A Connected Region: Moving Technological Innovations Forward in the NITTEC Region

ADVANCED TRANSPORTATION AND CONGESTION MANAGEMENT TECHNOLOGIES DEPLOYMENT INITIATIVE

Funding Opportunity Number DTFH6116RA00012

Submitted by:

NFTA
nfta.com

On behalf of:

New York State
Department of Transportation

nittec
Travel Smart.

Project Name	A Connected Region: Moving Technological Innovations Forward in the NITTEC Region
Previously Incurred Project Cost	$
Future Eligible Project Cost	$ 16,477,005
Total Project Cost	$ 24,290,261
ATCMTD Request	$ 7,813,256
Total Federal Funding (including ATCMTD)	$ 7,813,256
Are matching funds restricted to a specific project component? If so, which one?	Yes, $750,000 for Parking Management
State(s) in which the project is located	New York
Is the project currently programmed in the: ▪ Transportation Improvement Program (TIP) ▪ Statewide Transportation Improvement Program (STIP) ▪ MPO Long Range Transportation Plan ▪ State Long Range Transportation Plan	TIP – no (will be added once funded) STIP - no (will be added once funded) MPO LRTP - yes State LRTP - yes

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1. PROJECT DESCRIPTION

1.1. Executive Summary

The Niagara International Transportation Technology Coalition (NITTEC) and the New York State Department of Transportation (NYSDOT) offer up this grant application to the U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) under the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) program. The application is being submitted by the Niagara Frontier Transportation Authority (NFTA) on behalf of the Region. The initiative focuses on the Niagara Frontier Region, which includes Erie and Niagara counties, 64 local municipalities, and Native American Lands.

NITTEC, NYSDOT, and its partners are seeking to deploy a multi-agency, technology-enabled, integrated Regional mobility management system under the ATCMTD grant. The goal of the effort is to enhance safety and mobility across the Region through fulfillment of the following:

- Balancing multi-modal demand at international border crossings through active demand management to provide acceptable levels of service;
- Improving commercial vehicle operations, (CVO)primarily through CVO-targeted traveler information, including development of vehicle-to-infrastructure (V2I) applications supporting in-vehicle dissemination of alerts and advisories; and
- Enabling the benefits of integrated Regional mobility by extending existing integrated corridor management (ICM) activities geographically, and advancing from a corridor-based model (along the I-190 corridor) to a Regional focus.

To realize these achievements, the grant effort focuses on the following initiatives:

1. *Improve Border Crossing Performance and Travel Time*
   - Define operational performance goals for border crossing travel time and delay.
   - Dynamically monitor border crossing operational status.
   - Develop and implement strategies to balance border performance and travel time within the set thresholds.
2. *Improve Commercial Vehicle Operations and Safety*
   - Provide in-vehicle real-time traffic, parking and weather information to commercial vehicles to facilitate trucks operations from the Pennsylvania border and the Rochester area into Buffalo and the border crossings.
   - Provide truck parking management support to accommodate trucking and trucker needs.
3. *Expand Regional Smart Mobility*
   - Expand ICM to major highways in the Region, as well as the City of Buffalo main corridors and routes.

- Expand the I-190 ICM corridor from the east to Rochester and from the south to the Pennsylvania border.
- Upgrade municipal signal systems on potential alternate routes.
- Deploy a parking management system downtown and/or around major trip generators, such as hospitals, stadiums, special events, downtown business areas and more.
- Integrate real-time and forecast weather information system and the alerting applications within the Region.
- Upgrade the Regional Advanced Traffic Management System (ATMS) to have a fully integrated Regional smart mobility system.
- Develop a dynamic Regional Decision Support System and performance measures application to ensure optimized operational level of service.

4. *Improve Incident Management*
   - Improve coordination among responders by integrating with additional 911 Computer Aided Dispatch (CAD) systems and expanding the Regional information exchange network initial project to assure for a robust and timely exchange of information including incident location, response and incident status.
   - Integrate with on-scene Emergency Management Service providers using the Integrated Incident Management System (IIMS) concept employed as a pilot project in New York City.
5. *Provide for Operational Integration within NFTA and with Regional Smart Mobility*
   - Integrate various NFTA real-time data sources to improve operational efficiency.
   - Integrate NFTA operational data and systems within the Regional mobility concept.
   - Improve NFTA transit incident management by integrating various steps and process within the agency and with various involved departments.
   - Offer transit as an alternative strategy to highways and vice versa.
   - Provide real-time transit information to public via 511NY and other dissemination tools.
6. *Using Real-time and Forecasted Weather Information for Active Traffic Management Strategies*
   - Implement a robust real-time and weather forecast and alert system to warn truckers and motorists of inclement weather and delays.
   - Integrate with NYSDOT and New York State Thruway Authority (NYSTA) Road Weather Information System (RWIS) units currently in place and/or being expanded via the Mesonet project.
7. *Provide Travelers with Enhanced Rea-Time Information*
   - Provide real-time and forecasted multi-modal, multi-agency transportation network information via 511NY and other applications.
8. *Enhance Data Collection, Fusion, Distribution and Archiving*
   - Enhance the ability to collect, fuse, distribute and archive available data for all manner of performance measures, performance management, real-time operations and real-time information.

Most of the proposed initiatives should be broadly transferable to other areas of the state and country. This project is intended as a showcase for deployment of a multi-agency, multi-modal, integrated Regional mobility management system.

1.2. Contracting Agency

NITTEC and NYSDOT will be the agencies with overall responsibility for completion of the Advanced Transportation and Congestion Management Technologies Deployment Initiative. NFTA is submitting the application on the Region's behalf.

The point-of-contact for our proposal is:

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NITTEC in cooperation and coordination with NYSDOT will provide all progress reporting to the USDOT, with input from the local stakeholders and consultants.

1.3. Geographic Area

The Niagara Frontier, the border Region that encompasses the Niagara River border crossings, is a strategic international gateway for the flow of trade and tourism between the United States and Canada. The Niagara River, flowing from Lake Erie to Lake Ontario, forms the Niagara Frontier border with the United States and Canada.

On the United States side, the Buffalo-Niagara Frontier Region forms the western border of New York State with the province of Ontario. The City of Buffalo, the second largest city in New York State, is located at the eastern most end of Lake Erie, overlooking the Niagara River. The Region consists of Erie and Niagara Counties and 64 local municipalities.

The coverage area will be expanded to NYSDOT Region 4 boundaries for the CVO proposed concept to assure ample time to react to any adverse traffic and weather conditions prior to reaching the borders.

1.3.1. Highway Network

The existing highway network in the Niagara Frontier Corridor includes a number of controlled access highways that serve the Niagara Frontier and border area. The existing highway network within New York State and Canada is shown in Figure 1, below includes I-90 West to the PA border and I-90 East to the Rochester, NY area, I-190, I-290, I-990, US62, SR33, SR198, SR266, SR325, SR400. On the Canadian side, the principal approach highways are the Queen Elizabeth Way ("QEW"), a four-lane controlled-access highway, Highway 3, a Regional four-lane highway and the Niagara Parkway. Tolls are collected one-way only on crossing from the United States into Canada.

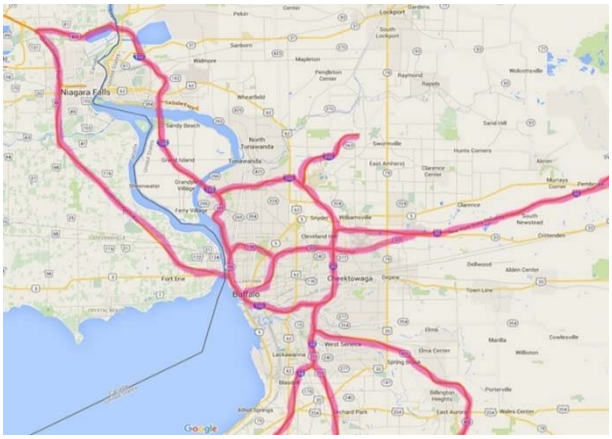

Figure 1: Buffalo Highways

1.3.2. Border Crossings

The Peace Bridge is located near the center of downtown Buffalo, New York, and Fort Erie, Ontario, where it crosses the Niagara River. The Peace Bridge is one of four vehicular toll crossings over the Niagara River in the Region as shown in Figure 2. The Buffalo and Fort Erie Public Bridge Authority (PBA) owns and operates the Peace Bridge. The other three crossings are the Lewiston-Queenston Bridge, the Whirlpool Rapids Bridge and the Rainbow Bridge, which are owned and operated by the Niagara Falls Bridge Commission and are located roughly 20 highway miles north of the Peace Bridge.

Of the four bridges, the Peace Bridge and Lewiston-Queenston Bridge carry a greater percentage of vehicles with non-local destinations being the only bridges that accept commercial traffic in addition to their connections to major international corridors. Consequently, there is a greater amount of traffic on the Peace Bridge and the Lewiston-Queenston Bridge.

