



North Carolina  
Department of Transportation

# TSMO

## Annual Program Report

Fiscal Year 2023  
(July 1, 2022 - June 30, 2023)



# TSMO Overview

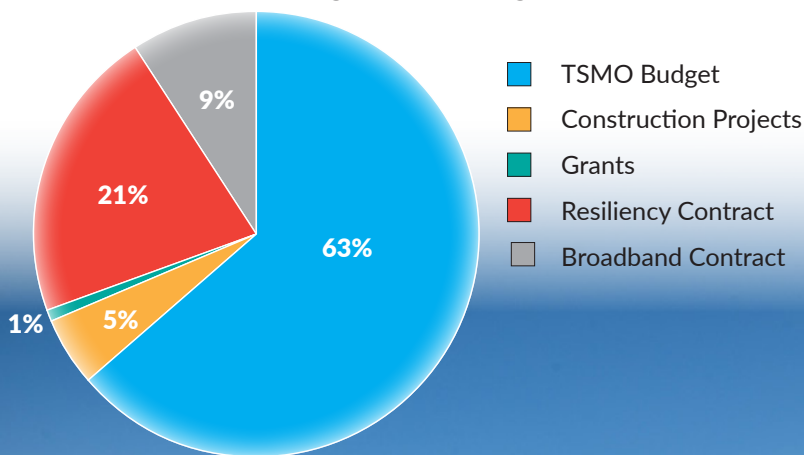
The North Carolina Department of Transportation (NCDOT) is one of the largest government agencies in the state and is responsible for the operations of approximately 80,000 miles of roadway statewide. The Transportation Systems Management & Operations (TSMO) Program oversees the operations of all freeway and arterial corridors in North Carolina. North Carolina 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.

To accomplish the needs of this \$37M dollar program, NCDOT accesses funding from the allocated TSMO Budget, Construction Projects, Grants, Resiliency Contract, and Broadband Project. Leveraging a variety of funding sources, the Department is able to provide impactful safety and mobility services to the traveling public. TSMO strategies often provide a high return on investment as technology is leveraged to increase safety and capacity within existing transportation infrastructure. Overall, NCDOT's TSMO Program has a benefit to cost ratio of 33:1 due to the safety, mobility, and environmental benefits of the specific TSMO strategies in our program.

The active traffic management and maintenance component of the TSMO program is comprised of the following core focus areas:

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

TSMO Program Funding Sources





# Message from the State Transportation Systems Management & Operations Engineer

NCDOT's TSMO program continues to evolve and strives to provide exceptional services that are aligned with the Department's mission to connect people, products, and places safely and efficiently.

Fiscal Year (FY) 2023 was a monumental year for our program. Our team has worked diligently to navigate through the pandemic, adapt to changing traveler behaviors that have increased safety risks on the roadway, and enhance business practices to ensure we are providing the best-in-class services to our community. Our accomplishments during FY 2023 include:

- Increasing our focus on establishing a centrally managed, Division delivered TSMO Budget. Our team:
  - Developed a five-year plan that will reduce the TSMO program's dependence on the General Maintenance Reserve funding source. Our plan includes management concepts that focus on programmatic and geographical strategies; and provide a path for consistent and dedicated funding for the program.
  - Implemented new WBS numbers to support better alignment of funding sources with programmatic services.
  - Actively worked with Division personnel to advance program budgeting practices that will increase accountability and overall management of funding used to support TSMO services across the state.
- Enhanced our Intelligent Transportation Systems (ITS) network to build resiliency for the future. Our team began the transition of our legacy analog traffic cameras to digital, implemented a Dynamic Message Sign (DMS) upgrade plan to replace signs at the end of their useful life, and updated the ITS infrastructure in all of the Traffic Management Centers.
- Established asset management practices that will improve device availability across the state. In FY 2023, NCDOT secured two performance-based ITS resiliency contracts that increase the reliability of our network.
- Enhanced our operational capacity across the state by expanding our staffing in the Statewide Operations Center and Regional TMCs.

North Carolina is resilient, and so is our TSMO unit. Our staff, partners, and leadership are working to move forward safety and mobility solutions that will energize our transportation program and position our state for the future.

Sincerely,

***Jennifer Portanova, PE, CPM***

State Transportation Systems Management  
& Operations Engineer



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The purpose of this report is to provide information regarding the TSMO Budget, which represents 63% of the total funding for the TSMO program. The report will highlight program accomplishments in FY 2023, program goals for FY 2024, and key strategic initiatives.

