2017 STRATEGIC PLAN

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EXECUTIVE SUMMARY

The 2017 NITTEC Strategic Plan outlines the steps required for the Niagara International Transportation Technology Coalition (NITTEC) and its leadership to achieve parity with today's practices and technology standards as a foundation on which to improve and add desired services.

These recommended actions are informed by our examination of NITTEC's mission, facilities, staff, information technology (IT) infrastructure, services, performance measures, public outreach, committees and organization, per the project scope of work, as documented in The Summary of Findings. We have categorized each recommended action as being (1) immediate, (2) 2-3 years, or (3) 4-7 years, to reflect when NITTEC should commence activity and based on the degree of priority.

We summarize our key findings by noting 10 gaps (i.e., differences between NITTEC's current practice versus best-in-class practices) and the corresponding 10 action steps required to address them.

GAP	ACTION
Strategic objectives rather than operational objectives	All stakeholders must align on and elevate the six Strategic Objectives
Strategic objectives infused with performance measurement	All stakeholders must align and support Performance Measures plan
Benchmarks rather than monitoring data	All stakeholders must align on key performance indicators (KPIs) and benchmarks
Collecting the right data versus collecting any data	All stakeholders must align and support approach to data management
Achieve 100% regional and consistent committee participation	Deploy collaborative tools to enable varying levels of ongoing participation
For stakeholders, outcome-driven management vs. reactive management	All committees will incorporate relevant performance measures
For staff, outcome-driven proactive management vs. reactive management	All staff will deploy performance measures in operations & systems
Automated operational processes vs. manual, labor-intensive processes	Deploy automated processes in Traffic Operations Center, data gathering, etc.
Inadequate staff, facilities, ITS and IT infrastructure to support future state	Enact IT infrastructure and ITS enhancements, hire more staff, move to a new facility
NITTEC as leading, vital resource vs. redundant information provider	All stakeholders align on and deploy Customer Engagement Plan

Operations-focused management not directly connected to desired outcomes via performance measures or data

NITTEC achieves these objectives…

MANAGEMENT OBJECTIVES
- Maintain Corporate Culture as a Service Organization
- Maintain Diverse Professional Staff of Service Providers.
- Build and Maintain Leadership Role for Implementing Technology in the Evolving Transportation Operations and ITS Environment.
- Maintain Organizational Hierarchy to Improve Career Development and Succession.
- Be Focal Point for ITS Projects & Information Sharing, Coordinated Operations, Congestion
- Mitigation and ITS Project Delivery in the Region

…by managing these operations…

OPERATIONAL FUNCTIONS
- Border traffic management
- Traveler information
- Traffic congestion management
- Incident management
- Event planning management
- Transportation system monitoring
- Emergency management
- Weather system monitoring
- Construction coordination
- Performance measures reporting
- Multi-agency collaboration

…through these committees…

NITTEC COMMITTEES
- Border Crossing
- Construction Coordination
- Incident Management – Ontario
- Incident Management – WNY
- Regional Traffic Signals
- Strategic Planning
- Technology & Systems
- Traffic Operations Center

…leveraging these resources…

NITTEC RESOURCES
- STAFF
- FACILITIES
- PROCESSES
- IT INFRASTRUCTURE
- ITS

…to capture, create, summarize data.

PERFORMANCE MEASURES
- Traveler information statistics
- Mobility TTI, PTI, FFTT
- Congested Hours
- Border Crossing Delay Time
- Incidents (by collisions severity)
- Secondary Incidents
- HELP team performance
- Traffic Operations incidents
- Communications (in & outbound)
- Systems activity
- Systems uptime & reliability

Operations connect directly to desired outcomes via data and metrics in a virtuous cycle toward continuous improvement

FUTURE STATE

The objectives NITTEC achieves...

STRATEGIC OBJECTIVES
- Know and meet the transportation needs of people and customers in the region
- Manage and optimize traffic flow
- Reduce congestion on the regional transportation network
- Improve safety and operations on the regional transportation network
- Become omniscient about the regional transportation network

...by managing these operations...

OPERATIONAL FUNCTIONS
- Border traffic management
- Traveler information
- Traffic congestion management
- Incident management
- Special event planning management
- Transportation system monitoring
- Emergency management
- Weather system monitoring
- Construction coordination
- Performance measures reporting
- Multi-agency collaboration

...through these committees...

NITTEC COMMITTEES
- Border Crossing
- Construction Coordination
- Incident Management – Ontario
- Incident Management – WNY
- Regional Traffic Signals
- Strategic Planning
- Technology & Systems
- Traffic Operations Center

...leveraging enhanced resources...

NITTEC RESOURCES
- STAFF (increased)
- FACILITIES (new, colocated)
- PROCESSES (automated)
- STANDARDS (enforced)
- IT INFRASTRUCTURE (enhanced)
- ITS (enhanced)

...to capture, create, summarize data...

DATA MANAGEMENT PROCESS
- Identify and select relevant data
- Capturing and receiving data
- Creating / generating data
- Authenticating and verifying data
- Classifying and organizing data
- Storing data
- Ensuring data integrity (e.g., security)
- Retrieving & sharing data for analysis

...based on benchmarks which reflect...

BENCHMARKS
- Collecting data
- Measuring data
- Analyzing outcomes
- Comparing results
- Establish performance benchmarks

...dashboard KPIs, which support...

KEY PERFORMANCE INDICATORS
- Define key performance indicators (KPIs)
- Filter outcome data via KPIs
- Analyze and disseminate results
- Publish in real-time via KPI dashboards
- For use by NITTEC stakeholders & operations...
- To adjust and optimize management operations and processes...
- And adjust KPIs and benchmarks

...desired outcomes, which lead to...

DESIRED OUTCOMES
- Share KPI results with the public
- Connect efforts with outcomes that affect regional quality-of-life
- Generate public participation
- Modify objectives as public needs evolve

NITTEC VISION & MISSION

PART I

NITTEC TODAY: VITAL SERVICE PROVIDER

Since the inception of NITTEC's Strategic Plan in 2007, NITTEC has successfully performed vital services in support of its members and their operations. Its record of accomplishment is long and impressive. It is clear NITTEC has created a lasting, ongoing impact on the quality of life in the Buffalo-Niagara region. The following critical functions illustrate NITTEC's central importance to its constituent organizations.

• Although independent of NYSDOT, NITTEC serves as the NYSDOT Traffic Management Center in the region, and these functions have grown over time. This includes such activities as incident response, border traffic management, congestion management and weather monitoring.

• NITTEC acts as a communications center, to centrally receive and disseminate information from and across multiple municipalities and agencies for ongoing traffic management and incident response, and during emergencies, inclement weather, road closures, construction projects and planned public events.

• NITTEC serves as an inter-agency coordinator for transportation-related issues such as construction projects and border management, ensuring multi-agency collaboration from the planning and design phase through implementation. Its role is even more critical during unplanned events such as traffic incident and weather emergencies when NITTEC helps coordinate a multi-agency response.

• NITTEC disseminates timely traveler information to the public and this service remains a key priority.

• NITTEC collects and disseminates data and ATMS functionality and services to Coalition members.

• NITTEC collects performance data and publishes monthly and annual performance measures reports indicating progress toward key objectives for several operations.

• NITTEC offers specialized training for common regional needs around transportation and safety.

Since the roll-out of its Strategic Plan, NITTEC has become a victim of its own success. Its members have come to rely increasingly on NITTEC to deliver even greater levels of service and in an increasingly customized way to fit their unique needs. These services have grown in operational complexity, breadth and scope but without a requisite corresponding increase in NITTEC's resources, staff or its authority. Further, NITTEC is not an independent entity and lacks authority and control over its own budget process. Despite its success and continued effectiveness, NITTEC has been unable to address some core and vital issues.

NITTEC's facilities and IT have supported its current mission but will face challenges supporting the addition of desired future services. Current staff spend considerable energy maintaining legacy IT infrastructure to maintain basic operations at the expense of more forward initiatives. Overall, NITTEC no longer operates at the state-of-the-art in most functional areas, from its facilities, IT infrastructure and ATMS platform, to its public outreach, manual processes and data collection. Hence, to raise NITTEC to the next level, our recommendations in each area focus on how to achieve parity with current practice to establish an adequate foundation for achieving a desired future state.

NITTEC TOMORROW: EMERGING LEADER

Rapid technological change and its emerging applications have created new possibilities for how public entities can deliver services more effectively and efficiently, and new kinds of services to meet evolving public needs.

In the next ten years, the application of technology will be instrumental in helping the leaders of the Buffalo-Niagara region to achieve desired planning goals, to sustain momentum toward making the region more economically dynamic, and to address the challenges of eroding infrastructure, aging workforce, rising costs and persistent budget issues. But regional entities, often narrow in focus, need the broader, holistic regional view that NITTEC naturally provides to help envision the opportunities which technology brings, understand their costs and benefits, and coordinate the collaborative action among regional entities.

Because surface transportation is a key pillar to the region's quality of life, and especially because of its bi-national, multi-agency, cross-regional, neutral, customer-orientation, NITTEC offers a natural platform to lead the charge. NITTEC is the one, trusted, centrally-placed and neutral organization with the proven capabilities and track record to facilitate desired regional outcomes on behalf of all stakeholders.

The Buffalo-Niagara region features a diverse range of interacting and overlapping state, local and bi-national public entities, each devoted to serving their own set of transportation objectives. They will continue to benefit from NITTEC's current role leading the ongoing coordination, collaboration and execution of traffic management and transportation technology projects in the region. But NITTEC has an opportunity to embrace an even more vital leadership role as a strong but fair broker to lead these many disparate parties in the development and fulfillment of strategic planning initiatives that achieve common regional objectives.

