New York Metropolitan Transportation Council

Congestion Management Process Report

2013 Status Report




ADOPTED ON SEPTEMBER 4, 2013

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EXECUTIVE SUMMARY

Under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), a bill that governed funding of surface transportation spending, metropolitan areas with populations of greater than 200,000 were required to engage in a Congestion Management Process (CMP) in order to provide for "safe and effective integrated management and operation of the transportation system" (Sections 23 CFR 450.320 and 23 CFR 500.105). The process is required to include 1) methods to monitor and evaluate performance, 2) definition of congestion management objectives, 3) establishment of data collection and system performance monitoring programs, 4) identification and evaluation of performance and benefits of management strategies, 5) identification of an implementation schedule and responsibilities, and 6) a process for periodic assessment of the effectiveness of implemented strategies. The CMP requirement was recently carried into the current Federal transportation authorization act – Moving Ahead for Progress in the 21st Century (MAP-21). MAP-21 also includes "Congestion Reduction" and "System Reliability" as two of seven national transportation goals

As an urbanized area with a population over 200,000, the planning area of the New York Metropolitan Transportation Council's (NYMTC) meets the federal definition of a Transportation Management Area (TMA). As a TMA, NYMTC must systematically forecast traffic congestion in its planning area, produce specific performance measurements to identify areas of high congestion, and prepare a program to reduce traffic congestion. The CMP is used to fulfill these requirements and identify strategies for congestion reduction as part of NYMTC's regional planning process. Individual projects and programs resulting from these strategies are defined in NYMTC's Regional Transportation Plan and moved towards implementation in its Transportation Improvement Program.

In 2005, NYMTC first issued a CMP Status Report that summarized the required forecasts of traffic congestion and congestion-reduction efforts in the NYMTC planning area. Under, NYMTC's CMP Procedures, a status report is issued every four years with each new NYMTC Plan. This 2013 CMP Status Report has been developed in conjunction with NYMTC's Plan 2040, and is organized into seven sections:

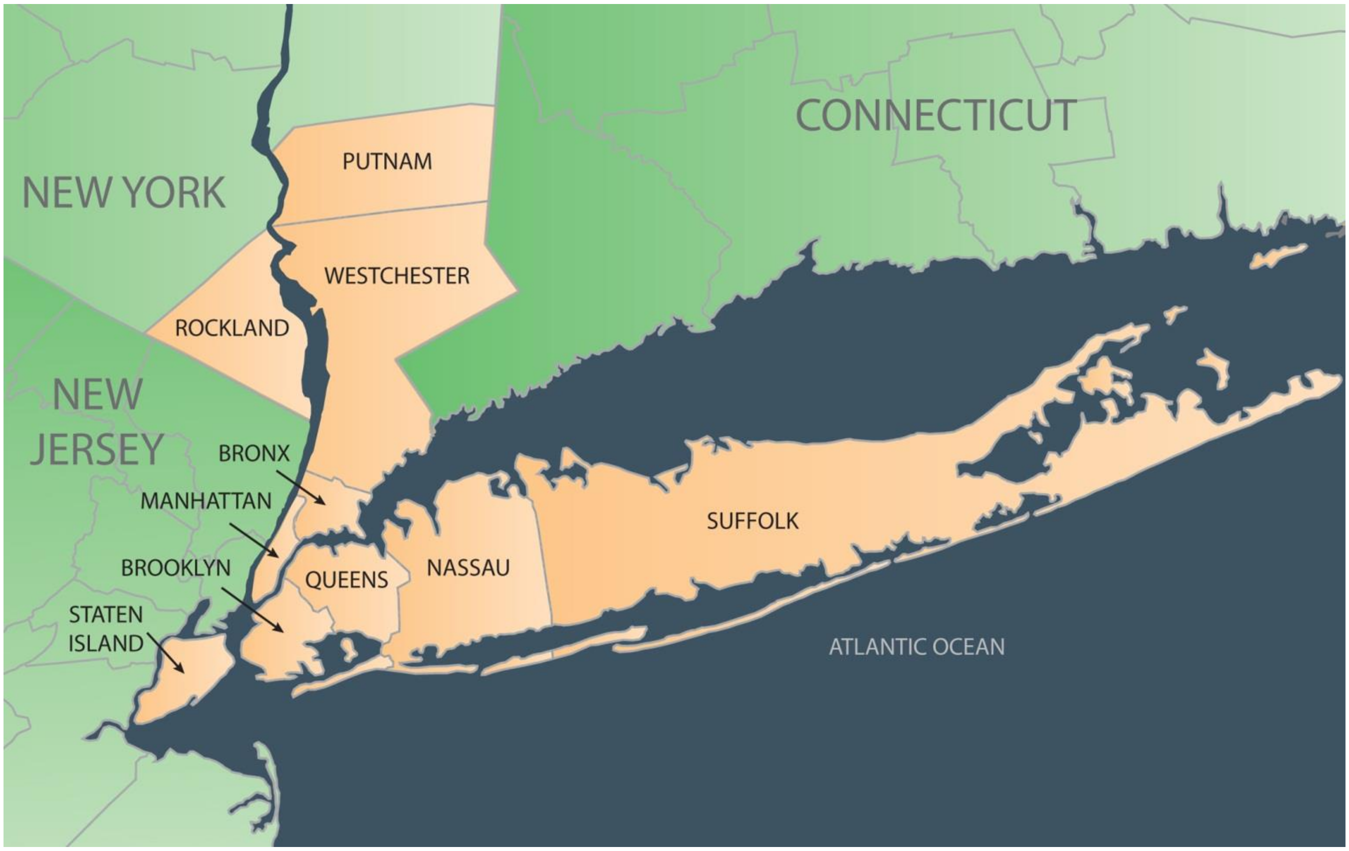
- An introduction summarizes the purpose of the CMP and the work conducted to produce the status report.
- Section 2.0 describes the transportation characteristics within the NYMTC region.
- Section 3.0 describes the Federal regulations related to the CMP and how they relate to NYMTC's CMP.
- Section 4.0 describes the methodology used for the CMP analysis, including tools used for analyzing congestion, selected performance measures, types of analysis performed, and reporting periods and scenarios are described.
- Sections 5.0 and 6.0 present the results of the CMP analysis at two levels – regional in Section 5.0 and county in Section 6.0. In response to the CMP analysis results, a description of the strategies committed to and further discussed in the Plan, as well as a toolbox of strategies for mitigating congestion is provided.

1.0 Introduction

NYMTC is a regional council of governments designated by the Governor of the State of New York and certified by the federal government to serve as the metropolitan planning organization (MPO) for New York City, suburban Long Island, and the lower Hudson Valley. The NYMTC planning area includes ten counties with an area of approximately 2,440 square miles and a population of close to 12 million people (64 percent of the population of New York State). Figure 1.1 presents the counties of the NYMTC region.

Designated in 1982, NYMTC provides a collaborative forum for regional transportation planning for sixteen members. Those members include five suburban counties (Nassau, Suffolk, Westchester, Rockland, and Putnam) and the City of New York as represented by the New York City Department of Transportation and the New York City Department of City Planning, the New York State Department of Transportation, the Metropolitan Transportation Authority and several advisory members, including the Port Authority of New York and New Jersey.

