

GENESEE **TRANSPORTATION** **COUNCIL**



UPWP 5903 **Regional Traffic** **Operations Center** **Strategic Plan**

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Prepared By:


in association with

Disclaimer

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Acronym Table

ATMS	<i>Advanced Transportation Management System</i>
CCTV	<i>Closed-Circuit Television</i>
CMF	<i>Capability Maturity Framework</i>
COOP	<i>Continuity of Operations Plan</i>
GTC	<i>Genesee Transportation Council</i>
IMAGE	<i>Improved Mobility Areawide Guidance Evaluation</i>
ITS	<i>Intelligent Transportation Systems</i>
LRTP	<i>Long-Range Transportation Plan</i>
MCDOT	<i>Monroe County Department of Transportation</i>
NYSDOT	<i>New York State Department of Transportation</i>
RTOC	<i>Regional Traffic Operations Center</i>
RWIS	<i>Road Weather Information System</i>
SOP	<i>Standard Operating Procedure</i>
SWOT	<i>Strengths Weaknesses Opportunities Threats</i>
TIM	<i>Traffic Incident Management</i>
TOC	<i>Transportation (or Traffic) Operations Center</i>
TSMO	<i>Transportation Systems Management & Operations</i>

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Executive Summary

Introduction

This Strategic Plan aims to contextualize the existing state of the Monroe County James R. Pond Regional Traffic Operations Center (RTOC) and provide guidance and actions for the facility and its staff to pursue over the next ten years of operation. This plan outlines a vision for the future and the steps which may be necessary to achieve it. As regional transportation operations evolve in a constantly changing technology environment, it is critical to have a plan that provides direction and purpose while also remaining flexible enough to accommodate changing priorities as the decade ahead unfolds. In addition to assessing the RTOC through multiple dimensions guided by Transportation Systems Management & Operations (TSMO) guidelines, a careful review of strengths, weaknesses, opportunities, and threats was conducted to develop a plan that is practical, realistic, and achievable.

Inventory

The James R. Pond RTOC is located in its own building on the grounds of the Greater Rochester International Airport. The RTOC facility is the result of partnership between Monroe County Department of Transportation (MCDOT) and New York State Department of Transportation (NYSDOT), who have come together under one roof to provide traffic operations and management services. New York State Police (NYSP) are also co-located within the RTOC and maintain their own dedicated facilities. The rest of the RTOC is shared equally between MCDOT and NYSDOT with each agency monitoring video walls, which provide Closed Circuit Television (CCTV) feeds, dynamic traffic signal maps, and other equipment needed to enable traffic management.

Four MCDOT positions work on the main operations floor at a time. NYSDOT maintains a minimum of two consultant operators per shift, though this number may increase depending on the scale of traffic events, weather events, and more. Throughout the development of this Strategic Plan it was noted that staffing deficiencies within the RTOC have resulted in challenges for efficient daily operations.

The RTOC's MCDOT staff operates from 6 AM to 6 PM, Monday through Friday. During weekday hours where MCDOT is not present and during weekends/holidays, NYSDOT staff takes over dispatching duties and communicate route issues to MCDOT, as NYSDOT personnel cannot control signal timing changes.

The RTOC receives data from Intelligent Transportation Systems (ITS) field equipment, such as CCTV, Road Weather Information Systems (RWIS), Traffic Signals, and System Sensors 24/7/365 which inform operators of traffic and weather conditions. This data helps guide and dictate operator actions related to signal retiming, dispatching resources such as H.E.L.P. Trucks, and more.

Currently the RTOC utilizes four H.E.L.P. Trucks to patrol and respond to motorists along one hundred miles of regional roadway, split into numerous operational "beats". H.E.L.P. Trucks are operational during the weekday peak hours, from 6 AM to 10 AM and from 2:30 PM to 6:30 PM.

To supplement operator capabilities, SOPs and other reference materials are available to MCDOT and NYSDOT staff. Portions of the SOP content are specific to each agency, while other portions address combined operational concerns. Members of the RTOC Steering Committee and operations staff engaged in the development of this Strategic Plan noted that the SOPs are not always useful to operators as many of them are written in a format more akin to technology user manuals rather than actual operational procedures based on specific scenarios.

A database has been developed by the RTOC for the purpose of tracking performance and dispatch metrics. These metrics have been determined by RTOC leadership. Performance measurement database results are planned to be compiled into periodic reports.

In order to facilitate internal and external partnerships, agreements and Memoranda of Understanding are crafted to share resources and/or data. Currently, most of these agreements are informal in nature, meaning that they can be forgotten and nullified as staff changes over time. The RTOC staff has expressed willingness to formalize agreements that would benefit from formalized documentation.

SWOT Analysis

A SWOT Analysis considers Strengths, Weaknesses, Opportunities, and Threats, and is a critical component of any planning report. In the context of the RTOC Strategic Plan, the SWOT Analysis assessed existing conditions with an eye towards internal and external influences that could benefit or potentially hinder the RTOC's future direction.

The RTOC has many strengths, although their documentation is limited throughout the Strategic Plan and serve to help how the facility can evolve and improve operations throughout the 10-year time horizon of the plan. The greatest strength of the RTOC is that it is a mature facility that has continually operated 24/7/365 since 2002 and has well-established operations. The RTOC also has the tools necessary to fulfill its existing services, from ITS field equipment to the H.E.L.P. program. Additionally, the RTOC's internal relationships between MCDOT, NYSDOT, and NYSP promote collaboration internally and externally.

Discussions with RTOC staff highlighted numerous weaknesses the facility currently faces. A lack of centralized systems, technology, and networks utilized by both MCDOT and NYSDOT was noted as a challenge as it often results in operators having to engage in redundant efforts which can create operational inefficiencies. Furthermore, Incident Response Plans (IRPs) and situational based-SOPs are sparse, leading to potentially inconsistent practices across operational shifts within MCDOT and NYSDOT. Another weakness noted is an insufficient number of formalized agreements and MOUs with partner agencies. Current agreements are largely informal "handshake" agreements that may be nullified during times of both internal and external staff changes. With data-driven decision making serving as a cornerstone of modern transportation operations, the RTOC is still in the process of developing a fully formed performance measurement program. As the RTOC has developed a performance measurement database, such a program does not seem far off, however a larger integration of metrics into the daily operations of the RTOC will be required for a complete program.

One major opportunity that was identified for the RTOC is the Infrastructure Investment and Jobs Act. This act promises roughly \$350 billion for Federal highway programs over the next 5 years. While it is unclear how the RTOC may be influenced, it is possible that a small portion of these funds could go towards RTOC facility upgrades and operations.

General threats to the RTOC come internally and externally. The COVID-19 pandemic highlighted how unprecedented external circumstances can impact a local facility such as the RTOC. The lack of a Continuity of Operations Plan in the face of situations such as these may seriously curtail or even halt RTOC operations. Internally, staffing challenges have illustrated the extent to which the RTOC is able to fully execute its mission of managing regional transportation operations.

Business Concept

The Business Concept developed for the Strategic Plan primarily focuses on identifying current and future goals for the RTOC. These goals would assist in the development of needs and gaps as well as recommendations for the RTOC to pursue over the next 10 years of operation.

The following tables identify future service delivery goals, divided into separate operational dimensions, for the RTOC. Any applicable goals identified in the GTC TSMO Plan or NYSDOT Strategic TSMO Plan are presented in the second column.

Workforce and Staffing	
Goal(s)	Related Statewide/Regional Goals
<ul style="list-style-type: none"> Expand the technical capacity and expertise of the RTOC staff Develop a workplace culture that encourages innovation 	Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation (GTC)
	Implement TSMO as a Low-Cost Solution to Regional Transportation Needs (GTC)

Table 1: Workforce and Staffing Future Service Goals

Business Processes	
Goal(s)	Related Statewide/Regional Goals
Strengthen inter and intra-agency communications to maximize service delivery	Improve Safety and Efficiency of the Multi-Modal Transportation System through Coordinated Management and Operations (GTC)
	Support Long-term TSMO Operations and Capital Investments Through Sustainable Funding and Asset Management Strategies (GTC)
	Enhance system safety and reliability by minimizing the impacts of travel disruptions (NYSDOT)
	Move People Efficiently (NYSDOT)
	Support reliable and efficient freight movement (NYSDOT)
	Serve as a trusted source of multimodal travel information (NYSDOT)
	Provide real-time traveler information (NYSDOT)

Table 2: Business Processes Future Service Goals

Systems and Technology	
Goal(s)	Related Statewide/Regional Goals
Minimize travel delay and disruption through deployment of advanced transportation technologies	Maximize Transportation System Performance from the User Perspective
	Target New Investment in ITS and Communications Infrastructure in Locations with the Greatest Impact and Value

Table 3: Systems and Technology Future Service Goals

Performance Measurement	
Goal(s)	Related Statewide/Regional Goals
<i>Expand the quality and quantity of transportation operations data available for decision-making</i>	Support enterprise-level systems and data for performance driven TSMO approach (NYSDOT)

Table 4: Performance Measurement Future Service Goals

Interagency Partnerships and Agreements	
Goal(s)	Related Statewide/Regional Goals
Goals: <i>Expand collaboration and cooperation with outside agencies and regions</i>	Promote Partnerships and Collaboration to Support Regional Operations (GTC)
	Integrate TSMO into Regional Planning and Policy Making (GTC)
	Maximize Program Efficiency through Resource and Cost Sharing (GTC)
	Promote Interoperability and Value-Add Services through Shared and Open Data (GTC)
	Strengthen partnerships with internal and external stakeholders (NYSDOT)

Table 5: Interagency Partnerships and Agreements Future Service Goals

Needs Assessment

In order to best shape recommendations, the RTOC was assessed to determine existing needs or gaps that should be addressed. In this section, Needs are identified as elements agreed upon by members of the RTOC Steering Committee and outlined in both the Inventory and Business Concept, while gaps are identified as inconsistencies between the vision and goals established for the RTOC and the current state of operations.

Within the operational dimension of Workforce and Staffing, the needs and gaps primarily focused on staffing to support efficient operations with the addition of new and expanded RTOC services. The RTOC cannot function as intended without the support of its employees, and while the number of employees is critical, those employees must also reflect the needs of the facility in terms of skills, knowledge, abilities, and qualifications.

Within the Business Processes operational dimension, the identified needs addressed operational consistency and resiliency. The development of a COOP plan was a primary need identified moving forward, after the COVID-19 pandemic highlighted how unforeseen events could impact operations. Additionally, it was determined that many of the existing SOPs utilized by RTOC staff did not necessarily provide situational protocols to follow when taking actions to respond to events impacting regional transportation. Gaps were also identified in relation to the RTOC's dissemination of traffic information – while tools like social media are used to make some traffic announcements to the public, the RTOC Steering Committee has expressed a desire to expand these types of services in the future to reflect real-time data for travelers. Lastly, it was learned that the RTOC was not accounted for in many regional planning documents. As the RTOC can be a valuable asset for the region's traffic system it will be important to integrate the RTOC into regional discussions, reports, and designs through TSMO planning, design, and construction activities.

The Systems and Technology related needs and gaps identified largely focus around addressing the asymmetry of MCDOT and NYSDOT networks, systems, and equipment. In most cases the two agencies

utilize different software which can lead to inefficiencies in certain scenarios. Consolidating systems or integrating them where possible could reduce redundancies and streamline workflows. As the Steering Committee expressed interest in widening their situational awareness, data acquisition/sharing with other agencies will be crucial. While it treads the line between this operational dimension and the Performance Measurement dimension; “Predictive analysis/forecasting to enable proactive approach to traffic management” relates more towards the technology side of the RTOC’s development of a performance measurement program. Utilizing traffic system data with analytical and modeling software can allow the RTOC to take a more proactive stance in traffic management.

The Performance Measurement dimension will be a major consideration for the RTOC in the near future, as a recently developed database will be used to launch the facility’s performance measurement program that will utilize data analytics to better understand the transportation system and RTOC operations. In regard to this dimension, all associated gaps revolve around elements that facilitate this program. For example, the “Transportation Operations Analyst” gap will need to be satisfied, as that position is critical to maintaining and utilizing the database and producing reports which allow RTOC leadership to make more informed operational decisions.

The Interagency Partnerships and Agreements dimension needs and gaps primarily revolve around fostering new and maintaining existing agency relationships. The RTOC is inherently the result of the partnership between MCDOT and NYSDOT (and NYSP), however additional relationships allow the facility to expand its services and situational awareness through sharing of resources and/or data. While there are numerous identified needs and gaps, “Formalization of internal and external agreements/MOUs (as applicable and beneficial)” is one of the most critical gaps in this dimension, as fulfilling it would help the RTOC organize its partnerships while also solidifying them into the future without the risks associated with informal, handshake agreements.

Draft Recommendations

Draft Recommendations are presented in the table below. The recommendations proposed are the product of all the RTOC assessments that were conducted in previous sections of the Inventory through the Needs Assessment. Recommendations were primarily drafted to meet the needs and gaps identified in the Needs Assessment; however specific RTOC Steering Committee feedback was also utilized. The Draft Recommendations section of the full Strategic Plan provides additional important context for each recommendation, and overlaps with the goals and objectives listed in other regional planning documents. Recommendations were assessed by the Steering Committee for applicability to their current interests and activities, represented in the table below by the number of star icons. The more icons listed, the greater the applicability of the recommendation to the RTOC Steering Committee at the time of review in March 2023.

Draft Recommendations	
Recommendation	Applicability
Consider additional MCDOT Traffic Control Operators to support the existing staff.	☆☆
Evaluate staggered shift schedules for MCDOT operations staff beyond 6pm to increase efficiency and streamline NYSDOT operations during traditional off-hours for MCDOT.	☆
Evaluate the benefits of cross-training additional personnel on second and third shift operations tours in basic signal maintenance to improve off-hours response efficiency.	☆☆

Draft Recommendations	
Recommendation	Applicability
Reassess Traffic Operations Specialist (formerly Transportation Analyst) position description and develop hiring plan to fill vacant position.	☆☆☆
Consider training on interpretation of alternate (e.g., third party providers) data sources to improve real-time operational decision-making.	☆☆
Investigate reconfiguration of space to improve internal communication such as quadrants or pods for operators and supervisors.	☆☆☆☆
Review the current RTOC operator training program and consider the benefits of a structured and formalized program with standard curriculum to augment job shadowing.	☆☆
Develop and maintain a Continuity of Operations Plan (COOP) that accounts for the unique structure of the RTOC.	☆☆☆
As part of the ongoing conversion of SOPs to digital format, the RTOC should consider developing operational, scenario-based guidance.	☆☆
Assess appropriate remote access into TMC Software or Devices to supplement COOP and improve RTOC operational resiliency.	☆☆☆☆
Consider developing procedures and protocols for expanding/enhancing the use of social media to disseminate (and potentially crowdsource) real-time traffic event information.	☆☆
Evaluate standardization of TMC-related networks, systems, and processes to create uniform workflows for NYSDOT and MCDOT in daily operations.	☆☆☆
Evaluate the need for the creation of a new technology piloting and testing program to streamline the introduction of new standard systems and technology.	☆☆
Investigate the possibility of using open-source or non-proprietary software at the RTOC to foster greater interoperability and reduce costs.	☆☆
Evaluate the benefits of requiring Application Programming Interfaces (APIs) and documentation for future developments and integrations with new systems/databases.	☆☆
Assess the feasibility of developing a data fusion engine to merge data from multiple sources, such as travel time information coming from toll tag readers, Bluetooth sensors, and/or third-party providers to streamline incoming data for more efficient reference by operators.	☆☆☆
Utilize and assess the performance measurement database for the collection/analysis of data and develop a maintenance plan.	☆☆☆
Assess staff priorities in addition to agency goals in the development of performance metrics to ensure that the performance measurement database is collecting statistics of value to the RTOC.	☆☆
Assess the benefits of frequently processing/distributing measures of effectiveness (MOE's) for RTOC systems and Operators to improve operational effectiveness.	☆☆
Consider training operators in how to use performance monitoring and how to populate the data needed for performance monitoring to increase operational efficiency.	☆☆
Consider developing formalized memoranda of understanding (MOU's) and inter-agency agreements that facilitate multi-agency cooperation & operations.	☆☆☆
Evaluate the need to promote additional coordination with agencies responsible for arterial transportation management.	☆☆☆

Draft Recommendations	
Recommendation	Applicability
Seek opportunities to share resources and data with other agencies and/or third parties (e.g., communication networks, cameras) as a means of developing beneficial relationships, improving situational awareness, and receiving a larger pool of data to enhance operations.	★ ★ ★
Examine multi-agency procurement with a goal of achieving cost reductions in order to implement projects that benefit the RTOC and other local stakeholders.	★ ★
Assess the need for data privacy and confidentiality protocols, including for media and other agencies co-located in the RTOC observing otherwise restricted material to define legal obligations and avoid litigation.	★ ★
Weigh the benefits of developing a decision support system to support RTOC operators while working towards standardization of event responses.	★ ★ ★
Standardize use of Systems Engineering processes to more easily implement and integrate new services, equipment, and software at the RTOC.	★ ★
Actively use and participate in updates to the Regional ITS Architecture.	★ ★ ★

Table 6: Draft Recommendations and Applicability

Strategic Plan Introduction

The RTOC is the hub of Transportation System Management and Operations (TSMO) activities in the Greater Rochester metropolitan area. Currently, the RTOC does not have a fully documented Strategic Plan. As a result of recently completed and ongoing planning efforts, including the Regional Transportation Systems Management and Operations Strategic Plan, the I-490 Integrated Corridor Management Plan, and the RTOC Performance Measurement Database project, RTOC staff have identified a need for an analysis that describes the functions and services currently provided by the RTOC, articulates the operational goals and associated services it will provide in the future, and describes what actions the RTOC needs to take to achieve those goals.



A Strategic Plan will serve as a roadmap for the RTOC to identify future staffing, equipment, space, and inter-agency management and coordination needs. It will document the RTOC's operational goals and identify a strategy for achieving those goals, and assist RTOC leadership with managing anticipated staffing requirements, ongoing interagency coordination challenges in areas like Traffic Incident Management (TIM) and Intelligent Transportation Systems (ITS) deployments, and performance measurement activities. This plan will also help justify local and federal-aid investments in the RTOC facility and ensure its long-term viability by identifying its capital and operating funding needs.

1. Inventory Purpose

This section of the Strategic Plan will serve to provide a broad background on the RTOC from an operational, technological, and administrative perspective - it is necessary to review and record the existing state of the facility, services provided, and operations.

A high-level Strength, Weakness, Opportunity, and Threat (SWOT) analyses is included in this section of the Strategic Plan based on subject matter expertise from the project team and input from RTOC staff. These analyses will identify internal and external factors that work for or against the goal of the RTOC achieving the objectives identified later in this Strategic Plan and is augmented by feedback from RTOC Steering Committee members. These analyses will primarily inform the later sections of this plan.

2. RTOC Inventory

2.1 Operations Overview

Monroe County's James R. Pond Regional Traffic Operations Center (RTOC) opened in 2002. It was renamed in memory of visionary leader James R. Pond, P.E., PTOE on August 8, 2022. RTOC is a state-of-the-art traffic management center that hosts a wide variety of traffic emergency responders under one roof. It serves as the primary traffic management center for the Greater Rochester area. Included within the facility are the Monroe County DOT (MCDOT) traffic signal system and dispatchers, New York State DOT (NYSDOT) dispatchers, traffic signal maintenance shops for MCDOT and NYSDOT, MCDOT's expressway lighting shop, New York State Police Troop E Zone 1 headquarters, and Monroe County

2.2 RTOC Physical Facility

NY 600 S. 1. GARAGE (1.01)

STORAGE (1.02)

REPAIR / TEST BENCHES (1.03)

M.C.D.S.T. GARAGE (1.04)

STAR (1.05)

N.Y.S.D.S.T. BUILD-UP (1.06)

TEST AREA (1.07)

M.C.D.S.T. CABINET ASSEMBLY STANDING (1.08)

N.Y.S.D.S.T. GENERAL STORAGE (1.09)

SIGNAL SYSTEMS ENGINEERS OFFICE (1.10)

FIELD ELECTRICIAN FOREMAN (1.11)

VESTIBULE (1.12)

CLOSET (1.13)

BLEED ROOM / CONDENSATION / METAL (1.14)

OFFICE (1.15)

OFFICE (1.16)

OFFICE (1.17)

CONFERENCE / REC. ROOM (1.18)

PROJECTION SCREEN (1.19)

T.O.C. DEMO ROOM (1.20)

PROJECTION / SERVICE / CONDENSATION (1.21)

RECORDS STORAGE (1.22)

NEW YORK STATE POLICE

EXIT

EXIT

EXIT

CLOSET

Figure 1: Current RTOC Facility Floor Plan

New York State Police Troop “E” is also located within the RTOC in a separate space within a secured set of rooms away from MCDOT or NYSDOT staff. When necessary, NYSP can view CCTV images from the main operations floor, however they must call or speak directly with the operations staff on the floor to obtain additional information relating to ongoing incidents.

2.3 RTOC Staff

2.3.1 Monroe County Department of Transportation

The Monroe County Department of Transportation manages the City and County arterial street network, including operation and maintenance of approximately 630 traffic signals and 175 other devices such as warning flashers and Rectangular Rapid Flashing Beacons (RRFBs). As of the authoring date of this tech memo, there are 515 traffic signals and 120 traffic cameras that can be remotely controlled and monitored from the RTOC, which also houses services for maintenance of the expressway lighting system and dispatch of County highway and bridge crews.¹

¹ <https://www.monroecounty.gov/dot-signalops>

While a large number of MCDOT staff work at the RTOC building, a much smaller number work on the main operations floor for the purpose of real-time transportation management. Additional staff within the building may come to the operations floor, as needed, to discuss specific issues with the signal operators on duty. It should also be noted that for a number of reasons, MCDOT has been short-staffed for a significant period of time, which has made their daily operations more difficult.

Position Title	Location	Number of Positions	Roles and Responsibilities
Chief of Traffic Signal Engineering & Operations	RTOC	1	<ul style="list-style-type: none"> • Supervises/directs RTOC, Traffic Studies, Signal Lab, Signal Maintenance & Construction, and Highway Lighting • Plan/Administer capital improvement projects • Requires bachelor's degree (minimum) in Engineering plus 7 years' experience with minimum 2 as supervisor • Reports to Director of Transportation
Traffic Engineer	RTOC	1	<ul style="list-style-type: none"> • Assists with signal timing overrides and implementing other timing plans • Reports to Chief of Traffic Signal Engineering & Operations
Senior Traffic Control Operator	RTOC	1	<ul style="list-style-type: none"> • Supervises Traffic Control Operators • Maintains situational awareness of signal operations • Reports to Chief of Traffic Signal Engineering & Operations • Updates MCDOT website and social media presence
Traffic Control Operator	RTOC	2	<ul style="list-style-type: none"> • Operates traffic signal control system • Monitors traffic flow and modifies signal timings • Resolves customer complaints • Dispatches maintenance crews • Maintains/updates databases • Reports to Senior Traffic Control Operator
Electronic Foreman	Signal Lab	1	<ul style="list-style-type: none"> • Supervises repair of traffic control equipment (complex microprocessor, electromechanical, and digital) and maintains repair history data • Manages parts inventory system • Coordinates calibration of electronic test equipment • Configures new test equipment • Establishes equipment diagnostic procedures and trains technicians in use of test equipment • Maintains/updates equipment manuals and parts spec guides • Designs/builds test fixtures • Solicits quotes and completes parts requisitions • Operates signal trucks with a GVW over 26,000 lbs.