To embrace a proactive leadership role in the region, NITTEC must balance its traditional role as a TOC and regional project coordinator-in-chief with its role as a platform for strategic initiatives. NITTEC must learn to think and become more strategic as an organization. Becoming strategic means two things.

First, it means elevating NITTEC's agenda and the work of the standing committees to be about achieving the desired regional outcomes (defined by the planning organization) rather than solely the details of project management. While committees should retain project oversight, the implementation of online collaborative tools to facilitate project management should enable committee leaders to elevate where they spend their focus.

Second, it means adopting an outcome-driven approach to

> "The future is already here, it just isn't evenly distributed"
> ~William Gibson

management. This involves defining clear strategic objectives, organizing its operations and committees in the service of meeting those objectives, then infusing a system of performance measures which provide ongoing, real-time feedback to enable NITTEC to adjust and optimize accordingly. The adoption of the Performance Measures plan will facilitate outcome-driven results. NITTEC must start by first grappling with its own challenges around its governance, infrastructure and capabilities by supporting its efforts with adequate staff, budget, infrastructure and resources. This is required to enable NITTEC to become a world-class entity.

THE NITTEC VISION FOR 2017

NITTEC MISSION

NITTEC's purpose is to improve the quality of life for residents, travelers and those conducting business in the Buffalo-Niagara region through a shared approach to better surface transportation.

NITTEC's mission is to lead the advances in technology and multi-agency collaboration that improve mobility, reliability and safety on the regional bi-national multimodal transportation network.

STRATEGIC OBJECTIVES

- Know and meet the transportation needs of people and customers in the region
- Manage and optimize traffic flow
- Reduce congestion on the regional transportation network
- Improve safety and operations on the regional transportation network
- Become omniscient about the regional transportation network

ORGANIZATIONAL OBJECTIVES

- Be focused on the current and future needs of users and customers in the region
- Be a vital resource for all travelers and stakeholders in the region
- Be a visionary leader and unlock the capabilities of every stakeholder
- Be an outcome-oriented and proactive champion for bi-national cross-regional solutions
- Be a neutral, independent driver of meaningful regional collaboration around shared needs and goals
- Be the central point of coordination, communication and information exchange for regional stakeholders
- Manage the region as a single transportation network and set common standards for technology
- Become a model for state-of-the-art, world-class operations, and best practices
- Exemplify core values of service, performance, communication, collaboration and the common good
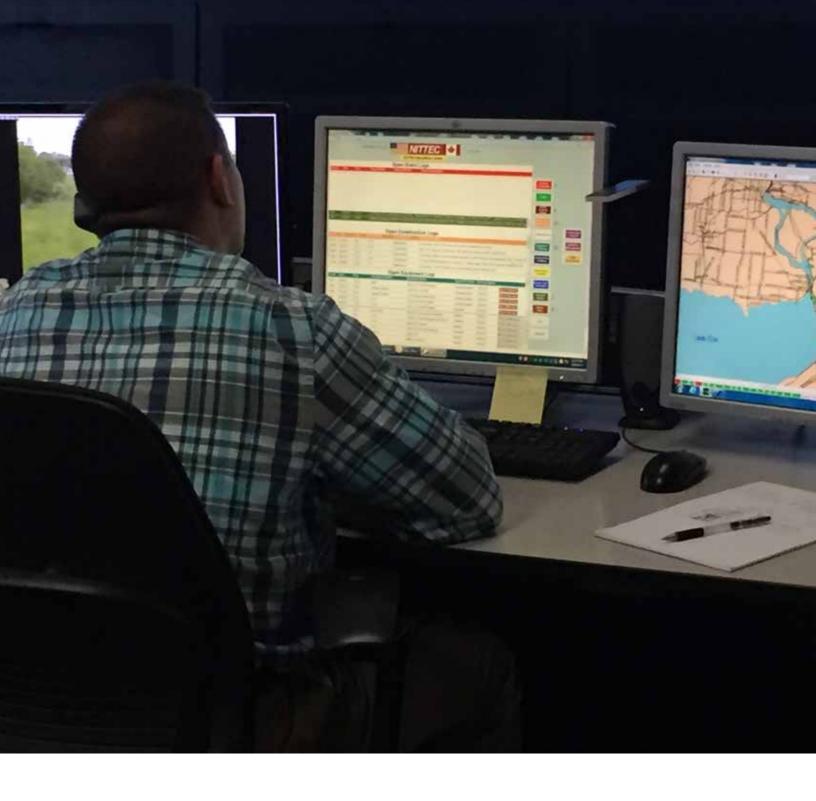
REGIONAL GOALS

- Achieve 100% participation in NITTEC across regional stakeholders at appropriate levels
- Deploy a single, unified system and process interoperability across NITTEC members
- Achieve 100% connectivity among ITS and ATMS elements
- Enable remote access and remote control for all ITS and ATMS elements
- Achieve operational processes that are 100% automated and automatic
- Deploy cloud-based mobile access with interactive functionality and capabilities for all NITTEC members
- Deploy outcome-driven management processes across all NITTEC operations and committees
- Achieve 100% participation in data exchange to collect maximum data for analysis and insights
- Achieve 100% coverage for emergency preparedness, capability redundancy and disaster recovery planning
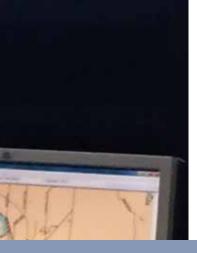- Achieve 100% systems security, privacy and integrity

NITTEC OPERATIONAL GOALS

- Ensure all travelers in the region have instant, accurate and up-to-the-minute information about travel, weather, road conditions and guidance, available anytime and anywhere
- Drive communication and information exchange to guide and keep regional stakeholders informed and coordinated with complete, accurate and up-to-the-minute information about travel, weather, road conditions and coordinated actions anytime, anywhere and for all potential situations
- Lead regional stakeholders to help envision, plan and lead regional transportation initiatives that address shared needs through multi-agency collaboration and planning toward common objectives

- Maximize stakeholder participation across the region in committees, shared services, information and data exchange, and other shared operations and services
- Facilitate multi-agency coordination around planned events, construction and maintenance projects
- Guide stakeholders to adopt operational best practices that achieve greater automation and interoperability for systems across the region
- Lead multi-agency notification and coordinated response for unplanned events, incidents and emergencies
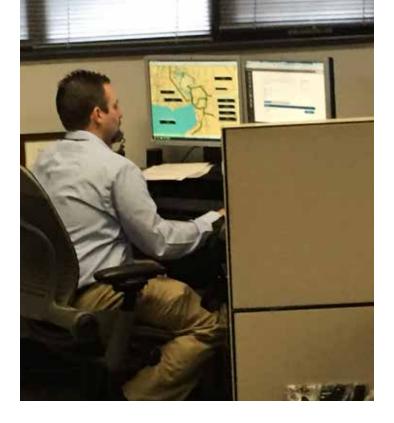
NITTEC INTERNAL

PART 2

NITTEC GOVERNANCE: RECOMMENDED ACTION

NITTEC should become an independent entity with its own dedicated and persistent source of funding from either state or local sources, or some combination thereof. Despite NITTEC's apparent stability and importance in the region, both its governance authority and budget processes represent weaknesses that require immediate and permanent solutions.

• In the past decade, NITTEC has not been given sufficient resources to be at par regarding staff, facilities and infrastructure.

• NITTEC's annual budgets have been flat, and NITTEC staff will remain challenged to implement recommendations given continued financial and resource constraints.

• Supplemental funding achieved through federal, state and other grant programs support the execution of short-term projects but do not constitute a long-term funding solution to support NITTEC's ongoing staff or operational costs. Grants are of limited duration and usually don't support the continuation of the original project. Recipients are expected achieve long-term project support independent of grant funding.

Coalition leaders must take action that empowers NITTEC to achieve desired regional transportation goals on their behalf and that makes NITTEC a more effective leadership platform.

NITTEC should take steps to establish itself as an independent entity.

Action item	Now	2-3 yrs	4-7 yrs
Develop a comprehensive plan to achieve organizational independence	X		
Incorporate human resource needs (i.e., retirement status for both current employees and current retirees)	X		
Ask the NY State to enact enabling legislation	X		
Achieve status as an independent organization		X	
End hosting agreement with NFTA		X	
Revise and re-establish the NITTEC MOU with members		X	

NITTEC should take steps to establish an independent and persistent source of funding.

Action item	Now	2-3 yrs	4-7 yrs
As part of plan for establishing organizational independence, assess and prepare projected fiscal needs	X		
Explore how to broaden funding beyond NYSDOT	X		
Explore and seek grants to address short-term project-focused funding	X		
Enact permanent, secure and independent funding mechanism, e.g., via NY State budget line-item		X	

IT INFRASTRUCTURE: RECOMMENDED ACTION

Like any organization with limited resources, NITTEC has faced the challenge of technology obsolescence by maintaining its current system, investing only in nominal fixes required to secure its ongoing and immediate operations, and foregoing the costs and benefits of adopting enhanced technology. As a result, NITTEC is falling behind the state of current practice. After conducting a thorough assessment of NITTEC's IT infrastructure, we believe NITTEC has reached a point where a systemic upgrade has proven necessary.

We strongly recommend that NITTEC undertakes an immediate plan to invest in new IT infrastructure. Failure to bring NITTEC's technical operations up to current industry standards may risk significant disruption in daily operations and would also not support the requirements to meet a desired future state.