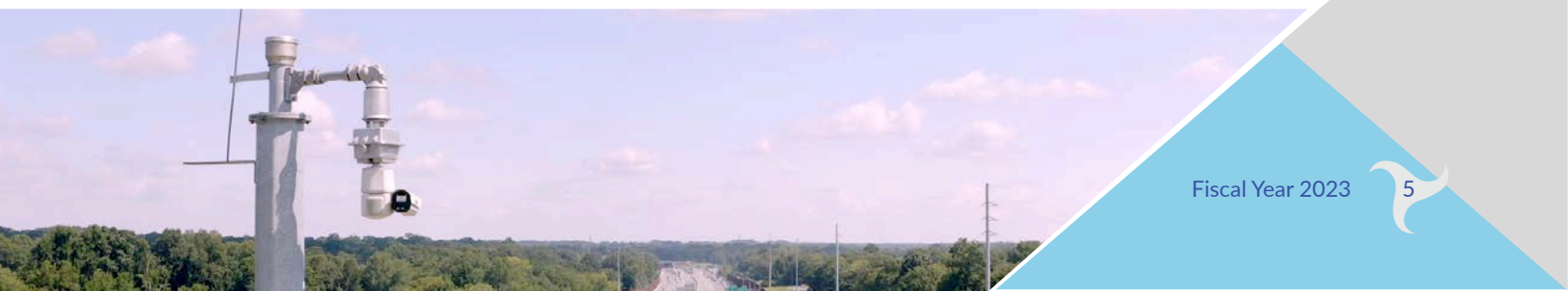
# FY 2023 Updates

## Report Card (July 2022-June 2023)

In FY 2023, the Department developed clear goals that aligned with shifting funding dependency on general maintenance funding sources, implementing strategies from the TSMO Program Report, and advancing key initiatives across the state. The following table captures the report card that identifies the state of the Department's FY 2023 goals.

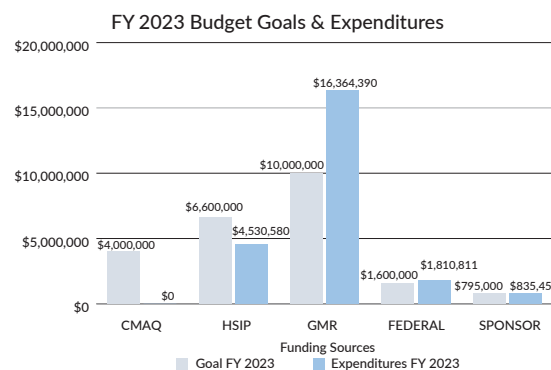
### FY 2023 Updates

Core Focus Area	Goal	Action Plan	Status
Program Wide	Develop 5-year Plan	Develop TSMO Strategic Plan & Funding Plan	Completed
	Transition division-managed budget to a centrally managed program	Meet with all Divisions	Completed
		Establish a funding mechanism	Completed
		Develop a tracking system	Completed
	Re-baseline TSMO budget and align with funding sources	Establish statewide Federal WBS	Completed
		Centralize funding into one statewide WBS	Completed
		Establish tracking system through SAP	Completed
		Establish statewide CMAQ WBS	Completed
		Develop plan to transition cost out of GMR (TMC/IM to CMAQ)	Completed
		Set up HSIP number	Completed
	Develop TSMO Strategic Plan	Develop programmatic and service layers	Completed
TIM	Expand IMAP	Perform IMAP privatization market sounding	Completed
		Define prototype vehicle, reduce average age of trucks by seeding fleet with new vehicles	Completed
		Identify necessary staffing levels and routes for expansion	Completed
	Expand TIM Coordinator Staffing	Establish TIM Coordinators for Metrolina and Eastern Regions	Completed
	IMAP Training	Expand training program	Completed
		Begin supervisor and in-service training	Completed
	Regional Coordination	Sign additional MOUs with local law enforcement agencies	Completed
TMC	Expand TMC Locations	Develop plan for establishing eastern TMC	In progress
ITS	DMS Upgrades	Develop DMS upgrade plan	Completed
	CCTV Conversions	Convert legacy analog cameras to digital	In progress
	Improve Device Uptime	Transition ITS devices to performance-based resiliency contract	In progress
Signal Modernization	Statewide Signal Upgrades	Develop 7 year modernization plan	Completed
		Transition 50 signals to new software	Completed
Signal System Timing	Signal Retiming	Achieve greater than 25 percent reduction in delay for 39 signal systems	Completed
	Signal Analytics	Implement probe data based signal analytics software	Completed
Traveler Information	Smart Grant	Win Smart Grant for Automating Actionable Road Anomalies (AARA)	Completed



## Budget

TSMO program budget for FY 2023 was \$22,995,000 and total expenditures were approximately \$23,500,000. NCDOT's goal is to stay within 10 percent of the designated budget; the TSMO program achieved this goal by staying within 2.5 percent of the budget. The TSMO program budget is used to fund salaries, contracts, and ITS devices.



GMR expenditures greater than budget due to not receiving anticipated CMAQ funds

## Awards

- 2022 NCSITE Outstanding Project Award and ACEC-NC's 2023 Engineering Excellence Transportation honors Award for TIM Training and Development Track
- 2022 NOCoE TSMO Champion: Jennifer Portanova
- 2022 NCDOT Buford Smith Excellence in Traffic Engineering Award: Jennifer Portanova

## Grants

NCDOT is committed to securing grants to support the TSMO program and advancing incident management practices that will add value to North Carolina. Our team was successful in securing the following grants:

- STIC Grant: Unmanned Aerial Vehicle (UAV) / Emergency Vehicle Alerts (EVA)
- CMAQ Grants: Statewide ITS Resiliency, Triad TMC Building, Automated Traffic Signal Performance Measures (ATSPM)
- SMART Grant: Automating Actionable Road Anomalies (AARA)