Position Title	Location	Number of Positions	Roles and Responsibilities
Electronic Technician	Signal Lab	2	<ul style="list-style-type: none"> • Performs repairs on technology equipment for traffic control functions • Installation/inspection/maintenance of multiple devices including controllers, loop detectors, conflict monitors, amplifiers, and other microprocessor and solid-state equipment • Assists with inspection/repair of traffic signal equipment and associated hardware • Assists in assembling, wiring, and testing traffic signal equipment and cabinets • Calibrates and repairs traffic signal system equipment • Operates signal truck with a GVW over 26, 000 pounds
Supervisor – Signal Construction	Signal Maintenance & Construction	1	<ul style="list-style-type: none"> • Plans/manages traffic signal and highway lighting capital construction programs • Oversees/coordinates daily operations and maintenance of contractor(s) to ensure both code and contract compliance • Directs/supervises installation and replacement of traffic signal hardware • Assists engineers with plan reviews and assessing need for signal and highway lighting upgrades • Attends construction meetings to guide project engineers and contractors • Inspects contracted repairs and maintenance of the expressway lighting system • Prepares traffic signal equipment and materials specs • Determines traffic signal and highway lighting equipment requirements and completes requisitions • Reviews and processes invoices, expenses, and insurance claims • Maintains signal and highway lighting repair history data • Installs traffic signal related field equipment (wire pulling, wire splicing, and electrical connections) • Reviews drawings to identify underground utility locations
Sr. Signal Mechanic	Signal Maintenance & Construction	4	<ul style="list-style-type: none"> • Skilled mechanic position • Electrical construction work • Installation/service of signals • Requires High School diploma and 2 years of related experience • Reports to Supervisor - Signal Construction

Position Title	Location	Number of Positions	Roles and Responsibilities
Electronic Technician	Signal Maintenance & Construction	1	<ul style="list-style-type: none"> • Performs repairs on technology equipment for traffic control functions • Installation/inspection/maintenance of multiple devices including controllers, loop detectors, conflict monitors, amplifiers, and other microprocessor and solid-state equipment • Assists with inspection/repair of traffic signal equipment and associated hardware • Assists in assembling, wiring, and testing traffic signal equipment and cabinets • Calibrates and repairs traffic signal system equipment • Operates signal truck with a GVW over 26, 000 pounds

Table 7: Monroe County RTOC Staff

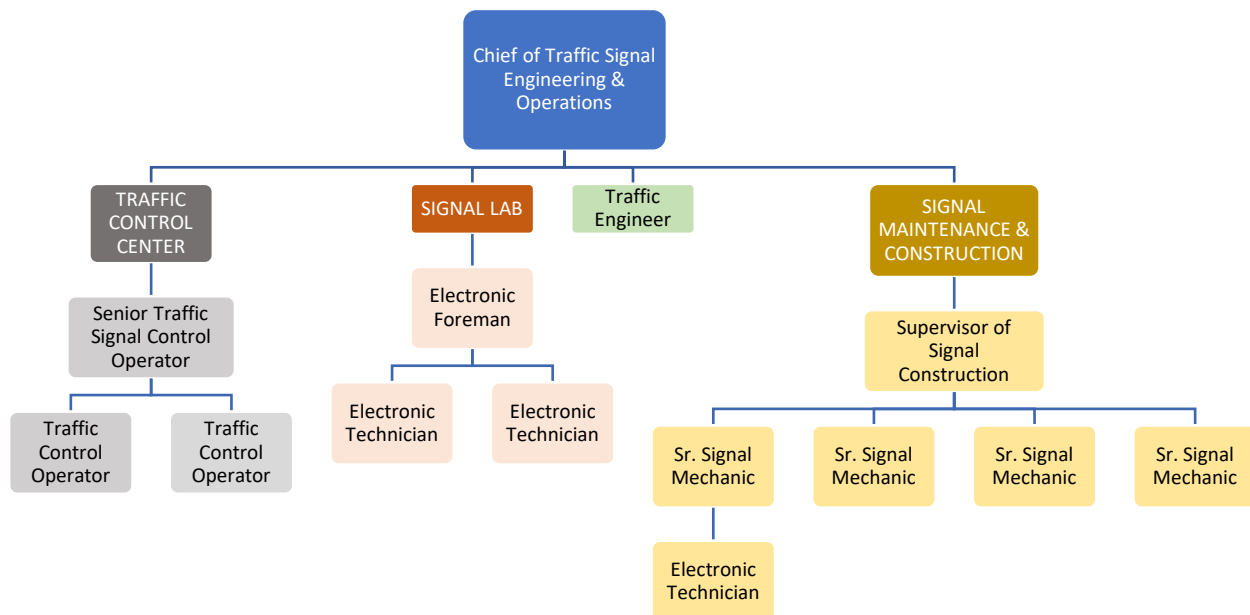


Figure 2: MCDOT Org Chart

2.3.2 New York State Department of Transportation

The New York State Department of Transportation manages the regional expressway and primary arterial system, including pavement temperature detection, traffic signals, traffic cameras, dynamic message signs, and the Highway Emergency Local Patrol (HELP) truck program.²

NYSDOT requires a minimum of two employees capable of fully operating all TMC systems per shift. The number of staff required is determined by the TMC Operations Manager in conjunction with the NYSDOT TMC Manager and may be modified in response to major incidents, special events, significant weather events or other operational needs. NYSDOT's operations staff at the RTOC is primarily

² <https://www.monroecounty.gov/dot-signalops>

comprised of consultants acting as Systems Operators of various levels. The following table breaks down each NYSDOT position at the RTOC.

Position Title	Location	Number of Positions	Roles and Responsibilities
NYSDOT TMC Manager	Traffic Control Center	1	<ul style="list-style-type: none"> Supervises the RTOC Operations Staff, Signal Systems Maintenance Engineer, and ITS Engineer Manages the Regional H.E.L.P., Operations, ITS Maintenance, and RTOC Facilities contracts Plan/Administer ITS capital improvement projects Provides support for ICS, construction, and local maintenance operations
NYSDOT ITS Manager/Engineer	Traffic Control Center	1	<ul style="list-style-type: none"> Responsible for maintaining the continued operation of all field ITS elements Manage the TMC System administrator, field technician, and consultant maintenance forces Support RTOC and Regional staff with ITS design and review of ITS elements on capital projects Maintains all Configuration Management records for all field components included record plans Provide support for construction and dig safe requests
Project Manager (Consultant)	Traffic Control Center	1	<ul style="list-style-type: none"> Act as the liaison and general manager for the consultant operations contract Provide oversight and QA/AC for the consultant contract The primary contact for the consultant and sub-consultant contract issues Reports directly to the RTOC TMC Manager
Operations Manager (Consultant)	Traffic Control Center	1	<ul style="list-style-type: none"> Manages all operational aspects of the TMC consultant and sub-consultant staff Oversee the consultant operations staff at RTOC Oversees daily operations on a 24/7 basis Provides support to maintenance, construction, emergency service providers and other local agencies as necessary Reports directly to the RTOC TMC Manager and Consultant Project Manager
Operator III (Supervisor)	Traffic Control Center	3	Responsible for <ul style="list-style-type: none"> All functions of Operator II plus. Serving as acting manager in absence of Operations Manager Assisting with SOP and protocols Ensuring employee compliance with guidelines/practices Oversight of the operations floor Providing QA/QC for operational workflow and ensuring staff compliance with expectations
Operator III (Supervisor – PT)	Traffic Control Center	1	Responsible for <ul style="list-style-type: none"> All functions of Operator II plus.

Position Title	Location	Number of Positions	Roles and Responsibilities
			<ul style="list-style-type: none"> • Serving as acting manager in absence of Operations Manager • Assisting with SOP and protocols • Ensuring employee compliance with guidelines/practices • Oversight of the operations floor • Providing QA/QC for operational workflow and ensuring staff compliance with expectations
Operator II	Traffic Control Center	Unknown	Responsible for <ul style="list-style-type: none"> • All functions of Operator plus. • Having strong knowledge of regional road system and location/purpose of ITS assets • Having a working knowledge of TMC policy and guidance • Participating in new Operator training
Operator (FT)	Traffic Control Center	6	Responsible for: <ul style="list-style-type: none"> • ATMS Operations • TIM Program Support • Coordinating NYSDOT responses for roadway concerns • Dispatching maintenance crews for snow/ice operations • Maintaining logs of roadway incidents, concerns, and inbound/outbound communications
Operator (PT)	Traffic Control Center	3	Responsible for: <ul style="list-style-type: none"> • ATMS Operations • TIM Program Support • Coordinating NYSDOT responses for roadway concerns • Dispatching maintenance crews for snow/ice operations • Maintaining logs of roadway incidents, concerns, and inbound/outbound communications
Systems Engineer	Traffic Control Center	1	<ul style="list-style-type: none"> • Responsible for the IT network administration and management include maintaining network security • Interface with installation, maintenance personnel and with the other agencies/organizations to coordinate scheduling of work on the TMC equipment • Ensure the reporting of TMC hardware, software and system problems are disseminated to the proper parties for identification and resolution • Maintain an inventory of TMC network equipment and ensure that disruptions of operations are minimized • Reports directly to the ITS Engineer
Field Technician	Traffic Control Center	1	<ul style="list-style-type: none"> • Provide daily maintenance of installed ITS devices including fiber communications.

Position Title	Location	Number of Positions	Roles and Responsibilities
			<ul style="list-style-type: none"> • Installs, replaces, and repairs field devices as needed • Provide daily troubleshooting, configuring, and updating of all ITS devices including communications • Maintain asset records of field deployed devices, storage inventories, and updates ITS record plans • Reports directly to the ITS Engineer
Transportation Analyst	Traffic Control Center	0	<ul style="list-style-type: none"> • Renamed Traffic Operations Specialist and position remains unfilled • Manage RTOC and transportation system performance measures program

Table 8: NYSDOT RTOC Staff

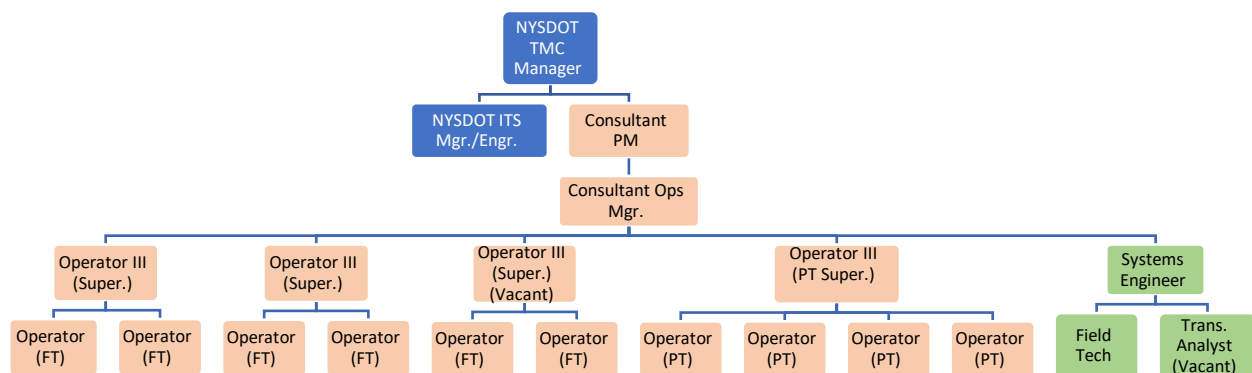


Figure 3: NYSDOT Org Chart

2.3.3 Off-Hours Staffing

MCDOT operators work at the RTOC from 6 AM through 6 PM, Monday to Friday. When MCDOT dispatchers are not present, after the 6AM-6PM period, holidays, or weekends, dispatching is conducted by NYSDOT. Additionally, NYSDOT provides overnight operators – these operators cannot control signal timing changes, instead they primarily act as an intermediary to route issues to the correct personnel at MCDOT when needed.

2.3.4 New York State Police and Monroe County Airport Authority

Rounding out the tenants of the RTOC are the New York State Police (NYSP) and the Monroe County Airport Authority. NYSP is responsible for patrolling the regional expressway system, while the airport authority manages the runways, taxiways, and lights for the Frederick Douglass Greater Rochester International Airport (GRIA). This includes weather and pavement temperature detection.³

³ <https://www.monroecounty.gov/dot-signalops>

2.4 Highway Emergency Local Patrol (H.E.L.P.) Service

The Highway Emergency Local Patrol, more commonly referred to by its acronym “H.E.L.P.”, has serviced the Rochester area since 2004. H.E.L.P. vehicles patrol around one hundred directional miles of regional roadway. Currently there are four H.E.L.P. trucks that are dispatched by the RTOC to different patrol areas, referred to as “beats” (*Table 3*), where they patrol and respond to motorists in need of assistance during peak travel times between the hours 6:00am to 10:00am and 2:30pm to 6:30pm Monday through Friday. There is a spare truck (Truck 401) that can be used as a backup if necessary. NYSDOT consultant operators communicate with H.E.L.P. trucks by hand-held two-way radios, but direct phone communication is also used as a backup in the event of poor or failed radio communications. In 2018, the H.E.L.P. service provided over 4100 “assists.” The H.E.L.P. service may extend the operational hours of its trucks in the event of special events or adverse weather forecasts.

Truck #	Beat
Truck 401	• Spare
Truck 402	• Rt. 390 Lehigh Station Rd to the Lake Ontario State Pkwy. • A portion of Rt. 590 between the Rt. 390 Interchange and S. Winton Rd.
Truck 403	• Rt. 490 at Buffalo Rd. to Rt. 441. Also Rt. 531 from Rt. 490 to Manitou Rd.
Truck 404	• Rt. 590 at S. Winton Rd. to East Ridge Rd.
Truck 405	• Rt. 104 from Lake Ave (City) to Rt. 250 Webster

Table 9: H.E.L.P. Truck Beats

2.5 RTOC SOPs and Reference Documents

NYSDOT: NYSDOT utilizes an array of reference documents to assist RTOC personnel with daily operations.

Physical copies of the Standard Operating Procedures (SOP) are maintained in a binder format but as of late 2022 have also been converted into digital copies. These digital copies are stored on a OneNote Notebook as well as a shared drive. As of July 2022, the RTOC does not plan to relocate these documents until a new performance metrics database environment is completed, as it may also provide a new repository for the SOPs. It is expected that this database environment will allow operators to use key terms in order to search for all appropriate SOPs whenever they are needed.

NYSDOT utilizes two versions of its SOP, a “full version” and a “quick reference” version. The full version is the SOP in its entirety while the quick reference version, last updated in June 2020, allows for faster referencing of more common and frequent operational procedures.

The Quick Reference Handbook contains the following sections:

- Phone Contacts
- Traffic Incidents
- Signals
- Stakeouts
- Signs
- VMS
- Weather-related issues
- Truck Bans
- Bridges
- O'Rourke Bridge
- Animals
- Bus Incidents
- CCTV Feeds
- Debris
- NYSDOT Routes
- Protests/Civil Unrest

In addition to the SOP, NYSDOT regularly references the Snow & Ice Manual/Call-Out Lists when seasonally appropriate. Similar to the SOP, this manual is currently a physical copy, last updated in 2020,

with the potential to be converted to a digital format at a later time. NYSDOT Supervisors are also provided access to the NYSDOT/MCDOT Traffic Signals manual, which was last updated in 2020, similar to the other resources.

MCDOT: MCDOT maintains several reference documents for internal use, as well as for use by NYSDOT operations personnel during off-hours operations.

The Monroe County-New York State RTOC Operator User Manual is currently maintained as a 249-page PDF document and referenced by MCDOT for information regarding policies, procedures, and user instructions for all systems in the RTOC. Even though this reference document contains applicable information for MCDOT and NYSDOT and is utilized by both organizations, much of the information within it pertains more specifically to MCDOT.

The MCDOT County Guide has been continually updated since 2010 and contains the following sections:

- Main
- Town Roads
- Signals
- Bridge
- Contacts

This resource is currently maintained as a physical copy; however, it has also been digitized and uploaded to the OneNote Notebook and shared drive referenced earlier in this tech memo.

Incident Response Plans: Both NYSDOT and MCDOT operations personnel defer to the NYSDOT Statewide Incident Level system as their official guidance resource. Incident Response Plans (IRPs) are not utilized frequently. Representative of the RTOC Steering Committee indicate that incident response actions are frequently left to the discretion of the operator handling the incident, however there are several notable exceptions such incidents involving a large number of pedestrians on an expressway. IRPs are found with the digital SOPs but were once located within the RTOC's Advanced Transportation Management System (ATMS) known as Foundation III.

Appendix B illustrates the current status of existing documents and operations resources at the RTOC, as well as others that are commonly used in TOC environments.

2.6 RTOC Systems and Traffic Operations Data

The RTOC receives traffic operations data from ITS field equipment located along key transportation corridors throughout the region. Data is received continuously 24 hours a day, 7 days a week, 365 days a year with RTOC personnel actively monitoring ITS field equipment. This data informs operators of current traffic conditions as well as the weather status, thus enabling actions to be taken as necessary; RTOC staff can address traffic issues by dispatching H.E.L.P. trucks or maintenance crews, changing signal timings, or implementing other solutions. Raw data is sent to RTOC's systems through a communications network (fiber and wireless), where it is then displayed to the operators.

The RTOC currently receives traffic operations data from an array of roadway sensors and similar systems around the region including:

- System Sensors (i.e., loops, roadside radar)
- Closed-Circuit Television Cameras (CCTV)
- Road Weather Information Systems (RWIS)
- Traffic Signals

Although these devices are all used by the RTOC, the various organizations within have separate ownership of the field equipment.

MCDOT: MCDOT owns and maintains ITS devices including nearly 100 CCTV traffic cameras, more than 630 remotely connected traffic signals, 12 sign post mounted speed feedback devices, two speed feedback trailers, and two portable DMS. Many devices are located at strategic positions on the critical I-490 corridor between NY-531 and Penfield Road.

Additionally, MCDOT maintains traffic signals and CCTV along diversion routes in the City of Rochester. Computerized traffic signals and traffic cameras have also been installed at expressway intersections within the City of Rochester.

MCDOT also operates many of the NYSDOT interchange signals from the RTOC.

NYSDOT: NYSDOT owns and operates many major expressway corridors, such as 104, 390, 490, and 590, as well as the Intelligent Transportation Systems (ITS) instrumentation along them. Additionally, NYSDOT owns and operates the Advanced Traffic Management System (ATMS) and the traffic signal network on the state arterials which currently numbers around 750 signals in Monroe County.



Figure 4: ITS Infrastructure Coverage Map

Currently, the RTOC receives crash and incident information from dispatched H.E.L.P trucks that happen upon a scene, or from the Monroe County 911 Center, which receives incident notifications via phone calls from motorists or first responders. This incident information is then entered into the ATMS system to track and update incident statuses as needed.

Occasionally, an operator at the RTOC may also recognize that an accident has occurred based on CCTV observation of the incident itself or abnormal traffic queues which prompt additional investigation into the cause. In these situations, RTOC operators will verify that an incident has truly occurred by contacting state or local police.

The RTOC uses a variety of systems to analyze data and for operational decision-making as listed below.

Foundation III - This is the Advanced Transportation Management System (ATMS) solution utilized by NYSDOT. Currently, this ATMS is strictly limited to command and control of NTCIP-compliant ITS devices.

R4 Database - A Microsoft Access database which was utilized as the primary method of tracking incidents handled by the RTOC operators. This application is no longer functional and will be replaced by the new, professionally constructed dispatch/performance measure database by the end of 2022.

FLIR - This system manages the command and control of CCTV feeds into the RTOC, enabling Pan/Tilt/Zoom control over NYSDOT and MCDOT's CCTV assets. CCTV can also be locked out of PTZ function, when necessary, to keep a camera focused on a particular incident. Within the RTOC, FLIR is often referred to as DVTel.

Utilisphere - This system is used for tracking Stakeout calls to 8-1-1 requesting to dig on NYSDOT/Monroe County right-of-way.

TransSuite - This is the software which MCDOT uses to provide signal control.

Safety Track - This system manages images coming from the forward and rear facing CCTVs mounted to H.E.L.P. trucks.

AVL/GIS - This is GIS software that is used to track the locations of H.E.L.P. trucks that have been outfitted with Automated Vehicle Location (AVL). This information is primarily used by the contracted H.E.L.P. truck provider.

Monroe County 911 website/Mobile Data Terminals (MDT) – This is the connection to the Mobile Data Terminal (MDT) page of the Monroe County Public Safety website, which allows RTOC operations staff to see real-time dispatch information for incidents.

Radio System – This is a two-way radio system which is used to dispatch H.E.L.P. trucks.

2.7 RTOC Ancillary Resources

2.7.1 Performance Measures

At present, efforts towards implementing operational performance measures by NYSDOT or MCDOT are somewhat sporadic. A full technical report was completed in 2019 outlining a number of performance measures that could be adopted by the RTOC. As of the publication of this report, a performance measure database has completed development and is beginning deployment. This database will combine dispatching and performance measurement reporting services. It is additionally expected to collect data from a number of sources and integrate with other programs' APIs in order to interpret the alternative data types used by the RTOC.

While performance data is currently collected in an ad hoc fashion, the new performance measure database will formalize and streamline the operations data analysis process. Key members of the RTOC staff have outlined relevant performance measures and implementation strategies, which will be discussed in future technical memoranda outlining a needs assessment and recommendations.

Once the new database has been rolled out, reports can be constructed using data gathered by the RTOC. However, it will take some time to accumulate a large enough dataset to obtain accurate information. It is expected that nearly 6 months to one year's worth of data will be required in order to draw meaningful observations from the data.

2.7.2 Formal and Informal Policies

Most existing policies and practices between the collocated agencies at the RTOC are verbal in nature, however the RTOC staff have expressed willingness to formalize these if it is advantageous to their operations.

The RTOC operates 24 hours per day, 365 days per year, and is staffed primarily by MCDOT and NYSDOT personnel, however NYSP and Monroe County Airport Authority utilize the facility as well. Beyond the organizations currently involved with the RTOC, there is also precedent for communication and coordination with the Monroe County Sheriff's Department and New York State Thruway Authority (NYSTA), and current communications with NYSTA is generally restricted to weather events and Traffic Incident Management (TIM) for larger-scale incidents.

Colocation of agencies within the RTOC provides many benefits, including NYSDOT's ability to work with MCDOT and NYSP on incident management, construction and maintenance, speed zones, and safety control activities. Colocation also provides the State Police with traffic monitoring capabilities because they do not have their own roadway CCTVs or other instrumentation.

RTOC staff are cross trained in several areas, meaning that staff can cover the roles of others if necessary. NYSDOT staff, for example, perform basic MCDOT functions after hours and on weekends when MCDOT personnel are not on site.

2.7.3 Interagency Agreements and Memorandums of Understanding (MOU)

Currently, there are very few formalized agreements and no Memoranda of Understanding (MOU) between agencies both internal and external to the RTOC. Most agreements, such as CAD sharing from 911, are informal in nature and characterized largely as a professional courtesy. Similar to existing policies mentioned in the previous section, the RTOC staff have expressed willingness to formalize agreements if it is advantageous to their operations.

Among the few formal agreements in place are related to NYSDOT's and NYSP's lease agreements for the use of the physical space. Aside from these lease agreements, there is a formalized agreement between MCDOT and NYSDOT to share the fiberoptic communication network and one additional agreement for NYSDOT to share CCTV footage through Skyline to be used on local television traffic reports.

The RTOC also participates in the Traffic Operations Coordination Committee (TOCC) which enables coordination between RTOC and responders in the surrounding region to strengthen relations, communications, and processes. However, gatherings of the TOCC have become infrequent at best with a perception that efforts have stagnated.

Additionally, it should be noted that MCDOT currently acts as the signal engineer for the City of Rochester, which benefits the RTOC with a more complete understanding of signals in the region. If necessary, the city signals could be configured in a way that would benefit traffic management across Monroe County.

Several other formalized, written agreements have been documented in the ITS Regional Architecture as follows.

- *City of Rochester Traffic Control Board (TCB)*: The Traffic Control Board determines which organizations manage/operate traffic control devices within the City of Rochester. Currently, TCB determined that MCDOT manages and operates all traffic control devices in the city. NYSDOT equipment in the City Rochester is the only exception.