Figure 1.1 Map of NYMTC Region



The NYMTC Regional Transportation Plan (the Plan), Plan 2040, acknowledges that "Chronic severe congestion on roadways, on transit and rail, and in the air, can undermine the region's continuous economic success," as well as the region's quality of life. A Congestion Management Process (CMP), federally mandated for all regions with populations greater than 200,000, the CMP is intended to help NYMTC's members enhance the regional planning processes by establishing an objective set of performance measures to define and quantify transportation system congestion, a toolbox of strategies to address congestion, a methodology to evaluate and prioritize congestion-reducing projects and strategies, and a mechanism to periodically assess the effectiveness of implemented strategies relative to previously established performance measures.[1]

With its 2005 CMP Status Report and the 2009 update, NYMTC met the federal requirements by developing tools and procedures for measuring congestion, identifying strategies for congestion reduction, and defining individual projects and strategies to address congestion, with associated funding, in the Transportation Improvement Program (TIP). NYMTC's most recent federal certification review made three comments or recommendations directly related to the CMP:

- First, the review recommended the use of two additional performance measures – accessibility and reliability. Performance measures are developed as a part of the CMP to understand congestion problems, assess potential solutions, and evaluate implemented strategies. NYMTC has included reliability and accessibility measures in the list of performance measures adopted for this report. Reliability reflects the variability in congestion due to nonrecurring events such as traffic crashes and incidents, weather, special events, and normal fluctuations in travel demand. Accessibility captures the ability of residents in the NYMTC region to access jobs, goods and services and for employers to have access to employees.
- Second, the review recommended that NYMTC conduct a peer review of comparable MPO Congestion Management Processes. NYMTC has undertaken a peer review process as part of the current CMP update and documented the results in a report titled,
- Third, FHWA and FTA recommended that NYMTC clarify how the CMP is integrated with the Plan and used to prioritize projects in the Transportation Improvement Program (TIP). Section 3 of this report explains the role of the CMP in NYMTC's planning and programming process.

The 2013 CMP Status Report is organized into seven sections, followed by two appendices. Following this introduction, Section 2.0 describes the characteristics of the transportation system in the NYMTC region. Section 3.0 describes the relationship between Federal regulations and elements of NYMTC's planning and programming process, including the CMP. Section 4.0 describes the methodology used for the CMP analysis, including tools used for analyzing congestion, selected performance measures, types of analysis performed, and reporting periods and scenarios are described. The results of the CMP analysis are provided at two levels – regional and county – in sections 5.0 and 6.0 respectively. In response to the CMP analysis results, section 7.0 describes the strategies committed to and further discussed in the Plan. Appendix A contains a toolbox of strategies for mitigating congestion, while Appendix B contains a worksheet summarizing the characteristics of the most congested corridors in each county or borough in the region.

[1] Cambridge Systematics, 2008. *The Congestion Management Process: A Guidebook.* Federal Highway Administration, Washington, D.C.

2.0 Transportation System Characteristics

The New York metropolitan area has one of the oldest, largest, most complex and highly utilized transportation networks in the world. On a typical weekday, the region's multimodal transportation network handles millions of passenger trips and thousands of tons of freight shipments. The share of travelers using public transportation is much higher than in other regions of the United States. Within the NYMTC planning area, the transportation system includes:

- Nearly 480 route miles of commuter rail and 225 route miles of subway tracks in passenger service, plus hundreds of miles of local, express, commuter, and intercity bus routes and an aerial tramway;
- An extensive network of passenger hubs, such as bus terminals and subway transfer facilities, ferry landings, and train stations where people transfer between modes of transport, including one of the most successful rail-to-airport links in the country;
- More than 1,100 miles of bicycle facilities, ranging from shared-use bike trails to on-road bike lanes, in addition to pedestrian sidewalks, trails, and paths;
- More than 50,000 lane miles of roads and highways, including more than 30 major bridges crossing navigable waterways (there are over 3,200 bridges of all types in the region), four major underwater vehicular tunnels, and special lanes for high-occupancy vehicles (HOV) and buses;
- Four commercial service airports, plus general aviation and heliport facilities;
- Major deepwater seaport facilities owned and operated by a mix of public and private sector entities, plus an extensive network of marine cargo support infrastructure and services;
- An extensive network of inland waterways supporting barge and ferry services; approximately 20 percent of freight traffic in the region (measured by weight) travels via waterways and approximately one percent by rail. Although less than one-half of one percent of the NYMTC regions' freight traffic (measured by weight) is carried by air cargo;
- More than 400 route miles of freight rail, some of which is shared with commuter rail services;
- A widespread network of freight hubs, including rail transfer facilities, rail yards, and truck-oriented warehouse and distribution centers; and
- Supporting infrastructure like rail yards and highway maintenance facilities, highway rest areas, parking lots and garages, bus depots and transit storage yards, bicycle parking areas, toll plazas, signage, signals, electronics, and other equipment.

The NYMTC planning area also plays a major role in the national rail, road, air, and waterborne networks. Amtrak's busiest facility in the nation is Penn Station, which served 9,493,414 passengers in fiscal year 2012,1 The Port Authority Bus Terminal has long been the primary location for long-distance bus service. In addition, since the late 1990s, curbside-pickup carriers have played an increasing role in transporting bus passengers beyond the region. There are four commercial service airports, including the John F. Kennedy (JFK) and LaGuardia (LGA) airports in New York City, Newark Liberty in northern New Jersey and several other general aviation and heliport facilities of varying sizes that together serve millions of passengers and ship tons of freight both within and immediately beyond NYMTC's borders. Finally, New York and New Jersey host port facilities that are essential to international trade and domestic distribution with one of the largest concentrations of public and private marine terminal facilities in the United States.

Although not a part of the NYMTC planning area, northern New Jersey's and southwestern Connecticut's transportation infrastructure is inextricably linked with New York's. In January 2008, a Memorandum of Understanding (MOU) was signed between MPOs in the New York, New Jersey, Connecticut metropolitan region in order to better coordinate transportation planning activities.[2] New Jersey Transit has an extensive network of commuter rail, light rail and bus services, much of which enters the NYMTC planning area. New Jersey's highways interface with New York at six bridges and tunnels, along with roads which cross the state line into Rockland County. Connecticut funds the majority of Metro-North's New Haven Line operations, as well as crucial bus routes such as the IBus linking Westchester and Connecticut destinations. Numerous roads also cross the state line, and ferries regularly cross from Connecticut to New York destinations.

[2] "MPO MOU Approved." NYMTC Notes, Jan 23, 2008, p. 1. Web. April 30, 2013.

3.0 THE CONGESTION MANAGEMENT PROCESS

Since SAFETEA-LU was signed into law in 2005, metropolitan areas with populations of greater than 200,000 have been designated as Transportation Management Areas (TMAs). All TMAs were required to implement a CMP in order to provide for "safe and effective integrated management and operation of the transportation system" (23 CFR Section 450.320 and 23 CFR Section 500.105). The CMP is required to include the following elements:

1. Methods to monitor and evaluate performance;
2. Definition of congestion management objectives;
3. Establishment of data collection and system performance monitoring programs;
4. Identification and evaluation of performance and benefits of management strategies;
5. Identification of an implementation schedule and responsibilities; and
6. A process for periodic assessment of the effectiveness of implemented strategies.

Since NYMTC's region is a TMA which does not currently attain specific National Ambient Air Quality Standards, additional federal requirements apply to the CMP, including:

- All reasonable, multi-modal Transportation Demand Management (TDM)/Operations and Supply Management (OSM) strategies must be analyzed in corridors where roadway capacity increase is proposed;
- If the analysis demonstrates that the TDM/OSM strategies cannot offset the need for additional capacity, the CMP shall identify all reasonable strategies for managing the increased roadway capacity effectively;
- All TDM/OSM strategies identified in the CMP shall be incorporated into roadway capacity projects or committed to by the State and the MPO; and
- Federal funds may not be programmed in a non-attainment TMA for any roadway capacity project unless based on an approved CMP.

The CMP requirement was recently carried into the most recent Federal surface transportation authorization bill, MAP-21, which includes "Congestion Reduction" and "System Reliability" as two of the seven national performance goals for Federal highway programs. Consistent with the performance measurement and monitoring emphasis of MAP-21, there is now an even greater emphasis on integrating effective target setting, monitoring, and reporting into the CMP process.

MAP-21 contains major changes to the metropolitan transportation planning process including the establishment of a performance-based planning and performance management for both highways and public transportation. MPOs and States are required to establish performance targets that address national performance measures established by the Secretary that are based on seven national goals. These targets must be set in coordination with the state and public transportation providers, within 180 days after the relevant state or public transportation provider sets performance targets.

The national goals and performance measures outlined in MAP-21 are as follows :

1. Safety: Achieve reduction in fatalities and serious injuries on all public roads.

2. Infrastructure Condition: Maintain highway infrastructure assets in state of good repair.

3. Congestion Reduction: Achieve reduction in congestion on the National Highway System.

4. System Reliability: Improve the efficiency of the surface transportation system.

5. Freight Movement and Economic Vitality: Improve freight networks, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.