• The legacy IT infrastructure was designed to support TOC services from 14 years ago. Supporting current services and operations is a continued challenge and would not support additional future services.

• The Technology & Systems Committee, as the natural forum to address NITTEC's long-term technology agenda, should develop a holistic roadmap of needed upgrades to replace obsolete equipment. The T&S committee should adopt a proactive process of considering new technology needs via a systems engineering approach, and jettison the current reactive, piece-meal approach to assessing technology needs.

• NITTEC's stretched-thin technical staff has, by necessity, focused on maintaining basic operational needs instead of achieving advances, hampering NITTEC's progress.

• Current systems are disparate, not fully interoperable or integrated, do not fully communicate, and require significant maintenance. NITTEC needs a single interoperable system for its traffic management and emergency services operations, and thus requires adequate IT infrastructure to support such a system.

• Most NITTEC functions that could be automated are manual and labor-intensive, e.g., TOC staff making duplicate entries for roadway events diverts staff time and attention from more valuable actions.

• A lack of common technology standards among NITTEC Coalition members undermines cross-agency interoperability of vital IT resources and ITS equipment and adversely affects the ability of NITTEC and Coalition members to achieve objectives. For example, traffic lights in the WNY region are owned and operated by different municipalities. Traffic signal controllers from different vendors are highly proprietary and require different software platforms to manage. This makes interoperability

a significant challenge and makes it harder to coordinate regional events and optimize traffic signal timings.

• Remedial steps, such as replacing the Crossroads ATMS, are already in process. However, NITTEC must ensure replacement solutions address core issues such as robust center-to-center (C2C) communications capabilities within a single, unified, interoperable ATMS for data sharing and device command and control.

• NITTEC is currently considering a backup facility for purposes of business continuity and redundancy in the event of an emergency that leads to the failure or unavailability of the physical facility.

NITTEC must upgrade its IT infrastructure to achieve parity with current practice.

Action item	Now	2-3 yrs	4-7 yrs
Deploy Systems Engineering approach to managing IT infrastructure	X		
Develop comprehensive upgrade plan and timing for implementation	X		
Define new staff requirements	X		
Define technical requirements for equipment and systems	X		
Secure necessary budget and facilities resources, including both operational cost and replacement cost at end-of-life	X		
Execute vendor consideration and selection process	X		
Deploy implementation plan	X		
Develop and maintain a Upgrade Plan for ongoing systematic IT infrastructure upgrades through planned retirement and replacement of equipment / systems	X		
Deploy Upgrade Plan through a regular and ongoing budgetary and implementation process		X	

Achieve fully redundant emergency backup capabilities.

Action item	Now	2-3 yrs	4-7 yrs
Complete emergency facility backup plan and define IT infrastructure, equipment, connectivity, location, communications and other requirements	X		
Locate backup location and deploy backup IT infrastructure		X	

Drive regional interoperability through common standards for IT equipment, software and systems.

Action item	Now	2-3 yrs	4-7 yrs
Define IT standards for interoperability and disseminate across the region	X		
Work with NITTEC members to adopt and deploy common standards		X	

IT INFRASTRUCTURE: RECOMMENDED ACTION, continued

Develop IT infrastructure that supports a single, interoperable multi-function platform.

Action item	Now	2-3 yrs	4-7 yrs
Develop ATMS requirements	X		
Integrate core ATMS functions into a single platform		X	
Integrate incident management response operations, plans, communication functions, and data into a single platform		X	
Integrate management and operations of IT's elements into a single platform		X	
Integrate all NITTEC field and performance data into a single platform		X	
Integrate all NITTEC member and regional stakeholder data and information		X	
Create a platform for interoperable C2C functionality and communications		X	

FACILITIES & MULTI-AGENCY COLOCATION: RECOMMENDED ACTION

NITTEC's operations reside in space rented from NFTA in a building with NFTA staff. It was once adequate to house its staff and operations. However, our analysis and the universal consensus of those we interviewed is clear regarding the inadequacy of NITTEC's current facility. Irrespective of aesthetics, amenities or minor issues, NITTEC's current facility is barely sufficient to support current functions and service demands, and its shortcomings preclude adopting future services. NITTEC needs more space. While expanding the size of NITTEC is not an inherent objective, ensuring an adequate facility to support its core mission is paramount.

NITTEC must consider a new facility space to continue its current level of operations.

Action item	Now	2-3 yrs	4-7 yrs
Define facility requirements based on future staff needs and IT infrastructure and other technical requirements	X		
Consider colocation and redundancy needs	X		
Work with member agencies to explore options	X		
Develop a transition plan that enables migration without service interruption	X		
Select facility of choice and enact necessary budget and supporting actions		X	
Deploy transition plan to achieve seamless migration into new facility		X	

FACILITIES & MULTI-AGENCY COLOCATION:
RECOMMENDED ACTION, continued

We also explored the opportunity for NITTEC to be colocated in a facility with other transportation-related agencies. There exists a strong consensus among NITTEC stakeholders that colocating NITTEC staff would be beneficial. Colocation means the placement of staff from agencies with relevant transportation-related operations into the same facility to obtain advantages from greater communication and operational coordination across agency staff, the reduction of silos, and from efficiencies gained from the co-utilization of various core facilities and infrastructure. It is clear from examples of other states, where colocation of traffic operations staff is common practice, that the benefits are tangible and can make a meaningful difference on advancing key priorities. We note there are some key reservations that would need to be addressed, namely the danger of NITTEC becoming less independent and more attuned to the needs of colocation partners.

More important, colocation is a state of mind that requires agencies to embrace new modes of thinking in how they will deliver core services, acquire what they need to support core functions, or what they can offer to related agencies in serving their relevant needs. The true realization of benefits from colocation does not derive solely from the proximity of multi-agency staff. Instead, the benefits derive from the capacity of agencies to engage and trust other agencies, remove operational silos, adapt and integrate their functions to the needs and opportunities presented by others, and to invent new modes of operations which leverage the inherent opportunities and advantages presented by the presence of other agency resources and staff. Colocation could result in better coordination and communication which could reduce incident clearance time.

We recommend that NITTEC explore colocation only in the context of establishing a new NITTEC facility. The capacity to realize colocation would be a function of the facility housing multi-agency staff and its allocation of space and resources to NITTEC and other agencies. Further, benefits derived from colocation would be determined by which agency staff, and which core functions, would be selected for colocation.

NITTEC should enact a colocation plan in the context of selecting and moving to a new facility.

Action item	Now	2-3 yrs	4-7 yrs
Ensure new facility requirements and migration plan incorporate colocation	X		
Determine space and other facility needs for colocated organizations	X	X	
Jointly establish clear roles & responsibilities and rules-of-engagement among agencies to minimize scope creep among agencies with related functions		X	
Jointly develop a colocation MOU that specifies rules of engagement, cost sharing for rent, utilities and janitorial services, and other facilities governance		X	
Perform budget analysis that details potential cost savings for colocation entities through shared services and leveraging incentive programs		X	
Determine new administrative procedures and staff training required to operate effectively and efficiently in the new multi-agency environment		X	
Deploy colocation agreement and commence migration to new facility		X	

High-priority candidates for NITTEC to engage in discussions about colocation include:

Action item	Now	2-3 yrs	4-7 yrs
NFTA (to continue colocation)	X		
Erie County	X		
Law enforcement	X		
Emergency response service providers	X		
City of Buffalo	X		
NYSDOT		X	
NYSTA		X	
GBNRTC		X	

FACILITIES & MULTI-AGENCY COLOCATION: RECOMMENDED ACTION, continued

Achieve cost savings by implementing shared ownership and usage of common services and equipment.

Action item	Now	2-3 yrs	4-7 yrs
Identify opportunities for co-utilization of services infrastructure, resources, and functional procedures	X		
Develop and deploy shared services agreements	X		
Achieve initial savings from colocation in shared facilities	X		
Develop shared services and integration plan and update shared service agreements	X		
Achieve future savings from integrated and shared services	X		
Deploy transition plan to achieve seamless migration into new facility		X	

STAFFING & ORGANIZATIONAL CULTURE : RECOMMENDED ACTION

In all aspects of their operations and daily duties, NITTEC staff members exude a strong, customer-service orientation with an authentic desire to fulfill the needs of both Coalition members and the general public. They have passion for public service and take pride in the impact of their work.

Despite a notable increase in functions, increasing technical complexity, and demand for services performed by NITTEC, its staffing level has not grown in recent years to meet new demand. It remains well below levels prescribed in the 2007 Strategic Plan. This has had an adverse impact on NITTEC's operations and progress.

NITTEC must make staff enhancements to meet ongoing demand for current services and to support future services. If NITTEC cannot recruit talent / expertise needed, NITTEC should consider supplementing gaps with consultants/temporary employees as interim backup support.

• The Technology & Systems staff consists of an Engineering Manager and three staff members, a small staff relative to the operational responsibilities, the degree of technical challenges they face, and the requirements to support IT systems that must be fully operational without exception on a 24-7-365 basis.

• The size of the traffic operations center staff was also small in comparison to other TOCs studied for this analysis. Every other TOC or transportation-related organization we've examined in comparison had a larger staff dedicated to technology and systems as well as operational and desktop support.

• Efficient operational procedures have helped mitigate a lack of capacity. However, the challenge for the TOC is not staff size but its duplication of efforts due to manual processes and IT management.

• Technology and systems staff are stretched thin, exacerbated by the extra time and attention required to maintain or work around non-interoperable legacy systems that reside on an archaic technology platform. Staff is barely able to tread water and is challenged to make progress on new initiatives.