- *Communications Conduit Usage Agreement (Planned Agreement)*: This agreement seeks to formalize the currently informal interagency agreement to share the communications conduit network in the region. No single transit organization related to the RTOC has their own, fully functional, and comprehensive communications network, so jointly building out and maintaining a network of fiber optic lines, allows all the ITS instrumentation to be linked to the RTOC.
- *Closed-Circuit Television (CCTV) Traffic Camera Feed Agreement (Planned Agreement)*: Regional CCTV camera feeds are currently available via agency websites, the 511NY system, and websites such as TrafficLand. However, emergency managers may be interested in having the ability to directly manipulate traffic cameras in order to improve incident scene management. This agreement will specify the terms and conditions that participating agencies will have to abide by when requesting temporary use of CCTV cameras. CCTV camera use will be governed by the NYSDOT privacy policy and will also be limited by technical capabilities, such as available bandwidth.
- *After-Hours Regional Traffic Operations Center (RTOC) Staffing Agreement (Planned Agreement)*: Currently, NYSDOT provides emergency dispatching services during MCDOT off-hours: nights and weekends. While this is an ongoing practice at the RTOC, this arrangement is not formalized, however this agreement will formalize it.
- *CLARIS* – NYSDOT currently oversees a video feed sharing service that is used for providing video to the media and emergency services. This service is tier-based, meaning that stakeholders are assigned to a specific tier, and only videos shared with that tier are viewable. Therefore, the media might now have access to some feeds that emergency services are provided with and vice versa.

2.7.4 Supporting Resources

The RTOC is integrated into other agency operations and relies on support and cooperation from these agencies with a vested interest in the safe and efficient operation of the regional transportation system. This includes internal partners such as maintenance and information technology as well as external partners including county transportation departments, the New York State Thruway, and emergency response disciplines of Law Enforcement, Fire/Rescue, and Emergency Medical Services.

For the development of this Strategic Plan, the RTOC benefits from a strong relationship with the planning community, specifically the Genesee Transportation Council which has authored numerous publications which directly inform and influence planning processes for the RTOC. The following publications are relevant to RTOC planning and operations.

Long Range Transportation Plan, Genesee-Finger Lakes Region 2045

Published in 2021, the Long-Range Transportation Plan (LRTP) Genesee-Finger Lakes Region 2045 is a federally mandated, comprehensive transportation plan that articulates future goals for managing and operating the regional transportation system and identifies strategies to achieve them. It is, in many ways, a macrocosm of this business concept tech memo in that it seeks to advance regional transportation operations and services but over a significantly longer time horizon.

Improved Mobility Areawide Guidance Evaluation (IMAGE) Report, 1996

The IMAGE report was developed by a NYSDOT-led committee in 1996 and outlined the need for an Advanced Transportation Management System (ATMS) covering highways and arterials in Monroe County as follows:

“The goal of the Advanced Transportation Management System (ATMS) is to manage the transportation system, to reduce traffic congestion, and to improve the efficiency of the incident management process through the integrated management of the expressway

and arterial roadway network, together with providing information to help efficiently manage the regional transit system.”

The IMAGE report included a specific recommendation to build a regional traffic operations center. It was the guiding document for both justifying the need for a regional TOC and for documenting the service needs for traffic management in the region.

Genesee-Finger Lakes Regional Transportation System Management and Operations (TSMO) Plan, 2018

This plan was prepared to provide a strategy for the coordinated implementation of TSMO programs and Intelligent Transportation System (ITS) technologies to address regional transportation system needs. From this study, the regional vision for TSMO in the Rochester-Genesee Region was defined by the project Steering Committee as follows:

“Transportation System Management and Operations (TSMO) in the Rochester-Genesee region improves the efficiency, safety, and convenience of the multi-modal transportation system through the use of advanced transportation technologies, free flow of information and data, and partnerships among public agencies and other transportation service providers.”

At a high level, TSMO as defined by FHWA can best be defined as a “series of strategies which focus on operational improvements that can maintain the performance of the existing transportation system before extra capacity is needed.”⁴ In more common language, TSMO essentially looks to address the old adage that you “can’t build your way out of congestion” by identifying strategies and best practices to better manage the existing transportation infrastructure and systems. The TSMO Plan documents regional traffic management objectives as follows:

- Improve the Safety and Efficiency of the Multi-Modal Transportation System through Coordinated Management and Operations
- Maximize Transportation System Performance from the User Perspective
- Implement TSMO as a Low-Cost Solution to Regional Transportation Needs
- Target Investment in New ITS and Communications Infrastructure where Benefits and Value are Greatest
- Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation
- Promote Partnerships and Collaboration to Support Regional Operations
- Integrate TSMO into Regional Planning and Policy Making
- Maximize Program Efficiency through Resource and Cost Sharing
- Support Long Term TSMO Operations and Capital Investments through Sustainable Funding and Asset Management
- Promote Interoperability and Value-Add Services through Shared and Open Data

NYSDOT TSMO PLAN, 2020

This plan was developed by NYSDOT to describe the importance of TSMO to the agency’s mission, develop links between TSMO activities and agency goals and objectives, describe the connection between TSMO activities and other agency activities, and identify immediate and near-term actions to support more effective and successful TSMO outcomes.⁵

⁴ <https://ops.fhwa.dot.gov/tsmo/>

⁵ Transportation Systems Management and Operations Strategic Plan, NYSDOT, 2020.

A core NYSDOT objective is to operate the existing transportation network efficiently while providing travelers with safe and reliable travel conditions. TSMO has been a long-standing and essential function within the agency to support overall system efficiency, and many of the TSMO strategies are well-known to not only NYSDOT but to many other transportation agencies in New York State. To address traveler mobility and reliability challenges in the state, NYSDOT engages in a wide variety of activities that fall under the current definition of TSMO. The NYSDOT TSMO goals as defined in the plan are:

- **Goal 1:** Enhance system safety and reliability by minimizing the impacts of travel disruptions
- **Goal 2:** Move people efficiently
- **Goal 3:** Support reliable and efficient freight movement
- **Goal 4:** Serve as a trusted source of multimodal travel information
- **Goal 5:** Strengthen partnerships with internal and external stakeholders
- **Goal 6:** Support enterprise-level systems and data for a performance-driven approach to TSMO

When compared to the IMAGE Report's vision and the Regional TSMO objectives, these goals are in alignment as in Appendix B of this document.

2.7.5 Diversion Routes

Diversion routes are used to mitigate the impacts of road closures on usual traffic operations. A diversion route acts as a replacement route in the event of a road closure, due to traffic incidents, emergencies, weather events, planned special events, and road work. These routes typically begin at an interchange or intersection on a designated road and end at another point on the same road, allowing traffic to bypass the road closure efficiently.

The GTC and various stakeholders within the region, including MCDOT, NYSDOT, the NYS Thruway Authority, NYSP, Monroe County Sheriff, and the City of Rochester determined seventy-nine diversion route segments, utilizing a series of evaluation criteria, for the following arterial roadways:

- **Interstates:** 90, 390, 490, and 590
- **US Routes:** 20
- **NYS Routes:** 5, 14, 15, 31, 63, 77, 104, 204, 250, 252, 259, 332, 383, 390, 441, 531, and 590
- **Misc. Roadways:** Inner Loop, Lake Ontario Parkway, Mt. Read Boulevard, Lake Avenue, and State Street

2.7.6 Business Continuity and Operational Resilience

As a critical component of transportation operations, the RTOC is often relied upon when the regional transportation system is under stress. These stressors can take many forms including major crashes, significant and/or dangerous weather events, or the damage or destruction of critical infrastructure elements. In addition to the more "traditional" stressors that can impact RTOC operations, 2020 introduced threats to transportation services posed by pandemics and mandated remote work environments.

At those times, the RTOC is looked to by both travelers and partner agencies as the definitive source of real-time transportation information for the purposes of situational awareness and emergency response. If the RTOC itself is compromised in its ability to perform daily operational functions, there could be significant ripple effect across the entire region with potentially crippling impacts on the regional transportation system.

According to the RTOC Steering Committee a "loose" Continuity of Operations Plan (COOP) is established, though the implications suggest that it is not fully developed, and any actual application of

its content would be dubious. Establishing a comprehensive and formalized COOP for the RTOC is essential. Ideally, a COOP will be constructed in a manner that identifies all essential RTOC functions and accounts for all possible scenarios, including operational, human, and systems-related, that could be subject to failure and identify mitigations strategies to employ in the event failures occur. These scenarios include, but are not limited to, the following:

- Communication Systems Failures
- Information Technology/Systems Failures
- Natural or Man-Made Disasters (e.g., fire, severe weather, or terrorism)
- Loss of key personnel

The RTOC COOP should consider the following elements for inclusion:

- Essential functions
- Delegations of authority
- Succession planning
- Alternate facilities (including work from home environments)
- Communication interoperability
- Vital records and databases (storage, retention, and recovery)
- Human capital
- Recovery/reconstitution plan

3. S.W.O.T. Analysis

A critical element to the development of any planning effort is a thoughtful and candid review of both internal and external factors that could impact the success of the plan. The mechanism to conduct this review is commonly known as a S.W.O.T. Analysis, which assesses areas of Strength, Weakness, Opportunity, and Threat. Strengths and weaknesses generally include the resources within an organization at a given time. Since these factors are primarily internal, the organization can exert more control over them and subsequently develop strategies and objectives to augment the strengths and address the weaknesses.

Opportunities and threats are generally considered to be external factors, and while an organization may be able to anticipate or even influence these factors, it may not be able to exert any direct control over them. Ultimately, the S.W.O.T. Analysis is a tool to encourage a pragmatic and realistic approach to planning. Within the environment of Traffic Operations Centers, S.W.O.T. elements fall into several major categories including financial, institutional, cultural, technological, and perhaps even political. The following represents higher level RTOC S.W.O.T. information based upon the project team's background and depth of experience in working with traffic operations centers, information obtained by the team during the 2020 I-490 Integrated Corridor Management project, as well as insights provided by RTOC staff during their review of an early draft of this document.

3.1 General Strengths

As a mature facility, the RTOC possesses numerous operational strengths. As a 24/7/365 operation, each shift has a minimum of two operators which can be quickly modified when necessary for major incidents or planned events. The scheduling structure promotes staff overlap which fosters communications updates between outgoing and incoming operations staff for activities including roadway maintenance, constructions projects, ongoing unplanned incidents, and operational status of ITS field devices.

The RTOC employs comprehensive Standard Operating Procedures (SOPs) which have been modernized from hard copy documents to an online format. Critical operational SOPs are available in a “quick reference” format as well to foster more efficient operations.

The RTOC benefits from numerous applications that foster efficient operations. NYSDOT and MCDOT maintain shared control over CCTV assets to facilitate better situational awareness between the agencies. Additionally, video sharing is provided to the Rochester Police Department as well as the Regional Transit Service. The H.E.L.P. program is another beneficial tool to provide situational awareness, maintain roadway safety, and help clear roadway incidents faster. H.E.L.P. trucks are also equipped with fleet management software that provides front and rear-facing video images, which is a best practice to allow RTOC operators to have real-time views of incident scenes. H.E.L.P. trucks are also equipped with Automated Vehicle Location (AVL) hardware to track the vehicle’s location in real time.

The ATMS (currently Foundation III) allows for command and control of NTCIP-compliant ITS devices for providing traveler information. Utilisphere is used for tracking calls for utility digging, commonly known as “stakeouts” in the region. This process is beneficial as any digging project, especially within the right-of-way, has the potential to damage ITS infrastructure which can negatively impact the RTOC’s operations.

Utilizing TransSuite software allows for signal control, which is a beneficial capability to help maintain mobility, especially during unplanned events when traffic on signalized corridors may be increased due to detours.

The RTOC yields benefits in the detection of incidents by connecting to the Mobile Data Terminal (MDT) page of the Monroe County website. This site displays real-time dispatch information for incidents that may impact regional roadways. The synergy created by this information sharing tool allows the RTOC to react more quickly and manage unplanned incidents.

3.2 General Weaknesses

Simply put, weaknesses can keep an organization from achieving peak performance. Within the RTOC environment, weaknesses can be identified in several areas. Among the most notable is the lack of a centralized software system to manage the most critical and common operational functions. Based on research conducted during the I-490 ICM project, it was noted that Information Technology policies and subsequent firewall issues are at the root of the issue and has caused the proliferation of too many “stand-alone” systems. This results in operators having to engage in redundant data entry across multiple systems which can hinder efficiency. Additionally, there is a lack of standardization of equipment across MCDOT and NYSDOT which is also attributed to both technology issues and inherent policy/procedure practices between the county and the state.

Operationally, the RTOC is lacking in formal Incident Response Plans to guide DMS activations and other incident management activities. Operational decisions regarding DMS messaging and other actions are generally left to the discretion of individual operators, which could lead to inconsistency in practices across shifts.

While the RTOC does cooperate and share information with other agencies, there is a significant gap in the presence of formalized agreements and Memoranda of Understanding with many partners. Most agreements are informal and verbal which, similar to what was noted with Incident Response Plans above, can lead to inconsistency of practice and potentially compromise operations. This is especially true when there are staff changes in which a new individual decides not to honor “handshake” agreements crafted by their predecessor.

Within the world of traffic operations, the move towards data analytics, dashboards, and performance measures continues unabated. The RTOC has recognized this, however, a fully developed performance measures program has not been implemented. However, efforts are continuing in this area and forward progress is being achieved.

3.3 General Opportunities

Opportunities focus on favorable factors outside of an organization that could help it achieve the goals and objectives outlined in a Strategic Plan. One opportunity that will have a major impact on transportation planning within the time horizon of this project is the Infrastructure Investment and Jobs Act which promises about \$350 billion for Federal highway programs over the next 5 years.

3.4 General Threats

Threats are those factors which constrain or harm an organization in its efforts to achieve Strategic Planning goals. Threats can come in many different forms and be generated from unexpected sources to quickly sideline planning efforts. The COVID-19 pandemic is an example of an unanticipated threat, the effects of which continue to resonate within the transportation industry well over two years after its arrival. Additionally, as the RTOC's services expand, more staff will likely be required, however this is challenged by the threat of staffing shortages, which are already affecting MCDOT and NYSDOT. If the RTOC is able to overcome these shortages, the issue of where to house additional staff comes into play – the RTOC is limited in its expansion capabilities and could likely only build up rather than out if needed, and reconfiguration of the existing operations floor will likely not solve all space related issues.

3.5 Area Specific Strengths, Weaknesses, Opportunities, and Threats

3.5.1 Funding

An opportunity will arise for the RTOC from an upcoming County Capital project to rehabilitate the facility. This project is scheduled for design work to commence in 2026, and construction to begin in 2028. While this project relates more to the building itself rather than the operations within, improvements could be leveraged to benefit both aspects. If an additional need for space is identified in the final Strategic Plan, the need could be fulfilled at the time of the capital project. As previously mentioned, funding from the 2021 Federal Infrastructure Investment and Jobs Act may also provide an opportunity to fund RTOC programs and initiatives.

A threat to funding and the RTOC could come from a need for additional employees. While the RTOC has seen a decrease in staffing since the COVID pandemic, it is theorized that in the near future the RTOC will surpass its current staffing needs.

3.5.2 Performance Measures

The current lack of formalized performance measures is a recognized weakness for the RTOC. However, the recently developed/deployed performance measure database will be a strength for the RTOC as it will enable a formalized performance measurement program. Potential data sharing requirements with FHWA provide the RTOC with an opportunity to justify spending additional money on the database. While the database will benefit the RTOC it does face a number of threats to its successful operation, with most of those tied to gaps in the quantity and quality of data which could disrupt accurate measurements of the RTOC's performance. Additionally, relying on data collected from third party agencies could pose a threat to the database as the RTOC would have limited control over how that data is presented or communicated, and any disruption to the connection with third parties could temporarily render the database unusable. Additional potential difficulties with third party data include

the ability of the information to successfully bypass RTOC firewalls and other information technology policy barriers.

3.5.3 Systems/Technology Integration

Currently, the separate networks utilized by NYSDOT and MCDOT within the RTOC could be considered both a weakness and a strength. While these networks are configured to the specific needs of their respective organizations, they complicate large-scale joint efforts and communication between the agencies. Integrating the two networks or having a separate combined network that would be utilized during major events/incidents would provide the RTOC with an opportunity to streamline their operations moving forward.

In addition to the separate networks, another weakness of the RTOC is that NYSDOT and MCDOT utilize different software suites for signal operations. Utilizing different software suites can complicate RTOC processes in the event that either agency would need to take control of another's signals.

While both agencies in the RTOC have separate operational capabilities, NYSDOT and MCDOT share control over the CCTV network. This is a strength for the RTOC as it allows both agencies to view the camera feeds and gather data as needed.

3.5.4 Maintenance

The RTOC currently utilizes a number of formalized signal maintenance agreements which provide clear roles, ownership, and responsibilities. A contractor is currently utilized for ITS device maintenance under a 3-year contract with two potential 1-year extensions. This designated contractor enables faster response times to equipment issues. Having these maintenance agreements is a strength for RTOC operations.

An ever-present threat to the RTOC will be keeping up with technology as it evolves in the future. Newer technology often makes existing technology obsolete and causes support to be dropped eventually. Currently there are 630 signal controllers owned by MCDOT, some of which date back to the 1990s. With the continued evolution of connected and automated vehicle technology, these controllers continue to drift towards obsolescence. While the replacement of all controllers in rapid succession is not a realistic goal, there is an opportunity to be found in replacing the most outdated technology as time and funds permit. The issue of technology obsolescence is exacerbated by the fact that MCDOT now has a ratio of one signal mechanic for every 105 3-color-signals. This labor shortage ultimately manifests itself in the form of prolonged maintenance and replacement times.

Currently, traffic signals are connected to the RTOC through underground fiber which enables consistent communication. However, there are a number of ways that this fiber can be damaged, threatening a disruption to communications. Fiber is likely to be struck during construction activities, however RTOC has already begun exploring wireless technology opportunities which could fill in communication gaps and mitigate the threats to communications. Another opportunity to protect underground communications infrastructure is adding the location of underground conduit to the New York 811 database for proper markings before any digging takes place.

3.5.5 Interagency/Intra-Agency Cooperation/Coordination

Existing formalized agreements would be considered a strength for the RTOC, as they create clear distinctions between agency responsibilities and ownership. However, these formalized agreements also highlight a weakness and opportunity for the RTOC as they emphasize the small quantity of them which can create confusion and contention if ownership or data sharing are ever called into question. There is an opportunity to formalize more agreements in the future to mitigate this weakness.

The TOCC acts a strength for the RTOC due to its effects on the local responder dynamics, however there are opportunities to revamp the organization to convene more frequently and make it more beneficial to everyone involved. Members of the RTOC Steering Committee have suggested that the TOCC could be expanded to encompass counties outside of Monroe to create a more comprehensive group of responders and traffic operations professionals.

An additional interagency agreement opportunity would lie in developing relationships with other county sheriff's and 911 centers. As the RTOC's responsibilities and impact continue to grow, more extensive and sustained relationships will allow for increased access to data for the RTOC to utilize. For example, the RTOC could benefit from information provided by the County Sheriff when roads outside of their typical boundaries are closed for any reason, as those closures may impact diversion routes.

3.5.6 Daily Operations

Communications are a primary risk factor for the RTOC. While communications between agencies in-house and with the NYSDOT Statewide Transportation Information and Coordination Center (STICC) are a strength for the RTOC, a weakness of the RTOC is that incidents on roadways outside of its purview, but that may still impact RTOC regional roadways, are not often communicated by partner agencies/organizations.

Outgoing communications from the RTOC operations staff to maintenance staff are consistent, which enables rapid response to critical maintenance tasks. However, a weakness of these communications is that maintenance staff are not as consistent with their responses, meaning that the operators are often unclear on work progress and the impact it is having on roadway operations. As an opportunity, the maintenance staff could provide the operators with more robust and detailed communications to clear confusion.

Additionally, while responding to maintenance tasks, maintenance personnel will contact the utilities team at NYSDOT if they are needed. As of now, the call from maintenance staff to NYSDOT's utility team is where the communication process ends for these cases, and it is unclear at this time if this is the best practice. As an opportunity, the RTOC can work with the utility team to make sure that the needs of both parties are met and revise/create standard operating procedures as needed.

3.5.7 Supporting Resources & Documents

At the time that this inventory was created, the SOPs were considered a weakness by most RTOC staff due to the fact that a considerable number of the procedures were more akin to software user manuals rather than scenario-based operational protocols. Additionally, there was an element of redundancy present whereby different SOPs existed to address the same situations, creating confusion amongst staff. Once a Traffic Operations Specialist is hired at the RTOC, there will be an opportunity to resolve these weaknesses by revising these SOPs and developing a structured maintenance schedule them as procedures change over time.

4. Business Concept Introduction and Purpose

The purpose of this business concept is twofold: first, to identify the RTOC's roles and functions in transportation service delivery; second, to identify strategies to optimize service delivery over the next 10 years. This section of the Strategic Plan will describe the current functions and services provided by the RTOC, articulate future operational goals and services, and provide strategies to achieve these goals while being mindful of efforts to improve travel safety, efficiency, and reliability on the region's roadways. Developing a business concept or plan for any agency, organization, or business is an opportunity to identify key goals and objectives to be pursued within a specified period of time. It is a

roadmap for both startup endeavors as well as established, mature organizations to plot growth and continued success as they continually evolve. Planning for the Monroe County Regional Traffic Operations Center (RTOC) began in 1996⁶ (Figure 5). In 2022, the James R. Pond Regional Traffic Operations Center (RTOC) celebrated its 20th anniversary, making it a mature facility that is looking to take its next evolutionary steps in a constantly changing transportation operations landscape. Developing the RTOC business concept requires a detailed assessment of key areas that define the critical path for growth and success including:

- **Assessing how the RTOC is perceived both internally and externally** to the extent possible within the scope of the task.
- **Identifying and prioritizing initiatives the RTOC wishes to achieve over the next 10 years.** This will include assessing these initiatives to determine which align with broader statewide planning and which are tied to more regional or localized priorities.
- **Define what must be achieved** to address the priority initiatives.
- **Assign some level of accountability** for achieving the objectives and strategies identified. The strategies and objectives are drivers of how the RTOC will allocate time, human capital, and funding to achieve Strategic Plan goals.

The business plan conceptualized within this technical memorandum (tech memo) is derived from industry trends as well as anecdotal information from the experience of the authorship team and the input of the RTOC Steering Committee.