## Industry Speaking Engagements

Industry engagements for FY 2023 included:

- AASHTO CTSO Annual Meeting (September 2022)
- MCSAP Safety Summit (October 2022)
- NOCoE Digital Infrastructure Peer Exchange (October 2022)
- NC Property Mappers Association Conference (October 2022)
- Southeastern ITS Summit Presentations (November 2022)
- TN Highway Safety Conference (November 2022)
- EDC-6 TIM Peer Exchange (January 2023)
- METTS Conference (March 2023)
- ITS Carolinas Annual Conference (April 2023)
- ITS America Annual Conference (April 2023)
- TETC Move Over/Distracted Driving Conference (May 2023)
- CTSO Delegate to International Symposium on Freeway and Tollway Operations in Vienna, Austria (June 2023)

## Active Committees

NCDOT is an active participant in many National committees to support the development and research of National studies, guidelines, and manuals, as well as hosting meetings with peers in other states to solve familiar challenges.

- AASHTO Committee on Transportation System Operations Technical Committee vice-chair
- EDC-6 Crowdsourcing Summit
- FHWA ATSPM Pooled Fund Study
- FHWA Safety Service Patrol Pooled Fund Study
- NCHRP 03-145: National Traffic Sensor System Evaluation Program
- NCHRP 03-149: Signal Timing Manual: Development of the Third Edition
- NCHRP 20-123 CTSO Strategic Plan
- NCHRP 3-146 Operations Implement Guide
- North Carolina Fully Autonomous Vehicle Committee
- The Eastern Transportation Coalition (TETC) Highway Operations Groups Meeting
- TETC Travel Information Services Committee
- TRB Freeway Operations Committee
- TRB IT & Technology Committee
- Work Zone Data Exchange (WZDx) Committee

# FY 2024 (July 2023 to June 2024)

## Goals

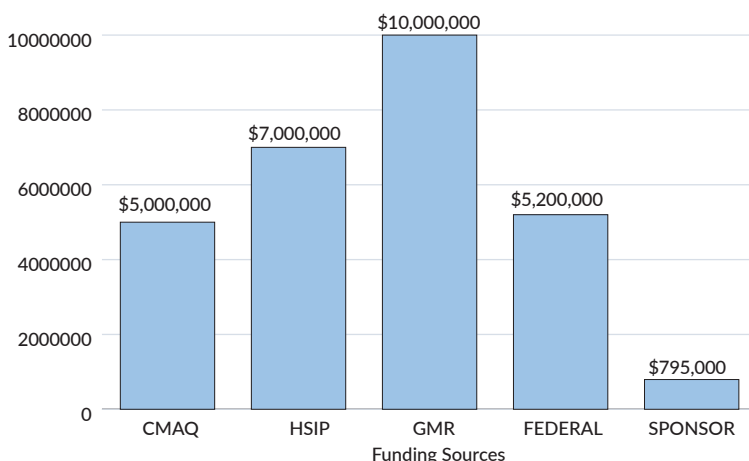
### FY 2024 Goals

Core Focus Area	Goal	Action Plan
Program Wide	Plan TSMO budget for next 5 years	Increase CMAQ funds by \$1 Million. Realign funding towards nonattainment areas
		Increase Federally assigned funds by \$3.6 Million
		Develop budget dashboard for increased accessibility and transparency
		Shift expenditures into new eligible funding areas
TIM	Expand IMAP	Hire Triangle TIM Coordinator
		Implement recommendations from IMAP Market Sounding
		Expand IMAP Routes based on highest return on investment
	IMAP Training	Complete Module 1 In-Service training for all existing IMAP personnel
TMC	Performance Measures	Upgrade IMAP Dashboard tool
	Establish Eastern TMC	Hire and train staff
	Design Triad TMC	Complete design and begin construction
	Design Mountain TMC	Complete design
ITS	DMS Replacement	Replace approximately 14 end of life DMS
	CCTV Conversions	Complete upgrade of all legacy analog cameras to digital
	Statewide Communication Plan	Initiate plan and develop cost
	Fiber Asset Management Tool	Populate data
	ATMS Software	Award ATMS contract
Signal Modernization	Signal Equipment Contract	Include compatible controllers for MaxTime and ethernet radios
	Statewide Signal Upgrades	Transition 600 signals to new signal software
Signal System Timing	Delay Reduction	Achieve 25% in delay reduction for existing signal systems
	CMAQ ATSPM	Let and construct project to install detection for equipment-based ATSPM and enhanced detection

## Budget

NCDOT's TSMO Program budget for FY 2024 is \$28 Million. From FY 2023 to FY 2024, there is a \$1 Million increase in CMAQ funds and a \$3.6 Million increase in Federally assigned funds.

FY 2024 Spending Goals





# Traffic Incident Management

Key components of NCDOT's Traffic Incident Management (TIM) program include the Incident Management Assistance Patrol (IMAP) and the direct TIM coordination provided across the state. In 2022, IMAP responded to 33,000 motorist assist calls covering over 850 centerline miles in eight Divisions. NCDOT was also an active participant in EDC-6 Next-Generation TIM: Integrating Technology, Data, and Training.