The main approaches to the Peace Bridge on the United States side are the New York State Thruway (I-190) and Porter Avenue, a four-lane arterial. The main approach to the Lewiston-Queenston Bridge on the United States side is the I-190.

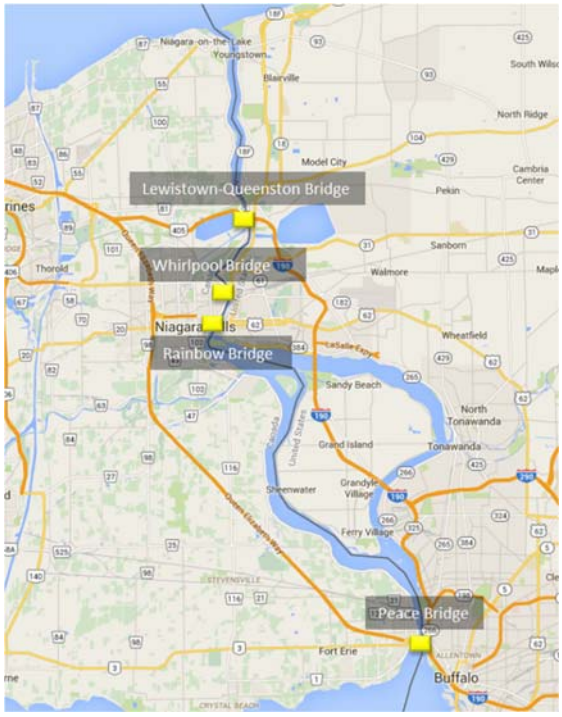

Figure 2: Border Crossings

1.3.3. Bus and Light Rail Operations, Routes, and Stations

NFTA-Metro is the transit provider serving Erie and Niagara counties in New York. There are 62 bus routes with over 4,800 bus stops being serviced shown in Figure 3, along with a 6.4-mile light rail system.

Metro's fixed route bus fleet consists of primarily 308 buses with either diesel, compressed natural gas (CNG) or hybrid (diesel/electric) power. The Paratransit Access Line (PAL) fleet is comprised of 74 Diesel, CNG, and gasoline powered vans. Vehicle performance has a direct impact on Metro's ability to deliver reliable safe service. All the bus routes are directly impacted by traffic congestion, incidents or pavement conditions.

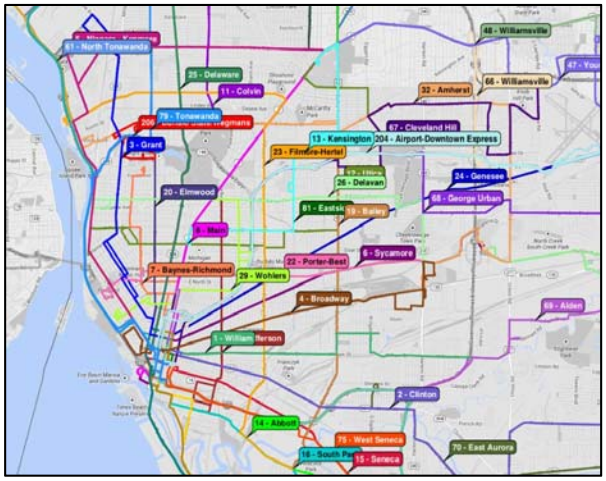

Figure 3: NFTA Bus Routes

1.3.4. Traffic Signal Systems

The City of Buffalo maintains over 650 traffic signals. Recently, a NITTEC Regional Traffic Signals Committee was established to develop continuity in traffic signal management amongst owning agencies and stakeholders in the Western New York Region. The Committee has identified goals to further enhance mobility, reliability and safety of travel along arterial roads throughout the Region. A main goal of the Committee is to synchronize and manage traffic signals along 14 priority corridors within the city using central signal software. To accomplish this goal, the City of Buffalo is in the process of upgrading controllers along Niagara Street with future expansions and procuring a new signal control system.

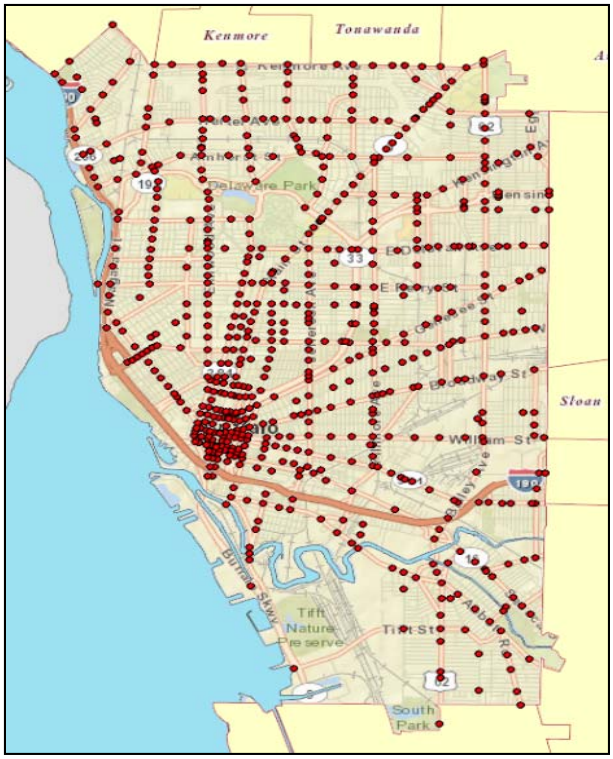

Figure 4: Traffic Signals – City of Buffalo

1.4. Issues and Challenges

High traffic volumes combined with operational and processing constraints at the border crossings can be subject to significant border delays. Generally, existing delays can be related to congestion and operational matters at the enforcement/processing plazas. These delays are often caused by large peaks in traffic volumes, such as mid-week truck traffic peaks, holiday passenger vehicle peaks, or by additional security measures that may be undertaken from time to time.

The major source of traffic at the three primary bridge crossings is a result of non-commuter related passenger cars as well as trucks. Due to tourist travel patterns, passenger car volumes are highest during Fridays and weekends, (heaviest in July and August). Truck traffic occurs during the weekdays, particularly on Wednesdays and Thursdays. Congestion is an increasing issue in the Niagara Corridor.

Complex travel demand across the border coupled with the need for tighter security and inspection procedures after September 11, 2001, border-crossing delay has become a critical problem with tremendous economic and social costs. Two reports released by Ontario Chamber of Commerce (OCC) in 2004 and 2005 show that border delays cost the US economy approximately, $4.13 billion every year. The reports also warn that if the border delay issue is not adequately addressed, the US stands to lose close to 17,500 jobs by 2020 and close to 92,000 jobs by 2030. In 2010, 12.9 million motor vehicles traveled between the US and Canada through the Buffalo-Niagara Gateway. The number of Vehicle Miles Traveled (VMT) in the Niagara Frontier Region has been steadily increasing over the past several years. Since 2010, while the overall traffic volumes across the bridges have been lower, the freight traffic across the Region bridges has increased. The bridge traffic is shown in Table 1, below.

Peace Bridge						
	East - to U.S.		West - To Canada			
Year	Auto	Trailer	Auto	Truck	Bus	Total
2010	2,374,904	628,319	2,396,606	592,673	14,161	6,006,663
2011	2,387,671	649,041	2,389,264	603,490	15,957	6,045,423
2012	2,369,676	656,635	2,381,124	608,710	15,142	6,031,287
2013	2,305,251	635,553	2,352,450	609,419	14,767	5,917,440
2014	2,163,781	637,091	2,180,968	613,397	13,633	5,608,870
2015	2,069,202	627,278	2,091,419	601,683	12,768	5,402,350
Average	**2,278,414**	**638,986**	**2,298,639**	**604,895**	**14,405**	**5,835,339**

Lewiston Queenston – US Bound Vehicles						
Year	Auto	RV/Limo	Truck	Bus		US Bound
2010	1,389,282	3,159	337,928	2,384		1,530,623
2011	1,670,492	3,397	349,840	3,446		1,780,221
2012	1,688,136	3,386	345,150	3,963		1,856,812
2013	1,546,104	3,179	340,513	3,829		1,708,495
2014	1,513,642	3,075	360,353	4,166		1,602,322
2015	1,345,730	2,956	362,108	3,968		1,490,794
Average	**1,525,564**	**3,192**	**349,315**	**3,626**		**1,661,545**

Rainbow Bridge – US Bound Vehicles						
Year	Auto	RV/Limo	Truck	Bus		US Bound
2010	1,644,751	2,207	141	12,842		1,831,964
2011	1,732,673	2,226	133	13,884		1,916,099
2012	1,613,145	2,014	124	12,651		1,794,234
2013	1,456,271	2,352	190	11,147		1,639,012
2014	1,247,363	1,912	463	10,325		1,387,052
2015	1,644,751	2,207	141	12,842		1,831,964
Average	**1,518,755**	**2,144**	**203**	**12,228**		**1,686,275**

Table 1: Vehicles using the Bridges

1.5. Vision, Goals and Objectives

With the border crossing, heavy commerce transaction, major CVO traffic, high tourism activities, adverse weather conditions and major sport activities as well as a Regional transportation network managed by multiple independent agencies, the Region has realized the need for better coordination and management of the transportation network as a whole. In 1995, NITTEC was created to coordinate activities among agencies on both sides of the border. Through the years and with limited available funding, NITTEC member agencies have made some progress to better coordinate activities, share information among agencies and with the public.