6. Environmental Sustainability: Enhance the performance of the transportation system while protecting and enhancing the environment.

7. Reduced Project Delivery Delays: Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Performance Measures and Standards outlined in MAP-21 are as follows:

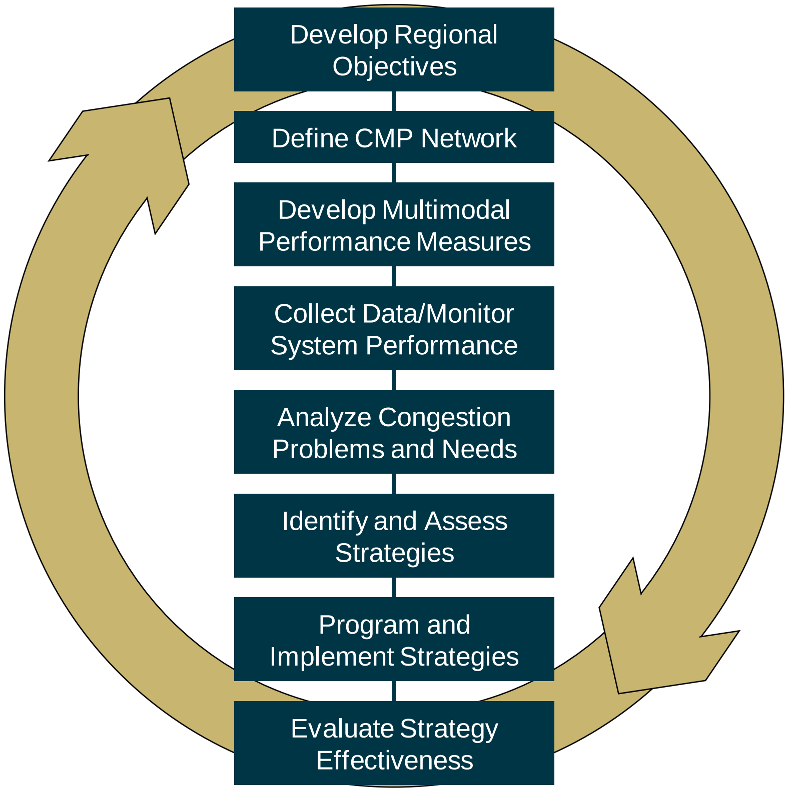
- Minimum standards for bridge and pavement management systems to be used by states
- Performance measures for pavement condition on the Interstate system
- Performance measures for pavement condition on the non-Interstate
- Performance measures for bridge conditions on the NHS
- Performance measures for the performance of the Interstate System
- Performance measures for performance of the non-Interstate NHS
- Minimum levels for pavement conditions on the Interstate System (which may be differentiated by geographic regions of the United States)
- Performance measures to assess serious injuries and fatalities per VMT
- Performance measures to assess the number for serious injuries and fatalities
- Performance measures for traffic congestion
- Performance measures for on-road mobile source emissions, and
- Performance measures to assess freight movement on the Interstate System

The performance measures and standards are based on national goals and aligned to various program and policy areas including the National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), the Congestion Mitigation and Air Quality Improvement Program (CMAQ), and the national Freight Policy.

Consistent with Federal requirements, NYMTC's CMP is a systematic process for planning to address regional congestion by exploring the basic questions of where, when, and to what extent congestion occurs. The CMP also identifies and evaluates strategies that can be considered by NYMTC's members for reducing and managing congestion. NYMTC's CMP is one component of a larger regional planning process, and it is important to describe its role within the overall system. A well-defined CMP is not a replacement for existing planning procedures, and congestion is not the only factor under consideration when planning the priority of transportation improvements. The proper role of the CMP is as a specific element that adds value to the planning process by providing agencies, the public and decision-makers with a tool by which congestion can be examined in greater detail and more effectively addressed.

In 2011, the Federal Highway Administration (FHWA) issued an advisory document entitled *Congestion Management Process: A Guidebook*.[3] The Guidebook is intended to provide guidance on "how to create an objectives driven, performance-based" Congestion Management Process. The Guidebook sets out an eight step Process Model comprised of elements or "actions" common to successful CMPs. The actions, shown in Figure 3.1, are considered essential to CMP formulation, but can be performed in varying sequences and, potentially, iteratively.

Figure 3.1 Actions Commonly Part of a Congestion Management Process



Source: FHWA, 2011.

The Guidebook provides in-depth reviews of the recommended considerations, processes, and partners that should be involved in formulating each action. MPO case studies are provided to illustrate key principles through brief case study inlays. Of particular applicability to NYMTC are the actions that underpin and promote performance-based CMP development: Action 1 (develop regional objectives), Action 3 (develop multimodal performance measures), Action 6 (identify and assess strategies), and Action 8 (evaluate strategy effectiveness). The Guidebook includes a companion document that focuses on the visualization of results.

NYMTC's Plan 2040 includes a set of regional shared goals along with specific desired outcomes and near-term actions that form the foundation of the CMP.

The seven shared goals are:

- Enhance the regional environment;

[3] Federal Highway Administration. *Congestion Management Process: A Guidebook*. Washington, D.C., 2011.

- Improve the regional economy;
- Improve the regional quality of life;
- Provide a convenient and flexible transportation system within the region;
- Enhance the safety and security of the transportation system for both motorized and non-motorized users;
- Improve the resiliency of the regional transportation system; and
- Build the case for obtaining resources to implement regional investments.

Several desired outcomes and near-term actions under these goals are directly related to the CMP. They include the following:

Under the regional shared goal "Enhance the Regional Economy":

- Desired outcomes
  - Reduced traffic congestion and improved air quality; and
  - Reduced greenhouse gas emissions.
- Near-term actions
  - Evaluate and enhance demand management programs;
  - Evaluate and enhance mobile source emissions reduction programs;
  - Inventory greenhouse gas emissions;
  - Plan for expanded road pricing;
  - Implement transit improvements, enhancements in the 2014-2018 TIP;
  - Implement mobility, traffic improvement projects in the 2014-2018 TIP;
  - Implement programmed strategic regional transportation investments.

Under the regional shared goal "Provide a Convenient and Flexible Transportation System within the Region":

- Desired Outcomes
  - A sufficient array of transportation choices;
  - Expanded connections, particularly across modes and between communities;
  - Increased reliability for passenger and freight trips; and
  - Increased transit ridership.

Roadway traffic congestion occurs when vehicle volumes exceed the available capacity of the roadway. Generally, traffic congestion can be categorized as either recurring or nonrecurring. Recurring traffic congestion is caused by the predictable daily use of roadways for work, school, services, and leisure activities. Recurring congestion is exacerbated as demand for road space continues to grow through population and job growth, decreasing land use densities, higher rates of automobile ownership, and rapid growth in truck freight. In contrast, nonrecurring traffic congestion is caused by atypical events, such as highway crashes, other incidents that close lanes or roads, weather conditions, or an increase in traffic demand caused by special events.

According to the Texas Transportation Institute's 2011 Congested Corridors Report the New York area has 5 of the top 20 ranked corridors for least reliable travel based on weekday peak period travel time reliability. New York also had the second highest number of corridors (nine) ranked for truck delay. Traffic congestion is a significant impediment to mobility in the NYMTC planning area and has many negative effects, including increased fuel consumption, air quality impacts, increased vehicular travel costs, and increased costs for shipping goods.

The overall goal of the CMP is to reduce growth of future vehicle trips, particularly during peak travel periods. Consistent with the goals of Plan 2040, the CMP is intended to:

- Improve the mobility of people and goods by reducing vehicle hours of delay and person hours of delay;
- Improve the reliability and convenience of the transportation system, ensuring ease of use, acceptable travel times and reasonable costs;
- Manage the transportation system efficiently to accommodate existing and anticipated demand for movement of people and goods; and
- Provide information on system performance and alternative strategies for alleviating congestion.

