Chapter 4 - TRANSPORTATION SYSTEM

Transportation System

The Region's social and economic vitality are dependent on a transportation system that safely, efficiently, and reliably moves people and freight. Residents and visitors require a system that provides mobility and access to employment, schools, health care services, religious and social activities, and recreational and cultural venues. The system must also connect employers with inputs (including labor) and the ability to get their products and commodities to local, domestic, and international markets. In meeting these requirements, consideration must be given to the system's impacts on the environment and how non-transportation-related decisions (namely, land use) affect the function and form of the system.

The transportation system of the region considered in the GTC policy, planning, and investment decision making processes is comprised of the following modes:

- Highways and Bridges
- Public Transportation
- Bicycle and Pedestrian
- Freight
- Interregional Travel

In addition, travel characteristics, congestion, Transportation Systems Management and Operations, safety, and security are important transportation-related factors that have significant impacts on quality of life and economic development, requiring specific attention in the regional transportation planning process.

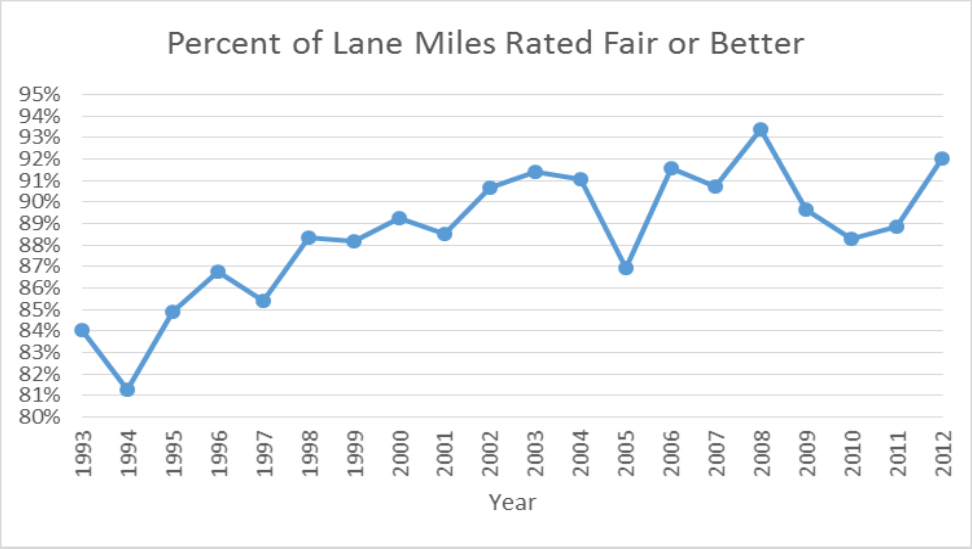
Highways

Highways and bridges comprise the vast majority of the transportation system in the Region. Personal vehicles, bicycles, trucks carrying freight, and buses that provide public transportation utilize these highways and bridges. The highway and bridge network carries over 30 million vehicle miles daily (the number of vehicles multiplied by the distance they travel) on nearly 27,000 lane miles and nearly 1,600 bridges. GTC has and continues to emphasize the preservation and maintenance of this network as one of its highest priorities.

Major highways that serve regional, state, and national needs are eligible to be repaired and improved with funding from federal transportation programs (i.e., are federal aid eligible). Approximately 7,300 lane miles of roadway in the Region (about 30 percent of total lane miles) are federal-aid eligible, handling approximately 80 percent of the vehicle miles traveled (VMT) on any given day. Map 6 presents the annual average daily traffic (AADT) on federal-aid eligible roads. FHWA is reporting that nationally, 2015 will be a record year for VMT.

The physical state of these highways is measured by their pavement condition. Exhibit 12 shows the percent of federal-aid highways in the Region with pavement conditions of fair or better since 1993.

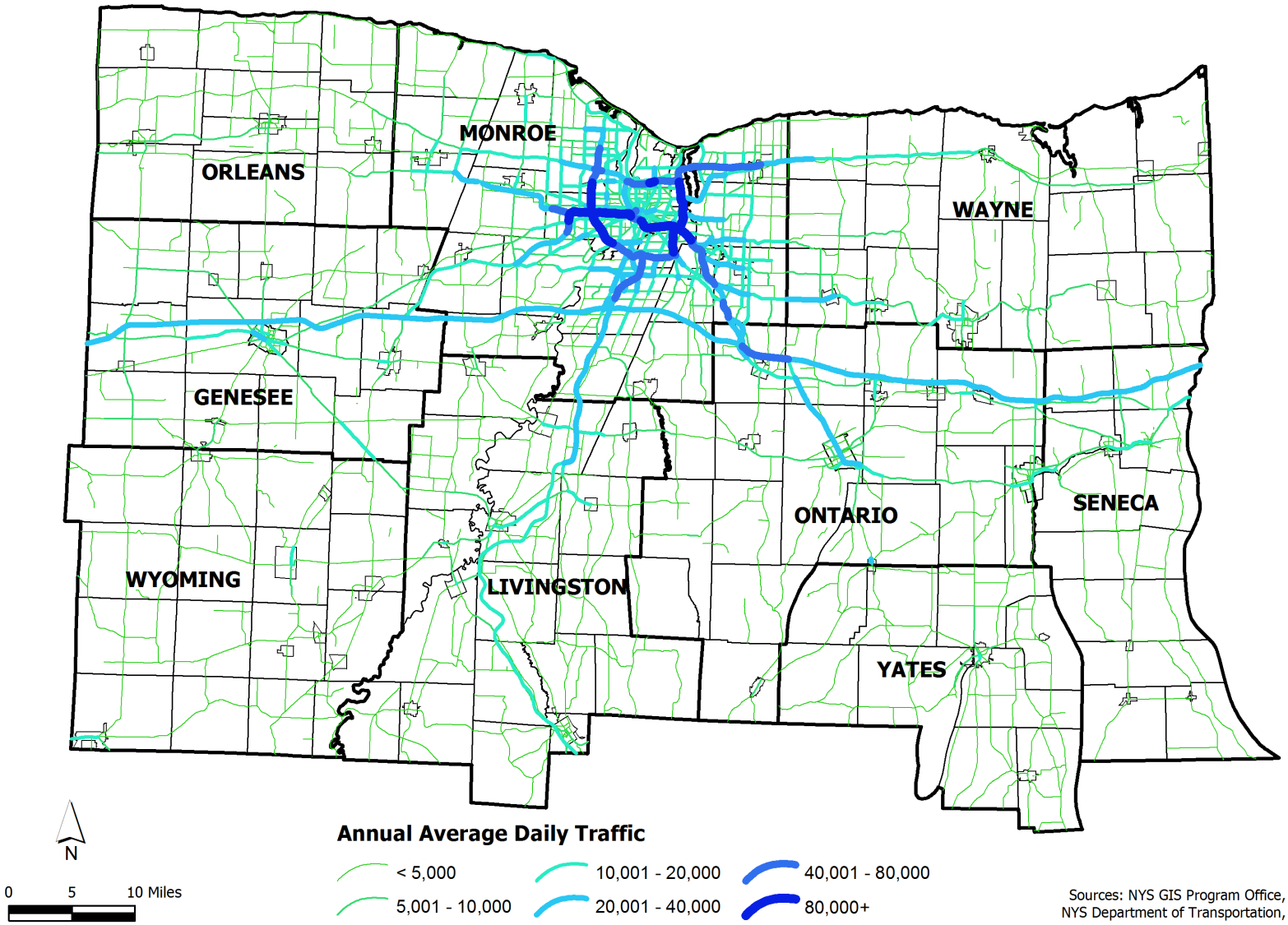
Exhibit 12



Source: New York State Department of Transportation & GTC

Traffic Volumes in the Genesee-Finger Lakes Region

Map 6



Sources: NYS GIS Program Office, 2015
NYS Department of Transportation, 2013

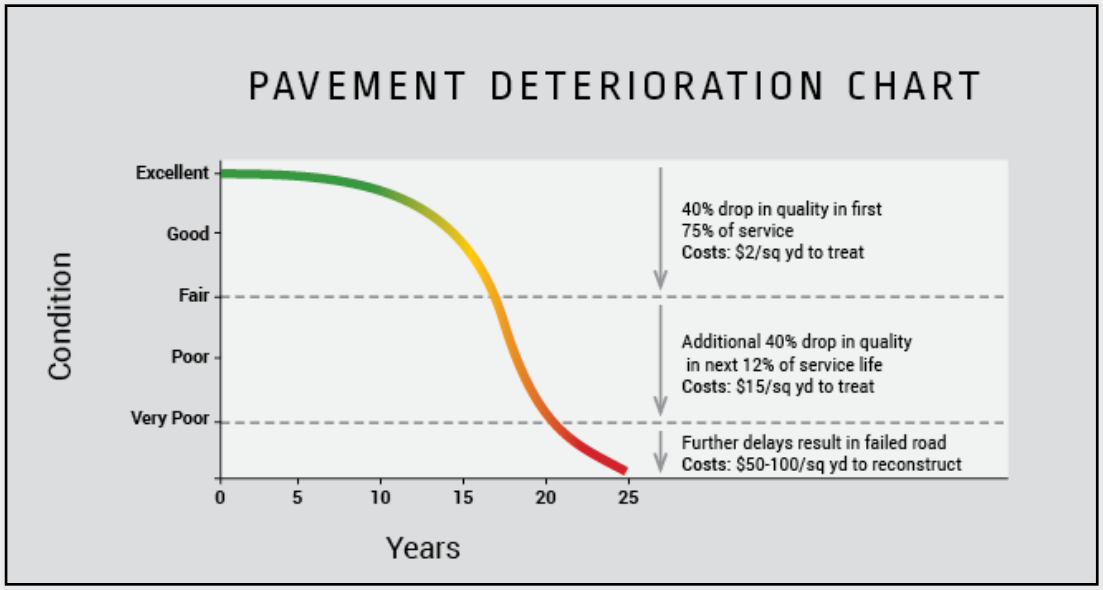
The general trend has been improving and peaked at 93 percent in 2008. While this measure dipped to 88 percent in 2010, it has since rebounded to 92 percent in 2012, the latest year of complete data.

According to FHWA, "State, city and county departments of transportation must manage this asset with ever more limited resources in comparison to the need. Their traditional approach has been to fix the worst pavements first. Only a few agencies are realizing the cost benefits of a sound pavement preservation program that includes preventive and corrective maintenance practices." and "While in the past, agencies had been reactive in their maintenance activities, some are now becoming increasingly proactive in preservation initiatives. The potential benefits are numerous, including improved pavement performance, safer roads, higher user satisfaction and reduced overall life-cycle costs." GTC encourages the owners of federal-aid roads to use an asset management approach to maintaining their roads. Simply put, asset management of roads means using the right treatment on the right roads at the right time.

Some roads are past the point where preventive and corrective maintenance is viable and will need a more intensive treatment (e.g., pavement rehabilitation, full-depth pavement reconstruction) to restore them to good condition; however, by investing resources in keeping good roads good, we can improve the overall condition of the entire road network.

Why is that road being repaved, it looks good to me?

Studies have shown that over the life of a road, it is more cost-effective to conduct less intense maintenance of roads within various windows of opportunity than it is to let the road deteriorate to the point that a more intensive treatment is necessary.



Bridges

Bridges are the most critical element of the regional transportation system. Ensuring their structural integrity is absolutely vital to safety and connectivity. If a road is allowed to deteriorate, it can result in increased wear and tear, and possible damage, to vehicles; if a bridge that is not structurally sound remains open to traffic, the consequences can be disastrous including loss of life. Inspectors measure the various components of the bridge (e.g., substructure, superstructure, bearings, deck, etc.) and rate the bridge's overall condition on a scale of one to seven, with seven being the highest. These ratings are based on inspections that are conducted for all bridges in the Region no less frequently that once every two years.

Using the rating system discussed above, bridges with a condition rating of 5.0 or above are considered non-structurally deficient. Those with a condition rating of less than 5.0 are considered structurally deficient. It is important to note that sufficiency ratings apply to the overall structural condition of bridges, and structurally deficient bridges are not inherently unsafe. Unsafe bridges are closed, and bridges that cannot handle typical weights are flagged—resulting in weight limits being posted and more frequent inspections.

Traditionally, bridges were designed to last 50 years, but newly constructed bridges are designed to last 75 years. In terms of the age of bridges in the Region, approximately 43 percent have been built in the last 35 years and will reach the end of their design life by 2040. Approximately 35 percent were built prior to 1960 (55 or more years ago) and have already passed their design life.

Approximately two of every three bridges in the Region are non-deficient. Of the approximately one-third that are deficient, 52 percent have a condition rating of 3.75 to 4.99. This is important to note because bridges that are non-deficient require preventive and corrective maintenance. Deficient bridges often require rehabilitation or replacement. While both rehabilitation and replacement are more expensive than preventive maintenance treatments, rehabilitating a bridge costs less than replacing it. Bridges with a condition rating of 3.75 to 4.99 are typically candidates for rehabilitation as opposed to replacement. Provided the required funding is available, and based on use by the travelling public, rehabilitating as many of these bridges as possible before they deteriorate further could save the Region a substantial amount of money in the long-term. While 41 percent of deficient bridges have a condition rating greater than 4.99, they are primarily Functionally Obsolete (i.e., they were not built to today's standards) and may still be candidates for preventive maintenance; however, they will eventually succumb to the elements and need more intensive treatments. Exhibit 13 presents the condition ratings of bridges in the Region by the year built.

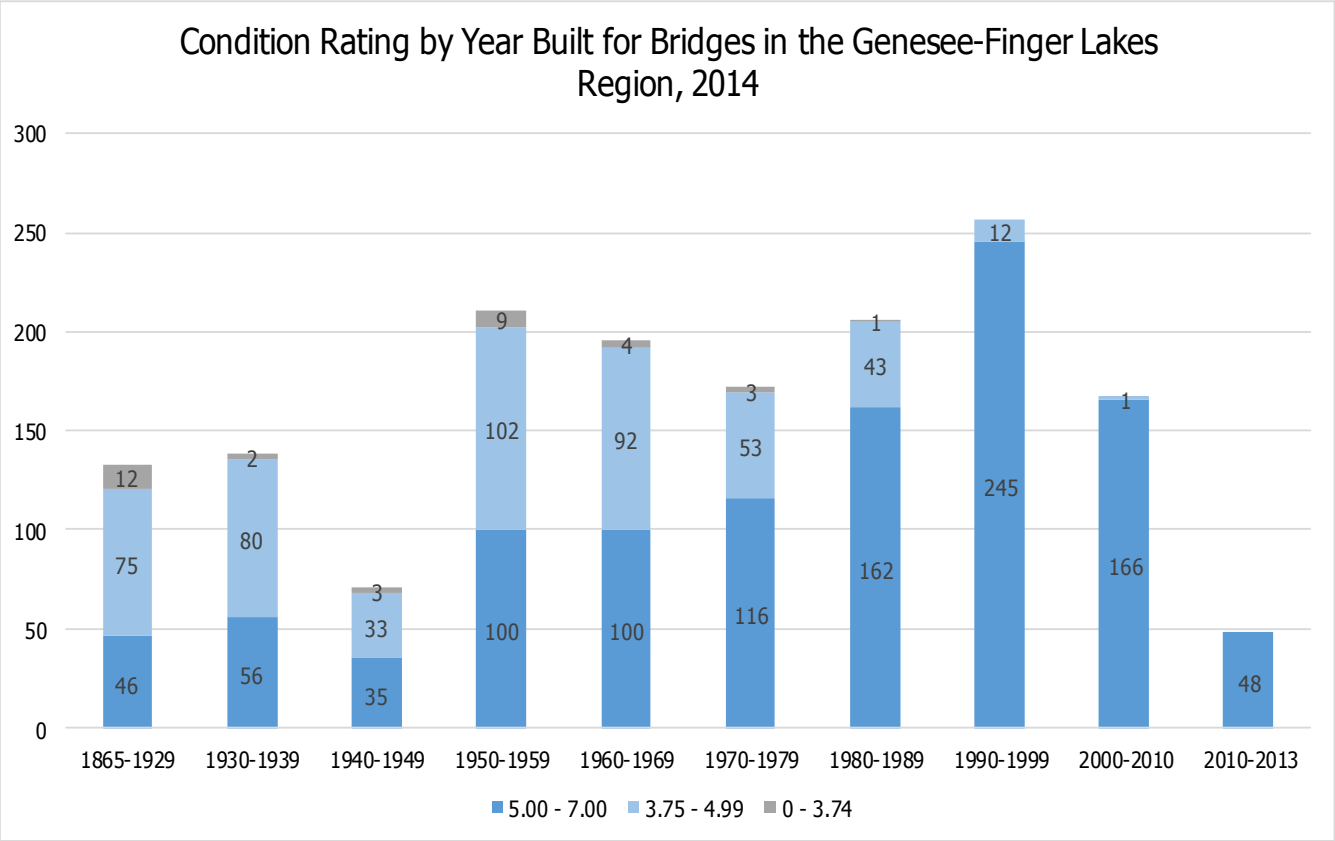
What is a deficient bridge?

Per Federal Standards, bridge condition is assessed in these terms:

Structurally Deficient - Describes the condition of a bridge and its elements at the point when the bridge requires significant maintenance and repairs to remain in service. The classification of a bridge as "Structurally Deficient" does not imply that it is unsafe for travel.

Functionally Obsolete - Describes a bridge that is no longer by design functionally adequate for its purposes (for example due to lack of compliance with current bridge design standards such as lane widths, shoulder widths, vertical/horizontal clearances), although the bridge is structurally sound and safe for all vehicles.

Exhibit 13



Source: New York State Department of Transportation

Similar to pavement, conducting preventive and corrective maintenance of bridges within the appropriate window of opportunity allows for more cost-effective investment. A balanced approach to timely bridge preventive and corrective maintenance, rehabilitation, and replacement allows for the overall condition of the entire bridge system to be improved.

In 2014, GTC commissioned the Genesee-Finger Lakes Regional Bridge Network Needs Assessment and Investment Strategy (Strategy). In recognition of limited resources available to fund transportation projects, the Strategy evaluated bridges from an economic optimization standpoint to determine the point at which investing money into a bridge no longer provides a return on investment. This point was deemed a State of Good Repair. The Strategy concluded that, to attain a State of Good Repair, the Region would need to increase annual investments in bridges by 60 percent between now and 2040.