In general, the Region and agencies handle their typical recurring traffic and congestion and manage their facilities as expected and without much of any coordination of operations with others. Once a major unexpected event takes place, even with the existence of NITTEC, the Region is not fully ready to deal with the situation in the most efficient manner, utilize the available alternative routes, coordinate operations and work as a team to manage the event as efficiently as possible.

1.5.1. Goals

The primary Regional transportation mobility goals are:

- **To improve, optimize and maintain acceptable performance goals at each and among all border crossings to and from Canada and approaching facilities** – This is not limited to border crossings only and has to be looked at from the Regional perspectives and as far back as needed. The past experience has shown that the concept of ICM will be helpful to deal with local issues along the corridors and the impact will be much more powerful if the concept is expanded to a Regional mobility with larger coverage and multiple coordinated corridors.
- **To apply the smart mobility application as part of the city of Buffalo smart city concept** – The facilities approaching the border crossings pass through the city of Buffalo and cities arterials will serve as potential alternative routes in the event of incidents. In addition, with the recent expansion of city's medical center as well as the extensive traffic and parking demand during the sport activities, it is important to look at the bigger picture and improve various transportation and traffic elements that collectively can make the mobility around and within the city of Buffalo smarter.
- **To improve commercial vehicles operations within the Region** – The Region and the border crossings are heavily used by the commercial vehicles traveling to and from Canada. They come from PA border from the west and from NYC and Rochester area from the east. Provision of real-time and reliable traffic data, non-recurring events, status of border crossings and weather related activities as well as parking availability and other related information will provide truck drivers with the ability to plan accordingly and efficiently and eliminate the confusion and congestion along the borders in the event of major activities.
- **To proactively provide accurate and timely real-time and forecasted tailored weather information** – Weather has been a major cause of incidents and congestion in the Region. The severity of adverse weather impacts on many occasions will result in closure of roadways due to incidents related activities. The knowledge of accurate weather conditions in the near future will result in better management of facilities and operations related decisions that will maximize safety while informing the operating agencies and travelers in advance of such activities.

- **Provide for Operational Integration within NFTA and with Regional Mobility** – Transit plays an important role in the region. In addition to serving local commuters within the greater Niagara Frontier region, the NFTA also serves tourists and others new to the region. Transit also plays an important role in offering alternate modes of transportation to travelers and particularly during major events. There are potential opportunities to improve NFTA internal operations as well as its integration with the regional mobility concept.
- **Enhance Data Collection, Archiving and Performance measures** – The building blocks of any multi-agency, multi-modal integrated system is its data collection, fusion, desalination and archiving applications and every goal mentioned above will rely on this function one way or another. With the USDOT's recent ruling on the need to develop performance measures reports, the need to automate the entire process is essential.

1.6. Transportation Systems and Services

The following Table summarizes the transportation systems and services that are proposed for the project. It also details the purpose of the system/service and the specific technology/system to be deployed to support that system/service. Within the Niagara Frontier Region, NITTEC provides the key technical and institutional hub that helps to bring together the various jurisdictions in the Region, modal interests, and service providers to focus on the common goal of optimizing the performance of the entire surface transportation system. Traffic data is collected and processed, and made available to the operators on various platforms. In that regard, our proposed system will:

- Consolidate the various data sources into one single, centralized database and make it available to the operators through a multi-layered dynamic map.
- Share the fused data with Regional partners through one Data Mart.
- Implement EcoTrafiX Performance Measures platform to dynamically monitor and operate the Regional transportation network based on performance measures.
- Implement the EcoTrafiX Expert Rule Engine and Cambridge Systematics simulation model as the DSS application to assist Regional stakeholders with cooperatively responding to Regional incidents, congestion, and events.
- Provide Parking Management Services of all downtown Buffalo parking spaces and truck parking facilities, including the installation of detectors, a parking management software system and providing data to the data mart.
- Provide CV technology to the Region by deploying roadside and onboard devices and data fusion of the V2I data into Regional transportation management systems.

The implementation of these coordinated strategies requires the development of a new and potentially complex set of inter-jurisdictional agreements and operating procedures but based on the experience to date, the effort required has proven to be beneficial. NITTEC has been instrumental to execute many existing inter-jurisdictional agreements in the past among Regional agencies and will lead expansion of such efforts in future. There have been measurable improvements in not only reducing the impact of congestion and the attendant environmental issues but, more importantly it provides the travelling public with far more efficient service – faster, safer and more responsive.

Goal	Solution Description	Proposed Technologies
Improve Border Crossing Performance and Travel Time	▪ Define operational performance goals for border crossing travel time and delay for passenger cars and commercial vehicles. ▪ Dynamically monitor border crossing operational status. ▪ Develop and implement strategies to maintain the border performance and travel time within the set thresholds.	▪ Performance Measures ▪ EcoTrafiX ▪ DSS ▪ HERE Data ▪ TRANSMIT Data ▪ Border Crossing Wait Time data
Improve Commercial Vehicle Operations and Safety	▪ Provide in-vehicle real-time traffic information to commercial vehicles using connected vehicles concept ▪ Provide information to facilitate trucks operations from the PA border and the Rochester area into Buffalo and the border crossings focused on non-recurring delays due to border crossing operations, construction, incidents, weather and emergencies. ▪ Provide timely, accurate and actionable real-time and dynamic traffic information to CVs via existing mobile apps. ▪ Conduct a CV pilot to communicate real-time traffic information directly into the trucks. ▪ Provide a truck parking management application to accommodate truck needs.	▪ Commercial apps such as Sirius ▪ Parking management system ▪ Weather system ▪ 511 (expanded) ▪ EcoTrafiX ▪ Connected Vehicle ▪ DSS
Expand Regional Smart Mobility	▪ Expand ICM to all major highways in the Region as well as the City of Buffalo. ▪ Expand the I-190 ICM corridor from east to Rochester and from south to the PA border and include additional corridors; I-90, I-290, 5, 33, 20, 219, 104, 31 and 62. ▪ Upgrade municipal signal systems on potential alternate routes. ▪ Deploy a parking management system downtown and/or around major trip generators such as; hospitals, stadiums, special events, downtown business areas and more. ▪ Integrate real-time and forecast weather information system and alerting application within the Region. ▪ Enhance the Regional DSS and performance measures application to ensure optimized operational level of service.	▪ EcoTrafiX ▪ Traffic Signals ▪ IIMS ▪ Parking Management System ▪ DTN Weather System ▪ DSS ▪ 511NY ▪ Compass ATMS ▪ Local Systems

Goal	Solution Description	Proposed Technologies
	▪ Provide 511NY with any available real-time data to be shared with travelers.	
Improve Incident Management	▪ Improve coordination among responders by implementing a system that will facilitate the robust and timely exchange of information including incident location, response needed, incident status, etc. ▪ Integrate with EMS service providers using the IIMS concept deployed in NYC.	▪ EcoTrafiX ▪ IIMS ▪ Crossroads
Provide for Operational Integration within NFTA and with Regional Mobility	▪ Integrate various NFTA real-time data sources within the agency to improve operational efficiency. ▪ Integrate NFTA operational data and systems within the Regional mobility concept ▪ Offer transit as an alternative strategy to highways and vice versa. ▪ Provide real-time transit information to public via 511NY and other dissemination tools.	▪ EcoTrafiX ▪ 511 (enhanced) ▪ Transit Systems
Implement Innovative Real-time and forecasted weather information and Alerting System	▪ Implement a robust weather forecast and alert system to warn truckers and motorists of inclement weather and delays	▪ EcoTrafiX ▪ DTN Weather data ▪ Mesonet
Provide Travelers with Enhanced Real-time Information	▪ Provide real-time and forecasted multi-modal, multi-agency transportation network information as far as possible via 511NY and other applications including in-vehicle devices	▪ EcoTrafiX ▪ 511 (enhanced)
Enhanced Data Collection, Fusion and Distribution	▪ Enhance the ability to collect, fuse and distribute data for all manner of performance measures, performance management, real-time operations and real-time information including	▪ EcoTrafiX ▪ Performance Measures application

High traffic volumes in the Region combined with operational and processing constraints can be subject to significant border delays. Generally, existing delays can be related to congestion and operational matters at the enforcement/processing plazas. These delays are often caused by large peaks in traffic volumes, such as mid-week truck traffic peaks, holiday passenger vehicle peaks, or by additional security measures that may be undertaken from time to time.