In order to accomplish these goals, NYMTC's CMP has been designed to provide:

- Performance measures for measuring regional levels of delay and congestion;
- Data and procedures for measuring changes in regional traffic conditions;
- Computerized highway and transit networks that can be used for simulating regional travel patterns, for estimating regional congestion, and for displaying the results on Geographic Information System (GIS) maps;
- Forecasts of future congestion levels based upon the latest regional population and employment forecasts;
- Procedures for evaluating, at a regional level, strategies for reducing and managing congestion; and
- Procedures for assessing the most effective strategies through NYMTC's Unified Planning Work Program and advancing them to implementation via the Transportation Improvement Program.

As explained in the Section 4.0 "Analysis Methodology", the CMP has been designed to make use of the New York Best Practice Model (NYBPM), NYMTC's regional transportation demand simulation model, to develop forecasts of congestion-related performance measures, and to integrate the findings of the CMP into NYMTC's metropolitan transportation planning process.

The CMP procedures closely integrate the CMP with the metropolitan transportation planning process, as illustrated in Figure 3.2. The CMP is integrated into the planning process as part of the development of the following regional planning and programming documents:

- The Plan, which defines the region's transportation needs and lays out a long range planning framework for improving the transportation system over a minimum of a twenty-year period;
- The TIP, which is a five-year program of all proposed federally funded transportation projects in the NYMTC region; and
- The Unified Planning Work Program , which defines NYMTC's short term (1-2 years) planning priorities.

As shown in Figure 3.2, the CMP involves the direct participation of NYMTC's member agencies. At the regional level, the NYBPM is used as the principal tool for estimating the extent of existing traffic congestion, forecasting the level of future congestion, and evaluating mitigation strategies within the CMP. At the project level, other appropriate planning tools are also utilized to meet CMP requirements, as described in detail in Section 4.0.

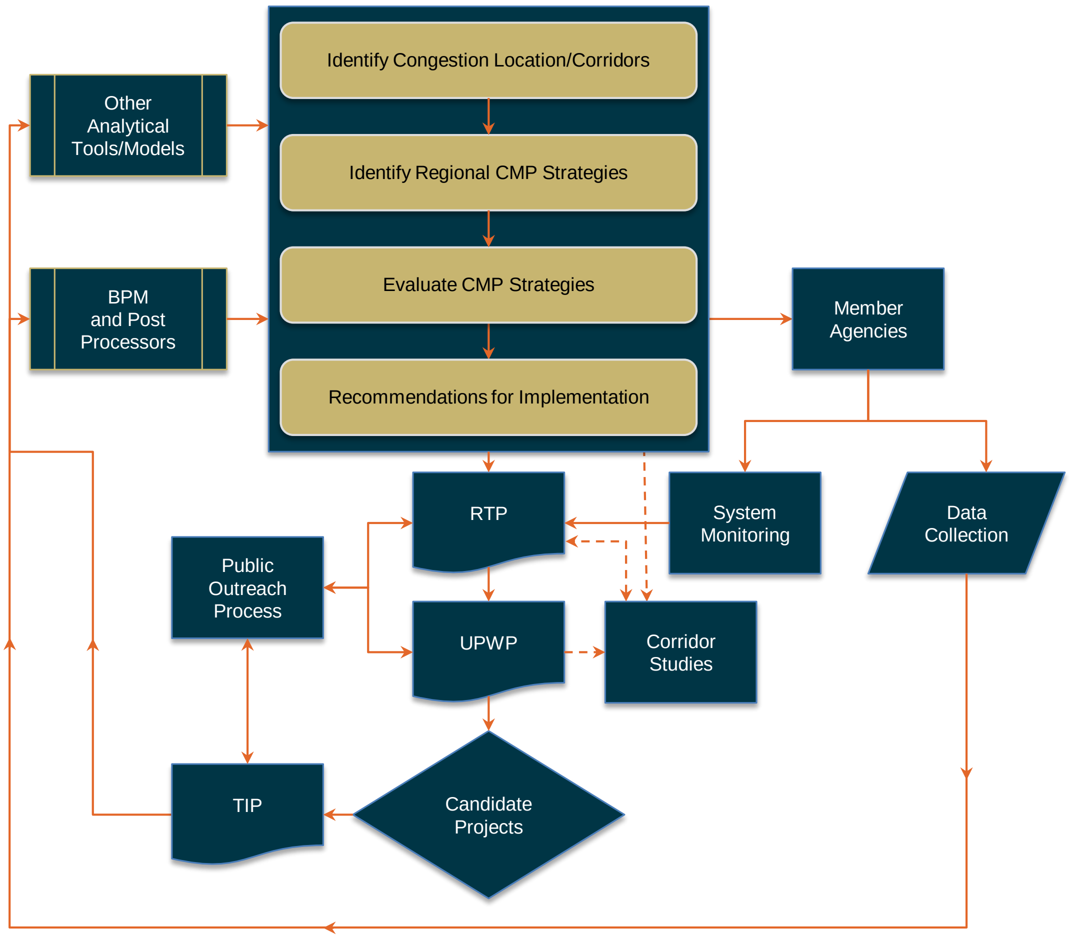
For selected congestion locations, NYMTC's CMP provides a toolbox of strategies to address congestion for consideration by the member agencies (see Section 7.0 and Appendix A). The member agencies propose mitigation projects utilizing the feasible strategies identified through the CMP. This process is repeated every planning cycle, or as needed by the members. Thus, it is both an interactive and iterative process.

System monitoring and data collection are also critical elements of the integration of CMP into NYMTC's overall planning process. Monitoring and data collection efforts provide feedback on the effectiveness of strategies at various levels, which ultimately influences regional policy, planning, and programming of projects for addressing congestion.

The CMP can also influence the development of major project analyses and corridor or areawide studies in two ways. First, it provides system performance information which may be used to identify corridors or segments for detailed analysis. Second, the CMP toolbox identifies alternative congestion management strategies for consideration in studies of this type, which ultimately define transportation improvements. When traffic congestion is referenced in the Purpose and Need statement of a study, the study should consider congestion management strategies included in the CMP as a starting point for the development of alternative strategies.

This does not preclude the study from considering other strategies that may not be in the CMP, nor does it require that the study select a strategy from the CMP as the preferred alternative.

Figure 3.2 Integration of CMP with NYMTC's Planning Process



4.0 Analysis Methodology

This section outlines the methodology used to identify and quantify congestion in the NYMTC planning area. It includes an overview of the transportation area and network, tools used to analyze congestion, the NYBPM, selected performance measures, types of congestion analysis, and reporting periods and scenarios. NYMTC's CMP is applicable to the entire 10-county planning area. Within that area, the CMP is focused on the roadway system; specifically, all roadway functional classes from freeways to minor arterial roadways.

4.1 Analysis Tools

The NYBPM, used with a travel demand model post processor, is the analysis tool used to forecast and analyze traffic congestion within the NYMTC planning area. The NYBPM is a suite of activity-based travel demand forecasting submodels that contains a coded representation of the transportation system – both roadways and transit services – in 28 contiguous counties in New York, New Jersey, and Connecticut, including the 10-county NYMTC planning area. The roadway network in the NYBPM is represented by over 50,000 links, and the transit network is represented through over 1,000 transit routes that include route variations for all forms of public transportation, such as commuter rail, subway, express bus, local bus, and ferry. The NYBPM can be used to forecast travel patterns by time periods, trip purposes, and modes of travel.[4]

- The NYBPM employs the following input data:
- Socioeconomic and Demographic (SED) forecasts – NYMTC's household, population, and employment county forecasts disaggregated to 16 variables at the NYBPM zonal level, with future year forecasts extending to 2040;
- Census data;
- Travel characteristics collected through the Regional Household Travel Survey;
- Twenty-four hour traffic counts at NYMTC screenline locations; and
- Transit ridership counts.

For the 2013 CMP Status Report, the NYBPM was used to estimate the 2014 base year traffic congestion levels, as well as to forecast traffic congestion in the Plan 2040 horizon year. The congestion analysis, described in more detail below, was based on the most recent NYBPM forecasts, which include the programs and projects contained in the fiscally-constrained element of Plan 2040 and the 2014-18 Transportation Improvement Program.