• New transportation initiatives, rapidly evolving technology, and a corresponding increase in the importance that Coalition members place on NITTEC's services underscore the risk in a lack of technical staff capacity. NITTEC could be at risk and unable to meet service demands due to its staff limitations.

• Staff size presents a challenge of maintaining adequate staff coverage for vacations or off-hours. The strain of coverage could become acute during emergencies when the work takes on urgency and higher stakes.

• There is inadequate succession planning to replace senior staff who hold considerable institutional knowledge and expertise. NITTEC faces the risk of diminished ability to maintain the operation of legacy systems if any staff member retires, leaves, experiences extended illness, or goes on a long vacation.

• NITTEC faces hurdles in competing for technical talent in the open market. Other companies can offer qualified candidates larger salaries and benefits, so NITTEC must instead recruit based on the opportunity for staff to work on potentially more interesting, cutting-edge challenges that have real-world impact.

NITTEC STAFF CAPABILITY: RECOMMENDED ACTION

We cannot separate the question of staff capabilities from the issue of insufficient staff size; the former is a direct result of the latter. In our evaluation of NITTEC's overall technology-related capabilities, staff's present duties focused on maintaining legacy systems are an insufficient basis to assess whether or not staff have the capabilities required to successfully implement and operate advanced IT infrastructure based on an assessment of NITTEC's upgrade needs. In fact, the staff's overall efficiency in stretching limited resources, implementing work-arounds, and deriving ongoing value from older systems is testament to their resourcefulness.

Nevertheless, the issue of staff skills is real and important, and moving forward NITTEC needs to address the natural process toward skill obsolescence proactively through training and through new hires.

- NITTEC features well-honed but manual, not automated, operational procedures in place for core functions such as incident management and emergency response, as well as ongoing traffic management.
- NITTEC staff features relatively low turn-over with solid retention; Personnel has been stable over time.
- NITTEC facilitates ongoing learning via some formal training and on-the-job experience, e.g., robust post-incident analysis for TOC staff, but needs to develop a more systematic, robust IT training program.
- The recent addition of younger, more junior staff has been a double-edge sword; Freshy-minted graduates from world-class universities learn quickly, have cutting-edge skills, a greater understanding of today's technology, strong ambition, and passion to learn and achieve measurable impact in their work.

- However, junior staff lack institutional knowledge and work experience, must learn to use legacy systems, and may be less motivated to address persistent challenges inherent in outdated operations.

It is impossible to quantify what NITTEC might have accomplished, and what beneficial results might have been achieved, had extra capacity existed to enable staff to focus on planning and executing higher-value and more strategic projects, and which in turn might have further accelerated progress in more high-priority areas.

We qualify our staffing recommendations which follow by noting the challenge of making specific staffing recommendations with accuracy and confidence based on incomplete information. Many factors enter into determine staffing proper levels. One must to consider applications supported, performance metrics that need to be met, degree of automation versus manual processes, hours of operations, standard operating procedures, quality of the IT infrastructure, and other relevant factors.

Also, arbitrary factors such as available budget and number of full-time employees (FTEs) are often fixed and unchangeable affecting the capacity to add staff. Further, depending on the skillset and experience of any given individual and their ability to cover multiple functions, a staff configuration can vary to reflect an allocation of staff resources which matches accordingly, and may even preclude the need for FTEs in some cases when staff have more experience and skills. Nevertheless, caveats and qualifications notwithstanding, our staff recommendations follow below.

NITTEC should add FTEs to current Technology & Systems staff to achieve the following staff configuration.

Action item	Now	2-3 yrs	4-7 yrs
Director, Technology Services	X		
Network Administrator (support switches, routers, etc.)	X		
Applications Support/Training (ATMS, in-house apps., etc.)	X		
Systems Engineer (supports servers, OS, etc.)	X		
IT Technician/Help Desk	X		
Applications Developer	X		
Database Administrator (supports SQL, Oracle, etc.)	X		
IT Manager	X		

The above list reflects technical and systems support staffing for a typical traffic management center. In fact, larger centers could typically employ two persons at some positions and even more in others. Smaller centers might combine the Director and IT Manager roles. These T&S staff recommendations relate to supporting current services only. By necessity, staffing requirements for future services must be considered only at a point in time when NITTEC rolls out new services since that is when its needs for personnel and skills will be clear.

For the Traffic Operations Center we recommend further analysis with no change in staffing at this time.

Action item	Now	2-3 yrs	4-7 yrs
Implement recommendations for IT infrastructure upgrades to free up staff time currently devoted to unproductive activities	X		
Create and deploy staffing plan to reallocate available staff and staff time to higher-value activities		X	
Deploy training and staff development programs as necessary		X	

NITTEC STAFF CAPABILITY, Continued

To support the staff needs of future services, NITTEC should build a staff plan based on desired outcomes.

Action item	Now	2-3 yrs	4-7 yrs
Define a revised NITTEC staffing budget with key stakeholders	X		
Define agreed-to outcomes, services and service levels that NITTEC will deliver, and define the corresponding operational and staff requirements	X		
Develop and deploy a staffing plan based on staff and operational requirements and in consideration of budget constraints	X		

NITTEC must also hire FTEs to support operations resulting from other functional recommendations.

Action item	Now	2-3 yrs	4-7 yrs
Communications Assistant (to manage digital content, social media, site, etc)	X		

NITTEC SERVICES

PART 3

CURRENT STATE

We evaluated NITTEC's current state with respect to the services NITTEC delivers, its core functions, methods of operation, and the IT infrastructure, staff, budget and other resources required to support it. We documented our findings of NITTEC's current state thoroughly in The Summary of Findings volume and summarize two positive points, below:

- First, overall, we found that NITTEC has considerable assets in its strong service and customer orientation, a culture of work pride and responsibility, a robust work-ethic of thoroughness and detailed diligence, and its vital role in driving bi-national, multi-agency collaboration and coordination.
- Second, NITTEC staff deserve considerable credit for the sheer quantity and consistent level of quality of services and functions they are able to deliver and maintain. These have a significant positive impact on the operations of NITTEC members and correspondingly on the quality of life for people in the region.
- Layered in with these strengths, we mainly found significant challenges which undermine NITTEC's functional capacity. Its current state is not a suitable foundation on which to build a desired future state.
- First, as we summarized in an earlier section on "Facilities," NITTEC's current state of services is largely defined by the issue of legacy IT infrastructure which does not fully support the needs of the TOC and other core functions. As a result, there is an ongoing and significant drain of staff focus, budget and other resources on maintaining these systems and merely keeping the larger system operational.
- Second, NITTEC's current state of operations is also defined by its lack of a single, interoperable platform to accommodate ATMS and other core functions. We counted nine separate non-interoperable systems currently in operation. The result is that a significant degree of NITTEC's staff time is devoted to manual and redundant processes and supporting disparate applications that create data silos.
- Finally, NITTEC does not take advantage of best practices in its operations, and its equipment, software and systems are not state-of-the-art. NITTEC lags in these very important areas and in ways that hamper its ability to make progress against internal and external objectives.

DESIRED FUTURE STATE

Envisioning NITTEC's desired future state is more than adding the right mix of ITS equipment and IT infrastructure and systems upgrades. Its future state is not about technology. It is about a change in thinking. It is about a holistic, integrated and outcome-driven management approach that embraces a systems engineering focus enabled by tools of technology. It is guided by a collaborative strategic planning process with buy-in and support at the highest leadership levels of all Coalition members and regional stakeholders.

To operationalize this approach, we define the elements NITTEC's desired future state as possessing a state-of-the-art facility, robust IT infrastructure and software, a sufficiently-sized staff with needed capabilities and operational best practices whose functions across the region are supported by the following:

- Single interoperable ATMS system integrated with all operational functions and ITS elements; incident management system, automatic alerts, notifications and triggers, robust response plan generation engine guided by business rules
- Cloud-based to enable remote mobile usage and interactivity
- Single unified source and view for all information with permission-based remote update capabilities

- Comprehensive interactive and extensible live map with ability to isolate unique elements
- Automated process documentation with a single point of data entry
- Proactive agency coordination with automated and automatic data & information sharing
- Robust Center-to-Center (C2C) subsystem to allow interagency data sharing and ITS device command and control to support NITTEC stakeholders as needed either onsite or from remote locations
- Complete video and data coverage of key roadways of the region
- Interoperable video feeds integrated into NITTEC's system to enable unlimited dissemination of feeds on a permission-basis back to Coalition members and publicly available channels
- Support for common ITS standards such as NTCIP and architecture for systems and equipment managed by non-NITTEC operators
- Automated data feeds integrated into NITTEC-operated data warehouse
- Customizable visualization dashboard and analytics tools with automated reporting
- Incident, emergency and predictive maintenance algorithms ties to automatic alerts and notification

- Robust cyber security and data privacy regimen and software
- Mastery of these capabilities which will enable NITTEC to achieve desired core strategic objectives:
- Know and meet the transportation needs of people and customers in the region
- Manage and optimize traffic flow
- Reduce congestion on the regional transportation network
- Improve safety and operations on the regional transportation network
- Become omniscient about the regional transportation network

FUTURE SERVICES: RECOMMENDED ACTION

The steps required to achieve the desired future state are represented by the recommended actions which follow, below. These are not presented in any order and are each high-priority in nature. Although these recommendations are grouped into separate service topics, each one represents an integral piece of a unified, holistic solution that establishes NITTEC as a single, integrated organism whose individual parts are mutually inter-dependent. Foregoing one or more steps will affect the impact of deploying the others.