The focus for this project will be to demonstrate underutilized strategies, plans, and policies, which have been proven to be effective elsewhere, nationally or internationally, in order to reduce congestion, which in turn will improve safety, and reduce emissions of greenhouse gases (GHG). The intent, however, is to replicate fundamental changes in system operations, which can be readily implemented without major equipment expenditures. The figure below shows the currently deployed assets that will be leveraged for this project (in blue), the new systems (shown in red), and new field infrastructure (shown in green) that will be integrated to support the goals and objectives.

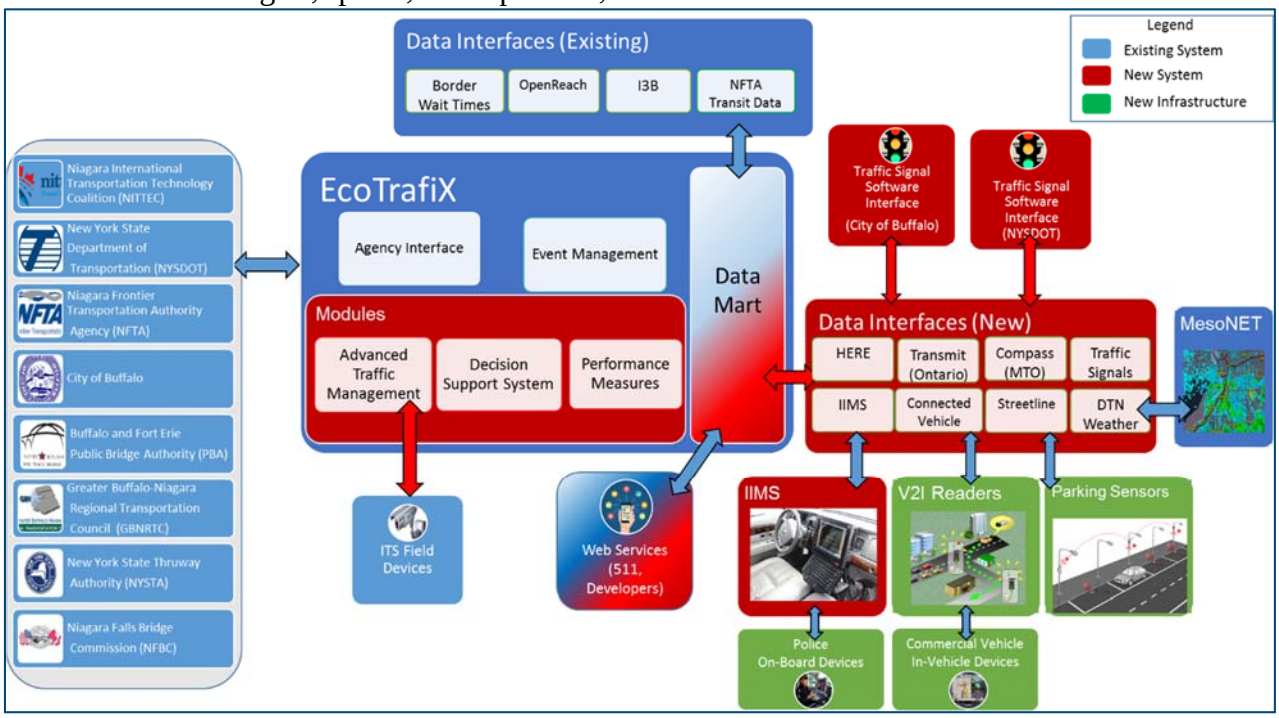

Figure 5: Buffalo Regional Integrated Mobility Management System

1.6.1. IEN Solution Expansion

In 2015, New York State Energy Research & Development Authority (NYSERDA) awarded the contract to deploy a first phase of the ICM deployment in the Buffalo – Niagara Region while creating a dynamic information exchange network among NITTEC member agencies. The IEN solution, EcoTrafiX (ETX) by Kapsch with a modular architecture will allow for additional functionalities and enhancements listed below.

1.6.1.1. ETX – Decision Support System

A DSS is the foundational methodology behind the deployment of ICM. It is the foundation of the information-fed, objectives-driven, software-intensive system. Since nominal traffic operations already exist for each of the individual agencies, the DSS screens for anomalies that are, for the most part, nonconforming to the Region and require a coordinated response.

The ETX-DSS provides candidate response plans to the Region based on network conditions received from the data fusion system, and on rule-based plans. The ETX-DSS uses a rules engine to select the response plan that provides the Region with the most benefit, based on agreed upon performance measures. For this project, the ETX-DSS will use time based rules to select plans based on the time of day (i.e. morning plan, afternoon plan, etc.) and will include weather and traffic status rules or workflow conditions to adapt action plans to these conditions.

1.6.1.2. ETX – Performance Measures

Performance measures are recognized as an important element of all Regional mobility management systems. TMC Operations managers and operators have a responsibility to know how, when, and where to institute a wide range of strategies. These changes cannot be sensibly implemented without knowledge of the appropriate information upon which they are based. The ETX Performance Measures module will be deployed to provide both output and outcome based performance measures for the Region. The ETX Performance Measures module will allow the operations organizations to visually inspect the real-time operation of the transportation networks in the Region. The software will allow each agency and user to configure the graphic depictions, reports, and measures used by the system for their purposes. The performance measures will provide the Region with a real-time indicator of how the network is performing versus historical performance. In addition, all MAP-21 required measures will be available in the system for agency use.

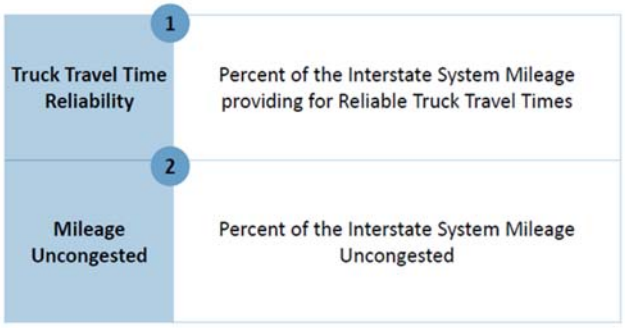

Figure 6: Performance measures for Freight Movement on Interstate System

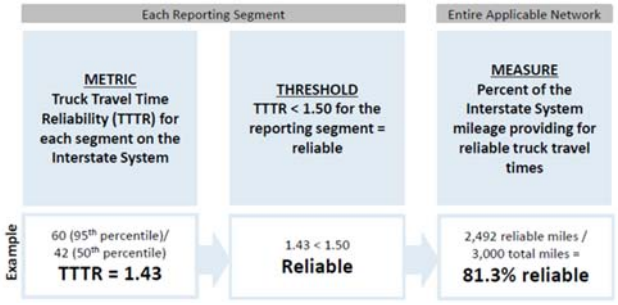

Figure 7: Measures to Assess Freight Movement on the Interstate System

1.6.1.3. ETX ATMS Module

As part of the Regional mobility concept and the proposed ICM expansion to all major highways within the Region, the current Crossroads ATMS will be replaced with the ETX ATMS module to ensure a fully integrated and coordinated operational systems across the Region and within involved agencies. This will provide the Region with a fully automated response plan deployment concept whereas the majority of recommended strategies will be deployed automatically in the field once the agencies are comfortable with the system performance and results.

1.6.1.4. Transit Integration

An interface to NFTA transit incident Data and General Transit Feed Specification (GTFS) schedule data will be developed to request real-time transit data and integrate it into ETX system and ultimately the various dissemination mechanisms. As previously discussed NFTA provides bus, light rail, and paratransit transit service in the region, and is

used as an alternate mode during times of special events and major incidents.

In addition, integration with the real-time transit Automatic Vehicle Location (AVL) and Automated Passenger Counter (APC) systems will provide transit operators with an intuitive graphical interface to monitor current vehicle location and available capacity status on the ETX map. This capability offers an operator, not only the ability to see where their vehicles are currently located, but also the capability to determine current passenger count on their fleet vehicles. ETX will be used to integrate and automate the NFTA event management operations by applying the business roles and DSS applications.

1.6.1.5. Data Collection, Fusion, Archive and Performance Measures

The data fusion engine is the center piece of the entire system. As the data becomes available, they are fused, stored, shared with various internal and external applications and stored and archived for the development of real-time and archived performance measures analysis. The ETX performance measures application will be used to archive data and provide agencies with the ability to create performance measures as well as configured operational dashboards according to the agency's needs. The new sources of the data from the systems described in the previous sections will all be integrated into a single Data Mart. This includes 3rd party data from HERE and Waze, devices data from the various agency systems, transit data, and event data from the ETX and agency systems.