5. RTOC Service Delivery Goals

5.1 Introduction

A Transportation Operations Center (TOC) is generally defined as a central facility that controls, monitors, and manages the surface street, highway, transit, and bridge/tunnel control systems within its control area.⁷ A TOC aims to manage the operation of the transportation system by communicating travel condition information, making necessary modifications to traffic and transit control systems, and directing response activities. TOCs are a component of transportation management systems, a primary means that transportation agencies can use to manage traffic flow and increase the efficiency of the existing transportation system. Within the system TOCs work with other elements (components) to accomplish the goals and objectives of transportation management. These components include field hardware (CCTV cameras, dynamic message signs, synchronized signals, electronic toll tag readers, etc.), communications equipment, and the policies and

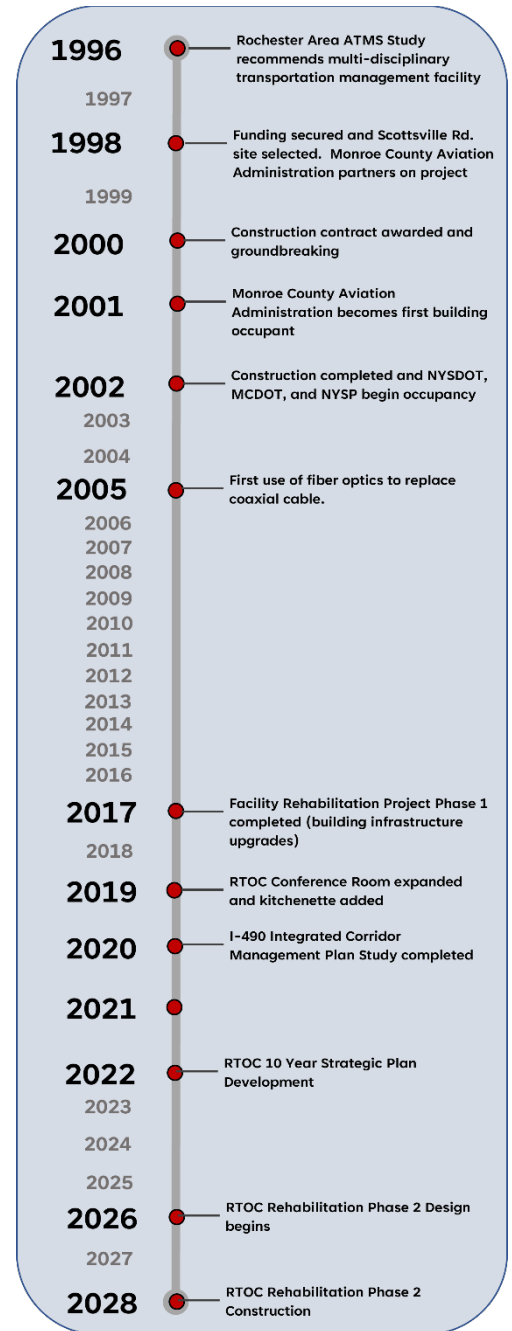


Figure 5: RTOC Development Timeline

⁶ https://www.countyhwys.org/assets/docs/RTOC_Facts_and_Figures_2021_1.pdf

⁷ Freeway Management and Operations Handbook, FHWA, 2006.

procedures established to manage transportation-related events that impact the system. TOCs play a critical role in managing travel on the surface transportation system and support the many interests which provide a variety of services to the traveling public. TOCs can serve as the technical and institutional hub for bringing these interests together within a metropolitan area, entire state, or region.

TOCs may be stand-alone facilities or as is more often the case, be integrated into an agency facility for closer coordination with other internal groups engaged in actively managing the transportation system. In some instances, a TOC may host representatives from outside agencies to provide more robust and real-time regional transportation management. A TOC may be owned or operated by a single agency, multiple transportation agencies, or multiple agencies with different missions such as transportation, emergency service, or media agencies. Hours of operation for TOCs are influenced by various considerations including traffic volumes and geographic location, with those hours ranging from facilities that operate only on weekdays during peak periods to those operating 24 hours a day/seven days a week.

The Monroe County RTOC is unique in that it houses both the state and county traffic management groups, and each group works together with the other to deliver quality service to travelers in the region. Another unique attribute of the RTOC is that it is led at the county-level, whereas most similar facilities are structured with state-level leadership.

While a regional center, the RTOC is one of several centers located statewide that works cooperatively with others to provide region-specific service, while simultaneously working towards developing consistent and uniform operational and service delivery goals.

5.2 Existing Services

ITS deployment in the region, except for MCDOT arterial management, has traditionally been tied primarily to funding availability as opposed to a long-term planning process. There has not been a systematic planning exercise conducted for the region to identify optimal traffic management strategies to meet future or current needs since 2018. However, since opening in 2002, several services have been delivered from the RTOC including:

- Regional Traffic Management
- Traffic Incident Management
- Planned Special Event Management
- Arterial Traffic Management
- Traveler Information
- Road Weather Management
- Maintenance Coordination
- Traffic Signal Operations and Maintenance

5.3 Regional ITS Architecture Services

A Regional ITS Architecture is a tool that can bring great benefit to the development of this business concept as it generally shares the same time horizon of ten years. It provides the framework for institutional agreements and technical integration while simultaneously bridging the gap between Strategic Planning for an integrated transportation system and the ITS projects which support that vision. By extension, the RTOC can utilize information provided within the architecture to inform its continued growth over the next decade. The very structure of an ITS Architecture lends itself almost directly to the core elements of a business concept or plan by stepping through the following areas:

- Planning
- Stakeholders
- Inventory
- Services
- User Needs
- Roles & Responsibilities
- Functions
- Interfaces
- Communications and.
- Agreements

The current Regional ITS Architecture identifies three Service Packages associated with the RTOC as listed below:

- Regional Traffic Management (Existing)
- Winter Maintenance (Existing)
- Disaster Response and Recovery (Planned)

Of the three services identified in the architecture, Disaster Response and Recovery is not identified as an existing service provided by the RTOC. This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).

5.4 Future Services

The following tables identify future service delivery goals for the RTOC and any associated regional/state planning goals. Strategies needed to achieve these goals are identified in the second column. The strategies are further elaborated in Section 5.

Workforce and Staffing	
Goals	Strategies
<ul style="list-style-type: none"> • Expand the technical capacity and expertise of the RTOC staff. • Develop a workplace culture that encourages innovation. <p>GTC</p> <hr/> <ul style="list-style-type: none"> • Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation • Implement TSMO as a Low-Cost Solution to Regional Transportation Needs 	Operator Training Programs
	Education and skills advancement
	Keep pay commensurate with responsibilities and skills
	Leverage performance measurements to help drive performance reviews
	Foster a culture of embracing technology change
	Promote transparent operational communication
	Educate staff and make greater use of the ITS Architecture as a planning tool and resource

Table 10: Workforce and Staffing Goals and Strategies


Business Processes	
Goals	Strategies
<p>Strengthen inter and intra-agency communications to maximize service delivery.</p> <p>GTC</p> <ul style="list-style-type: none"> Improve Safety and Efficiency of the Multi-Modal Transportation System through Coordinated Management and Operations Support Long-term TSMO Operations and Capital Investments Through Sustainable Funding and Asset Management Strategies  <ul style="list-style-type: none"> Enhance system safety and reliability by minimizing the impacts of travel disruptions Move People Efficiently Support reliable and efficient freight movement Serve as a trusted source of multimodal travel information 	Develop a Continuity of Operations Plan (COOP)
	Integrate TSMO into NYSDOT-Region 4 and MCDOT planning, design, and construction activities.
	Align organizational resources for TSMO
	Provide remote operations access
	Coordinate with NYSDOT-R4 PIO and county communications office to expand social media connections
	Advance Integrated Corridor Management strategies
	Reduce incident-related delay
	Provide real-time traveler information

Table 11: Business Processes Goals and Strategies

Systems and Technology	
Goals	Strategies
<p>Minimize travel delay and disruption through deployment of advanced transportation technologies.</p> <p>GTC</p> <ul style="list-style-type: none"> Maximize Transportation System Performance from the User Perspective Target New Investment in ITS and Communications Infrastructure in Locations with the Greatest Impact and Value 	Centralize/consolidate/remove operational redundancies
	New Tech Pilot/testing program
	Develop Standards
	Consider use of Application Programming Interfaces (API) to increase efficiency in data collection and processing
	Utilize the Systems Engineering process
	Transit Signal Priority
	Road Weather Management
	Decision Support Systems
	Predictive Analytics (proactive vs. reactive)
	Increase data acquisition from / sharing with third party app developers
	Advance applications of CAVs and other advanced technologies to support safer, more efficient travel.

Table 12: Systems and Technology Goals and Strategies


Performance Measurement	
Goals	Strategies
Expand the quality and quantity of transportation operations data available for decision-making.  <ul style="list-style-type: none"> Support enterprise-level systems and data for performance driven TSMO approach 	Human performance
	System performance
	Consider staff priorities as well as agency goals when developing KPIs/performance measures
	Provide accurate, real-time travel information of road conditions.
	Incident Durations & Secondary Crash Data
	Delay and Reliability Measures

Table 13: Performance Measurement Goals and Strategies


Interagency Agreements and Partnerships	
Goals	Strategies
Expand collaboration and cooperation with outside agencies and regions. GTC <ul style="list-style-type: none"> Promote Partnerships and Collaboration to Support Regional Operations Integrate TSMO into Regional Planning and Policy Making Maximize Program Efficiency through Resource and Cost Sharing Promote Interoperability and Value-Add Services through Shared and Open Data  <ul style="list-style-type: none"> Strengthen partnerships with internal and external stakeholders 	Elevate “Planned” services to “Existing” (Regional ITS Architecture)
	Develop additional MOUs when possible/feasible
	Expanded regional detour planning (multiregional)
	Expand resource sharing with outside agencies
	Expand data sharing/overcome IT constraints and firewall issues – involve IT in all initiatives
	Embrace the Regional ITS architecture to foster partnerships and coloration.
	Reinvigorate and maintain regional partnerships to achieve operational and safety goals.

Table 14: Interagency Agreements and Partnerships Goals and Strategies

The RTOC’s current service offerings are comprehensive and are the foundation of regional traffic management. In lieu of identifying additional services that the RTOC should provide, this analysis seeks ways to improve the effectiveness of current service delivery. However, as a resource that focuses on planning for operations, the Regional ITS Architecture is a good place to begin ascertaining potential service offerings and is generally structured in a manner that spans a similar time horizon as this Business Concept. The current version of the Regional ITS Architecture aligns with many of the planning resource documents outlined in section 2.7.4 Supporting Resources. Service Areas identified as “Planned” within the architecture are summarized along with the stakeholder elements which have been connected to them as Appendix A of this technical memorandum. The following information has been adapted directly from the Rochester Genesee ITS Regional Architecture RAD-IT file which is maintained by the Genesee Transportation Council.

6. Strategies (2023-2033)

As shown in *Figure 2*, transportation operations and traffic operations center practices are evolving and moving (albeit not always quickly) from a reactive to a proactive stance with greater emphasis on predictability. FHWA has documented that transportation agencies have typically managed congestion by funding major capital projects that focused on adding capacity, and operational improvements were often an afterthought and only considered after the new infrastructure was added to the system. TSMO provides alternate approaches to overcome these challenges and address a broader range of congestion issues to improve overall system performance. This approach supports agencies' abilities to address changing system demands and be flexible for a wide range of conditions.

Effective TSMO efforts require full integration within a transportation agency and should be supported by partner agencies. This can be achieved by identifying opportunities for improving processes, instituting data-driven decision-making, establishing proactive collaboration, and developing actionable activities to develop processes that optimize performance.

The following strategies span the breadth of the TSMO objectives and as such, are associated with every service:

- Ensure sustainable, programmatic, and stable funding for TSMO
- Leverage data for performance-driven approach to TSMO
- Ensure TSMO systems and technology investments are secure and resilient
- Enhance workforce capabilities for TSMO

An essential component of the RTOC business concept is the identification of strategies to serve as a guide to identifying and implementing operational service goals over the next ten years. For this, the FHWA Capability Maturity Framework (CMF) for TSMO provides a strong foundation upon which to review critical operational dimensions that impact the RTOC. At its core, the CMF promotes a process-driven approach to improve TSMO, which combines organically with the business concept for the RTOC as it engages in visioning its next ten years. For the purposes of this tech memo, the RTOC will not be assessed from a capability perspective, but instead the CMF dimensions will be used to organize the strategies for the advancement of services.

Within each dimension below, specific strategies derived from both industry trends as well as locally observed needs at the RTOC will be noted along with brief context for each. It is important to note that there may be some overlap where strategies may bridge multiple dimensions.

6.1 Workforce and Staffing

Workforce and Staffing Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Operator Training Programs	Developing and regularly updating operator training programs as conditions change will result in a better trained workforce, consistency of practice across all	<ul style="list-style-type: none"> • Daily operations • Performance Measures

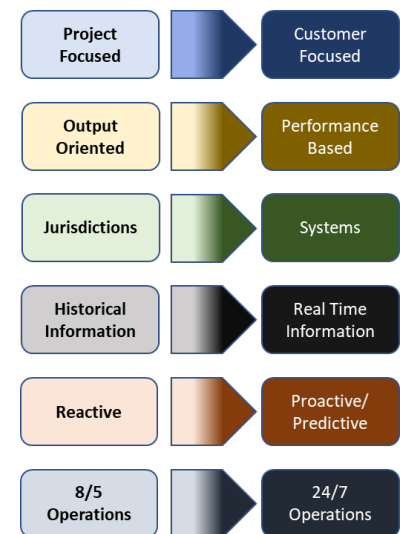


Figure 6: Evolution of Transportation Operations (Adapted from FHWA)

Workforce and Staffing Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
	shifts/dayparts, and increase engagement of more tenured staff who may be responsible for administering training and evaluating results.	
Education and skills advancement	TOCs that invest in their staff to continually advance their skills and education in transportation operations will net benefits over time. While there is no formalized degree program for TOC operators, there are numerous outlets to provide training in higher level skills that operators will need to work efficiently in a constantly changing technology environment.	<ul style="list-style-type: none"> • Daily operations • Staffing support, recruitment, and retention
Keep pay commensurate with responsibilities and skills	Turnover in transportation operations staff is a recurring theme in the industry and is often tied to pay scales that do not keep pace with job and skill requirements. Finding a better balance in this strategic area will yield results in the form of staff stability and better performance.	<ul style="list-style-type: none"> • Staffing support, recruitment, and retention
Leverage performance measurements to help drive performance reviews	See “Human Performance” in the Performance Measurement Strategies table on page 39.	<ul style="list-style-type: none"> • Staffing support, recruitment, and retention
Promote transparent operational communication	Open and transparent communication across all levels of operational staff fosters a collaborative and inclusive environment that increase staff buy-in and engagement.	<ul style="list-style-type: none"> • Daily operations efficiency
Educate staff and embrace the ITS Architecture as a planning tool and resource	A properly updated and well-maintained Regional ITS Architecture is a critical tool in planning for operations and can influence TOC Strategic Planning across a wide spectrum.	<ul style="list-style-type: none"> • Planning for operations • Funding

Table 15: Workforce and Staffing Strategies

6.2 Business Processes

Within the realm of TSMO, Business Processes include specific activities and/or tasks that are needed to successfully deliver a TSMO program. This dimension includes planning, programming, budgeting, project development, and implementation. Business Processes set a clear definition of what an agency (in this case, the RTOC) wants to accomplish through defined vision, mission, goals, and objectives.

Business Process Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Develop a Continuity of Operations Plan (COOP)	Developing a COOP is a critical component of any TOC and affords an opportunity to conduct a detailed assessment of capabilities during times of emergency when transportation operations may play an even more vital role.	<ul style="list-style-type: none"> • Operational Resiliency • Identify essential functions and gaps • Enhance communications to support essential operations during emergencies

Business Process Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Integrate TSMO into planning, design, and construction activities.	Integrating TSMO into a broad scope of transportation planning processes increases visibility of operational needs and TSMO strategies when investment decisions are made.	<ul style="list-style-type: none"> • Planning & Funding • Intra-agency coordination
Align organizational resources for TSMO	A clearly defined leadership and organizational structure for TSMO is important for effectively advancing a TSMO culture and executing TSMO strategies within an agency.	<ul style="list-style-type: none"> • Planning & Funding • Intra-agency coordination
Remote Operations Access	Accommodations for remote operations and systems access is critical to keep a TOC nimble, agile, and adaptable to maintain operational consistency.	<ul style="list-style-type: none"> • Continuity of Operations/Resiliency • Staffing support
Enhance/Expand Social Media Connections	Develop new or augment existing policies and procedures for the use of social media platforms for giving and receiving information to serve both RTOC situational awareness and traveler information.	<ul style="list-style-type: none"> • Traveler Information • Inter-agency information sharing, cooperation, and coordination
Advance Integrated Corridor Management Strategies	ICM strategies coordinate and integrate a range of independent traffic management systems for improved monitoring and optimization of all corridor operations within a network, across regions, and state lines. This can help strengthen existing and develop new formalized partnership agreements.	<ul style="list-style-type: none"> • Traveler Information • Incident detection/management • Inter-agency information sharing, cooperation, and coordination
Reduce delays from traffic incidents	A key strategy and goal for any traffic operations facility, reducing delays recognizes benefits across multiple spectrums from congestion management to safety and reduction of secondary crashes.	<ul style="list-style-type: none"> • Incident Management • Congestion Management
Provide Real-Time Traveler Information	Providing real-time information to travelers allows them to reschedule or re-route trips away from traffic incidents work zones, road closures, and transit service changes which improves travel times, reliability, and safety by distributing traffic across a wider swath of the transportation network.	<ul style="list-style-type: none"> • Incident Management • Traveler Information • Congestion Management
Foster a culture of embracing technology change	TOC management should foster an environment in which technological change is viewed as a positive influence on operational improvement. Often, technology change may be characterized as unnecessary or assigned other negative connotations which subsequently influences operator performance in a negative fashion.	<ul style="list-style-type: none"> • Daily operations efficiency

Table 16: Business Processes Strategies

6.3 Systems & Technology

The systems and technology component of TSMO includes:

- Systems engineering
- Regional architectures
- ITS procurement processes

Systems engineering, in relation to ITS, assesses the value and functionality of a high-technology project, service, or system from inception to end of life. It considers what the system requires operationally

throughout its lifespan, results in better project cost and schedule adherence, and ensures that stakeholder needs are met.⁸

Systems & Technology Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Centralize/consolidate/remove operational redundancies	By reducing redundant operational systems and tasks, TOCs can significantly improve both the operational efficiency and morale of operators. Operational actions that cascade across multiple systems also helps reduce human error and improve the quality and accuracy of information.	<ul style="list-style-type: none"> • Improved operational efficiency • Performance measures
New Tech Pilot/testing program	A testing and piloting program for new technologies can reduce the risk associated with implementation. TOCs can identify objectives, participants, deployment schedule, and evaluation period and begin testing in a controlled environment to help demonstrate new technology functions as expected.	<ul style="list-style-type: none"> • Funding • Systems Integration • Maintenance
Develop Standards	TOC equipment and ITS field equipment can benefit from standardization when it is balanced with an agency's needs and capabilities. Standardizing equipment can improve interoperability, and reduce inventory needed and the complexity of maintenance activities.	<ul style="list-style-type: none"> • Systems Integration • Maintenance
Consider use of Application Programming Interfaces (API) to increase efficiency in data collection and processing	APIs are a set of routines, protocols, and tools for building software applications that instill confidence that all programs using the API will have similar interfaces and make it easier for operators to learn new programs. API calls are usually free of charge.	<ul style="list-style-type: none"> • Data Collection & Analysis • Performance Measures
Utilize the Systems Engineering process	The systems engineering process provides a framework for helping select key strategies, and then successfully implementing technologies and systems. Coupled with a Regional ITS Architecture, it can guide TOCs in evaluating needs, translate the needs into requirements and trace those requirements through design and implementation.	<ul style="list-style-type: none"> • Planning for Operations • Funding • Systems Integration
Transit Signal Priority	Transit Signal Priority (TSP) utilizes technology to give priority to transit vehicles at signalized intersections. TSP can reduce transit travel time and increase reliability, but it needs to be evaluated for impacts on general traffic flow as well as on other transit vehicles in the system.	Indirect impact to RTOC: <ul style="list-style-type: none"> • Congestion Management
Road Weather Management	Proactive management of the road network for weather conditions is strategy to enhance both safety and efficiency.	<ul style="list-style-type: none"> • Incident Management • Congestion/mobility management • Traveler information/advisory messages

⁸ FHWA – Organizing for TSMO

Systems & Technology Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Decision Support Systems	Decision Support Systems enhance TOC operators' ability to make informed decisions. DSSs are generally a collection of integrated software applications which are designed to process, format, and analyze data and knowledge in database-format based on operator need at a given time.	<ul style="list-style-type: none"> • Daily operations • Incident Response Plans • Planning for Operations
Predictive Analytics (proactive vs. reactive)	Predictive analytics utilizing real time information and dashboards is a continually evolving strategy that allows TOC operations staff to more quickly identify variations in roadway conditions and take proactive steps to respond and mitigate potential incidents.	<ul style="list-style-type: none"> • Incident Management • Congestion/Mobility Management
Increase data acquisition from / sharing with third party app developers	TOCs provide valuable service to motorists by providing real-time data to third party application developers. Developers take this data and use it to calculate speed and travel times which are disseminated to travelers through their smart phones or in-vehicle navigation.	<ul style="list-style-type: none"> • Traveler Information • Planning for Operations • Performance Measures
Advance applications of CAVs and other advanced technologies to support safer, more efficient travel.	As the proliferation of connected and automated vehicle technology continues, TOCs should keep pace by preparing to lay a foundation for developing operational tools to best utilize this technology.	<ul style="list-style-type: none"> • Planning

Table 17: Systems and Technology Strategies

Current trends have found traffic operations centers moving towards the acquisition of third-party data for use in both real-time transportation management decisions and historical performance measures. This is a marked shift away from the traditional approach of relying on the deployment of physical infrastructure on public rights of way to collect data to support transportation operations. Traditional intelligent transportation systems (ITS) equipment such as sensors, vehicle counters, and cameras allowed agencies to get a better understanding of system conditions. Agencies were responsible for the procurement and installation of these sensors along with ongoing maintenance. This business model proved to be a double-edged sword whereby agencies were able to exert full control over the equipment and ownership over devices that could be owned, inventoried, and held. However, the agency was also fully responsible for ongoing maintenance, including such items as routine calibration, physical repair, power, and communications. However, these costs can be cost prohibitive and potentially impact funding for other projects, and while the devices could provide relatively high-quality data, it was generally limited to only the area in which the devices were deployed.

While a turn towards private-sector third-party data can address the high cost of operating and maintaining physical field devices, this strategy is not without its own inherent challenges. To access the data, the RTOC will invariably face some obstacles which may include justification, funding, data management, and risk assessment. External data sources (such as third party and crowdsourcing) often require a subscription and continued investment to receive a constant feed. The benefits of these data services are not always easy to identify and quantify against the cost, which may pose a challenge for agencies seeking to justify the additional costs. Internal agency policies may prevent the use of certain external data. For example, risk management groups may not allow the use or distribution of unverifiable data or data that is generated from unknown sources. Additionally, procurement rules may prohibit acquiring data that may be proprietary or sole-sourced.

From a technology or process standpoint, third-party data generally provides access to new information, but it is not customized. Additional effort is often needed to develop tools, automated tasks, performance measures, or other output that utilizes third-party data for agency goals. This need for customization creates the potential to rapidly increase costs and will require the RTOC to decide if it will adapt to the “off-the-shelf” configuration of the data or if it will need the data to adapt to their operational needs.

As the use of third-party operations data is referenced in both the *Genesee-Finger Lakes Regional TSMO Plan* and the *NYS DOT TSMO Strategic Plan* it’s important to address key steps towards bringing the plan visions to reality. The acquisition and use of third-party data inside the RTOC will require significant planning and coordination largely driven by county and state information technology information technology policies related to cybersecurity and data governance. As part of the overall Strategic Plan, the RTOC can begin taking some early actions as noted in the following bullets to start positioning itself to begin acquiring third-party data. This list, adapted from FHWA guidance⁹, is not all-inclusive and other potential steps will be driven by the type and quantity of data desired.

- **Coordinate TSMO and Information Technology Strategic Plans:** Agencies can improve integration between TSMO and IT groups by coordinating their respective TSMO and IT Strategic Plans. Though often separate, these plans can include overlapping functions and efforts to ensure appropriate planning and programming.
- **Develop a long-range IT/TSMO framework:** IT and TSMO shared benefits can be identified and formally documented in a long-range IT-TSMO framework to provide both groups a guide for future needs.
- **Develop IT policies that support TSMO:** IT policies that are developed for a wide range of efforts may not support TSMO efforts and may call for modification or new rules to better respond to the unique operational environment. Such policy changes likely require the input and approval from TSMO, IT, risk management, legal, and other teams prior to being implemented. Agencies should consider the administrative and legal frameworks in which they operate when developing or modifying policy or regulatory approaches to support TSMO efforts.
- **Define and coordinate data sharing and access agreements:** TSMO functions that include outside partners, either for data or access, can formalize the arrangements through written agreements.

RTOC personnel can also benefit by talking with other agency TOCs which have already implemented third-party data to assess best practices and common challenges to help focus their efforts.