As budgets are currently strained, this increased level of investment does not seem reasonable and, therefore, the Region needs to make informed investment decisions. As part of the Strategy, the Bridge Asset Management Planning Tool was developed to identify a cost-effective balance of work types for bridges in the Region based on the amount available to be invested.

In 2014, the Village of Albion decided to remove a bridge over a railroad rather than replace it since the traffic could be sufficiently served by a nearby at-grade crossing. To help other bridge owners make informed decisions, the Bridge Prioritization Screening Tool was developed to prioritize bridges based on various factors and provide the necessary data to assess if traffic currently using multiple bridges in close proximity to each other could be served by a single bridge if funding is insufficient to safely maintain all of the bridges currently in service.

Alternate Fuel Vehicle-Supportive Infrastructure

The transportation sector accounts for 34 percent of GHG emissions in New York State. Reducing GHG outputs is an important step in mitigating the environmental impacts of GHG emissions. The use of alternate fuel vehicles is one action that individuals and organizations can take to reduce GHG emissions and improve air quality. In addition to the environmental benefits, other reasons for using alternate fuel vehicles include lower operating costs and improved performance over conventional fuel vehicles, and the stimulation of domestic energy production which generates economic activity and strengthens national energy security by reducing dependence on energy imports.

Alternate fuel vehicles are powered by fuels other than gasoline or diesel. Commercially available alternate fuels include electricity, natural gas, propane, ethanol, biodiesel, and hydrogen. In addition, there are several emerging alternate fuels such as renewable natural gas and synthetic liquid transportation fuels that are currently in development. At present, alternate fuel vehicles are mainly used in public and private fleets; however, increased consumer interest in these types of vehicles is leading to a rise in demand and a corresponding rise in demand for alternate fuel stations.

There are several challenges to the widespread use of alternate fuel vehicles, including: higher purchase prices than conventional fuel vehicles; the limited availability of alternate fuel stations, ultimately limiting a vehicle's range; and uncertainty about the costs and benefits of alternate fuel technologies. In addition, regulatory challenges include municipal building codes and zoning regulations that may not permit alternate fuel station installation.

The Genesee Region Clean Communities (GRCC) coalition of public and private partners has been working to overcome these challenges in the Region. One of six Clean Cities coalitions in New York State sponsored by the U.S. Department of Energy, GRCC was established in 1994 to reduce dependency on imported petroleum and improve air quality through the development of alternative fuel vehicle fleets and stations. There are currently about 40 publicly accessible alternate fuel stations in the Region. These stations are located at a variety of sites, including municipal parking garages and lots, town halls and community centers, automobile dealerships, conventional fuel stations, privately-operated fleet centers, and university campuses. Planning efforts are underway to identify the optimum future locations of alternate fueling stations as a means of addressing vehicle-range concerns among alternate fuel vehicle consumers.

Public Transportation

Public transportation is critical to providing access to employment and needed services for individuals unable to afford or operate a private automobile. A robust public transportation system can also serve as a viable alternative for those who choose not to use a private vehicle for some or all of their transportation needs.

The Rochester Genesee Regional Transportation Authority (RGRTA) is the Region's sole public transportation operator, providing fixed-route, fixed-schedule services in eight of the nine counties (except Yates). RGRTA provides transit and paratransit service via its Regional Transit Service (RTS) with each named for the county it operates in (e.g., RTS Monroe, RTS Ontario, etc.) and, in the case of complementary paratransit service in Monroe County, RTS Access.

RGRTA provides Americans with Disabilities Act (ADA) compliant service via a combination of fixed route, paratransit, route deviation, dial-a-ride, demand response, non-emergency medical, and shuttle service depending on the area served.

Map 7 presents the routes of the eight public transportation services in the Region while Map 8 presents routes located in the City of Rochester with a quarter mile buffer—a reasonable walking distance to access transit service.

In fiscal year 2014 (April 1, 2014 to March 31, 2015), approximately 18.2 million trips in the Region were made via public transportation.

RTS Monroe service is configured as a hub-and-spoke system that reinforces downtown Rochester as the Region's commercial, civic, and cultural center in a cost-effective manner.

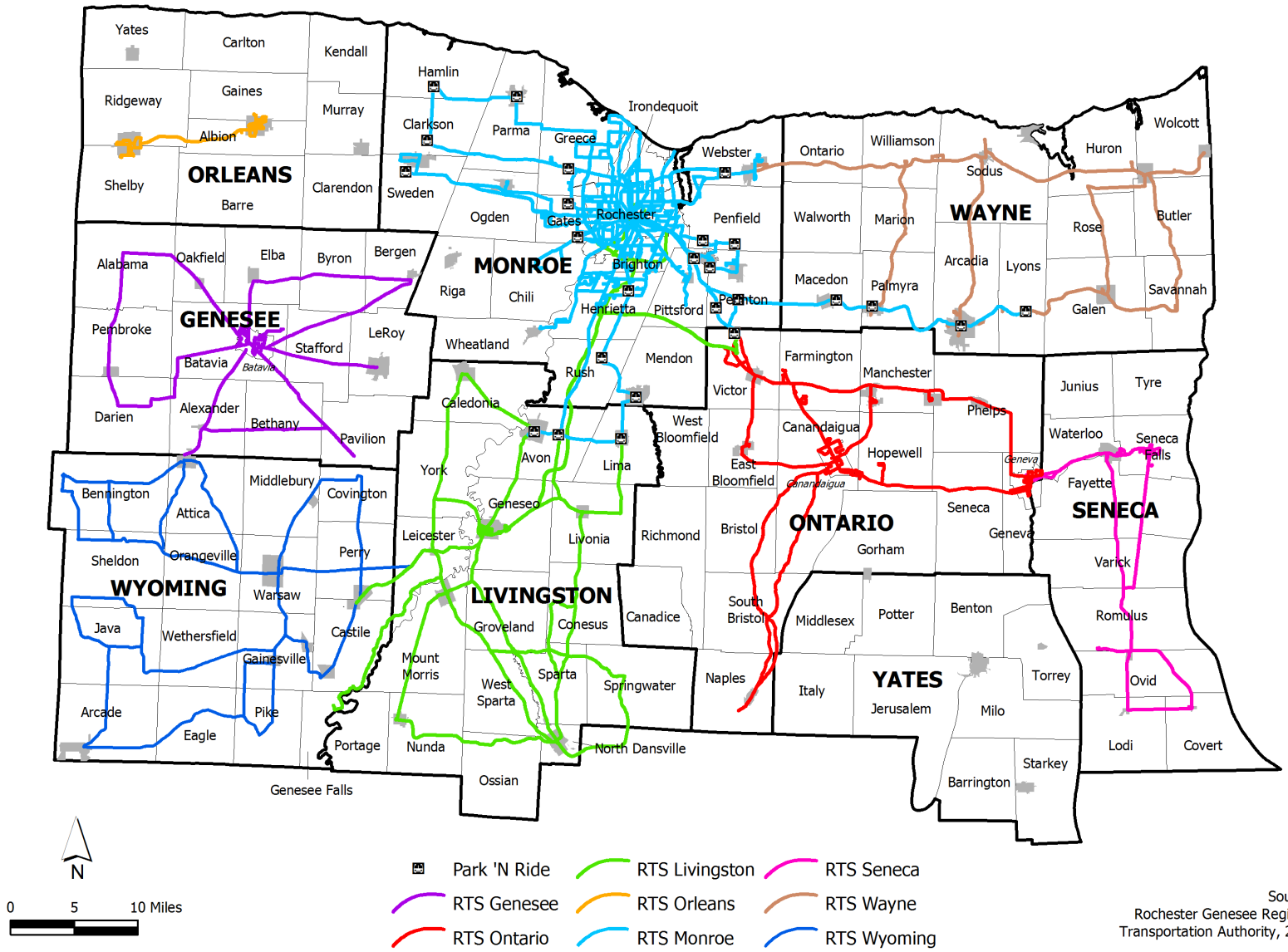
While the density of development to support the most extensive and frequent public transportation service is located in the Regional Urban Core and Mature Suburbs, the availability of service in other places (especially, Rural and Rural Centers) is critical to those that depend on it.

Service linkages across county lines exist to varying degrees. RTS Monroe provides service to Lima and Avon (Livingston County), to Eastview Mall in Victor (Ontario County), and to Macedon, Palmyra, Newark and Lyons (Wayne County). Between Seneca and Ontario County, RTS Seneca provides service to and from Geneva (Ontario County).

In partnership with SUNY Geneseo, RTS Livingston provides service on weekends to Eastview Mall in Victor (Ontario County) and to points of interest in the Rochester area including: Marketplace Mall and Rochester Institute of Technology in Henrietta, and Strong Memorial Hospital, the Greater Rochester International Airport, University of Rochester, Geva Theater, the Rochester Intermodal Station (Amtrak, Greyhound, and Trailways), the Public Market, the Little Theater, and the Memorial Art Gallery. These routes are free for SUNY Geneseo students and available to the general public with a paid fare. RTS Livingston also provides service to the Village of Perry, Wyoming County and a Medical Shuttle for appointments in Monroe County.

Public Transportation Routes in the Genesee-Finger Lakes Region

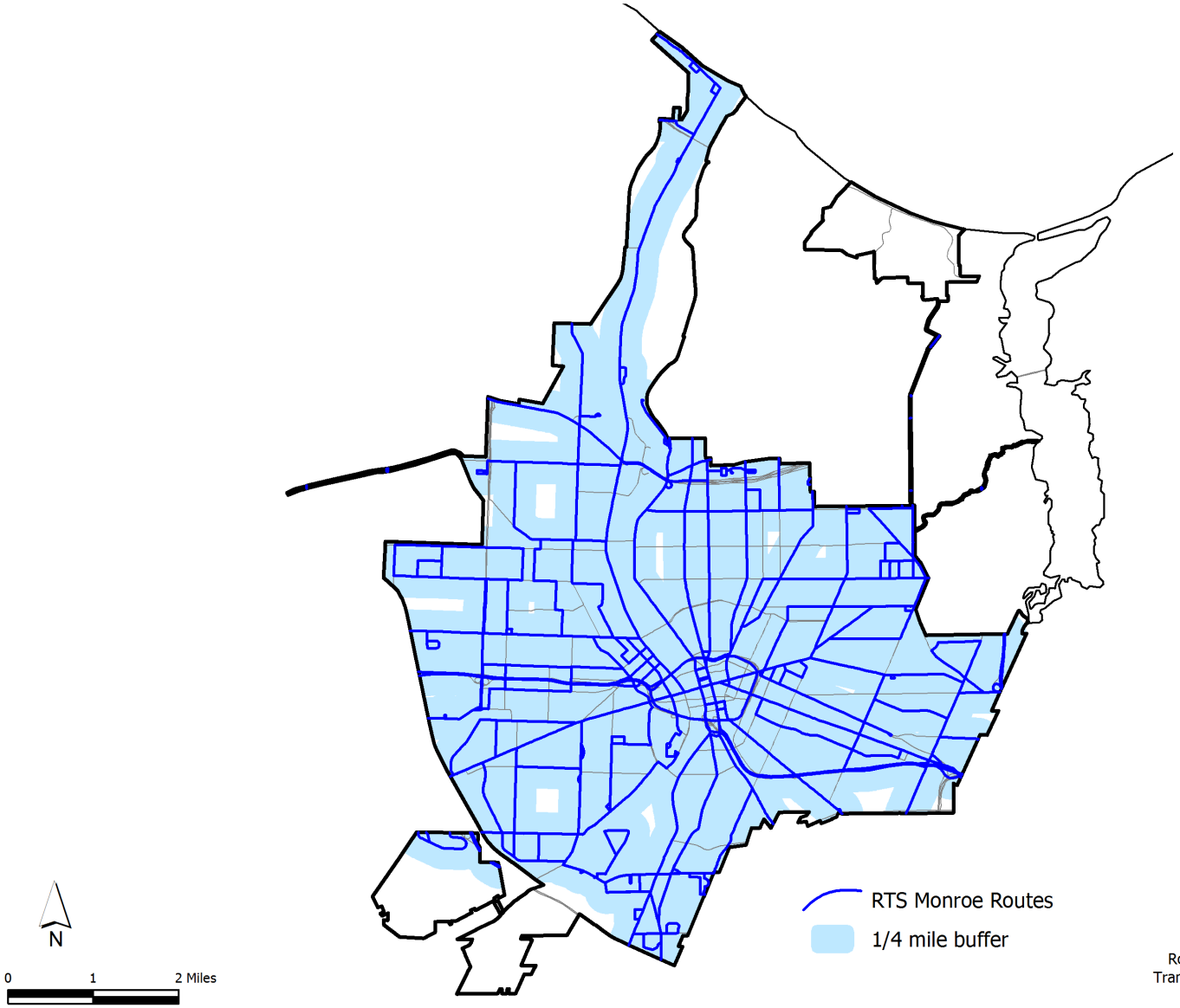
Map 7



Source:
Rochester Genesee Regional Transportation Authority, 2014

Regional Transit Service Routes in the City of Rochester

Map 8



Sources:
Rochester-Genesee Regional Transportation Authority, 2014

Paratransit services are available to persons with disabilities throughout the Region. The majority of these trips are provided in Monroe County through RTS Access, which provided 185,473 trips in fiscal year 2015. RTS Access provides paratransit service within three-quarters of a mile of RTS Monroe fixed routes in full compliance with the American with Disabilities Act.

RTS bus
Image credit: RTS

As with highways and bridges, preservation and maintenance of existing transit infrastructure to improve cost-effectiveness is a high priority. Approximately one-third of the Federal Transit Administration funds allocated directly to RGRTA for its RTS Monroe service (i.e., FTA Urbanized Area Formula Grant – Section 5307) are programmed for preventive maintenance activities to ensure that the existing fleet of buses—which provides nearly 17 million trips per year—is reliable with breakdowns kept to a minimum. Frequent breakdowns or disruptions in service will result in choice riders (i.e., those that have the option to drive themselves) opting not to use public transportation.

RGRTA has and continues to expand the use of Transportation System Management & Operations (TSMO) strategies to improve operations and customer service. Beginning in 2007, RGRTA began implementing Technology Initiatives Driving Excellence (TIDE) in its RTS Monroe service. TIDE includes: a bus operations and facility management system; automatic stop annunciation and bus sign control; real-time next bus information at stops via Advanced Traveler Information System (ATIS) signs as well as though text and e-mails, upgraded fare collection system and computer aided dispatch (CAD); vehicle in-service health monitoring and diagnostics; automatic passenger counters; and a next generation Automated Vehicle Location (AVL) system. RGRTA is also implementing technology to improve its overall customer service interactions. TIDE components are planned to be introduced on other RGRTA services, as appropriate. A CAD/AVL system is fully integrated with RTS Monroe and was recently installed on RTS Livingston buses. The system includes ATIS signs at locations with high ridership near SUNY Geneseo.

RTS Transit Center

On November 28, 2014, the RTS Transit Center opened in downtown Rochester. Located on Mortimer Street between Saint Paul Street and North Clinton Avenue, the RTS Transit Center is the most significant public transportation accomplishment in the Region since the *LRTP 2035* was adopted. The RTS Transit Center is a fully-enclosed and climate-controlled facility that allows more than 20,000 daily customers to access their desired bus in a safe, secure, and comfortable setting. Prior to the opening of the RTS Transit Center, all downtown arrivals, departures, and transfers took place outside along East Main Street, Saint Paul Street, and North Clinton Avenue in all kinds of weather conditions.

RTS Transit Center
Image credit: RTS

In conjunction with opening the RTS Transit Center, the City of Rochester and Monroe County coordinated efforts to convert Saint Paul Street and North Clinton Avenue north of East Main Street from a one-way pair for traffic operations to two-way traffic on each street. This change allows more efficient access and egress for bus operations.

Two-way traffic on these streets also allows for more efficient deployment of various transit vehicles. No longer is an individual bus required to travel a route that it is not well-suited for just so it can change direction and service the route where it is needed (this is known as through-routing). For example, a sixty-foot articulated bus is needed to serve demand on the Lake Avenue route to and from downtown. Prior to opening the RTS Transit Center, that vehicle could not easily change direction downtown and was required to continue service along the Park Avenue route where a smaller bus is more appropriate. Now RTS has the ability to deploy the most appropriate size bus available to every route since they can change direction downtown. This will allow RTS to use its bus fleet in the most efficient manner, reduce criticism of running "empty" buses, and optimize the fleet mix as buses are replaced at the end of their useful life.

The RTS Transit Center

- Can handle up to 100 buses per hour
- Measures 87,000 square feet
- Has 30 bus bays - 26 indoor and 4 spots on Mortimer Street
- Is built to Silver-level LEED certifications
- Has heated flooring for customer comfort during the cold, winter months

Amenities include

- Electronic displays of departure times
- Ticket vending machines
- Fully-staffed Customer Information Desks
- Trip Planning Kiosks
- On-site security
- Public and family restrooms

Bicycle and Pedestrian

In addition to the highway and bridge network and public transportation service, bicycle and pedestrian facilities are key elements of the regional transportation system. In order to promote active transportation and healthier communities, bicycling and walking options must be convenient and safe transportation choices.

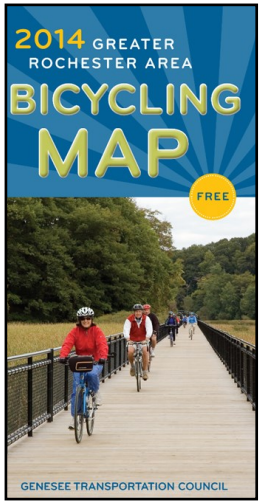
Improving bicycle and pedestrian infrastructure is critical to improving access to employment and services for individuals without private vehicles, expanding mobility for persons with disabilities, and reducing delay on the highway and bridge network. In addition, increasing bicycling and walking have the potential to create a healthier community which would reduce overall public costs for medical care and energy usage.

The bicycle and pedestrian network is especially important to certain populations. These include children, seniors, people with disabilities, and those without access to a private automobile. Many of these groups depend on the ability to safely travel to and from public transportation service and their final destinations. The Genesee-Finger Lakes Region is home to a contingent of organizations representing these groups that actively promote and advocate for the expansion of the regional bicycle and pedestrian transportation system.

The highway and bridge network serves as the main component of the bicycle and pedestrian network because roads and sidewalks provide the primary facilities for bicyclists and pedestrians.

