NCDOT TSMO Statewide Strategic Plan

Strategic Plan

July 31, 2023

Final

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Introduction

Strategic planning is imperative to assess an organization's current direction and the trajectory of its mission and goals. This Strategic Plan aligns evolutions experienced by the North Carolina Department of Transportation (NCDOT) over recent years and provides the vision and goals of the Transportation System Management & Operations (TSMO) program for the next five to ten years. This evolution includes a strong focus on how to approach active traffic management. As part of this most recent assessment, the plan continues to integrate the NCDOT's Mission Statement, Vision, and Values defined by the current executive leadership of the Department, shown in **Figure 1**.

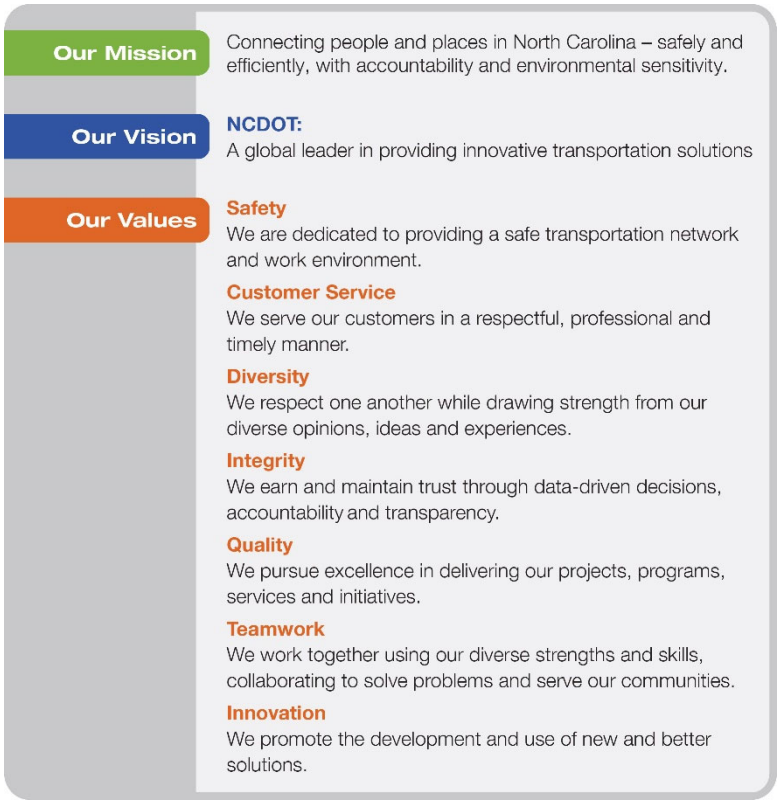

Figure 1. NCDOT Mission, Vision, and Values

As an update to the 2017 TSMO Statewide Strategic Plan, this plan expands on the TSMO suite of documents to include programmatic and tactical layers. The 2023 TSMO Statewide Strategic Plan layers are:

- **Strategic** – Provides an overview and the business case for TSMO. This is a single plan that includes mission and vision, goals and objectives, and performance measures. The audience includes all levels of staff from NCDOT and partner agencies.
- **Programmatic** – Describes the TSMO program objectives, overarching or programmatic focuses, and presents the list of services layers that are the focus of the tactical layer. This single plan includes roles and responsibilities, business processes, an overview of service layers, and resources. The audience for the programmatic layer includes the program managers within NCDOT and key partner agencies.
- **Tactical** – Summarizes the action plan and targeted focus for each TSMO service layer. This layer is a suite of individual service layer plans with specific activities derived from the gap assessment. The audience includes those that will lead these activities and move the TSMO Program forward to the next level of maturity.

The strategic service layer document will focus on:

- A brief education on **Transportation Systems Management and Operations (TSMO)** terminology and links to additional resources.
- The process followed for the Development of the TSMO Strategic Plan.
- **Capability Maturity Assessment** including a summary of completed, planned, and future activities.
- A discussion of the Department's **Commitment to the TSMO Program**.