The NYMTC CMP Post Processor was used to develop performance measures from NYBPM outputs. The Post Processor provides system performance reporting capabilities for both general operations and air quality emissions analysis. To calculate traffic volumes, the Post Processor uses the AM and PM peak period and two off-peak period assignments along with a 24-hour traffic volume distribution file (by county and function class) to develop hourly volumes for each roadway link in the NYBPM. The Post Processor computes speeds on all of the links for each hour of the day based on the 24-hour distribution of volumes.

[4] New York Metropolitan Transportation Council, "Data and Model," The Metropolitan Planning Organization, http://nymtc.org/.

4.2 Performance Measures

Performance measures are used in NYMTC's CMP to assess the effectiveness and efficiency of the roadway system. Several performance measures are considered in order to quantify the level of congestion. These performance measures are described below.

Demand-to-Capacity Ratio

Demand-to-Capacity (D/C) ratio is a measure that reflects the level of mobility and the quality of travel of a roadway or a section of a roadway. The D/C ratio compares the roadway capacity with the estimated trip demand generated directly from the travel demand models. The capacity of a roadway is defined as the theoretical maximum volume that can be processed by that roadway during a specified time period. The main advantage of using D/C ratio (instead of the conventional vehicle to capacity or V/C ratio) is to allow estimation of congestion explicitly based on travel demand. (Note: Under saturated flow conditions, field counts cannot reflect the actual travel demand and hence do not provide reliable information about the intensity of congestion, whereas the travel model provides a more comprehensive demand estimate.)

Vehicle Hours of Delay

Vehicle Hours of Delay (VHD) is the sum total of delay experienced by all vehicles on the network. Delay is defined as the difference between estimated actual travel speed and free flow travel speed, and is therefore a measure that is readily understood by the traveling public.

Person Hours of Delay

Person Hours of Delay (PHD) is calculated by multiplying VHD by the average vehicle occupancy rate. As vehicle occupancy differs from place to place, the following rates were used: 1.48 for New York City counties, 1.75 for Nassau and Suffolk counties, and 1.44 for Westchester, Rockland, and Putnam counties.

Average Travel Speed

Average Travel Speed (ATS) is the calculation for a weighted average of speed. The average speed for each element of the road system is multiplied by the amount of travel on the set of roads. Using the amount of travel as a weighting factor provides an average "system experience" of travelers for each portion of the road system.

Lane Miles of Congestion

Lane Miles of Congestion measures the road space that functions at less than free-flow speeds during the peak, and compares actual roadway volume with maximum acceptable volume for the roadway. It reflects the mobility of roadway or section of roadway, indicating the proportion that is congested. Lane Miles of Congestion can easily be aggregated from facility to corridors to subregional to region. For purposes of this performance measure, a roadway is defined as congested if the volume is greater than or equal to 85 percent of the maximum acceptable volume (MAV) for that roadway (essentially the Level of Service E volume).

Travel Time Index

Travel Time Index (TTI) is the ratio of peak-period travel time to free-flow travel time. The TTI expresses the average amount of extra time it takes to travel in the peak relative to free flow travel. For example, a TTI of 1.5 for a specific route indicates that if the free-flow time is 30 minutes, the travel time during peak congestion is 45 minutes.

Vehicle Miles Traveled

Vehicle Miles Traveled (VMT) is another performance measure that is developed by the post processor. VMT is the sum of distances traveled by all motor vehicles in a specified region. Travel demand forecasting is used to generate the average trip lengths for a region. The average trip length measure is then used to estimate vehicle miles of travel, which in turn is used in estimating gasoline usage or mobile source emissions of air pollutants. It should be noted that VMT estimated by the travel model was adjusted for consistency with the observed travel in the base year that is reported for the Federally mandated Highway Performance Monitoring System (HPMS). For the 2014 CMP analysis base year VMT adjustments were made based on the 2007 version of the NYBPM.

Accessibility

Accessibility indicates the collective performance of land use and transportation systems and determines how well that complex system serves its residents. There may be many ways of improving transportation, including improved mobility, improved land use accessibility (which reduce the distance between destinations), or improved mobility substitutes such as telecommunications or delivery services. This performance measure was evaluated outside the post processor environment.

Reliability

Reliability is estimated as the travel time coefficient of variance for each link, by time period, for one day. Reliability is calculated as the average standard deviation of travel time, on links of each road group (freeways, arterials, and local streets), within a county.

4.3 Data Collection

NYMTC's CMP is built on a large database that includes information describing regional travel patterns, the regional transportation network, and regional socioeconomic/demographic patterns.

The data collected and assembled by NYMTC, used to describe regional travel patterns and to enhance the NYBPM includes the following items:

- Travel characteristics
- Traffic counts;
- Speed data;
- Transit data; and
- Freight data.

These data provide the basic information to assess the state of existing and forecast congestion on the regional transportation system. Agencies collect these data to update, calibrate, and validate the NYBPM, among other purposes. Because of these data, the results provided in the CMP reflect the most recent and accurate information available on the state of congestion.

The NYBPM highway and transit networks represent the region's transportation system and simulate traffic conditions.

The data required to adequately model the highway and transit networks include the following items:

- Roadway classifications;
- Number of lanes;

- Posted speed limits;
- Parking restrictions;
- Truck usage;
- Subway and commuter rail routes and schedules;
- Bus routes and schedules; and
- Ferry routes and schedules.

- NYMTC collects and maintains a large socioeconomic and demographic database at transportation analysis zone(TAZ) level covering the 28 counties in the NYBPM study area. The data variables summarized by TAZs include:

- Total population
- Household population
- Group quarters population (total, in institutions, homeless/streets, other)
- Households
- Average household size
- Average household income
- Employed labor force
- Employment (total, office, retail)
- Average earnings per worker
- K-12 school enrollment
- University enrollment

4.4 Congestion Analysis

Three types of analyses were performed to forecast traffic congestion within the NYMTC planning area for the 2013 CMP Status Report: a regional-level analysis, a county-/borough-level analysis, and identification of hot spots (congested locations).

The **regional-level** analysis was performed to assess traffic congestion and the performance of the transportation system on a regional scale. The CMP regional analysis allows a means for assessing the effectiveness of planned transportation improvements in addressing future traffic congestion.

The **county-level** analysis is a subset of the regional analysis, focusing on congestion and system performance in each county and facility group in NYMTC’s planning area.

The **hot spot** analysis identifies bottleneck locations and congested areas within each of the 10 counties in the NYMTC region. A bottleneck is defined as a specific location that causes localized, point-source congestion on the regional transportation system. A bottleneck hot spot typically occurs due to physical capacity constraints or other characteristics that affect traffic flow, such as traffic control devices and weaving movements. The congested area is defined as an area consisting of a set of congested links in proximity or in sequence. Two criteria were used to identify the congested areas within each county, including:

- Demand-to-Capacity (D/C) ratios (greater than 0.8) as an initial screening process; and
- Visual inspection of corridors or areas that experience congestion defined by high D/C ratios.

The CMP Post Processor identifies congested roadway links for each time period. It reports up to 10 top congested links for each county presenting them on the map. It also reports all congested links with Demand-to-Capacity ratios between 0.8 and 1.0 and above 1.0. This Demand-to-Capacity threshold was used to select Hot Spot locations in each county.

For the 2013 CMP Status Report, three time periods (weekday AM peak period, weekday PM peak period, and 24-hour weekday period) and two scenarios (2014 Base Year and 2040 Build) were used for the regional-level and county-level congestion analyses.

The weekday AM and PM peak periods were chosen under the assumption that a significant percentage of the recurring delay can be captured by analyzing these two time periods. The AM peak period is the four-hour morning period lasting from 6:00 AM to 10:00 AM Congestion in this period is typically of greater intensity and shorter duration than the PM peak period and consists primarily of trips between work and home.

The PM peak period is the four-hour evening period lasting from 4:00 to 8:00 PM Congestion in this period is typically of longer duration and lesser intensity than the AM peak period. Trip-making characteristics also are different; while some trips are the reverse of the AM peak period trips (such as work-to-home trips), a significant number of trips are from work to other locations, or from home to other destinations such as retail or recreational. These characteristics are captured by the activity-based structure of the NYBPM.