Typical bicycle space on roads and bridges consists of a minimum of four-foot paved shoulders or curb offsets (the latter being provided by the right-hand edge line of the traffic lane being located at least four feet from the curb). Both paved shoulders and curb offsets provide delineated space for bicyclists but, because they are not intended solely for bicyclists, they are not designated (signed or marked) as bicycle lanes. Although delineated bicycle space is available along many raodways in the Region, designated bicycle lanes are limited to the following state bicycle routes:

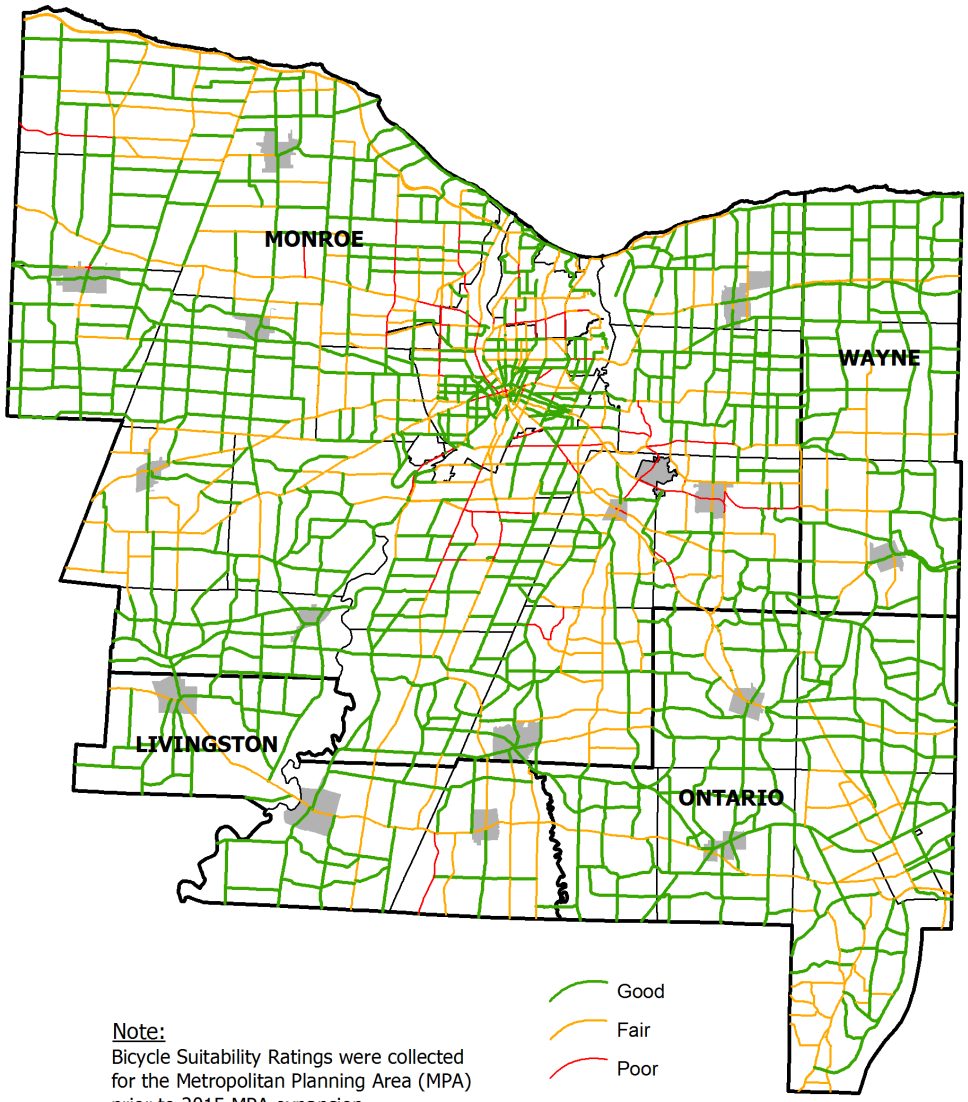
- State Bicycle Route (SBR) 5 which runs east-west parallel to the Erie Canal
- SBR 14 which runs north-south from the Seaway Trail in Sodus Point, Wayne County through Ontario and Yates Counties into the Southern Tier of New York State and Pennsylvania
- SBR 19 which runs north-south from the Seaway Trail/Lake Ontario State Parkway in Hamlin, Monroe County past Letchworth State Park into the Southern Tier of New York State and Pennsylvania



A field assessment of the suitability of highways in the Rochester MPA for bicycling (i.e., bicycle suitability ratings) was conducted by the Rochester Bicycling Club (RBC) in cooperation with GTC in 2007 and again in 2013. These ratings served as the basis for the 2009 and 2014 Editions of the *Greater Rochester Area Bicycling Map* produced by GTC and distributed throughout the community to facilitate improved bicycling behavior and to enhance safety via inclusion of safety information on the Map. Based on the most recent RBC assessment (2013), approximately two-thirds of roads were rated "good" for bicycling. Map 9 presents the bicycle suitability ratings as determined by the RBC in 2013. A more formally determined bicycle level of service (BLOS) was created during the 2010-2011 development of the City of Rochester's Bicycle Master Plan. At that time, it was determined that the BLOS of the City was 3.7 (with one being the best and five being the worst); the national average is 3.9.

Bicycle Suitability Ratings on Major Roadways in the Rochester Metropolitan Planning Area

Map 9



N

0 4.5 9 Miles

Note:
Bicycle Suitability Ratings were collected for the Metropolitan Planning Area (MPA) prior to 2015 MPA expansion.

Good
Fair
Poor

Sources:
Rochester Bicycling Club, 2014
NYS GIS Program Office, 2015

The Region has a strong commitment to developing multi-use trails. These facilities serve as expressways for bicyclists and require interconnections with roadways to optimize their usefulness. There are more than 340 miles of existing trails in the Region, including 149 miles that have been completed or rehabilitated since 1993. The development of multi-use trails is guided by the *GTC Regional Trails Initiative (RTI)* as well as concept-level Trail Plans. The *RTI Update,* completed in 2016, provided an update to the original *RTI*, Phase I within the MPA (2002) and Phase II for the remaining nine-county Region (2004). The *RTI Update* covers the complete nine-county Region and reflects changes in completed and proposed trail development, funding sources, and design guidelines, as well as provides a gap analysis of the existing trail network and a review of maintenance policies. Map 10 presents existing multi-use trails and those that are currently under development or planned in the Region.

It is important to note that the trails shown Map 10 do not necessarily end at the boundaries of the nine-county Region.

The Canalway Trail System includes a network of approximately 300 miles of multiple-use trails across upstate New York, of which approximately 75% has been completed off-road. Within our Region this includes the main stem of the Canalway Trail through Orleans, Monroe, and Wayne Counties – largely complete west of the Village of Lyons in Wayne County – as well as the Cayuga-Seneca Canal Trail, partly developed between the City of Geneva (Ontario County) and the Town of Seneca Falls (Seneca County). The Canalway Trail is the major east-west spine of the regional trail system and, when completed between Buffalo and Albany, will represent one of the longest multi-use trails in the United States.

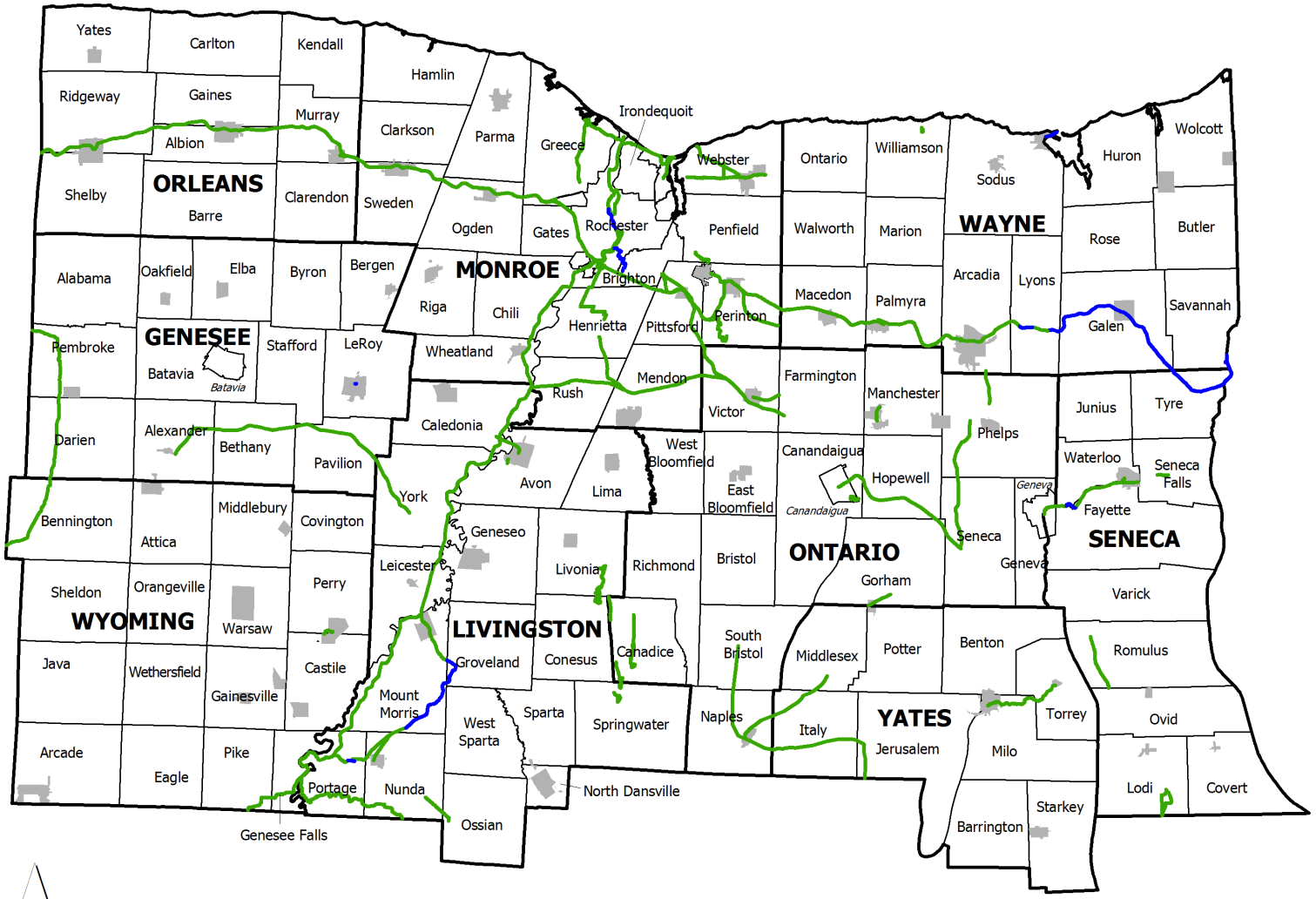
The second trail of major significance in the Region is the Genesee Valley Greenway State Park (GVG). This trail is 90-mile open space corridor that follows the route of the Genesee Valley Canal (1840-1878) and the Pennsylvania Railroad Rochester Branch (1882-1963) from the Erie Canalway Trail in Rochester's Genesee Valley Park to the Village of Cuba in Allegany County. The New York State Department of Parks, Recreation, and Historic Preservation indicates that the GVG will eventually extend to Hinsdale in Cattaraugus County; however, the concept of a trail extending from Lake Ontario to the Chesapeake Bay, and designated the Genesee-Susquehanna Greenway, has been under active discussion since its initial development in November, 2014 by federal, state, regional (including GTC), municipal and not-for-profit representatives in Williamsport, Pennsylvania.

These two trails, already recognized as important assets to the Region, take on even more significance when their potential economic benefit to the cities, towns, villages, and hamlets along the way are considered.

In fact, the Rails-to-Trails Conservancy reports that direct annual spending by trail users along the Great Allegheny Passage Trail System (Pennsylvania) exceeds $40 million. This economic infusion has enabled a resurgence of many towns that had declined with the loss of mining jobs and the original railroad. Trail-related businesses pay out $7.5 million in wages every year,

Multi-Use Trails in the Genesee-Finger Lakes Region

Map 10



Sources: GTC, 2014
NYS GIS Program Office, 2015

and since 2007, more than 50new or expanded businesses serving trail users have created over 80 new jobs in eight small towns.

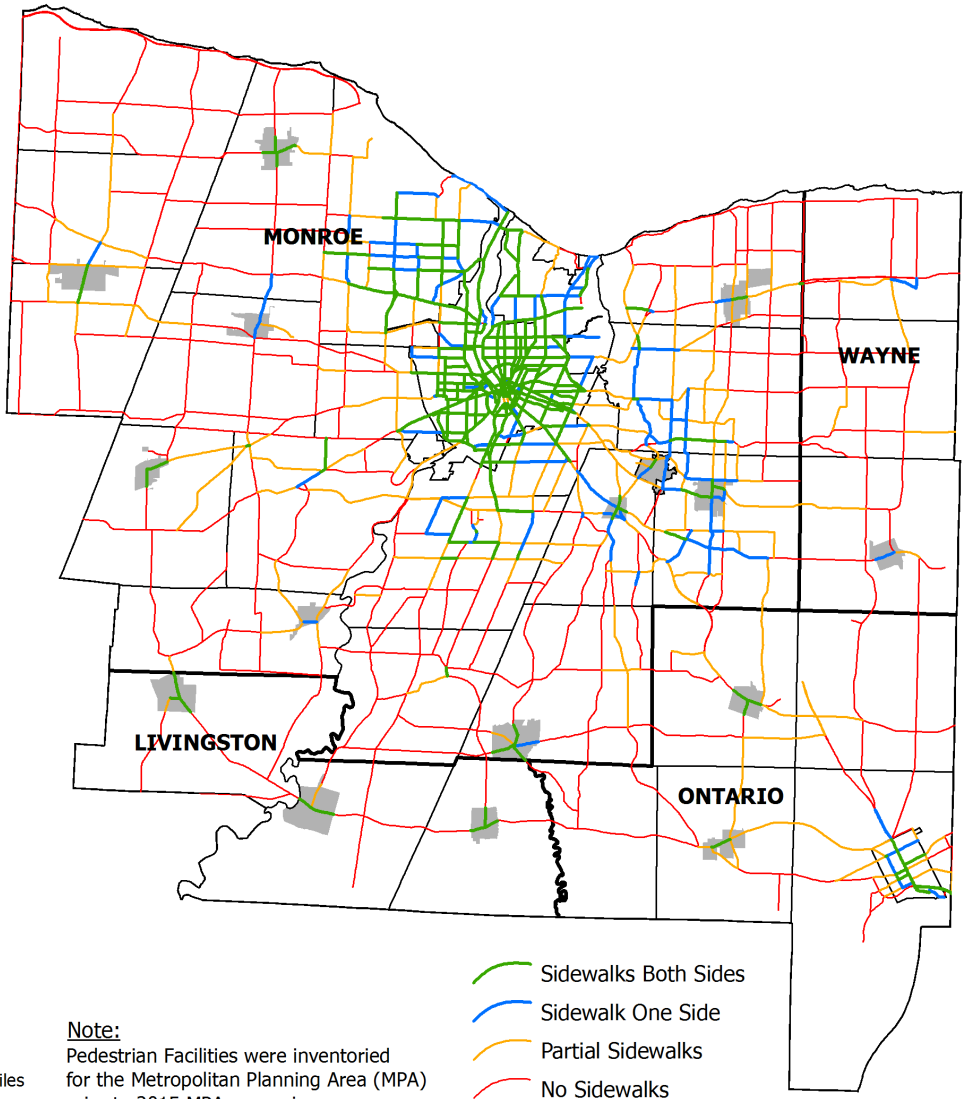
Bicycle facilities can be provided on-street by delineated or dedicated space. Pedestrians, however, require separate travel ways via sidewalks. The limited exceptions would be along certain low-traffic, low-vehicular speed roads such as residential streets and rural highways where origins and destinations are separated by distances that cannot be reasonably traversed by walking.

Sidewalks are also critical to providing access to public transportation services, especially for persons with disabilities who may require the use of assistive devices such as wheelchairs. A 2007 field survey of pedestrian facilities conducted by GTC found that 19.6 percent (203 miles) of federal-aid eligible roadways in the Rochester MPA had complete sidewalks. A 2013 Update to that survey found 21.8 percent (226 miles) with complete sidewalks, an increase of 11.3 percent during the intervening six years. While this increase represents progress, much more remains to be done, as at this rate it will take more than a generation to complete the necessary improvements. Sidewalks are most common in the Region's cities (Rochester, Batavia, Canandaigua, and Geneva), Mature Suburbs, and the villages (Sub-Regional Urban Cores and Rural Centers). The results of the GTC Pedestrian Facilities Inventory (2013 Update) are presented in Map 11.

The primary rationale for continued investments in bicycle and pedestrian supportive infrastructure is and will remain to improve safety for all users of the roads, sidewalks, and trails in the Region. As shown in Map 12, the 76 fatalities and 505 serious injuries to bicyclists and pedestrians that occurred during the 2009 through 2013 time period represent many lives changed for the worse, as the result of crashes between motor vehicles and bicyclists or pedestrians. While not all crashes can be prevented, many can, through enforcement programs, education on the rules of the road, and in some cases, investments in infrastructure such as sidewalks, multi-use trails, and bicycle facilities. For this reason, as investment decisions are made, especially with respect to relatively vulnerable and unprotected bicyclists and pedestrians, safety will continue to be a primary concern.

