can be difficult as well, especially when the benefits are qualitative rather than quantitative. Representatives from each agency participating in the group shared examples of their approach, challenges, and innovation.

Virginia DOT (VDOT) recently completed a comprehensive review of their asset management from both the program and asset perspective (including ITS systems and fiber network) examining lifecycle and maintenance of the technologies. Key aspect was to examine downstream maintenance requirements of new assets before construction due to the potential concern of fiscal resource allocations being consumed by maintenance. In addition, VDOT is working to leverage grant monies for innovative programs and TSMO assets but wants to be able to be mindful of the need to provide on-going support for those innovations.

The agency has established a [Regional Multimodal Mobility Program](#) in collaboration with multiple agencies across northern Virginia (towns, cities, counties, VDOT, the MPO, transit systems, etc.). This is similar to an Integrated Corridor Management program, but in a beefed up network context. The program is more than funding resource collaboration; the focus is for all of the partners and owners to join together to have a stake in the direction and outcomes. In addition, VDOT has a $25M per year dedicated [Innovative Technology Transfer Fund](#) (ITTF) established in the Code of Virginia that supports innovative projects through a staff idea submission process that evaluates potential benefit vs. risk.

As noted in Session 1, Wisconsin DOT has a dedicated set-aside funding programs for standalone signal and ITS improvements, along with funding from utility fees and dark fiber network leases. At Wisconsin DOT there are challenges in retiring old but still functional technology (e.g., point detection systems) because of the gap between old assets and current state of the practice replacement technology. There are costs associated with decommissioning and replacing outdated equipment as well as the necessary changes to staff knowledge and maintenance resources. (Note: *As part of follow up discussion on this point, the group suggested NOCoE webinar(s) or case studies on guidelines on technology obsolescence, need a comprehensive review, building in lifecycle cost for asset function vs. specific assets, and supportive content from the Transportation Operations Manual.*)

The agency is partnering with the University of Wisconsin – Madison beyond the typical research and development relationship to provide supplemental expertise and intern staffing for the Milwaukee TMC. Other agencies in this discussion shared they are leveraging partnerships with universities as well to access expertise, data, and innovative technologies. Universities can also be a source of incubator staff and facilitate technology testing at a lower cost compared to in-house solutions.

Iowa has dedicated funding for highway helper, the state transportation operations center (TOC), ITS devices and small scale TSMO improvements. The challenge is the costs continue to increase and require additional resources. When requesting funds major TSMO/ITS projects compete with infrastructure projects. The agency is in the early stages of a plan to better structure the TSMO funding requests to have a better chance of success against other project based on the value proposition.

For the Iowa DOT sensors have been a challenge since they are still needed for accurate traffic counts, though they are no longer necessary for situational awareness of traffic conditions. The agency found that removing Highway Advisory Radio was difficult and expensive as well.

Iowa DOT has relationships with Iowa State University to access sensor data and feeds since they can scale their data storage faster than the agency. There is a research contract with the university to investigate the data and dig into the data set (e.g., for connected vehicles), which the DOT staff then reviews the analysis.

Illinois DOT (IDOT) is working on identifying ideal locations for V2X communications. Agency representative(s) noted their policies for retiring technology particularly around expensive to maintenance copper wire to fiber communication lines. There are struggles with analog cameras and some software does not allow image capture; there is a challenge of working with district offices to ensure that funds are secured and allocated for upgrades. They are looking at applying some sort of federal financial support more broadly.

IDOT has an agreement with the University of Illinois – Chicago to assist running the travel website by compiling and merging data from other states. IDOT has found that the university is more affordable due to lower overhead and they are more willing to test out leading edge new technology.

Tracy Scriba shared that some states went to sponsorship programs to fund their freeway service patrols to sustain the service. Now states are bringing these programs back in-house because the sponsorships would change resulting costs to rebrand vehicles and negotiate new agreements.