6.4 Performance Measurement

Performance Measurement Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Human performance	Despite increases in automation for TOC functions, human capital will always be a critical component of TOC operations. Regular evaluation and measurement of staff performance in key operational areas is a tactic to maintain quality control and consistency of practice.	<ul style="list-style-type: none"> • Improved staff support • Performance Measures

⁹ FHWA Practices for Improving the Coordination of IT and TSMO Resources: A Reference Document

Performance Measurement Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
System performance	The efficient and consistent performance of TOC systems is the lifeblood of the operation. Measuring this performance (e.g., device uptime/downtime, maintenance requirements) is a way to identify and assess problem areas when they occur and help with planning for device end of life and funding of capital projects for replacement equipment.	<ul style="list-style-type: none"> Operational Resilience System reliability Daily operations Planning for operations and maintenance
Consider staff priorities as well as agency goals when developing KPIs/performance measures	Consideration of staff priorities is a good practice to keep operators engaged and provide them with useful information to help them perform daily functions. Staff priorities should be balanced, as much as feasible, with broader agency performance goals	<ul style="list-style-type: none"> Staffing support Planning
Provide accurate, real-time travel information of road conditions.	In addition to real-time travel time information, road condition information is critical to driver decision making with regard to speed and other behaviors which can directly impact safety.	<ul style="list-style-type: none"> Planning for operations
Incident Durations & Secondary Crash Data	FHWA estimates about 20% of crashes are “secondary crashes.” These crashes are usually more severe than the initial crash. Measuring incident duration and secondary crash information will allow TOCs to develop strategies to reduce the incident timeline, and also inform any TIM task forces that may collaborate with them.	<ul style="list-style-type: none"> Incident Management Planning for operations Inter-agency information sharing, cooperation, and coordination
Delay and Reliability Measures	Travel time reliability can highly influence traveler behavior and is tied directly to the perception of credibility for a TOC. This data is important because it better quantifies the benefits of traffic management and operation activities beyond simple averages	<ul style="list-style-type: none"> Traveler Information Congestion/Mobility management

Table 18: Performance Measurement Strategies

6.5 Interagency Partnerships

Interagency Partnerships Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
Elevate “Planned” services to “Existing” (Regional ITS Architecture)	TOCs should maintain close contact with stakeholders identified in a Regional ITS Architecture to advance any planned services as much as possible to bring them into existence.	<ul style="list-style-type: none"> Planning/Funding
Develop additional MOUs when possible/feasible	TOCs seeking to increase stakeholder engagement and partnerships can benefit from advancing the development of Memoranda of Understanding and/or formalized agreements with external agencies whenever possible	<ul style="list-style-type: none"> Inter-agency information sharing, cooperation, and coordination
Expanded regional detour planning (multistate)	Detour information is critical during times of emergencies and incidents that impact the transportation network. Expansion of detour planning	<ul style="list-style-type: none"> Planning Incident Management

Interagency Partnerships Strategies		
Strategy	Strategy Detail	Potential RTOC Benefit
	to include adjacent states is a strategy to not only manage traffic but foster partnerships that yield an even wider range of operational benefits.	<ul style="list-style-type: none"> • Congestion Management
Expand resource sharing with outside agencies	Two-way resource and information sharing with outside agencies provides greater situational awareness and operational support to improve accuracy of traveler information. The extent of resource sharing can also extend to physical resources such as maintenance equipment to enhance incident management.	<ul style="list-style-type: none"> • Inter-agency information sharing, cooperation, and coordination • Incident Management
Expand data sharing/overcome IT constraints and firewall issues – involve IT in all initiatives	Similar to resource sharing, data sharing is also critical to situational awareness and real-time decision making for operations. TOCs can benefit from engaging their technology partners both internally and externally to overcome common issues and constraints that can limit or completely prevent success in this strategic area.	<ul style="list-style-type: none"> • Inter-agency information sharing, cooperation, and coordination • Incident Management • Performance Measures
Embrace the Regional ITS architecture to foster partnerships and collaboration.	A cornerstone of a Regional ITS Architecture is the benefits it can yield in terms of collaborative planning and funding to avoid redundant projects and increase the efficiency of project development and completion.	<ul style="list-style-type: none"> • Planning/Funding • Inter-agency information sharing, cooperation, and coordination
Reinvigorate and maintain regional partnerships to achieve operational and safety goals.	Connecting with regional partners, especially in the emergency response community, is key to improving operations and incident management. A TOC sharing perspectives and insights with responders allows for development of a common operating picture that can improve incident management as well as safety for both responders and the traveling public.	<ul style="list-style-type: none"> • Inter-agency information sharing, cooperation, and coordination • Incident Management

Table 19: Interagency Partnerships Strategies

7. Needs Assessment Introduction and Purpose

As a Strategic Planning tool, a Needs Assessment serves to help an organization pinpoint how it will accomplish its strategic goals. For the purposes of developing the Monroe County RTOC Strategic Plan, a Needs Assessment can help target growth and improvement of overall transportation operations, policy and program decisions, systems and technology, training, and both internal and external agency coordination and information sharing.

The purpose of this section of the Strategic Plan is to document the RTOC's needs and suggested actions required to achieve them over the course of the larger Strategic Plan timeline. Emphasis will be placed on a pragmatic approach to promote high level actions that are realistically achievable to address the needs and close the gaps. The actions identified for each need in this section will set the stage for more detailed and specific recommendations which will be outlined in the following section, Draft Recommendations.

It is important to remember that there can be several types of “needs,” ranging from those that are the opinion of a single individual or small group and those that are more globally recognized throughout an agency. The needs identified in this section represent those that have been identified and agreed upon by members of the RTOC Steering Committee and outlined in Inventory and Business Concept, while gaps are identified as inconsistencies between the vision and goals established for the RTOC and the current state of operations.

Additional content has also been obtained from on-site stakeholder interviews that were conducted as part of the 2020/2021 I-490 Integrated Corridor Management project, regional planning documents, and broader shared goals and best practices of TSMO programs and TOCs throughout the country.

Below, needs and gaps are illustrated and explained in several operational dimensions that span the major facets of RTOC operations. Each operational dimension presents needs and gaps on a table with high level actions that can be taken to begin fulfilling their respective need or gap. The operational dimensions are as follows:

- Workforce & Staffing
- Business Processes
- Systems & Technology
- Performance Measurement
- Interagency Partnerships
- Other Considerations

7.2 Needs/Gaps Assessment & Actions

7.2.1 Workforce and Staffing

As the RTOC aims to pursue new operational strategies and provide a wider array of services in the future, additional staff will likely be necessary to maintain efficient operations. Staffing is a concern that has been consistently identified in previous sections for the development of the RTOC Strategic Plan and was also a key concern identified in the I-490 Integrated Corridor Management Plan. Not only is it important for the RTOC to have a sufficient workforce, but that workforce must be structured in such a way that the operations of the facility are well organized and efficient.

Key to the success of many of the desired services that RTOC intends to offer is a data analyst/Traffic Operations Specialist. At one time the RTOC did have a short-lived Transportation Analyst (now referred to as the Traffic Operations Specialist) position, however the position has remained unfilled for several years. An analyst on staff would allow the RTOC to position itself to take a more proactive approach to operations and incident management through the use of analytical tools including performance dashboards to increase daily operational efficiency and provide justification for continued and expanded funding.

Workforce and Staffing	
Need (N) / Gap (G)	Action(s)
(G) Additional Staff to support daily operations and fill vacant positions and newly created positions.	<ul style="list-style-type: none"> • Develop a staffing plan designed to meet future organizational and operational demands. Assess and refine Knowledge, Skills, and Abilities (KSAs) for all positions, and update organizational charts.

Workforce and Staffing	
Need (N) / Gap (G)	Action(s)
(N) Formalized Operator Training Programs to support consistent operational efforts and outcomes	<ul style="list-style-type: none"> Identify gaps between current staff qualifications and desired future KSAs Designate a Training Coordinator or Training Committee to develop and maintain an Operator Training Program Develop a “jump start” guide for new operators to augment their operator “job shadowing” process.
(N) Education and skills advancement to support employee development	<ul style="list-style-type: none"> Integrate RTOC staff with broader training initiatives where possible to develop skills/promote advancement Develop a work plan to develop elevated skillsets amongst RTOC staff to meet the challenges of evolving technology and services.

Table 20: Workforce & Staffing Needs Assessment

7.2.2 Business Processes

As the RTOC plans to widen its scope of operations, it may prove beneficial for the facility to review a number of its business processes related to operational consistency and resiliency. The COVID-19 pandemic illustrated the need for the RTOC to become more resilient in the face of unprecedented scenarios. Meanwhile, differing levels of operator engagement across operational shifts highlighted in the Inventory indicates a need for greater consistency of practice within the RTOC.

As the COVID pandemic illustrated, unprecedented circumstances that drastically impact work environments are events that should be anticipated and planned for in advance. By developing a Continuity of Operations Plan (COOP), the RTOC can map out appropriately scaled actions to continue operations in the face of major events that compromise the RTOC physical facility or its personnel. These plans could potentially be supplemented by increased remote access capabilities for operators. The RTOC did remain staffed despite COVID-related stay-at-home mandates through the use of modified and reduced staffing levels, which was possible due to a dramatic and unprecedented reduction in traffic volumes and operations activities. However, there is still a need to develop a COOP to account for other circumstances that may keep operations staff out of the building in an environment where traffic volumes have returned to pre-pandemic levels.

Business Processes	
Need (N) / Gap (G)	Action(s)
(G) SOPs emphasizing scenario-based protocols	<ul style="list-style-type: none"> Convene a working group to conduct a full review and revision of SOP content. Institutionalize SOP review processes to ensure accuracy and relevance.
(N) Incident Response Plans to create consistency among operator solutions	<ul style="list-style-type: none"> Convene a working group to develop Incident Response Plans to lessen discretionary decision-making amongst operators.
(N) Continuity of Operations Plan to ensure continuous RTOC support even during unprecedented circumstances	<ul style="list-style-type: none"> Convene a multi-agency working group to develop a COOP and scheduled review intervals for updates.
(N) Remote Operations Access to supplement continuous RTOC support by enabling employees to work from anywhere	<ul style="list-style-type: none"> Work with multi-agency IT personnel and RTOC management to develop a Concept of Operations and draft policy documents for remote work.
(G) Enhancement and Expansion of Social Media Connections to make information more accessible to the public and stakeholders	<ul style="list-style-type: none"> Engage NYSDOT and MCDOT Public Relations to strategize improved social media presence.

Business Processes	
Need (N) / Gap (G)	Action(s)
(G) Integration of TSMO into planning, design, and construction activities to further integrate the RTOC into regional discussions, reports, and designs	<ul style="list-style-type: none"> Engage NYSDOT TSMO Coordinator(s) and their MCDOT equivalents.
(G) Expansion of real-time traveler information services	<ul style="list-style-type: none"> Assess existing infrastructure as well as available technologies and sources (including third party) for expanded traveler information services. Leverage additional resources available through 511NY.

Table 21: Business Processes Needs Assessment

7.2.3 Systems and Technology

Systems and technology are the beating heart of the RTOC and other similar facilities and are responsible for maintaining daily operations of a wide array of Intelligent Transportation Systems devices and traffic signal networks. Currently the agencies within the RTOC, NYSDOT and MCDOT, do not utilize common systems, software, or technology (with few exceptions). As efficiency is a core goal for a facility such as the RTOC, solutions to these discrepancies should be considered.

Throughout the development of the RTOC Strategic Plan, it was noted that the RTOC's field equipment is aging and potentially outdated. The RTOC should consider advancing efforts towards developing a modernized asset management system. The speed of technology development has resulted in shorter lifecycles for hardware in both center and field environments. As a result, many traffic operations centers are faced with scenarios in which hardware sits inoperable in both environments as suitable repair parts are no longer being manufactured.

Systems and Technology	
Need (N) / Gap (G)	Action(s)
(G) Integration of NYSDOT and MCDOT networks and software suites as much as possible to streamline operations and improve efficiency	<ul style="list-style-type: none"> Convene a working group of operations management and IT staff to identify potential paths to increased sharing of network resources.
(G) Centralizing, consolidating, and removing operational redundancies to introduce new, standard networks/systems	<ul style="list-style-type: none"> Convene a working group of operations management and IT staff to identify systems performing identical or similar functions and assess centralization/integration opportunities.
(N) Standardized center equipment for both NYSDOT and MCDOT	<ul style="list-style-type: none"> Adopt standards and include them in applicable agency specifications to improve interoperability and streamline maintenance.
(G) Develop modernized asset management system for center and field equipment	<ul style="list-style-type: none"> Assess current asset management practices and identify gaps/areas of improvement. Assess RTOC systems and develop an equipment lifecycle plan to minimize obsolescence.
(G) Data acquisition/sharing with third party developers	<ul style="list-style-type: none"> Evaluate use of existing third-party data and identify other potential sources/uses under the Data-as-a-Service model.
(N) Predictive analysis/forecasting to enable proactive approach to traffic management	<ul style="list-style-type: none"> Examine current data quantity and quality and identify the RTOC's current and future capabilities to pivot from reactive to proactive operations.

Table 22: Systems and Technology Needs Assessment

7.2.4 Performance Measurement

Performance measures are a key driver in advancing planning for operations and are prominently featured in both regional and statewide planning documents. The adage “what gets measured gets managed” has become a mantra for many TSMO programs and traffic operations centers nationwide as they seek to stand out amongst a crowded field of other transportation programs seeking funding. The RTOC has been actively engaged in developing a performance measure program that will be utilized to give the RTOC a more proactive approach to traffic management.

Performance Measurement	
Need(N) / Gap (G)	Action(s)
(G) Performance measurement database for archiving and analyzing incoming transportation system data over time	• Deploy performance measurement database currently in development and assign roles and responsibilities for use and maintenance.
(G) Develop/distribute regular performance reports	• Develop procedures for collecting, analyzing, and distributing performance measure information.
(G) Transportation Operations Analyst	• Revisit and revise job description for an Operations Analyst position and begin recruitment efforts.
(G) Additional data from third party sources to enhance services and operations of the RTOC	• Identify desired data and collaborate with multi-agency IT personnel to assess feasibility of increased data sharing and access agreements.

Table 23: Performance Measurement Needs Assessment

7.2.5 Interagency Partnerships and Agreements

Inter-agency Partnerships are critical to the success of the RTOC. The RTOC itself is built on the partnership between MCDOT and NYSDOT (as well as NYSP and the Airport Authority). Additionally, the RTOC relies on partnerships with many outside agencies and organizations for the data that is pivotal to their observation of the local traffic system as well as for resolving issues as they arise. The RTOC will depend upon an even more robust pool of data in the future, as its services expand – this will entail new collaborative relationships to manage and organize.

Interagency Partnerships and Agreements	
Need(N) / Gap (G)	Action(s)
(G) Formalization of internal and external agreements/MOUs (as applicable and beneficial)	• Develop or revise an MOU template that can be applied to multiple stakeholders.
(N) Revitalization of the TOCC (with potential new members) to build agency relations and partnership for operations and incident management.	• Assign a RTOC representative to liaison with previous and potential new members of the TOCC to re-establish and sustain the program. • Guided TMC Educational Tours
(G) Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC	• Assess current agreements and determine what operational activities would benefit from new formalized agreements and partnerships.
(G) An ITS architecture reflective of the RTOC’s and other stakeholders’ current plans for regional services	• Working with planning partners at the Genessee Transportation Council, develop an ITS Architecture specific to RTOC systems and have RTOC staff participate in architecture updates.

Table 24: Interagency Partnerships and Agreements Needs Assessment

7.3 Other Considerations

Outside of the RTOC itself, there are a number of factors at play that contribute to the operational success of the facility. It will be important that considerations are made for the field equipment and the communication infrastructure that provide data to the RTOC. Additionally, there are numerous industry practices among TMCs/TOCs which the RTOC may wish to consider in addition to those already suggested above. These best practices, outlined in greater detail in the Business Concept are presented in Table 6 below.

Other Considerations	
Need(N) / Gap (G)	Action(s)
(G) Resilient data communications infrastructure	<ul style="list-style-type: none"> Assess field/center systems resiliency and recovery capabilities, and consider adding to COOP.
(N) Standardized field equipment for both NYSDOT and MCDOT	<ul style="list-style-type: none"> Convene a working group to develop field equipment standards to improve interoperability and streamline maintenance.
(N) Decision Support Systems (DSS)	<ul style="list-style-type: none"> Investigate potential role of DSS and associated data sources in future RTOC operations.
(N) Systems Engineering process	<ul style="list-style-type: none"> Integrate the Systems Engineering Process where practical to integrate RTOC operational needs in project development.

Table 25: Other Considerations Needs Assessment

7.4 Challenges and Constraints

The Monroe County RTOC and other centers like it rely on advanced technologies which require dedicated management, staff with specialized skills and training, and operating and capital funding. TOCs face complex institutional issues in coordinating with service providers in response to incidents, and function within a time critical environment which is a culture that differs drastically from most other segments of a public agency.

Meeting these challenges and customers' expectations requires pursuing a wide variety of both proven and innovative strategies to realize the full potential of the investment that has been and will continue to be made in the RTOC. Challenges and constraints for the RTOC in meeting needs and closing the gaps identified in this section are not unlike those faced by similar TOCs nationwide. On a broad scale, the amount of available time, resources, and personnel are consistent challenges for any TOC, especially in environments where personnel have multiple job responsibilities. To manage resource constraints and the increasing complexity involved in managing and operating the RTOC, it is essential that all staff have access to the technical guidance, best practices, training, innovative techniques and technologies, and fact-based tools to assist them in improving RTOC performance and services. In that vein, it will be critical for the RTOC to begin planning for staffing expansion to better balance workloads and increase overall efficiency. Identifying personnel with the skills and background to manage an increasingly data-driven operation will also be a focus area, and the RTOC will face the challenge of choosing to elevate the skills of existing operations staff or recruit new personnel.

Communications is another key challenge, and the best intentions for interoperable cross-disciplinary communications are often hampered by technological, institutional, or policy barriers. As a result, operations become less efficient which impacts roadway operations in the form of increased congestion and longer incident durations.

While funding is traditionally a challenge for TOCs, the Monroe County RTOC is uniquely positioned to maintain a prominent place in the funding landscape with a consistent presence on the Genesee Transportation Council's Transportation Improvement Program (TIP). Maintaining an upward trend in operational impact and performance will be key to maintaining this position on the TIP.

Partnerships, both internal and external, must also be developed and maintained to improve RTOC operations. The management of the transportation system and the variety of planned and unplanned incidents which impact it are part of a team approach comprised of the RTOC and many other regional agencies. However, current efforts and outreach to galvanize a teamwork environment and develop a common operating framework among those agencies are limited and are influenced heavily by the staffing and workload challenges noted earlier in this section. A key challenge to success in this area is elevating the effort beyond individual "champions" into a more structured and institutionalized effort. This effort should account for the RTOC's needs while also considering differing cultures and priorities of other agencies and demonstrating tangible value and a return on the time investment made by participants.

8. Draft Recommendations Introduction and Purpose

This technical memorandum aims to provide the RTOC with more detailed recommendations that can be used to address the needs and gaps identified in Technical Memorandum 3 – Needs Assessment while also aiming to fulfill the goals determined in Technical Memorandum 2 – Business Concept.

8.1 Methodology

In keeping with the structure established during development of the previous tech memos, these draft recommendations are rooted in operational change strategies defined by FHWA and tailored to meet the needs of the Monroe County RTOC's operational environment based on feedback obtained from members of its Steering Committee. Throughout this tech memo, needs and gaps previously identified are presented in multiple tables separated by operational dimensions as follows:

- Workforce & Staffing
- Business Processes
- Systems & Technology
- Performance Measurement
- Interagency Partnerships
- Other Considerations

Tables are divided to illustrate needs and gaps that were derived specifically from the Monroe County RTOC Steering Committee and those based upon best practices of TSMO programs nationwide.

Following the tables, detailed draft recommendations are listed within the operational dimensions identified in the Needs Assessment tech memo. Recommendations are not linked directly to specific needs or gaps, as they may often influence many or perhaps all within the specific dimension. Similarly, some recommendations may also be applicable across several other operational dimensions. Each recommendation is intended to fulfill specific needs or gaps identified in the Needs Assessment as well as meet regional goals, national best practices, or Steering Committee feedback.

Recommendation alignment can occur with one or all of the following, meaning that the recommendation goes beyond its written objective, it also works towards fulfilling a regional goal, etc.:

- **NYSDOT TSMO Strategic Plan Goals**



- **GTC TSMO Plan Goals**



- **FHWA identified National Trends and Best Practices**



- **RTOC Steering Committee (comprised of MCDOT and NYSDOT Leadership) Feedback and Discussion**



Additional context for each recommendation can be found in the Considerations and Constraints section following the recommendation. The “Association with Regional/Statewide Goals, National Best Practices, and Steering Committee Feedback” section provides specific details on the sources and alignment of each recommendation. The purpose of these recommendations and all of the supplemental context is to provide specific, actionable items for the RTOC to consider and potentially implement throughout the next decade.

During a review of the recommendations with the RTOC Steering Committee, some members began to refer to certain recommendations as “gold star[s]”, indicating those of particular relevance to the Steering Committee’s current interests and pursuits. While all of the following recommendations should be considered, recommendations with gold star status may warrant extra weight when determining actions for the next 10 years of RTOC operations. Gold star recommendations are indicated in the with icons, following the symbology below, next to the recommendation name:

Highest Relevancy: ★★★★★

Significant Relevancy: ★★★

Moderate Relevancy: ★★

Low Relevancy: ★

8.2 Recommendations

8.2.1 Workforce and Staffing

The core of the Monroe County RTOC is the staff who facilitate and manage the services that operate and maintain the regional transportation system. Staffing is a consistent concern for the RTOC as it expands its roles and responsibilities in a constantly evolving transportation technology environment. As the facility aims to provide a wider array of services, staffing quantity and quality will continue to be a primary focus, which is supported by feedback received during the Needs Assessment phase of the Strategic Plan development. Additionally, RTOC staff will need to be equipped with the appropriate skillsets to efficiently and successfully manage transportation systems of higher complexity, which can be achieved through a combination of training and continuing education.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Additional Staff to support daily operations and fill vacant positions and newly created positions. Incident training connecting to emergency services, to be prepared for events 	<ul style="list-style-type: none"> Formalized Operator Training Programs to support consistent operational efforts and outcomes Education and skills advancement to support employee development

Table 26: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Workforce and Staffing

Recommendations: Workforce and Staffing

Recommendation: Consider additional MCDOT Traffic Control Operators to support the existing staff.



Source(s):  RTOC Steering Committee

Considerations and Constraints: A recurring theme identified throughout the development of the Strategic Plan was staffing levels and their capacity to effectively facilitate operations. It is recommended that the RTOC assess current staff workloads and identify potential adjustments to the dissemination of work and/or quantity of staff. A key element of this process will also involve evaluating required educational background or equivalent work experience to ensure suitable personnel are hired.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to solve the “Additional Staff to support daily operations and fill vacant positions and newly created positions” Need identified in the Needs Assessment. This recommendation is primarily sourced from previous discussions with the RTOC Steering Committee, who have highlighted concerns over on-going short staffing.

Recommendation: Evaluate staggered shift schedules for MCDOT operations staff beyond 6pm to increase efficiency and streamline NYSDOT operations during traditional off-hours for MCDOT.




Source(s):  RTOC Steering Committee

Considerations and Constraints: In the current operational environment, MCDOT employees transition their responsibilities to contracted NYSDOT employees at the end of their workday each day during the week and all day on weekends. This adds an additional layer to the process of coordinating signal work during “off hours” and could potentially cause delays for incidents of higher criticality. Having qualified staff working outside of traditional office hours would allow for more efficient operational responses, however, it is understood that there may be inherent contractual stipulations or other human factors that may render this recommendation unfeasible. This effort would likely require new policies or a revision to those that exist currently – framing the employment of staff to the RTOC rather than one of the specific agencies within could potentially suffice in this case.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to solve the “Additional Staff to support daily operations and fill vacant positions and newly created positions” Need identified in the Needs Assessment and was proposed as an alternative solution to the MCDOT short staffing issue by the RTOC Steering Committee in previous feedback.