Pedestrian Facilities on Major Roadways in the Rochester Metropolitan Planning Area

Map 11



N

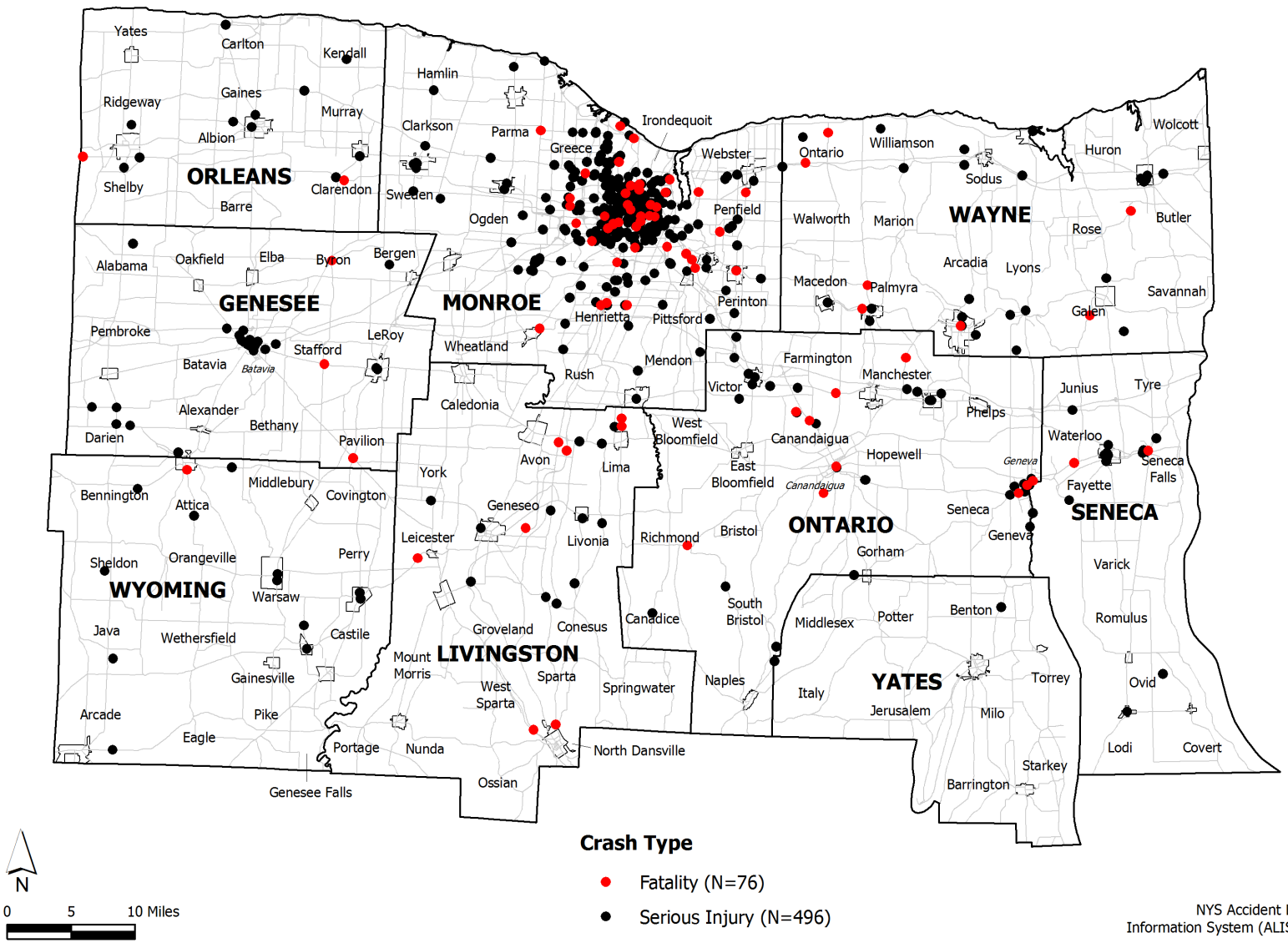
0 5 10 Miles

Note:
Pedestrian Facilities were inventoried for the Metropolitan Planning Area (MPA) prior to 2015 MPA expansion.

Sources: GTC, 2014
NYS GIS Program Office, 2015

Bicycle- and Pedestrian-Motor Vehicle Crashes Fatalities and Serious Injuries (2009-2013)

Map 12



Source:
NYS Accident Location
Information System (ALIS), 2014

Freight

Recognizing freight transportation's role in sustaining and spurring economic development, MAP-21, for the first time, enacted a national freight policy including multiple freight provisions to enhance the capability of the U.S. to compete competitively in the global economy. The FAST Act expands on MAP-21 by establishing a National Multimodal Freight Policy and the development of a National Freight Strategic Plan to implement the national policies set forth along with several new funding sources for freight-specific infrastructure improvements.

The competitiveness of a region's economy is inextricably linked to the strength of that region's transportation network.

MAP-21 encouraged, although did not require, state departments of transportation to develop state freight plans. The New York State Department of Transportation (NYSDOT) is currently developing a state freight plan. GTC is assisting NYSDOT with stakeholder outreach efforts and will continue to provide technical assistance to advance the development of the plan.

The Panama Canal is currently undergoing a $5.25 billion expansion that will more than double its current capacity. The present configuration of the Canal limits ship to 5,000 TEUs (i.e., twenty-foot equivalent unit used to measure cargo capacity of container ships). Once the expansion is completed in 2016, ships carrying 13,000 TEUs from Asia will be able to sail through the Canal bypassing longer trade routes. These co-called Post-Panamax ships will soon be docking along East Coast ports.

The Port Authority of New York and New Jersey is already preparing for the Post-Panamax ships by investing in multiple infrastructure improvements and purchasing new cranes designed to unload the larger ships. The Port Authority's chief initiative is the Bayonne Bridge Navigational Clearance Project. At $1.29 billion, the project will raise the level of the bridge from 151 feet to 215 feet to allow Post-Panamax ships the needed height clearance to enter the terminals at Port Newark—Elizabeth (New Jersey) and Howland Hook (Staten Island).

These international and state-level investments will increase the amount of freight on New York State's roadways and railroad network. Planning for growth in freight traffic is imperative to continue to maintain a state of good repair on the Region's freight transportation network and to capitalize on resulting opportunities that may arise to grow the Region's economy. Freight is a derived demand—as consumers continue to demand that a variety of products be available at the store and shipped to their home, freight needs will continue to evolve and increase. In 2010, approximately 282 million tons of freight worth over $900 billion was transported into, out of, within, and through the Region. Between 2010 and 2040, these freight movements are expected to increase 75 percent in terms of weight to approximately 494 million tons and 138 percent in terms of value to nearly $2.1 trillion. The breakdown of tonnage and value by direction in 2010 and 2040 is presented in Exhibit 14.

Employment in the manufacturing sectors may continue to decline but the volume of goods produced, and therefore goods that need to be shipped, will continue to rise. In 2013 the manufacturing industry contributed about $4 billion dollars in total annual wages accounting for nearly 17 percent of total income and 20 percent of private sector income in the Region. Manufacturing employment is the second largest share among private sector industries. Twelve of the Region's top 50 firms

Exhibit 14

Freight Tonnage and Value by Direction in the Genesee-Finger Lake Region, 2010 & 2040

	Tonnage		Percent Change	Value		Percent Change
Direction	2010	2040	2010-2040	2010	2040	2010-2040
Inbound	40,066,000	60,614,231	51.29%	$122,005,776,725	233,570,505,685	91%
Outbound	34,442,000	55,687,731	61.69%	$170,993,401,128	522,652,884,413	206%
Within	14,047,000	23,001,231	63.74%	$11,014,860,961	32,531,322,052	195%
Through	193,362,000	355,208,231	83.70%	$611,801,443,611	1,388,152,386,754	127%
Total	**281,917,000**	**494,512,615**	**75.41%**	**$915,815,482,424**	**2,176,907,098,904**	**138%**

Source: IHS/Global Insight VIA NYS Department of Transportation and the U.S. Department of Transportation 2010, extrapolated to 2040

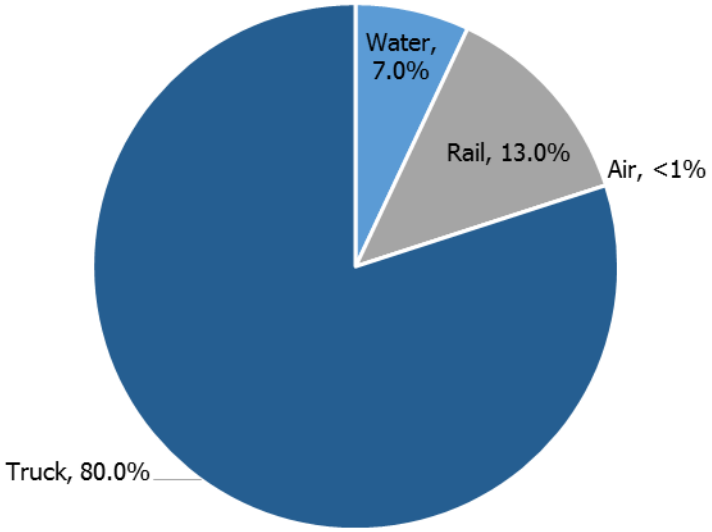
based on employment are classified as manufacturing. The Region has more persons employed in the manufacturing and supporting industries than any other large metropolitan area in Upstate New York.

How Does Freight Move in the Region?

The highway and bridge system form the foundation of the Regional freight network and carry the bulk of the freight traffic. Freight tonnage by mode in the Region for 2010 is presented in Exhibit 15. The primary mode for moving freight is truck, which accounts for over 80 percent of the tonnage transported in all directions. Thirteen percent of tonnage is transported by rail, five percent by water, and approximately one-half of one percent by air. The flexibility and accessibility that freight trucks provides to the vast majority of customers receiving raw materials, intermediate inputs, and final products will in all likelihood result in trucks continuing to be the preferred shipping mode for transporting goods.

Exhibit 15

Freight Tonnage by Mode in the Genesee-Finger Lakes Region, 2010



Source: Regional Goods Movement Strategy

Map 13 presents the Roadways with Significant Daily Truck Traffic. A roadway with significant daily truck traffic is defined as one with average daily truck traffic that is more than 20% above the regional average for a roadway segment (i.e., >=1,187 trucks per day). The findings are shown on Map 13, the Highway Trade Corridors in the Region. The trade corridors are classified as Primary Regional, Secondary Regional, and Connector based on the amount of truck traffic they carry, representing the level of access they provide to national/statewide, regional, and sub-regional markets, respectively.

The Region is located within a one-day's drive to the Greater Golden Horseshoe (home of Toronto) and the Boston-New York City -Washington mega-regions. Given the proximity to these major markets, the Region processes a high volume of through truck trips on the Interstate Highway System, particularly Interstates 90 and 390 – Primary Regional facilities.

Railroads serve as a vital component to the Regional freight network, moving high-volume and heavy weight commodities over long distances in a highly efficient manner. Railroads may not be the fastest mode but typically offer the lowest price per ton mile shipped making them the preferred shipping choice for bulk commodities (e.g., coal, paper and lumber products, chemicals, and raw agricultural products).

Three of the seven Class I railroads – those with operating revenue of $467.0 million or more in 2013 – in the United States and Canada operate in the region: CSX Transportation (CSXT), Norfolk Southern (NS) and Canadian Pacific (CP). The CSXT mainline that traverses the Region and New York State (the former Conrail Chicago Line) is the most heavily traveled of the any of the company's lines, which includes operations in 22 states. Canadian Pacific does not own any trackage in the Region but operates with an agreement on NS's Southern Tier Line allowing CP to reach additional U.S. markets. Congestion along the Class I rail corridors due to the boom in crude oil production in the Bakken Shale Fields has led not only to significant delays for passenger trains but for other heavy bulk commodities (e.g., coal, grain, and vehicles) that have traditionally relied on the railroads to provide a safe and cost effective form of transport. According to the Surface Transportation Board, America's railroads moved 415,000 rail tanker cars of crude oil in 2014 compared to just 9,500 rail tankers cars in 2008. This rapid increase in the number of tanker cars across the nation filled with violate crude oil has raised the alarm on safety and security measures along the rail line. Locally, residents have voiced concerns over the increase in crude oil tanker cars traversing through the populated communities along the CSXT mainline. Given the market volatility and the recent drop in crude prices, trains carrying oil to the coasts are estimated to be down 30 percent since their peak in December 2014.

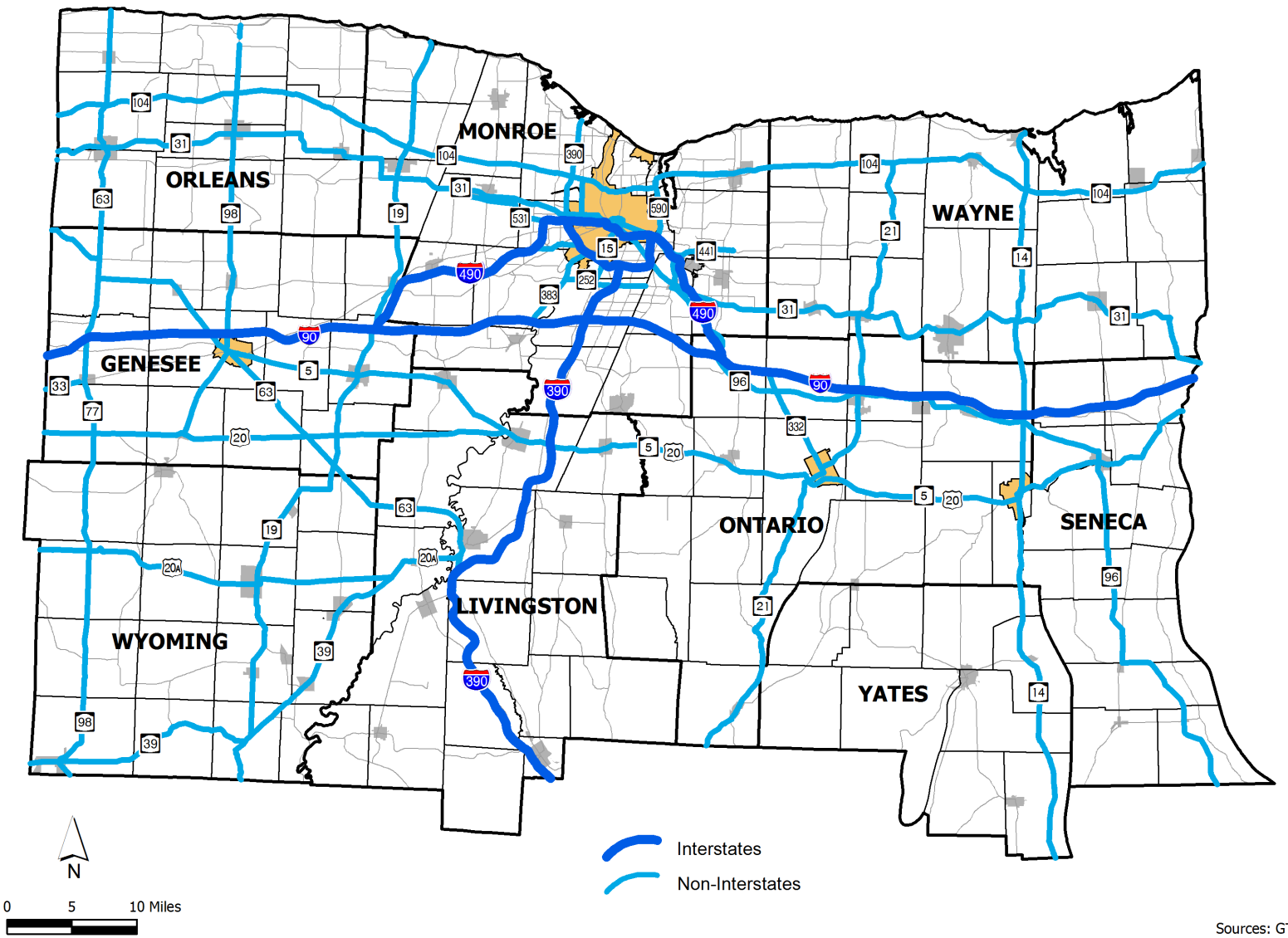
The Region is also home to nearly a dozen Class III or Shortline railroads – those with operating revenue of less than $37.4 million in 2013 – accounting for approximately one-third of the Shortlines in New York State. Map 14 presents active Class I and Class III railroads in the Region.

In addition to trucks and railroads, freight also moves via airplanes and waterborne vessels. The Greater Rochester International Airport (GRIA) is the Region's main cargo handling airport. In 2013, nearly 147,000 tons of freight landed at the GRIA. While the tonnage of freight handled via air service is minor compared to the trucks and railroads, the proportional value is significantly higher. Accordingly, air cargo capabilities comprise a vital component of the freight network that is critical to the growth of industries such as optics and imaging, and biotechnology.

The Port of Rochester was once a busy freight port but lack of direct access to major highways and the on-going revitalization of the Port as a residential and entertainment center limit its potential as a shipping facility. There are also minor freight movements along the Erie Canal but, because of varying controlling depths, major shipping activity is limited.

Regional Freight Network in the Genesee-Finger Lakes Region

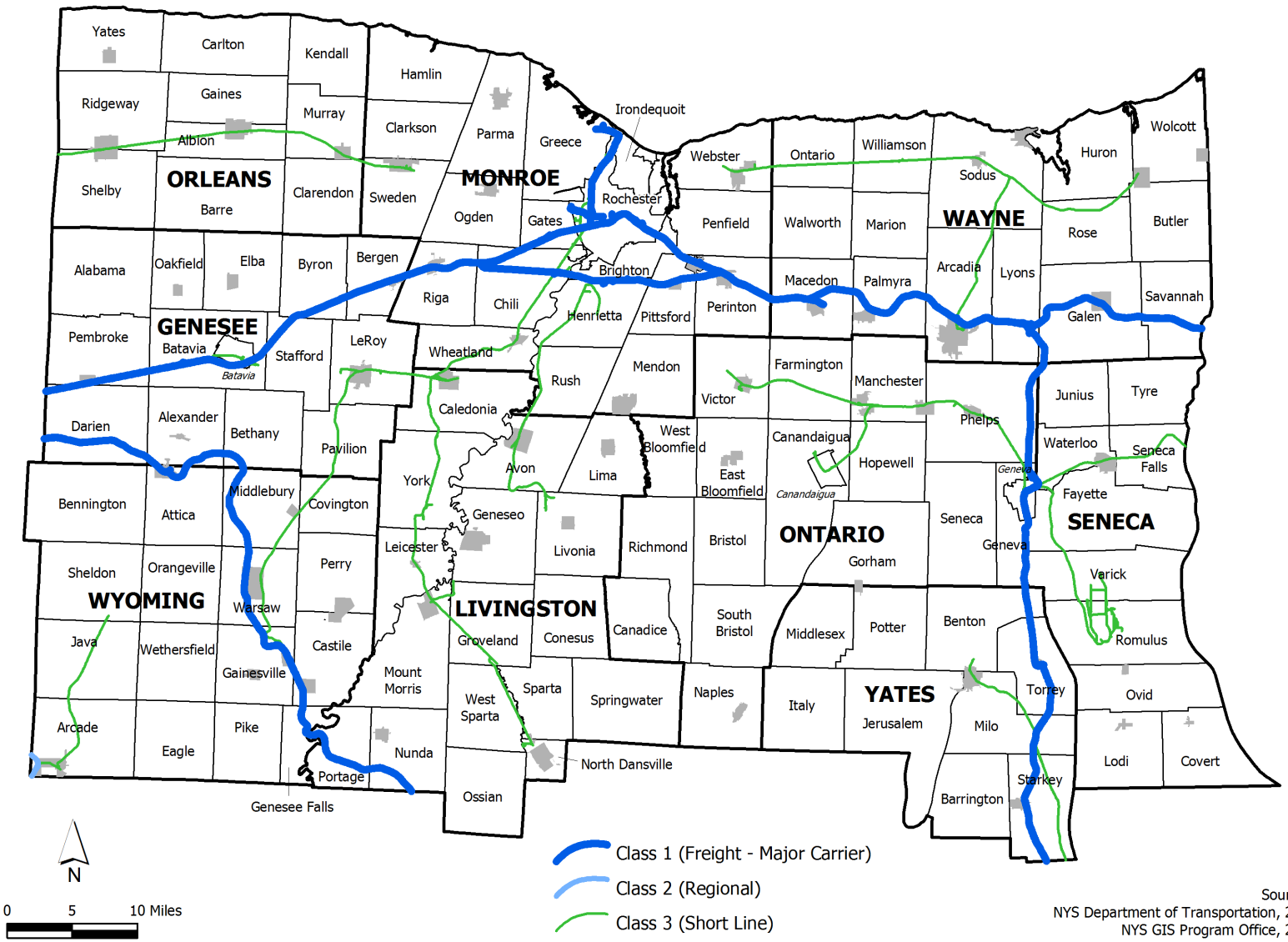
Map 13



Sources: GTC, 2015
NYS GIS Program Office, 2015

Railroads in the Genesee-Finger Lakes Region

Map 14



Sources:
NYS Department of Transportation, 2010
NYS GIS Program Office, 2015

Regional Goods Movement Strategy

Recognizing freight transportation's role in sustaining and spurring economic development, GTC and NYSDOT, in cooperation with their partners, completed the *Transportation Strategies for Freight and Goods Movement in the Genesee-Finger Lakes Region* (Regional Goods Movement Strategy), in the fall of 2012. The vitality of the freight transportation system is an important factor when retaining and attracting new manufacturing firms and agriculture industrial facilities to the Region.