### Topic 3 – Contracting and Procurement Methods

This discussion covered challenges, innovative approaches, and recommendations for contracting and procurement methods for TSMO. Agencies face challenges with decentralized procurement processes, particularly when dealing with multiple districts or regions and lack of familiarity by contracting offices with programmatic or service-oriented TSMO functions. Retiring outdated technology can be expensive and challenging, especially for agencies with limited budgets. Procuring and maintaining software for TSMO applications can be complex and require careful consideration of long-term costs and compatibility, especially if there is software as a service, proprietary or sole-source technology. Coordination with jurisdictions' information technology departments can vary widely from imbedded staff, to following standardize procurement rules, or an arm's length relationship due to a lack of understanding of ITS technologies. This varies based on the size of the jurisdiction and its agencies as well as span of control and funding sources, i.e., statewide vs. city level. Cybersecurity is one of the drivers of this relationship.

Securing funding for innovative TSMO projects can be difficult, as agencies often prioritize more traditional infrastructure projects.

Some agencies have established dedicated funding sources for innovative TSMO projects, such as the Innovative Technology Transfer Fund (ITTF) in Virginia. Collaborating with universities can provide access to expertise, data, and innovative technologies at a lower cost. Fostering collaboration among agencies at the regional level can improve resource sharing, leverage economies of scale, and address regional transportation challenges more effectively.

The NOCoE can play a valuable role in sharing best practices in procurement, including model procurement documents and lessons learned from other agencies. There was an interest in exploring the tactical challenges and opportunities associated with procuring and maintaining software-as-a-service (SaaS) solutions for TSMO applications. In addition, there was an interest in the potential for greater collaboration between state transportation agencies and their respective state information technology departments to streamline TSMO procurement processes and improve data sharing.

The development of standardized procurement procedures for different specific categories TSMO assets as well as examining the impact of agency size and structure on procurement processes would be helpful to improve practices in the area.

## Session 5– Intra-Organization and Regional Collaboration

### Portland Metropolitan Area

In the Portland metropolitan area Transport is a collaborative multi-agency committee that meets monthly to share information, discuss best practices, and coordinate priorities for TSMO efforts that includes representatives from the Oregon Department of Transportation (ODOT), Metro (MPO), Portland Bureau of Transportation (BPOT), TriMet (transit agency), Clackamas County, Multnomah County, Washington County, City of Beaverton, Portland State University, and Federal Highway Administration. Transport is structured as an informal subcommittee of Metro's Transportation Policy Alternatives Committee (TPAC). Although it lacks dedicated funding and staff, the coordination framework provides an effective structure for regional collaboration, although subsequent discussion probed whether the informal structure of Transport presents challenges in terms of accountability and decision-making. There are focused groups within Transport that address specific areas like network management, data sharing, traffic incident management, and traffic signal systems.

Transport coordinates recommendations on funding allocation for TSMO investments to the TPAC and has helped strengthen applications for federal TSMO grants. Cooperative agreements allow agencies within Transport to leverage each other's contracts for equipment, services, and infrastructure and engage in joint collaborative project efforts on TSMO initiatives. Examples include implementing cloud-based NextGen Transit Signal Priority for improved bus transit efficiency by providing real-time bus arrival data to traffic signals for optimized green light timing and the centralized regional traffic signal system connecting multiple agencies, facilitating signal operation, troubleshooting, and incident response.

The organization collaborates on the integration of TSMO strategies into the Portland region's long-range transportation plan, considering factors like safety, equity, reliability, and environment. Standardization has allowed for the shared use of equipment, software, and communication protocols reduces costs and improves interoperability. Coordinated efforts through Transport have avoided duplication and streamlined processes for project implementation and maintenance. Sharing traffic and transit data

allows for better informed decision-making, improved traffic management across the region, and plays a crucial role in coordinating responses during emergencies. Collaboration has fostered knowledge sharing and the exploration of new, innovative technologies and approaches to TSMO.