## TIM FY 2023 Updates

Focus Area	Goals	Status
Staffing	Hire a Regional ITS Engineer position for the Eastern Region	In progress
	Hire an Incident Management Engineer position for the Eastern Region	In progress
IMAP Training	Establish a training program that shows all existing and planned training initiatives	In progress
	Establish a collaborative training calendar accessible within NCDOT outlook	Completed
	Revise the current IMAP Field Training Guide (responder training manual)	Completed
	Conduct 2 quarterly multi-agency training sessions in 2 different regions	Completed
	Create curriculum and draft schedule for In Service Training	Completed
	Begin In-Service Training for responders and supervisors	Completed
	Hold Multidisciplinary Joint Response Exercise at the TIM Training and Development Track	Completed
	Hold Multidisciplinary Mountain Area Medical Airlift Scene Safety Training at the Buncombe County Emergency Services Training Facility	Completed
Expand IMAP	Increase staffing levels and coverage as defined in the TSMO plan	In progress
	Begin distributing new vehicles across the state	Completed
	Define the specifications for the next generation IMAP vehicle	Completed
	Initiate market sounding for privatization of SSP services and present results to executive leadership	Completed
	Advertise and award new IMAP sponsorship contract	Completed
IMAP Guidelines	Define a Crash Review Board for IMAP struck-by crashes	Completed
	Create guideline for after-hours response of IMAP	Completed
	Create messaging guideline for portable CMS on new IMAP vehicles	Completed
Regional Outreach	Hire Metrolina and Eastern Regional TIM Coordinators	Completed
	Establish an IMAP Quarterly Newsletter	Completed
	Establish Biweekly Commendation Reports	Completed
	Re-establish a relationship between IMAP and three regional first responder agencies	Completed
	Sustain reoccurring Team Meetings (Open Road Meetings) to include first responders, regional representative, and others	Completed
	Increase number of MOUs with Local Municipalities	Completed
	Obtain MOU between NCSHP and TMCs	Completed
Safety Service Patrol (SSP) Pooled Fund Study (PFS)	Coordinate with partners to establish the SSP PFS, join the SSP PFS, and review draft outline of PFS document	Completed
Unmanned Aerial Vehicle (UAV)/Emergency Vehicle Alerts (EVA)	Deliver pilot program: Complete assessment and document findings	Completed







## TIM FY 2024 Goals

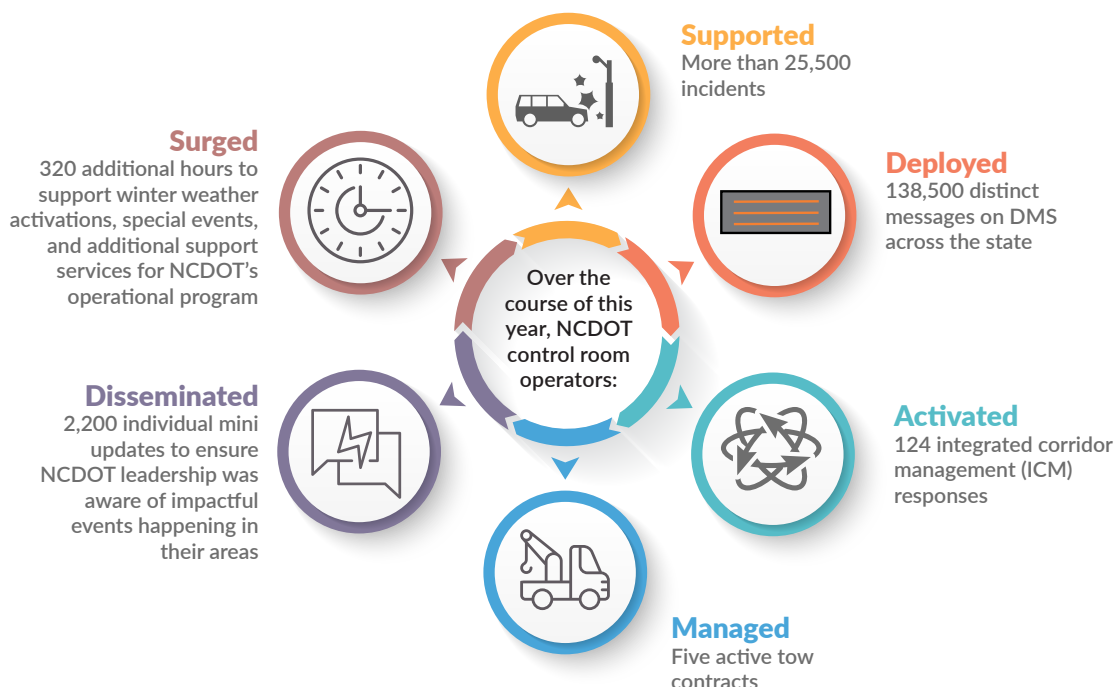
Goal	Action Plan
Regional Outreach	Sign additional MOUs with local law enforcement and other partner agencies.
	Hire a Triangle Regional TIM Coordinator.
Expand IMAP	Hire Triangle TIM Coordinator.
	Increase staffing levels and coverage. Investigate creative recruiting strategies and reallocation of positions.
	Continue distributing new vehicles across the state. Investigate creative procurement strategies and revisit equipment requirements.
	Confirm the specifications, build, and pilot the next generation IMAP vehicle.
	Assess the benefits and applicability of different debris removal equipment on IMAP vehicles.
IMAP Manual	Assess EV charging technology on IMAP vehicles
	Complete IMAP Manual Volume 1.
Training	Develop guidance on training material and assessment as a reference for new trainers.
	Add an additional trainer to conduct in-service training.
	Conduct multi-agency training sessions.
	Conduct crash simulation and multi-agency response demonstration.
	Complete In-Service Module 1 training for all responders and supervisors.
	Conduct additional In-Service Training Modules.
	Hire a Training Administrator.
	Integrate Regional TIM Coordinators into training program to support assessments and supplemental training needs.
	Establish dashboard providing status of training and certification of staff.
	Conduct EV safety training and integrate into training program.
Performance Measures	Roll-out human tracking training.
	Update the IMAP Dashboard to use more recent data and to reflect new use cases. Review availability and accuracy of data and determine a process for updating dashboard regularly.
	Implement VIP goals for IME and RITS Engineers.
	Conduct quarterly audits on IMAP data with each region (routes, vehicles, staffing, needs).
Heavy Tow Program	Initiate the crash review board for IMAP vehicle struck-bys.
	Leverage DMV Driver License offices to provide educational videos on TVs located in those offices.
VIPER Equipment	Initiate a Heavy Tow Program outside of a construction project.
	Replace out of date handhelds.