The Regional Goods Movement Strategy had three primary objectives:

1. To develop freight strategies that will position the region's transportation system as a distinguishing factor in retaining and attracting both traditional and emerging-technology manufacturing firms as well as enhancing the viability of agriculture;
2. Establish relationships between GTC and the business community that will endure beyond the completion of the project; and
3. Help educate the public and key stakeholders in the region about the importance of freight transportation.

The Regional Goods Movement Strategy began with a comprehensive Regional Freight and Economic Profile summarizing the key trends and issues regarding population, employment, and freight movement in the Region. Extensive stakeholder outreach and a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was conducted to form the Needs Assessment that directly aligned with the goals and objectives of the *LRTP 2035*. Prioritization of the Needs Assessment led to the development of 35 Near-Term, Medium-Term and, Long-Term Recommendations. Policies, strategies, and specific projects are discussed in the Recommendations Chapter. These recommendations have been fully incorporated into *LRTP 2040*.

Interregional Travel

Regions that are well connected offer easy access to and from neighboring cities, states, and international destinations. Enhancing accessibility offers greater economic development opportunities for freight, businesses, and tourism. Current residents benefit by being able to work and play far beyond Regional boundaries.

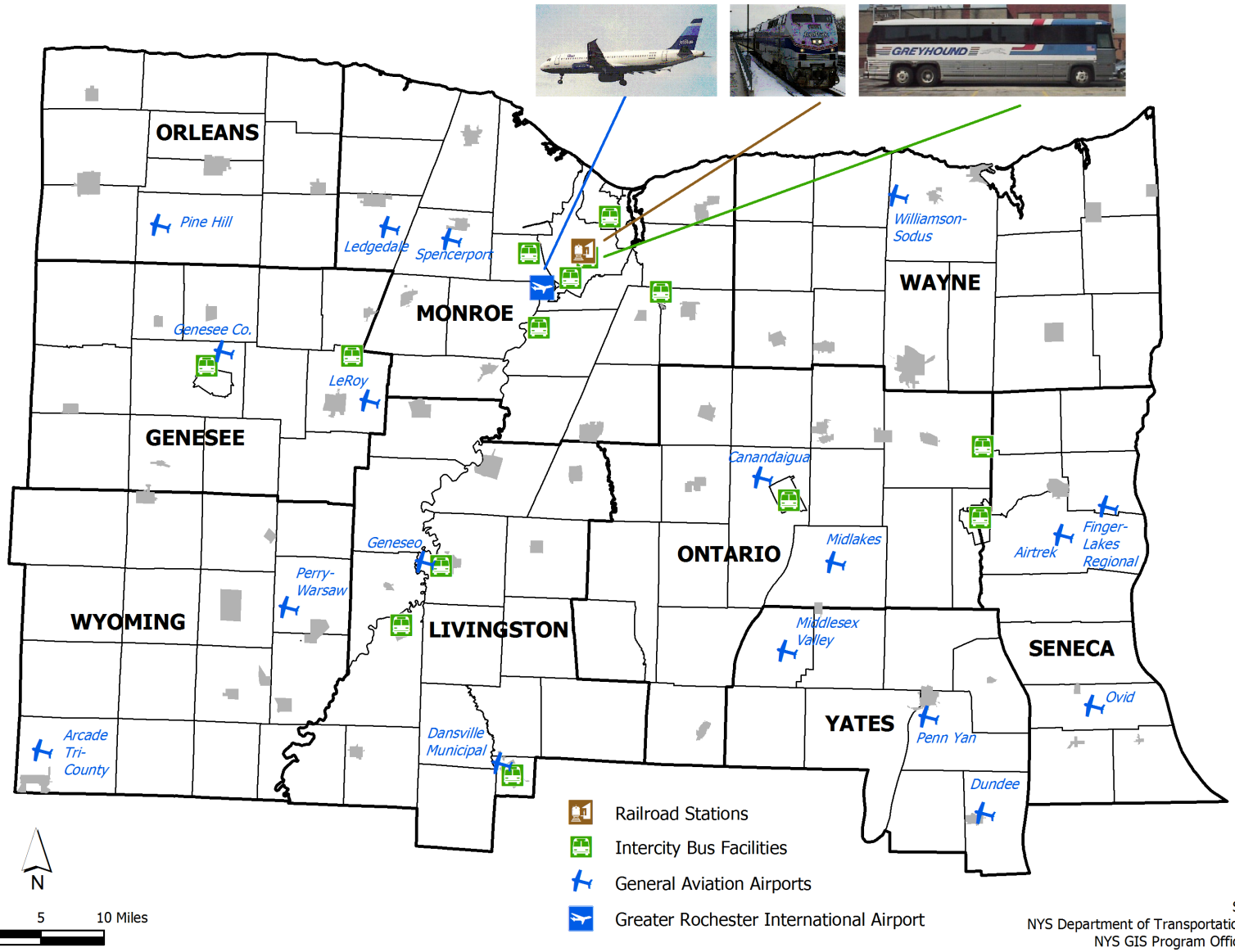
Interregional travel is provided through air, bus, and passenger rail services, as shown in Map 15. Providing connections to these services via the highway and bridge network, and the public transportation system ensures the public can reach destinations outside the Region with ease.

The GRIA is served by seven major commercial airlines offering 120 flights a day to over 17 destinations. According to the Federal Aviation Administration in 2013, over 1.2 million passengers boarded a plane GRIA. Since 2009 the number of passengers boarding a plane at GRIA (i.e., enplanements) have decreased by 5 percent.

Public transportation to the airport, through RTS, to downtown Rochester and the subsequent intercity bus and passenger rail services is available directly in front of the GRIA grounds. Presently RTS does not provide direct access to the passenger arrivals and departures drop-off facilities at GRIA. In addition to GRIA, there are 19 public-use airports in the Region that are designated as General Aviation airports. General Aviation airports serve all civil aircraft that are not classified as air carrier, commuter, or military. Five of the General Aviation airports are Reliever airports that reduce traffic at Commercial Service airports such GRIA by providing service for smaller aircraft.

Interregional Transportation Facilities in the Genesee-Finger Lakes Region

Map 15



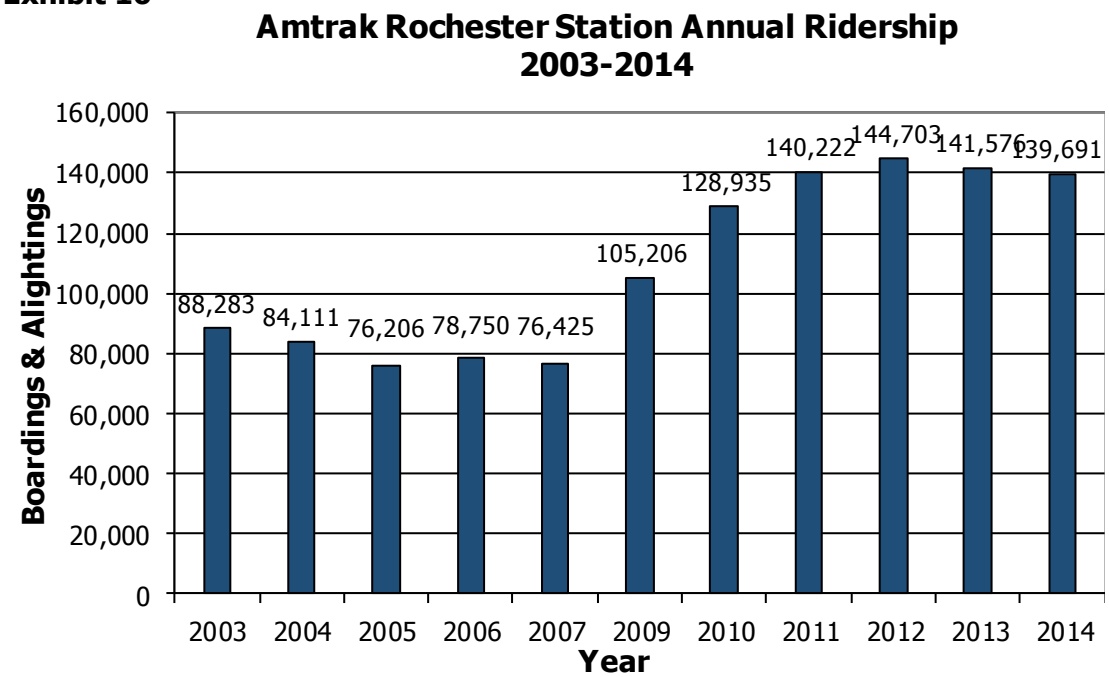
Sources:
NYS Department of Transportation, 2015
NYS GIS Program Office, 2015

Amtrak provides passenger rail service to Rochester via nine trains per day on its Empire Service (New York City to Niagara Falls), Lakeshore Limited (New York City/Boston to Chicago), and Maple Leaf (New York City to Toronto) routes. Overall Amtrak ridership in Rochester, as measured by passenger boardings and alightings, has increased approximately 37 percent since 2003. Although, for 2013 and 2014 ridership has been slightly tapering off as shown in Exhibit 16. Amtrak operates trains on the CSX Transportation (CSXT) railroad's mainline and must yield the right-of-way to CSXT traffic. The railroad typically operates 70-80 trains per day along the mainline. According to Amtrak, on-time performance along the Empire Service corridor was 78.4 percent with the majority of delays attributed to CSXT interference. Uncertainty surrounding the performance of passenger rail service may push riders to other more reliable modes of travel, if not rectified over the long term.

Seeking to increase ridership and update the current defunct Amtrak Station, the City of Rochester in partnership with the NYSDOT secured federal funding through the USDOT's National Infrastructure Investments Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant to construct a new Intermodal Transportation Center in Rochester.

The recently demolished Amtrak Station, built in 1978 as a temporary facility, lacked ADA accommodations and was in dire need of repairs. Phase one of the new project is fully funded at $29.5 million. This funding includes upgrades to the tracks, better access to boarding platforms, and construction of a fully ADA compliant facility. Construction of the new Intermodal Transportation Center began in October 2014 and is expected to be fully operational in 2017. Ridership is projected to increase as a result of these upgrades as has been the case with other station enhancements around the country.

Exhibit 16



Rendering of the Rochester Intermodal Transportation Center

Source: TIGER Application

The City of Rochester and NYSDOT are actively working to advance and secure funding for Phase 2 of the Intermodal Transportation Center. Phase 2 will provide customer direct access to interregional bus service providers, allowing a seamless travel experience along with new circulation and parking components.

In 2011, the current downtown Greyhound/Trailways Bus Station located directly across from the existing Amtrak Station handled over 220,000 boardings and alightings. In addition to the downtown Rochester terminal, there are eleven other locations in the Region where residents and visitors may access the Greyhound Lines or New York Trailways bus services. Megabus, a discount interregional bus operator, provides service from downtown Rochester to four destinations in New York State along with Toronto, Ontario.

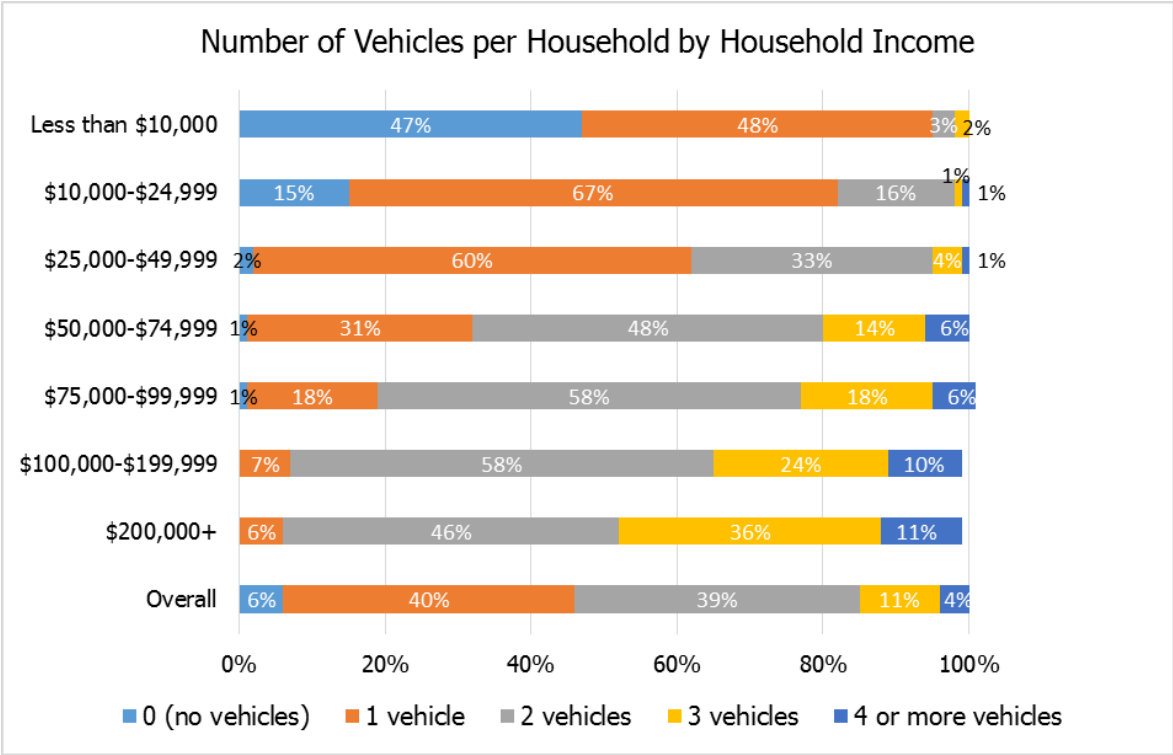
Travel Characteristics

The travel characteristics of the Region's residents are determined by where they live and where they need and want to go. Several data sources are regularly utilized to obtain and analyze such travel information, including Census Transportation Planning Products (CTPP), National Household Travel Surveys (NHTS), and local/regional household travel surveys.

GTC commissioned a household travel survey covering the Rochester MPA in 2011 (*2011 Rochester Area Transportation Study*) – a previous survey was conducted in 1993. Between 1993 and 2011, the total number of households in the MPA rose from 300,321 to 334,127 – an increase of 11 percent. Because only a small, representative sample of households are included in both surveys, expansion factors are applied to the responses to estimate overall travel characteristics of MPA residents. Based on the surveys, the total number of daily (weekday) trips in the MPA for individuals age 16 and older rose from 1,988,000 in 1993 to 2,488,564 in 2011 – an increase of 25 percent.

The number of cars owned per household in the MPA also increased between 1993 and 2011. The proportion of zero-vehicle households decreased from approximately 12 percent to 6 percent; and the proportion of one-vehicle households increased from approximately 35 percent to 40 percent. There were also slight increases in the proportions of two- and three-vehicle households. Perhaps not surprisingly, there is a strong correlation between the number of vehicles per household and household income, as shown in Exhibit 17.

Exhibit 17



This relationship can be attributed to a variety of possible factors including: lower income households are unable to afford a car or are located in areas with alternative transportation options; smaller households with fewer income-earning members do not have the need to own multiple cars; or households with higher income have more income-earning members who need access to a vehicle.

In addition to more cars on the road, people are also making more and longer trips. The average daily person trips per household rose from 6.9 in 1993 to 7.7 in 2011. The average length of a trip increased from 5.4 miles in 1993 to 6.1 miles in 2011.

According to the 2011 survey, work-related trips (i.e., those made to earn a living) accounted for nearly 37 percent of all person trips. Approximately 32 percent of person trips were for family and personal business (e.g., shopping, health care visits, etc.). Trips made for social and recreational purposes (e.g., visit friends and relatives, take vacation, etc.) made up approximately 11 percent of all person trips. A breakdown of trips by purpose is presented in Exhibit 18.