In the ensuing conversation participants discussed the structure and function of other MPO's committees and how they compare to Transport as well as the potential benefits and challenges of formalizing Transport with dedicated funding and staff. In addition, there was an observation regarding the need to consider language requirements for multilingual regions, particularly in Canada or the Southwest. Overall, the Portland region's collaborative approach to TSMO serves as a model for other regions seeking to optimize transportation operations and improve efficiency.

**Niagara International Transportation Technology Coalition (NITTEC)**

Niagara International Transportation Technology Coalition (NITTEC) was established in 1995 to improve mobility in the binational region of Western New York and Southern Ontario. The coalition works with various partners including transportation agencies, public safety, border enforcement, emergency services, recovery teams, and local universities. The group works to secure grant funding to support various transportation initiatives in the region.



**Niagara International Transportation Technology Coalition**

nittec
Travel Smart.

Athena M. Hutchins, P.E., F.ASCE
Executive Director
Niagara International Transportation Technology Coalition

December 10, 2024

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NITTEC operates a wide range of services including management and operation of all ITS equipment and a TOC on behalf of all the agencies in the region as well as sharing real-time traffic information to the traveling public through website, mobile app, and 511 systems. The information NITTEC collects is shared as data and performance measures with the region's agencies and MPOs. The agency develops traffic management plans for various events (e.g., weather, construction), stages equipment and resources in preparation for winter storms, and assists with incident management through committee meetings, debriefs, and information sharing among partners.

NITTEC is involved in several initiatives to improve regional operations including collaboration with customs agencies on both sides of the border to improve traffic flow and wait times as well as working with agencies to minimize disruptions caused by construction projects. There is a current focus on arterial management to improve traffic signal coordination on major roadways, especially corridors with high traffic volume or serving as evacuation routes. This includes a pilot project on Niagara Street with traffic signal priority for transit funded through an FHWA Advanced Transportation and Congestion Management Technologies Deployment Program (ATCMTD) grant.

Looking forward, the organization is planning to expand their program related to traffic signal management across jurisdictional boundaries. This will include implementation of traffic signal priority in additional corridors in the region as well as emergency vehicle preemption, and formalizing procedures for connecting intersections on corridors across jurisdictions. The goal is to leverage NITTEC's experience with arterial management to improve overall transportation in the region.

## Session 6– Do Without Doing: From TSMO Champion(s) to TSMO Organizations

The moderator explained that the title of this session, "Do Without Doing" was borrowed from Taoism and refers to the idea of doing something without thinking. In today's context, this idea is exemplified by organizations that have moved from individual TSMO champions within an agency to a more integrated

and pervasive TSMO culture where TSMO principles are so deeply ingrained within an organization that they are applied naturally and consistently without requiring conscious effort. The success of this transition depends on factors such as organizational culture, leadership support, and the integration of TSMO principles into agency goals and objectives. The following discussion explores this shift in perspective.

### Arizona DOT

Arizona Department of Transportation (ADOT) is re-evaluating its TSMO organizational structure after ten years in place. ADOT initially created a separate TSMO division, pulling together various maintenance and operations functions. The agency has found over time that this initial approach led to duplication of effort and inefficiencies within the organization.

ADOT is now reorganizing its structure by reintegrating field maintenance and operations personnel into a single, unified group within district offices. The ITS, TOC, and traffic signal divisions will remain separate but will be more closely integrated with the overall operations and capital programs.

The agency's experience highlights the importance of careful consideration and flexibility when implementing organizational changes related to TSMO. A "one-size-fits-all" approach may not always be the most effective. However, ADOT continues to work finding the optimal balance between a dedicated TSMO focus and seamless integration of TSMO principles across all organizational levels. This will involve careful consideration of how to best leverage the expertise and resources within the newly structured organization to achieve TSMO goals.

### Virginia DOT

As shared by Paul Szatkowski and Mena Lockwood, the Virginia Department of Transportation's (VDOT) historical evolution since 2013 to integrate TSMO into its organizational culture has moved through several phases and three changes of executive leadership that necessarily led to each successive iteration of the organization. VDOT's approach emphasized gradual integration in an evolutionary manner rather than a drastic overhaul.