# Traffic Management Center

## (Control Room Operations)

Traffic Management Centers (TMC) are the communication hubs of NCDOT's Incident Management Program. Our team is committed to supporting the needs of North Carolina.



### TMC FY 2023 Updates

Goal	Action Plan	Status
Enhance Control Room Quality	Implement quality control program for public-facing control room floor actions	Completed
Upgrade VIPER Console	Install DIT circuits	Completed
	Install VIPER equipment at all TMCs	Completed
Improve TMC Incident Detection	Evaluate multiple incident detection sources	Completed
STOC Conference Room Upgrade	Upgrade network and AV equipment	Completed
Eastern TMC Initiation	Select location	In progress
	Take Division 4 on a tour of Regional TMCs	Completed
	Obtain staff positions from regions to create new Eastern TMC position	Completed
	Reallocate positions	In progress
Triad TMC Facility Upgrade	Develop architecture drawings	Completed
	Aquire funding from legislature	Pending

### TMC FY 2024 Goals

Goal	Action Plan
Right size DOT staffing in TMCs	Secure positions
	Define roles
Design Triad TMC	Complete TMC design
Design Mountain TMC	Complete TMC design
Establish Eastern TMC	Hire staff
	Establish location for staff
	Revisit responsibilities for STOC as Eastern TMC is activated

# Intelligent Transportation Systems Operations

NCDOT strives to futurize our ITS network and elevate the asset management practices across the state. Executing innovative projects, deploying pilot programs, and implementing strategies to replace outdated technology are among the ways the department is making step wise improvement within the TSMO program.

## ITS FY 2023 Updates

Goal	Action Plan	Status
Analog CCTV Camera Replacement	Replace analog cameras with digital	In progress
End of Life DMS Device Replacement	Complete design of 56 DMS	In progress
FAMS	Complete Segments 1-2 in FAMS	Completed
	Train broadband contractors	Completed
Statewide ITS Communications Plan	Hold kickoff meeting	Completed
	Support middle mile broadband evaluation	Completed
ATMS Deployment	Complete procurement	Cancelled by DIT and reposted May 2023
Ramp Meter Software Upgrade	Transition ramp meters to kinetic signals software	Completed

## ITS FY 2024 Goals

Goal	Action Plan
End of Life DMS Device Replacement	Replace 14 DMS (funding in place)
FAMS	Configure broadband in FAMS
	Integrate existing infrastructure in the Triangle
	Configure Segments 3-20 in FAMS
	Integrate with IT Database
	Evaluate signal assets in FAMS
Statewide ITS Communications Plan	Complete plan to include ITS communication plan GIS dataset and evaluation matrix
ATMS Deployment	Finalize ATMS procurement and get vendor under contract



# ITS Initiatives Outside of TSMO Budget

NCDOT's TSMO program supports numerous initiatives that are funded outside of the TSMO budget. Two major initiatives include NCDOT's Broadband project and Statewide ITS Resiliency contract.