Recommendation: Evaluate the benefits of cross-training additional personnel on second and third shift operations tours in basic signal maintenance to improve off-hours response efficiency. ★★

Source(s):  RTOC Steering Committee

Considerations and Constraints: As an extension of the previous recommendation, the RTOC may find benefit in cross-training off-hours contracted staff in baseline signal maintenance procedures to help reduce the number of off-hours callouts. This training would likely be limited to those actions which could be performed via software systems within the RTOC without any requirement for off-site fieldwork. However, efforts in this area could be constrained by internal network policies related to sharing access to signal system software with partner agencies.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to solve the “*Additional Staff to support daily operations and fill vacant positions and newly created positions*” Need identified in the Needs Assessment and was proposed as a potential alternative/supplement (to the previous recommendation) solution by the RTOC Steering Committee in prior feedback.

Recommendation: Reassess Traffic Operations Specialist (formerly Transportation Analyst) position description and develop hiring plan to fill vacant position. ★★

Source(s):  RTOC Steering Committee  TSMO Strategic Plan

Considerations and Constraints: Previous efforts to fill the NYSDOT Traffic Operations Specialist position have been largely unsuccessful. The position was occupied briefly but has been vacant since that individual left the RTOC. While this position was previously in place to benefit NYSDOT, it can and should be leveraged to support both MCDOT and NYSDOT operations. It is possible that instead of working directly for NYSDOT, the Traffic Operations Specialist could work for the RTOC itself, so that both agencies could utilize it. As data analytics represent a large part of modern-day transportation operations, the RTOC should assess the specific needs of both MCDOT and NYSDOT, the quantity and quality of data available, and the level of technical skill would be required for a candidate to achieve success and bring value to improving the RTOC’s contributions to regional transportation operations. Based upon Steering Committee feedback this position could be thought of as an elevated Operator rather than a full-blown data scientist. These types of positions are often difficult to hire as TOCs are unable to clearly articulate their needs to identify candidates with suitable skillsets. Often, these challenges for public sector agencies are also compounded by pay rates that are not comparable with private industry.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation is specifically sourced from Steering Committee feedback, specific to the NYSDOT members, related to the currently unfilled, Traffic Operations Specialist position. This position is critical to the larger aim of becoming a more Performance Measurement oriented facility. This recommendation further aligns with the NYSDOT TSMO Plan goal of “*Support enterprise-level systems and data for performance driven TSMO approach*”.

Recommendation: Consider training on interpretation of alternate (e.g., third party providers) data sources to improve real-time operational decision-making. ★


Source(s):  

Considerations and Constraints: As a potential extension of the Traffic Operations Specialist position recommendation, the RTOC would yield benefits from an assessment of third-party data sources, such as WAZE, and their potential integration into RTOC systems to improve real-time operational decision making. Third parties provide a broad stream of data to TMC operators and also consume data provided by other facilities for their own applications and distribution channels. With this effort would come an increase in the need to properly process, manage, and validate this information which could help inform and refine the skill and educational requirements for a Traffic Operations Specialist.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation originates from a national best practice identified by FHWA, “*Train TMC Operators on How to Interpret Alternate Data Sources to Support Operations Decision Making*” which fits into the larger national trend of “*Involvement of Third Parties in Data and Traveler Information*”. This recommendation directly supports RTOC Steering Committee objectives to utilize wider arrays of data in future operations.

Recommendation: Investigate reconfiguration of space to improve internal communication such as quadrants or pods for operators and supervisors. ★ ★ ★ ★

Source(s): 

Considerations and Constraints: Physical space at the RTOC is at a premium with little to no room for additional expansion. While a building rehabilitation project is scheduled to begin in 2026 there may be an opportunity to investigate potential structural reconfigurations that would improve overall communications and information flow on the operations floor. However, this project will largely focus on overhauling mechanical elements of the building so any reconfigurations of the RTOC space would likely fall outside the scope of that effort. According to the Steering Committee, experimentation has already begun to make better use of the operations floor for communications purposes. A major component of successful reconfiguration will be defining which staff are involved in active transportation management and should belong on the actual operations floor. As there are no defined standards for TMC facility space needs, determining best practices may rely on anecdotal examples. Because the RTOC operates in a similar style as a 911 Emergency Operations Center, the RTOC Steering Committee could conduct a scanning tour of Monroe County’s 911 facility and those of nearby counties to identify best practices in the use of space and communications center furnishings that may allow for some degree of improvement. An extended benefit of these scanning tours would be relationship building between the RTOC and 911 center personnel who often work together for coordinating traffic incident management.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation originates from previous discussions with the RTOC Steering Committee regarding concerns of decreasing facility space (in relation to proposed increasing staff sizes) and was proposed in feedback to the Needs Assessment.

Recommendation: Review the current RTOC operator training program and consider the benefits of a structured and formalized program with standard curriculum to augment job shadowing. ★ ★

Source(s):  

Considerations and Constraints: While job shadowing and observation of experienced personnel is a long-standing practice in transportation operations, there are many opportunities to improve learning experiences for new operations staff. A training program that balances both job shadowing and a structured hands-on experience yields a more well-rounded experience for operators and contributes to greater consistency in operational practices in a 24/7/365 environment. This approach could utilize a variety of strategies including software simulations and online interactive e-learning courses. Any materials that are applicable to both MCDOT and NYSDOT can be shared. As an extension of this process, a similar approach could be used in continuing education modules that may be used to drill existing staff for internal re-certification or for staff who may be assuming additional responsibilities/roles. When constructing training materials, it is critical to set expectations for what the training is desired to achieve.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to satisfy the Need for a “*Formalized Operator Training Programs to support consistent operational efforts and outcomes*”, identified in the Needs Assessment. The recommendation is sourced from the FHWA “*Create a TMC Operator Training Program*” defined strategy found within the larger “*Nimble Service-Oriented Program Mindset and Organizational Structure*” national trend. FHWA does identify several other training related strategies that also relate to the one listed here. The RTOC Steering Committee has previously mentioned that the RTOC staff undergo constant training to utilize new systems and processes, however their initial training is largely shadowing. NYSDOT is currently working on rolling out an Onboarding Academy, which is similar to this recommendation and something MCDOT may want to also consider.

8.2.2 Business Processes

While the RTOC has consistently provided numerous traffic services to the public since its inception, there will always be opportunities to improve the facility’s efficiency and strengthen its position and impact in regional transportation. A significant focus area for the RTOC is operational resiliency and the need for documented protocols to ensure operational continuity in the event that regular operations at the facility were significantly impacted.

Throughout the development of the Strategic Plan, it was noted that RTOC operators often use their own personal discretion when implementing traffic management solutions and incident response strategies and tactics. While every situation may be unique and call for a different solution, there is a lack of consistency in how operators are guided in determining these solutions. As an extension of this condition, the RTOC’s Standard Operating Procedure documents have been identified as an area of improvement as they are often more akin to software and system user manuals than actual scenario-based operational procedures.

A challenge that the RTOC currently faces is improvements to information dissemination to the public. The RTOC is currently somewhat limited in its ability to actively share information in ways the public can easily access to make travel decisions that will not only influence the individual motorists but also other impacted areas (e.g. nearby arterials) of the roadway system.

Finally, it was discovered that while the RTOC is accounted for in GTC planning documents, the RTOC (and many similar facilities throughout the state) was not mentioned in any state level planning documents. As a result, many visions of the region’s future transportation network did not account for the services that the RTOC provides and did not consider any improvements that would directly benefit the RTOC’s operations.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Continuity of Operations Plan (COOP) to ensure continuous RTOC support even during unprecedented circumstances Incident Response Plans to create consistency among operator solutions SOPs emphasizing scenario-based protocols Expansion of real-time traveler information services 	<ul style="list-style-type: none"> Remote operations access to supplement continuous RTOC support by enabling employees to work from anywhere Enhancement and expansion of Social Media connections to make information more accessible to the public and stakeholders Integration of TSMO into planning, design, and construction activities to further integrate the RTOC into regional discussions, reports, and designs

Table 27: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Business Processes

Recommendations: Business Processes

Recommendation: Develop and maintain a Continuity of Operations Plan (COOP) that accounts for the unique structure of the RTOC. ★★ ★

Source(s):  

Considerations and Constraints: While the RTOC functioned essentially as normal during the COVID-19 pandemic, the situation highlighted the need for contingency plans in the face of unprecedented or severe events. While there is a “loose” emergency plan in place, according to the RTOC Steering Committee, developing a full-fledged COOP would prepare the RTOC for these types of events, while potentially laying the groundwork for backup TMC locations, redundant systems/software, and remote access possibilities. The COOP, in conjunction with backup infrastructure, is critical to uninterrupted 24/7/365 RTOC operations, no matter the circumstances. A key consideration and potential constraint for a COOP is ensuring that all relevant stakeholders are included in the development process and regular reassessment intervals to ensure information is relevant when needed. Adequate funding for backup infrastructure and facilities may also be a constraint, as it may be difficult to justify funneling the RTOC budget towards facilities or tools that may rarely be used.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation directly addresses the Need for a “Continuity of Operations Plan to ensure continuous RTOC support even during unprecedented circumstances” identified in the Needs Assessment. This recommendation was developed from the FHWA identified best-practice of Continuity of Operations Planning. Previously, the RTOC Steering Committee noted that there were no existing plans for a COOP, however it was indicated that putting one together would be beneficial. While it was determined that such an undertaking was outside the scope of this project, the Strategic Plan could be used as the foundation for building a COOP.

Recommendation: As part of the ongoing conversion of SOPs to digital format, the RTOC should consider developing operational, scenario-based guidance. ★ ★


Source(s):  

Considerations and Constraints: As has been indicated by the RTOC Steering Committee, most SOPs are available digitally now, with the hardcopies being used as backups. It was previously noted by RTOC staff that many existing SOPs are more akin to software manuals or instructions, rather than actual situational protocols. While it is certainly important to have software user instructions readily available, materials rooted in scenario-based guidance, like IRPs, that support operator decision-making would provide greater operational benefit and can be shared between MCDOT and NYSDOT for off-hours shifts. To ensure that the lifespan of these SOPs, it is critical to tie in instructions to position titles rather than staff names. While employees change, the roles of each position should stay consistent. As an extension of this recommendation, the RTOC would also benefit from developing detailed SOPs for the systems environment, which would allow consistent and easily accessible knowledge base to operate and maintain the many systems that contribute to operation of the regional transportation network. It may be beneficial to compile both systems and operational SOPs into a digital platform, such as SharePoint, where the latest iterations can be accessed anywhere at any time and easily navigated to search for specific information. SOPs should be regularly reviewed/revise to reflect the current practices most accurately. Document compliance practices should be developed to track staff review and acknowledgements of SOP revisions— this can be done on platforms like SharePoint.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to satisfy the Need for “Incident Response Plans to create consistency among operator solutions” and Gap of “SOPs emphasizing scenario-based protocols”, identified in the Needs Assessment. The recommendation is primarily sourced from previous feedback received from the Steering Committee that indicated that many SOPs were not helpful to operators beyond references to software. Additionally, FHWA lists numerous strategies in various trend areas that deal with developing standard processes/procedures – these point to the more general need for development and documentation of the standards.

Recommendation: Assess appropriate remote access into TMC Software or Devices to supplement COOP and improve RTOC operational resiliency. ★ ★ ★ ★

Source(s): 

Considerations and Constraints: Enabling RTOC staff to connect to certain systems and software remotely under specific circumstances could potentially supplement a number of COOP protocols. However, such possibilities can pose security and legal threats related to certain types of data. Additionally, the remote location (e.g., operator home environments) would need to be assessed for networking capabilities prior to configuring remote access. Before implementing remote connection options, it would be critical to work with IT staff at both NYSDOT and MCDOT to ensure that all security requirements will be met. According to the RTOC Steering Committee, efforts have already been made to work towards remote access in order to make after-hours operations more efficient. So far this has proven possible as ATMS uses web UI.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to fill the Need identified in the Needs Assessment, “Remote Operations Access to supplement continuous RTOC support by enabling employees to work from anywhere”. This recommendation was based off of an FHWA defined strategy, “Allow Appropriate Remote Access into TMC Software or Devices” from the “Mobile Communications and Wireless Networks” trend. This strategy also tied in with previous Steering Committee discussions relating to remote access in the context of a COOP, where it was noted that it was likely not feasible but was still worth considering.

Recommendation: Consider developing procedures and protocols for expanding/enhancing the use of social media to disseminate (and potentially crowdsource) real-time traffic event information. ★ ★

Source(s):



Considerations and Constraints: While Monroe County social media accounts (Facebook and Twitter) are utilized by MCDOT to share some RTOC specific announcements as well as general travel alerts, it is possible to leverage social media to be a more effective tool for real-time traffic system information dissemination. Social media is an effective tool for transmitting and receiving critical transportation system information amongst other agencies and the public. For example, as a major congestion event occurs on a specific roadway, the RTOC could utilize Twitter to ‘tweet’ alerts to individuals about to travel in the region or passengers currently enroute, allowing them to make informed travel decisions. Non-driver occupants of vehicles could tweet at the RTOC to inform them of an incident that they happened upon. The RTOC could even leverage tools such as TweetDeck to easily organize the social feeds of other agencies to easily share relevant regional traffic information from an RTOC account. Enhanced social media communication could contribute to reduced congestion around incident scenes as well as the secondary crashes which may result. Expanding the current social media presence will likely require the development of specifications for what to share and who is responsible for sharing it – this could be a new dedicated position or an additional responsibility for an existing role at the RTOC. Additionally, the RTOC may want to consider developing its own dedicated accounts rather than utilizing the Monroe County accounts that currently post on their behalf. The content that will be shared should be considered when developing new accounts, for example Facebook may be better suited for sharing RTOC pictures or staff news, whereas Twitter may be the better location for consistent traffic updates.

Associations with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation is relatively broad and covers a number of needs/gaps in the business practices dimension including, “Enhancement and Expansion of Social Media Connections to make information more accessible to the public and stakeholders” and “Expansion of real-time traveler information services”. Social media usage for traveler information ties into NYSDOT’s statewide goal of “Serve as a trusted source of multimodal travel information”. Additionally, it aligns with an entire FHWA defined trend; “Social Media for Traveler Information and Crowd sourcing”. Within that trend, specific strategies such as, “Develop Procedures and Protocols for Use of Social Media”, “Support Two-Way Information Exchange Via Social Media”, “Utilize Crowd sourcing for traffic information, incident information, feedback on department performance, pavement roughness” are most applicable. This recommendation also works towards fulfilling the GTC goal of “Promote Partnerships and Collaboration to Support Regional Operations”. Discussions with the Steering Committee have also indicated an interest in taking a more active role in the sharing of information – It was previously noted that MCDOT

is already trying to update the social media accounts more frequently – this recommendation supports that effort suggests going even further.

8.2.3 Systems and Technology

The systems and technology that MCDOT and NYSDOT utilize are integral to the services that the RTOC provides. However, as discussed in previous tech memos, both agencies utilize separate networks and different software in nearly all cases. This is largely a result of differing IT/cybersecurity policies and preferences between the agencies coupled with differences in systems that are tied to divergent operational priorities. Expanding and normalizing operations between the agencies through common software and hardware would enable operators from both agencies to better match workflows and provide substitute operational support as is often required when MCDOT is off-hours.

As the RTOC intends to adopt a proactive approach to traffic management rather than their current reactive approach, new software and systems specifically designed for that purpose will need to be implemented and integrated. In order to properly facilitate these new systems, larger pools of data will likely be required in order to accurately map trends and make predictions for the future.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Integration of NYSDOT and MCDOT networks and software suites as much as possible to streamline operations and improve efficiency Standardized center equipment for both NYSDOT and MCDOT Integrate redundant systems as back-ups in the event of a critical failure 	<ul style="list-style-type: none"> Predictive analysis/forecasting Data acquisition from third parties or a data broker

Table 28: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Systems and Technology

Recommendations: Systems and Technology

Recommendation: Evaluate standardization of TMC-related networks, systems, and processes to create uniform workflows for NYSDOT and MCDOT in daily operations. ★★

Source(s):   

Considerations and Constraints: MCDOT and NYSDOT utilize separate networks and systems chosen to meet the specific operational requirements of their respective agencies. Logic dictates that a large number of unique or individual machines and/or applications that must be managed brings with them a greater demand and level of effort for operations staff. Consolidation of the two agencies’ data networks would allow for a “single source of truth” and provide consistent and uniform situational awareness. Consolidating systems and equipment would allow NYSDOT and MCDOT operational staff to better manage each other’s duties effectively when needed. Potential constraints in this area include agency IT policy, firewall restrictions, and other cybersecurity considerations. New networks and systems that meet the needs of both agencies would likely come as a significant investment, however the cost would likely be shared between the agencies. The RTOC Steering Committee has suggested that consolidation of the agencies networks/systems will most likely not be possible or necessary, however revising the way that the systems integrate could be the best way to maximize efficiency through better communication.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation applies to three needs/gaps: “Integration of NYSDOT and MCDOT networks and software suites as much as possible to streamline operations and improve efficiency”, “Centralizing, consolidating, and removing operational redundancies to introduce new, standard networks/systems”, and “Standardized center equipment for both NYSDOT and MCDOT”. This recommendation aligns with GTC’s TSMO Plan goal of maximizing program efficiency through resource and cost sharing while also aligning with the FHWA identified trend of “A Nimble Service-Oriented Program Mindset and Organizational Structure”. A specific applicable FHWA strategy from that trend area is “Adopt Standards on TMC Related Equipment and Processes”. Additionally, this topic has been previously discussed by the involved parties at the RTOC and it was determined that while it was likely that there would never be full integration of every network, system, etc., a shared network for use in major situations involving both agencies could be beneficial and feasible.

Recommendation: Evaluate the need for the creation of a new technology piloting and testing program to streamline the introduction of new standard systems and technology. ★ ★


Source(s):   

Considerations and Constraints: As the RTOC considers the implementation of new systems and technologies, creating a piloting program for testing will help to demonstrate they work as expected and will provide value to improving RTOC operations. Such a program would consume staff hours and perhaps some level of capital investment, so a risk/reward analysis or similar process should be conducted prior to utilizing the piloting program. Additionally, the “borrowing” of equipment from vendors should be vetted through agency policies and procedures prior to proceeding.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation is applicable to the numerous needs and gaps in the Systems and Technology that relate to the integration of new technologies or replacement of those that currently exist at the RTOC. This recommendation aligns with FHWA best practice strategy, “Create New Technology Piloting and Testing Program” which is categorized in the “Nimble Service-Oriented Program Mindset and Organizational Structure” trend area. The GTC TSMO Plan goal of “Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation” also aligns with this recommendation. While a broad piloting program has not been proposed by the RTOC Steering Committee, specific pilot programs have been planned and executed, such as the UPWP Study for Transit Signal Priority. The fact that the RTOC has engaged with these efforts indicates that the benefit of these programs is understood and that they can be applied at a larger scale.

Recommendation: Investigate the possibility of using open-source or non-proprietary software at the RTOC to foster greater interoperability and reduce costs. ★

Source(s): 



Considerations and Constraints: In the event that the RTOC’s agencies decide to consolidate to shared software, open-source or non-proprietary software is worth considering due to lower costs and continuous support from the development community. However, this approach carries with it increased data security risks, as many open-source software applications do not meet the same level of protection or privacy offered by proprietary counterparts. The RTOC Steering Committee expressed doubt that

open-source software could be utilized due to the need for constant back-end support that would essentially shackle the RTOC to another organization for as long as the software is utilized. As open-source software does not seem to be viable, the RTOC should aim to have an end-user perspective on new proprietary programs that are developed for operations – often times the developers and project managers in charge of providing new software are not aware of the exact needs of the RTOC which then creates issues upon implementation. If the RTOC continues to utilize proprietary software, it must be prepared to spend the money and time needed to have tools developed that will meet its exact needs.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation is most applicable to the “Centralizing, consolidating, and removing operational redundancies to introduce new, standard networks/systems” Gap, though it could apply to others in the Systems and Technology dimension. This recommendation primarily aligns with the FHWA strategy of “Use Open-Source or Non-Proprietary Software when Possible” which is from the larger national trend of “A Nimble Service-Oriented Program Mindset and Organizational Structure”. It could also be argued that this recommendation corresponds with the GTC TSMO Plan goal of “Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation”.

Recommendation: Evaluate the benefits of requiring Application Programming Interfaces (APIs) and documentation for future developments and integrations with new systems/databases. ★ ★


Source(s):  

Considerations and Constraints: With the proliferation of mobile devices and connected vehicle technologies that capture transportation information from many sources, the RTOC may want to consider a requirement that supports the use of APIs when engaged in traveler information software development projects. At a high level, APIs set forth protocols that ensure consistency among user interfaces which translates to quicker learning cycles for operators. It will be critical to document the APIs interfaces and developer access which may require extensive attention from IT staff, however it could reduce the time required to integrate new systems once they are selected.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation primarily corresponds with the FHWA strategy of “Require Application Programming Interfaces (APIs) and Document for Future Development” found in the “A Nimble Service-Oriented Program Mindset and Organizational Structure” trend area. This recommendation also fits with the GTC TSMO Plan goal of, “Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation”. The Steering Committee indicated that API documentation was being done by the Transportation Analyst while they were on staff. One of their primary jobs was to data-mine everything that the RTOC had available and put together a report. Since the Transportation Analyst (now Transportation Operations Specialist) position is empty that duty is no longer being performed.

Recommendation: Assess the feasibility of developing a data fusion engine to merge data from multiple sources, such as travel time information coming from toll tag readers, Bluetooth sensors, and/or third-party providers to streamline incoming data for more efficient reference by operators. ★ ★ ★

Source(s): 

Considerations and Constraints: In an environment where the RTOC receives data from outside sources to support its own data (coming from hundreds of field sensors), a data fusion engine could be used to

help ease the absorption of large quantities of data from numerous sources. An engine such as this could intake data directly from its respective source while converting it to a format that would be optimized to fit with RTOC systems, meaning that much of the data that was previously going unused previously, now could be utilized in some capacity. This would reduce inefficiencies and cut out the need for manual data conversion. A potential constraint would be the likelihood of a sizable cost associated with the development of a data fusion engine.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation works to address the Gap of “Data acquisition/sharing with third parties” identified in the Needs Assessment. This recommendation is tailored from the FHWA strategy, “Develop a Data Fusion Engine to Merge Data from Multiple Sources, such as Travel Time Information Coming from Toll Tag Readers, Bluetooth Sensors, and/or Third-Party Providers” found within the “Automation Tools and Related Tools to Increase Efficiency” trend. While it does not directly align with the goals or feedback of NYSDOT, GTC, or the RTOC Steering Committee, it does indirectly impact goals pertaining to collaboration, partnerships, and efficiency.