Commitment to the Program

In early 2022, the Department conducted an in-depth assessment on the health of the TSMO program and focused on a declining state due to "extreme sacrifices to the investment levels." In recent years, gaps in funding forced the Department to reallocate resources away from the program. The assessment recommended that, "to provide the greatest impact to safety and mobility, the Department should strive for a proactive level of traffic management." This recommendation further defined an approach to support this level of traffic management.

This assessment divided the overall TSMO Program into specific core focus areas. These core focus areas, listed below, align with the service layers defined for this NCDOT TSMO Strategic Plan.

- Traffic Incident Management (TIM)
- Traffic Management Centers (TMC)
- Intelligent Transportation Systems (ITS)
- Traveler Information
- Signal Systems Timing and Operations
- Emergency Weather Traffic Operations
- Active Work Zone Management/Planning for Operations
- Mobility Performance Measurement
- Data Purchases (Probe Data)

The Department adopted the recommendations from that assessment and commitment to invest funding following the five steps presented in **Figure 2**. This endorsement by Executive leadership reinforces the importance of the direction outlined in this Strategic Plan.

Figure 2. Recommended Approach

Purpose of Strategic Plan

Over the past decade, transportation agencies have increasingly integrated TSMO into practice at federal, state, and regional levels. Historically, agencies have dedicated resources to improve congestion and capacity on roadways via high-cost infrastructure projects. These solutions may have offered improvements to mobility and safety, while not entirely addressing the primary causes of congestion. As state DOTs increasingly focus on user and roadway performance, agencies must consider how best to approach operational and capacity expansion through a more cost-effective and near-term approach. The purpose of this TSMO Strategic Plan is to guide NCDOT on TSMO-focused strategies and activities that enhance programmatic and agency integrations.

TSMO Mission Statement

The following TSMO-focused Mission Statement builds on the Department's Mission and Vision.

Connecting people and places in North Carolina safely and efficiently, *using Transportation System Management and Operations (TSMO) strategies to support NCDOT's overall mission through innovative processes and approaches, collaboration, and coordination among modes and systems on the transportation network.*

Table 1 summarizes the goals developed as part of the 2023 TSMO Strategic Plan. These goals integrate the 2017 goals to better represent the content and focus of the Service Layer Plans, which function as the framework for activities to advance the program. Each activity within the Service Layer Plans maps back to these goals to ensure alignment with the overall program vision.

Table 1. TSMO Program Goals

Goal		Goal Statement
	Collaboration	Support increased collaboration within the Department and with external partner agencies.
	Internal Knowledge and Awareness	Establish tools and processes that support continuous education for project sponsors, owners, and those identified with specific roles and responsibilities for each TSMO strategy.
	Performance Management	Evolve the use of data to make informed decisions regarding TSMO investments.
	Integrate Operations	Integrate operations and TSMO strategies into every aspect of program and project delivery.
	Funding	Implement a sustainable approach to funding TSMO strategies.
	Project Delivery	Focus on project prioritization, phasing, and the effective application of TSMO strategies.
	Resource Management	Focus on staffing and funding resources based on the most impactful TSMO strategies.
	Educate	Develop a TSMO Strategy Library of resources that includes easily digestible summaries of TSMO strategy impacts – include performance measures, return on investments (ROIs), and benefit-cost analyses (BCAs).
	Data Management	Integrate consistent practices in data management to improve efficiencies and decision making regarding TSMO investments.

What is Transportation Systems Management and Operations (TSMO)?

Long-range planning and capital-intensive investments achieve traditional improvements to transportation infrastructure regarding mobility, reliability, safety, and accessibility. TSMO approaches these improvements with strategies that focus on optimizing existing infrastructure, supporting lower cost capital improvements, or implementing near-term, integrated solutions. These solutions allow the active management of transportation systems based on current operational and organizational conditions. These conditions include both real-time impacts on traffic behavior, such as crashes or severe weather, and existing physical conditions that may restrict the mobility or safety of the infrastructure. TSMO focuses on all aspects of agency and system operations and management, with an emphasis on agency collaboration, agency readiness, and a cultural shift away from legacy approaches to transportation services.

Additional information regarding TSMO is available in the National Operations Center of Excellence Traffic Operations Manual (TOM).