Six key milestones that contributed to this successful integration:

- Streamlining and consolidating operations-related contracts. Securing leadership buy-in to the program.

- TSMO principles were formally codified into the Code of Virginia and actively promoted throughout the organization.

- Integration of operations metrics into project ROI evaluation(s) and inclusion of TSMO strategies in corridor improvement plans through discussions with their planners and engineers.

- Establishment of dedicated funding streams for TSMO initiatives to create continuity for the TSMO program

- Restructuring VDOT to eliminate silos of separate operations regions from district offices and integrated operations into agency culture. Created a unified operations division while also placing operations staff in each district office with manager accountability.

- Development of a future-oriented operations strategic plan with prioritized actions for the next 10 years, an innovation focus, and a systematic approach to TSMO strategy implementation.

The agency has benefited from this approach by becoming more operationally focused and nimble to take advantage of leading edge software, artificial intelligence, and machine learning. Now with TSMO strategies embedded in planning, design, and project execution across the organization when grant and budget funding opportunities are available the agency will be ready.

### Nevada DOT

Tracy Larkin-Thomason, Director of the Nevada DOT, shared her perspective on the state's approach to TSMO, particularly focusing on the I-80 corridor and its connection to the national transportation system. Nevada has had a history of TSMO implementation, starting with winter operations coalitions and gradually evolving to incorporate advanced technologies like dynamic message signs and road weather information systems.



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The I-80 Corridor Initiative aims to enhance coordination and create digital infrastructure for data sharing across 11 states along the corridor supporting tourism and recreation travel, safety, and operational efficiency. There is specific recognition of the critical role of freight movement along the I-80 corridor and strategies are being prioritized to improve efficiency and reliability for freight operators. The initiative emphasizes the importance of establishing seamless data exchange and interoperability across state lines and stresses the importance of considering the impact of TSMO strategies on intersecting interstate highways and other transportation networks. The project touches on many of the current forward leaning approaches to TSMO such as analytics and data-driven decision-making as well as adoption of new technologies and operational approaches. However, this is being managed though collaborative situational awareness among states, MPOs, and other stakeholders to achieve common goals.

The Nevada DOT's work connects the I-80 Corridor Initiative to the broader AASHTO Moonshot program, which aims to create a more resilient, sustainable, and equitable transportation system. This initiative has the potential to serve as a model for other corridors across the country that aligns with national transportation goals, demonstrating how collaborative efforts and innovative approaches can enhance TSMO performance and improve the overall efficiency and safety of the national transportation system.

### Iowa DOT

Scott Marler observed that the transportation profession has come a long way as a community with respect to TSMO by making it part of the fabric of transportation agencies, not just an add-on, rather by building on what is already in place. Iowa DOT emphasizes the importance of continuous learning within the organization through training programs, conferences, and knowledge sharing within the organization and across the transportation community. The agency emphasizes leveraging the existing structures and processes within the organization rather than creating entirely new ones, e.g., incorporating TSMO considerations into the early stages of the planning process, such as evaluating operational strategies before considering major construction projects.

This allows TSMO principles to be integrated into the core values and decision-making processes of the organization. This results in the need for dedicated funding streams to support TSMO initiatives to be recognized across the agency for operations, maintenance, and technology upgrades. In addition, Iowa DOT uses data and analytics to inform TSMO strategies and evaluate their effectiveness and emphasizes the importance of collaboration with other states, MPOs, and stakeholders at the national level to

advance TSMO initiatives and address shared challenges.