The peak periods have been selected for analysis instead of the peak hour to account for both the intensity and duration of traffic congestion in the NYMTC planning area. Therefore, only those segments that experience an average demand-to-capacity ratio of 0.8 or greater during the entire AM or PM peak period were identified as a congested link for CMP purposes. The weekday period is the entire 24-hour period. This time period is included as it captures the entire trip-making activity of the population on a typical weekday for all purposes. Although congestion is generally not perceived as occurring on a daily level, a 24-hour study period provides an estimate for the range of congestion throughout the entire day.

The 2014 Base Year scenario reflects current congestion in the NYMTC planning area. The Plan's 2040 Build Scenario includes all transportation improvements NYMTC has made a commitment to in a planning sense by programming them in the 2014-2018 TIP or listing them in the fiscally constrained element of the 2015-2040 Plan, is employed for forecasts of future traffic congestion.

Identification of Congested Corridors – Methodology

The hot spot analysis identifies problem areas with high congestion levels for the entire NYMTC planning area based on high demand-to-capacity ratios. When evaluated at the county level, the process helps to isolate local problems. This effort directly supports the selection and prioritization of potential congestion mitigation projects.

Specific areas of congestion – hot spots – are currently reported by the CMP Post Processor and based on demand-to-capacity ratio for each transportation network segment for all four periods, as well as a daily statistic. The 10 top locations within the highest demand-to-capacity ratio are selected in each county.

To identify congested corridors, congested links identified by the post processor in each county were further evaluated with Congestion Ranks that include the following scoring components and weights:

- **Importance –** Functional class of the roadway (15 percent);
- **Magnitude –** Daily one-way traffic on the link (45 percent);
- **Intensity –** Level of congestion that is based on demand-to-capacity ratio (25 percent); and
- Consistency – number of consecutive congested links on the transportation network (15 percent).

Examples of other possible link scoring components could include severity, based on link average speed estimated by the post processor; and extent, the distance of an individual link.

5.0 Regional Analysis

This section discusses the level of congestion forecast for the entire NYMTC planning area in 2014 and 2040. Congestion levels in the New York metropolitan region are first benchmarked against congestion in other peer regions. Section 5.3 discusses performance measures derived from the forecasts. Section 5.4 presents the top congested corridors in New York City, suburban Long Island and the lower Hudson Valley. Finally potential mitigation strategies and access to regional airports are both considered.

5.1 Comparisons of Congestion

The NYMTC planning area is second only to the greater Los Angeles region (Los Angeles, Long Beach, Santa Ana) in terms of total population, but far exceeds the population density of any other metropolitan region in the country. Among the large peer regions shown in Table 5.1, the NYMTC planning area has the third lowest daily VMT per capita due mainly to high population density and high proportion of transit use.

Table 5.1 Comparison of Daily VMT per Capita and Travel Time Index

Metropolitan Area	2011 Population (million)	2011 Daily VMT/Capita (Freeway + Arterial)	2011 Travel Time Index
NYMTC Planning Area	12.4	15.7 (2014)	1.3 (2014)
Chicago	8.6	13.3	1.25
Philadelphia	5.4	14.9	1.26
Baltimore	2.5	17.9	1.23
Boston	4.3	17.9	1.28
Seattle	3.3	18.6	1.26
Los Angeles, Long Beach, Santa Ana	13.2	19.3	1.37
Washington D.C.	4.6	19.5	1.32
San Francisco Bay Area	4.1	20.1	1.22
Dallas-Fort Worth	5.3	20.3	1.26
Atlanta	4.4	21.3	1.24
Houston	4.1	23.1	1.26

Source: Texas A&M Transportation Institute, *2012 Urban Mobility Report* (all regions except NYMTC).

NYMTC's peer regions evaluate mobility and congestion performance measures as part of their federally-required CMPs; however, comparative performance measurement across regions is difficult given the many different measures and methodologies used to evaluate congestion. As a result, data from the Texas A&M Transportation Institute's Urban Mobility Report, an annual publication that assesses congestion in 101 urban areas across the country, was reviewed to provide a comparison of congestion to New York. Because congestion in the urban mobility report is estimated based on nationally available data, the comparison does not take into account any unique features of New York that do not show up in these data. Also, because the Urban Mobility report is calculated for metropolitan statistical areas (MSAs), the comparisons shown here include northern New Jersey and southwestern Connecticut.

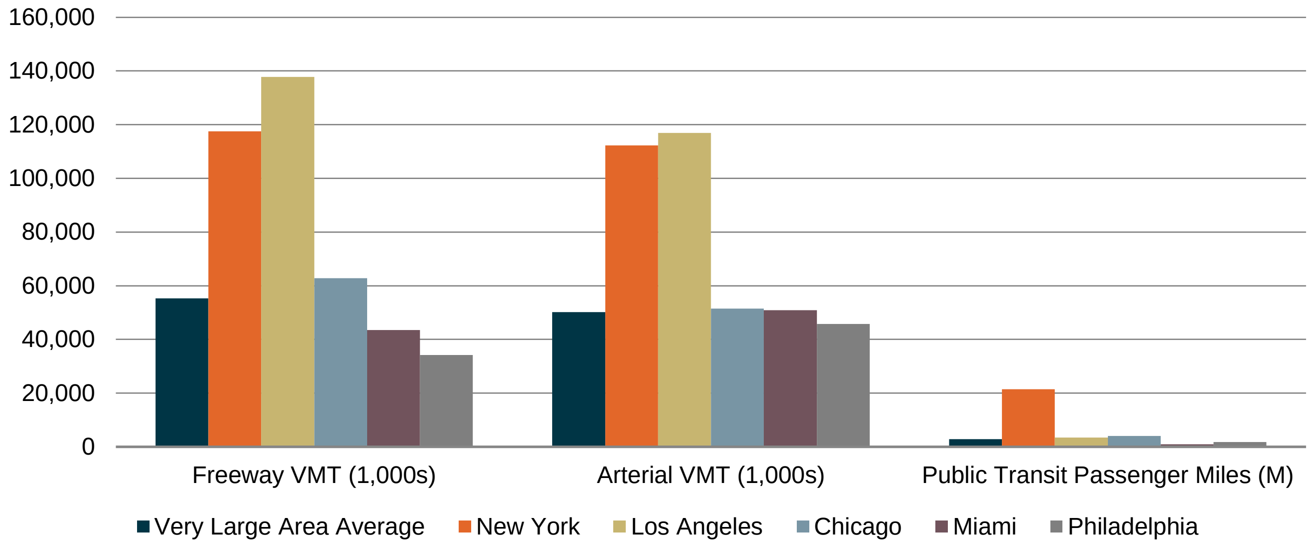
The comparisons are illuminating. The Urban Mobility Report provides estimates of travel, several metrics of overall congestion, plus specific analyses of the impacts of system operations and public transportation on congestion.

For the purposes of this analysis, we compared the New York metro area to other metropolitan areas in the 'very large' category, which includes MSAs with over 3 million residents. In 2011, there were 15 metro areas with over 3 million residents. All comparisons are for 2011.

Travel Estimates

In terms of total travel, only Los Angeles metro area exceeds the volume of travel experienced in New York and no other metro area comes close. The New York metro area has over 10 times the amount of public transit utilization as the average and more than 5 times the next closest, Chicago. Figure 5.1 presents the travel on freeways, arterials, and public transportation for the average of the very large areas and the top 5 travel markets.

Figure 5.1. Travel Volumes in New York and Comparable Metro Areas



Note: Very Large Area refers to a metropolitan statistical area with over three million residents.