Because many work-related trips are made during the same weekday morning and evening hours, they result in weekday "peak" travel periods which account for the most intense use of the transportation system. Exhibit 19 shows the Time of Day Distribution for all trip purposes in the Rochester MPA as estimated using the *2011 Rochester Area Transportation Study.*

Exhibit 18

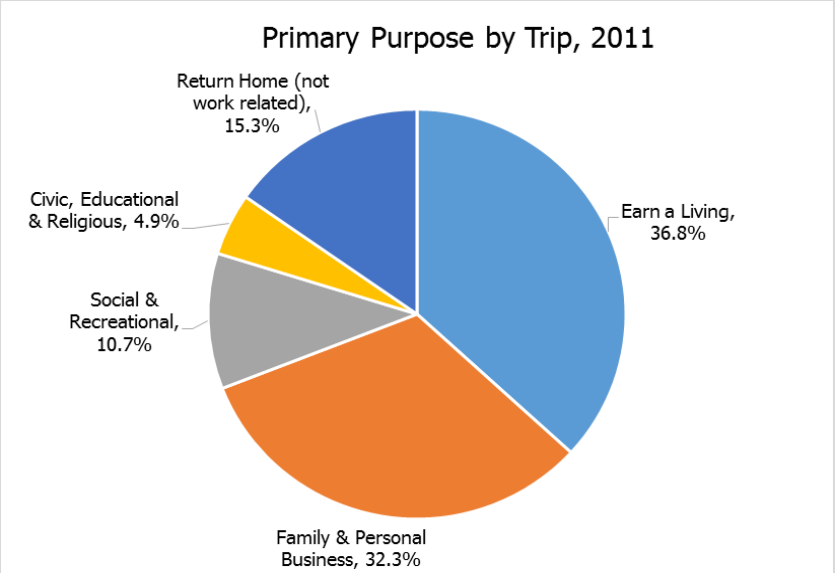
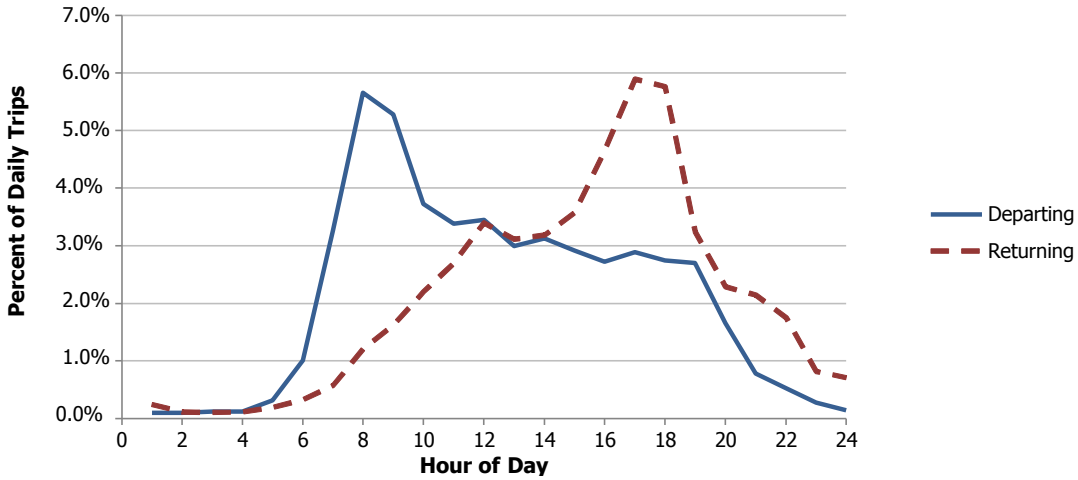


Exhibit 19

Time of Day Distribution – All Trip Purposes



The vast majority of person trips in the MPA in 2011 were made by private vehicle at 92 percent – down slightly from approximately 95 percent in 1993 (these percentages, derived from GTC household surveys, are consistent with 2010 and 2000 CTPP 5-year trend data: 89 and 91 percent respectively). The share of public bus trips remained unchanged between 1993 and 2011 at nearly two percent; while the share of walking and/or bicycling trips increased from approximately three percent to six percent (five percent walking; one percent bicycling).

The small overall proportion of trips made by modes other than the private vehicle, however, obscures the importance of alternative modes to lower-income individuals as shown in Exhibit 20.

According to the *2011 Rochester Area Transportation Study*, trips by seniors (ages 65 and over) are made almost exclusively by private vehicle, 95 percent, and their primary trip purpose is family and personal business, 71 percent. It is anticipated that seniors will continue to choose private vehicles as their preferred method for mobility but the increase in their overall numbers will require additional public transportation services.

The 2014 American Community Survey (ACS) 5-year estimate data show that very little has changed since Census 2000 in terms of how people travel to and from work – 90 percent of workers either drive alone or carpool to their place of employment. Exhibit 21 presents the means of transportation to work by employed persons residing in the Region.

Exhibit 20

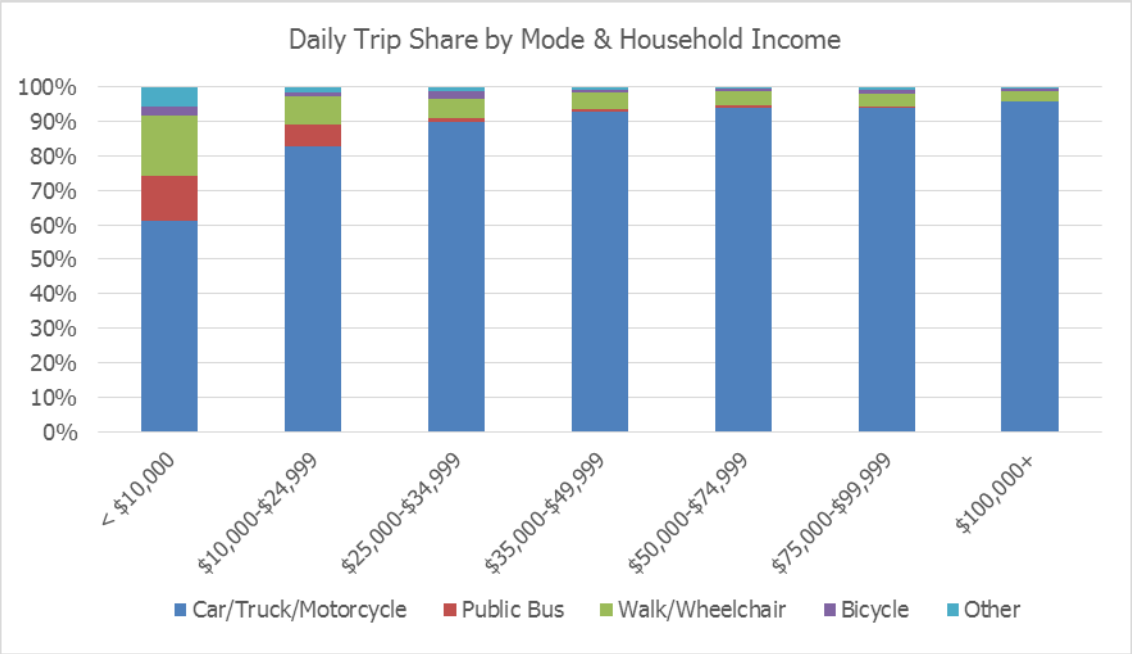
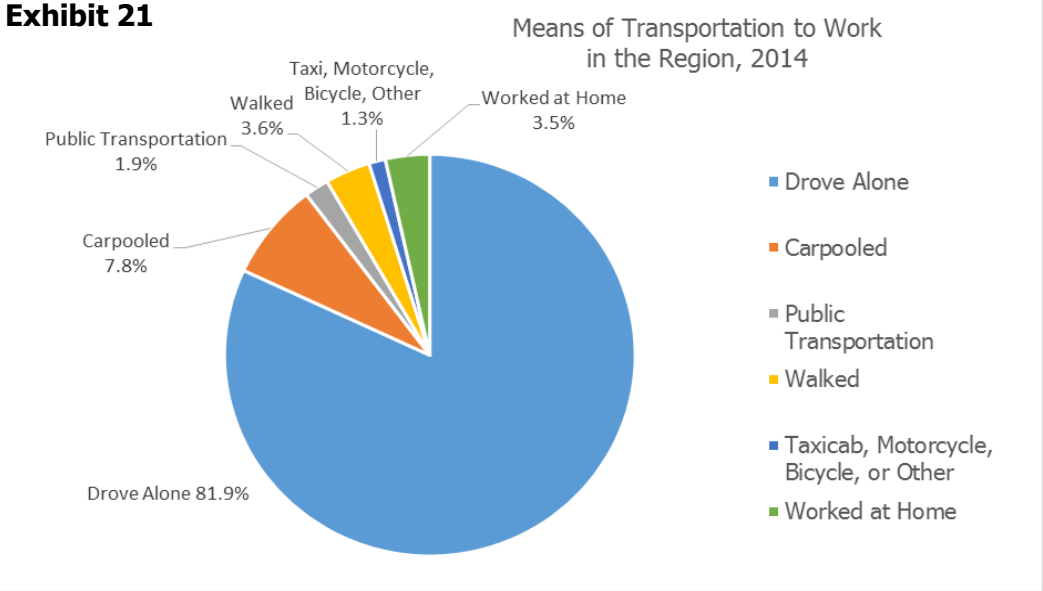
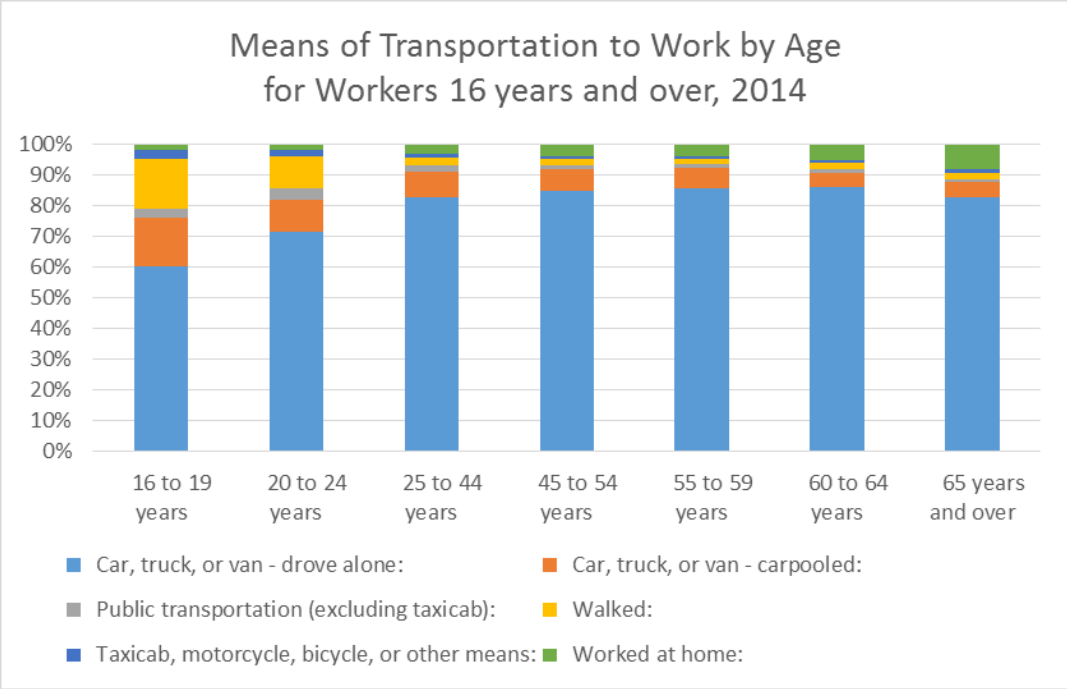


Exhibit 21



There is also a strong correlation between age and the means of transportation used to get to work. According to the 2014 ACS 5 -year estimates for the Region, while individuals ages 25 to 44 make up the majority of workers utilizing all modes, workers ages 16 to 24 are much more likely than their older counterparts to use modes other than the single-occupancy vehicle, as shown in Exhibit 22. Additionally, as workers age, working at/from home becomes more prevalent.

Exhibit 22



Travel Patterns

Many people live in one community and work in another. To measure the impact of this on the transportation system, we can look at daytime population. In places with higher concentrations of businesses, we expect the daytime population to increase while in places with lower concentrations of businesses, we expect the daytime population to decrease. The 2010 ACS 5-year includes data on Daytime Population by Town. Daytime population is an important consideration as communities with more businesses must accommodate an influx of people and increased traffic during peak periods.

In terms of county to county workflows in the Region, the 2013 ACS 5-year estimate data show only slight variation since 1990. Monroe County continues to have the highest percentage of residents who work in their county of residence at 95 percent.

Exhibit 23 shows places with a 15 percent or more increase in the daytime population. The community with the greatest net increase in daytime population is the City of Rochester with a gain of 72,486 people. The community with the largest percentage increase in daytime population is the Town of Henrietta with a gain of 47.4 percent.

Exhibit 23

Places with 15 Percent or More Increase in Daytime Population

Municipality	# Increase	% Increase
Albion town	2,450	28.3
Arcade town	1,202	28.6
Batavia city	4,094	26.3
Canandaigua city	3,682	34.5
Geneva city	2,943	22.1
Henrietta town	19,924	47.4
Lyons town	880	15.4
Rochester city	72,486	34.2
Victor town	4,314	32.1
Warsaw town	885	17.2

Some communities serve primarily as residential. Daytime population is an important consideration as communities with fewer businesses must accommodate the needs of residents without a broad tax base to support their budgets. Exhibit 24 shows places with a 15 percent or more decrease in the daytime population. The community with the largest net decrease in daytime population is the Town of Greece with a loss of 18,304 people. The community with the largest percentage decrease in daytime population is the Town of Walworth with a loss of 42.4 percent.

Exhibit 24

Places with 15 Percent or More Decrease in Daytime Population

Municipality	# Decrease	% Decrease
Canandaigua town	-1,474	-15.4
Chili town	-4,592	-16.2
Clarkson town	-1,917	-29.1
Farmington town	-2,424	-20.9
Greece town	-18,304	-19.2
Hamlin town	-3,368	-37.1
Irondequoit town	-12,892	-25.0
Livonia town	-1,830	-23.6
Ogden town	-4,216	-21.6
Ontario town	-2,183	-21.7
Palmyra town	-1,545	-19.5
Parma town	-4,825	-31.3
Penfield town	-5,524	-15.4
Phelps town	-1,275	-18.1
Riga town	-1,122	-20.3
Sodus town	-1,617	-19.1
Walworth town	-3,929	-42.4

Many communities also have residents who work in that same community. People that live and work in the same community have shorter commutes and greater potential to commute to work using an alternative to the single occupant vehicle. Communities with a higher concentration of residents working in the same community have are more likely to have a balanced tax base to support their budgets.

Exhibit 25 shows places with a 40 percent or more resident workers employed in the same place in which they live. The community with the greatest number and percent of resident workers employed therein is the City of Rochester with 49,326 and 58.1 percent, respectively.

Exhibit 25

Places with 40 Percent or More Residents Working in that Place

Municipality	Total Number of Working Residents	Number of Residents Working in Municipality	Percent of Residents Working in Municipality
Albion town	2,768	1,220	44.1
Arcadia town	6,968	3,051	43.8
Batavia city	6,577	3,463	52.7
Geneseo town	4,146	2,007	48.4
Geneva city	5,815	3,055	52.5
Milo town	3,026	1,431	47.3
North Dansville town	2,405	1,214	50.5
Rochester city	84,878	49,326	58.1
Warsaw town	2,300	1,204	52.3

Exhibit 26 shows places with a 20 percent or less resident workers employed in the same place in which they live. The community with the lowest number of resident workers employed in the same place is the Town of Clarkson with 253. The community with the lowest percentage of resident workers employed in the same place is the Town of Walworth with 7.9 percent.

Exhibit 26

Places with 20 Percent or Less Residents Working in that Place

Municipality	Total Number of Working Residents	Number of Residents Working in Municipality	Percent of Residents Working in Municipality
Batavia town	3,738	483	12.9
Brighton town	17,299	2,948	17.0
Canandaigua town	4,630	686	14.8
Chili town	14,627	2,313	15.8
Clarkson town	3,178	253	8.0
East Rochester	3,255	536	16.5
Farmington town	6,096	1,094	17.9
Gates town	13,529	2,127	15.7
Hamlin town	4,372	476	10.9
Irondequoit town	24,829	3,823	15.4
Macedon town	4,706	743	15.8
Ogden town	9,795	1,442	14.7
Ontario town	5,418	1,078	19.9
Parma town	7,535	1,128	15.0
Penfield town	17,440	2,738	15.7
Phelps town	3,799	742	19.5
Riga town	2,871	293	10.2
Walworth town	4,761	378	7.9
Wheatland town	2,575	375	14.6

Congestion Management Process

The Congestion Mitigation Process (CMP) is a systematic approach to managing traffic congestion that provides accurate, up-to-date information on transportation system performance regarding congestion and an assessment of strategies to address it. Congestion management is the application of strategies to improve efficiency and reliability by reducing the adverse impacts of congestion, on the movement of people and goods. Even though the Region enjoys relatively low levels of congestion, the management of congestion is important because excessive travel delay has adverse safety, environmental, and economic impacts, causing increases in travel times, fuel consumption, vehicle emissions, and emergency response times, as well as lost productivity.

The USDOT requires that metropolitan areas with a population greater than 200,000 people, known as Transportation Management Areas, maintain a CMP to:

- monitor and evaluate transportation system performance;
- identify alternative congestion mitigation actions;
- assess and implement cost-effective congestion mitigation actions; and
- evaluate the effectiveness of the implemented actions.

The objective of the GTC CMP is to provide practical tools to identify and implement strategies that improve the mobility of people and freight, emphasizing coordinated corridor-level and region-wide solutions that mitigate existing sources and avoid the creation of future sources of congestion that result in excess delay.

The GTC CMP identifies congested road segments with the Travel Time Index (TTI), a measurement of travel delay. The TTI is the ratio of travel time during the peak period to the time required to make the same trip at free-flow speeds. It is calculated by dividing the peak period travel time by the free-flow travel time. A TTI value of 1.3, for example, indicates that a 20-minute trip in free-flow conditions requires 26 minutes during the peak period. A road segment with a TTI of 1.25 or greater is considered congested.

According to the GTC CMP, travel delay may fall into one of the following three categories:

1. Recurring Capacity Related Delay is the predictable daily increase in demand for road space that exceeds available capacity. This type of delay is typically caused by commuters during morning and evening peak periods. It may also occur in urban and village centers as a result of demand for access to economic activities in those areas. In addition, seasonal traffic patterns such as increased traffic around regional retail during the holiday shopping season and at university campuses when students arrive and depart for the semester also contribute to recurring delay. Typical impacts include increased travel times, driver frustration, fuel consumption, vehicle emissions, and emergency response times.

