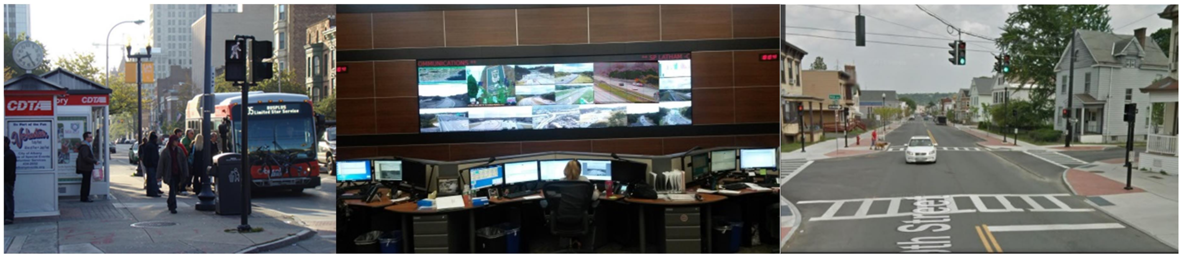

CAPITAL DISTRICT TRANSPORTATION COMMITTEE

CDTC NEW VISIONS

Regional Operations and Travel Reliability:

CDTC's Congestion Management Process

White Paper

September 3, 2020 FINAL

Capital District Transportation Committee
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Contents

Introduction

The Regional Operations and Safety Advisory Committee was asked to examine issues relating to the operations and travel reliability for the New Visions Regional Transportation Plan update, and to make recommendations for policies and actions for the New Visions 2050 Plan. The topics considered include:

- Reliability of Travel
- Intelligent Transportation System Priority Network
- Congestion Management Process
- Use of a new data set to estimate performance measures

Many of these topics are already considered and supported in the New Visions 2040 Plan. This paper, when incorporated into the New Visions 2050 Plan, will serve as an update to the CDTC Congestion Management Process (CMP). The Advisory Committee considered ways in which the Plan could be updated and strengthened. The Advisory Committee is not a policy decision making committee, but rather has been asked to make recommendations to CDTC's Planning Committee and Policy Board. The Advisory Committee members include:

Regional Operations and Safety Advisory Committee:

Adam Hornick, Town of Bethlehem
Andrew Sattinger, NYSDOT Main Office
Andrew Tracy, CDTC
Bill Trudeau, City of Albany
Brent Irving, CDTA
Brian Kirch, NYSDOT Region 1
Brian Menyuk, NYSDOT Region 1
Brian Cross, NYSDOT
Brian Rossi, Schenectady County Sheriff
Chief Elaine M. Rudzinski, Town of East Greenbush
Chris O'Neill, CDTC
Christopher R. Wallin, City of Schenectady
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Jacob Beeman, CDTC
Jason Temple,
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Kerry Thompson, Albany County
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Maureen Kozakiewicz, GTSC
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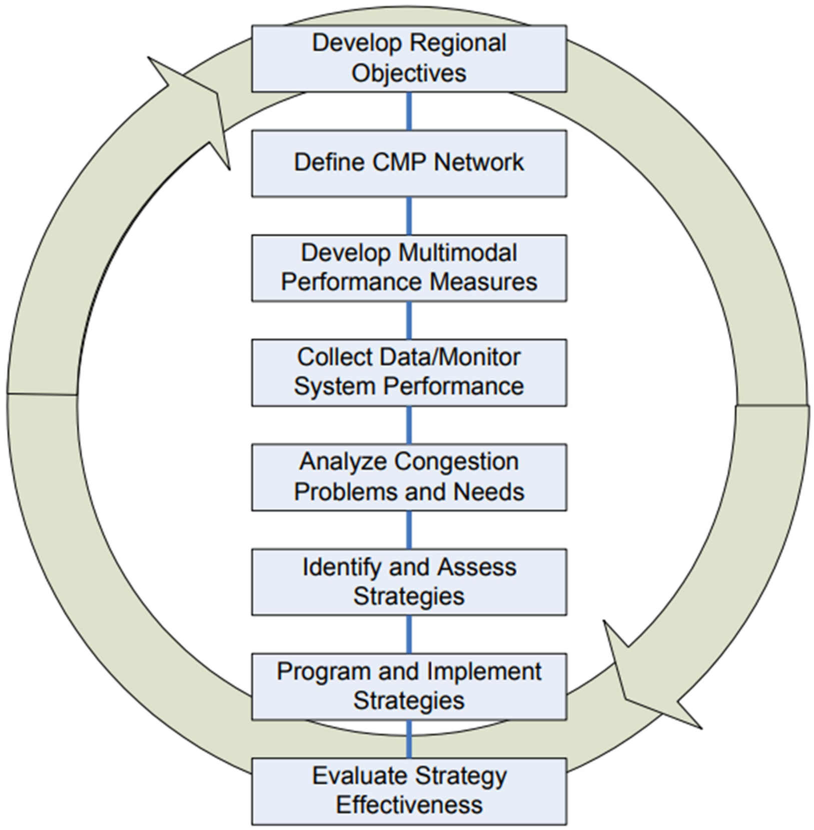
Rich Cordero, CDTA
Sandy Misiewicz, CDTC
Sergeant Steve Hopsicker, NYS Police
Thomas Werner, Saratoga County
Tim Wainwright, New York State Thruway Authority
Timothy Crothers, FHWA
First Sergeant Tracy Mance, Albany County Sheriff's Dept.
Tracy Balogh, NYSDOT

The CDTC congestion planning process is based on the workflow detailed in the FHWA Congestion Management Process Guidebook and on the principles of the New Visions 2050 Plan. The FHWA CMP Guidebook has eight distinct steps, which can be visualized in the figure below.



Elements of the Congestion Management Process
(Source: FHWA Congestion Management Process: A Guidebook)

The FHWA CMP Guidebook is a compilation of state-of-the-practice congestion planning methods used throughout the nation and was most recently updated in 2017. The Guidebook was collaboratively developed by FHWA, FTA, and metropolitan transportation planning professionals. The Guidebook is not a strict prescription of the best methodology to use, but rather is a literature review of successful congestion planning processes documented and endorsed by FHWA. The Guidebook features a Case Study of CDTC's Congestion Management Goals and Principles, an example of a national best practice. These goals and principles are preserved in the New Visions 2050 CMP update.

Action 1: Develop Regional Objectives for Congestion Management

New Visions Principle: Operations, Congestion Management and Travel Reliability

The New Visions Plan addresses operations, congestion management travel reliability in a number of important ways and provides a framework for improving regional environmental quality. The New Visions planning and investment principles guide decision-making at CDTC. As statements of principle, they provide a framework for funding decisions, project selection criteria, corridor-level planning and project implementation. The principles state when and how CDTC believes transportation investment is warranted, and when it believes such investment is not warranted. The following New Visions Planning and Investment Principle supports the Congestion Management Process:

Travel Reliability – Reliable traffic flow is more important than reducing congestion – traffic congestion is often a sign of an area's economic vitality.

Managing traffic flows on the Capital Region expressway and arterial system is critical for both economic and social reasons.

- *Congestion management is much more cost effective than highway capacity increases or new lanes. Congestion alone does not justify increasing highway capacity or adding new lanes.*
- *Congestion management actions will include traffic management center improvements, incident management, managed lanes, managed tolls, traffic information technology, traffic signal coordination, parking management, and travel demand management strategies such as supporting more transit, pedestrian, and bicycle travel, carpooling, vanpooling, carsharing, bikesharing, and flexible work hours.*
- *Some congestion is acceptable when the community deems it acceptable, or when it results from balancing the needs of other transportation modes such as pedestrian, bicycle, and transit.*

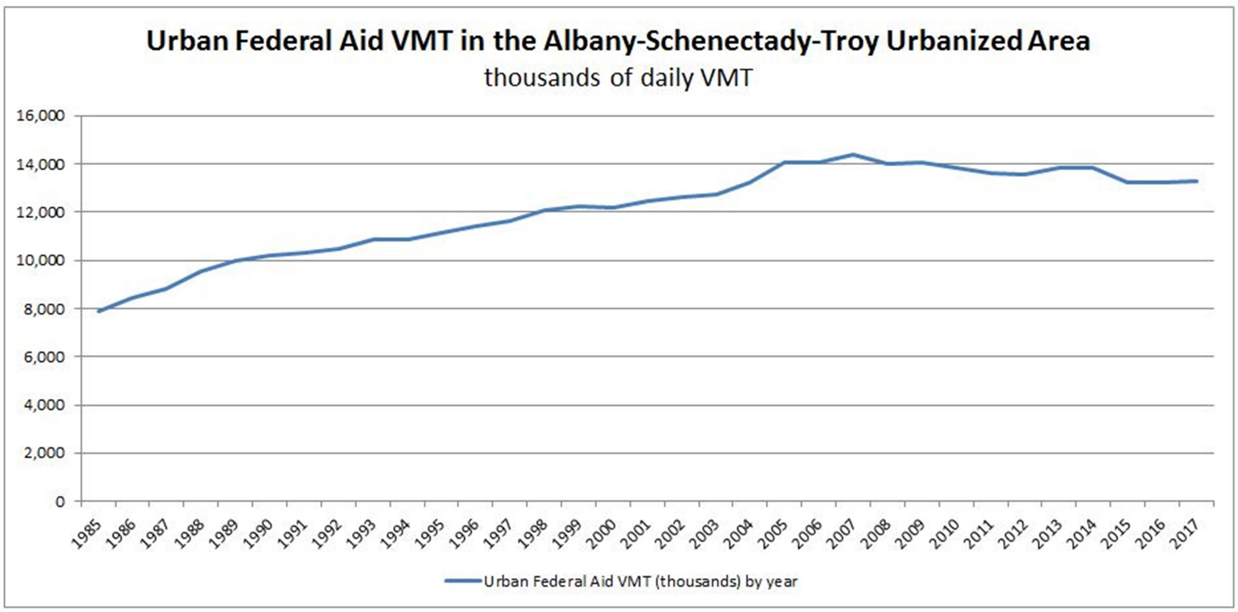
CDTC has studied traffic congestion and traffic operations in the Capital District. The New Visions Plan recognizes that managing traffic flows is critical for the health of the region. The New Visions Plan also recognizes that because it is not possible to eliminate all congestion, reliability of traffic flow is emphasized. Congestion Management must be consistent with the entire New Visions Plan and must support growth in economic activity and maintain the quality of life in the Capital District. It is important that any congestion management actions must recognize the importance of pedestrian, bicycle and transit objectives described in the New Visions Plan. Trade-offs are often necessary in project design and when necessary some congestion is acceptable to maintain high quality access for pedestrians, cyclists and transit users. Reduction in single-occupancy vehicle (SOV) travel through the use of Travel Demand Management (TDM) strategies shall be prioritized over the expansion of existing facilities. Transportation Systems Management and Operations (TSMO) strategies shall also be incorporated into the congestion management process.

There are multiple tools available for managing traffic and the Plan supports a comprehensive approach to traffic management. Some of the major categories of tools include incident management, demand management, intelligent transportation systems (technology), arterial management and land use planning. These approaches are discussed in this paper.

Growth in Vehicle Miles of Travel is Slowing Down

After rapid growth in the 1980s and 1990s, growth in vehicle miles of travel (VMT) has been slowing for the last fifteen years. Figure 1 shows VMT growth in the Albany-Schenectady-Troy Urbanized are from 1985 to 2017. While VMT grew by 79% between 1985 and 2005 in the A-S-T Urbanized Area, it has declined by 6% between 2005 and 2017. Comparable time series data is not available for the rest of the CDTC area, but indications are that the trends have been similar. Nationally, while VMT has increased between 2005 and 2017, because of faster population growth, VMT per capita has been growing much more slowly than in previous years. CDTC modeling work indicates that VMT will continue to grow at a slower rate than previous years. This slower rate of VMT growth supports the principles and recommendations of the CDTC CMP.

Figure 1



Action 2: Define CMP Network

Congestion Management Network: the Intelligent Transportation System Priority Network

Given the expense and difficulty of adding expressway capacity, and given the high demand for expressway usage that is forecast to continue to grow in the Capital District, it is clear that strategic investments in operational improvements will continue to be important to the future of the Capital District. ITS investments, including incident management and traveler information systems, will make the Capital District more accessible and will be important for maintaining the quality of travel. Emerging and future technologies hold promise, and analysis of future traffic growth and future conditions further underscores the importance of ITS and operational investments to provide important benefits to the traveling public.

The CDTC New Visions Plan identifies priority networks for bike, pedestrian, transit, ITS, goods movement and infrastructure improvements. One purpose of the priority networks is to help set priorities for TIP project selection. Another purpose is to give guidance for project development to make sure that individual projects address important needs on each priority network. For example, if a bridge replacement project takes place on the ITS priority network, the ITS needs at that location should be carefully reviewed and given special consideration to determine if an ITS component could be efficiently incorporated into the project.

The identification of priority networks makes the most efficient and effective use of available resources. The largest impact will be seen by directing funding to the functionally most significant part of the transportation system.

The identification of priority networks does not imply that improvements off the defined networks are not warranted or desirable. Flexibility is required in interpretation, so long as the basic message—*these are important facilities*—is not lost.

The New Visions Plan identifies a network of expressway and arterial facilities as the platform for the regional ITS. There should be centrally coordinated traffic control and/or guidance along these facilities. The logic is that advising travelers of preferable alternatives *before* they enter the most congested areas and facilitating smooth flows along the alternatives can keep overall traffic conditions from worsening. The regional ITS priority network contains:

- priority expressways;
- arterials representing their immediate alternatives (ordinarily either parallel to or connecting the expressways);
- their secondary alternatives (which entail more surface street travel); and
- other arterials that are strategically important because they are important travel corridors, although they are not viewed as alternative routes for expressway travelers.

The Regional Operations and Safety Advisory Committee was asked to review the ITS priority network and determine if updates were needed. One of the comments made by the Committee is that volume and accidents on roads within the priority network should be considered in evaluating funding priority. The CDTC project evaluation process already takes into account volumes, facility importance and potential crash reduction in evaluating and prioritizing projects. This concept will be further considered in the context of ITS projects as CDTC refines its project evaluation and selection process.

The ITS priority network recognizes the importance of the expressway system, but the role of ITS on the arterial system is also important. Some ITS improvements to arterials which parallel the expressways will have direct benefits to expressway travel, especially by providing alternate routes during expressway incidents. Access management and physical improvements will be required for this to be effective. Nonetheless, ITS benefits from signal coordination, transit signal priority, or other improvements will also provide significant benefits to normal daily arterial function.

The ITS network recognizes the importance of coordinating signal timing on major city and suburban arterials. Transit-friendly application of that technology will include designing the operation of the signal system to achieve multiple objectives. Rather than optimizing signal timing for maximum traffic flow, signal system design can be developed that allows for efficient traffic progression at travel speeds that are compatible with pedestrian, bike and transit movements. This may provide for a win/win outcome. Even modest improvements in basic signal timing will show important results. Implementation of signal coordination along arterial corridors will improve traffic flow for autos as well as for transit using Transit Signal Priority (TSP). Successful implementation of signal coordination along the Route 5 corridor in Albany, Colonie, Village of Colonie, Niskayuna and Schenectady has demonstrated the value of ITS for arterial performance. For routes that parallel expressways, ITS holds the promise of allowing the signal coordination and timing plan to be changed by the TMC to facilitate diverted traffic during an incident.

The ITS priority network is described in Table 1 and is illustrated in Map 1. The priority network was updated to show it not going to Lake George, but does extend to the Saratoga County/Warren County border. It also includes all routing in the 40 mile BRT system. The Route 5 portion of the ITS Priority Network continues to include the BusPlus BRT; while the updated Priority Network includes all routing for the Washington Western BRT and the River Corridor BRT.