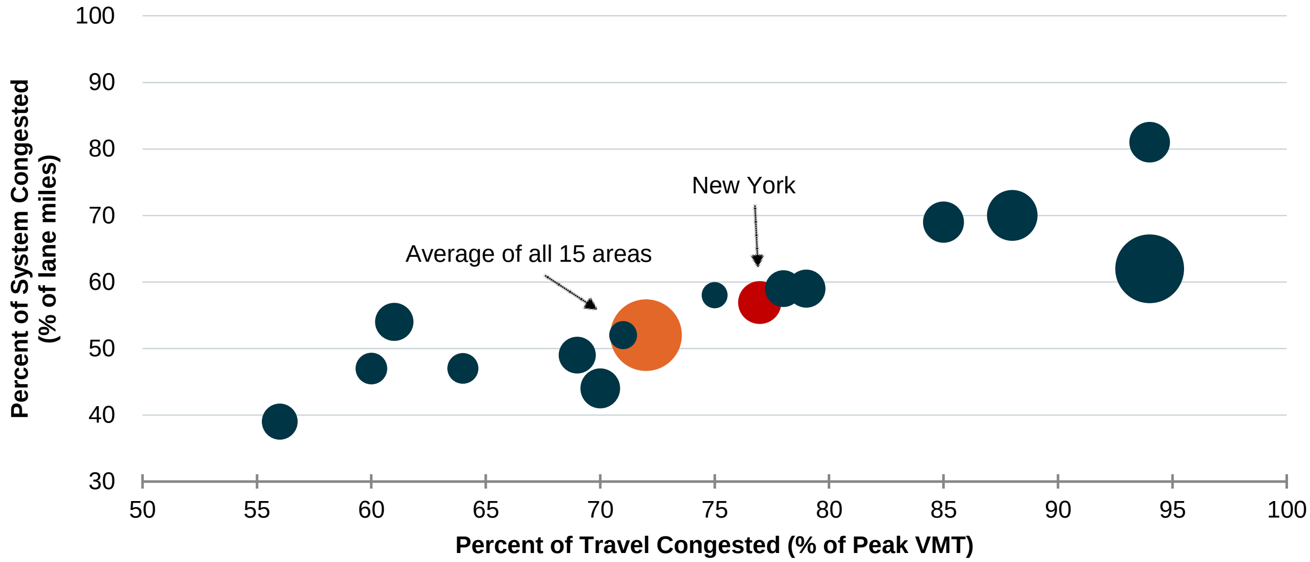
System Congestion

Figure 5.2 presents three indicators of total congestion for the 15 very large metropolitan areas:

- The percent of travel that is in congested conditions (x-axis);
- The percent of the system that is congested (y-axis); and
- Total delay (bubbles are sized based on total delay).

New York is shown in red and the average of all 15 areas is shown in orange. By percent of travel or system, New York is not the most congested area. However, because of the amount of travel, New York travelers experience the most delay (over 500 million hours per year), with only travelers in Los Angeles experiencing anything close to the level of delay.

Figure 5.2 Measures of Systemwide Congestion



Note: Bubbles are sized to total delay. New York is shown in red and the average of all 15 areas is shown in orange.

While total congestion is relevant for the overall economic and social impact that it has, travel time measured on a per person basis controls for the size and scale of the region. On a per person basis, commuters in the New York metropolitan region experience the fourth highest level of travel time per year according to the Urban Mobility Report data, with Washington, D.C., Los Angeles, and San Francisco metropolitan areas exceeding New York levels (Figure 5.3).

The extensive public transportation system in the New York metropolitan region is illustrated by the comparison of travel time index (TTI) and planning time index (PTI) (Figure 5.4). Where TTI is the ratio of travel time in the peak period to travel time at free-flow conditions. A Travel Time Index of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak period. The Planning Time Index is the ratio of travel time on the worst day of the month to travel time at free-flow conditions. A Planning Time Index of 1.80 indicates a traveler should plan for 36 minutes for a trip that takes 20 minutes in free-flow conditions (20 minutes x 1.80 = 36 minutes). The Planning Time Index is only computed for freeways only; it does not include arterial roadways. When a PTI is followed by a number, the number indicates a percentage of on-time arrival. PTI80, translates to the additional time required to ensure an on-time arrival 80 percent or 4 out of 5 times.

Figure 5.3 Per Capita Travel Time

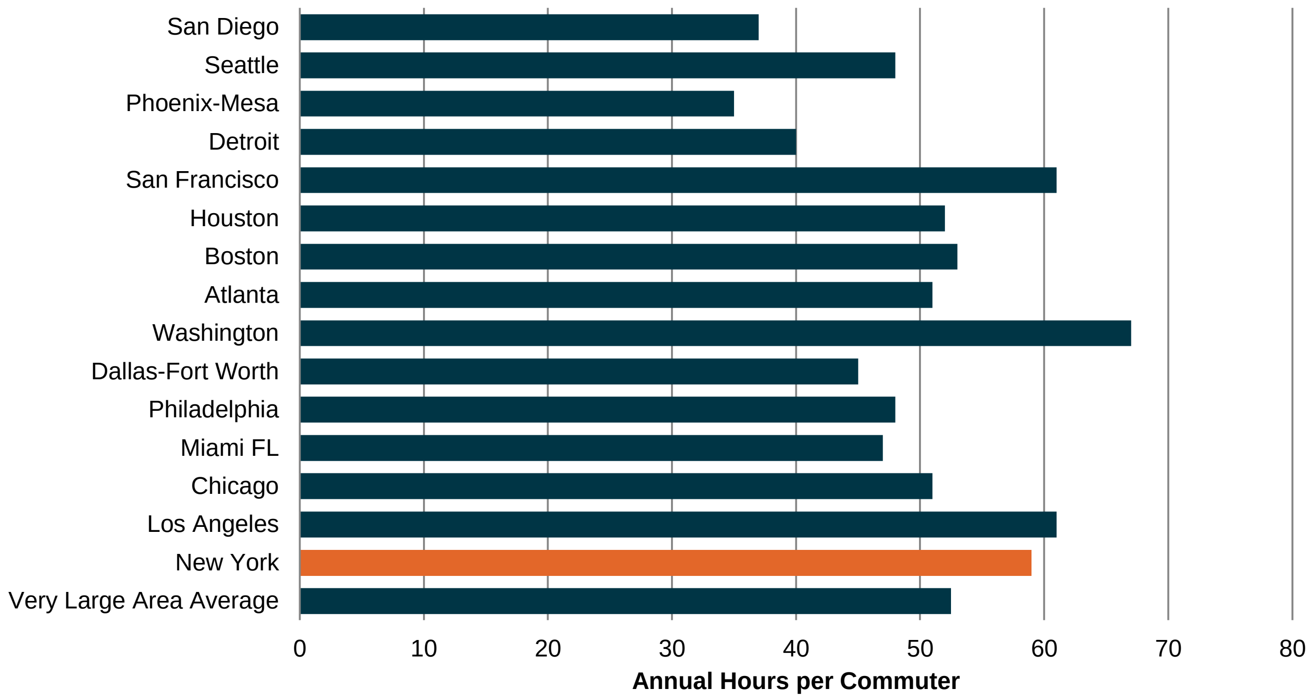
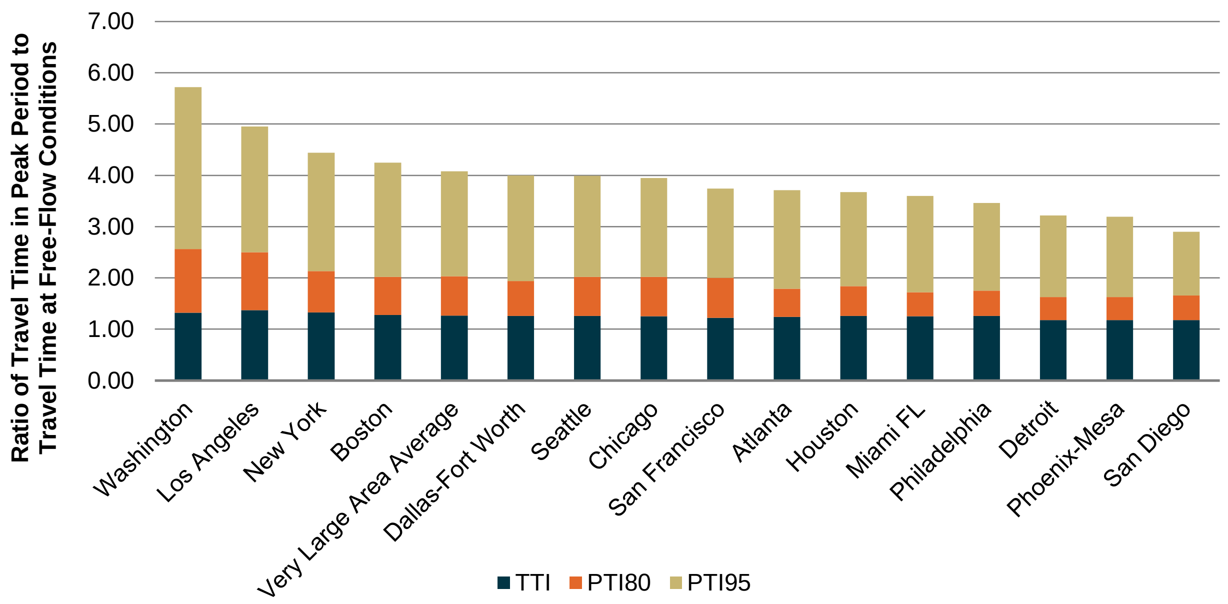


Figure 5.4 Comparison of Travel Time Indices Across U.S. Cities



Note: TTI is the ratio of travel time in the peak period to travel time at free-flow conditions. PTI is the ratio of travel time on the worst day of the month to travel time at free-flow conditions;

PTI80 translates to the additional time required to ensure an on-time arrival 80 percent or 4 out of 5 times. PTI95 translates to the additional time required to ensure an on-time arrival 95 percent.