- Traffic Operations Manual (TOM) https://transportationops.org/news/headline-news/nocoe-news-operations-manual-now-available

TSMO Deployments

TSMO deployments often focus on ITS, controlled communication, and other infrastructure applications that quickly and efficiently identify real-time roadway conditions that can streamline costs associated with physical infrastructure improvements. Monitoring transportation systems and integrating technology can help identify crashes, lane obstructions, congestion, and other scenarios that can impact traffic flow. Providing real-time traveler information to commuters and roadway users through dynamic message signs (DMS) may alert upstream drivers regarding an incident or redirect drivers to alternate routes. The integration of strategies is essential to addressing more complex impacts of congestion and reliability. For example, TIM programs help clear incidents more safely and efficiently, and the integration of traveler information with traffic management systems could improve fuel economy and reduce time lost. The Appendix of the Programmatic Plan includes a comprehensive summary of existing conditions. An annual TSMO Program Report will maintain the status moving forward.

Promoting Agency Collaboration

Promoting TSMO culture among partners, stakeholders, and agencies is critical to the program's success. Embedding TSMO as a key priority within an agency typically requires the integration into other agency functions, plans, and programs to support optimized system performance. These functions may be investment and funding decisions, project designs and development, maintenance of infrastructure and assets, or long-range transportation documents. Regardless of whether a single agency, multiple agencies, or a region develops a TSMO program, transparent support and communication to internal and external agencies is critical to efficiently incorporating the TSMO activities defined.

Assessing TSMO Capabilities

The Capability Maturity Model (CMM) Assessment guides agencies through a self-evaluation regarding key processes and capabilities related to their effectiveness. The six dimensions include:

- **Business Processes** including formal scoping, planning, programming, and budgeting
- **Systems and Technology** including use of systems, engineering of systems, and architecture standards
- **Performance Measurement** including measures definition, data acquisition, and utilization
- **Culture** including technical understanding, leadership, outreach, and legal authority
- **Organization and Staffing** including programmatic status, organizational structure, staff development, recruitment, and retention
- **Collaboration** including relationships with public safety agencies, local governments, MPOs, and the public sector

Each of the six dimensions include four distinct levels of capability that may reveal current strengths and weaknesses of an agency, and further provide a starting place for capability action. Each level emphasizes establishing a program with documented practices in each dimension. These levels range from performing ad hoc or fragmented activities (Level 1) to more optimized and institutionalized programs (Level 4). As an agency progresses through each level, its mission, process, management, and approaches become more efficient. In addition, each maturity level criteria supports progress to the subsequent levels of capability. **Table 2** presents the CMM framework that combines the six core dimensions and four capability levels into a single framework.

The maturity levels include:

- **Level 1: Performed** – Activities and relationships largely ad hoc, fragmented, informal, and champion-driven
- **Level 2: Managed** – Basic strategy applications in place with key technology and needed staff capacities under development, but limited accountability and lacking internal and external collaborative partners
- **Level 3: Integrated** – Standardized strategy applications implemented in priority contexts and managed for performance; the TSMO program has developed, documented, and integrated more technical and more diverse processes into multiple agencies.
- **Level 4: Optimizing** – TSMO is a full, sustainable, regionwide program, established based on continuous collaboration and improvement with all partnerships.

Table 2. Capability Maturity Model (CMM)

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

Current Capability Maturity Assessment

The development of the TSMO Plan included individual CMM assessments for each of the core focus areas. The Appendix of the Programmatic Plan includes the individual matrices from those assessments. **Figure 3** provides an average of those assessments by dimension.

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Figure 3. Capability Maturity by Dimension

Conversations within each workshop yielded certain successes and risks. **Table 3** summarizes notable successes by Core Focus Area.

