GENESEE TRANSPORTATION COUNCIL

RESOLUTION

Resolution 21-83 Accepting the *I-490 Integrated Corridor Management (ICM) Plan* as evidence of completion of UPWP Task 5902

WHEREAS,

1. The *FY 2021-2022 Unified Planning Work Program* includes Task 5902, I-490 Integrated Corridor Management (ICM) Plan, for the purpose of developing an Integrated Corridor Management Plan for the I-490 corridor;

2. Said Task included collaboration among regional transportation systems management and operations stakeholders, identification of common objectives to guide stakeholder policies and initiatives, examination of current Intelligent Transportation System deployments and coverage gaps along the I-490 corridor, identification of recommendations for implementing ICM strategies and associated management and operations activities, and a review of updates to the Regional ITS Architecture required for ICM-supportive deployments;

3. Said Task has been completed and has resulted in the *I-490 Integrated Corridor Management (ICM) Plan* which provides a strategy for the coordinated management and deployment of ITS instrumentation along the I-490 corridor and parallel routes; and

4. Said Study has been reviewed by GTC staff and member agencies through the GTC committee process and has been found to be consistent with the goals, objectives, and recommendations of the Long Range Transportation Plan.

NOW, THEREFORE, BE IT RESOLVED

1. That the Genesee Transportation Council hereby accepts the *I-490 Integrated Corridor Management (ICM) Plan* as evidence of completion of UPWP Task 5902; and

2. That this resolution takes effect immediately.

CERTIFICATION

The undersigned duly qualified Secretary of the Genesee Transportation Council certifies that the foregoing is a true and correct copy of a resolution adopted at a legally convened meeting of the Genesee Transportation Council held on December 9, 2021.

Date _____ _____

CHRISTOPHER T. REEVE, Secretary
Genesee Transportation Council

EXECUTIVE SUMMARY

I-490 is one of greater Rochester's key transportation corridors. It links the City of Rochester with its eastern and western suburbs and provides access to I-90 (New York State Thruway), the state's primary east-west corridor. During the past 20 years, the New York State Department of Transportation (NYSDOT) has deployed Intelligent Transportation Systems (ITS) instrumentation along the I-490 corridor in an effort to increase travel safety, efficiency, and reliability. ITS deployments currently in use include traffic cameras, Dynamic Message Signs (DMS), vehicle detection sensors, Road Weather Information Systems (RWIS) and their associated power and communications infrastructure. Monroe County Department of Transportation (MCDOT) has deployed computerized traffic signals and traffic cameras to better manage traffic operations at expressway intersections within the City of Rochester. These deployments are managed from the Regional Traffic Operations Center (RTOC) on Scottsville Road.

However, ITS deployments along this corridor have been traditionally planned on a piecemeal basis, as funding becomes available and in response to specific needs. There has not been a systematic ITS planning exercise conducted for the entire corridor to identify the optimal future locations of ITS deployments and their power and communications linkages or to ensure that existing ITS capabilities for traffic monitoring and management are maintained. In addition, there is a need to better link ITS capabilities with transportation system management strategies such as Traffic Incident Management (TIM).

The purpose of this overall project is to develop an Integrated Corridor Management (ICM) Plan for the entire (37-mile) I-490 corridor that will guide future investments in ITS and operations strategies aimed at improving safety, minimizing delay, and enhancing the overall efficiency of traffic operations in the corridor for all modes of transportation.

What is Integrated Corridor Management

ICM is a transportation planning approach that seeks to coordinate multi-modal operations along a corridor to maximize travel safety, efficiency, and reliability. The vision of ICM is that transportation networks will realize significant improvements in the efficient movement of people and goods through institutional collaboration and aggressive, proactive integration of existing infrastructure along major corridors. Through an ICM approach, corridors are managed as a multimodal system and make operational decisions for the benefit of the corridor as a whole.