8.2.4 Performance Measurement

Performance measurement will be a key element in the RTOC’s evolution towards proactivity while also collecting the data necessary to illustrate key traffic system elements that must be accounted for in future regional plans. As of now, a performance measure database has completed development and is preparing for launch. However, it may be several months until enough data has been collected to start analyzing patterns and system performance. Once the database is fully functional the RTOC can begin to regularly pull system performance data – formalizing a previously ad hoc and infrequent practice. As alluded to in the Systems and Technology section above, performance measurement may require a larger pool of data than is currently utilized in order to function as effectively and accurately as possible. Perhaps most important to the RTOC’s performance measurement plans is the planned NYSDOT Traffic Operations Specialist position whose primary focus would be monitoring performance measures and acting as a data analyst. The Traffic Operations Specialist would essentially facilitate the entire performance measurement program for the RTOC.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Performance measurement database for archiving and analyzing incoming transportation system data over time Traffic Operations Specialist 	<ul style="list-style-type: none"> Develop/distribute regular performance reports Additional data from third party sources to enhance the services and operations of the RTOC

Table 29: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Performance Measurement

Recommendations: Performance Measurement

Recommendation: Utilize and assess the performance measurement database for the collection/analysis of data and develop a maintenance plan. ★★ ★

Source(s): 

Considerations and Constraints: As of the authoring of this tech memo, the RTOC’s performance measurement database is reportedly deployed. This database will be an efficient way to pull specific information, while also turning raw data into actionable items. By performing analyses of the traffic

system data this database will enable the facility to begin a more proactive/adaptive approach to traffic management in the region. This database will be crucial in fulfilling data requests from other agencies, driving new policies, and obtaining additional funding. As of now, there are no dedicated staff members specifically positioned to maintain or utilize this database, so filling the Traffic Operations Specialist role will be critical for facilitating a performance measurement program. It may prove beneficial to the RTOC to also analyze metrics automatically produced by the systems or software that is utilized, in order to ensure that they run as optimally as possible.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation works toward fulfilling the Gaps of a “Performance measurement database for archiving and analyzing incoming transportation system data over time” and “Develop/distribute regular performance reports” identified in the Needs Assessment. This recommendation generally aligns with the FHWA defined “Performance Monitoring and Management” national trend. The NYSDOT TSMO Plan goal of “Support enterprise-level systems and data for performance driven TSMO approach” also directly correlates to this recommendation. Additionally, while GTC does not have a specific performance measurement goal, this recommendation supports the GTC goal of “Maximize Transportation System Performance from the User Perspective”. The RTOC Steering Committee has indicated throughout the development of the technical memoranda that active/proactive management of the traffic system is a priority moving forward. This recommendation and all those in this operational dimension tie in with that vision. Not only that, but the performance measurement database is already being developed (and potentially launched at this point) – so the value in this recommendation is already understood and being acted upon.

Recommendation: Assess staff priorities in addition to agency goals in the development of performance metrics to ensure that the performance measurement database is collecting statistics of value to the RTOC. ★ ★

Source(s):  


Considerations and Constraints: The value of the performance measurement database will largely depend upon the extent to which relevant operational data is being collected and analyzed. RTOC staff, including operators, should be consulted often to assist in determining metrics that have the greatest impact on operations to help maximize the use and value of the system. Performance dashboards could be a simple way to showcase relevant metrics to different positions within the RTOC and allow for cognitive linking of the work being performed with the real-world results – for example it was stated by the Steering Committee that operators were interested in seeing crash resolution data. Over time, RTOC data interests will likely evolve as new services are provided and the traffic system grows, so it will be crucial to continuously evaluate and replace existing performance metrics to match.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: Like the previous, this recommendation works toward fulfilling the Needs Assessment identified Gaps of a “Performance measurement database for archiving and analyzing incoming transportation system data over time” and “Develop/distribute regular performance reports”. This recommendation generally fits into the FHWA “Performance Monitoring and Management” national trend and ties directly to “Proactively Develop Performance Metrics Based on Staff Priorities as well as Agency Goals” strategy. The RTOC Steering Committee has placed emphasis on proactive approaches to traffic management – which this recommendation would help achieve. In previous meetings, it was

discussed that the performance measurement database was being finished with some specific metrics in mind for collection (though they weren't clearly defined).

Recommendation: Assess the benefits of frequently processing/distributing measures of effectiveness (MOE's) for RTOC systems and Operators to improve operational effectiveness. ★


Source(s): 

Considerations and Constraints: Performance measures which track trends over extended periods of time are common in TOC environments and contribute to monthly quarterly, and annual reports. However, there is also potential value in more frequent assessments of Measures of Effectiveness to help the RTOC analyze internal operational efficiency. RTOC staff will need to determine what metrics will actually be observed in these MOEs. The findings can help facilitate internal changes at the RTOC in staff organization and responsibilities to potentially increase efficiency. Considering the nature of the MOEs it will need to be determined if they will be analyzed by the Traffic Operations Specialist or perhaps by a management level RTOC staff member.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to fill the "Develop/distribute regular performance reports" Gap from the Needs Assessment. This recommendation is primarily sourced from the FHWA strategy, "Frequently Process and Distribute Measures of Effectiveness (MOE's), Including to Operators, to Improve Operational Effectiveness" from the "Performance Monitoring and Management" trend.

Recommendation: Consider training operators in how to use performance monitoring and how to populate the data needed for performance monitoring to increase operational efficiency. ★

Source(s): 

Considerations and Constraints: In addition to filling the Traffic operations Specialist position, it may be advantageous for the RTOC to consider training most operators in basic data analysis principles. Doing so could enable them to assist the Specialist by correctly populating data or even doing basic interpretation. Training operators could also mean that they better understand the outcomes of analyses made by the Traffic Operations Specialist, which can help shape their actions as Operators. This type of training can also be a way to "home-grow" additional Traffic Operations Specialists (or similar positions) in the future.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to address the Gaps of a "Performance measurement database for archiving and analyzing incoming transportation system data over time" and "Develop/distribute regular performance reports". This recommendation generally aligns with most strategies in the "Performance Monitoring and Management" national trend identified by FHWA but most directly parallels the "Train TMC Operators How to Use Performance Monitoring and How to Populate the Data Needed for Performance Monitoring" strategy.

8.2.5 Interagency Partnerships

At a fundamental level, the RTOC is the product of multiple agencies working together. The primary partnership that enables the RTOC is between MCDOT and NYSDOT, however there are a number of other agencies that are also interconnected to varying capacities. While the RTOC currently operates

with its various partnering agencies (internally and externally), it has been noted that responsibilities/roles and what information is shared between agencies can become confusing as many of these elements are not documented – they are largely “handshake” agreements.

Not only is it beneficial for the RTOC to maintain agency agreements, but it is also advantageous to maintain its relationships with these agencies as well as new ones. Previously, the TOCC was utilized to align regional goals and partnerships for traffic related agencies and responders, however it has essentially gone dormant. Additionally, updating and maintaining an ITS architecture for the region will help to keep the RTOC and partnering agencies organized and aligned in their goals, supporting any efforts made at TOCC. The TOCC can also be expanded to include agencies that weren’t before, such as those from neighboring regions. Developing relationships with agencies not previously partnered with the RTOC will open opportunities for additional data sharing agreements. As the RTOC aims to widen its scope of service, any additional data will strengthen its ability to analyze trends and make predictions.

While the need for RTOC training has already been highlighted, joint training that goes beyond the inner workings of the RTOC, to more large-scale situations should potentially be conducted. This training would aim to get all respective agencies outside of the RTOC ready for major events that will require a group response.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Formalization of internal and external agreements/MOUs Revitalization of the TOCC (with potential new members) to build agency relations and partnership for operations and incident management Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC Joint drills that reinforce standard operating procedures during events that connect with EOC/911/NYSP/MCSO 	<ul style="list-style-type: none"> An ITS architecture reflective of the RTOC’s and other stakeholders’ current plans for regional services

Table 30: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Inter-Agency Partnerships

Recommendations: Interagency Partnerships

Recommendation: Consider developing formalized memoranda of understanding (MOU’s) and inter-agency agreements that facilitate multi-agency cooperation & operations. ★★ ★

Source(s):    

Considerations and Constraints: Reportedly, some of the MCDOT and NYSDOT’s informal agreements have been in place since the 1960s and ‘70s and the Steering Committee alluded to the MCDOT is “neck-deep” in handshake agreements. Given that daily RTOC operations are reliant on consistent communication and data sharing with agencies both internal and external, taking steps to formalize agreements is a worthwhile undertaking as a means of reducing risk exposure. Documenting roles and responsibilities along with potential limitations or liability concerns may help avoid future conflict, help direct funding priorities, and define the parameters of data or resource sharing. At a high level, it

develops consistency of practice that is essentially agnostic of staffing changes or potential differences in operational philosophies among individuals. However, formalized MOUs are often difficult to execute in a transportation operations environment. Misperceptions regarding potential legal liability may preclude agencies from participating in documented MOUs, and the RTOC should consider developing agreements that are positioned as non-binding.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation directly addresses the “Formalization of internal and external agreements/MOUs (as applicable and beneficial)” Gap identified in the Needs Assessment. This recommendation ties into GTC TSMO Plan goals relating to collaboration and partnerships such as, “Promote Partnerships and Collaboration to Support Regional Operations” and “Maximize Program Efficiency through Resource and Cost Sharing” as well as a similar goal found in the NYSDOT TSMO Plan, “Strengthen partnerships with internal and external stakeholders”. Alignment can also be found within the “Nimble Service-Oriented Program Mindset and Organizational Structure” FHWA trend, specifically the “Develop Memoranda of Understanding (MOU’s) and Inter-Agency Agreements Facilitating Multi-Agency (sometimes Multi-State) Cooperation & Operations” strategy. The RTOC Steering Committee has previously admitted that most of their agreements internal/external are essentially handshake agreements and has conceded that it may be beneficial to formalize some of them.

Recommendation: Evaluate the need to promote additional coordination with agencies responsible for arterial transportation management. ★ ★ ★

Source(s):   

Considerations and Constraints: The partnership between NYSDOT and Monroe County is demonstrable proof that state and local agency collaboration yields significant benefits. Expansion of coordination with other agencies responsible for arterial roadway management is a worthwhile consideration due to the inherent interdependence of freeway and arterial management. This coordination would potentially allow for better management of detour routes when freeways are impacted by incidents, thereby optimizing the performance of the regional transportation system. Coordination with arterial agencies will also be crucial for mitigating impacts from preplanned events such as PGA 2023 which will be hosted in the region later this year.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation addresses the Gap, “Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC” and directly ties into the NYSDOT TSMO Plan goals of “Enhance system safety and reliability by minimizing the impacts of travel disruptions” and “Strengthen partnerships with internal and external stakeholders”. The GTC TSMO Plan goal of “Improve Safety and Efficiency of the Multi-Modal Transportation System through Coordinated Management and Operations” also corresponds with this recommendation. This goal parallels the FHWA defined strategy, “Promote Coordination with Arterial Management Agencies” from the *Active Transportation and Demand Management (ATDM) Concept and Toolkit*.

Recommendation: Seek opportunities to share resources and data with other agencies and/or third parties (e.g., communication networks, cameras) as a means of developing beneficial relationships, improving situational awareness, and receiving a larger pool of data to enhance operations. ★★ ★

Source(s):    

Considerations and Constraints: Sharing resources with agencies external to the RTOC would enable the RTOC to effectively expand the reach of its field equipment, without the need for major investment. Agencies who may not be able to share physical resources with the RTOC may be able to instead share the data they produce. Data sharing would achieve similar results for the RTOC, enabling the facility to ‘see’ beyond their geographic purview into other areas that may still impact the regional traffic system. Recent trends show TOCs working with data from third-party, WAZE, to supplement their regional situational awareness – often times WAZE reports incidents and traffic system events before even 911 centers are notified. A larger available pool of traffic data, supplemented by any relevant source, can help the RTOC establish a more comprehensive understanding of the traffic system at a given time, while also providing systems, such as the performance measurement database, with the ability to perform better analyses. Conversely, similar benefits can be found if the RTOC shares data with external partners such as 511. 511NY is utilized by travelers in the region to make informed decisions about what roads to use or avoid – having real-time incident or congestion data from the RTOC would help supplement 511NY’s regional potential. Sharing of physical resources and/or data would likely rely on formalized agreements and potentially even some minor costs depending on the agency. Additionally, developing data validation standards and protocols would reduce the concerns of dubious data quality and ensure accuracy of RTOC operations.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation addresses the Gap of “Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC”. The recommendation was tailored from the national trend “Involvement of Third Parties in Data and Traveler Information” identified by FHWA. In particular the strategy defined by FHWA of “Look for Opportunities to Share Resources with other Agencies (e.g., communication networks, cameras) and Share Data Among Agencies” corresponds with this recommendation. Alignment is also found with two NYSDOT TSMO Plan goals, “Strengthen partnerships with internal and external stakeholders” and “Enhance system safety and reliability by minimizing the impacts of travel disruptions” as well as the GTC TSMO Plan goals of “Promote Partnerships and Collaboration to Support Regional Operations” and “Maximize Program Efficiency through Resource and Cost Sharing”. Additionally, the RTOC Steering Committee has expressed interest in partnering with some agencies that it has not previously. This is largely seen as a way to share resources or acquire data that RTOC staff would not have access to otherwise, giving the facility better situational awareness of the region.

Recommendation: Examine multi-agency procurement with a goal of achieving cost reductions in order to implement projects that benefit the RTOC and other local stakeholders. ★★ ★

Source(s):   

Considerations and Constraints: Another avenue to strengthen and formalize partnerships between the RTOC and its partners is shared acquisition of resources. Multi-agency procurement may allow multiple agencies with shared interests to realize reduced costs in procuring services/resources, while also having

the potential to establish common data standards to enhance future work in the area of data analytics and performance measures. Cooperation among the RTOC and its agencies during this process would invariably strengthen agency relationships which may result in formalized memoranda of understanding. It is critical to bear in mind that for this process to work effectively, there must be a clear understanding of expectations amongst all agencies involved, a definitive service/resource that all parties agree upon, transparent communications, and any potential issues (real or perceived) surrounding equity in the use and administration of shared resources should be addressed in advance before moving forward. Whatever transactions occur during shared procurement will need to be established in accordance with the RTOC's quarterly billing cycle as well.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation addresses Needs Assessment identified Gap, "Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC". This recommendation was tailored from the FHWA strategy of "Use Multi-Agency Procurement for Economies of Scale" found in the "Involvement of Third Parties in Data and Traveler Information" trend area. This recommendation aligns with the GTC TSMO Plan goals, "Maximize Program Efficiency through Resource and Cost Sharing" and "Promote Partnerships and Collaboration to Support Regional Operations". Additionally, the NYSDOT TSMO Plan goal, "Strengthen partnerships with internal and external stakeholders" is also applicable to this recommendation.

Recommendation: Assess the need for data privacy and confidentiality protocols, including for media and other agencies co-located in the RTOC observing otherwise restricted material to define legal obligations and avoid litigation. ★ ★

Source(s):  

Considerations and Constraints: Working with internal Information Technology professionals, the RTOC may yield current and future benefits by reviewing and implementing protocols for data privacy and confidentiality. With the proliferation of data sources including those from third-party providers, agreements of some variety will likely need to be in place to balance privacy and access, and the more sharing that is done, the more agreements that will need to be put in place. Privacy audits may need to be performed by an independent party knowledgeable in privacy law and issues related to it to promote a culture of transparency between the RTOC and the public. In addition to privacy matters with agencies external to the RTOC, internal policies should be considered too, as the accidental or purposeful leak of information from employees can be dangerous.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation applies to the Needs Assessment identified gaps of "Data acquisition/sharing with third party developers" and "Partnerships with other regional TMCs and agencies to gather additional data that is beyond the purview (but may still effect) of the RTOC". The recommendation overlaps the FHWA trend "Involvement of Third Parties in Data and Traveler Information", and more specifically the strategy of "Develop Protocols for Data Privacy and Confidentiality, including for Media and other Agencies Co-located in the TMC Observing otherwise Restricted Material" from that trend. The RTOC Steering Committee has previously discussed legality/liability components specifically in regard to video recording/sharing and reviewed some of their existing practices. A broader solution to these concerns is offered by this recommendation.

8.2.6 Other Considerations

The RTOC’s operations rely heavily on field equipment outside of the facility itself, whether they are sensors that send data to the RTOC or signals/DMS that receive data from the RTOC, disruptions to the flow of information to or from these devices can result in problems for RTOC operations. Just as was the case for the equipment within the RTOC, MCDOT and NYSDOT do not utilize the same equipment in the field. As a lot of this field equipment has been previously indicated to be outdated, the RTOC will need to replace the old array with modern equipment, that will increase efficiency and open up the potential for either agency to work with another’s field equipment if ever needed.

While operator training and updates to RTOC SOPs were discussed previously in this tech memo, to support the needs/gaps revolving around operator efficiency at the RTOC, a decision support system (DSS) could be considered for implementation. A DSS would supplement the SOPs and the training that operators undergo in an effort to standardize the actions taken by each operator for similar events.


Finally, the RTOC will likely need to evaluate the very way in which it thinks, moving into the future. The facility, its services, and partnerships will only continue to become more complex and nuanced in the future, so adopting a more calculated and organized approach to operations will be critical.

Monroe County RTOC Steering Committee	National Best Practices/Trends
<ul style="list-style-type: none"> Standardized field equipment for both NYSDOT and MCDOT 	<ul style="list-style-type: none"> Resilient data communications infrastructure Decision Support Systems (DSS) Systems Engineering process

Table 31: Needs/Gaps Identified by the Steering Committee and the Needs Assessment – Other Considerations

Recommendations: Other Considerations

Recommendation: Weigh the benefits of developing a decision support system to support RTOC operators while working towards standardization of event responses. ★★ ★


Source(s): 

Considerations and Constraints: In order to supplement updated, situational SOPs and or IRPs, a Decision Support System would assist operators in determining the best actions to make in certain situations. A DSS would help to create consistency among operator approaches, so that all events, although unique, will receive responses that are consistent based on the given factors. A DSS, while beneficial to RTOC operations would likely be costly and receive a lengthy development process.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to fulfill the Need for a “Decision Support System”. The recommendation corresponds with the FHWA strategy “Develop Decision Support Systems” from the “Automation Tools and Related Tools to Increase Efficiency” tend area.

Recommendation: Standardize use of Systems Engineering processes to more easily implement and integrate new services, equipment, and software at the RTOC. ★★

Source(s): 

Considerations and Constraints: Adopting a Systems Engineering approach on a wider scale would assist the RTOC in expanding its services, systems, and more by essentially providing staff with an organizational framework. The RTOC Steering Committee expressed interest in the Systems Engineering approach especially for the implementation of new software. A primary tenet of systems engineering is using consensus-based requirements to drive system design, procurement, implementation, testing, operations, and maintenance which may challenge existing current RTOC practices. In order to reframe the thinking of RTOC staff, training may be beneficial. Additionally, while Systems Engineering does not necessarily require the use of specific software, it may be advantageous to the RTOC to consider utilizing some software which will help to facilitate a Systems Engineering approach.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation works towards solving the identified Need for a “Systems Engineering Process”. This recommendation aligns with the FHWA identified strategy “Follow the Systems Engineering Process” from the trend area, “A Nimble Service-Oriented Program Mindset and Organizational Structure”. While it does not directly correspond with RTOC feedback, Systems Engineering does tie into the large emphasis that the group has placed on active/proactive traffic system management as it would facilitate the processes and technologies that would make that possible.

Recommendation: Actively use and participate in updates to the Regional ITS Architecture. ★ ★ ★

Source(s):   

Considerations and Constraints: ITS Architectures, while often dismissed as a “box to be checked” for the Federal Highway Administration (and FHWA funding), can be a very useful tool for RTOC Strategic Planning. Developing/maintaining an ITS Architecture requires thoughtful examination of both needs and opportunities, but this effort can yield significant benefits to RTOC operations by allowing leadership staff to select and successfully implement systems and strategies that fit their specific goals and objectives. Currently GTC maintains the regional architecture, however the next update could be supported in some way by the RTOC. Constraints in this area are largely tied to lack of available time on the part of staff who may already be overcommitted to other efforts due to staffing challenges. Additionally, it is critical to provide a strong background education on ITS Architecture development and benefits to remove any stigma surrounding their perceived complexity and/or usefulness. An updated ITS Architecture, with additional input from the RTOC, could supplement this Strategic Plan by adding additional context to the technological, functional, and enterprise relationships with the RTOC and the region at large.

Association with Regional/Statewide Goals, National Best Practices, and Steering Committee

Feedback: This recommendation aims to solve the Gap, “An ITS architecture reflective of the RTOC’s and other stakeholders’ current plans for regional services”. This recommendation is tailored from FHWA defined “Plans and Preparedness Tools” which account for best practices nationwide including: “Regional ITS Architecture, Strategic Plan, System Plans, and Definition of Readiness”. Coincidentally, as this project aims to create a new Strategic Plan for the RTOC, an ITS architecture would further supplement it. This recommendation was further sourced through discussion with members of the Steering Committee, where interest in updating the ITS architecture and using it more readily in planning discussions was emphasized. The RTOC Steering Committee also noted that the Business Concept could be used to help inform an update of the architecture in the near future. This

recommendation also aligns with the GTC TSMO plan goals, “Integrate TSMO into Regional Planning and Policy Making” and “Promote Partnerships and Collaboration to Support Regional Operations”.

Appendix A

Categorized MCDOT/NYS DOT RTOC Resources

The following list theoretically represents the full, categorized library of resources used by MCDOT and/or NYSDOT at the RTOC.

Bridge Info

- Monroe County Bridge Inventory
- Bridge Maintenance Jurisdiction Table
- City of Rochester Posted Bridge Clearance Table
- Monroe County Posted Road Weight Limit Guide
- Emergency Action Guide for O’Rorke Bridge (Bridge Cannot Open)
- O’Rorke Memorial Bridge – Procedure for Emergency Operation of the Bridge
- Irondequoit Bay Outlet Bridge – Procedure for Emergency Operation of the Bridge
- Procedure for Measuring Bridge Clearance Heights
- Bridge Clearance Measurement Diagram

Highways and Roads

- Monroe County Highway Road Inventory
- Highway Maintenance Managers Table
- MCDOT County Highway Right of Way Reference Book
- NYSDOT Local Roads Listing

Policies and Procedures

- Traffic Signal First Response (70) Policy
- Annual Traffic Signal Maintenance Billing Process and Procedures
- CCTV Operation Policy
- Highway Dispatch and Response Process
- Stakeout Procedures
- Policy for Use of VMS or Static Signs in Advance of Road or Bridge Closing
- MCDOT Pavement Markings Long Line Striping Procedure
- Manhole Entry Policy
- NYSDOT Operator Guidelines for MCDOT Calls; After-Hours, Holidays, & Weekends
- County Work Order Priority Guidelines
- NYSDOT Standard Operating Procedures
- NYSDOT Standard Operating Procedures (Quick Guide & Handbook)
- Monroe County Guide
- Monroe County-New York State RTOC Operator User Manual
- Snow & Ice Manual/Call-Out List

Sign Information

- 2019 Monroe County – Stop & Yield Sign Inventory
- 2021 City of Rochester Sign Inventory
- Monroe County Sign Inventory
- MCDOT Borderline Boundaries – Sign Maintenance Responsibility Guide
- Sign Standards Cheat Sheet
- In-Street Yield to Pedestrians Sign Locations Map

Signals Information

- 3M Bulbs Inventory
- Expressway Camera Inventory
- Traffic Signal Timing Manual
- Nighttime Flash Operations Inventory

MCDOT Traffic Preemptive Signal Inventory
MCDOT Traffic Signal Master List
NYSDOT/MCDOT Traffic Signals

Agreements and MOUs

City of Rochester Traffic Control Board (TCB)
Communications Conduit Usage Agreement
Closed-Circuit Television (CCTV) Traffic Camera Feed Agreement
After-Hours Regional Traffic Operations Center (RTOC) Staffing Agreement

Staffing/HR



NYSDOT Org Chart
MCDOT Org Chart
NYSDOT Roles and Responsibilities
NYDOT Contact List
MCDOT Contact List

Maintenance

NYSDOT Planned Construction Bulletin

Appendix B

NYSDOT and MCDOT Resource Documents

Document/Resource	 Department of Transportation	Last Update	 MCDOT	Last Update
Organizational Chart	●	October 2020	●	June 2020
Roles & Responsibilities document	●	-	●	-
Contact List	●	October 2020	●	June 2020
Agreements / MOU / Policies	●	-	●	-
Standard Operating Procedures	●	June 2020	N/A	-
User Manual Operations Guide	N/A	-	●	October 2020
NYSDOT/MCDOT Signals Book	●	2020	●	2020
Snow & Ice Manual/Call-out list	●	September 2020	N/A	N/A
Monroe County Guide Book	N/A	-	●	Various between 2010 and 2020
Analytics/KPI/Performance Measures	●	-	●	N/A
Sign Book	N/A	-	●	2018
Decision Support Systems/Predictive Analytics	●	-	●	-
Concept of Operations document	●	-	●	-
Planned Construction/Construction Bulletins	●	-	N/A	-
<p>Legend</p> <p>● Existing/Current ● Partially Existing ● Not Existing N/A: Not applicable</p>				

Appendix C

REGIONAL ITS ARCHITECTURE PLANNED SERVICES

The following information has been adapted from the Rochester Genesee Regional Intelligent Transportation Systems Architecture. The intent of this table is to display service areas that have been identified as “Planned” within the Regional ITS Architecture along with the stakeholder elements associated with them. While this table should not be considered as a definitive roadmap for RTOC business planning, it is indicative of key areas of potential operational evolution over the next ten years and the stakeholders that may be required to achieve them.