Table 3. Successes by Core Focus Area

Core Focus Area / Service Layers	Successes
Traffic Incident Management (TIM)	▪ NCDOT is introducing new tools which will improve program management (IMAP Dashboard, Tow Contract Benefit-Cost Analysis (BCA)) ▪ A formal multidisciplinary TIM program has dedicated staff with position levels, job descriptions, etc. ▪ The state has authority removal and driver removal laws ▪ Strong partnership with State Highway Patrol and the towing industry ▪ Performance measures integrated with position descriptions for some positions ▪ There is a mature Safety Service Patrol (SSP) Program ▪ There is a training and certification program for responders
Traffic Management Centers (TMC)	▪ Clearly defined Standard Operating Procedures ▪ Peer-to-Peer Exchange for Integrated Corridor Management (ICM) ▪ Well-documented training procedures ▪ Co-located TMC with Emergency Management (EM) and SHP ▪ Some performance measures used to populate statewide dashboard ▪ Single contracting mechanism for TMC staffing across the state and allows for support staff beyond control room roles
Intelligent Transportation Systems (ITS)	▪ QPL supports consistency in devices across the state ▪ Standards for field equipment installation exist ▪ Recurring coordination meetings with DIT
Traveler Information	▪ Well documented traveler information processes ▪ Work Zone Data Exchange feed ▪ Redundant knowledge across multiple staff members ▪ Consistency exists for incidents entered at TMCs based on the statewide SOPs ▪ NCDOT monitors the successes of other states and attempts to implement best practices

Core Focus Area / Service Layers	Successes
Signal Systems Timing and Operations	▪ Procurement and consistent design guidance are well documented and followed ▪ Signals on the statewide system have clear performance measures ▪ Staff is well-trained in their expertise but not all staff know how to do advanced signal operations ▪ There is a high-level champion in the DOT leadership for all mobility and safety activities ▪ Arterial performance tool provides high-level assessment ▪ NCDOT can remotely access or manage a limited number of the statewide signals ▪ Shared O&M responsibilities with local agencies through Schedule D Agreements ▪ Signal timing philosophy manual documents standard procedures and promotes statewide consistency
Emergency Weather Traffic Operations	▪ NCDOT formally documented business processes ▪ Established processes for balancing resources during major events ▪ Coordination with agencies and data-driven responses supported from multiple platforms ▪ Value understood from a multi-agency response and partnerships
Active Work Zone Management/Planning for Operations	▪ Evolving traffic management plans with room to grow ▪ Partnering with SHP and law enforcement through Helping All Work Zones Keep Safe (HAWKS) program ▪ NCDOT has fully integrated TSMO functions into the NCDOT Project Delivery Network and Integrated Project Delivery with standard SOWs that are well-defined throughout the process

Table 4 summarizes the risks associated with the current state of the program. These risks help justify why support and funding should be refocused to a more proactive approach.

Table 4. Risks By Core Focus Area

Core Focus Area / Service Layers	Risks
Traffic Incident Management	▪ Challenges for IMAP to provide adequate coverage (miles and shifts) based on staffing challenges. ▪ Procurement challenges are impacting the ability to transition the fleet to new vehicles.
Traffic Management Centers (TMC)	▪ Immature active traffic management and substandard facilities resulting in travel times increase and travel time reliability decrease. ▪ NCDOT has implemented active traffic management strategies when and where necessary – focused on mitigating the impacts on increased travel times associated with work zone. ▪ Lack of ATMS with more complex operations increasing. ▪ Lack of ATMS facilities in key locations.
Intelligent Transportation Systems (ITS)	▪ Lack of redundance and knowledge of existing assets. ▪ Lack of redundancy impacts threat to resiliency in communications network. ▪ Resource limitations impact device uptime.
Traveler Information	▪ Keeping pace with evolving technologies and investing NCDOT resources with the most impactful solutions. ▪ Manual input on current platforms can create a higher risk to error of data in the system.
Signal System Timing and Operations	▪ System timing plans do not address existing conditions causing unnecessary delay and underutilization of roadway capacity. ▪ Remote access to all signals. ▪ Lack SOPs for signal maintenance and inspection. ▪ Proactively assessing the asset management plans and standards for signals.
Emergency Weather Traffic Information	▪ Limited trained staff to respond appropriately to emergencies; increase in recovery or service to partners. ▪ Unpredictability of events.
Active Work Zone Management / Planning for Operations	▪ Lack of understanding across the state on how to implement TSMO functions into projects

TSMO Strategic Plan Development

The TSMO Strategic Plan development process included three main components: stakeholder outreach, service layer plan development, and a capability maturity assessment.