Stakeholders

This multi-modal, multi-user imitative requires coordination of many stakeholders. In addition to the users (motoring public) of the corridor, there are other stakeholders along the corridor and in the metropolitan area that operate, manage and maintain the network. Each has a role in successful ICM. The operational stakeholders include:

- NYSDOT — Owns and maintains I-490, many state arterials that parallel I-490 and Park-n-Ride facilities along I-490. They also operate the freeway Advanced Traffic Management System (NYSDOT ATMS) housed at the Regional Traffic Operations Center (RTOC), and the traffic signal network on the state arterials.
- New York State Thruway Authority (NYSTA) – Owns and maintains I-90, the New York State Thruway (Thruway). They also operate the Thruway ATMS.

- MCDOT — Owns and maintains traffic signals along county arterials that parallel I-490. Their arterial traffic signal system is operated from the RTOC.
- Regional Transit Service (RTS) — Owns and operates regional local and express bus services
- New York State Police (NYSP) — Enforcement, security, and crash investigations on I-490.
- Monroe County Sheriff — Enforcement, security, and crash investigations on I-490 and Monroe County arterials.
- City of Rochester — Owns and maintains City arterials that parallel I-490.
- Fire Departments — Nine Fire Departments have territorial responsibility for responding to incidents and crashes on I-490 and the parallel arterials, including (from east to west):
    - Fishers Fire Department
    - Pittsford Fire Department
    - Rochester City Fire Department
    - Chili Fire Department
    - Bergen Fire Department
    - Bushnell's Basin Fire Department
    - Brighton Fire Department
    - Gates Fire Department
    - Riga Fire Department

Current Traffic Management Program

The traffic management program on I-490 is a coordinated effort of NYSDOT, MCDOT and RTS. Its mission is to improve mobility and safety for the users of the Rochester area's highways through the application of ITS technology and interagency teamwork. The program is not delivered by transportation agencies only, but in conjunction with the NYSP, the Monroe County Sheriff's Department and City and local fire departments.

Traffic management is accomplished by focusing on mitigation of non-recurring congestion that occurs due to events such as crashes, breakdowns, construction, weather, etc. According to the Federal Highway Administration (FHWA), non-recurring congestion is the cause of about 50 percent of highway congestion. Recurring congestion – generally caused by high volumes on highways with limited capacity – accounts for the other fifty percent.

At the heart of the area's traffic management program is the RTOC, which houses the central computing system that monitors the state highways in real-time, including I-490, and monitors and controls the ITS devices including detectors, closed circuit television cameras (CCTV), dynamic message signs (DMS), and road weather information systems (RWIS), and the state and county traffic signal systems. The RTOC's current functionality includes incident detection and management. It does not possess active traffic management functionality.

ITS Infrastructure

Current ITS infrastructure along the I-490 corridor includes CCTV Cameras, DMS, System Sensors, limited RWIS devices and Portable VMS and Fiber Optic Cable. The primary locations of these devices are between

NY-531 on the west side of the County and Penfield Rd on the east side of the County. Fiber optic cable and some wireless devices are installed to provide the backbone for communication along the corridor.

All of the installed devices transmit data back to the RTOC, where operators review and determine actions to be taken. Co-located at the RTOC are NYSDOT, MCDOT and the NYS Police. During incidents on I-490 the agencies work to manage traffic flow and determine the appropriate actions to be taken

Currently traffic signals along the diversion routes in the City of Rochester are maintained by MCDOT are coordinated and can be monitored and controlled by operators in the RTOC. Along with the traffic signals, MCDOT has several cameras to monitor traffic flow.

RTOC Operations

The RTOC's main operations floor is split evenly between NYSDOT and MCDOT traffic operations staff. New York State Police Troop "E" also maintains operations at the facility. However, NYSP is located in a secured set of rooms located apart from both the NYSDOT and MCDOT traffic operations staff.

The RTOC, and specifically NYSDOT's and MCDOT's operational capabilities, have a sound foundation for ICM, but several gaps and needs still exist to improve the program's core services – traffic and incident management – and ultimately provide an ICM program.