Director Marler closed with some observations about advocating for policy recommendations changes to support TSMO implementation, including dedicated funding, coordinated research, improved project development processes, and streamlined procurement procedures. At the national level, AASHTO is working on a white paper promoting operations policy at the federal level. The paper will identify key elements for the next transportation reauthorization bill for operations-focused policy initiatives, including:

- Dedicated funding for evolving operations
- Better coordination research around emerging technology and CAVs
- Blueprint for project development/deployment
- Improving procurement models; doing a lot that is not typical for DOTs

**Discussion**

Following the presentations a general discussion reenforced a number of points on integrating TSMO into DOTs, including:

- Several states highlighted the importance of integrating TSMO into all aspects of their transportation operations. Arizona expanded their description of decentralizing TSMO through re-integration into the agency's existing district organizational structure to avoid duplication of effort. Virginia has done so as well as keeping a central office element as a resource center and statewide operations. The conversation touched on leveraging existing strengths and processes in agencies' organizations

- Emphasis on the importance of using data to inform TSMO decisions. This includes using data to identify problems, create strategies, evaluate potential solutions, and track the effectiveness of implemented strategies.

- The role of the MPO is to plan for the future and to plan transportation for urban areas. There is a need for better communication and collaboration between DOTs and MPOs to ensure that TSMO is integrated into regional planning efforts. Another example is the question of where MPOs fit into the creation of multi-state corridors and the timing for engagement in the corridor development process. MPOs can be a convening body for stakeholder groups to advance TSMO goals. It was also mentioned that many states also have rural planning organizations (e.g., Iowa, North Carolina) that can be useful in reaching stakeholders for transportation and TSMO issues.

- Several states highlighted the value of partnering with universities for multiple roles which span the traditional research and development, technology testing, etc. to using the university as a provider of data analytics and staffing. States are looking to universities for more agile development processes and the creation of research consortiums to move innovations to implementation. There is also recognition that states' universities have different strengths, resources and research interests that need to be best leveraged for the DOT's needs.

- Creating business cases can be a helpful way to justify grants or funding streams for TSMO activities and/or technology by documenting ROI. Business cases can be incorporated into strategic plans, capital improvement programs, or created for specific TSMO innovation-focused initiatives to move topics in front of agency leadership. Leading states emphasized that in their case it is not a separate business case because it is integrated into everything. Other states observed that there still is a ROI value conversation for TSMO projects and technologies that are evaluated against each other, but more difficult to weight the ROI factors against larger infrastructure projects in the agency's project prioritization.

# Next Steps

### *Gaps and Future Actions*

This peer exchange focused on sustaining TSMO with participation from various agencies across the country. NOCoE will meet the AASHTO, ITE, ITS America, and FHWA representatives to review the peer exchange findings and work on next steps as well as potential products. Based on participants' feedback, it is anticipated that the following priority topics and questions need to be further explored.

Topics for consideration of resource development:

- Guidelines for technology obsolescence and replacement. Questions included: When to perform a comprehensive review? Policies for retiring old technology? How to approach from an asset management and life cycle cost perspective? Impact on other assets and services? Role of the Transportation Operations Manual?

- Models for TSMO in agencies: TSMO standalone office, full integration into district offices, or some combination. When changing from one approach to another, what are the tips for success?

- Digital Infrastructure topic continues to have interest especially at the tactical topics and actions level.

- Multi-state collaboration. What are the types of agreements? What key elements should be included?

- Processes to encourage innovation and how to move ideas forward for testing and potential implementation.

- Share best practices in procurement, including model procurement documents and lessons learned from other agencies. Explore the challenges and opportunities associated with procuring and maintaining software-as-a-service (SaaS) solutions for TSMO applications. The development of standardized procurement procedures for TSMO assets and services. Touch on the impact of agency size and structure on procurement processes.

- Explore the potential for greater collaboration between state transportation agencies and their respective state information technology departments to streamline procurement processes and improve data sharing. (This is a Spring 2025 NOCoE Peer Exchange.)

Topics specifically identified for webinars and /or case studies:

- Software for Asset Management of ITS and Signal Elements

- Leveraging AASHTOWare for ITS and Signal Asset Management

- Agreements with universities or research consortiums for different types of work (agile research, data analysis, staffing, etc.)