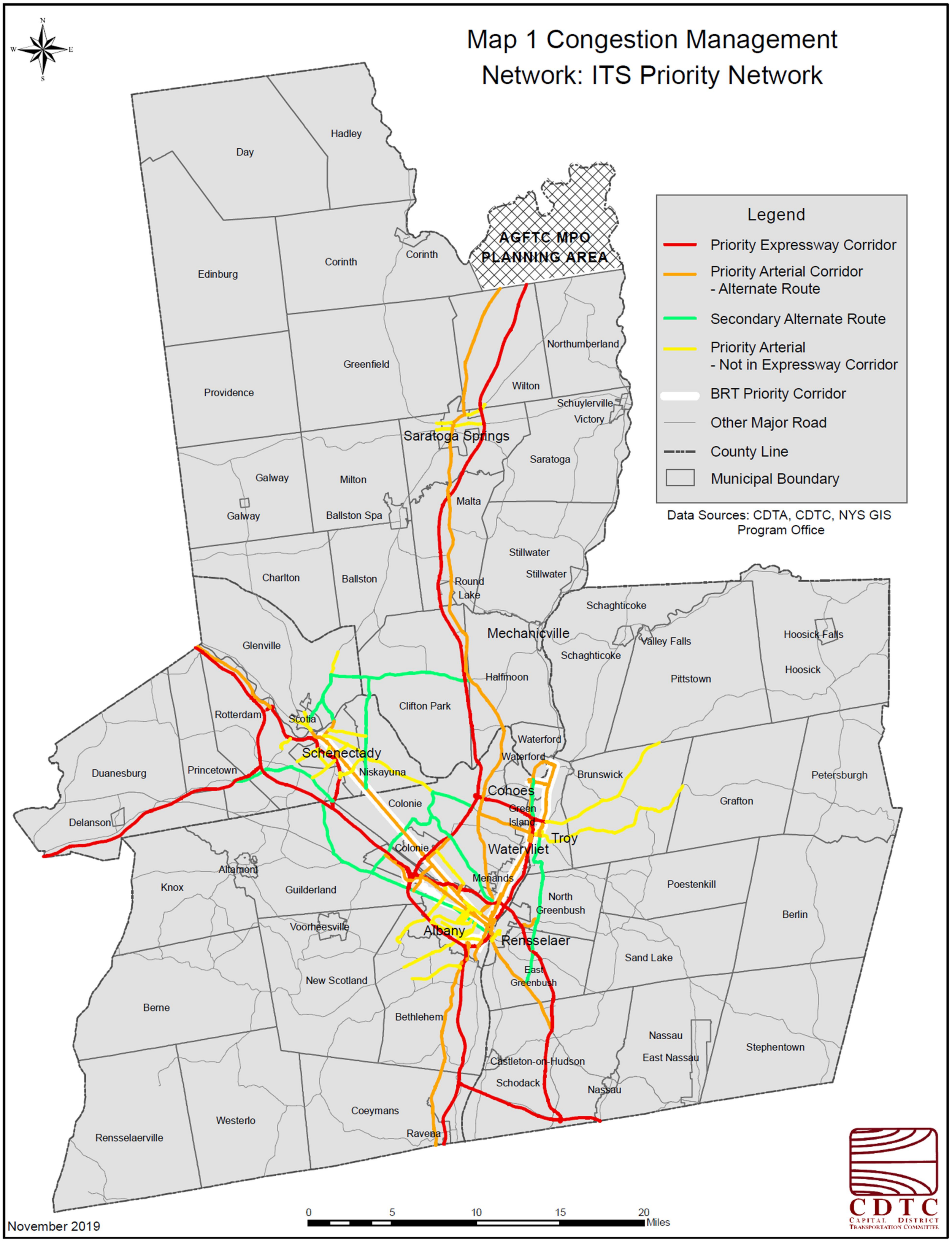

Map 1 Congestion Management
Network: ITS Priority Network
Legend
Priority Expressway Corridor
Priority Arterial Corridor - Alternate Route
Secondary Alternate Route
Priority Arterial - Not in Expressway Corridor
BRT Priority Corridor
Other Major Road
County Line
Municipal Boundary
Data Sources: CDTA, CDTC, NYS GIS Program Office
AGFTC MPO PLANNING AREA
Hadley
Day
Edinburg
Corinth
Corinth
Providence
Greenfield
Northumberland
Wilton
Schuylerville
Victory
Saratoga Springs
Saratoga
Galway
Milton
Galway
Ballston Spa
Malta
Stillwater
Stillwater
Charlton
Ballston
Round Lake
Schaghticoke
Mechanicville
Glenville
Valley Falls
Hoosick Falls
Schaghticoke
Halfmoon
Pittstown
Hoosick
Clifton Park
Rotterdam
Scotia
Waterford
Waterford
Schenectady
Duanesburg
Princetown
Niskayuna
Brunswick
Petersburgh
Cohoes
Colonie
Green Island
Grafton
Delanson
Troy
Colonie
Watervliet
Altamont
Menands
Poestenkill
Knox
Guilderland
North Greenbush
Berlin
Voorheesville
Albany
Rensselaer
Sand Lake
New Scotland
East Greenbush
Berne
Bethlehem
Nassau
Stephentown
East Nassau
Castleton-on-Hudson
Schodack
Nassau
Coeymans
Westerlo
Rensselaerville
Ravena
0 5 10 15 20 Miles
November 2019
CDTC
Capital District Transportation Committee

Table 1
ITS Priority Network Facilities

Priority Expressway Corridors	Centerline Miles
Northway (I-87) and Fuller Road Alternate: US 20 to Saratoga County/Warren County Line	43.6
Thruway (I-87/I-90): Albany/Greene County line to Schenectady County/ Montgomery County line; Berkshire Spur (21A to B1)	44.9
I-88: Thruway Interchange 25A to Schenectady County/Montgomery County Line	14.5
I-90: Thruway Exit 24 to Berkshire Spur	19.3
I-787: Thruway Interchange 23 to Alternate Route 7	8.7
I-890: End to End	7.8
Alternate Route 7: Northway to I-787	3.6
TOTAL MILEAGE	**142.4**
BRT Priority Corridors	
Bus Plus: Route 5, Downtown Albany to Downtown Schenectady	16.0
Washington-Western Bus Rapid Transit	8.5
River Corridor Bus Rapid Transit	17.0
TOTAL MILEAGE	**41.5**
Priority Arterial Corridors – Immediate Alternate Routes for Expressways	
NY 2: I-787 to US 9	4.0
US 9: Downtown Albany to Warren County Line	50.5
US 9/20: Downtown Albany to I-90 Interchange 11	7.0
Everett Road from Sand Creek Road to Route 5	0.8
Erie Boulevard: NY 5 to Freeman's Bridge Road	1.2
Fuller Road: US 20 to NY 5	1.9
Washington Avenue: Central Avenue to NY 155	7.6
Wolf Road: NY 5 to Albany Shaker Road	2.0
I-90 Exit 8 Connector (NY 43): I-90 to US 4	1.3
US 9W: I-787 to Greene County Line	11.4
NY 5S from I-890 to Schenectady County/Montgomery County Line	5.86
TOTAL MILEAGE	**93.6**

Table 1 (continued)

Secondary Alternate Routes for Expressways	Centerline Miles
US 4: US 9/20 to NY 7	10.4
NY 7: I-890 to I-88	5.7
US 20: Downtown Albany to NY 155; includes Washington Western BRT routing	10.4
US 20/NY 146: NY 155 to Thruway Interchange 25	5.7
NY 50: NY 5 to Glenridge Road	3.4
NY 146: US 9 to Glenridge Road	6.1
NY 155: US 20 to Watervliet Shaker Road	4.0
Albany Shaker Road: NY 7 to US 9	7.7
NY 7: I-87 to Albany Shaker Road	3.2
Balltown Road: NY 5 to Glenridge Road	6.7
Freeman's Bridge Road: Erie Boulevard to NY 50	1.7
Glenridge Road: NY 50 to NY 146	2.1
Watervliet Shaker Road: New Karner Road to Albany Shaker Road	1.3
NY 787 Cohoes Arterial: NY 7 to Route 32	2.6
TOTAL MILEAGE	**71.0**
Priority Arterials Not in Expressway Corridors	
NY 2 in Troy and Brunswick	10.3
NY 7 in Troy and Brunswick	9.1
NY 7: Albany Shaker Road to I-890	6.6
NY 32: US 9W to Elm Avenue	3.6
NY 85: I-90 to NY 140	4.6
NY 443: Downtown Albany to Elm Avenue	5.7
Broadway/Partition Street/East Street: US 20 to Amtrak Station	0.3
Streets with a density of more than two traffic signals per mile	53.0
TOTAL MILEAGE	**93.2**

Action 3: Develop Multimodal Performance Measures

Performance Measures: Definition, Collection of Data, and Analysis of Congestion Problems and Needs

Reliability

The focus of the CDTC Congestion Management Process is on reliability. Reliable traffic flow is more important than reducing congestion. Because it is not possible to eliminate all congestion, drivers must accept some levels of congestion during the peak hours; but focusing on reliability can significantly improve traffic flow. Most of the congestion in the Capital District is caused by "non-recurring delay" such as delay caused by a vehicle crash, a snowstorm or major weather event, or construction. TSMO strategies such as special event management, road weather management, and traffic incident management may be used to mitigate sources of non-recurring congestion. **Traffic Incident Management** is the planned, coordinated process of detecting and removing incidents to restore normal traffic operations as quickly as possible. With a majority of all expressway system delay caused by incidents -- ranging from vehicles with flat tires on shoulders to major crashes -- quick detection and removal are critical to maintaining traffic flows, particularly during peak travel periods.

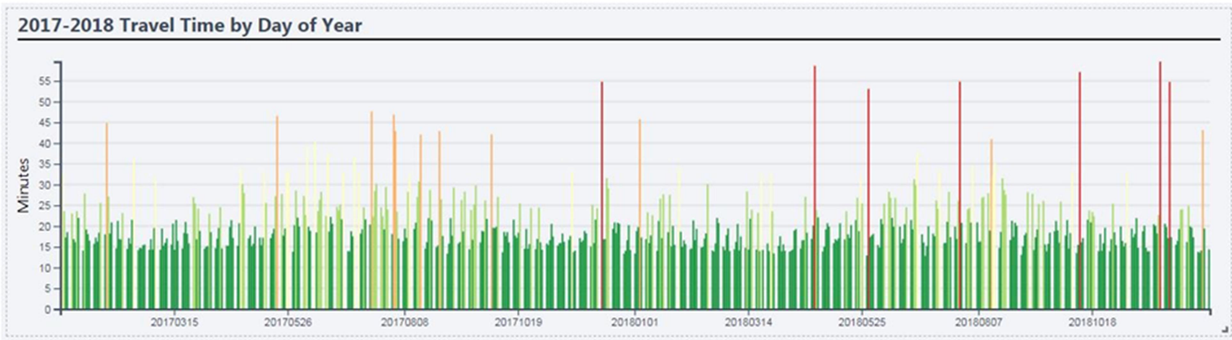
The National Performance Management Research Data Set (NPMRDS) uses anonymous data from variety of GPS devices carried by both trucks and cars to record highway speeds. Data is collected under contract with the Federal Highway Administration twenty-four hours a day, 365 days a year, for both passenger cars and trucks.

The Albany Visualization and Informatics Lab (AVAIL) at the University at Albany, under contract with New York State Department of Transportation, has developed a powerful tool to summarize and analyze the NPMRDS data. This tool is used by CDTC to better understand congestion and to support congestion management in our region.

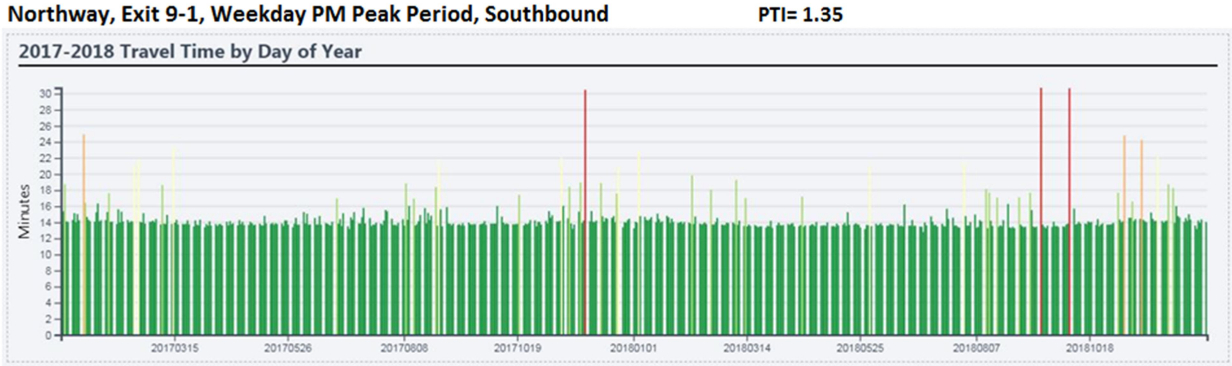
The NPMRDS data can be used to better understand reliability. Non-recurring delay is more unacceptable to the average commuter because it is unexpected and disrupts plans, while predictable, recurring delay can be more tolerable. For example, the NPMRDS data shows that on an average day, in the PM peak period, average travel time from downtown Albany to Northway Exit 9 in Clifton Park is 29 minutes or 11 minutes longer than free flow. However, the 95th percentile travel time (incident related) is 51 minutes, which is 22 minutes longer than regular PM peak travel time. The incident related travel time is more disruptive. In order to measure the reliability of expressway segments, CDTC uses the Planning Time Index (PTI). This index represents the ratio of travel time on a worse than average day (95th percentile) to the travel time at free flow speed. Figure 2 shows average weekday travel times on the Northway in the PM Peak, for every weekday in 2017 and 2018. In the northbound direction, the Planning Time Index is 3.24, and the graph shows a great deal of daily variation. In the southbound direction, the Planning Time Index is 1.35, indicating that traffic flow is much more reliable in the southbound direction in the PM peak. The two graphs give a visual indication of the difference in reliability. Similar graphs of all of the Interstate and expressway corridors are included in the Appendix.

Figure 2

Northway, Exit 1-9, Weekday PM Peak Period, Northbound **PTI= 3.24**



Northway, Exit 9-1, Weekday PM Peak Period, Southbound **PTI= 1.35**



Peak Hours of Excessive Delay

Another performance measure for the CDTC Congestion Management Process is Peak Hours of Excessive Delay (PHED), measured in person hours. This measure is calculated using the NPMRDS data. Excessive delay means the extra amount of time spent in congested conditions defined by speed thresholds that are lower than a normal delay threshold. The speed threshold used by CDTC is 20 miles per hour or 60 percent of the posted speed limit, whichever is greater. So for example, if the speed limit on an expressway is 65 mph, the threshold for calculating excessive delay would be 39 mph. So if heavy volumes reduce the speed on the expressway to 45 mph, that is not considered to be excessive delay. When speeds fall below 39 mph, excessive delay occurs. The excessive delay is calculated as the extra amount of travel time as compared to travel time at 39 mph, multiplied by the number of people experiencing that delay.

Action 4: Collect Data / Monitor System Performance

Regional Performance Measures and Targets

Federal Law established a performance- and outcome-based transportation program in MAP-21 and later the FAST Act. The objective is for States and transit agencies to invest resources in projects that collectively make progress toward the achievement of national goals. CDTC, as a Metropolitan Planning Organization, is required to coordinate with the state and transit agencies through its planning and programming activities to assist the state in meeting its goals.

Measures for the System Performance on the National Highway System include measures of travel time reliability and measures of delay. Two measures for Level of Travel Time Reliability (LOTTR) are defined:

1. Percent of Miles Traveled on the Interstate that are reliable.
2. Percent of Miles Traveled on the non-Interstate National Highway System (NHS) that are reliable.

The LOTTR is defined as percent of miles considered reliable. A link is considered reliable if the ratio of 80th percentile travel time over 50th percentile travel time is greater than 1.5 during peak travel times. Mileage that is “reliable” is multiplied by traffic volume, and an average vehicle occupancy factor to determine the PMT that is reliable.

The New York State Department of Transportation has developed targets for New York State, as shown in Table 2. CDTC has agreed to support these targets, and will plan and program projects that contribute to the accomplishment of these targets. Note that these targets are based on one year of data (2018), and there is no existing framework for forecasting future trends. The declining targets are not reflective of an analysis of future performance. The targets will be reconsidered in 2020 based on additional data, guidance, and analysis. CDTC recognizes that emphasizing reliability will support the Statewide target and will also support congestion management in the Capital District. The values for LOTTR in the CDTC Region are also shown.

Table 2

	Statewide		CDTC Region	
Year	**LOTTR Interstate**	**LOTTR Non-Interstate NHS***	**LOTTR Interstate**	**LOTTR Non-Interstate NHS**
2018 (Baseline)	81.3	77.0	94.4	86.2
2020	73.1	NA	NA	NA
2022	73.0	63.4	NA	NA

*Only a four year target is required for Non-Interstate NHS. Targets are not defined for the CDTC Region since CDTC supports the Statewide targets.

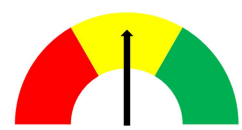
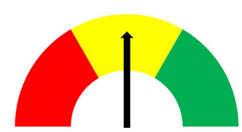
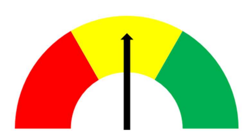
Peak Hours of Excessive Delay (Person Hours)- This measure was defined in the previous chapter. This measure is defined as a measure for the System Performance on the National Highway System in the FAST Act, but is not required for the CDTC area. It is currently required for urbanized areas of more than 1 million people that are also in nonattainment or maintenance areas for ozone, carbon monoxide or particulate matter. However, it is very consistent with the performance measure defined in the 2040 New Visions Plan, Vehicle Hours of Congestion. CDTC will replace “Vehicle Hours of Congestion” with

"Peak Hours of Excessive Delay (Person Hours)" as a regional congestion measure. In 2018, the CDTC areas experienced 6,909,602 Peak Hours of Excessive Delay (Person Hours).