   The following Congestion Scale was developed as a tool to categorize congested road segments by ranking them according to TTI and to the degree they are impacted by Recurring Capacity Related Delay:

Congestion Scale for Recurring Capacity Related Delay				
Delay			Excess Delay	
Minimal Congestion	Minor Congestion	Moderate Congestion	Congestion	Severe Congestion
<1.00	1.01-1.14	1.15-1.24	1.25-1.99	2.00>

Recurring Capacity-Related Delay typically occurs at "bottlenecks" in the transportation system, such as the approaches to and within expressway interchanges or intersections, where demand for road space is greater than the intersection's capacity to handle that demand. Map 16 shows congested locations during the morning peak period (7:00 a.m. – 9:00 a.m.) and Map 17 shows the congested locations during the evening peak period (4:00 p.m. – 6:00 p.m.) both color coded to match the congestion scale.

2. Planned Event Related Delay includes planned events and scheduled activities that can cause delay. This includes programmed construction work that reduces roadway capacity and special events such as concerts, festivals, and sports games that occur and place a greater demand on the roads around those venues. Planned Event Related delays occur in the vicinity of the MPA's special event venues, including: stadiums, theatres, and performing arts centers; parks and fairgrounds; and college campuses. In addition, planned events include scheduled road work in designated work zones. Typical impacts include increased travel times, fuel consumption, vehicle emissions, and emergency response times. In addition, this type of delay may restrict access to special event venues. Like Recurring Capacity-Related Delay, this type of delay decreases the efficiency, reliability, and safety of the transportation system.

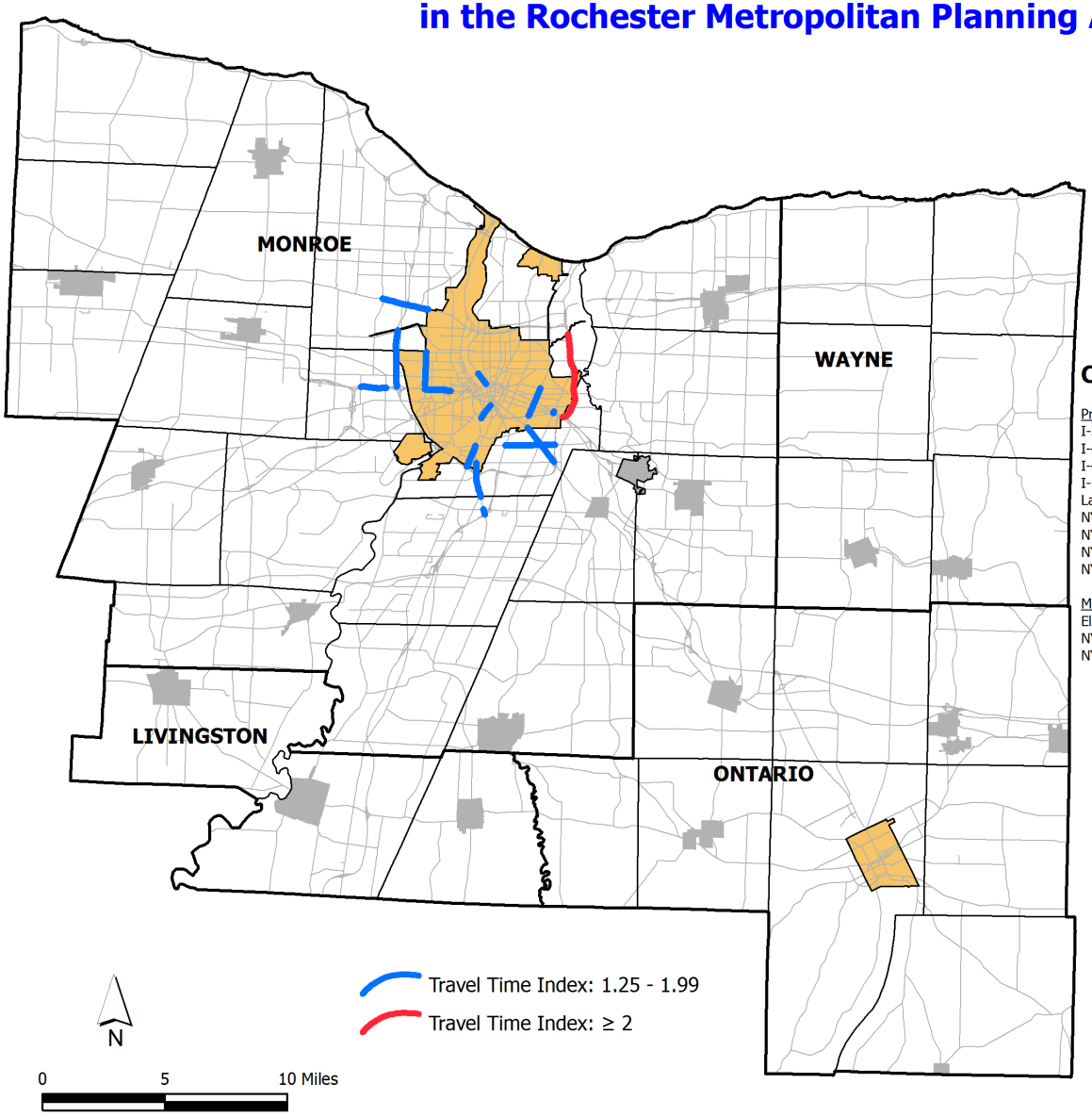
3. Non-Recurring Incident Related Delay occurs as the result of traffic incidents that block travel lanes or cause road closures. Incident related delay may range from a few minutes for a minor vehicle crash to a long-term closure, such as a hazardous materials spill.

   Due to its unpredictable nature, this type of delay is the most disruptive and frustrating for travelers. Recurring congestion can be factored into trip planning, but there is no way to anticipate the location or duration of incident related delay. This is especially true for incidents that occur during peak periods on roads that already experience Recurring Capacity Related Delay. The combination of these two delay types may have serious impacts on travel times, causing significant disruption.

   Like the other types of delay, typical impacts of Non-Recurring Incident Related Delay include increased travel times and fuel consumption, as well as uncertainty about when travelers and freight will arrive at their destinations. This type of delay increases the risk of secondary incidents, which are incidents that occur as a direct result of the disruptions caused by a primary incident. These impacts collectively decrease the safety, efficiency, and reliability of the transportation system by imposing additional costs and uncertainties on system users.

Congested Links in the Morning Peak Period in the Rochester Metropolitan Planning Area

Map 16



Congested Links (Travel Time Index ≥ 1.3)

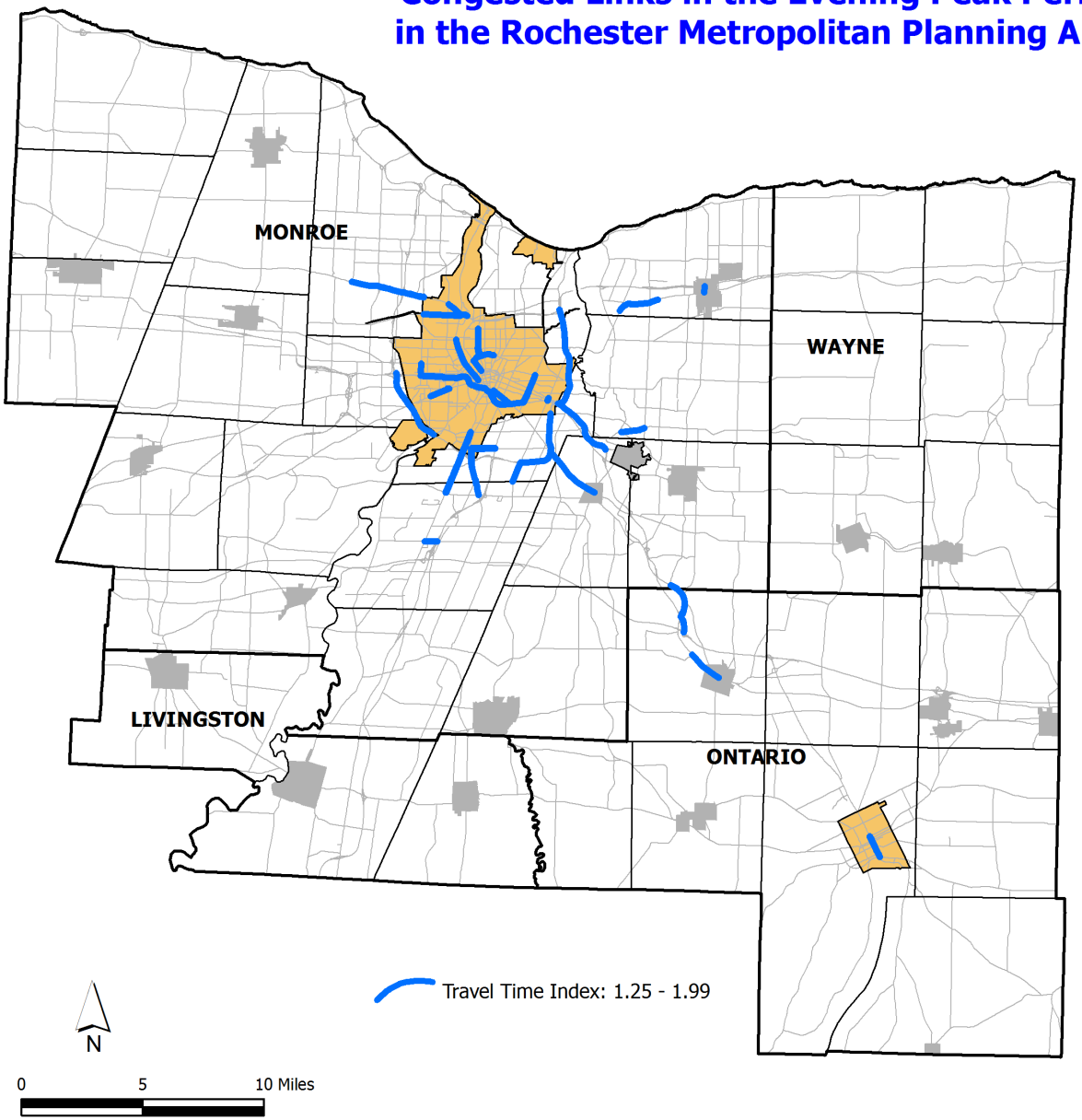
Principal Arterials
I-390 - Southbound from Exit 22, Lexington Ave to Exit 17, Scottsville Rd.
I-490 - Eastbound from Exit 7, Buffalo Rd. to Exit 10, Mount Read Blvd.
I-490 - Westbound from I-590 Split to Exit 17, South Goodman St.
I-590 - Southbound from Exit 11, East Ridge Rd. to Exit 6, Blossom Rd.
Lake Ave. - Southbound from NYS Rt. 104 / West Ridge Rd. to Lyell Ave.
NYS Route 104 - Eastbound from I-390 to Lake Ave., Rochester
NYS Route 204 / Chili Ave. / Brooks Ave. - Eastbound from I-490 to I-390
NYS Route 204 / Chili Ave. / Brooks Ave. - Westbound from I-390 to I-490
NYS Route 441 - Westbound from NYS Rt. 250 to I-490

Minor Arterials & Collectors
Elmwood Ave. - Westbound from Clinton Ave. to NYS Route 383
NYS Route 31 - Eastbound from Highland Ave. to Elmwood Ave.
NYS Route 31 - Westbound from I-490, Exit 26 to French Rd.

Sources: INRIX © 2015
NYS GIS Program Office, 2015

Congested Links in the Evening Peak Period in the Rochester Metropolitan Planning Area

Map 17



Congested Links (Travel Time Index ≥ 1.3)

Principal Arterials
I-390 - Southbound from Exit 22, Lexington Ave to Exit 17, Scottsville Rd.
I-490 - Eastbound from Exit 7, Buffalo Rd. to Exit 10, Mount Read Blvd.
I-490 - Westbound from I-590 Split to Exit 17, South Goodman St.
I-590 - Southbound from Exit 11, East Ridge Rd. to Exit 6, Blossom Rd.
Lake Ave. - Southbound from NYS Rt. 104 / West Ridge Rd. to Lyell Ave.
NYS Route 104 - Eastbound from I-390 to Lake Ave., Rochester
NYS Route 204 / Chili Ave. / Brooks Ave. - Eastbound from I-490 to I-390
NYS Route 204 / Chili Ave. / Brooks Ave. - Westbound from I-390 to I-490
NYS Route 441 - Westbound from NYS Rt. 250 to I-490

Minor Arterials & Collectors
Elmwood Ave. - Westbound from Clinton Ave. to NYS Route 383
NYS Route 31 - Eastbound from Highland Ave. to Elmwood Ave.
NYS Route 31 - Westbound from I-490, Exit 26 to French Rd.

Sources: INRIX © 2015
NYS GIS Program Office, 2015

Congestion Mitigation Strategies

Exhibit 27 presents congestion mitigation strategies that can be applied to each of the three types of congestion as a means of reducing delay and improving travel time reliability.

Exhibit 27

Recurring Capacity Related	Planned Event Related	Non-Recurring Incident Related
Supply-Driven Strategies		
Advanced Parking Management	Advanced Parking Management	Traffic Incident Management
Traffic Signal Coordination	Traffic Signal Coordination	Traffic Signal Coordination
Multi-Modal Traveler Information Systems	Multi-Modal Traveler Information Systems	Multi-Modal Traveler Information Systems
Roadway Monitoring and Management	Roadway Monitoring and Management	Roadway Monitoring and Management
Intersection/Interchange Improvements	Traffic Enforcement	Traffic Enforcement
Access Management	Reversible Traffic Lanes	Work Zone Management
Bicycle and Pedestrian Networks	Temporary Lane Restrictions and Turn Prohibitions	Temporary Lane Restrictions and Turn Prohibitions
Expanded Public Transportation Services	Work Zone Management	
Ramp Metering		
Transit Signal Priority		
Demand-Driven Strategies		
Transit-Supportive Development	Alternate Modes of Transportation	
Alternative Modes of Transportation		
Alternative Hours to Travel		
Alternative Workplace Locations		

*definitions for the strategies listed above may be found in the CMP Technical Documentation at www.gtcmpo.org

Reliability

Travel Time Reliability is a measure of the amount of congestion users of the transportation system experience at a given place and time. Reliable travel times are important because they provide system users with a degree of certainty regarding the length of time a trip will take. This allows users to build travel times into their schedules and know that, on a given road at given times, they will be able to reach their destinations within a specified timeframe. Businesses benefit from reliable travel times through consistent freight deliveries and pick-ups. Regardless of the mode of transportation used for these activities, reliable travel times provide businesses with a consistent schedule to build their operations around. Reliability is less about the amount of traffic and more about consistency from day to day.

Transportation Systems Management and Operations

TSMO is an integrated program to optimize the performance of existing transportation infrastructure through the implementation of systems, services, and projects designed to preserve capacity and improve safety, efficiency, and reliability. TSMO initiatives emphasize dynamic, real-time management of the transportation system and offer cost-effective alternatives to traditional capacity expansion through the addition of new travel lanes, whether through the construction of new roads or the widening of existing ones.

TSMO-supportive initiatives can be grouped into one or more of the following three categories:

- Technology – Intelligent Transportation Systems (ITS) provide the technical tools needed to manage and operate transportation assets. ITS field instruments (see Call-Out Box on page 85) are deployed in strategic locations;
- Coordination – Multi-modal and multi-jurisdictional interagency coordination initiatives that maximize the efficiency of ITS operations and service delivery; and
- Demand – Real-time travel information is provided to help motorists, transit passengers, freight carriers, and others make informed decisions about where, when, and how to use the transportation system.

Initiatives in all three categories are implemented in accordance with recommendations in the *Intelligent Transportation Systems Strategic Plan for Greater Rochester*, which establishes the strategic direction for TSMO initiatives and ITS deployments in the Greater Rochester area. The Technology and Coordination categories address supply (i.e., how the transportation system is managed and operated) while the Demand category addresses use (i.e., what are community expectations for use of the transportation system).

Benefits of TSMO initiatives can be grouped into one or more of the following three categories:

- Improved Mobility: Mobility is the ability of people and freight to reach their destinations. TSMO improves personal mobility by providing travelers with information they can use both before and during a trip to determine the optimal way to reach a destination. TSMO improves freight mobility by enhancing the efficiency of freight operations and provides up-to-date information on the status of shipments.
- Increased Safety and Security: TSMO improves emergency response by enabling faster incident detection, verification, response, and clearance. In addition, notification of an incident can be broadcast to the public, which gives drivers the option of using a different route to avoid delay at the incident scene.
- Reduced Costs: TSMO initiatives generate many financial benefits for individuals, businesses, and governments. Individuals benefit from fuel and time savings. Businesses benefit from reduced freight delivery costs, as well as more efficient dispatching and routing services. Governments benefit from the relatively low implementation costs of TSMO initiatives.

Intelligent Transportation Systems and Services

Examples of Intelligent Transportation Systems and Services currently deployed in the Region in support of TSMO initiatives include, but are not limited to:

- 511ny: NYSDOT maintains and regularly updates the 511ny website, which is New York State's official traffic and travel information source. Real-time information about traffic conditions, as well as trip planning resources, construction updates, and other pertinent information are available on this website.
- Automatic Vehicle Location (AVL): AVL technology enables fleet managers to monitor vehicle operations through the use of a Global Positioning System (GPS). The GPS allows fleet operators to track vehicle locations and dispatch vehicles in real-time.
- Closed Circuit Television (CCTV) Traffic Cameras: Strategically placed traffic cameras provide operators and the public with real-time images of road conditions.
- Coordinated Traffic Signal Operations: Remote-controlled traffic signals allow operators to set signal timing plans that maximize the efficiency of traffic flow during normal operating conditions and adjust signal timing to lessen the impacts of delay on traffic flow.
- Dynamic Message Signs (DMS): A DMS is an electronic sign that displays alerts to motorists regarding travel conditions. A DMS can either be installed permanently or portable so that it can be moved from one site to another.
- Highway Advisory Radio (HAR): NYSDOT and the New York State Thruway Authority broadcast travel updates over their HAR systems. The broadcasts, provide real-time information on incidents, road closures, traffic congestion, and other conditions that might impact travel.
- Highway Emergency Local Patrol (HELP) Program: HELP trucks patrol four designated patrol areas, or "beats", on the region's expressways during the morning and evening peak periods. They respond to incidents ranging from disabled vehicles to major crashes and can provide a range of services, to lessen the impact on travel time.
- Road Weather Information Stations (RWIS): RWIS are sensors installed on or alongside a roadway that monitor weather conditions. The data is relayed to the RTOC to help system operators make informed decisions about how to optimally manage roads during inclement weather.
- System Sensors: System sensors detect congested conditions by monitoring the percentage of time a lane is occupied by vehicles.