Due to the inter-connected nature of these recommendations, we repeat certain similar functional enhancements within each individual section to emphasize the importance of that specific element to achieving overall success. For example, the need to deploy a single interoperable system is very critical.

Finally, you may notice our recommendations do not emphasize solutions which feature recent advances in transportation technology, e.g., connected and autonomous vehicles (CAV). Given NITTEC's current state and resource constraints, we strongly recommend that NITTEC first focus on more modest goals. This means achieving parity with only those practices strictly necessary for NITTEC to be effective in pursuing its regional transportation objectives. The result will be a more solid foundation upon which NITTEC can build more advanced solutions. Nevertheless, this still represents quite an ambitious agenda for NITTEC to enact.

Integrate all systems into a single, unified interoperable ATMS platform that incorporates these features.

Action item	Now	2-3 yrs	4-7 yrs
Action item	X		
Closed circuit TV/video CCTV and camera controls (PTZ)	X		
Dynamic messaging signs / portable messaging signs	X		
TRANSMIT system data	X		
Automated incident detection	X		
Automatic response plans (which can be modified)	X		
Automatically-generated public alerts	X		
Auto-generated reports & performance measures	X		
C2C and interface with 3rd-party systems, such as police CAD	X		
Map interface	X		
Event management		X	
Remote command application		X	
Roadway sensors		X	
Roadway Weather Information Systems (RWIS)		X	
Ramp meters and other techniques to effectively manage congestion		X	
Lane control signals		X	
Variable speed limit signs		X	
Weather sensors		X	
Inventory & maintenance (using predictive analytics)			X
HOV/T lane management			X
Regional traffic signals control (i.e., during emergency)			

FUTURE SERVICES: RECOMMENDED ACTION, continued

Enlarge traveler information and public communications by enhancing existing services.

Action item	Now	2-3 yrs	4-7 yrs
Real-time updates which automatically populate and disseminate through key distribution channels	X		
Initiate parallel updates to DMS by staff, as appropriate	X		
Website and mobile app would be interactive to enable users to customize views and information, and address specific travel needs	X		
Partner with regional media owners (e.g., TV and radio newscasts) to establish regular outreach and which promote NITTEC and its traveler information tools and services; For example, create and distribute daily segments on traffic from NITTEC covering traffic congestion, road conditions, alternate routes (when deployed), upcoming events, and transportation updates	X		
Ability to motorists to report incidents, road debris or need for assistance via SMS with precise GPS		X	
Contractor-operated PVMS would be integrated into a communications alert system to be available for utilization as needed in specific geographic areas or region-wide, as determined by NITTEC (i.e., standards should be made compatible with NITTEC's ATMS to enable automatic command & control)		X	
Site or app functionality and information which includes traffic and estimated travel times on specific routes and locations, current and forecasted weather, road and driving conditions, alternate routes (when applicable), and other important information		X	
Full-matrix signs in select locations (e.g., graphics)		X	
Partner with private-sector owners of popular mobile applications (e.g., Google Maps or Waze) to create an interface for easy means to incorporate key NITTEC updates and regionally-specific information, and so 3rd-party applications can send and receive data (e.g., INRIX, HERE, RITIS, etc.)		X	
Deploy Signal Phase and Timing (SPaT) as part of ATMS as a first step toward supporting CAV			X

Upgrade traffic congestion management capabilities with new services.

Action item	Now	2-3 yrs	4-7 yrs
Unified view of all activities; Bring all data into a single ATMS	X		
Cameras which cover arterials and other key routes	X		
Proactive monitoring	X		
Data-driven decision support system (i.e., rules based)		X	
Variable speed limits		X	
Implement hard shoulder running i.e., using paved shoulder as travel lanes during peak hours (and usually accompanied by deployment of LCS)		X	
Bluetooth or wi-fi on key local/arterial routes to track travel times		X	

Enhance special event planning and management capabilities with a single unified tool.

Action item	Now	2-3 yrs	4-7 yrs
Develop a single, unified system with construction coordination and other planned projects to enable a single point of entry for event information and dissemination, made available 24-7 to NITTEC member	X		
Event information and plans incorporated into single, unified map-based system to view and manage events on a regional basis	X		

FUTURE SERVICES: RECOMMENDED ACTION, Continued

Integrate incident management tools to achieve faster and more effective detection and response.

Action item	Now	2-3 yrs	4-7 yrs
Achieve response time capabilities of under 1 minute	X		
Automatic incident detection and notification i.e., via video analysis or TRANSMIT data to monitor traffic flow and detect sudden slow-downs which may indicate an incident	X		
Automatic generation of events for NITTEC staff	X		
Automatic generation of response plans (i.e., pre-planned, conditionally triggered) with ability to preview and modify response plans	X		
Automatic reminders to update event status	X		
Staff response capabilities housed in a single system; eliminate need for duplicate action	X		
Single point of data entry via scalable & extensible, user-friendly application	X		
Automated, easy report generation and documentation (after-action analysis)	X		
Integration of all available NITTEC and 3rd-party data into a single incident detection system to expand and enhance incident detection capabilities and reduce response time	X		
Automatic information dissemination to interested parties, including notification and status updates	X		
Automatic logging and documentation of incidents, time of discovery and actions taken by NITTEC staff	X		
Single, unified and comprehensive map-based view of region for management and control	X		
Cloud-based / mobile interactivity to enable interested parties to access, edit and make status and information updates or customize information and map views as necessary from any remote location		X	
Single unified access point for incident, video feed, status updates, and related documentation, available to all interested parties in real-by permission-only		X	
Enable MYNITTEC app users to report incidents, road debris, need for help using SMS with precise GPS locations; feeds directly into incident management system to trigger notification and response		X	

Unify regional transportation system monitoring capabilities.

Action item	Now	2-3 yrs	4-7 yrs
Managing the regional transportation system as one system, including arterial roads and enhanced corridor management	X		
Ability to display potential diversion routes (i.e., only when activated)	X		
Extend camera coverage to priority areas not already covered	X		
Video feeds available in real-time to all NITTEC members using a permission-based system	X		
Incorporate existing camera feeds not already served to NITTEC (i.e., from City of Buffalo, Erie County and Ontario)	X		
Full regional camera coverage of major roadways and arterials		X	
Equip county and municipal vehicles with cameras to provide feeds on a mobile basis		X	
Enable remote camera operation to NITTEC (for during emergencies)		X	
Incorporate camera feeds from law enforcement, with appropriate rules of usage		X	
Enable users to select and customize feeds		X	
Wrong-way driver detection and warning capability		X	
Over-height detection on bridges and warning system for trucks		X	
AVL and cameras for track snow plows and HELP vehicles		X	

Expand and automate emergency management operations to be faster and more effective.

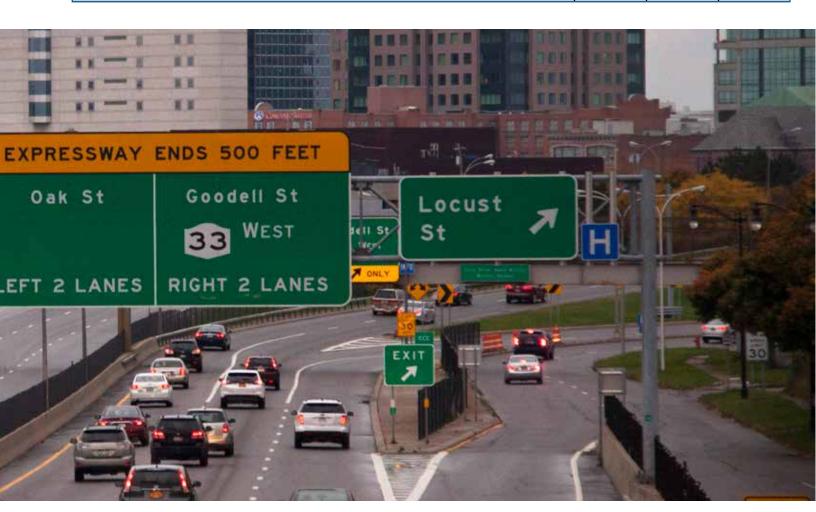| Action item	Now	2-3 yrs	4-7 yrs
Expand HELP program with more vehicles			
Make TOC SOPs from manual to be electronic and automated	X		
Automatic generation of events for NITTEC staff	X		
Automatic generation of response plans (i.e., pre-planned, conditionally triggered)	X		
Ability to preview and modify response plans	X		
Automatic reminders to update event status	X		
Automated plans, pre-determined and rules-based, and conditionally-triggered	X		
Automatic notification and emergency systems enactment	X		
Pre-determined rules-based conditions to automate recognition and declaration of emergency conditions		X	
Automated triggers based upon when certain thresholds are reached to alert operations staff of potential problems before they become critical		X	
Develop incentive program to reward first-responders for faster response times (e.g., bonus payouts to towing companies who arrive first)		X	
Full capability to temporarily control regional traffic signals			X

Develop robust weather system detection and monitoring capabilities across the region.

Action item	Now	2-3 yrs	4-7 yrs
Integration with automated feeds from the National Weather Service for automatic updates and availability of forecast information on NITTEC site	X		
Ability to discern and display localized weather conditions across the region	X		
Add detection capabilities, such as RWIS, and ability to assess weather patterns as they develop across the entire region	X		
Add weather detection instrumentation in Canada and in geographical areas outside Western NY to detect weather before it reaches NITTEC areas	X		
Prediction capabilities (i.e., ability to determine potential traffic impact from weather conditions based on previous experience and event probability)		X	
Ability to detect, predict and show weather impact on road and driving conditions		X	
Ability to determine and show where snow and ice clearance action has been taken or is needed		X	
Create a local weather monitoring and detection network		X	
Instrument county and municipal vehicles and building exteriors as part of a regional weather detection and monitoring network		X	
Extend the network to include privately owned vehicles, buildings and boats to expand detection capabilities		X	
Enable analysis of data on a localized basis to discern and predict variance in local weather patterns and local impact		X	

FUTURE SERVICES: RECOMMENDED ACTION, Continued

Improve construction and project coordination by adopting unified collaboration tools.