Both NYSDOT and MCDOT reported that they are currently lacking in processes to measure the performance of the transportation system and the efforts of the RTOC to manage it. The RTOC leadership has a strong vision and direction about the types of Key Performance Indicators that should be developed, and the specific performance areas to be measured. NYSDOT has identified expressway and arterial measures that would be desirable. These measures include:

• Monitoring and Managing Traffic	• Monitoring and Managing Incidents
• Monitoring and Managing Work Zones	• Monitoring and Managing Weather Data
• Monitoring and Managing ITS field instrumentation.	

MCDOT's key areas of pursuit for measuring performance includes:

• Traffic signal timing overrides	• Performance of all traffic signal timing plans
• The number of highway light repairs, caller complaints, follow ups, etc. for each highway lighting location	• The number of signal repairs, timings adjustments, caller complaints, follow ups, etc. for each traffic signal.
• The number of stakeout tickets that are cleared, the number of tickets that crews mark out, and the number of emergency stake outs.	• Number of times each camera is called up on a display and/or moved and correlate that information to a crash and/or viewing the operations of traffic flow or response to a crash.
• The number of fire pre-emptions at each traffic signal	

RTOC TSMO Capability/Maturity Assessment

As part of the RTOC observation process related to ICM, an assessment of ICM capabilities was conducted. Through a series of interviews with NYSDOT and MCDOT staff and observations at the RTOC, a high-level assessment of the RTOC's current capabilities (maturity) to manage a future ICM project on the I-490 corridor was conducted. The capability maturity model assessment graded key attributes of integration to maturity levels including being siloed, centralized, partially integrated, multi-modal integrated, or multi-modal optimized. The key attributed examined include:

- Institutional Integration - interagency cooperation was assessed to be between being siloed and centralized, and funding to be partially integrated.
- Technical Integration - traveler information was assessed to be between centralized and partially integrated, and data fusion was assessed as siloed.
- Operational Integration - performance measures and decision support systems were both assessed as siloed.

Highway Infrastructure

While much of the ICM operational and ITS strategies available to the I-490 corridor are electronic and technological, highway infrastructure must be able to support some of the operational strategies.

One possible operational strategy, ramp metering, requires adequate storage along the on-ramps to store queuing traffic. There also must be adequate width on the ramp for emergency vehicles to bypass queued traffic when responding to a crash or other incident. In some cases, these two needs clash like when the full ramp width is necessary for queueing traffic (using multiple lanes rather than a single lane).

Comparative Metropolitan Areas

Planning for a possible I-490 ICM project can benefit from examining other existing ICM programs to capitalize on existing practices and lessons learned. By understanding the process other metropolitan areas took in developing their ICM program, the I-490 team can identify what is crucial to the development process early on and what ICM strategies should be considered. Comparable metropolitan areas were selected based on their similarities to Rochester, NY in the areas of population size, metropolitan area size, traffic characteristics of ICM corridor, current status of the ICM program. Buffalo, NY and Des Moines, IA were chosen due to the similarities in population and metropolitan areas.

Gaps and Needs

Based upon the Regional Traffic Operations Center (RTOC) observation, individual staff and management interviews, and the capability maturity model assessment in Task 3, a series of high-level gaps and needs were identified for future assessment of integrated corridor management.

Gaps

The gaps identified exist in the following areas:

- Coordinated inter-agency Traffic Incident Management (TIM) planning
- Automated travel time information
- Real-time weather and road surface/subsurface condition information

- Smart traffic signal system on the New York State Department of Transportation (NYSDOT) network
- Real-time traffic condition information from NYSDOT and Monroe County Department of Transportation (MCDOT) arterial network
- Real-time information on I-490 traffic conditions for diversion
- En-route traveler information
- Coordination and integration between Advanced Traffic Management System (ATMS) and arterial traffic signal systems
- Coordination and integration of personal vehicle motorists and bus transit

Needs

To achieve an integrated corridor, some or all of the following needs must be met:

- Formalized and regularly scheduled Traffic Incident Management (TIM) meetings
- TIM and on-scene State-of-the-Practice (SOTP) assessment and training
- Assessment of the implementation of a quick clearance policy
- Increased standardization/centralization of hardware/software systems to improve operational efficiency and reduce redundant effort
- Synchronization of signal plans between MCDOT and NYSDOT
- Event-based signal timing plans.
- Formalized process for Standard Operations Procedures (SOP) review and updates.
- Interconnection with, and real-time information from, NYSDOT and MCDOT signal systems
- Additional detector sensors and Closed-Circuit Television (CCTV) cameras for better situational awareness
- Additional Dynamic Message Signs (DMS) at strategic diversion locations along I-490 as well an intermittent location for travel time information display
- Additional Roadway Weather Information System (RWIS) stations for proactive weather response
- Communication to motorists on the availability of transit status

ICM Strategies

A number of operational strategies are available to support ICM. Some of these strategies are in place presently, but may need modification or expansion, while other strategies will need to be explored for viability along the I-490 Corridor. Operational strategies identified as feasible for deployment include:

- Advanced Traveler Information Systems (ATIS) – ATIS acquires, analyzes, and presents information to assist travelers in moving from a starting location (origin) to their desired destination. An ATIS operates by using data supplied by the traffic management centers. Relevant information may

include locations of incidents, weather and road conditions, optimal routes, recommended speeds, and lane restrictions.

- Closed-Circuit Television (CCTV) Monitoring – CCTV systems have been used for many years to provide visual monitoring of I-490. The RTOC uses CCTV systems for detecting and verifying incidents, monitoring traffic conditions, monitoring incident clearance, and monitoring environmental conditions (e.g., visibility distance, wet pavement).
- Intelligent Traffic Signal Control – Intelligent Traffic Signal Control are systems that collect and use data to provide real-time management and control of the traffic signals on arterials as well as isolated signals (like diamond interchange ramps). Intelligent traffic signal control will automatically detect and respond to ramp congestion impacts on the local arterial roads or increase volume throughput as a result of traffic being diverted from I-490 resulting from a crash or other incident
- Modal Integration – ICM is founded on balancing the traveler demand across expressway, arterial and transit. When both recurring and non-recurring congestion occurs, there is value in reducing the number of vehicles on the expressway or arterial by switching travelers to transit. This is done by providing real-time information on transit options and providing a hub for motorists to change to transit.
- Vehicle Detection – In a traffic management system, the data collected from the detection sensors or third-party providers, (e.g., HERE, etc.) supports the process in which data characterize traffic flow conditions on the expressway or arterial. The data are used to supply information about conditions on the roadway to other system components. Thus, detection provides the information needed to perform critical traffic management functions.
- Ramp Metering – Ramp Meters are traffic signals at expressway on-ramps that control the rate of vehicles entering the expressway. The meters can be set for different flow rates to optimize traffic flow and minimize congestion. When in operation, ramp meters will alternate between red and green lights, restricting the number of vehicles entering I-490, thereby reducing congestion, bottlenecks and managing the traffic flow on the mainline.
- Queue Warning – Queue Warning's purpose is to inform motorists of the presence of downstream stop and-go traffic (based on real-time traffic detection) using warning signs and in some cases, flashing lights. Drivers can anticipate an upcoming situation of emergency braking and slow down, avoid erratic behavior, and reduce queuing related crashes.
- Weather Monitoring – Road weather management strategies can be used to mitigate the impacts of rain, snow, ice, fog, high winds, flooding, tornadoes, hurricanes, and avalanches on the highway network:
- System Integration & Decision Support – When congested traffic conditions occur on one roadway, traffic on adjoining expressway interchanges in the corridor, are also impacted. Typically, as congestion occurs on one roadway, travelers respond in a variety of ways: finding an alternate route, selecting a different roadway (expressway versus arterial), adjusting their trip to another time of day, or remaining on their current route and enduring the significant delays.
- Field Communications – ICM relies on a significant amount of ITS field infrastructure resources such as CCTV cameras, detection sensors, DMS, etc. It is critical that there be enough connectivity to support the devices across the geographic area to be covered.

Other strategies that were studied, but found not to be feasible, include variable speeds limits, dynamic junction control, dynamic lane assignment, and dynamic shoulder lanes.