<u>Regional Traffic Operations Center (RTOC)</u>

TSMO-supportive technologies and services are managed from the RTOC. Opened in 2002, the RTOC houses personnel from NYSDOT, the New York State Police (NYSP), the Monroe County Department of Transportation (MCDOT), and the Monroe County Airport Authority. By co-locating personnel from these agencies at one site, the RTOC facilitates effective interagency coordination and collaboration as operations personnel constantly monitor the Region's road and bridge network. RTOC personnel actively manage the transportation system by using ITS field instrumentation, which are linked to the RTOC through fiber-optic and wireless communications networks, to respond to situations as they occur.

Connected and Automated Vehicles

Connected and Automated Vehicle technologies have the potential to fundamentally transform the nation's transportation system. These emerging technologies are expected to be deployed within the timeframe of this plan, so it is important for transportation management agencies to begin planning for their impacts on the regional transportation system.

Connected Vehicles are vehicles that use wireless technology to interface with other vehicles and roadside infrastructure. These wireless interfaces relay information regarding vehicle speed, heading, and position between vehicles (vehicle-to-vehicle or V2V) and infrastructure (vehicle-to-infrastructure or V2I). This allows vehicles to maintain situational awareness of surrounding traffic conditions at all times and alert motorists of potential hazards.

Automated Vehicles are vehicles with safety features that function automatically (i.e., without driver input). For example, automated vehicles may be equipped with sensors that detect when other vehicles ahead of them in traffic brake. If the driver of the automated vehicle does not brake within specified parameters, the automated braking function will stop the vehicle before it collides with the vehicle in front of it. Automated vehicles do not need to be connected to other vehicles or infrastructure; they simply monitor traffic conditions and automatically respond to changes in those conditions.

Safety

The ability for people to travel safely, across all modes, is a key determinant of the success of our transportation system. This is especially true for the elderly, youth, bicyclists, and pedestrians – who tend to suffer more serious injuries and fatalities than motorists due to their enhanced vulnerability – and for people with lower incomes, who bicycle and walk more often than others by economic necessity. Enhancing and improving transportation safety is GTC's highest priority.

The popular phrase to describe incidents involving motor vehicles that result in injury, fatality, or property damage is that "accidents happen". However, many of these incidents are anything but accidental. The New York Governor's Traffic Safety Committee (GTSC) reports that during 2013, out of 83 fatalities recorded in the nine-county Region, 26 (31 percent) were alcohol-related and 27 (32 percent) were speed-related. Underscoring the importance of "human factors" the GTSC reports that law enforcement officials identified unsafe driver behavior as a factor in more than 90 percent of all such "accidents" in the Region during 2013.

As the behaviors leading to these events can in many cases be predicted, understood, reduced and ultimately eliminated, they are better referred to by their results: crashes. During 2013, the GTSC reports that more than 25,000 crashes occurred in the Region. These include the 83 fatalities noted above as well as more than 7,000 crashes involving personal injuries and 18,000 non-injury crashes involving property damage of more than $1,000 in value.

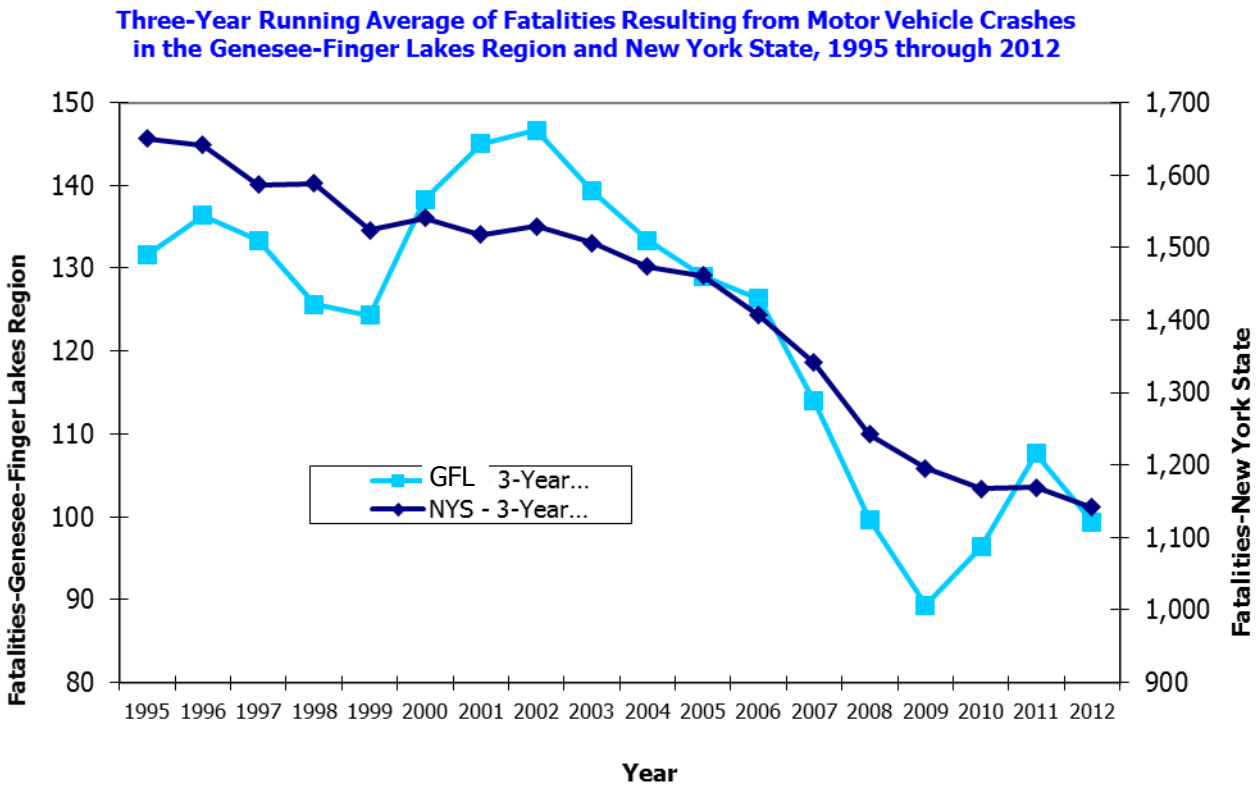
In its November 2011 report *Crashes vs. Congestion*, the AAA estimated that during the year 2009, the societal cost of crash fatalities in the Rochester urbanized area was $360 million and the cost of injuries was more than $1 billion. These totals reflect the staggering economic cost of fatalities and injuries but cannot begin to account for the human pain, suffering and loss affecting crash victims, families, and friends.

To identify the long-term trend and account for unusual variations in a single year, fatalities resulting from motor vehicle crashes in the Region and in New York State were analyzed using a three-year rolling average. As presented in Exhibit 28, there has been a long-term decrease in the number of fatalities resulting from motor vehicle crashes statewide, matching national trends, since 1995. However, at the regional level the trend is not consistent even with the smoothing provided by the use of a rolling average. The cause for the decline in fatalities in 2009 is unable to be determined without further research.

While required improvements to vehicle safety technology are mandated by the National Highway Traffic Safety Administration (NHTSA) at the federal level, state and local initiatives to reduce and eliminate the injuries and fatalities resulting from crashes are key in addressing causes related to the roadway environment and unsafe actions by pedestrians, bicyclists, and motorists. These state and local level efforts follow two general approaches: 1) safety improvements to infrastructure, and 2) reducing unsafe human behaviors, also referred to as "human factors."

The statewide Strategic Highway Safety Plan (SHSP) prepared by NYSDOT and submitted to FHWA is intended to promote best practices and strategies that, if implemented, could have a substantial impact on reducing fatal and injury crashes. The 2010 SHSP identifies seven emphasis areas including driver behavior,

Exhibit 28



pedestrians, large trucks, motorcycles, highways, emergency medical services, and traffic safety information systems. Although the SHSP describes and includes behaviorally-focused initiatives its most critical role is guiding the implementation of the Highway Safety Improvement Program (HSIP) in advancing infrastructure improvements that improve safety. In New York State, NYSDOT administers the HSIP on behalf of FHWA and with the participation of the MPO's in a data-driven process intended to identify and implement cost-effective improvements to transportation safety for all users. Examples of the types of improvement funded by the HSIP include installing pedestrian countdown timers to improve crossing safety and rumble strips to help reduce run-off-the-road crashes. The HSIP implements site-specific improvements to address identified opportunities to reduce crashes at particular locations as well as systemic safety improvements (such as the rumble strips and countdown signals described above) to improve safety system-wide.

Human behavior including consumption of alcohol, excessive speed, and driver distraction is a contributing factor in many crashes and can be addressed by a variety of countermeasures, primarily relevant laws and associated enforcement. Attempts to discourage these unsafe behaviors are extremely important to improving traffic safety and balance infrastructure-based improvements.

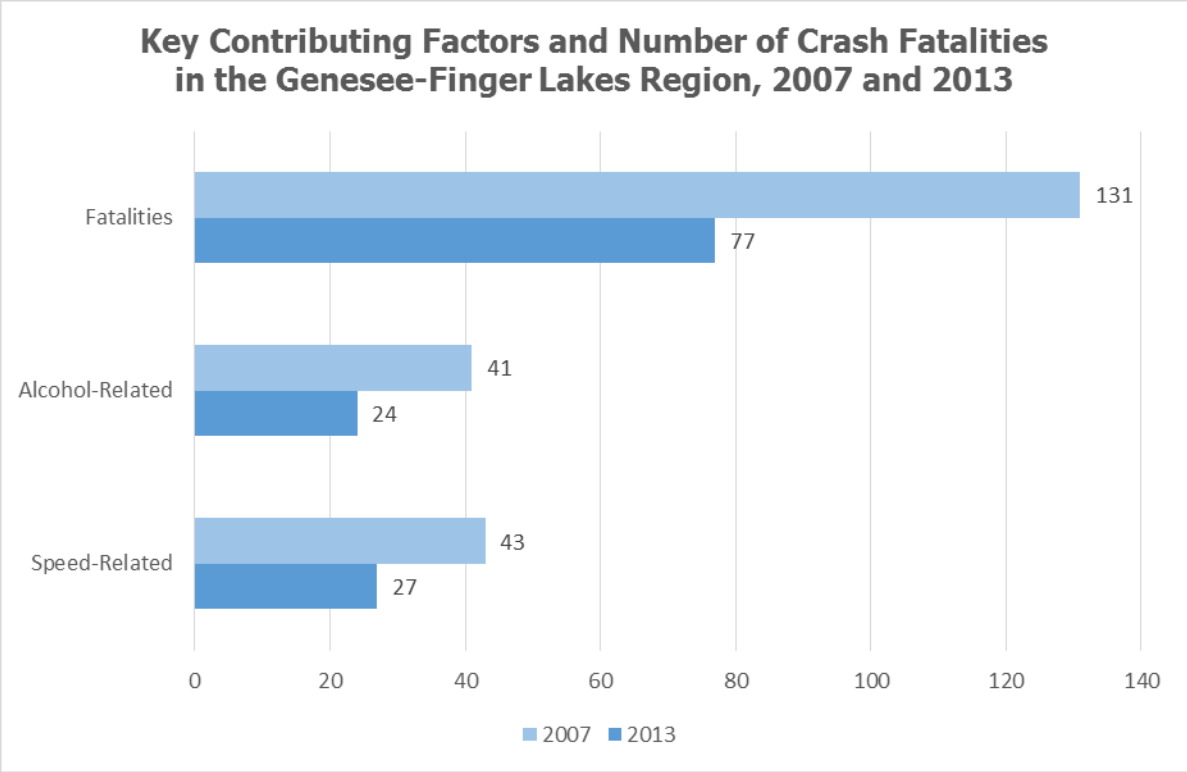
Behaviorally-related safety initiatives are the primary focus of the New York State Highway Safety Strategic Plan (HSSP), prepared by the GTSC and submitted to the NHTSA. The HSSP articulates the state's traffic safety priorities at both the state and local level and the state's performance-based plan for achieving its goals. The 2015 HSSP addresses the following program areas: Impaired Driving; Police Traffic Services; Motorcycle Safety; Pedestrian, Bicycle and Wheel-Sport Safety; Occupant Protection; Traffic Records; and Community Traffic Safety Programs and Program Management.

The HSSP emphasizes data-driven programs to increase safe behaviors such as seat belt and child restraint use and to reduce dangerous behaviors such as impaired driving and speeding. The HSSP guides the implementation of the State and Community Highway Safety Grant Program (Section 402) focusing on programmatic countermeasures. In New York State, the GTSC administers the Section 402 funds on behalf of NHTSA, with the participation of the County Traffic Safety Boards.

The need to implement programs to reduce distracted driving is pressing, and many programs are in progress at the federal, state, and local level. Success for these programs, being newly-implemented, is difficult to assess. However, two areas where "human factors" have long been addressed, excessive speed and impaired driving, do show promising results, as Exhibit 29 illustrates. Efforts to reduce speed- and alcohol-related fatalities have had a positive influence (declines from 41 to 24, and 43 to 27 fatalities, respectively for alcohol- and speed-related crashes).

The HSSP and SHSP share the common goal of improving highway safety while recognizing the need for a balanced approach to achieving that goal. GTC programs and activities are intended to advance both plans through complimentary infrastructure- and program-based countermeasures and by working with partner agencies as well as stakeholders to reduce the burden of motor vehicle crashes on individuals and society.

Exhibit 29



Source: NYS Governor's Traffic Safety Committee

Security and Resiliency

In the context of transportation planning and asset management, security is the reduction of risk to transportation assets from the impacts of hazardous events. Resiliency refers to the ability to prepare for, withstand, and rapidly recover from hazardous events. Strengthening an asset's resiliency to hazardous impacts is a means of improving the security both of that asset and the transportation system as a whole. The concepts of security and resiliency are integrated into the LRTP to establish the policy basis for planning recommendations that:

- Strengthen the transportation system's ability to withstand the impacts of natural and human-caused disasters;
- Accommodate anticipated climate change impacts on transportation infrastructure; and
- Safeguard public investments in transportation infrastructure.

Related concepts that inform the discussion of security and resiliency include adaptation and mitigation. Adaptation refers to the process of better preparing for anticipated hazardous impacts, including extreme weather events. Mitigation refers to the process of minimizing the impacts of hazardous events by reducing the severity of their impacts.

Security and resiliency considerations should be integrated into the transportation planning process on two scales, system-wide and asset-specific. System-wide actions are aimed at improving the ability of the entire transportation system to withstand hazard impacts. Asset-specific actions are aimed at improving the ability of specific assets within of a transportation system, such as a bridge, to withstand hazard impacts.

Critical Transportation Assets are those assets so vital to the safety, efficiency, and reliability of the regional transportation system that their damage or destruction would have a debilitating impact on public health and safety, the regional economy, and general community well-being. All transportation assets (e.g., infrastructure, facilities, equipment, and personnel) are vulnerable to one or more hazards.

Impacts of Hazards

The Region is fortunate in that it is not exposed to natural hazards such as hurricanes, tornadoes, earthquakes, and volcanos to the same degree as other parts of the United States. However, the Region is vulnerable to severe winter storms and ice storms, flooding, and high wind events.

Severe winter storms and ice storms can impact the entire Region. These storms may cause white-out driving conditions, temporary road blockages due to icing or snow accumulation, and place a strain on highway and emergency response personnel and equipment as they work to keep roads clear and respond to incidents.

Flooding can occur throughout the Region, but is a particular concern along streams, rivers, and lakes, especially in floodplains; in low-lying areas with poor drainage; in areas with high water tables such as wetlands and locations with poor soil drainage; and in areas near drainage channels, culverts, dams, and other water control structures when runoff exceeds drainage capacity. Flooding may cause minor damage to assets, such as leaving a layer of mud and debris on a road, or it can completely wash out roads, bridges, and culverts. Floods may also cut off access to support facilities, preventing highway crews and emergency response personnel from accessing an incident scene.

High wind events may knock down trees, power lines, and other objects into roads, causing a temporary obstruction. In addition, high wind events pose a special hazard for trucks and other high profile vehicles, which may be blown over.

Two human-caused hazards that pose the greatest threat to the region are hazardous materials spills and terrorist acts. Hazardous materials spills are a special concern on roads handling a high volume of truck traffic. They may result in fires and explosions, posing a severe hazard both to emergency responders and the public. Impacts from a hazardous materials spill may range from minor damage to a road surface to the complete destruction of an asset that requires large-scale reconstruction and replacement. A particular source of concern in recent years is the potential for serious infrastructure and environmental damage should a train carrying crude oil derail and explode. Obtaining access to a derailment site is a critical concern for transportation management and emergency response personnel. Acts of terrorism are most likely to be directed against key links in the transportation network, as well as facilities where large numbers of people routinely assemble.

Berne, NY (09/19/2011) Road Damaged by Irene
Image credit: FEMA-Elissa Jun

Countermeasures to strengthen transportation system and asset security fall into one of the following four categories:

1. Preventive actions are aimed at stopping incidents from occurring. For example, a transit agency may restrict access to its bus garage and use security systems to monitor the garage for unauthorized access.
2. Protective actions are taken to minimize damage to assets should an incident occur. This includes asset hardening, such as the use of blast-proof glass in windows.
3. Redundancy countermeasures seek to integrate back-up components into a system or structure to prevent catastrophic failure in the event of an incident.
    - Micro-scale countermeasures are asset specific. For example, a structure such as a bridge is designed and built with multiple support elements so there is no possibility of a single-point failure.
    - Macro-scale countermeasures are system wide. For example, transportation agencies may identify alternate routes so that, in the event of a major flood that leaves a key road impassable, other roads will available to reach a site that would be otherwise inaccessible.
4. Recovery countermeasures are taken to recover from the impacts of an incident event.
    - Short Term actions include the emergency response to an incident event, such as the deployment of police, fire, and emergency medical services to a disaster scene.
    - Long Term actions include the restoration of disrupted services and reconstruction of damaged assets, such as the replacement of a road, bridge, or culvert that was washed out by a flood.

GENESEE TRANSPORTATION COUNCIL

Long Range Transportation Plan for the Genesee-Finger Lakes Region 2040