Average Speed- Average speed was identified in the 2040 New Visions Plan as a regional performance measure. However, experience working with the NPMRDS data has demonstrated that average speed is more appropriate as a performance measure to be used at the corridor level and project level. Therefore, average speed will not be used as a regional performance measure in the New Visions 2050 Plan.

Other Performance Measures- As stated in Action 1, Congestion Management must be consistent with the entire New Visions Plan and must support growth in economic activity and maintain the quality of life in the Capital District. It is important that any congestion management actions must recognize the importance of pedestrian, bicycle and transit objectives described in the New Visions Plan. Trade-offs are often necessary in project design and when necessary some congestion is acceptable to maintain high quality access for pedestrians, cyclists and transit users. Therefore, multi-modal performance measures defined elsewhere in the New Visions 2050 Plan are considered part of the Congestion Management Process.

Table 3
New Visions Performance Measures: Desired Change by 2050

Performance Measures	Baseline Value	Desired Change (2050)	Current Trend
LOTTR Interstate	94.4%	Increase Current Value	
LOTTR Noninterstate	86.2%	Increase Current Value	
Peak Hours of Excessive Delay (Person Hours)	6,909,602 Hours	Increase Current value by no more than 20%	

Action 5: Analyze Congestion Problems and Needs

Table 4 shows the Planning Time Index by Interstate segments and the expressway segment of Alternate Route 7, for AM and PM peaks for 2018 weekdays. The tables also show average speed and 95th percentile speeds. Incident management is a vital tool for addressing traffic reliability. Appendix A shows average weekday travel times for all Interstate corridors and Alternate Route 7, for every weekday in 2017 and 2018.

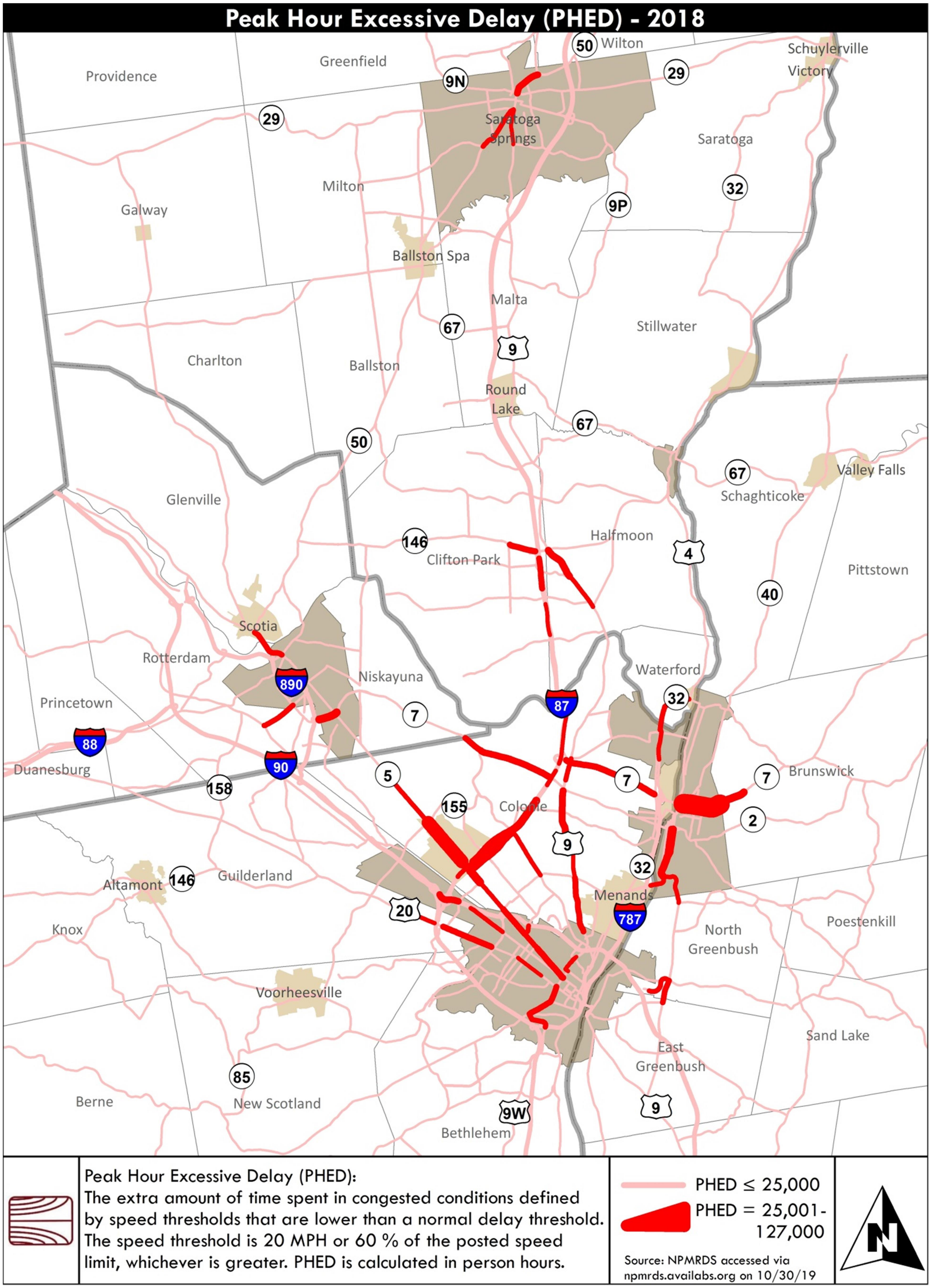
Table 4

2018 Weekday Average Speed, 95th Percentile Speed, and Planning Time Index

	PM Peak Hour			AM Peak Hour		
Corridor	**Average Speed (mph)**	**95th Percentile Speed (mph)**	**Planning Time Index**	**Average Speed (mph)**	**95th Percentile Speed (mph)**	**Planning Time Index**
Northway, Exits 1-9, Northbound	39.7	20.1	3.24	60.4	54.8	1.20
Northway, Exits 9-1, Southbound	58.1	48.6	1.35	48.1	30.1	2.23
Northway, Exit 9 to Hudson River, Northbound	65.7	58.3	1.21	65.7	59.8	1.18
Northway, Hudson River to Exit 9, Southbound	65.9	60.9	1.15	63.9	59.3	1.34
I-90, I-787 to Northway, Westbound	44.4	22.3	2.80	56.2	48.3	1.30
I-90, Northway to I-787, Eastbound	51.1	31.4	2.03	54.7	45.1	1.41
I-90, Patroon Island Bridge to Exit 12, Eastbound	60.5	51.4	1.29	60.9	53.9	1.23
I-90, Exit 12 to Patroon Island Bridge, Westbound	61.3	52.6	1.28	58.1	44.7	1.50
I-787, Route 7 to Exit 23, Southbound	54.4	42.0	1.51	49.3	32.8	1.94
I-787, Exit 23 to Route 7, Northbound	45.6	26.0	2.43	55.9	49.2	1.27
Route 7, I-787 to Northway, Westbound	26.8	12.8	4.83	54.8	45.9	1.37
Route 7, Northway to I-787, Eastbound	55.3	44.4	1.45	44.6	23.9	2.70
I-890, Thruway Exit 25 to Exit 4, Westbound	53.5	39.8	1.55	52.9	41.7	1.48
I-890, Exit 4 to Thruway Exit 25, Eastbound	52.2	39.3	1.57	53.4	42.6	1.45
I-890, Exit 4 to Thruway Exit 26, Westbound	53.6	41.0	1.49	53.3	42.8	1.43
I-890, Thruway Exit 26 to Exit 4, Eastbound	53.9	41.0	1.49	53.6	43.4	1.41
Thruway, Exit 21A to Exit 23	64.5	61.4	1.11	63.3	60.6	1.12
Thruway, Exit 23 to Exit 21A	63.6	58.7	1.14	64.5	60.6	1.11
Thruway, Exit 23 to Exit 24	62.7	59.0	1.15	65.1	62.0	1.10
Thruway, Exit 24 to Exit 23	64.2	61.1	1.10	63.9	60.0	1.12
Thruway, Exit 24 to Exit 25	48.6	29.7	2.18	61.7	56.5	1.15
Thruway, Exit 25 to Exit 24	62.5	57.7	1.15	50.4	32.1	2.06
Thruway, Exit 25 to Exit 26	62.2	53.9	1.25	62.9	55.2	1.22
Thruway, Exit 26 to Exit 25	63.9	58.2	1.16	62.5	58.4	1.16
Thruway, Exit 21A to Massachusetts State Line	60.4	54.7	1.17	59.9	53.9	1.19
Thruway, Massachusetts State Line Exit 21A	60.5	55.2	1.19	61.7	55.2	1.19
I-88, Thruway to Route 20	55.6	43.6	1.41	55.6	44.2	1.41
I-88, Route 20 to Thruway	58.1	47.6	1.35	59.0	48.7	1.32

Source: NPMRDS data. The AM peak period is defined as from 7:00 AM to 9:00 AM. The PM peak period is defined as from 4:30 PM to 6:30 PM.

Map 2 shows Peak Hours of Excessive Delay (PHED) on the National Highway System in the Capital District. The map highlights locations with greater than 30,000 person hours of excessive delay per year. Note that this measure factors in the number of vehicles—that is, a higher volume roadway will have more excess delay than a lower volume roadway, given the same level of delay per vehicle. Major delay corridors include the Northway corridor and Wolf Road; Alternate Route 7; Hoosick Street in Troy; Route 5 in Albany and Colonie; Route 9 in Colonie; Route 50 in Saratoga Springs; the Northway Exit 9 area in Clifton Park; as well as several smaller segments. Further analysis at the corridor level would be necessary to develop recommendations for these congested corridors. The CDTC New Visions Plan policy is to not widen roadways but rather to implement ITS and TDM improvements. ITS (Intelligent Transportation System) improvements include signal improvements, signal coordination and advanced traffic management improvements. TDM (Travel Demand Management) refers to efforts to reduce auto travel and congestion by improving transit access, bicycle and pedestrian access, providing opportunities for carpooling and telecommuting, and other strategies.


Peak Hour Excessive Delay (PHED) - 2018
Providence
Greenfield
Wilton
Schuylerville
Victory
Saratoga Springs
Saratoga
Milton
Galway
Ballston Spa
Malta
Stillwater
Charlton
Ballston
Round Lake
Glenville
Schaghticoke
Valley Falls
Halfmoon
Clifton Park
Pittstown
Scotia
Rotterdam
Niskayuna
Waterford
Princetown
Duanesburg
Brunswick
Colonie
Guilderland
Altamont
Menands
Knox
North Greenbush
Poestenkill
Voorheesville
Sand Lake
East Greenbush
Berne
New Scotland
Bethlehem
Peak Hour Excessive Delay (PHED):
The extra amount of time spent in congested conditions defined by speed thresholds that are lower than a normal delay threshold. The speed threshold is 20 MPH or 60 % of the posted speed limit, whichever is greater. PHED is calculated in person hours.
PHED ≤ 25,000
PHED = 25,001-127,000
Source: NPMRDS accessed via npmrds.availabs.org on 10/30/19

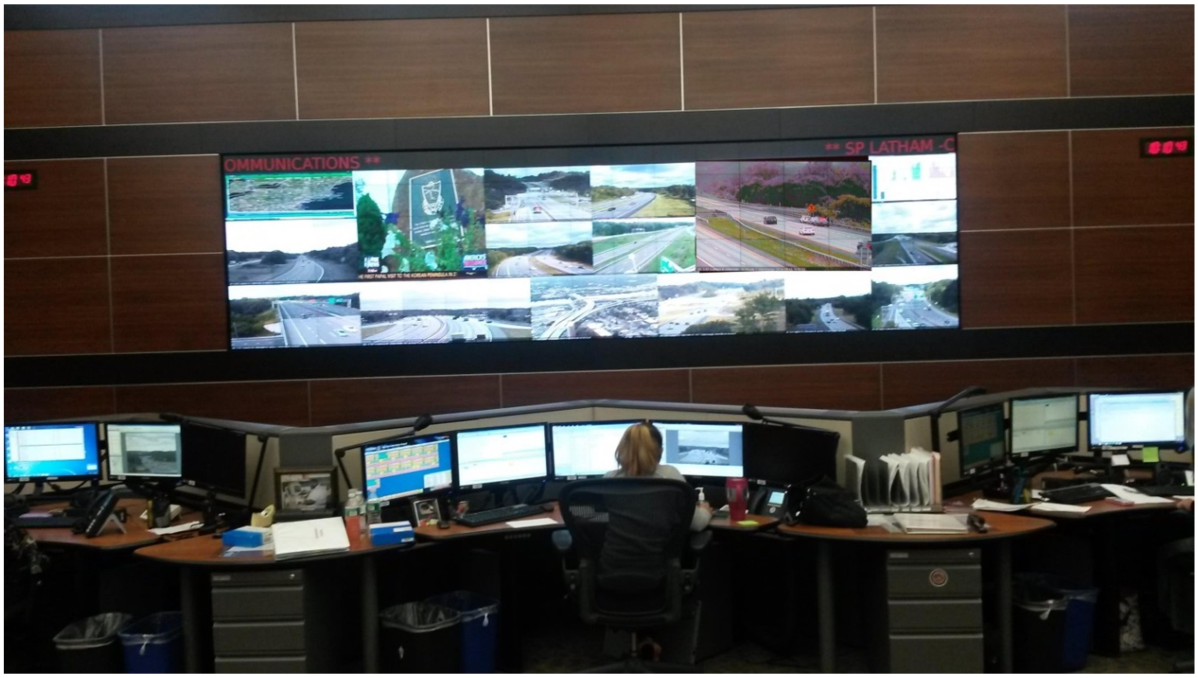
Action 6: Identify and Assess CMP Strategies

Strategies and Programs

The Capital Region Transportation Management Center is a traffic monitoring and response center operated by the New York State Department of Transportation in partnership with the New York State Police. The TMC is located at the New York State Police Troop G headquarters in Latham, NY and has been in continuous operation since December, 1998. Partnering with the State Police has enhanced situation awareness of regional traffic issues and decreased incident response time. The TMC is a focal point for regional traffic incident management, utilizing traffic cameras and road sensors, and it is the originator of NYSDOT regional 511 video and message feeds. The TMC enables State Troopers, DOT HELP Trucks, and other emergency personnel to respond swiftly to crash scenes and other highway problems. When it is appropriate, DOT maintenance crews are dispatched to help restore traffic flow quickly. Since the establishment of the TMC, traffic flow has improved for all Capital Region highway users. The TMC also coordinates with the Thruway Operations Center (TSOC), CDTA, and plans for traffic management during construction and special events.

The TMC is an essential tool for providing incident management services. Reliability of and predictability of travel are important goals supported by the TMC. Quick clearance of incidents, management of traffic during construction, coordination between NYSDOT and emergency service providers are critical to minimizing delays. The TMC is an important component of the Governor's "Drivers First" initiative. Reliability and predictability of travel time on expressways benefits all users including passenger vehicles, truck freight/commodity movements and public transit such as the CDTA's Northway Express Bus Service. Planning for traffic management during construction as part of design benefits drivers.

CDTC has provided strong support for the TMC and its mission. CDTC has consistently provided funding through the Transportation Improvement Program (TIP). The 2019-24 CDTC TIP provides $12.5 million for the TMC, including support for the HELP program. The CDTC New Visions Plan identifies the TMC as a vital component of congestion management and traffic reliability for the Capital District. Non-recurrent delay represents the worst congestion Capital Region drivers encounter, and TMC incident management and operations efforts are the most effective ways to reduce non-recurrent delay in the Capital District. Commercial vehicles rely on TMC and 511 data. The TMC is also a critical resource for responding to emergencies such as Hurricane Irene and Hurricane Sandy. By managing traffic flows, the TMC makes a vital contribution to the attractiveness and economic vitality of the Capital District.



The Capital Region Transportation Management Center

The HELP program provides roadside assistance

Variable message signs help motorists avoid incidents and delays

The TMC operates 75 Digital CCTV cameras

Travel Demand Management- Travel demand management (TDM) refers to efforts to reduce auto travel and congestion by improving transit access, bicycle and pedestrian access, providing opportunities for carpooling and telecommuting, and other strategies. TDM reduces congestion, reduces the costs of driving, and it is an important way to reduce greenhouse gas emissions. CDTC strongly supports TDM by investing in transit, bicycle and pedestrian facilities, carpooling and land use planning. CDTC projects and investments that support TDM include:

- Federal funding for **transit** service in the Capital District is a major part of the CDTC TIP. New Visions incorporates CDTA's Transit Development Plan, which will improve and grow a variety of transit services for the Capital District, increasing mobility and supporting economic development and smart regional growth.