1.6.1.6. Modeling and Forecasting

As part of the Greater Buffalo Niagara Regional Transportation Council's (GBNRTC) on-going planning activities, and integrated corridor management initiatives, Cambridge Systematics has developed several planning models, and is currently exploring using models for use with the ICM system. These models will be used to evaluate potential scenarios, and assist in the development of performance measures for actions which the Regional agencies enact.

1.6.2. Parking Management

Today, Cities are actively generating a variety of parking and mobility data in their parking ecosystem such as meter and mobile payments, license plate recognition readings, GPS probe, connected car events, security camera data and more. Each of these datasets provides some insights into the City's curbside utilization. However, when analyzed separately they each have their own imperfections that provide an incomplete representation of actual demand.

Unfortunately, any single dataset does not provide a complete and accurate view. Based on the experience of our team there is value in combining multiple datasets using sensor technology as a reference point, developing "Ground Truth." Our proposed solution is the Streetline Hybrid Smart Parking, a unique machine-learning analytics engine, sensor–lite infrastructure and suite of guidance products and services that is accessible via mobile and web interfaces. This technology will be custom-fit to Buffalo to effectively provide access to a continuous, comprehensive and accurate flow of occupancy data enabling the City to make informed and effective parking policy and demand management decisions.

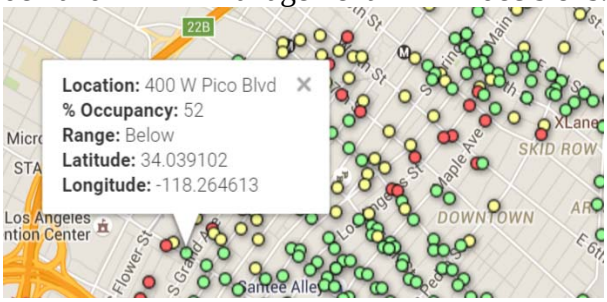

Figure 8: Parking Status

Utilizing the occupancy demand data generated by the Hybrid Platform, the City can access a range of mobile, web and tools to obtain a city-wide view of occupancy demand, optimize curbside utilization, make informed policy

decisions and provide real-time guidance to available parking spaces and as such, take another step forward toward archiving the smart mobility concept.

1.6.3. Weather Information

The project will integrate available real-time weather sources of data with existing and portable RWIS units as part of the Mesonet project in order to provide the Region with real-time weather data, weather forecasts and weather alerts. DTN Weather service will ingest, decode and store data from NYSDOT Mesonet sites as well as any other available local RWIS sites needed to provide an observational foundation for weather decision-making in the Niagara Frontier Region, including the Canadian side of the Region. It is assumed that data from these sites are available from the National Weather Service's MADIS program and any permission to access this data will be granted.

DTN will feed these observations into their weather forecast infrastructure and create site-specific atmospheric and pavement forecasts for the Niagara Frontier Region. The ETX platform already includes the data interface for the DTN Weather feed, the forecast and radar overlay.

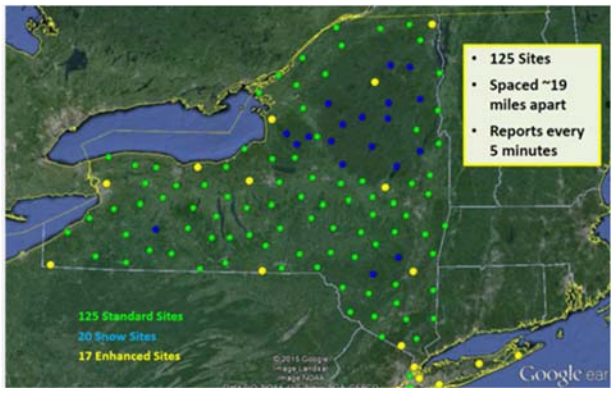

Figure 9: NY Mesonet

1.6.4. NITTEC CVO and Connected Vehicle Concept

Connected Vehicle information services empower users with timely and relevant regional transportation information for data driven route decisions. The information dispersion strategy for Connected Vehicle in this case is to provide alternative route and parking information which reduces congestion and thereby increases mobility within the Buffalo Region. Connected Vehicle dispersion are communications abstract and the distribution systems should accommodate multiple communication methods such as 5.9 GHz Dedicated Short Range Communication (DSRC), cellular, and traditional fixed roadside communications. Increasing the breadth and depth of information channels ensures regional information for commercial carriers is available and accessible at the time needed. Core services being provided as a part of this project promote mobility and safety compliance throughout the Region via border information services, truck parking availability, and Traveler information. For this project, 20 Roadside units and ~500 Vehicle based units specifically for commercial vehicles will be deployed along the major freight corridors in western New York. Specifically, the project team will strategically select locations along the I-90 corridor, _I-190, and the I-290 loop around Buffalo.

The project will use the Connected Vehicle Reference Implementation Architecture (CVRIA) in its CV app and project architecture development (Iteris, Accessed June 2015). The CV project CV apps include:

1. Vehicle Data for Traffic Operations (VDTO)
2. Advanced Transportation Information Systems (ATIS)
3. Traveler Information - Smart Parking (Streetline CV)
4. Spot Weather Impact Warning (SWIW)
5. Road Weather Information for Maintenance and Fleet Management Systems (RWI-MFMS)

The CV apps are described in CVRIA, which presents a definition and typical Physical Diagram for each app.

1.6.4.1. Border wait times

Freight movement across the Region relies heavily on smoothly and efficiently navigating the border transition. Existing infrastructure is challenged with the growing freight movement which will only continue to grow in the coming years. Wholesale capacity additions and modifications required are costly and somewhat unrealistic given the geographical limitations of the border crossings. Disseminating border crossing or wait times throughout the Region provides carriers opportunities for timing border transits or selecting alternate border crossings around heavy congestion periods. The border wait times system currently deployed will be integrated with the ETX platform and provided to in-vehicle devices through the proposed deployment of road side units.

1.6.4.2. Truck Parking Availability

Parking availability within the Region is critical for the safety of the general driving public as well as the commercial vehicle driver. Commercial vehicle drivers must adhere to hours of service guidelines stipulated by the Federal Motor Carrier Safety Administration. In basic terms, pre-trip parking location and availability allows drivers to plan routes and trip durations which maximize their operational day. Many cases of drivers "timing out" results in drivers selecting unsafe parking locations such as on or off ramps, roadside shoulders, or general parking lots.

Through the in-vehicle devices, the 511 systems, and message signs the Region will disseminate border wait times and parking availability locations outside of the Buffalo Region, this will allow truck drivers to wait until a more efficient time is available to cross the border. Adding this aspect decreases congestion in the Border Regions and in the greater Buffalo Region in general.

Truck parking options throughout the Region, both public and private, will be disseminated through the Connected Vehicle system. The parking system discussed previously in Section 1.6.2 will disseminate parking availability along the Connected Vehicle corridors. This paradigm provides a single Regional parking platform for private and commercial vehicle usage.

1.6.4.3. Traveler Information

Traveler information Connected Vehicle services are the information dissemination mechanism. 511NY and 511Canada systems currently send source traveler information including traffic and road conditions, incident, maintenance and construction, event, transit, parking and weather information through the 511 phone system, website and mobile application. For this project, we will add the ability to broadcast this information to connected vehicles.

1.6.4.4. Probe Data

Probe data is the foundational element for traffic management center speed and travel time data. Vehicle location and motion broadcasts will be provided by connected vehicles and used by the infrastructure to support traffic management applications.

1.6.5. Integrated Incident Management System (IIMS)

Integrated Incident Management System (IIMS) is an application for real-time on-scene data collection and distribution to responders and operation centers. Whether in the chaotic environment of an emergency situation or the routine reporting of a maintenance issue, the IIMS provides the ability for first and second responders to quickly transmit accurate on-scene data to response centers, other networked systems and/or individual persons. IIMS is a NYSDOT USDOT data collection and sharing application designed to enhance multi-agency incident collaboration. IIMS consists of mobile clients, a web client and middleware. The mobile clients are smartphones and tablets with IIMS application installed on them.

IIMS is currently under deployment in Western New York (WNY). IIMS and ETX will be fully integrated to assure seamless and coordinated event management across the borders and within the Region.

1.6.6. Traffic Signal System

The City of Buffalo is in the process of upgrading their legacy traffic signal controllers and central control software. NYSDOT traffic signals located on NYSTA-identified diversion routes for I-90 between PA line and Rochester. For this project, a National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) based interface will be developed between the signal systems and the ETX platform. Status data from the Traffic Signal systems will be used for the evaluation of response plans within the DSS, and allow signal plan and intersection state information to be considered as part of the real-time model. The plan is to automate the interface between the ETX DSS module and the signal control systems in order to activate the recommended signal timing plans as part of the selected strategies and in response to major events.