Stakeholder Outreach

Projects stakeholders represented various areas within NCDOT and partner agencies. Workshop invitations targeted specific individuals based on their primary roles and responsibilities within the TSMO Program. The dates for each core focus area workshop were:

- Arterials and Signal Operations, February 15, 2022
- Emergency Response and Resiliency, March 16, 2022
- ITS and Communications, January 4, 2022
- TIM, March 14, 2022
- TMC, January 5, 2022
- Traveler Information, January 24, 2022
- Planning for Operations: Active Work Zone Management, March 10, 2022
- Data Management, February 24, 2022

Each breakout included a Subject Matter Expert (SME) to actively engage in the session and to bridge the knowledge of other breakout sessions along with the capability maturity model (CMM) and TSMO framework. Since some stakeholders were unfamiliar with CMM and TSMO terminology, facilitation of the breakout focused on each stakeholder's responsibilities and centered around four key categories:

- Successes
- Challenges
- Opportunities
- Risks

Service Layer Development

Feedback from the workshops fed the development of the activities and action items that are the primary content of the service layer plans. Additionally, the programmatic plan integrated input into cross-cutting topics like data management and performance measures.

Programmatic Plan Development

The programmatic plan focuses on the subject matter experts and program managers responsible for delivering the TSMO plan. It emphasizes the importance of the TSMO plan and

its impact on the Department. Additionally, the programmatic plan oversees how the SME can execute the service layer action items.

Strategic Plan Revision

Based on the service layer action plans, revisions to the strategic plan reflect any necessary adjustments in the TSMO program vision and goals. This revision was administrative, as opposed to a full revisit of the vision and goals. This document provides senior level management with an overview of the TSMO program direction for the next five to eight years.

Appendix A
TSMO Program Document Executive Summary

TSMO PROGRAM OVERVIEW

The Traffic Systems Management & Operations (TSMO) Program oversees the operations of all freeway and arterial corridors in North Carolina. The North Carolina Department of Transportation (NCDOT) is one of the largest government agencies in the state and is responsible for the operations of approximately 80,000 miles of roadway statewide. NC has the 9th largest overall population with the 3rd highest rural vehicle miles traveled (VMT) in the nation. NCDOT partners with other first responders to leverage a range of active traffic management strategies capable of promoting safety and mobility on the transportation network. The active traffic management and maintenance component of the TSMO program is comprised several **core focus areas**.

In 2016, the TSMO Program experienced extreme sacrifices to the investment levels and resources were reallocated at dangerously low levels. This impacted the program's ability to mature at an acceptable pace and even regressed progress made in recent years. Significant effort and investment into the TSMO Program will be required to regain this lost ground. To provide the greatest impact to safety and mobility, the Department should strive for a proactive level of traffic management. This requires the Department to establish resource allocations that support a defined level of service through the following approach.

CORE FOCUS AREAS

- Traffic Incident Management (TIM)
- Traffic Management Centers (TMC)
- Intelligent Transportation Systems (ITS) Operations
- Traveler Information
- Signal System Timing and Operations
- Emergency Weather Traffic Operations
- Active Work Zone Management / Planning for Operations
- Mobility Performance Measures
- Data Purchases (Probe Data)

CURRENT GAPS

- ITS devices like cameras, overhead message signs are not being maintained and/or replaced, rendering approximately half of our resources inoperable
- We do not have IMAP coverage everywhere it is needed and are not able to expand to additional routes
- Immature active traffic management and substandard facilities resulting in travel times increase and travel time reliability decrease
- Existing appropriations support only a fraction of the needs and pale in comparison to other states
- Funding levels have not been consistent over the past 7 years since the program was moved out of the TIP (R-4049)
- Our funding source (General Maintenance Reserve) is already under funded for its original purpose, creating challenges for advancement
- Staffing levels are sub-par, stretching existing staff beyond reasonable limits
- Expertise in our field is a valuable resource that is limited

RECOMMENDED APPROACH