- New Visions encourages development that incorporates **bicycle and pedestrian** accommodations into highway construction as well as city, village, and town plans and provides for recreational opportunities through creation of bike/hike trails.
- CDTC maintains the **iPool2** website which offers a ridematching service and a one-stop shop for traveler needs.
- CDTC maintains the **Capital Coexist** website, a localized education campaign geared towards cyclists and motorists safely coexisting when using the region's roadways.
- **Capital CarShare-** CDTC sponsors this car-sharing program in Albany and Troy, with nine cars available**.** Future expansion could include Schenectady and Saratoga Springs. Providing the opportunity to rent a car on an as needed basis makes not owning a car, or only owning one car in a household, more feasible.
- CDTC provides funding for CDPHP *Cycle*!, which is a bikeshare program offered through CDTA in partnership with CDPHP. CDPHP *Cycle*! Is located at dozens of hubs in Albany, Schenectady, Troy and Saratoga Springs.
- Investments in **Park and Ride** lots have been supported by CDTC and CDTA and NYSDOT.
- **Guaranteed Ride Home**- this program provides a taxi trip home for a bus rider or carpooler when they need to respond to an unexpected issue, such as picking up a sick child from school.

Traffic Signal Technology and Intersection Improvements- Improving intersection operations is critically important to improving traffic flow for autos, transit vehicles and freight, and high quality access for pedestrians and cyclists. CDTC supports improvements to traffic signals that improve travel efficiency and traffic flow while reducing delay. CDTC also supports the construction of roundabouts at intersections where feasible. Examples of CDTC sponsored traffic signal and intersection improvements are listed below.

- Route 5 Transit Signal Priority/Signal Coordination;
- Queue Jumpers at the Intersections of Central Avenue with New Karner Road and Wolf Road;
- ITS Transit Signal Priority on Washington and Western Avenues;
- ITS Signal Improvements on New Scotland Avenue;
- ITS Signal Improvements on Pawling Avenue;
- Green Island Traffic Signals;
- Erie Boulevard/Jay Street/Nott Street/Front Street Roundabout;
- ITS Signal Improvements in the Troy's Second Avenue Corridor and in the area around Federal Street, Congress Street, Ferry Street and Fifth Street;
- South Broadway/Ballston Avenue Intersection Improvements;

  - Rosa Road, Wendell Avenue and Nott Street Intersection
  - New Traffic Signal at Intersection of Providence Avenue & Hillside Avenue
  - US NY 9W/Feura Bush Road/Glenmont Road (NYS NY 910A): Roundabout
  - Intersection of US Route 4 and I-90: Intersection Safety Improvements
  - Nott Street/Balltown Road Intersection: Safety Improvements
  - River Road/Rosendale Road Intersection: Roundabout
  - Rosendale Road/Old River Road Intersection Improvements
  - NY 146/NY 146A Intersection: Safety Improvements—Roundabout
  - Intersection of NY 146 and Clifton Country Road: Intersection Safety Improvements
  - New traffic signal improvements for the Hudson River Corridor BRT: transit signal priority, replacement of 10 traffic signals, and queue bypass lanes in the Waterford to Downtown Albany via Troy, Watervliet, and Menands corridor.

- **Signal coordination** provides the opportunity for cars to move along an arterial with only infrequent stops at traffic signals, and significantly reduces delay. CDTC has sponsored signal coordination projects. Signal coordination can be used to improve arterial function, to discourage speeding on arterials while allowing motorists to make better time. Signal coordination can also be used to encourage speed calming on community streets. The goal of signal coordination is to improve travel time for an entire trip rather than focusing on travel time at a single intersection.

- **Signal connectivity and monitoring** – City of Albany and City of Schenectady are able to remotely monitor connected traffic signals through the use of Traffic Management System (TMS) software. Signals with internet connectivity provided via fiber conduit or wireless modems can be connected to this system to securely monitor signal performance and local traffic. The software even allows for signal operators to remotely deploy revised signal timing directives for traffic management purposes.

- **Transit Signal Priority** (TSP) is an innovation which allows buses to activate signals for extended green time as they approach a signal if they are behind schedule. The extended green time is usually ten seconds, which allows transit vehicles to provide higher quality service. It should be noted that autos in the same traffic stream with the bus will benefit as well. Because the green phase is typically extended only two or three times per hour, the impact on side streets is minimal. CDTC supports TSP as an important tool for improving transit service. TSP has been implemented in the Route 5 BusPlus corridor and is being developed for other corridors. Queue jumper signal phases also have the potential to improve transit on time performance by allowing buses to advance on green ahead of other vehicles, without disrupting traffic flow.

- **Pedestrian Signals** – Innovations in pedestrian signals include pedestrian activation of advanced walk phases, where pedestrians can begin crossing before vehicles enter the intersection; exclusive pedestrian phasing, where all vehicles, including right-turn-on red movements, are stopped while the pedestrian crosses. Countdown timers for pedestrians make crossing easier. In addition, a new type of signal for midblock pedestrian crossing has been introduced, called a HAWK beacon. This signal requires autos to stop only when a pedestrian needs to cross. Innovative technology holds promise for improving midblock pedestrian crossings, school crossings, and speed control.

- **Roundabouts-** At many intersections, roundabouts are extremely effective at improve traffic flow and can provide significant safety benefits, especially for reducing severe (injury/fatal) crashes. An additional benefit of roundabouts is that maintenance requirements can be significantly less than for signalized intersections, and roundabouts by design can adapt to changing traffic conditions. NYSDOT has policies in place to require consideration of roundabouts when reconstructing an intersection. Additionally, roundabouts are the preferred alternative if the roundabout alternative is feasible.

Implementation of signal technology improvements has the potential to improve traffic mobility and safety at low cost. Signal technology also can enhance pedestrian, bicycle and transit access and provide an important component of complete streets. The CDTC Regional Operations and Safety Advisory Committee is developing recommendations for implementing and operating signal technology.

ITS technologies for transportation operations- – Traffic signals are considered to be one type of Intelligent Transportation System (ITS) technology. ITS can be defined as using technology to make smarter use of transportation networks. It includes communications with drivers as well as communications within the transportation system. CDTC has long recognized the value of using ITS to improve travel for all modes, including autos, transit, bicycles and pedestrians, and freight. Emerging ITS technologies include:

- **Adaptive signal control** is a control strategy whereby the signal controller makes adjustments to cycle length, off-sets and phase timings in real time based on changes in the traffic characteristics on the arterial. This can be especially valuable during an incident on an expressway, when traffic may divert to a parallel arterial. Adaptive signal control has been recommended for the Northway/Route 9 corridor in the I-87/US 9 Integrated Corridor Management Plan. Under adaptive control, traffic signals in a network communicate with each other and adapt to changing traffic conditions to reduce the amount of time cars and trucks spend idling. Using fiber optic video receivers similar to those used in dynamic control systems, the new technology monitors vehicle numbers and makes changes in real time to minimize congestion wherever possible.

- **Self-Organizing Signals** – One example of Adaptive Signal Control is a system being developed and tested at the University at Albany called Self-Organizing Signals. This proposed system is based on the theory of self-organizing biological systems. Analogous to biological systems, each traffic signal in the system would communicate with the immediately adjacent signals and based on traffic sensor information would adjust the signal timing plan. This innovative approach has the potential to respond to minor changes in traffic flow as well as major changes to traffic flow in a way that optimizes the system. CDTC will continue to monitor the development of this innovative approach.

Arterial Management and Land Use Planning – A critical factor to the success of preserving capacity along existing arterial highways involves the coordination of development along the roadway. How land owners adjoining arterial highways use or develop their property and gain access to the highway system has a direct impact on how well the highway user is served. Land use and access considerations are critical to a successful arterial management program. CDTC supports strong municipal planning because municipal land use and zoning policies strongly influence the efficiency of the region's arterials and highways. CDTC also supports accommodation of pedestrian, transit, and access management concerns in the site planning review process. New Visions endorses corridor transportation plans that call for a well-designed network of connected streets featuring pedestrian and bicycle treatments and transit access. The Plan acknowledges the importance of land use and development. CDTC sponsors the Linkage Planning Program, which provides funding for cities, towns, and villages to prepare and implement community-based transportation and land use plans consistent with New Visions principles.

The I-87/US 9 Integrated Corridor Management Plan- In partnership with CDTC, NYSDOT prepared an Integrated Corridor Management Plan for the Northway/Route 9 corridor. Integrated Corridor Management (ICM) would enable the New York State Department of Transportation (NYSDOT) to optimize use of available transportation infrastructure by directing travelers to underutilized capacity in a corridor. Strategies could include motorists shifting their trip departure times, routes, or modes, and/or NYSDOT dynamically adjusting capacity on I-87 by or adjusting traffic signal timings to accommodate demand fluctuations.

The Thaddeus Kosciusko Bridge carries the Northway over the Mohawk River

In addition, access management and smart growth strategies are proposed for the US 9 corridor. Access management is the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway. Good access management provides a safe operating system for all users while balancing the function of the roadway with the access needs of the adjacent land uses.

The ICM Plan is based on the CDTC New Visions Plan policy that says that adding physical capacity to the Northway is not the right approach, but that managing congestion and traffic flows in the Northway corridor is the best way to add capacity and improve the Northway. A management approach is the best approach because the most severe delay on the Northway is “non-recurrent” delay; that is, delay that results from incidents and other events. CDTC analysis has shown that widening the Northway would result in travel demand immediately increasing to fill the new capacity, while doing little to address incident delay and reliability. One of the conclusions of this analysis is that there is no feasible capital improvement such as highway widening that can eliminate daily recurring congestion in the peak periods. Adding capacity to the Northway can be expected to result in higher traffic volumes and could generally be expected to result in conditions similar to those which exist today. In addition, widening would not prevent delays that result from incidents such as bad weather conditions, traffic accidents and vehicle breakdowns. Adding considerable capacity in one corridor would also re-concentrate traffic into the peak period, putting severe traffic pressure on all intersecting roads and expressways that are not widened. In addition, widening the Northway would be prohibitively expensive and would provide benefits for only short periods in peak periods in one direction.

The I-87/Route 9 ICM Plan was developed in consultation with state and local police/emergency response staff and other local officials. It developed recommendations to manage incidents, improve traffic flow, and improve reliability. These recommendations are listed in Table 5. It is important to note that an important part of managing the Northway corridor is based on ongoing operational costs, which are shown in Table 5. Investing in operations is critical to managing traffic flow in the Northway corridor and in other corridors, and the corresponding costs need to be budgeted.

Table 5
I-87/Route 9 Integrated Corridor Management Recommendations

Description	Capital Cost	Operation/ Maintenance Cost (per year)
Short Term: Bluetooth Based Detection for Travel Time	$460,000	$92,000
Medium Term: Extension of Existing ITS Program on I-87	$6,210,000	$770,000
Long Term: Adaptive Signal Control on Route 9	$3,000,000	$600,000
Strategies Requiring Further Study: Active Traffic Management on I-87: Speed Harmonization, Variable Speed Limits, Dynamic Lane Assignment, Queue Warning	$4,500,000	$450,000

One concept studied during the ICM but needing further study is **active traffic management** (ATM) to serve traffic approaching the Twin Bridges. Active traffic management is defined as the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing traffic conditions. Non-recurrent congestion refers to congestion that results from traffic accidents, weather events or other incidents. Speed harmonization is one example of active traffic management. Speed harmonization can help to reduce flow breakdown and the onset of stop-and-go driving behavior in support of improved mobility. An example of a speed harmonization strategy is the use of variable speed displays. They are set (and varied) according to prevalent roadway and operating conditions, including visibility, weather, lane constraints (e.g., work zones), crashes and other incidents, and real-time traffic flows/congestion levels. Variable speed displays may be advisory or regulatory. Another example of active traffic management is Dynamic Lane Assignment (DLA), which consists of lane control signals – typically installed in conjunction with variable speed displays – providing advance notice that a lane(s) is closed ahead and to start the merge process into the available lanes well in advance of the actual closure.

For the Northway, this strategy would require the installation of a series of overhead gantries at a spacing of approximately every 1/2 mile northbound on I-87 from Exit 4 to the Twin Bridges (5 miles) and southbound on I-87 from Exit 9 to the Twin Bridges (5 miles). Estimated costs are shown in Table 8. As described earlier, this is a location of recurring traffic congestion due to the geometry of I-87 approaching the Twin Bridges. Active traffic management has been shown to improve travel time reliability, increase roadway throughput, reduce crashes, save fuel and squeeze more traffic capacity from the existing roadway cross section. A comprehensive program of before and after traffic studies is underway for an active traffic management project in northern Virginia. CDTC will further evaluate this approach as national experience increases.

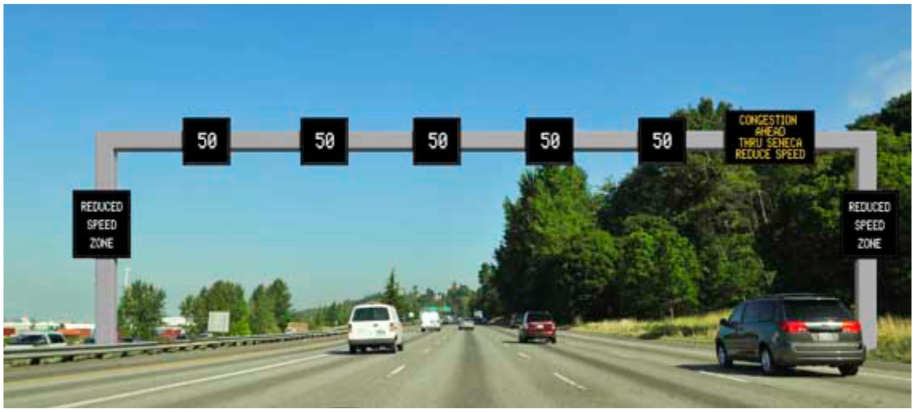


Figure 2. Variable speed displays in Seattle

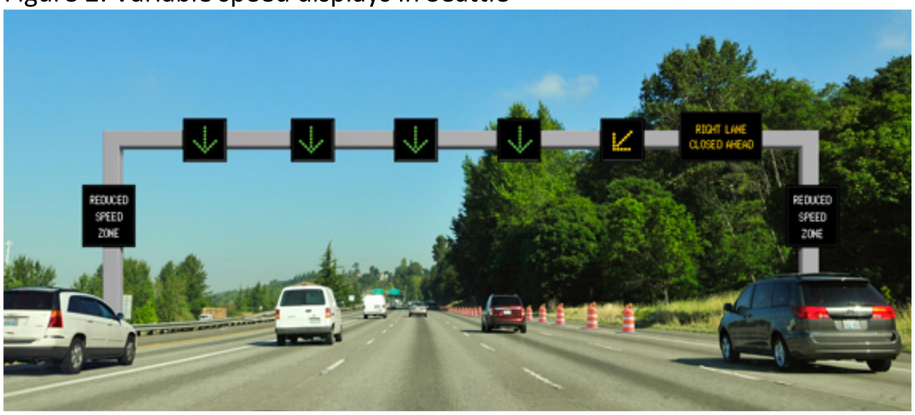


Figure 3. Dynamic Lane Assignment in Seattle

Regional ITS Architecture

In 2016, an update to the NY Capital Regional ITS Architecture was completed. Regional ITS Architectures are required in order to receive Federal funding for ITS projects. The purpose of maintaining a Regional ITS Architecture is to provide a consistent framework to guide the planning and deployment of ITS projects within the region. Compliance with the architecture ensures that ITS technologies can work together as a system. The Regional ITS Architecture contains information on:

- The visions, goals, and objectives of regional ITS deployment;
- The functions performed by ITS services;
- The hardware components needed to deliver these functions;
- The interfaces and communications protocols necessary for data exchange; and
- Stakeholder roles and responsibilities with regard to ITS deployment.

The NY Capital Regional ITS Architecture covers the four-county CDTC planning region. As part of the 2016 update, each major stakeholder was provided with an architecture document detailing it's ITS systems and their relationships. The agencies with their own specific ITS architecture documents are:

- The Capital District Transportation Authority (CDTA)

- The Capital District Transportation Committee (CDTC)
- Municipalities with Transit Signal Priority, which at this time are Albany and Schenectady, but can be expanded as transit signal priority expands.
- New York State DOT Region 1
- New York State Thruway Authority (NYSTA)

In addition to the stakeholders listed above, many other stakeholders are included in the architecture database including NYS Police, local municipalities and counties, local transit agencies, Albany International Airport, and numerous others.

The ITS Architecture is intended to be a living document. Recent ITS projects including Computer Aided Dispatch / Automatic Vehicle Location (CAD-AVL), Bus Rapid Transit projects, Transportation Management Center (TMC) Operations, and others are included in the database.

In addition, as part of the 2016 update, a Concept of Operations (ConOps) document was produced that enumerates the roles and responsibilities of regional stakeholders. The ConOps document details relationships among maintenance agencies, emergency responders, planning agencies, and information service providers. CDTC intends to continue to work with NYSDOT Region 1 staff and all other regional architecture stakeholders to maintain, update, and utilize the architecture for deployment of future ITS.

Action 7: Program and Implement CMP Strategies

The following are recommendations by the Regional Operations and Safety Advisory Committee for CDTC Planning Committee consideration.