## NC Broadband

### Maintenance of fiber and ITS devices

- I-95, US 70, and US 74 corridors
- 30-year contract, flexible for renegotiation every 5 years
- Preventive, responsive, and emergency maintenance including NC 811
- Performance-based (device uptime and repair time)
- Device replacements at regular intervals
- Includes fiber, cameras, DMS, hubs, fiber connections for rest areas, weigh stations, and closed-loop signal systems

### Public-private partnership for commercialization

- Commercialization helps pay for maintenance costs

## Statewide Resiliency

### Maintenance of fiber and ITS devices in non-attainment areas

- Metrolina, Triad, and Triangle regions
- Three-year contract
- Preventive and responsive maintenance including NC 811
- Ability for device replacement if additional funds are available
- Performance-based (device uptime and repair time)
  - Sixty percent of urban devices transitioned to performance-based ITS Maintenance
  - Remaining forty percent to be transitioned by end of October 2023
- Developing SOPs for management



# Traveler Information

North Carolina's Traveler Information Management System (TIMS) is essential to storing incident management information and disseminating information out to the public and key stakeholders. NCDOT has made strategic investment into the functionality of this system. This year, there have been 5 system wide upgrades to TIMS, ranging from redesign of the management notification page, increasing county alert text character limits that allow for multiple Amber/Silver alerts, and thorough up-to-date documentation.

## Traveler Information FY 2023 Updates

Goal	Action Plan	Status
TIMS & DriveNC.gov Enhancements	Automate full closures from TIMS to Waze	Completed
	Improve functionality of system	Completed
	Minimize erroneous full closures	Completed
	Complete 3 training sessions for NCDOT staff	Completed
	Compare functionality of TIMS to expectation of future ATMS	In progress
	Integrate new CAD feed if before ATMS	Completed
	Implement TIMS Training into Learning Management System for new users	In progress
511 & Customer Service Enhancements	Scope new phone software tying STOC/TMC's and 511/CS together	Completed
	Provide training at North Carolina Correctional Institution for Women (NCCIW)	Completed
Drivewyze Deployment and Enhancements	Add 1,700 miles of Controlled Access Freeways	Completed
	Issue more than 100,000 Drivewyze Alerts	Completed
HELP Deployment	Secure IT Acceptance	Completed
	Develop SOP	Completed
	Receive EM concurrence	In progress
	Complete TMC training	Completed
	Deploy HELP	In progress

## Traveler Information FY 2024 Goals

Goal	Action Plan
SMART Grant	Design system and begin implementation
TIMS & DriveNC.gov Enhancements	Improve Work Zone Parent/Child Incidents
	Improve integration with SHP CAD Feed
	Create Minor, Intermediate, Major Incident Categories
	Complete training sessions
	Compare functionality of TIMS to expectation of future ATMS
	Begin transition from TIMS to new ATMS
	Enhance DriveNC
511 & Customer Service Enhancements	Implement new TMC phone system
	Provide training sessions at NCCIW
Drivewyze	Involve IMAP with using and validating alerts
	Enlist more users with the help of NC Trucking Association
HELP Deployment	Deploy HELP

# Signal Systems Timing and Operations

NCDOT is responsible for the timing and operation of the signal systems. Under the Signal Modernization project, all signals in coordinated signal systems statewide will be transitioned to MaxTime and Kinetic Signals over the course of the next four years. The first two years of the project will upgrade any signals that are already connected to our current central system (Centracs) and the third and fourth years of the project will upgrade the remaining closed loop system signals to MaxTime and then connect them to the Kinetic Signals platform if the communications equipment is sufficient.

## Signal Systems FY 2023 Updates

Goal	Action Plan	Status
FY 2023 Signal Timing Projects	Update signal timing for 39 systems, impacting 328 signals	Completed
	Achieve a 25% reduction in delay target for signal timing projects	Completed
Signal Analytics Tool Pilot (August 1, 2022 to July 31, 2023)	Evaluate the Signal Analytics Tool	In progress
	Determine future of existing prioritization tool	Completed
CMAQ ATSPM	Select detection location and system	Completed
Kinetic Signals	Complete system onboarding	Completed
	Complete training for Statewide and Divisions	Completed

## Signal Systems FY 2024 Goals

Goal	Action Plan
FY 2024 Signal Timing Projects	Let FY 2024 projects
	Update signal timing for FY 2024 projects
	Achieve a 25% reduction in delay target for signal timing projects
CMAQ ATSPM	Let and construct project to install detection for equipment-based ATSPM and enhanced detection
	Begin comparing for ATSPMs for equipment-based with standard detection and enhanced detection and Probe Data Signal Analytics tool
Kinetic Signals Training	Develop strategies for using Kinetic Signals
	Develop training material for field staff and technicians
Active Traffic Management Plan	Develop a plan for moving towards active traffic management
	Develop ATSPM guidelines for Division Personnel





# Signal Modernization

NCDOT's signals utilize antiquated legacy signal controller hardware and run a legacy signal software platform that is non-compliant with the National Transportation Communications for ITS Protocol (NTCIP). Unlike newer advanced controllers, legacy controllers are unable to utilize the latest technological advances in traffic signal safety, operations, and maintenance, like Connected Vehicle connectivity and ATSPM. To address legacy software and hardware deficits, new local controller and central signal system software was procured and over 5,000 traffic signals across the State will be modernized over the next seven years.