Service Package	Service Package Name	Service Package Description	Included Elements
CVO12	HAZMAT Management	<i>This service package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material transport, including response to incidents. HAZMAT tracking is performed by the Fleet and Freight Management Center. The Emergency Management Center is notified by the Commercial Vehicle and the Fleet and Freight Management Center of the HAZMAT vehicle location and information about the HAZMAT load. If an incident occurs, the Emergency Management Center can use the information to coordinate the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Center. The latter information can be provided prior to the beginning of the trip, during the trip, or gathered following the incident depending on the selected policy and implementation.</i>	9-1-1 Center (Monroe County / City of Rochester)
			Fire Stations
			Monroe County Emergency Operations Center (EOC)
			NYS Police Troop E Headquarters
			Private Emergency Management Service (EMS) Vehicles
DM01	ITS Data Warehouse	<i>This service package provides access to transportation data to support transportation planning, condition and performance monitoring, safety analysis, and research. Configurations range from focused repositories that house data collected and owned by a single agency, district, private sector provider, or research institution to broad repositories that contain multimodal, multidimensional data from varied data sources covering a broader region. Both central repositories and physically distributed ITS data repositories are supported. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package may be parsed by the local repository and dynamically translated to requests to other repositories that relay the data necessary to satisfy the request. The repositories could include a data registry capability that allows registration of data identifiers or data definitions for interoperable use throughout a region.</i>	Rochester Police Department (RPD) Dispatch
			9-1-1 Center (Monroe County / City of Rochester)
			Airport Flight Information
			Airport Weather Information
			Amtrak Station
			City Off-Street Parking Management Systems
			MCDOT Closed-Circuit Television (CCTV) Traffic Cameras
			MCDOT Dynamic Message Signs (DMS)

Service Package	Service Package Name	Service Package Description	Included Elements
			MCDOT Traffic Signals and Highway Maintenance Dispatching
			Municipal DPW Vehicles
			NYS Police Troop E Headquarters
			NYS Thruway Authority HQ Toll Data Center
			NYS Thruway Closed-Circuit Television (CCTV) Traffic Cameras
			NYS Thruway Statewide Operations Center (TSOC)
			NYSDOT 511NY System
			NYSDOT Road Weather Information System (RWIS) Stations
			NYSDOT Traffic Count Data Archive
			NYSDOT Traffic Signal System
			Private Emergency Management Service (EMS) Vehicles
			Rochester Police Department (RPD) Dispatch
			RTS Advanced Traveler Information System (ATIS)

Service Package	Service Package Name	Service Package Description	Included Elements
			RTS Monroe Campus and Operations Center
			Weather Radar Scans
MC01	Maintenance and Construction Vehicle and Equipment Tracking	<i>This service package tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. Checks can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.</i>	MCDOT Traffic Signals and Highway Maintenance Dispatching
			Municipal DPW Vehicles
MC02	Maintenance and Construction Vehicle Maintenance	<i>This service package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle and equipment maintenance.</i>	MCDOT Traffic Signals and Highway Maintenance Dispatching
			Municipal DPW Vehicles
MC03	Roadway Automated Treatment	<i>This service package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The service package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.</i>	NYSDOT Road Weather Information System (RWIS) Stations
MC06	Work Zone Management	<i>This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., TIC, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.</i>	Drivers
			MCDOT Closed-Circuit Television (CCTV) Traffic Cameras
			MCDOT Dynamic Message Signs (DMS)
			MCDOT Traffic Signals and Highway Maintenance Dispatching
			Municipal DPW Vehicles

Service Package	Service Package Name	Service Package Description	Included Elements
			NYSDOT 511NY System NYSDOT Closed-Circuit Television (CCTV) Traffic Cameras NYSDOT Dynamic Message Signs (DMS) NYSDOT Highway Advisory Radio (HAR) NYSDOT Traffic Signal System
MC09	Infrastructure Monitoring	<i>This service package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This service package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.</i>	City DES Fleet Vehicle ITS Instrumentation MCDOT Closed-Circuit Television (CCTV) Traffic Cameras Municipal DPW Vehicles NYSDOT Road Weather Information System (RWIS) Stations
PM01	Parking Space Management	<i>This service package monitors and manages parking spaces in lots, garages, and other parking areas and facilities. It assists in the management of parking operations by monitoring parking lot ingress and egress, parking space occupancy and availability. Infrastructure-based detectors and/or connected vehicles may be used to monitor parking occupancy. The service package shares collected parking information with local drivers and information providers for broader distribution.</i>	City Off-Street Parking Management Systems Drivers
PM03	Parking Electronic Payment	<i>This service package supports electronic collection of parking fees. This includes all types of parking fee collection including short term and long-term parking and pay-for-use loading zones. It collects parking fees from in-vehicle equipment, contact or proximity cards, or any smart payment device. This service package supports both payment via a local point of sale in the parking area or direct payment via wide area wireless communications. User accounts</i>	City Off-Street Parking Management Systems Drivers

Service Package	Service Package Name	Service Package Description	Included Elements
		<i>may be established to facilitate secure payment using only a secure ID and enhance services offered to frequent customers.</i>	
PM04	Regional Parking Management	<i>This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management centers and transportation information centers to support multimodal travel planning. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.</i>	City Off-Street Parking Management Systems
			City On-Street Parking Management Systems
			NYS Thruway Statewide Operations Center (TSOC)
			NYSDOT 511NY System
			RTS Advanced Traveler Information System (ATIS)
			RTS Monroe Campus and Operations Center
PS03	Emergency Vehicle Preemption	<i>This service package provides signal preemption for public safety-first responder vehicles. Both traditional signal preemption systems and new systems based on connected vehicle technology are covered. In more advanced systems, movement of public safety vehicles through the intersection can be facilitated by clearing queues and holding conflicting phases. In addition, this SP also covers the transition back to normal traffic signal operations after providing emergency vehicle preemption.</i>	9-1-1 Center (Monroe County / City of Rochester)
			Fire Stations
			MCDOT Closed-Circuit Television (CCTV) Traffic Cameras
			MCDOT Dynamic Message Signs (DMS)
			Monroe County Emergency Operations Center (EOC)
			NYS Police Troop E Headquarters
			NYS Police Vehicles
			NYS Thruway Closed-Circuit Television (CCTV) Traffic Cameras

Service Package	Service Package Name	Service Package Description	Included Elements
			NYS Thruway Statewide Operations Center (TSOC) NYSDOT Highway Emergency Local Patrol (HELP) Vehicles NYSDOT Traffic Signal System Private Emergency Management Service (EMS) Vehicles Rochester Police Department (RPD) Dispatch Rochester Police Department (RPD) Vehicles
PS04	Mayday Notification	<i>This service package provides the capability for a vehicle to automatically transmit an emergency message when the vehicle has been involved in a crash or other distress situation. An automatic crash notification feature transmits key data on the crash recorded by sensors mounted in the vehicle (e.g., deployment of airbags) without the need for involvement of the driver. The emergency message is sent to emergency response services, which determines and carries out the appropriate response. This service package allows passing vehicles to receive and forward mayday requests in areas where no communications infrastructure exists. Emergency notifications from personal devices are also supported.</i>	<None>
PS09	Transportation Infrastructure Protection	<i>This service package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels, and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio</i>	9-1-1 Center (Monroe County / City of Rochester) Fire Stations MCDOT Closed-Circuit Television (CCTV) Traffic Cameras MCDOT Dynamic Message Signs (DMS)

Service Package	Service Package Name	Service Package Description	Included Elements
		<i>surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust systems and other automated and remotely controlled systems that mitigate impact of an incident.</i>	MCDOT Traffic Signals and Highway Maintenance Dispatching Monroe County Emergency Operations Center (EOC) Municipal DPW Vehicles NYS Police Troop E Headquarters NYS Police Vehicles NYS Thruway Closed-Circuit Television (CCTV) Traffic Cameras NYS Thruway Statewide Operations Center (TSOC) NYSDOT Highway Emergency Local Patrol (HELP) Vehicles NYSDOT Road Weather Information System (RWIS) Stations NYSDOT Traffic Signal System Private Emergency Management Service (EMS) Vehicles Rail Operations Center Rochester Police Department (RPD) Dispatch Rochester Police Department (RPD) Vehicles

Service Package	Service Package Name	Service Package Description	Included Elements
			RTS Monroe Campus and Operations Center
PS10	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information websites.	MCDOT Dynamic Message Signs (DMS)
			NYS Police Troop A Headquarters
			NYS Police Troop A Zone Stations
			NYS Police Troop E Headquarters
			NYS Police Troop E Zone Stations
			NYS Thruway Dynamic Message Signs (DMS)
			NYS Thruway Statewide Operations Center (TSOC)
			NYSDOT 511NY System
			NYSDOT Dynamic Message Signs (DMS)
PS11	Early Warning System	This service package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The service package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.	9-1-1 Center (Monroe County / City of Rochester)
			Airport Weather Information
			NYS Police Troop E Headquarters
			NYS Thruway Statewide Operations Center (TSOC)
			Rochester Police Department (RPD) Dispatch

Service Package	Service Package Name	Service Package Description	Included Elements
			RTS Monroe Campus and Operations Center
PS12	Disaster Response and Recovery	<p><i>This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).</i></p> <p><i>The service package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.</i></p> <p><i>The service package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this service package, the Emergency Management Center represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Center and the other centers provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control</i></p>	9-1-1 Center (Monroe County / City of Rochester)
			MCDOT Traffic Signals and Highway Maintenance Dispatching
			Monroe County Emergency Operations Center (EOC)
			Municipal DPW Vehicles
			NYS Police Troop A Headquarters
			NYS Police Troop A Zone Stations
			NYS Police Troop E Headquarters
			NYS Police Troop E Zone Stations
			NYS Thruway Statewide Operations Center (TSOC)
			Private Emergency Management Service (EMS) Vehicles
			Rail Operations Center
			Regional Traffic Operations Center (RTOC)

Service Package	Service Package Name	Service Package Description	Included Elements
		<p><i>strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this service package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities.</i></p> <p><i>This service package builds on the basic traffic incident response service that is provided by TM08, the Traffic Incident Management service package. This service package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of ARC-IT will want to consider both TM08 and this service package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.</i></p> <p><i>Disaster Response and Recovery is also supported by PS14, the "Disaster Traveler Information" service package that keeps the public informed during a disaster response. See that service package for more information.</i></p>	Rochester Police Department (RPD) Dispatch
			RTS Monroe Campus and Operations Center
PS13	Evacuation and Reentry Management	<p><i>This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.</i></p>	9-1-1 Center (Monroe County / City of Rochester)
			MCDOT Traffic Signals and Highway Maintenance Dispatching
			Municipal DPW Vehicles

Service Package	Service Package Name	Service Package Description	Included Elements
		<p><i>This service package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.</i></p> <p><i>Evacuations are also supported by PS14, the "Disaster Traveler Information" service package, which keeps the public informed during evacuations. See that service package for more information.</i></p>	<p>NYS Police Troop E Headquarters</p> <p>NYS Thruway Authority HQ Toll Data Center</p> <p>NYS Thruway Statewide Operations Center (TSOC)</p> <p>NYSDOT 511NY System</p> <p>Private Emergency Management Service (EMS) Vehicles</p> <p>Rail Operations Center</p> <p>Rochester Police Department (RPD) Dispatch</p> <p>RTS Advanced Traveler Information System (ATIS)</p> <p>RTS Monroe Campus and Operations Center</p>
PS14	Disaster Traveler Information	<p><i>This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed, and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.</i></p> <p><i>A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public</i></p>	<p>9-1-1 Center (Monroe County / City of Rochester)</p> <p>Drivers</p> <p>Local Internet Access</p> <p>Metro Traffic Reports</p> <p>NYS Police Troop E Headquarters</p> <p>NYS Thruway Statewide Operations Center (TSOC)</p> <p>NYSDOT 511NY System</p>

Service Package	Service Package Name	Service Package Description	Included Elements
		<p>evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.</p> <p>This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.</p> <p>This service package augments the Traveler Information (TI) service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.</p>	<p>Private Emergency Management Service (EMS) Vehicles</p> <p>Radio/TV/Print Traffic Reporting</p> <p>Rochester Police Department (RPD) Dispatch</p> <p>RTS Advanced Traveler Information System (ATIS)</p> <p>RTS Monroe Campus and Operations Center</p> <p>Weather Radar Scans</p>
PT08	Transit Traveler Information	<p>This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop announcement, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.</p>	<p>Local Internet Access</p> <p>Metro Traffic Reports</p> <p>Radio/TV/Print Traffic Reporting</p> <p>RGRTA Transit Route Planning Service</p>

Service Package	Service Package Name	Service Package Description	Included Elements
			RTS Advanced Traveler Information System (ATIS)
			RTS Monroe Buses
			RTS Monroe Campus and Operations Center
PT09	Transit Signal Priority	<i>The Transit Signal Priority service package uses transit vehicle to infrastructure communications to allow a transit vehicle to request priority at one or a series of intersections. The service package provides feedback to the transit driver indicating whether the signal priority has been granted or not. This service package can contribute to improved operating performance of the transit vehicles by reducing the time spent stopped at a red light.</i>	MCDOT Computerized Traffic Control System (CTCS)
			NYSDOT Traffic Signal System
			RTS Monroe Buses
			RTS Monroe Campus and Operations Center
PT14	Multi-modal Coordination	<i>This service package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency.</i>	Amtrak Station
			City Office of Special Events
			NYS Thruway Statewide Operations Center (TSOC)
			RTS Monroe Buses
			RTS Monroe Campus and Operations Center
SU03	Data Distribution	<i>This service package manages the distribution of data from data providers to data consumers and protects those data from unauthorized access. It informs data providers of how to provide data, manages data subscriptions, and provides data forwarding capabilities. The service package also maintains a directory of System Users that want data and supports multiple distribution mechanisms including publish-subscribe and directly from data provider to data consumer. It allows data consumers to specify (and change the specification of) data they wish to receive.</i>	<None>
TI02	Personalized Traveler Information	<i>This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported.</i>	Airport Flight Information
			Airport Weather Information
			City Office of Special Events

Service Package	Service Package Name	Service Package Description	Included Elements
	(continued on next page)	The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours, and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications with the traveler. A variety of interactive devices may be used by the traveler to access information prior to a trip or enroute including phone via a 511-like portal and web pages via smart phone, tablet, personal computer, and a variety of in-vehicle devices.	City Off-Street Parking Management Systems Local Internet Access MCDOT Traffic Signals and Highway Maintenance Dispatching Metro Traffic Reports NYS Police Troop E Headquarters NYS Thruway Authority HQ Toll Data Center NYS Thruway Statewide Operations Center (TSOC) NYSDOT 511NY System Private Emergency Management Service (EMS) Vehicles Radio/TV/Print Traffic Reporting Rochester Police Department (RPD) Dispatch RTS Advanced Traveler Information System (ATIS) RTS Monroe Campus and Operations Center Weather Radar Scans

Service Package	Service Package Name	Service Package Description	Included Elements
TI03	Dynamic Route Guidance	<i>This service package offers advanced route planning and guidance that is responsive to current conditions. The package augments a user's navigation system equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is used by the user equipment to provide real-time route guidance that factors in current conditions.</i>	<None>
TI04	Infrastructure-Provided Trip Planning and Route Guidance	<i>This service package offers the user trip planning and enroute guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike TI03, where the user equipment determines the route, the route determination functions are performed by the center in this service package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.</i>	<None>
TI05	Travel Services Information and Reservation (continued on next page)	<i>This service package provides travel service information and reservation services to the traveler pre-trip and while enroute. This includes information for tourist attractions, lodging, dining, service stations, parking, emergency services, and other services and businesses of interest to the traveler.</i>	Drivers
			Local Internet Access
			NYSDOT 511NY System
			NYSDOT Highway Advisory Radio (HAR)
			Roceasyride
			RTS Advanced Traveler Information System (ATIS)
			Transit Riders

Service Package	Service Package Name	Service Package Description	Included Elements
TI07	In-Vehicle Signage	<i>This service package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). This service package also includes the capability for maintenance and construction, emergency, and transit vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in areas such as work zones, around incidents, and at bus stops.</i>	<None>
TM02	Vehicle-Based Traffic Surveillance	<i>This service package uses probe data information obtained from vehicles in the network to support traffic operations, including incident detection and the implementation of localized operational strategies. Since traffic data is collected from vehicles, travel times and other related traffic performance measures are available. This service package includes the capability to collect data from Connected Vehicles so that "probe" data can be collected from all equipped vehicles, providing access to a large vehicle population as penetration increases. Incident detection enables transportation agencies to determine the location of potential incidents so the agencies can respond more quickly to the incident and mitigate any negative impacts to the transportation network. Vehicle data that can be used to detect potential incidents include changes in vehicle speeds indicating the disruption of traffic flow, when a vehicle's safety systems have been activated or deployed, or sudden vehicle turns or deceleration at a specific location (indicating a potential obstacle in the roadway).</i>	NYS Thruway Authority HQ Toll Data Center NYS Thruway Statewide Operations Center (TSOC) NYSDOT Communications Infrastructure NYSDOT Traffic Signal System RTS Monroe Campus and Operations Center
TM09	Integrated Decision Support and Demand Management (continued on next page)	<i>This service package recommends courses of action to transportation operators in a corridor, downtown area, or other heavily traveled area. Recommendations are based on an assessment of current and forecast transportation network performance and environmental conditions. Multi-modal transportation operational strategies are created that consider all modes and all roads in the travel area to correct network imbalances and effectively manage available capacity. As part of the operational strategies, this service package may also recommend lane restrictions, transit, parking, and toll strategies to influence traveler route and mode choices to support active demand management programs and policies managing both traffic and the environment. Operational strategies, including demand management</i>	City Office of Special Events City Off-Street Parking Management Systems NYS Thruway Authority HQ Toll Data Center NYS Thruway Closed-Circuit Television (CCTV) Traffic Cameras

Service Package	Service Package Name	Service Package Description	Included Elements
		<i>recommendations, are coordinated to support operational decisions by each transportation operator that are consistent with the recommended strategy. All recommended operational strategies are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. This service package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support operational strategies that manage and balance capacity and demand.</i>	NYS Thruway Statewide Operations Center (TSOC) NYSDOT 511NY System RTS Advanced Traveler Information System (ATIS) RTS Monroe Campus and Operations Center
TM17	Speed Warning and Enforcement	<p><i>This service package monitors vehicle speeds and supports warning drivers when their speed is excessive. Also, the service includes notifications to an enforcement agency to enforce the speed limit of the roadway. Speed monitoring can be made via spot speed or average speed measurements. Roadside equipment can display the speed of passing vehicles and/or suggest a safe driving speed. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to the motorist. For example, warnings can be generated recognizing the limitations of a given vehicle for the geometry of the roadway such as rollover risk for tall vehicles.</i></p> <p><i>This service focuses on monitoring of vehicle speeds and enforcement of the speed limit while the variable speed limits service (covered in TM20-Variable Speed Limits service package) focuses on varying the posted speed limits to create more uniform speeds along a roadway, to promote safer driving during adverse conditions (such as fog) and/or to reduce air pollution.</i></p>	<None>
TM18	Drawbridge Management	<i>This service package supports systems that manage drawbridges at rivers and canals and other multimodal crossings (other than railroad grade crossings which are specifically covered by other service packages). The equipment managed by this service package includes control devices (e.g., gates, warning lights, dynamic message signs) at the drawbridge as well as the information systems that are used to keep travelers apprised of current and forecasted drawbridge status.</i>	Drivers MCDOT Closed-Circuit Television (CCTV) Traffic Cameras MCDOT Dynamic Message Signs (DMS)

Service Package	Service Package Name	Service Package Description	Included Elements
			<div>NYSDOT 511NY System</div> <div>NYSDOT Dynamic Message Signs (DMS)</div> <div>NYSDOT Highway Advisory Radio (HAR)</div> <div>O'Rorke Memorial Bridge</div>
TM19	Roadway Closure Management	<p><i>This service package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The service package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this service package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This service package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other Traffic Management service packages.</i></p>	<None>

Service Package	Service Package Name	Service Package Description	Included Elements
VS12	Pedestrian and Cyclist Safety	<i>This service package supports the sensing and warning systems used to interact with pedestrians, cyclists, and other non-motorized users that operate on the main vehicle roadways, or on pathways that intersect the main vehicle roadways. These systems allow automated warning or active protection for this class of users. It integrates traffic, pedestrian, and cyclist information from roadside or intersection detectors and new forms of data from wirelessly connected, non-motorized traveler-carried mobile devices to request right-of-way or to inform non-motorized travelers when to cross and how to remain aligned with the crosswalk or pathway based on real-time Signal Phase and Timing (SPaT) and MAP information. In some cases, priority will be given to non-motorized travelers, such as persons with disabilities who need additional crossing time, or in special conditions (e.g., weather) where non-motorized travelers may warrant priority or additional crossing time. This service package will enable a service call to be routed to the traffic controller from a mobile device of a registered person with disabilities after confirming the direction and orientation of the roadway that the individual is intending to cross. It also provides warnings to the non-motorized user of possible infringement of the crossing or pathway by approaching vehicles.</i>	<None>

Appendix D
NYSDOT STATEWIDE TSMO PLAN & GTC TSMO PLAN COMPARISON
TABLE

GTC TSMO Plan Objective	NYSDOT Statewide TSMO Plan Goals					
	Enhance system safety and reliability by minimizing the impacts of travel disruptions	Move People Efficiently	Support reliable and efficient freight movement	Serve as a trusted source of multimodal travel information	Strengthen partnerships with internal and external stakeholders	Support enterprise-level systems and data for performance driven TSMO approach
Improve Safety and Efficiency of the Multi-Modal Transportation System through Coordinated Management and Operations	◆	◆	◆	◆		
Maximize Transportation System Performance from the User Perspective	◆	◆	◆	◆		◆
Implement TSMO as a Low-Cost Solution to Regional Transportation Needs	◆	◆				
Target New Investment in ITS and Communications Infrastructure in Locations with the Greatest Impact and Value	◆	◆	◆	◆		◆
Prepare for Emerging Technologies with a Potential Transformative Impact on Regional Transportation	◆	◆				
Promote Partnerships and Collaboration to Support Regional Operations	◆		◆	◆	◆	

GTC TSMO Plan Objective	NYSDOT Statewide TSMO Plan Goals					
	Enhance system safety and reliability by minimizing the impacts of travel disruptions	Move People Efficiently	Support reliable and efficient freight movement	Serve as a trusted source of multimodal travel information	Strengthen partnerships with internal and external stakeholders	Support enterprise-level systems and data for performance driven TSMO approach
Integrate TSMO into Regional Planning and Policy Making	◆		◆			
Maximize Program Efficiency through Resource and Cost Sharing	◆	◆		◆	◆	
Support Long-term TSMO Operations and Capital Investments Through Sustainable Funding and Asset Management Strategies	◆		◆			
Promote Interoperability and Value-Add Services through Shared and Open Data	◆	◆	◆	◆	◆	