Implementation of the Congestion Management Process: Recommendations

1. **Funding for Operations** – CDTC should continue to support funding for operations, including the TMC, traffic signals, ITS innovations, improved project selection process for ITS/signals. At a minimum, funding should continue at existing levels. While existing funding at the federal and state level is often set up for capital projects, funding for operations provides essential improvements to traffic flow and traffic reliability, as well as improvements to transit systems.

2. **Major Highway Expansion Should Not Be Considered** – CDTC should continue its strong policy that congestion management is much more cost effective than highway capacity increases or new lanes; and that congestion alone does not justify increasing highway capacity or adding new lanes. Because of other less expensive strategies, and because of changing transportation technologies, major highway expansion (adding through lanes for several miles or more) should not be considered. CDTC policy does not support increasing road capacity by constructing new lanes. Strategic removal of bottlenecks can be considered without major highway expansions.

3. **Right-size our existing roadways** – Because some of the roads in our region were built years ago based on higher-than-actual forecasted traffic, some of these roads have unused capacity. These roads should be right-sized so that underutilized right-of-way can be used to improve access for other modes of transportation, such as pedestrian, bicycling, and transit.

4. **Community Traffic Engineering Services Program** – CDTC should explore the option of establishing a community traffic engineering services program. Under this potential program, CDTC would partner with a municipality to hire a traffic engineering consultant to provide intersection signal analysis, traffic counts, or analysis of potential operational improvements or ITS improvements. Municipalities would need to apply for funding for this program. The result could be the identification of candidate projects for future improvements.

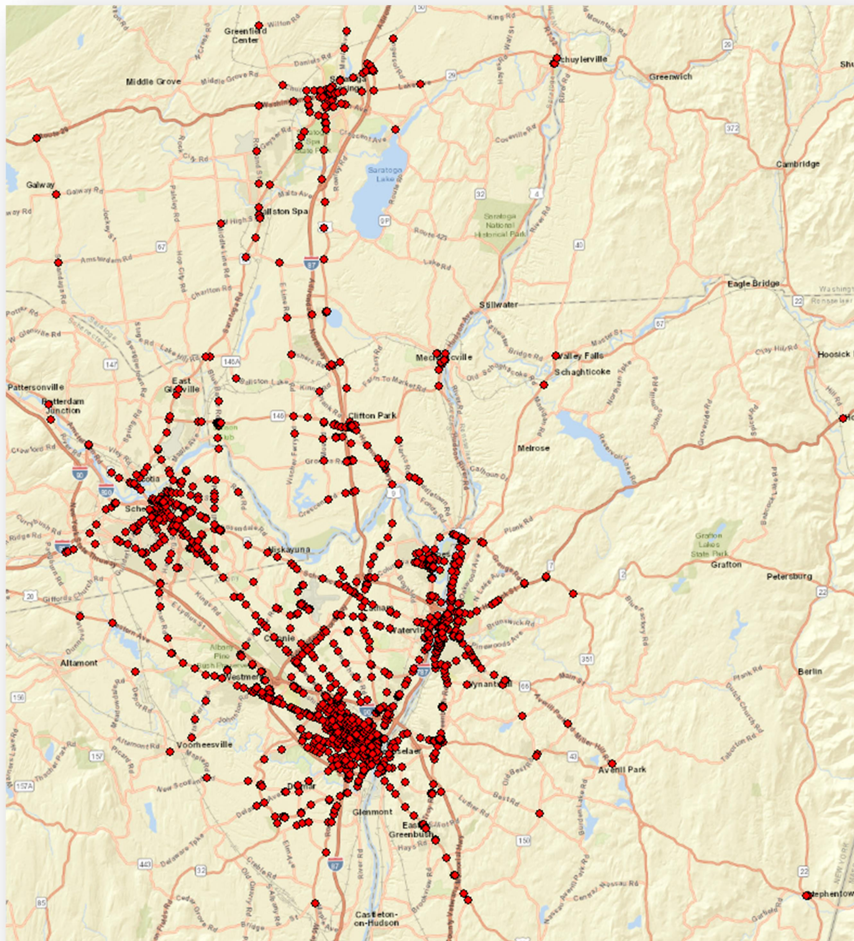
5. **Active Traffic Management Strategies** – CDTC should further evaluate active traffic management (ATM) strategies, including speed harmonization and Dynamic Lane Assignment (DLA) for the Northway as national experience increases. Further national experience will help NYSDOT and CDTC determine if ATM strategies are a good fit for the Capital District. CDTC should further evaluate and eventually recommend ITS and ATM strategies, including speed harmonization and Dynamic Lane Assignment (DLA) for local interstate highways as national experience increases.

6. **Regional Traffic Signal Timing Program** – Traffic signal retiming is a highly cost-effective method of improving arterial safety and operations. FHWA guidance encourages signal operators to establish a periodic assessment of signal timing for all signals on a 3 to 5 year timeframe. CDTC should establish a Regional Traffic Signal Timing Program to conduct a data-driven, performance measure-based screening of regional arterials to determine which would benefit most from timing optimization. The program can also ensure that safe pedestrian crossing intervals are present at all

signalized intersections. The program should also proactively monitor signal performance and make timing changes in response to land use changes or shifting travel demand.

7. **Traffic Incident Management Committee** – A Traffic Incident Management Committee should be formed that will meet regularly and assess management of recent incidents and plan for upcoming events. Emergency service providers, State Police, NYSDOT staff and others should be included.

8. **Inventory of Signals and Signal Coordination Systems** – Like pavement and bridges, traffic signals are a key component of our transportation system, and their condition should be similarly tracked. CDTC should develop a plan to inventory signals in the region and assess their level of operational capability for performance reporting purposes, and as a first step toward developing a Traffic Signal Management System. CDTC should work with regional signal operators to compile a geodatabase of existing signal data and develop a plan for filling in the gaps. Both safety and operations can be improved by identifying outdated signal hardware and prioritizing these locations for future improvements.



Map 3-Traffic Signals in the Capital District

9. **ITS/TSMO Strategies Survey and Self-Assessment** – CDTC should work with regional operating agencies to compile a survey of ITS and TSMO strategies currently in use. This data could be used to identify gaps in TSMO adoption along with areas where regional best practices could be shared among agencies. This activity may also lay the groundwork for an eventual regional Capability Maturity Model (CMM) assessment, in which business processes and organizational concepts that lead to successful TSMO deployment would be evaluated, improved, and institutionalized.

10. **Classification of Signalized Arterials** – CDTC should adopt a data-driven approach to prioritizing corridors for traffic signal upgrades and transit ITS deployment. Signalized arterials should be

mapped and classified based on traffic volumes, transit use, access management, signal delay, travel time reliability, safety, and other factors. The appropriate level of signal technology (such as signal coordination, actuated-coordinated systems, demand responsive systems, or Computerized Traffic Signal Systems) and the appropriate transit ITS would then be selected for each corridor. Such a study would provide a useful roadmap for arterial improvements.

11. **Automated Traffic Signal Performance Measures Pilot** – One of FHWA's Every Day Counts Round 4 initiatives is Automated Traffic Signal Performance Measures (ATSPMs). ATSPMs allow for real-time and historical monitoring of many performance metrics. Signal with vehicle detection can record and archived high-resolution operations data when the appropriate software is installed on the controller. This data can be used for modeling purposes, signal retiming, and for planning future improvements. CDTC should explore the use of ATSPMs for arterial performance monitoring.

12. **Regional Transportation Systems Management Operations (TSMO) Plan** – CDTC will develop a Regional Transportation Systems Management Operations Plan. Many of the recommendations listed above, such as the ITS/TSMO Strategies Survey and Self-Assessment, will lay the groundwork for an eventual Regional TSMO Plan. The TSMO Plan would be developed in accordance with Federal guidance on Advancing Metropolitan Planning for Operations. The TSMO plan would be incorporated into New Visions and would adopt the same regional goals. The plan would require substantial buy-in and participation from regional stakeholders. Per the Metropolitan Planning for Operations guidebook, the TSMO Plan shall:

    - Advance goals within New Visions that focus on safe and efficient management and operation of the transportation system.
    - Develop regional operations objectives for New Visions – specific, measurable statements of performance designed to advance regional goals.
    - Use a systematic process to develop performance measures, analyze transportation performance issues, and recommend M&O strategies.
    - Select M&O strategies within fiscal constraints to meet operations objectives for inclusion in the metropolitan transportation plan (MTP) and transportation improvement program (TIP).
    - Implement M&O strategies including program investments, collaborative activities, and projects.
    - Monitor and evaluate the effectiveness of implemented strategies and track progress toward meeting regional operations objectives.

The TSMO Plan could be used to help build the Business Case for TSMO in the region. TSMO strategies can be cost-effective, and making the business case to decision makers and senior leadership is necessary for TSMO adoption. Barriers to TSMO adoption may include Institutional, Organizational, and Procedural (IOP) arrangements that were developed for traditional highway "build and maintain" program approaches. When making an effective business case for TSMO, the case should be tailored to local priorities, and should take advantage of local TSMO success stories. Benefit-cost analyses may be conducted to quantify the benefits of TSMO and illustrate that TSMO strategies may be cost-effective and thus should be competitive for funding.

As part of a TSMO Plan, a regional Capability Maturity Model (CMM) assessment could also be conducted. Per SHRP 2 Reliability Program research, there are six dimensions to CMM:

- **Business processes** including formal scoping, planning, programming and budgeting
- **Systems and technology** including use of systems engineering, systems architecture standards, interoperability, and standardization
- **Performance measurement** including measures definition, data acquisition, and utilization
- **Culture** including technical understanding, leadership, outreach, and program legal authority
- **Organization and workforce** including programmatic status, organizational structure, staff development, and recruitment and retention
- **Collaboration** including relationships with public safety agencies, local governments, MPOs and the private sector

As part of a TSMO CMM Self-assessment, regional stakeholders would be asked where they fall in each of the six dimensions, where they would like to be, and steps that could be taken to get there. The purpose of the CMM self-assessment would be to get agencies to think beyond project-level TSMO implementation and start thinking about staffing, policy, and institutional processes to advance TSMO in the long term.

Action 8: Evaluate Strategy Effectiveness

Evaluation of congestion management strategies is essential to the performance-based planning process. If each federal dollar is to be spent as cost-effectively as possible, then implemented strategies must be evaluated to ensure they are effective at addressing congestion as intended. The FHWA CMP Guidebook identifies two general approaches for this type of analysis:

1. **System-level performance evaluation** – Regional analysis of historical trends to identify improvement or degradation in system performance, in relation to objectives; and

2. **Strategy effectiveness evaluation** - Project-level or program-level analysis of conditions before and after the implementation of a congestion mitigation effort.

System-level evaluation is advantageous in that it wholly captures the experience of the travelling public. CDTC will monitor regional performance measures such as peak-hour excessive delay and level of travel time reliability as discussed in Actions 3 and 4 earlier in this document. These measures may be derived from the NPMRDS dataset and tracked annually. Other analytics made available via the AVAIL tool will also be used for system-level performance evaluation.

System-level evaluation cannot, however, be used to evaluate the effectiveness of any one particular strategy. Economic factors and shifting travel demand will have an impact on system performance that is difficult to separate from CMP strategies. Therefore, CDTC shall also conduct project-level and program-level analyses of implemented strategies.

Before-and-after studies shall be conducted using travel time analytics from the AVAIL tool and through alternative means contingent upon data availability. For projects intended to mitigate congestion bottlenecks, the AVAIL tool can be used to assess metrics such as mean travel speed, planning time index, or travel time reliability before and after the project is implemented to assess its efficacy. For TDM programs, utilization metrics such as vanpool participation and park-and-ride use shall be assessed. For transit programs, metrics such as transit ridership or transit on-time percentage shall be used, pending the availability of such data.

CDTC also intends to develop in-house capability to use microsimulation software as an additional method of assessing corridor performance. Microsimulation modeling tools such as PTV VISSIM may be used to conduct before-and-after studies for many types of congestion mitigation projects including traffic signal upgrades, addition of turning lanes, roundabouts, changes to access management, and more. Microsimulation allows for analysis of metrics that cannot be directly derived solely from archived operations data such as emissions, fuel use, approach delay, number of stops, level of service, and more. Microsimulation may also be used to estimate the cost-effectiveness of TSMO strategies such as traffic incident management.

Congestion Management Process & Environmental Justice

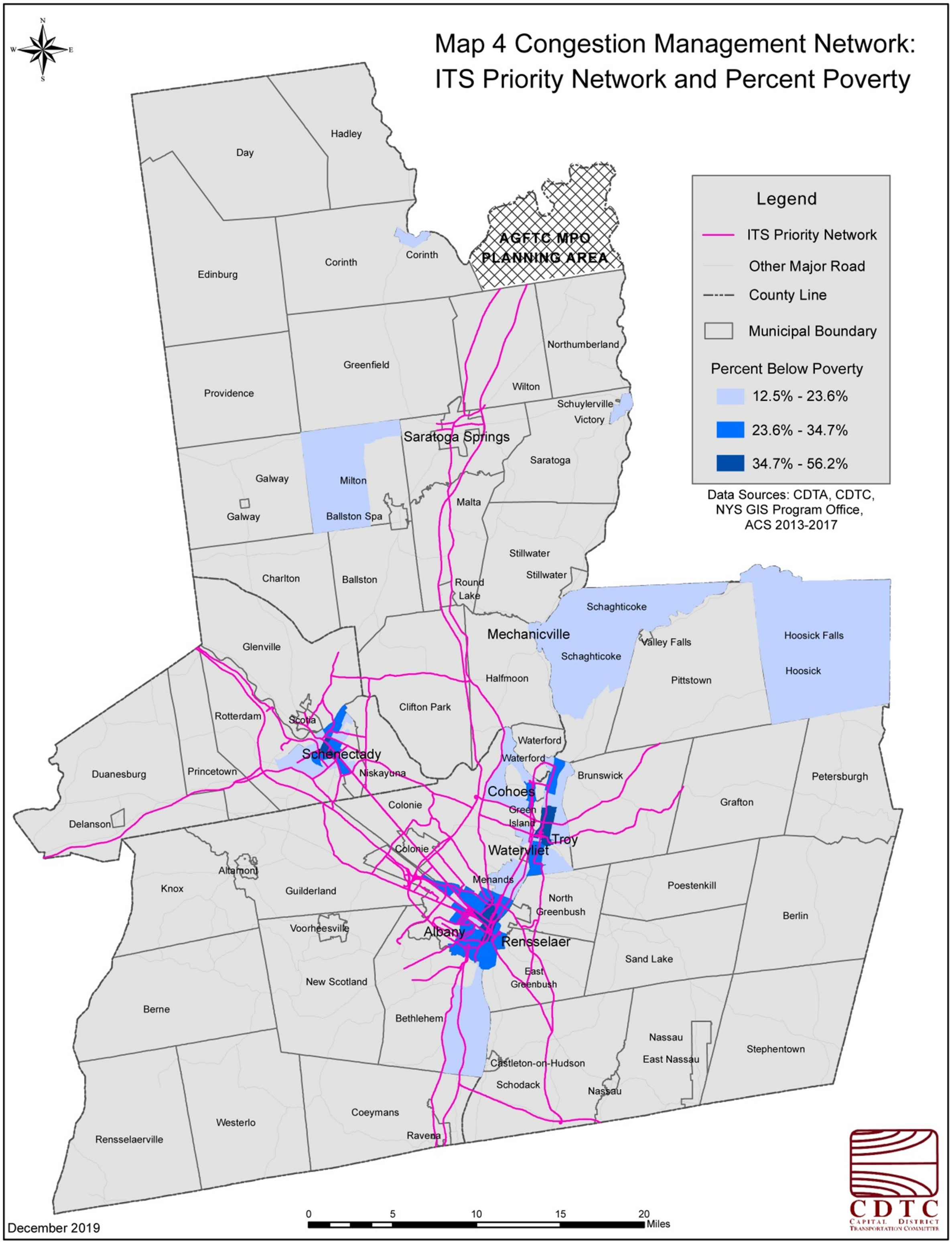
CDTC seeks to mitigate the negative impacts of its Congestion Management Process (CMP) programs and policies on local communities. Congestion management actions include incident management actions, traffic signal improvements, intersection improvements and travel demand management programs.