Action item	Now	2-3 yrs	4-7 yrs
A single, unified system with planned event coordination and other planned projects to enable a single point of entry for event information and dissemination, made available 24-7 to NITTEC members	X		
Project information and plans incorporated into single, unified map-based system to view and manage projects on a regional basis	X		
Regional view of all construction projects to advance shared transportation objectives via regional coordination among entities	X		
Enable real-time coordination through cloud-based mobile access and functionality	X		
Greater integration of planning and other functions to facilitate multi-agency regional construction projects		X	
Predictive analytics using relevant usage, weather and other data to anticipate maintenance needs		X	

Achieve greater multi-agency collaboration via online collaboration tools.

Action item	Now	2-3 yrs	4-7 yrs
Deployment of cloud-based online collaboration tools for common projects	X		
Automatic data sharing for key operational functions and metrics of interest	X		
Web-based (permission only) access to NITTEC data	X		
Deployment of common standards for IT hardware and software procurement to promote interoperability and working collaboration	X		
Enhanced center-to-center communication capabilities		X	
Common planning for ITS and transportation infrastructure improvements based around shared needs and common goals		X	

Improve border traffic management via tools that enhance traffic flow at borders.

Action item	Now	2-3 yrs	4-7 yrs
Automatic detection of end-of-queue and queue warning	X		
Expand Green Lanes to facilitate faster border crossing with more bridges and with a program of pre-approved and pre-inspected vehicles and drivers who use reserved lanes and where only a smaller, random portion get stopped for full customs inspection		X	
Establish customs and border patrol pre-clearance centers for international freight prior to arrival at bridge crossings, as part of expanded Green Lanes			X

Formalize and deploy a training curriculum to meet multi-agency and internal NITTEC needs.

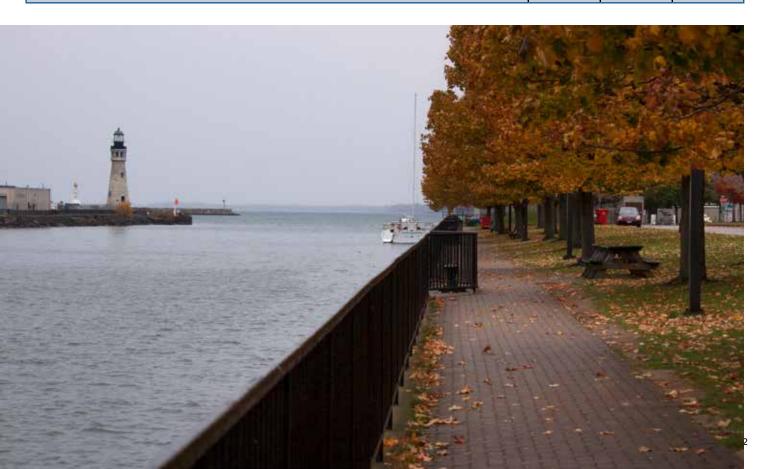| Action item	Now	2-3 yrs	4-7 yrs
Lead members to co-develop an interdisciplinary learning agenda and training curriculum for NITTEC members	X		
Develop a priority learning agenda and curriculum for NITTEC TOC and Technology & Systems staff	X		
Acquire requisite resources and deploy NITTEC member training program based on curriculum	X		
Acquire requisite resources and deploy NITTEC internal training program based on curriculum	X		
Systematic and period review of other TOCs for best practices and to remain current	X		

FUTURE SERVICES: RECOMMENDED ACTION, Continued

Deploy Unmanned Aerial Systems (UAS, i.e., drones) to enhance NITTEC's overall capabilities.
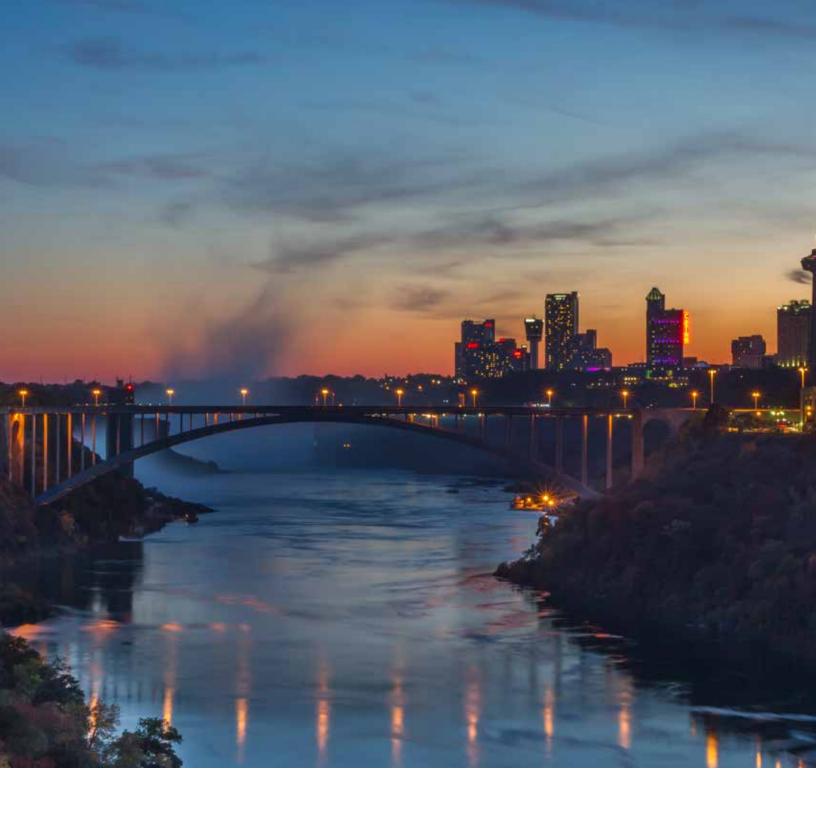
Action item	Now	2-3 yrs	4-7 yrs
With agency partners (who would own and operate UAS) develop a budget and operational plan for the utilization of UAS in key NITTEC operations (per FAA regulatory requirements) and define performance measures	X		
Deploy a UAS pilot program to extend video surveillance of the region; define and use performance measures		X	
Deploy a UAS pilot program to detect traffic presence and flow, changes in traffic flow, traffic congestion; define and use performance measures		X	
Deploy a UAS pilot program for purposes of detecting unplanned traffic incidents; define and use performance measures		X	
Deploy a UAS pilot program for purposes of monitoring construction site and event sites for planned incidents; define and use performance measures		X	
Deploy a UAS pilot program for purposes of detecting weather conditions and disseminating weather data i.e., as part of a NITTEC weather network;		X	
Deploy a UAS pilot program for purposes of monitoring and estimating bridge traffic and border crossing times; define and use performance measures		X	
Deploy a UAS pilot program for purposes of monitoring road and bridge conditions; define and use performance measures		X	
Deploy UAS to collect and integrate broad data into NITTEC data warehouse and analytics; Integrate feeds and data from UAS operated by other members		X	
Deploy larger UAS program integrated into NITTEC systems			X

FUTURE SERVICES:
EXPLORED BUT NOT RECOMMENDED AT THIS TIME

NITTEC should support but allow other stakeholders to serve as the lead for development and deployment for the following services.

Action item	Now	2-3 yrs	4-7 yrs
Public transportation vehicle signal prioritization systems	N/A		
Emergency vehicle preemption systems	N/A		
Physical and cybersecurity systems	N/A		
Transportation demand management techniques such as managed express lanes or ramp metering	N/A		
Ridesharing, Transportation network company services	N/A		
Electronic and app-based payment systems		N/A	
Parking space / available parking assistance mobile app functionality		N/A	
Advanced traveler information systems (ATIS)		N/A	
Audio signal detection, automatic road enforcement, collision avoidance systems, or other advanced ITS solutions		N/A	
Connected Vehicle technology (e.g., V2V, vehicle-to-road integration)			N/A

NITTEC COMMITTEES

PART 4

NITTEC COMMITTEES: RECOMMENDED ACTION

NITTEC's committees are the main policy execution and arm guiding how NITTEC operates, sets priorities and facilitates coordination and collaboration among Coalition members. The importance of NITTEC's committees as a feature in its overall organizational capacity cannot be over-stated. The effectiveness of NITTEC's committees has had a direct impact on how well NITTEC has functioned and its success to date.

While our overall assessment has been that NITTEC's committees function extremely well, we do perceive several opportunities for improvement in current operations and adoption of organizational best practices. It is vital NITTEC's members provide a requisite level of support and participation through the committee structure. NITTEC's committees currently share some common defects, summarized below:

- Inconsistent participation among Coalition members due to lack of relevance of committee business to and impact on the immediate priority, concerns or focus of member organizations.
- Lack of alignment between committee mandates and day-to-day committee operations; Some committees are bogged down by project management concerns and administrative minutiae at the expense of developing long-term vision.
- Committees rarely consult or use available performance metrics and do not use an outcomes or data-driven approach to evaluate or manage committee work.
- Varying degrees of strength among each committee's leadership.
- Turnover as active participants retire; More junior and newer members lead and chair committees but without necessarily a full understanding of the institutional procedures or opportunities to lead.
- Opportunities to engage in true regional collaboration toward shared regional concerns but discussion and focus remain limited to information sharing and dissemination for only limited coordination.
- Lack of clarity of participant roles and responsibilities, in some cases.
- Lack of fully endowed support from key Coalition leaders vested in their committee representatives.
- Large quantity of municipalities and organizations in the region not affiliated or engaged with NITTEC.