1.7. Long-term Operations and Maintenance

It is anticipated that each agency will be tasked to operate and maintain the systems that are deployed within their jurisdiction and/or systems. NITTEC will provide Operations & Maintenance (O&M) for systems that are "Regional" in nature such as the ETX application at the NITTEC TMC. NITTEC agency members should provide either direct or indirect funding support for NITTEC to perform these activities. The team will examine areas where it may be necessary for specific vendors to operate and maintain their systems for at least a start-up/shake down period. NITTEC and the Regional partners will work to ensure that any needed O&M funds are programmed onto the TIP as this project advances. The following table provides additional detail:

System	Proposed Maintainer
ETX Regional System including traffic management, data interfaces/fusion, DSS, etc.	NITTEC
Arterial Traffic Signals	City of Buffalo, City of Niagara Falls, City of Fort Erie, and NYSDOT among others.
Transit Systems	NFTA
Parking Management System	Streetline
511 NY and 511 Canada	NYSDOT Main Office, Ministry of Transportation Ontario
CVO in-vehicle systems	Trucking Association of NY
Border Crossing Monitoring systems	Buffalo and Fort Erie Public Bridge Authority, Niagara Falls Bridge Commission
DTN weather system	NITTEC
IIMS	NYSDOT Main Office

Table 2: Long-Term Maintenance

1.8. Challenges

At the present time it is not anticipated that there will be any major regulatory or legislative challenges to be addressed. Anticipated institutional/other challenges include:

- Overall coordination of the large set of agency stakeholders;
- Development and implementation of an explicit O&M Plan acceptable to all members;
- Coordination with the Commercial Vehicle Industry/Operators;
- Integration of the wide variety of legacy systems;
- Technology system changes/advancement during the life of the project; and
- Maintaining a realistic schedule.

It should be noted that the existence of NITTEC and their extensive experience in developing, coordinating, implementing and operating similar complex technology projects will greatly facilitate overcoming these challenges.

1.9. System Performance Improvements

System performance is a result of the various projects that support the eight (8) major goals of the study. The following six system performance improvements are expected as a result of the project elements identified in the proposal.

1.9.1. Measured improvements in border crossing times for freight and passenger traffic

Through wide area dissemination of border crossing and providing better information to freight users and travelers, NITTEC and partners can proactively manage and distribute demand across the four bridge crossings in the Region. Key performance measures include measuring the shifts in spatial and temporal extent of congestion at various border crossings during specific periods where one or more border crossings experiences a delay.

1.9.2. Measured improvements in commercial vehicle operations safety

Through connected vehicle technology and advanced traveler information systems, better information both en-route and pre-trip to fleet operations will provide measureable improvements in truck safety as measured by crash rates and involvement of trucks in crashes in the Buffalo Region.

1.9.3. Measured improvements in Regional incident response performance measures

By gathering traffic data into a real-time dynamic visualization approach, the Buffalo Region will be able to optimize and improve traffic using data-driven decision support for proactive response to incidents & events.

NITTEC and its partner agencies will see significant performance improvements for event management and response, including alarm and incident detection, and the status of action/response plans. This means that working with partner agencies, collaborative, proactive traffic management is now possible allowing for greater speed in event clearance, traffic mitigation and recovery, including the potential to modify construction schedules in the event traffic conditions warrant a change to pre-authorized lane closures.

1.9.4. Measured improvements trip reliability measures

ICM implementation on key corridors will result in improved trip reliability for both automobile and transit travelers. Improved situational awareness from the ICM system, coordinated response plans enabled by the DSS, actionable information will lead to travel times becoming more reliable (as measured by travel reliability indicators, buffer, planning time indices for car and transit schedule adherence.)

1.9.5. Measured improvements in person throughput on key corridors

Similarly, ICM implementation on key corridors will result in optimizing networks leading multi-modal corridor performance measured by person throughput, particularly in

high travel demand and/or reduced capacity periods.

1.9.6. Measured improvements in overall traveler safety

Safety performance measures to evaluate the safety benefits to the Region including overall crash rate, fatality and injury rates. Indirect measures including vehicle speeds, speed variability, the number of traffic violations, percentage reduction in rescue response time and public perceptions will also be considered.

1.10. Key Performance Measures and Targets

Based on the expected system performance measurements the following key outcome performance indicators are identified for our project. These measures will be further defined as part of the evaluation task along with the data collection and management approach. Other input, output related performance measures will also be defined. For example, the team will assess the improvements to situational awareness, the use of the DSS and the effectiveness of the CV applications that are proposed as part of the pilot. However, measures of effectiveness for input and outputs are not presented in the table below due to page limit restrictions.

Performance Area	Description	Key Performance Measures (Targets)
This project will provide the following Safety benefits:		
Safety	The Region will realize an improved overall safety outcome, through better incident management and utilizing connected vehicle technologies thereby reducing the occurrence of secondary crashes.	Reduction of Truck-Related Crashes and Crash Severity across the Region (5%) Reduction in the number of secondary incidents in corridors where CV technology is implemented (5%)
This project will provide the following Mobility benefits		
Improved incident management	Operators will realize a more comprehensive and accurate understanding of underlying operational conditions considering all networks in the Region. Operating agencies within the Region will improve management practices and coordinate decision-making, resulting in enhanced response and control.	Reduction of total response time to incidents reduced across the Region (5%) Reduction of incident clearance times across the Region (5%)
Improved border crossings	NITTEC and partners can proactively manage and distribute demand across the four bridge crossings in the Region.	% change in measured volumes –historical volumes at border crossings when border crossing advisories or alerts are disseminated

Performance Area	Description	Key Performance Measures (Targets)
Better Inform Travelers	Travelers will have actionable multi-modal (highway, arterial, transit, parking, etc.) information resulting in more personally efficient mode, time of trip start, and route decisions especially during high-demand and capacity constrained times	Improvement in planning time index and buffer time index for key facilities (Target TBD) Improvement in transit on-time performance in the ICM corridors (Target TBD)
Improve Corridor Performance	Optimizing networks at the corridor level will result in an improvement to multi-modal corridor performance, particularly in high travel demand and/or reduced capacity periods.	Increased Person throughput on ICM corridors (Target TBD)

Table 3: Key outcome-related performance measures

1.10.1. Safety Benefits

The impact of this project on Safety will be evaluated to ensure that the systems deployed and the management strategies used will have a positive direct and measurable effect on the Region. This project will consider several safety performance measures to evaluate the safety benefits to the Region including overall crash rate, fatality and injury rates. Indirect measures including vehicle speeds, speed variability, the number of traffic violations, percentage reduction in rescue response time and public perceptions will also be considered.

1.10.2. Mobility Benefits

The actual impact of improved traveler information, coordinated incident response, and many of the strategies we are proposing on mobility includes several key performance measures. This includes travel time reliability for both freight and commuters in the Region; better managing capacity across modes by utilizing ICM strategies; informing travelers and truck drivers of the wait times and travel time of routes so that trips can be postponed or alternate routes can be taken thereby decreasing travel demand and improving travel time reliability. As part of the evaluation of the project, we will consider several of the key performance measures previously mentioned including freight travel time reliability and mileage of uncongested routes.

1.10.3. Environmental Benefits

Transportation is a major contributor of CO_2 and other greenhouse gas emissions from human activity, accounting for approximately 14 percent of total anthropogenic emissions globally and about 27 percent in the U.S. Fortunately, transportation technologies and strategies are emerging that can help to meet the climate challenge. These include automotive and fuel technologies, intelligent transportation systems (ITS), and mobility management strategies that can reduce the demand for private vehicles. While the climate change benefits of innovative engine and vehicle technologies are relatively well understood, there are fewer studies available on the energy and emission impacts of ITS and mobility management strategies. In the future, ITS and mobility management will likely play a greater role in reducing fuel consumption. Studies are often based on simulation modes, scenarios analysis, and limited deployment experience.

A 2013 study estimated that integrated corridor management projects in San Diego, Dallas and Minneapolis would lead to annual fuel savings of 323,000, 981,000, and 17,600 gallons, respectively, correlating to 6 million, 17.6 million, and 316,800 lbs. of annual CO_2 reductions for the three sites.