- TSMO employee learning programs (courses, sequence, target audiences / learning objectives)

- Best practices conduct ROI / value analysis for TSMO and ITS supporting technologies in the context of factor weighting of TSMO vs. new construction/ expansion (How to level the playing field?)

- Using MPO's as an organizing entity for interagency regional TSMO programs (What are the successes? What are the challenges? Why?)

# Resources

**Federal Highway Administration**

Mainstreaming Operations web page has links to multiple resources:

- *Mainstreaming TSMO* primary landing page with links to resources.
- *Mainstreaming Operations info graphic*.
- *Mainstreaming TSMO: Making the Business Case*.

**Iowa DOT**

- Business Case One Pager resources

**MetroPlan Orlando**

- *Transportation Systems Management & Operations* MetroPlan Orlando webpage with links to TSMO resources.
- *Transportation Systems Management & Operations Master Plan*.
- *Feasibility of a Regional Transportation Systems Management and Operations (TSMO) Program*, National Institute for Congestion Reduction, University of South Florida, February 2023.

**Mid America Regional Council**

- *Operation Green Light* information.
- *KC Scout* information.

**Minnesota DOT**

- Transportation Systems Management and Operations Minnesota DOT webpage with links to Strategic Plan, tactical plans, and benefits information.
- *TSMO Strategic Plan*.
- *Tactical Plans webpage*.

**Nashville DOT**

- *Choose How You Move* information.
- *Connect Downtown* information.

**Nevada DOT**

- AASHTO Journal, January 10, 2025, "TRB Panel: Technology Key to 'Future of Transportation'".
- AASHTO Journal, January 12, 2024, "State DOTs Outline Ongoing 'Moonshot Project' Efforts".
- ITS America AV Freight Panel Brief Transforming the I-80 Corridor: A New Era of Connected Freight Movement, November 2024.

**New Jersey DOT**

- *Mobility and Systems Engineering* New Jersey DOT webpage.
- *New Jersey Statewide ITS Architecture*, November 22, 2022.

### New Jersey DOT (Continued)

- *Transportation Choices 2030: New Jersey's Long-Range Transportation Plan*, 2008.
- *2023 Comprehensive Statewide Freight Plan* webpage with links to document and appendices.

### Niagara International Transportation Technology Coalition (NITTEC)

- NITTEC website.
- NITTEC Strategic Plan, 2017.
- Niagara Street Project presentation, *Integrating Smart Transit into Complete Streets* to APTA 2018 Sustainability & Multimodal Planning Workshop by Robert Jones, Manager-Service Planning, Niagara Frontier Transportation Authority.

### Oregon

- Oregon DOT System *Operation and ITS*.
- Oregon Metro *Transportation System Management and Operations (TSMO) Strategy*.
- *TransPort Bylaws*.

### TX DOT

- Transportation systems management and operations TX DOT webpage with links to TSMO resources.
- Transportation Systems Management and Operations 2021 Statewide Strategic Plan.
- TxDOT Statewide TSMO Technology Solutions, February 2021.

### Virginia DOT

- Virginia DOT FY2024-2026 Business Plan, see pgs. 23-26 for traffic operations and cybersecurity.
- VDOT Information Session on traffic operations presentation to ITS Virginia Winter Meeting February 20, 2024.
- Regional Multimodal Mobility Program
- Innovative Technology Transfer Fund

### Washington State DOT

- *Gray Notebook* quarterly performance and accountability report. Each edition features quarterly, semi-annual, and annual updates on key agency functions and provides in-depth analysis of topics that align with Washington's transportation goals as well as our strategic plan.
- *Incident Response Example* from the Gray Notebook.
- *Cost and Economic Benefit / Performance Analysis* for incident response program.

### Wisconsin DOT

- *Traffic Engineering, Operations & Safety Manual, Chapter 17, Section 6* (2019) for system operations and ITS planning.
- *TSMO-TIP Needs Analysis Tool*.
- Most recent (FY22) TSMO-TIP Needs Report.
- *Historical TSMO-TIP Info / Benefits Tool*.