The recommendations which follow (not listed in any order or priority) will help strengthen NITTEC's committees with respect to having the right level of support and engagement from Coalition members:

- To enhance participation among NITTEC's current membership
- To ensure committees have the right representation and leadership support
- To increase the number of regional organizations participating in NITTEC

Give NITTEC coalition members greater motivation and urgency to participate be elevating the importance and impact of the work to be more focused on outcomes, not just project management.

Action item	Now	2-3 yrs	4-7 yrs
Re-balance committee agenda focus from project execution to strategic outcomes; Redefine committee mandates to align with strategic outcomes	X		
Define specific committee objectives that are tangible, quantifiable and measurable which reflect NITTEC's overall strategic objectives	X		
Establish target performance goals for each committee to achieve	X		
Elevate the role of performance measures and data by using outcome data to assess the committee's ongoing performance against those goals	X		
Identify how current projects direct back to broader NITTEC strategic objectives	X		
Identify gaps in NITTEC's overall strategic objectives directly relevant to committee jurisdiction, the regional action or projects necessary to address them; Then collectively plan and execute required actions		X	
Empower committees to engage in collaborative long-term joint planning and initiatives to achieve long-term, mutually shared regional goals which are multi-agency in scope and nature		X	
Identify unique capabilities that each member organization can contribute to NITTEC (e.g., camera feeds, weather alerts, data, shared services, etc)		X	

Manage committees on a data and outcome-driven basis by elevating the role of performance measures.

Action item	Now	2-3 yrs	4-7 yrs
Collect performance data that reflects (1) progress and status against individual projects (2) progress against the committee's established goals (3) progress against NITTEC strategic objectives, in addition to performance data reflecting daily operational functions relevant to the committee	X		
Regularly publish and disseminate performance outcomes that reflects (1) progress and status against individual projects (2) progress against the committee's established goals (3) progress against NITTEC strategic objectives, in addition to daily operational functions relevant to the committee	X		
Analyze performance data related to (1) progress and status against individual projects (2) progress against the committee's established goals (3) progress against NITTEC strategic objectives, in addition to (4) performance data reflecting daily operational functions relevant to the committee to draw operational insights and findings that inform ongoing practices	X		
Publish interactive, high-level dashboards showing progress in real-time		X	
Establish performance benchmarks for each metric for each committee		X	
Evaluate committee performance according to progress against metrics		X	

NITTEC COMMITTEES: RECOMMENDED ACTION, continued

Elevate the importance of NITTEC's work and shared regional transportation objectives among elected officials and the leadership of key NITTEC stakeholder and constituency organizations in the region.

Action item	Now	2-3 yrs	4-7 yrs
Enforce requirement for committee representation by most senior-level representatives or their authorized proxies	X		
Ensure NITTEC committee representatives are empowered to speak and act on behalf of the full scope of the organization; increase representation as needed to represent other parts of the organization	X		
Enact clear guidelines for succession planning for committee leadership and for each organization's representation	X		
Establish regular briefing meetings and ongoing communication between NITTEC leadership and key elected officials	X		
Disseminate regular NITTEC strategic performance report with (1) key long-term strategic goals (2) status on projects to achieve those goals (3) top-line summary of relevant performance measures (4) upcoming initiatives and needs	X		
Achieve synchronization between NITTEC's strategic objectives and the agenda of local, county and state political leadership		X	

Enhance the impact of participation by reducing friction and barriers to participation and collaboration.

Action item	Now	2-3 yrs	4-7 yrs
Share a document that establishes clear roles and responsibilities for each participating organization on the committee including their unique strengths	X		
Deploy a "RACI" chart for each project (i.e., a prioritization of which entities are either responsible, accountable, consulted or informed)	X		
Enact clear roles and responsibilities for each committee member	X		
Create a robust onboarding process for new members	X		
Promote greater use of online collaborative tools (e.g., private member access to website) to cover each committee's basic administrative elements, information sharing, common access to documents and materials	X		
Establish forum to share, disseminate and encourage adoption of best practices among municipalities (i.e., how to use NITTEC's services)	X		
Reward participation by enacting official public recognition for a member or an organization's significant contribution or impact (e.g., on website)		X	
Integrate municipalities onto a shared platform for automatic data delivery		X	
Drive integration of municipalities onto a shared platform for traffic management and signals operations		X	
Leverage online collaborative tools for shared project management and ongoing real-time collaboration		X	
Publish online key-information & performance dashboards for each committee with ongoing project status and results in real-time		X	

COMMITTEE-SPECIFIC: RECOMMENDED ACTION

Border Crossing Committee Enhancements

In our analysis, the Border Crossing committee continues to be an effective forum for facilitating discussion and projects related to regional bi-national border crossings and managing border traffic. We do not recommend major changes to the committee structure, membership or focus at this time. However, the committee should consider some enhancements and other related recommendations.

Action item	Now	2-3 yrs	4-7 yrs
The Border Crossing committee should oversee the implementation of a "green lanes" program at the bridge crossings to improve freight traffic	X		
The committee should expand informal membership to include regional stakeholders in international transport, such as freight operators, to obtain input regarding their border crossing needs and their feedback on proposed solutions	X		
The Border Crossing committee should more proactively serve as a platform to collect and share examples of best practices related to border crossing activities nationwide, on an ongoing basis, for NITTEC to consider for implementation	X		

Construction Coordination Committee Enhancements

The Construction Coordination committee has been successful in achieving baseline objectives but needs to expand its focus to be a true platform for a collaborative approach toward defining and realizing the region's construction needs related to transportation.

Action item	Now	2-3 yrs	4-7 yrs
Enact a single software platform such that each regional Coalition member can independently enter and access information about construction projects (on a permission-basis) in a secure, user-friendly manner. The ideal construction planning / coordination software should collect and integrate information, coordinate and assist Coalition members with their planned construction activities	X		
Deploy use of cloud-based collaboration software tools to more easily facilitate information, coordination and actual project collaboration	X		
Expand information to include a broader set of community stakeholders in the region, such as school bus operators, railroads, livery services, delivery services, freight organizations and utility organizations	X		
Focus on achieving higher-benefit outcomes, not just project management to be more outcome-oriented	X		
Incorporate greater role for regional planning organizations so the Construction Coordination committee's agenda is set by planning objectives in addition to the maintenance needs of roads and bridges		X	
Consider broader mandate to facilitate multi-agency coordination and collaboration on construction projects in the planning stages via shared planning visions; bring needs to the table to jointly enact construction projects that address projects on a regional basis		X	

Ontario and Western NY Incident Management Committee Enhancements

Both the Ontario and Western NY Incident Management committees already serve as models of effectiveness for other NITTEC committees. Their focus should continue to be on discovering ways to enhance regional improvements in the overall system. However, there is opportunity to expand the committees' work toward incident reduction as well.

Action item	Now	2-3 yrs	4-7 yrs
Use the committee to explore best practices and methods to accelerate incident detection time and then incorporate into current operations.	X		
Use the committee to explore best practices and methods that could help achieve proactive incident reduction in addition to efficient incident response	X		
For example, using historical data, identify most likely areas and road, weather and other conditions that could result in traffic incidents to enable activities around proactive incident reduction, such as where and when to deploy variable speed limits and other measures	X		
Enhance the incident and secondary crash performance measures which enumerate time to detection, response times from detection, and speed in achieving clearance; report and disseminate to all first responders; create incentives for first-responders to respond and clear incidents more quickly	X		
Create competitive incentives for service providers to respond first and more quickly; For example, for towing companies or even first responders		X	

Regional Traffic Signals Committee Enhancements

The Regional Signals plan constitutes a high priority project for NITTEC and Coalition members. But progress toward signal coordination has been slow and unrealized for a variety of reasons. These are among the steps NITTEC should take to overcome the barriers to progress this committee has experienced.

Action item	Now	2-3 yrs	4-7 yrs
Elevate the committee's workplan objectives from project management to achieving regional results	X		
Establish more aggressive timeframes and mark progress accordingly	X		
Establish as a key performance indicator, the percentage of traffic signals that are interconnected within the larger system; Use this metric to drive action toward integration by signal operators	X		
Engage key public officials to adopt regional signal coordination as a priority to ensure efforts are sufficiently supported across municipal and county governments	X		
Engage the leadership of key committee members to empower representatives with authority to lead	X		
Leverage the natural constituencies public and law enforcement agencies to augment communications with public officials to elevate the priority of signal coordination	X		
Make achieving 100% connectivity across all traffic signals in the region a priority and requirement	X		
Continue to utilize revolving loan funds as a means to achieve these objectives	X		
Establish traffic signal control at the county level but maintain municipal input		X	
Develop and implement technology standards to ensure signal interoperability across the region		X	

COMMITTEE-SPECIFIC: RECOMMENDED ACTION, Continued

Strategic Planning Committee Enhancements

The Strategic Planning committee needs to stop being a project manager and operations coordinator and embrace its role as the driver of NITTEC's long-term vision by defining shared objectives and then driving efforts through other NITTEC committees. The Strategic Planning committee can "level-up" its thinking and approach, away from administrative and management minutiae and toward a more strategic orientation, by using performance measures and a clear agenda of desired strategic objectives as a means to hold other committees accountable for managing and achieving project success, and ensuring other committee's objectives are tied directly to desired outcomes and managed via quantifiable goals.