1.11. Partnering

The following private companies have partnered with the Region for this project:

- **KAPSCH TrafficCom Transportation (KTT)** – KTT is currently under contract to deploy the Regional Information Exchange Network system called EcoTrafiX which will be the building blocks of our entire proposal and systems integration. KTT will be our overall consultant lead in charge of project management, system integration, deployment and O&M services
- **Cambridge Systematics (CS)** – CS is currently under contract to perform the analysis, modeling and simulation task (AMS) for the 1-190 ICM corridor and border crossings as well as expanding the coverage area to include the NITTEC region. CS will lead the AMS task and will evaluate the strategies for the Region and corridors along the border crossings.
- **IBI Group** – IBI is currently under contract to maintain their Crossroads ATMS software. IBI also leads the statewide 511NY system. IBI will lead the traveler information task as well as provide support in integration of Crossroads system into the Regional fusion engine during the transition to the new ATMS.
- **General Dynamics (GD)** – GD is currently under contract with NYSDOT to provide the Integrated Incident Management System (IIMS) where they provide the emergency service providers and on-scene first responders with the ability to directly communicate with the TMC and DOT team and provide on-scene status update, pictures, videos and more. They will lead the deployment of the same concept in this project.
- **ICF** – ICF is currently under contract to NYSDOT to provide ATDM statewide consultancy services. ICF will lead the evaluation task and will assist during the planning stages of this project.
- **Streetline** – Streetline will provide a real-time parking management application in the downtown Buffalo area and in particular around the medical district and sporting arena. They will also provide real-time parking information for commercial vehicles in advance of approaching the Region.
- **DTN** – DTN will integrate available real-time weather sources of data with existing and portable RWIS units as part of the Mesonet project to provide the Region with the real-time and forecasting weather conditions and weather alerts.
- **HERE** – The Region as part of the TRANSCOM agreement with HERE has access to real-time data on facilities on the U.S. side of the border. HERE will provide additional data to cover the local streets as well as facilities on the Canadian side. HERE will also provide a routing application that will enable the DSS application and travelers to select the best routes for their destinations.
- **University at Buffalo** – As part of the development of the decision support system, the University at Buffalo will be assisting with the response plan development, in particular, signal timings and the validation process.

1.12. Existing Local and Regional Investments and Systems

The Region has many investments by the local, state, and federal government to ensure travelers move efficiently and reliably within the Region. These investments include the four border bridge crossings, the traffic signal systems in the Region, ITS infrastructure, and

mobility services. The Region developed their ICM program without federal funding, and was later provided an ICM planning grant for the I-190 corridor – which demonstrates the Regions cooperative multi-agency, multi-modal approach to transportation in the Region.

In addition, as previously mentioned NITTEC is a coalition of multiple agencies in Western New York and Southern Ontario that share the goal of improving traffic mobility, reliability, and safety on the Regional, bi-national, and multi-modal transportation network. NITTEC's member agencies are represented on the Coalition's Board of Directors and Committees. The members of the Board of Directors work collaboratively on the development and operation of NITTEC.

The Niagara Frontier Intelligent Transportation System (ITS) infrastructure is comprised of various technologies used to monitor traffic conditions and provide real-time information to travelers throughout the Region. NITTEC manages a 24/7 centralized operations center and controls over 250 ITS elements on behalf of the member agencies for traffic management services for the bi-national Region.

Closed Circuit Television (CCTV) cameras allow operators from the NITTEC operations center to monitor traffic conditions throughout the Niagara Frontier Region. Dynamic Message Signs (DMS) are used to provide travelers with information on current traffic conditions within the Niagara Frontier Region. Messages displayed on DMS include information on incidents, construction events, and border crossing wait times, travel times, weather conditions and special events.

Travel times to highly traveled destinations throughout the Region are also displayed on specific DMS signs. TRANSMIT readers use E-Z Pass tags as anonymous probes, encrypts the data taken from the tag so that no customer identifiable information is collected, thus insuring the privacy of the customer. The system averages data from the latest 20 vehicles to provide the average speed and travel time. The system is used in a privacy-protected manner to monitor traffic flow, but the system does not track individual transponders.

Due to severe weather conditions resulting from lake effect snow and wind drifts, the NYSDOT and NYSTA have implemented systems to shutdown various highways throughout the Region. The Skyway closing system is located along the elevated portion of Route 5 near Lake Erie through downtown Buffalo. The system includes fixed message signs with flashing beacons to warn motorists if the Skyway is closed. The NYSTA has installed 22 ramp access gates along I-90 and I-190. Ramp access gates are manually operated and are used to prevent travelers from entering I-90 and I-190 in severe weather conditions. NYSDOT has installed 34 ramp access gates on I-290, Route 5, 33, 400, and 219.

In 2016, the New York State Energy Research & Development Authority (NYSERDA) began a project to deploy the base EcoTrafiX (ETX) platform for integration of data and providing a platform for the testing of Integrated Corridor Management strategies to research the effects of ICM on greenhouse gas (GHG) emissions and overall air quality. The ETX platform provides performance improvements to the Region for event management and response coordination, better traffic mitigation and recovery, and the potential to more easily make changes to construction plans.

The data interfaces to be deployed as part of the NYSERDA project, which will be used for this project include:

Crossroads Data Interface – The existing NITTEC ATMS provides event, CCTV, DMS and link speed and travel time data. The Crossroads system will be replaced over time by the EcoTrafiX ATMS platform.

Intelligent Information Integration Broker (I3B) Data Interface – The I3B data interface

is used by the IIMS platform to publish event, CCTV, DMS and link data.

Border Crossing Data Interface – The NITTEC border crossing wait time data is provided through a web service, the static data and the real-time data from this feed are integrated into the EcoTrafiX platform.

OpenReach Data Interface – TRANSCOM provides OpenReach to many Regions of New York State in order to provide a common platform for sharing events, travel times, and speed data to the NY511 system, and for coordination across Regions for major events.

Niagara Frontier Transportation Authority (NFTA) Data Interface – NFTA provides static data (routes and schedules) and real-time location (AVL) data to the EcoTrafiX platform.

In order to allow Regional partners, external transportation sub-system and third party application developers to integrate and use the Region's transportation data, a Data Mart will be deployed as part of the NYSERDA project, and further expanded as part of this project. Currently, the Data Mart provides: Dynamic Link Data and Link Inventory Data; Dynamic Event Data and Static Roadway Network Data; DMS static and dynamic data; CCTV static and dynamic data; Real-time Vehicle Location data; Travel Time, weather alerts, Decision support system recommendations, timing plan recommendations, and Border crossing wait time data.

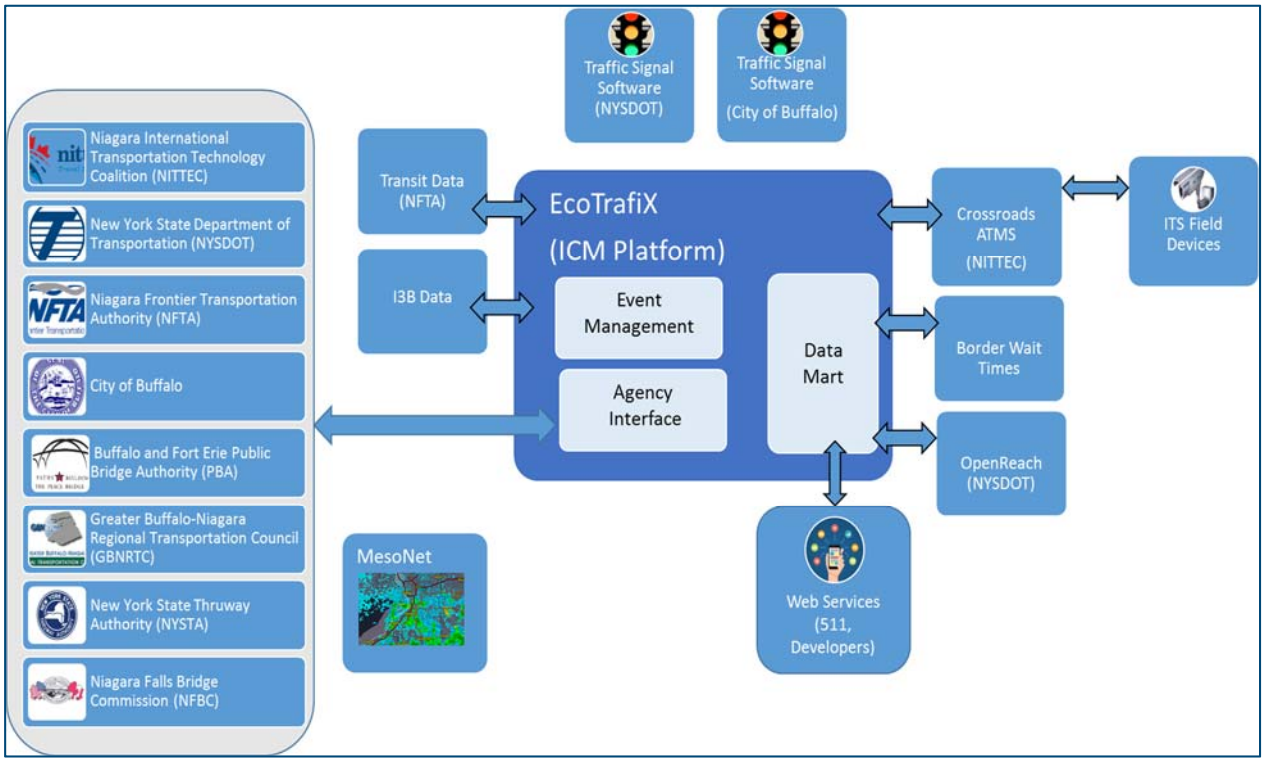

Figure 10: Existing ETX System

1.13. Schedule

We are proposing a 3-year schedule, with an 18-month planning/design/build phase followed by an 18-month Operations and Maintenance phase.