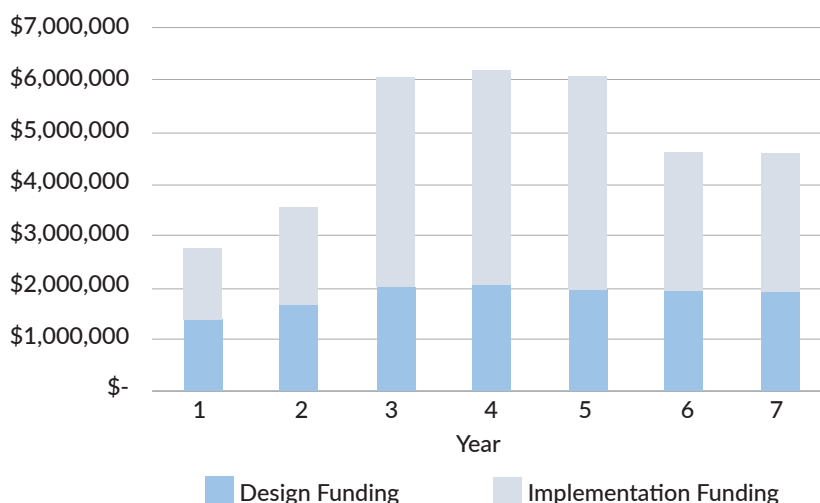
## Signal Modernization FY 2023 Updates

Goal	Action Plan	Status
Transition Signals to Central Software, Kinetic Signals	Setup Central System	Completed
	Perform acceptance testing	Completed
	Provide training	Completed
Funding Allocations	Release funding	Completed
	Setup WBS Structure	Completed
Hardware Procurement	Approve hardware	Completed
	Procure hardware	Completed
Signal Equipment Contract	Include compatible controllers for MaxTime and ethernet radios	In progress
Local Controller Software	Approve software	Completed
	Develop standards and SOPs	Completed
	Provide training	Completed

## Signal Modernization FY 2024 Goals

Goal	Action Plan
Transition to Kinetic Signals	Upgrade 600 signals to new software
	Develop signal plans
	Procure controllers
	Install controllers
	Conduct kickoff meetings with remaining Divisions
Begin transition of half of the signals from Centracs to Kinetic Signals	Configure intersections in Kinetic Signals
	Establish communication between controllers and Kinetic Signals
	Migrate coordination and schedules
	Remove signals from Centracs

## Signal Modernization 7-Year Plan



# Emergency Weather Traffic Operations

Emergency weather operations and management is a critical function of NCDOT's TSMO program. Our team works to provide accurate information, support first responders, and navigate traffic around impacted areas during hurricanes, major rain events, and winter weather.

Winter weather storms threaten the safety of thousands of travelers each year in North Carolina. These storms are especially significant in areas with steep grades. NCDOT partners with the NC National Guard Hot Spot Team to keep the highway open when severe storms impact a location with intense elevation. Hot Spot teams are typically deployed to I-26, I-77, and I-40. Our partnership with the NC National Guard is key to maintaining mobility in these areas.

## Emergency Weather Traffic Ops FY 2023 Updates

Goal	Action Plan	Status
Hurricane Evacuation Plans	Begin plans for hurricane evacuation routes	Completed
Prepare for Hurricane Season	Complete Mock Exercise	Completed
Prepare for Winter Weather Season	Complete Mock Exercise	Completed
Bordering States Agreements	Develop documentation on coordination and communication with bordering states	In progress

## Road Closures from Storm Events

Storm Event	Date	Number of Road Closures
Tropical Storm Ian	Sept. 30-Oct 2, 2022	225
Tropical Storm Nicole	Nov. 11, 2022	28
Dec. 22-23 Winter Weather	Dec. 22-23, 2022	29
Feb. 11-12 Winter Weather	Feb. 11-12, 2023	1
June 20-23 Rain Event	June 20-23, 2022	19

## Emergency Weather Traffic Ops FY 2024 Goals

Goal	Action Plan
Finalize Hurricane Evacuation Plans	Develop plans for hurricane evacuation routes
Prepare for Hurricane Season	Complete Mock Exercise
Prepare for Winter Weather Season	Complete Mock Exercise



# Active Work Zone Management/ Planning for Operations

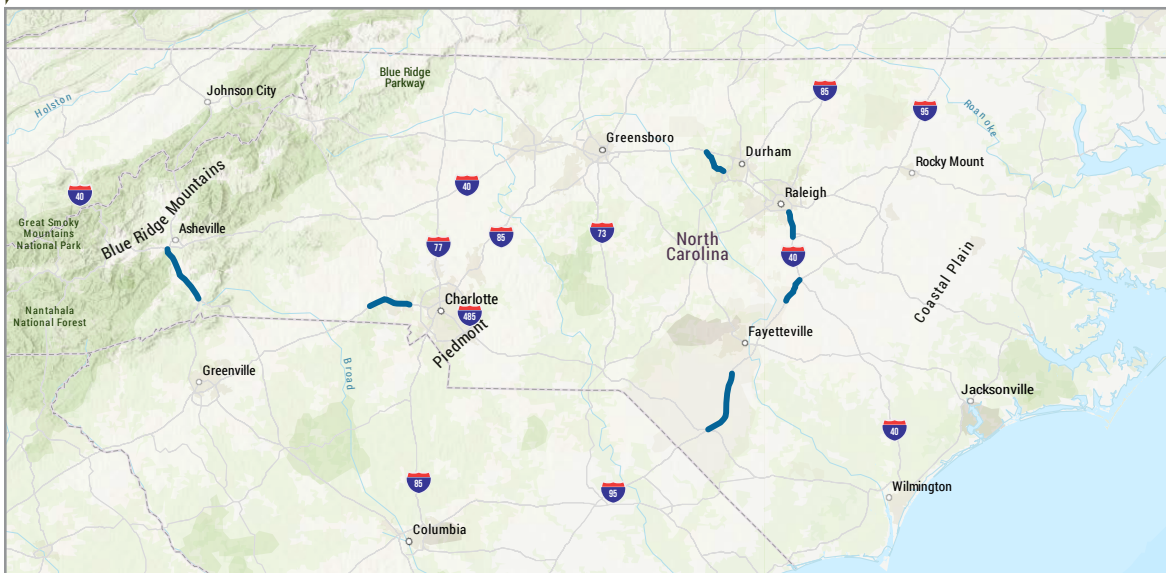
The TSMO Program is committed to supporting the awareness of the operational key elements in the transportation project life cycle and continues to elevate them by working with all Divisions.