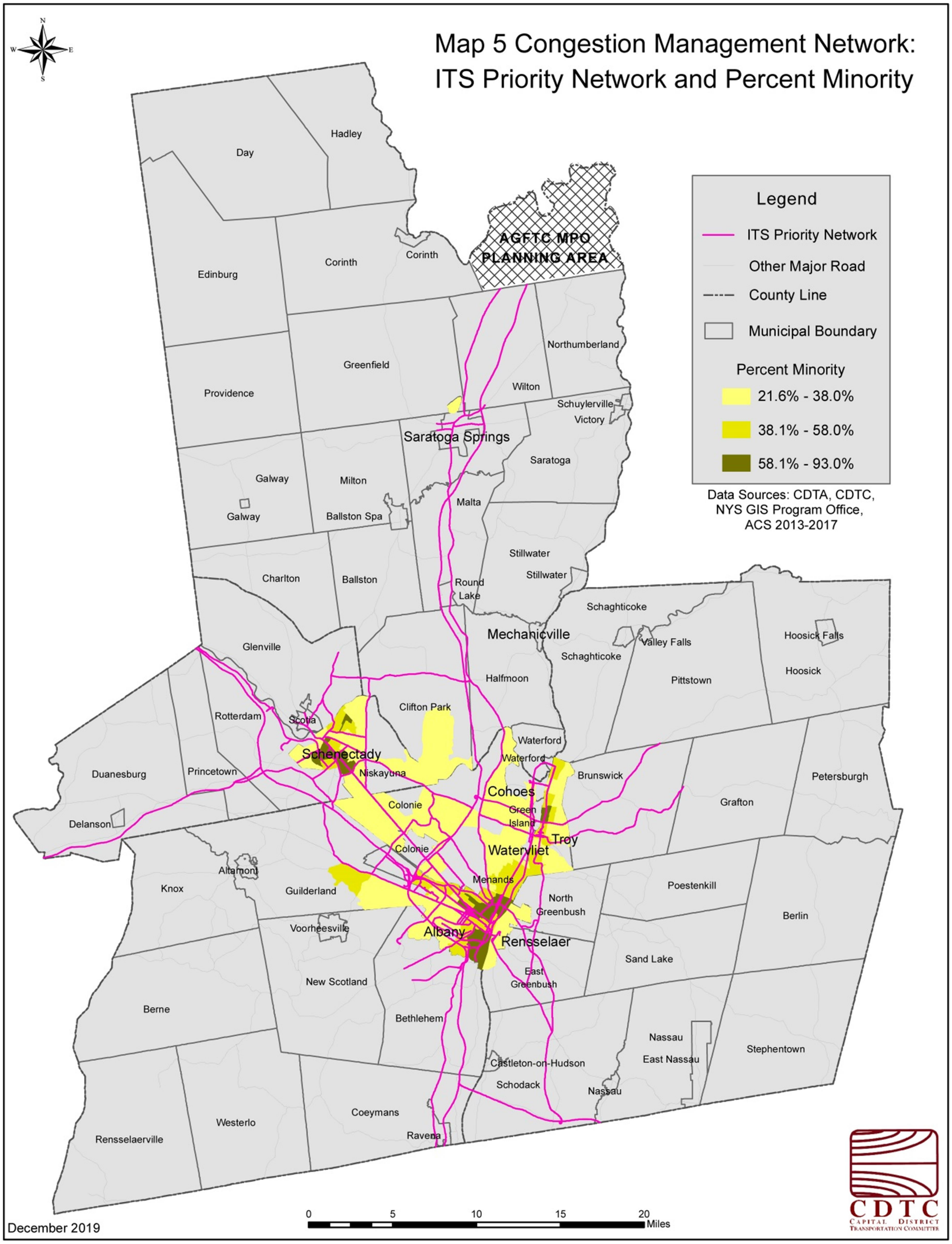
US Department of Transportation guidance offers several environmental justice principles:
"To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process;
To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority or low-income populations; and
To prevent the denial of, reduction in or significant delay in the receipt of benefits by minority or low-income populations."[10]

[10] Source: https://www.transportation.gov/transportation-policy/environmental-justice/environmental-justice-strategy

CDTC is required by law to consider the environmental justice impacts of federally funded transportation projects.

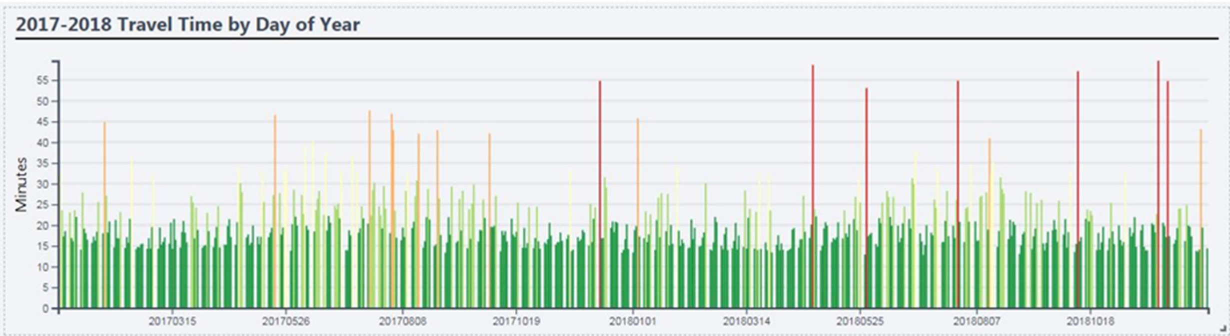
CDTC considers environmental justice as part of the candidate Transportation Improvement Program (TIP) funding merit evaluation process. Congestion management and environmental justice issues often intersect in the CDTC region, illustrated on Map 4: Congestion Management Network: ITS Priority Network and Percent Below Poverty; and Map 5: Congestion Management Network: ITS Priority Network and Percent Minority, below. On Map 4 the areas shown in shades of blue are census tracts with percent below poverty above the regional average, i.e. environmental justice areas. Likewise, on Map 5 the areas shown in shades of yellow are census tracts with a percent minority above the regional average, i.e. environmental justice areas. In both cases, the Congestion Management Network often travels near or through these areas. Any congestion management projects in these areas need to strongly consider environmental justice impacts. Congestion management improvements such as transit improvements, traffic signal improvements and pedestrian and bicycle improvements on the Congestion Management network could improve access to employment for EJ communities.


Map 4 Congestion Management Network:
ITS Priority Network and Percent Poverty
Legend
ITS Priority Network
Other Major Road
County Line
Municipal Boundary
Percent Below Poverty
12.5% - 23.6%
23.6% - 34.7%
34.7% - 56.2%
Data Sources: CDTA, CDTC, NYS GIS Program Office, ACS 2013-2017
AGFTC MPO PLANNING AREA
Hadley
Day
Edinburg
Corinth
Corinth
Northumberland
Greenfield
Providence
Wilton
Schuylerville
Victory
Saratoga Springs
Saratoga
Galway
Milton
Galway
Ballston Spa
Malta
Stillwater
Stillwater
Charlton
Ballston
Round Lake
Schaghticoke
Mechanicville
Valley Falls
Hoosick Falls
Glenville
Schaghticoke
Hoosick
Halfmoon
Pittstown
Clifton Park
Rotterdam
Scotia
Waterford
Schenectady
Waterford
Duanesburg
Princetown
Niskayuna
Brunswick
Petersburgh
Cohoes
Colonie
Green Island
Grafton
Delanson
Troy
Colonie
Watervliet
Altamont
Menands
Poestenkill
Knox
Guilderland
North Greenbush
Berlin
Voorheesville
Albany
Rensselaer
Sand Lake
New Scotland
East Greenbush
Berne
Bethlehem
Nassau
East Nassau
Stephentown
Castleton-on-Hudson
Schodack
Nassau
Coeymans
Westerlo
Ravena
Rensselaerville
0
5
10
15
20
Miles
December 2019
CDTC
Capital District Transportation Committee

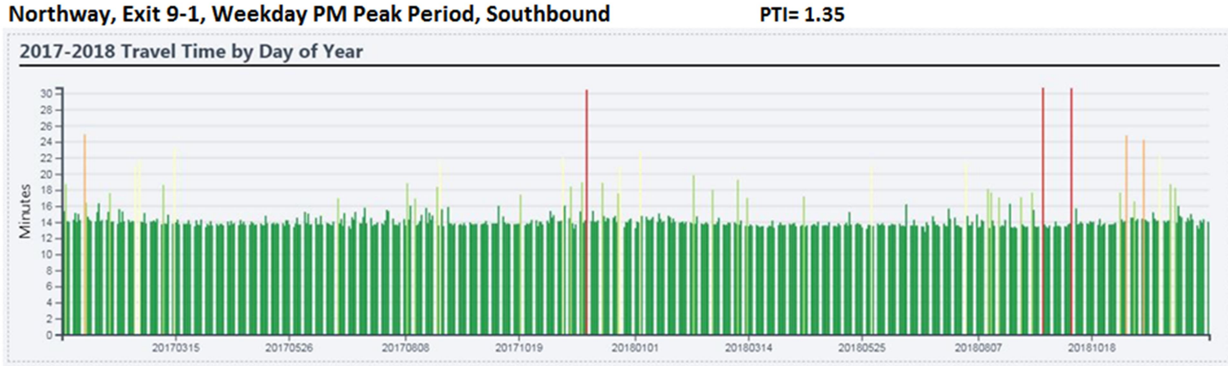

Map 5 Congestion Management Network:
ITS Priority Network and Percent Minority
Legend
ITS Priority Network
Other Major Road
County Line
Municipal Boundary
Percent Minority
21.6% - 38.0%
38.1% - 58.0%
58.1% - 93.0%
Data Sources: CDTA, CDTC, NYS GIS Program Office, ACS 2013-2017
AGFTC MPO PLANNING AREA
Day
Hadley
Edinburg
Corinth
Corinth
Northumberland
Greenfield
Providence
Wilton
Schuylerville
Victory
Saratoga Springs
Saratoga
Galway
Milton
Galway
Ballston Spa
Malta
Stillwater
Stillwater
Charlton
Ballston
Round Lake
Schaghticoke
Mechanicville
Valley Falls
Hoosick Falls
Glenville
Schaghticoke
Halfmoon
Pittstown
Hoosick
Clifton Park
Rotterdam
Scotia
Waterford
Waterford
Schenectady
Niskayuna
Duanesburg
Princetown
Brunswick
Petersburgh
Cohoes
Colonie
Green Island
Grafton
Delanson
Troy
Colonie
Watervliet
Altamont
Menands
Poestenkill
Knox
Guilderland
North Greenbush
Berlin
Voorheesville
Albany
Rensselaer
Sand Lake
East Greenbush
New Scotland
Berne
Bethlehem
Nassau
Stephentown
East Nassau
Castleton-on-Hudson
Schodack
Nassau
Coeymans
Westerlo
Ravena
Rensselaerville
December 2019
0
5
10
15
20
Miles

Appendix: Charts Showing Reliability of Interstate/Expressway Corridors

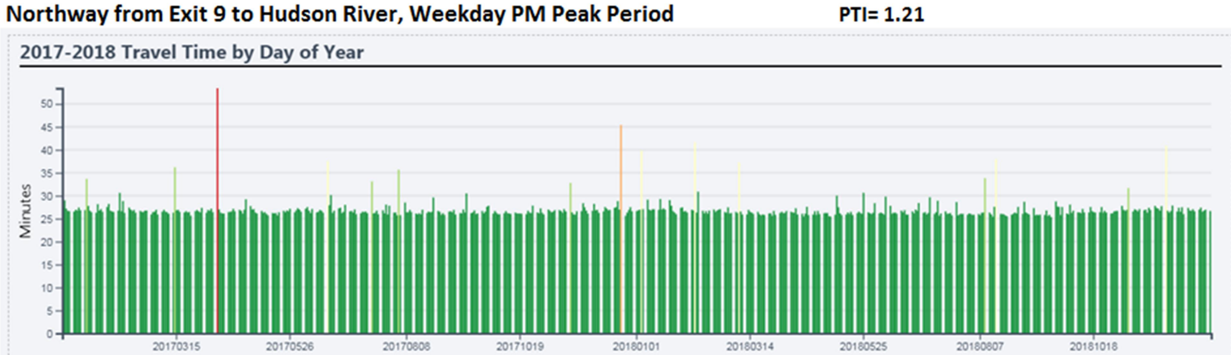
Northway, Exit 1-9, Weekday PM Peak Period, Northbound **PTI= 3.24**



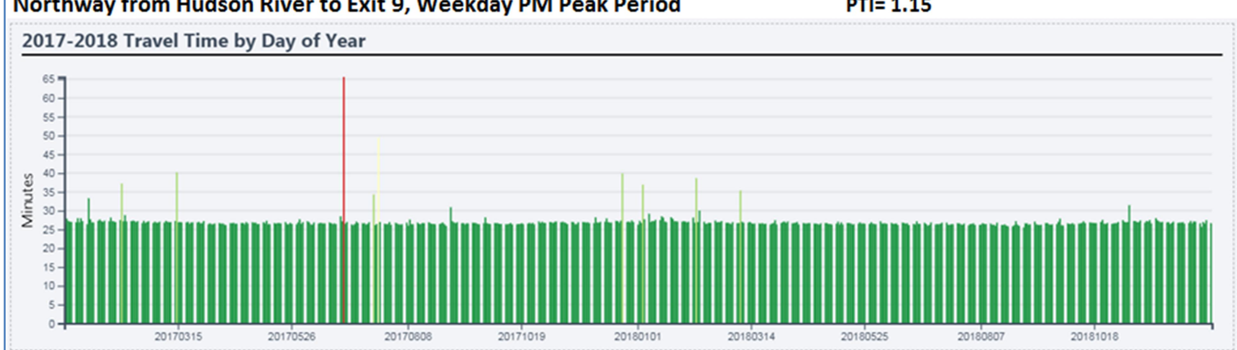
Northway, Exit 9-1, Weekday PM Peak Period, Southbound **PTI= 1.35**



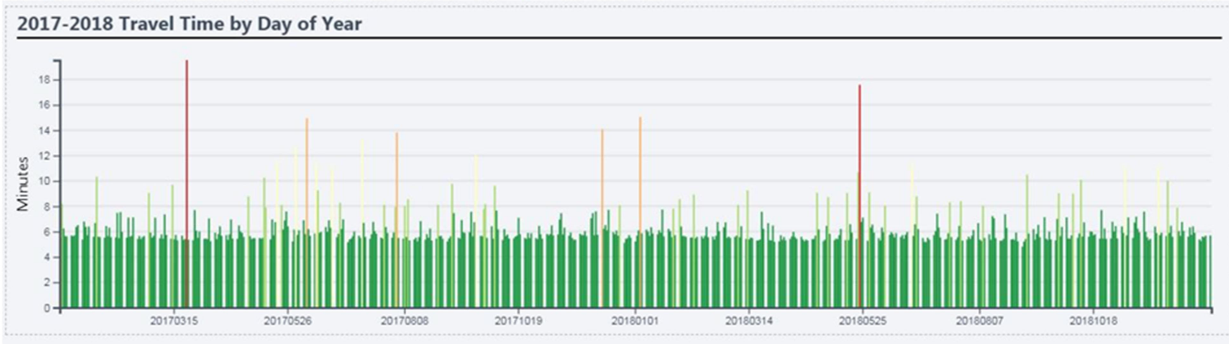
Northway from Exit 9 to Hudson River, Weekday PM Peak Period **PTI= 1.21**



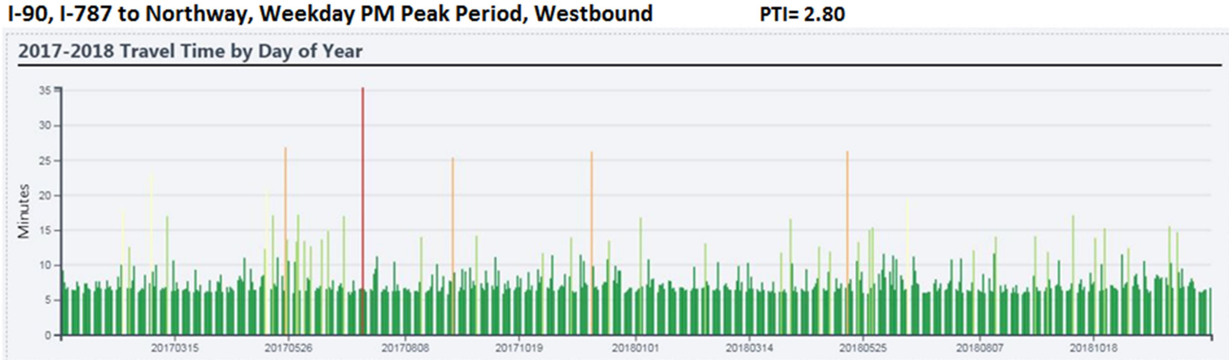
Northway from Hudson River to Exit 9, Weekday PM Peak Period **PTI= 1.15**