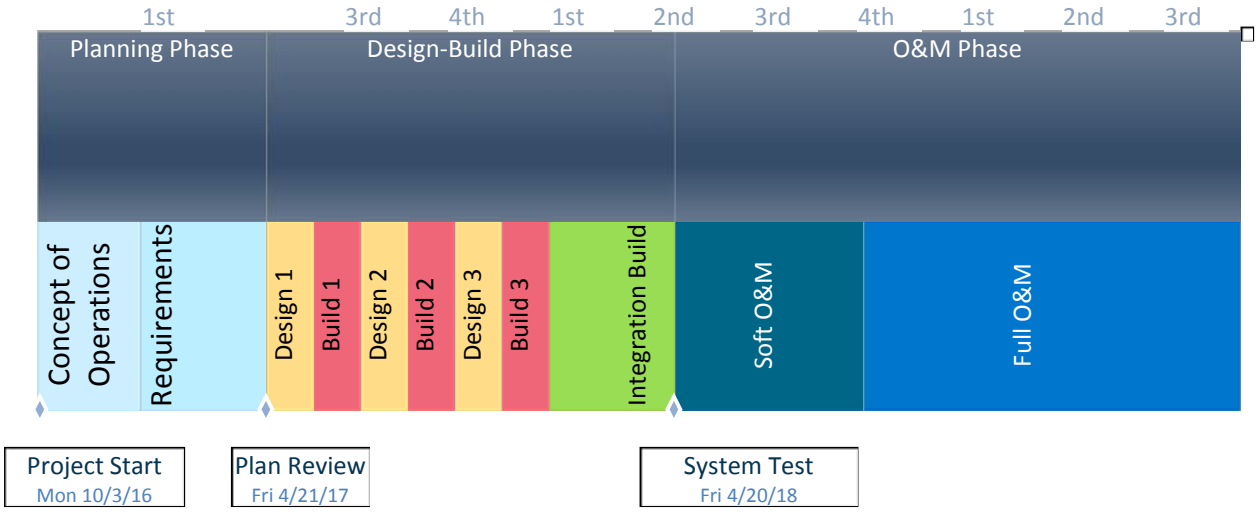

Figure 11: Project Schedule

1.13.1. Phase 1: Planning Phase

For the planning phase of the project, a Concept of Operations document and Requirements document will be the primary deliverables. Following the FHWA Systems Engineering process, a Project Management Plan (PMP) and Systems Engineering Management Plan (SEMP) will also be provided. Leveraging the existing programs in the Region, we expect the Planning Phase to take about 6 months.

1.13.2. Phase 2: Design-Build Phase (Agile Development)

Since some of the data used for the system will be new, an agile development process will be followed. We currently expect three iterations of the build to be designed, prior to a final Integration build which will be used for the Systems Acceptance Test (SAT). Our goal is to have an operations system within 12 months after the planning phase is complete.

1.13.3. Phase 3: Operations and Maintenance Phase

Following the ICM program's model, we are proposing a 6-month "soft launch" of the system to test and modify the operational processes prior to a 12-month full O&M phase.

1.14. Leveraging the ITS Program

The Buffalo Integrated Mobility Management System project supports the majority of the USDOT's ITS Program initiatives for Safety, Mobility, Environment, Road Weather, Intermodal Research, and Connected Vehicle Technology. We will leverage the lessons learned, and knowledge technology transfer initiatives provided by USDOT to ensure that our project is consistent with USDOT policy and programs.

2. STAFFING DESCRIPTION

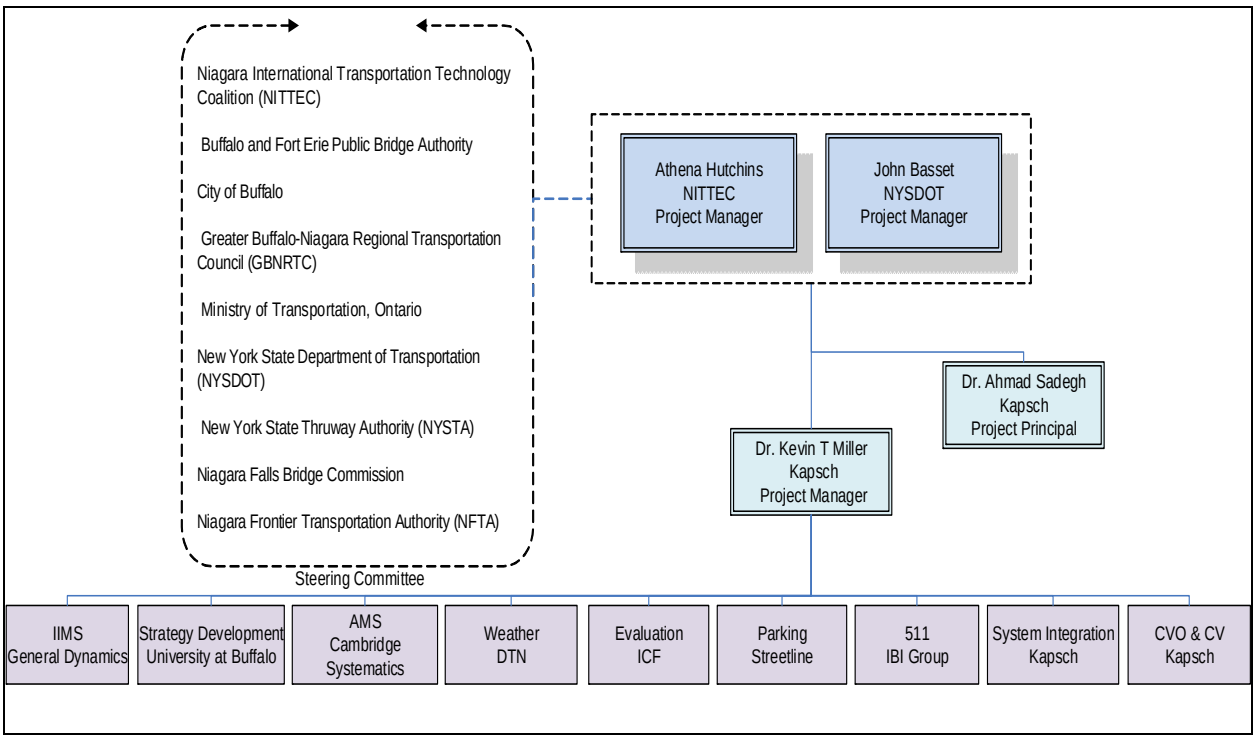

Figure 12: Organization Chart

2.1. Organization

The NITTEC organization provides a high-level structure for the management and implementation of this project. Participating stakeholder agencies on the steering committee for this project include:

2.1.1. Steering Committee

- **Athena Hutchins, P.E.** – Project Manager, Niagara International Transportation Technology Coalition (NITTEC)
- **John Bassett. P.E.** – Project Manager, New York State Department of Transportation (NYSDOT)
- **Jim Davis** – Mobility Manager, New York State Department of Transportation (NYSDOT)
- **Darrell Kaminski, P.E.** –Regional Director, New York State Department of Transportation (NYSDOT)
- **Charles Morgante, P.E.** – Director of Operations, New York State Department of Transportation (NYSDOT)

- **Douglas Tokarczyk, P.E.** – Buffalo Division Acting Director, New York State Thruway Authority (NYSTA)
- **Hal Morse** – Executive Director, Greater Buffalo Niagara Regional Transportation Council (GBNRTC)
- **Thomas George, P.E.** – Director of Public Transit, Niagara Frontier Transportation Authority (NFTA)
- **Ron Rienas** – General Manager, Buffalo and Fort Erie Public Bridge Authority (PBA)
- **Lew Holloway** – General Manager, Niagara Falls Bridge Commission (NFBC)
- **Michael Finn, P.E.** – City Engineer, City of Buffalo
- **Robert Chan** - Supervising Engineer, Implementation Unit, ITS Program Section, Ministry of Transportation, Ontario

2.2. Point of Contact

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