Action item	Now	2-3 yrs	4-7 yrs
Adopt a more proactive and strategic outcome-based perspective to inform at a higher-level and to drive collaboration at a strategic level	X		
Turn the focus of the Strategic Planning committee to strategic planning development and implementation	X		
The Strategic Planning committee should stop being responsible for project management. It should view project status information as a means to keep the Board of Directors informed rather than being responsible for overseeing or fixing project details	X		
Place project oversight and management responsibilities squarely with committees	X		
Hold committees responsible for establishing and meeting quantifiable goals	X		
Use performance measures to evaluate overall progress against strategic objectives	X		
Elevate the role of overall performance measures reports as a feedback and continuous improvement mechanism for NITTEC operations	X		
Long-term, the Strategic Planning committee should engage in bi-national planning with US and Canadian counterparts to align regional objectives and long-term plans		X	

Technology & Services Committee Enhancements

Despite the capabilities of its participants, this committee has been largely ineffective in its ability to define and support the needs of the Traffic Operations Center and other technical needs of the NITTEC organization. It has been unable to draw down the required budget expenditures in IT system equipment and upgrades to keep NITTEC on par with current technology. The committee is insufficiently empowered to obtain the resources it needs to support NITTEC's current operation. We envision that this committee could instead be an integral leader in establishing technology standards across the region and defining technology needs on a regional basis that guides how NITTEC members approach their own information and communication technology (ICT) operations and ITS and ICT procurement.

Action item	Now	2-3 yrs	4-7 yrs
The Technology & Services committee must adopt a forward-thinking approach in defining NITTEC's IT needs and establishing the right business case and planning to acquire requisite support for them	X		
The committee's work must cease to be solely about maintaining existing legacy systems and fixing bugs on a list; While this work is critical, the committee should maintain oversight of the status of these elements rather than their executional responsibility	X		
Establish a proactive IT infrastructure plan for the ongoing acquisition and implementation of new IT infrastructure to replace obsolete equipment on an ongoing operational basis	X		
Establish a business case and cost-benefit analysis for each element, identifying costs and required budget resources, and a developing a plan with timelines for acquisition and implementation	X		
Take ownership of a data strategy to define how NITTEC will collect, store, secure, authenticate and make accessible the many potential terabytes of data that NITTEC and its partners may create through the increased usage of ITS and other technology-driven elements	X		
This committee should prepare and coordinate appropriate measures for potential cyber and systems security threats in conjunction with appropriate state and federal emergency and national security services	X		

COMMITTEE-SPECIFIC: RECOMMENDED ACTION, Continued

Traffic Operations Center Committee Enhancements

The Traffic Operations center needs to proactively manage the TOC and elevate its focus from solely oversight of basic operations to achieving a preferred vision of the TOC and defining and implementing the roadmap to achieve it. The adoption of a more sophisticated performance measures system will be integral for how the Committee achieves a more outcome-driven management approach of the TOC's operations.

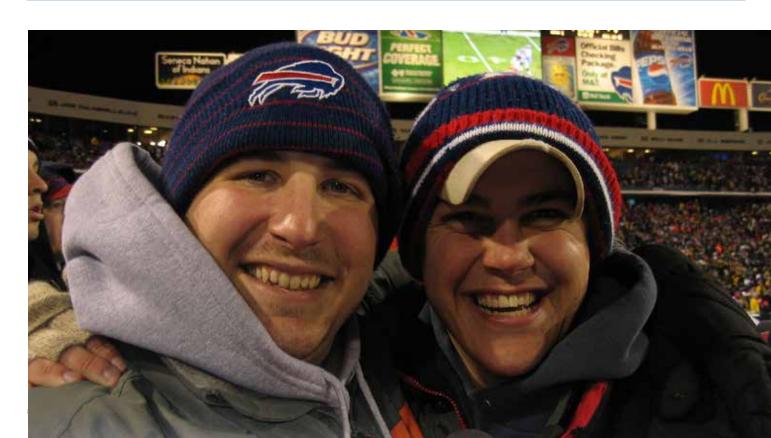| Action item	Now	2-3 yrs	4-7 yrs
Elevate the oversight function of the TOC committee from being reactive to being proactively focused on achieving a desired state for TOC operations	X		
Collaborate with other NITTEC committees to deploy an interoperable, single-platform unified ATMS and incident management system that automates data inputs and outputs, performance reports, and inter-agency communications	X		
Committee should collaborate with key TOC constituencies, particularly law enforcement agencies in municipalities across the region, to define and standardize operational practices for incident response and other emergency operations in the context of a new unified platform	X		
Manage TOC operations using data-driven performance outcomes by establishing a practical vision for a desired state	X		
This requires articulating specific objectives for the TOC for each service use-case the TOC acts against, and doing so in ways that are clear and quantifiable	X		
Translate desired operational practices to achieve optimal results into corresponding operational performance measures	X		
Begin collecting data against desired outcomes and then use results to develop target performance benchmark	X		
Continue to regularly assess and measure progress against achieving or maintaining those standards	X		
Obtain and compare best practices from examples of other organizations and use as a framework to assess its TOC operational practices	X		
Collaborate with the Technology & Systems committee to define and address the systems and other IT needs, and other areas where TOC operations are challenged, to define an ongoing roadmap or required improvements	X		

NITTEC MEMBERSHIP: RECOMMENDED ACTION

NITTEC should view its members as a distribution channel for its services and information; having more is an advantage. Through affiliated members, and services that each provides to its audiences, NITTEC delivers its own services and communications. For example, NITTEC passes public alerts and other real-time communications through members' electronic channels. In the longer term, while still providing a key communication channel, NITTEC members will increasingly become active nodes in an overall "smart" system by automatically contributing data and information and aligning their own operations accordingly.

Increase NITTEC membership to every relevant organization in the region, and at an appropriate level.

Action item	Now	2-3 yrs	4-7 yrs
Identify all potential regional participants not currently active with NITTTEC	X		
Enact an outreach program to engage and invite non-member entities to join	X		
Redefine clear and tangible services and benefits that NITTEC delivers to General and Affiliate membership levels; Redefine participation at these levels	X		
Establish and achieve participation of objective of 100% of the region by 2020		X	

Establish incentives for participation: exclusive membership benefits to Coalition members in good standing.

Action item	Now	2-3 yrs	4-7 yrs
Exclusive access to region-wide video feeds for members in good standing	X		
Safety and other benefits of being included in the TOC information loop	X		
Broader public reach and access for alerts via NITTEC's site, app and social	X		
Access to participation in and development of relevant training programs	X		
Private online access to NITTEC committee work, NITTEC reports and other publications of interest	X		
Participation in regional performance measures program and access data	X		
Assessment of member's key performance indicators of interest (KPIs) plus assessment and guidance for improvement	X		
Exclusive access to best practices video and publications and comparative benchmarks for key operations	X		
Access to cloud collaboration tools for multi-agency coordination and advanced planning	X		
Ability to control views of video feeds for members in good standing		X	
Access to advanced weather detection information		X	
Access to NITTEC comprehensive map, including private data		X	
Ability to manipulate, edit and add local elements to NITTEC map		X	
Access to members-only NITTEC performance measures dashboard		X	
Benefits of other shared services as they are implemented		X	
System integration to automatically deliver or access performance data			X

Establish requirements for NITTEC Affiliate or General members to maintain their good standing status.

Action item	Now	2-3 yrs	4-7 yrs
Must contribute local transportation outcome data to NITTEC	X		
Must share camera feeds to NITTEC	X		
Mutually incorporate other public information of interest on websites	X		
Mutually incorporate public alerts and traveler information on social feeds	X		
Adopt NITTEC technology standards and guidance	X		
Active participation in NITTEC committee or committee work (appropriate to membership level)	X		
Promote MYNITTEC app and functionality and other NITTEC services	X		
Host a NITTEC content widget on organization site or apps		X	
Publish NITTEC videos, other content and link to NITTEC site on organization site and publish in social media		X	
Share weather and weather detection information to NITTEC		X	
Coordinated content calendar related to public alerts		X	
Data integration and automation		X	
Participation in integrated NITTEC system		X	

The following committee topics were explored and considered but we do not recommend action at this time.

Freight Committee

We do not recommend establishing a stand-alone freight committee at this time. Instead, the Border Committee presents the natural place to address the needs of freight operators. Further, NITTEC should explore and define the needs of freight operators in relation to how NITTEC can promote the more efficient flow of goods and services through the region. Then NITTEC should evaluate how these needs can be most effectively facilitated, whether by the creation of a stand-alone committee or within the work stream of an existing committee.

Performance Measures Committee

We explored but do not recommend establishing a stand-alone committee to create and implement a performance measurement plan, or to collect, monitor and analyze data to evaluate performance on an ongoing basis. Instead, this vital work should remain the central focus of each respective committee to ensure ongoing work is managed on a data and outcome-driven basis, and that NITTEC uses performance data to evaluate how well NITTEC is or is not achieving its overall strategic objectives. Performance measurement cannot be disengaged from overall management and should not be siloed as a function.

Railroads & Utilities

We explored whether or not efforts to increase participation among railroad and energy companies would be fruitful, and what such participation might look like. Our analysis did not yield discovery of any concrete benefits, nor did it discount the value of any potential opportunity to engage, such sharing weather detection information. Hence, our findings are inconclusive and we recommend no specific action at this time.

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