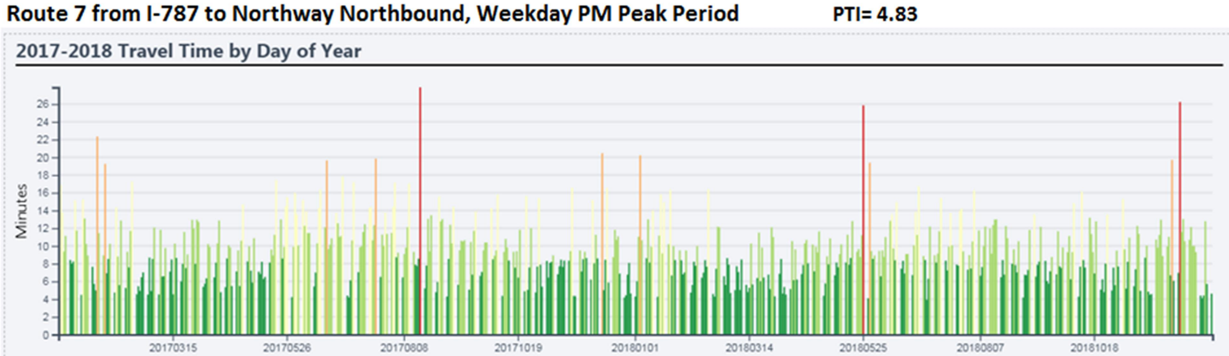
I-90, Northway to I-787, Weekday PM Peak Period, Eastbound **PTI= 2.03**



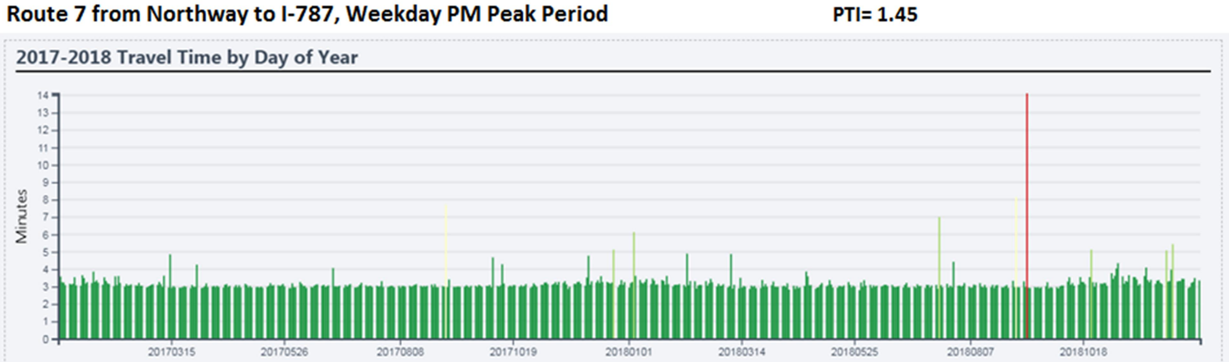
I-90, I-787 to Northway, Weekday PM Peak Period, Westbound **PTI= 2.80**



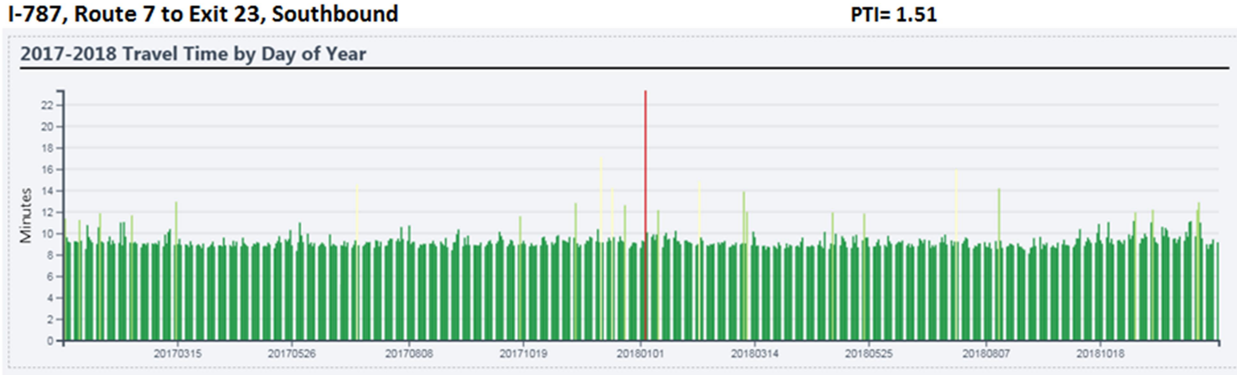
Route 7 from I-787 to Northway Northbound, Weekday PM Peak Period **PTI= 4.83**



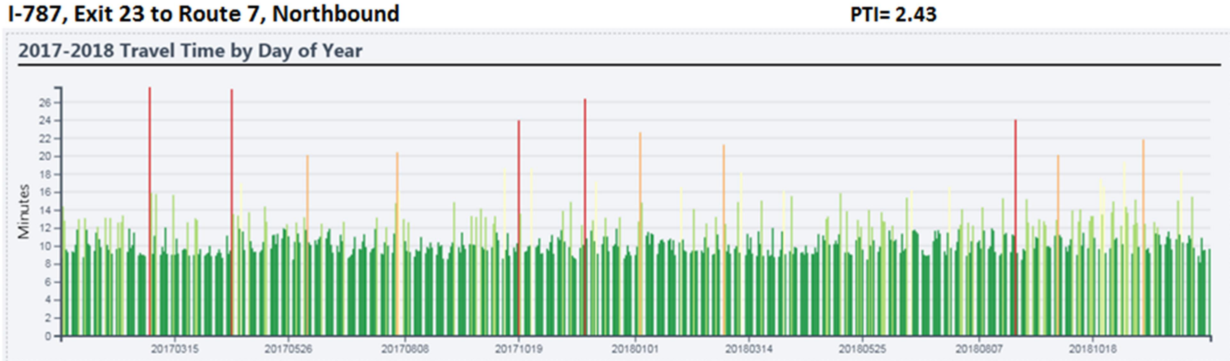
Route 7 from Northway to I-787, Weekday PM Peak Period **PTI= 1.45**



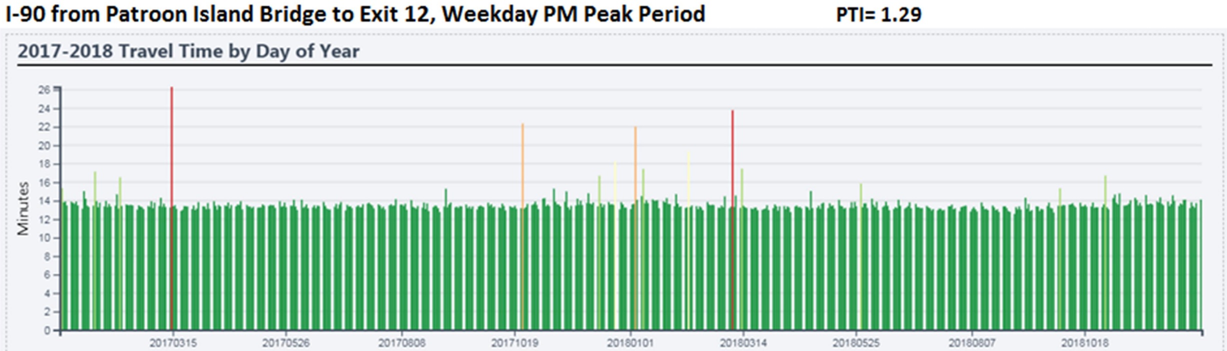
I-787, Route 7 to Exit 23, Southbound **PTI= 1.51**



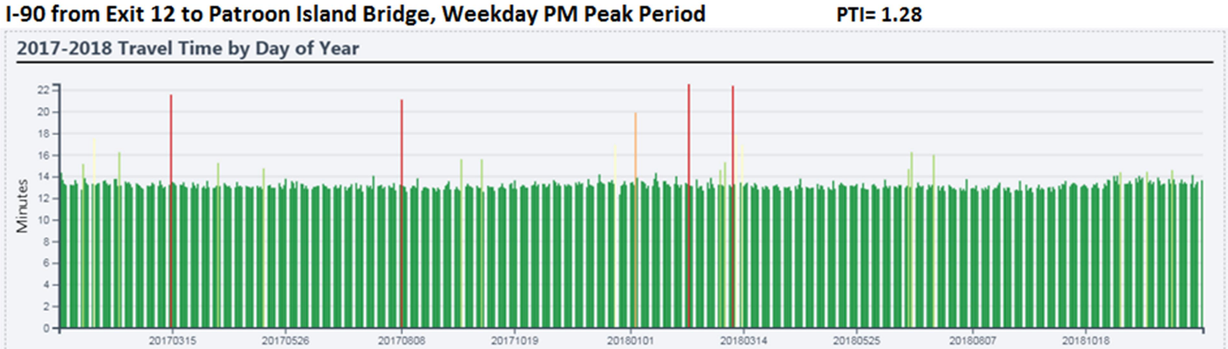
I-787, Exit 23 to Route 7, Northbound **PTI= 2.43**



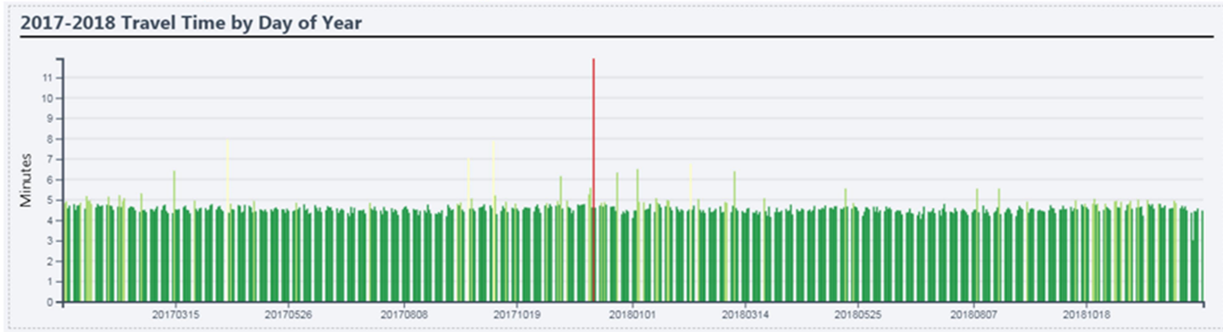
I-90 from Patroon Island Bridge to Exit 12, Weekday PM Peak Period **PTI= 1.29**



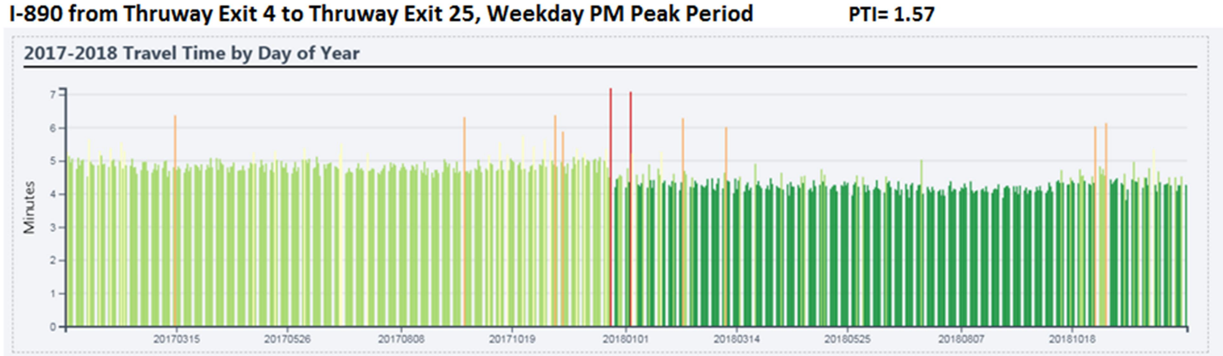
I-90 from Exit 12 to Patroon Island Bridge, Weekday PM Peak Period **PTI= 1.28**



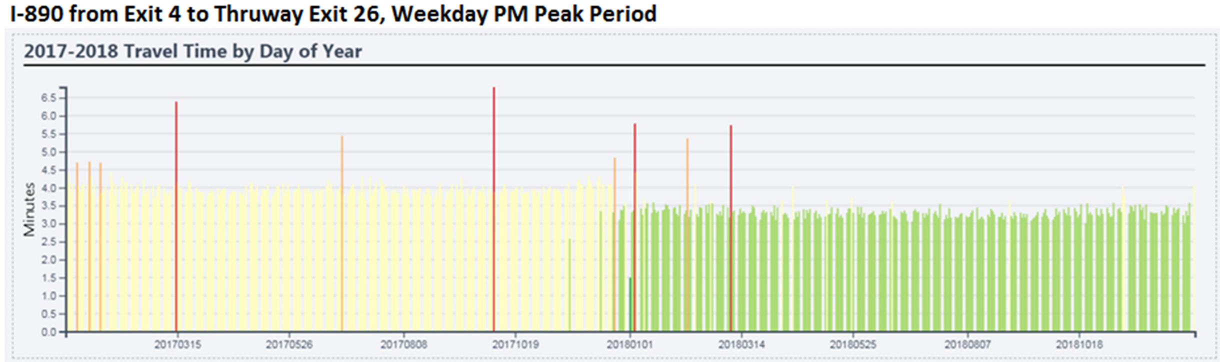
I-890 from Thruway Exit 25 to Exit 4, Weekday PM Peak Period **PTI= 1.55**



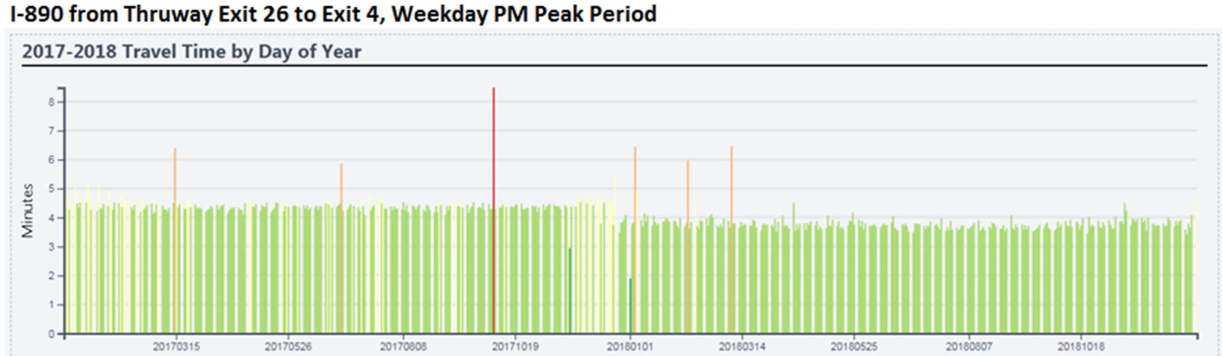
I-890 from Thruway Exit 4 to Thruway Exit 25, Weekday PM Peak Period **PTI= 1.57**



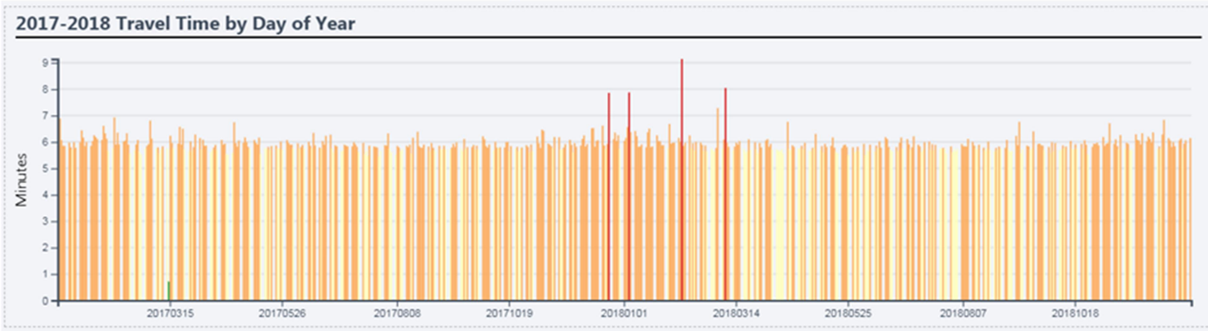
I-890 from Exit 4 to Thruway Exit 26, Weekday PM Peak Period



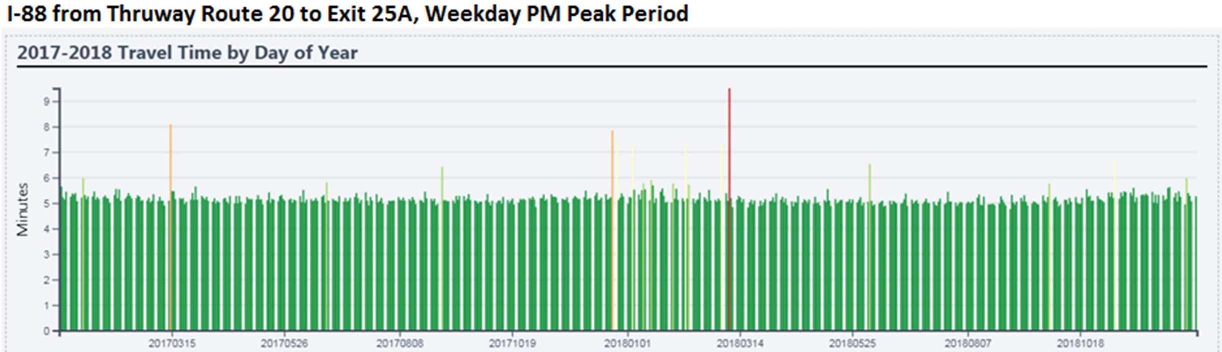
I-890 from Thruway Exit 26 to Exit 4, Weekday PM Peak Period