Recommendations

Specific recommendations that address the needs and meet the goals of ICM and the objectives of this project are categorized by priority based of need. They are fiscally unconstrained and are a menu of recommendations that should be considered and assessed further for program-or project-level implementation. The priority categories are meant to rate a recommendation's importance to ICM, not imply the order of deployment. As traditional transportation planning dictates, these recommendations will be assessed in more detail to determine what recommendations are implemented.

The priority categories are:

High Priority (H)*:* These strategic recommendations are necessary, and the goal of having an ICM program to support operations cannot be achieved without them. These are must dos.

Medium Priority (M): These elements bring significant improvement to integrating the corridor to support operations and are strongly desired. The goal of having an integrated corridor management program to support operations and attain compliance with priority result areas can still reached without these elements; however, they bring significant improvement to the program.

Low Priority (L): These elements bring some benefit to integrated corridor management but are not highly desired because they either bring little benefit or are not financially feasible.

To display the ITS infrastructure required to implement ICM strategies, I-490 was divided into twelve sections, and a map was prepared for each section that shows the approximate location of current and anticipated future ITS elements. These maps are shown on Figures 15-26, inclusive, in the main report. The arterial (parallel routes) recommendations are illustrated on Figures 27-29, inclusive. These maps are intended to be a concept-level guide to the future siting of ITS infrastructure along I-490 and parallel routes.

Operations and Policy recommendations address:

- Coordinated Traffic and Incident Management Practices
- Improved Incident Management Response
- Data Quality and Management

Asset Management recommendations address:

- Asset Management Plan that includes:
    - A schedule of preventative maintenance and inspection of all ITS equipment
    - A timeline that prioritizes the replacement of aging / obsolete and legacy equipment so that new equipment can be incorporated into upcoming contracts
- Coordinated Maintenance Policy
- Asset Maintenance Best Practices

This assessment identified updates to the Genesee-Finger Lakes Regional ITS Architecture, which are needed to address:

- The strategies identified for deployment as part of the I-490 ICM project, and
- Changes to ARC-IT from the last update.

In addition to the prioritized recommendations, other strategies and deployments that could provide benefit to ICM, but not in the foreseeable future, are recommended for future study Those include:

- Transit Signal Priority (see section 4.1.8)
- Bus Rapid Transit (see section 4.1.9)
- Modal Integration (see section 4.1.10)
- Staffing: As recommendations are implemented and ICM evolves, it would be prudent to perform a task analysis to examine the need for additional NYSDOT or MCDOT professional staff as well as examining skill sets for current and future staff. For instance, a need for a data scientist may develop as more, and different types of, data are collected and used to measure performance and manage proactively.

Summary and Next Steps

Much discussion in this report centers around the disparate systems that are in operation from the RTOC. On their own, these systems, namely Foundation III (the expressway advanced traffic management system) and MCDOT's traffic signal system (TransSuite), are sound systems that provide the service that was intended. However, ICM and traffic and incident management dictate that these systems – and the NYSDOT traffic signal systems – be integrated together to achieve ICM, and any further engineering analysis moving forward on bettering the traffic management service on the corridor focus on this effort.

Moving forward toward deployment from this report, the next step is to develop a project or set of projects to implement the ICM plan. Specific steps in developing a project or set of projects are needed to further develop what the system will do and how it will perform. Project development includes the systems engineering process, including developing the concept of the system, identifying system requirements, and the design process. A critical first step, which this report provides sufficient detail to inform, is the development of the Concept of Operations (ConOps).

A ConOps is a document that describes how a system will be used and identifies the fundamental needs of all stakeholders involved throughout the lifecycle of a system. It also considers different use cases or scenarios for how the system will operate. A ConOps is essential to success, as it serves as the repository of needs and helps ensure that all aspects of the system lifecycle from design, implementation, maintenance, and upgrades, support those needs. The ConOps allows for stakeholders to understand how the system is to be developed, maintained and operated; it also identifies users and system capabilities in an easy-to-understand format.