## AWZM/Planning Ops FY 2023 Updates

Goal	Action Plan	Status
ICM Planning & Implementation	Deploy I-6064 ICM Solutions	In progress
	Analyze monthly crash trends in ICM projects	Completed
HAWKS Funding	Coordinate with the North Carolina State Highway Patrol (NCSHP) to manage the \$1.6 Million HAWKS program	Completed
	Maintain list of active and upcoming HAWKS projects	Completed
Feasibility Studies	Evaluate projects in feasibility and planning for TSMO strategy and inclusion	Completed
Feasibility Study Guidelines	Draft documentation and guidelines for feasibility studies	Completed

## AWZM/Planning Ops FY 2024 Goals

Goal	Action Plan
Increase HAWKS Funding	Request approval for additional funding
ICM Planning & Implementation	Deploy I-2513 ICM Solutions
Develop a Preliminary TSMO – Traffic Operations Planning Manual	Draft an outline document
Update Planning Tools - ITS Planning Map, ORA Guidelines, Incident Management Plan, ITS Database, etc.	Review existing planning tools and update



Active ICM Projects



# Mobility Performance Measures

NCDOT is responsible for providing several metrics to the North Carolina General Assembly and Federal Highway Administration (FHWA) including:

- Maintenance Operations and Performance Analysis Report (MOPAR) as required by G.S. 136-44.3. NC-DOT's TSMO program is responsible for providing the following performance measures:
  - Travel Time Index – the variability of travel time during rush hour
  - Average Number of Congested Hours – the number of hours that speeds are slow
  - Travel Time Reliability – the variability of travel time on a “bad day”
- Moving Ahead for Progress in the 21st Century (MAP-21) administered by FHWA. Reliability results and targets can be found in the following table:

## Performance Measurements Past and Future

Performance Measurement	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Actual	Proposed 2023 Target	Proposed 2025 Target
Percent of person-miles traveled on the Interstate that are reliable	88.8%	88.7%	98.2%	96.6%	95.1%	75%	75%
Percent of person-miles traveled on the non-Interstate NHS that are reliable	91.3%	91.8%	96.0%	95.7%	95.1%	70%	70%
Truck Travel Time Reliability Index	1.40	1.43	1.23	1.27	1.33	1.70	1.70

## Mobility Performance Measures FY 2023 Updates

Goal	Action Plan	Status
Performance Measures Service Layer	Develop Performance Measures plan as part of the TSMO Strategic Plan	Completed
Dashboard Plan	Develop plan to display performance measures through an automated dashboard	In progress

## Mobility Performance Measures FY 2024 Goals

Goal	Action Plan
Performance Measures Service Layer	Implement Performance Measures Plan
Dashboard Implementation	Develop and implement dashboard

# Return On Investment in FY 2023

**\$37,365,754**

**Annual TSMO Program  
Investment**



**33:1**



**Benefit/Cost  
Ratio**

**Over \$425M in Benefits**

**Due to Estimated Reduced Crashes**



**Over \$663M in Benefits**

**Due to Reduced Travel Time**

**Over 29M Hours of  
Travel Time Savings**



**Over \$125M in Benefits**

**Due to Reduced Fuel Consumption  
and CO2 Emissions**

**Over 27M Gallons Fuel  
& 243 Thousand Tons  
Emmissions Reduction**

NCDOT utilized industry research and analysis from leading TSMO agencies: FHWA, NoCOE, and AASHTO to develop a return on investment (ROI) analysis for FY 2023. We specifically evaluated the ROI associated with our traveler information, incident management, and signal system timing TSMO strategies. These strategies alone resulted in the following benefits for the program:

- Over \$425 million in benefits due to estimated reduced crashes (3,414 crashes, 774 injuries, and 20 fatalities)
- Over \$663 million in benefits due to reduced travel time (over 29 million hours of travel time savings)
- Over \$125 million in benefits due to reduced fuel consumption (over 27 million gallons) and reduced CO2 emissions (over 243 thousand metric tons)

These benefits, when compared with an annual TSMO Program investment of \$37,365,754 resulted in a benefit/cost ratio of 33:1 for the program.