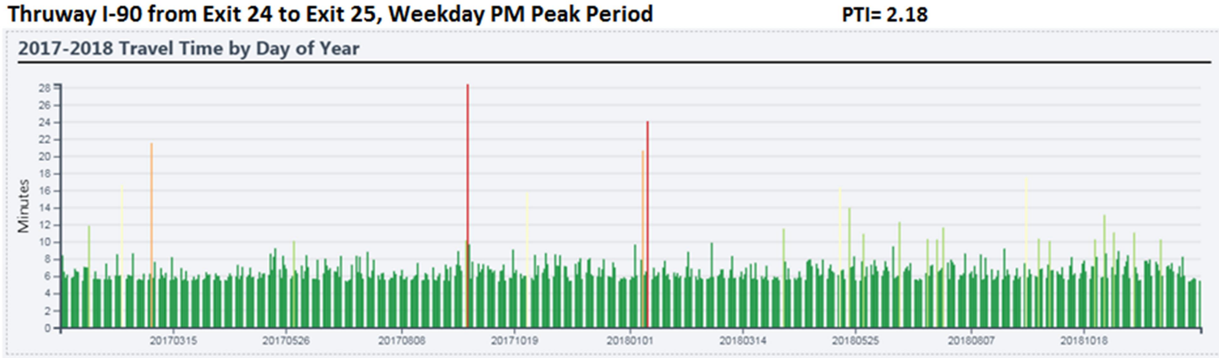
I-88 from Thruway Exit 25A to Route 20, Weekday PM Peak Period



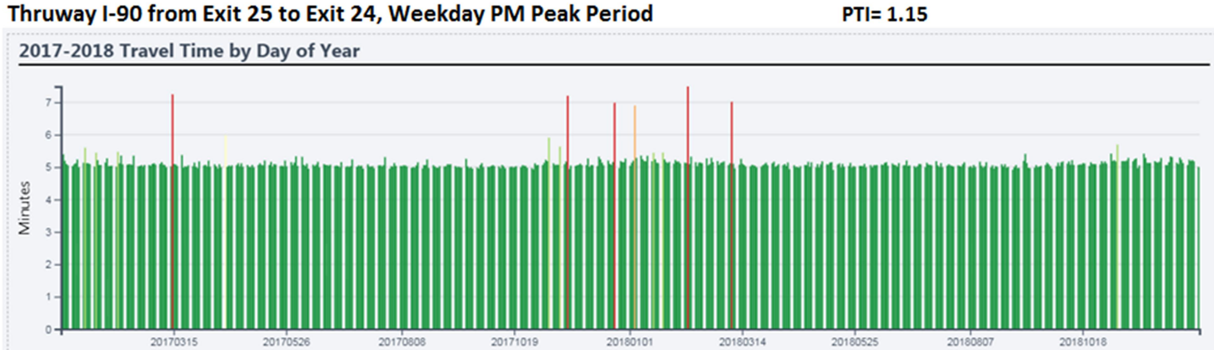
I-88 from Thruway Route 20 to Exit 25A, Weekday PM Peak Period



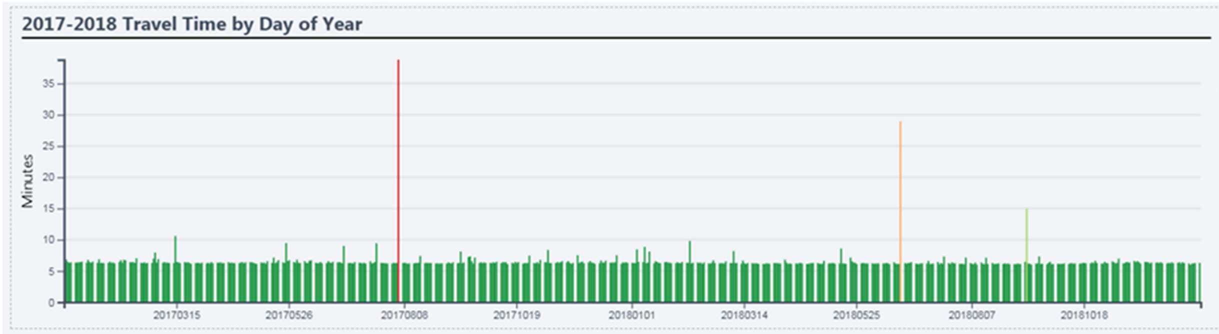
Thruway I-90 from Exit 24 to Exit 25, Weekday PM Peak Period **PTI= 2.18**



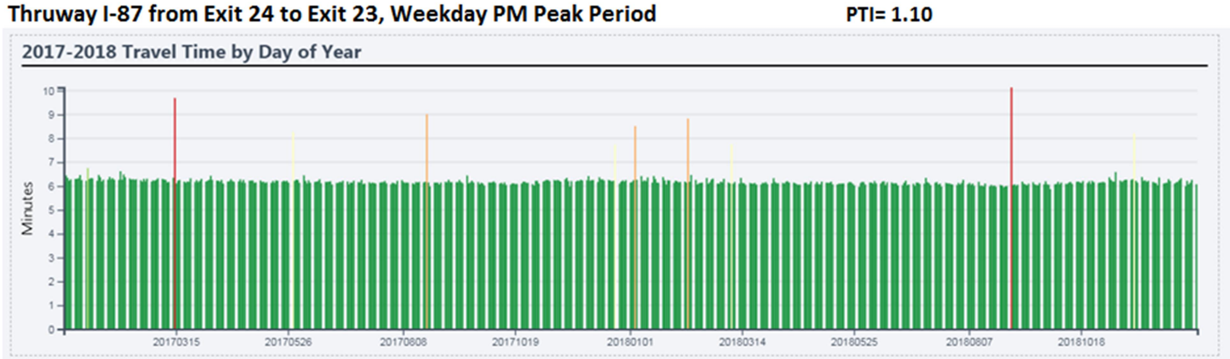
Thruway I-90 from Exit 25 to Exit 24, Weekday PM Peak Period **PTI= 1.15**



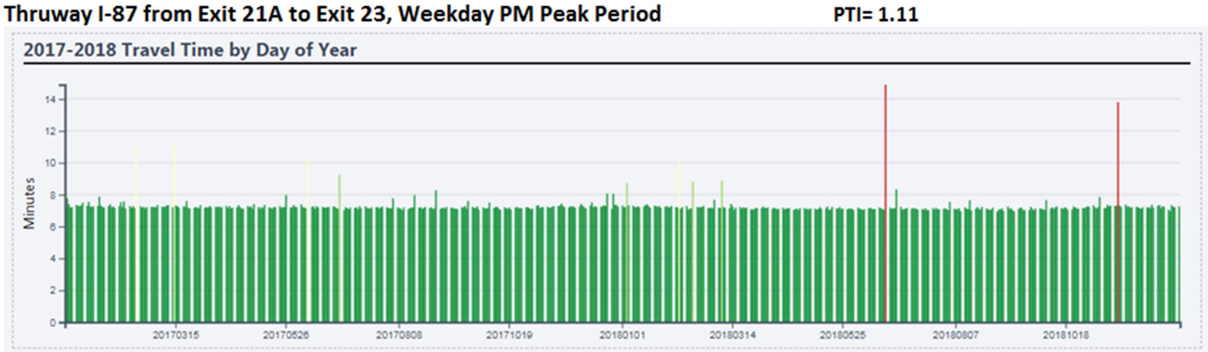
Thruway I-87 from Exit 23 to Exit 24, Weekday PM Peak Period **PTI= 1.15**



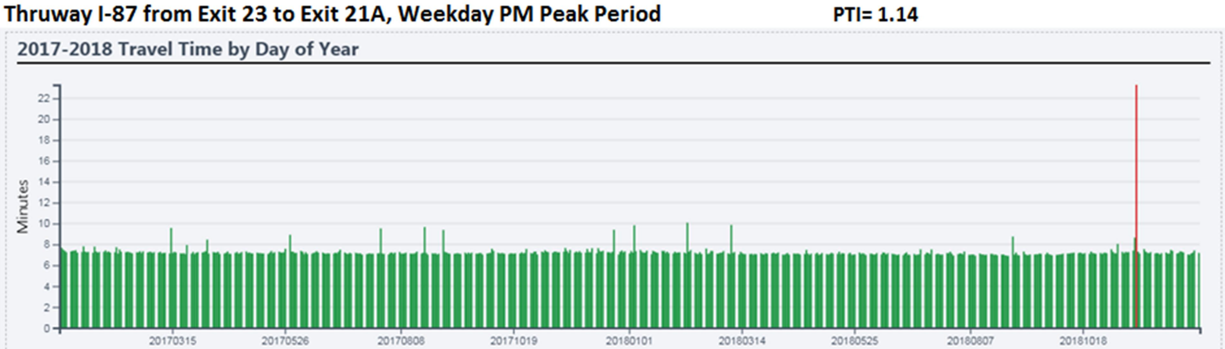
Thruway I-87 from Exit 24 to Exit 23, Weekday PM Peak Period **PTI= 1.10**



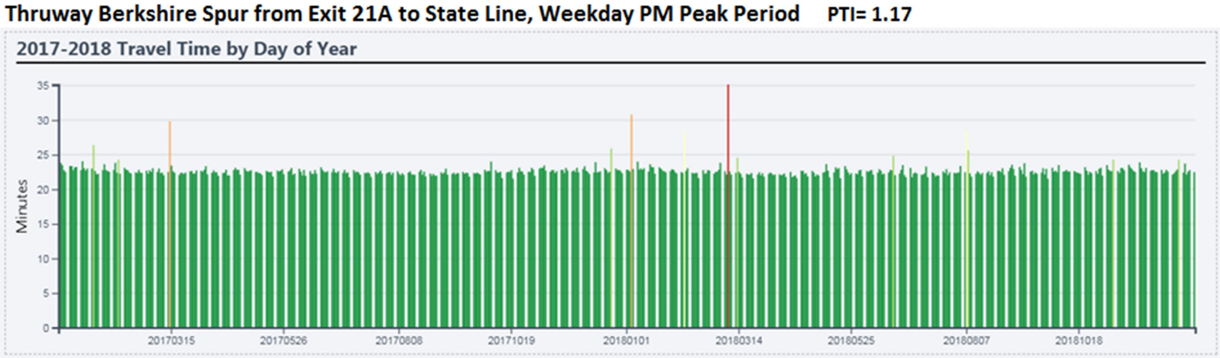
Thruway I-87 from Exit 21A to Exit 23, Weekday PM Peak Period **PTI= 1.11**



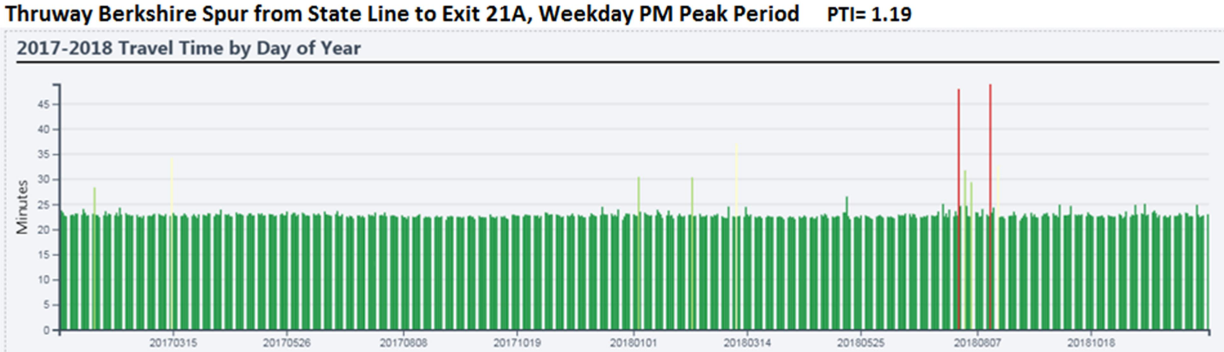
Thruway I-87 from Exit 23 to Exit 21A, Weekday PM Peak Period **PTI= 1.14**



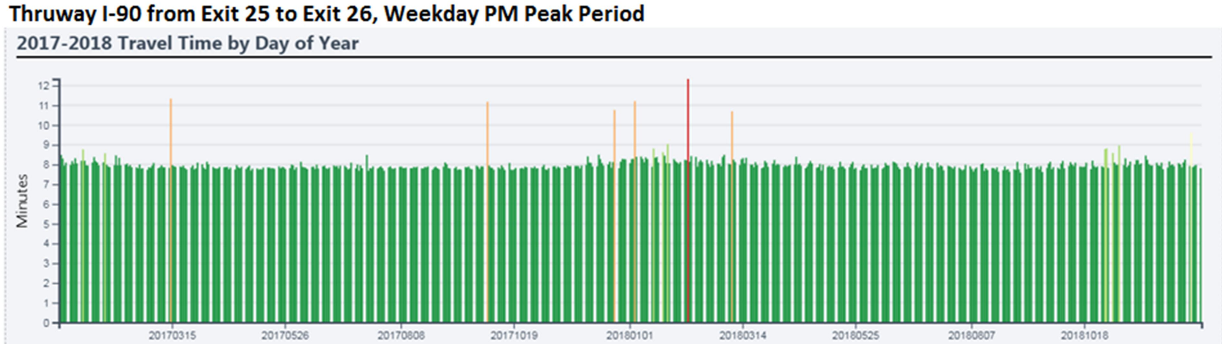
Thruway Berkshire Spur from Exit 21A to State Line, Weekday PM Peak Period PTI= 1.17



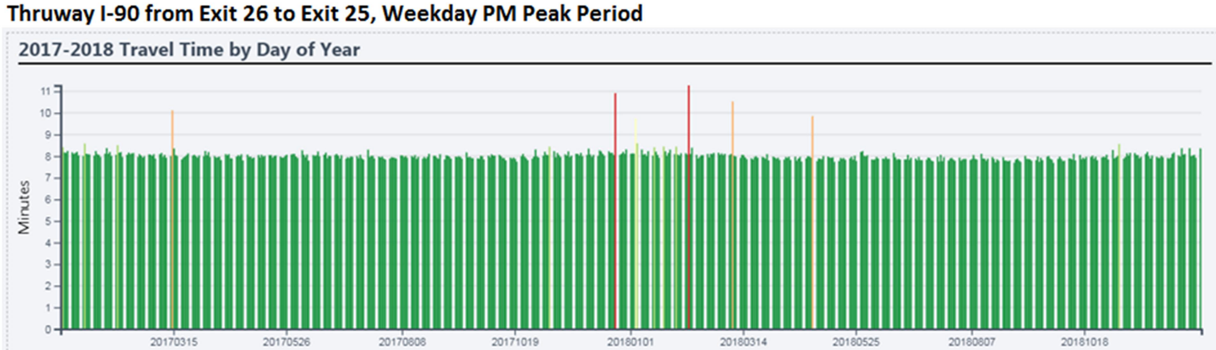
Thruway Berkshire Spur from State Line to Exit 21A, Weekday PM Peak Period PTI= 1.19



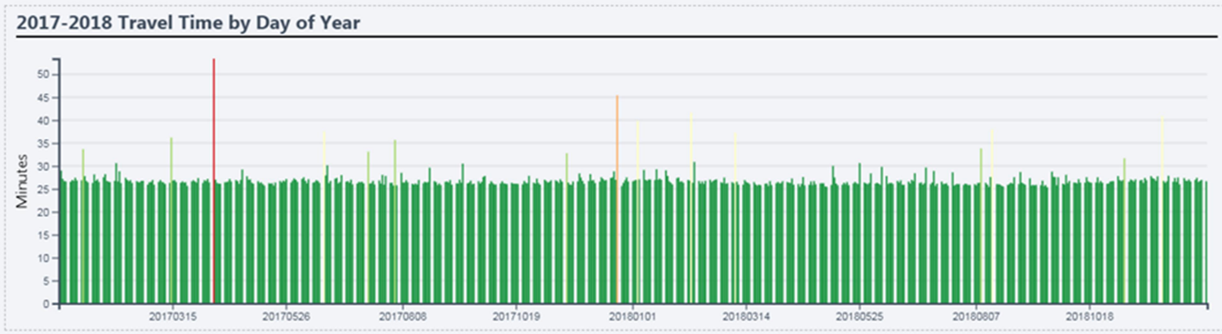
Thruway I-90 from Exit 25 to Exit 26, Weekday PM Peak Period



Thruway I-90 from Exit 26 to Exit 25, Weekday PM Peak Period



Northway from Exit 9 to Hudson River, Weekday PM Peak Period **PTI= 1.21**



Northway from Hudson River to Exit 9, Weekday PM Peak Period **PTI= 1.15**