5.2 Performance Measures

Tables 5.2 and 5.3 provide regional performance measures in the NYMTC planning area, by county, for the years 2014 and 2040. Table 5.4 provides a percentage difference of the two. The first two tables provide estimates by county and time period for the following measures:

- Lane miles of congestion (LMC);
- The travel time index (TTI);
- Daily vehicle miles traveled (VMT);
- Vehicle hours of delay (VHD);
- Person hours of delay (PHD);
- Vehicle hours of delay per one thousand miles traveled; and
- Daily person hours of delay per capita.

Lane miles of congestion appear to be consistently higher in the AM peak compared to the PM peak, across counties. This could be an indication of a sharp peak in the AM (e.g., significant traffic volumes in a single hour) compared to the PM, when volumes are spread more evenly across several hours. TTI estimates reflect the same pattern. The 2012 Urban Mobility Report provides some guidance for interpreting the values of the TTI. In the case of Very Large urban areas (greater than three million residents), , the minimum TTI value for a portion of an hour to be considered congested is 1.12. The average commuter suffered 6 hours of congested road conditions on the average weekday. Queens has amongst the highest vehicle and highway person hours of delay, followed by Manhattan and Brooklyn. Queens' high estimate for LMC is likely due to several very congested roadways that pass through the borough, including the LIE, the BQE, the Van Wyck Expressway, and the Grand Central Parkway. However, the Long Island counties exhibit the highest levels of VMT.

Across counties, VHD per one thousand miles traveled increase marginally between 2014 and 2040, as does daily person hours of delay per capita. Putnam County, however, is forecast to double both measures between 2014 and 2040, likely a result of the large growth compared to the relatively small base.

Figures 5.5 through 5.7 represent modeled VHD, PHD, and VMT, at a county level, for years 2014 and 2040.

Table 5.2 2014 Regional Performance Measures

	LMC		TTI (Weighted by VMT)		VHD	VMT	PHD	Vehicle Hours of Delay per 1,000 Miles	Daily Person Hours of Delay per Capita	Daily VMT/ Capita
Facility Type	**AM**	**PM**	**AM**	**PM**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**
New York City Boroughs										
Bronx	360	60	1.4	1.1	219,060	10,636,250	324,210	20.6	0.23	7.63
Brooklyn	810	470	1.5	1.3	732,080	14,960,260	1,083,480	48.9	0.4	5.9
Manhattan	530	440	1.9	1.3	875,580	9,470,560	1,295,850	92.5	0.8	5.9
Queens	1,320	320	1.7	1.1	1,264,240	26,356,540	1,871,070	48.0	0.8	11.6
Staten Island	60	20	1.1	1.0	61,550	5,581,650	91,100	11.0	0.2	11.7
Suburban Counties										
Nassau	580	330	1.2	1.1	510,440	32,784,990	893,280	15.6	0.7	24.3
Suffolk	140	320	1.1	1.1	251,060	39,731,990	439,350	6.3	0.3	26.0
Putnam	60	20	1.0	1.0	23,290	6,026,010	33,530	3.9	0.3	58.3
Rockland	80	20	1.2	1.0	258,290	8,067,290	371,930	32.0	1.2	25.4
Westchester	190	150	1.1	1.1	200,080	23,328,850	288,120	8.6	0.3	24.1
Region										
NYMTC Planning Area	4,130	2,140	1.3	1.10	4,395,660	176,944,390	6,691,910	24.8	0.6	15.7

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Table 5.3 2040 Regional Performance Measures

	LMC		TTI (Weighted by VMT)		VHD	VMT	PHD	Vehicle Hours of Delay per 1,000 Miles	Daily Person Hours of Delay per Capita	Daily VMT/ Capita
Facility Type	**AM**	**PM**	**AM**	**PM**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**
New York City Boroughs										
Bronx	414	84	1.4	1.1	281,219	11,397,786	416,203.8	24.7	0.3	7.6
Brooklyn	1,006	536	1.7	1.3	959,497	16,225,594	1,420,056	59.1	0.5	5.8
Manhattan	594	587	2.1	1.4	1,164,879	10,702,575	1,724,021	108.8	0.9	5.8
Queens	1,498	393	1.8	1.1	1,670,197	28,011,559	2,471,892	59.6	0.9	10.6
Staten Island	91	54	1.1	1.1	126,574	6,319,429	187,330	20.0	0.3	11.4
Suburban Counties										
Nassau	747	441	1.2	1.1	697,930	34,553,560	1,221,378	20.2	0.8	22.7
Suffolk	255	460	1.1	1.1	374,847	45,453,222	655,982	8.2	0.4	25.4
Putnam	167	34	1.1	1.0	67,415	8,198,783	97,078	8.2	0.7	62.1
Rockland	195	68	1.3	1.1	454,119	10,055,092	653,931	45.2	1.8	27.7
Westchester	331	363	1.1	1.1	317,228	27,840,339	456,809	11.4	0.4	24.6
Region										
NYMTC Region	5,299	3,021	1.3	1.12	6,113,906	198,757,939	9,304,681	30.8	0.7	15.9

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Table 5.4 Percentage Difference between 2040 and 2014 Regional Performance Measures

	LMC		TTI (Weighted by VMT)		VHD	VMT	PHD	Vehicle Hours of Delay per 1,000 Miles	Daily Person Hours of Delay per Capita	Daily VMT/ Capita
Facility Type	**AM**	**PM**	**AM**	**PM**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**
New York City Boroughs										
Bronx	13.9%	33.3%	4.4%	0.7%	28.4%	7.2%	28.4%	19.8%	18.9%	-0.7%
Brooklyn	24.7%	14.9%	7.1%	3.0%	31.1%	8.5%	31.1%	20.8%	18.1%	-2.2%
Manhattan	11.3%	34.1%	11.1%	2.5%	33.0%	13.0%	33.0%	17.7%	16.1%	-1.3%
Queens	13.6%	21.9%	6.9%	2.0%	32.1%	6.3%	32.1%	24.3%	13.7%	-8.5%
Staten Island	50.0%	150.0%	2.7%	3.0%	105.6%	13.2%	105.6%	81.6%	77.9%	-2.0%
Suburban Counties										
Nassau	29.3%	33.3%	3.8%	2.9%	36.7%	5.4%	36.7%	29.7%	21.1%	-6.6%
Suffolk	85.7%	43.8%	1.0%	0.7%	49.3%	14.4%	49.3%	30.5%	27.7%	-2.2%
Putnam	183.3%	50.0%	6.0%	0.4%	189.5%	36.1%	189.5%	112.8%	126.8%	6.6%
Rockland	150.0%	250.0%	7.9%	1.7%	75.8%	24.6%	75.8%	41.1%	53.8%	9.1%
Westchester	73.7%	140.0%	2.6%	2.7%	58.6%	19.3%	58.5%	32.9%	35.2%	1.7%
Region										
NYMTC Region	28.3%	41.1%	4.4%	1.8%	39.1%	12.3%	39.0%	23.8%	25.5%	1.4%

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Figure 5.5 NYMTC Planning Area Daily Vehicle Hours of Delay by County

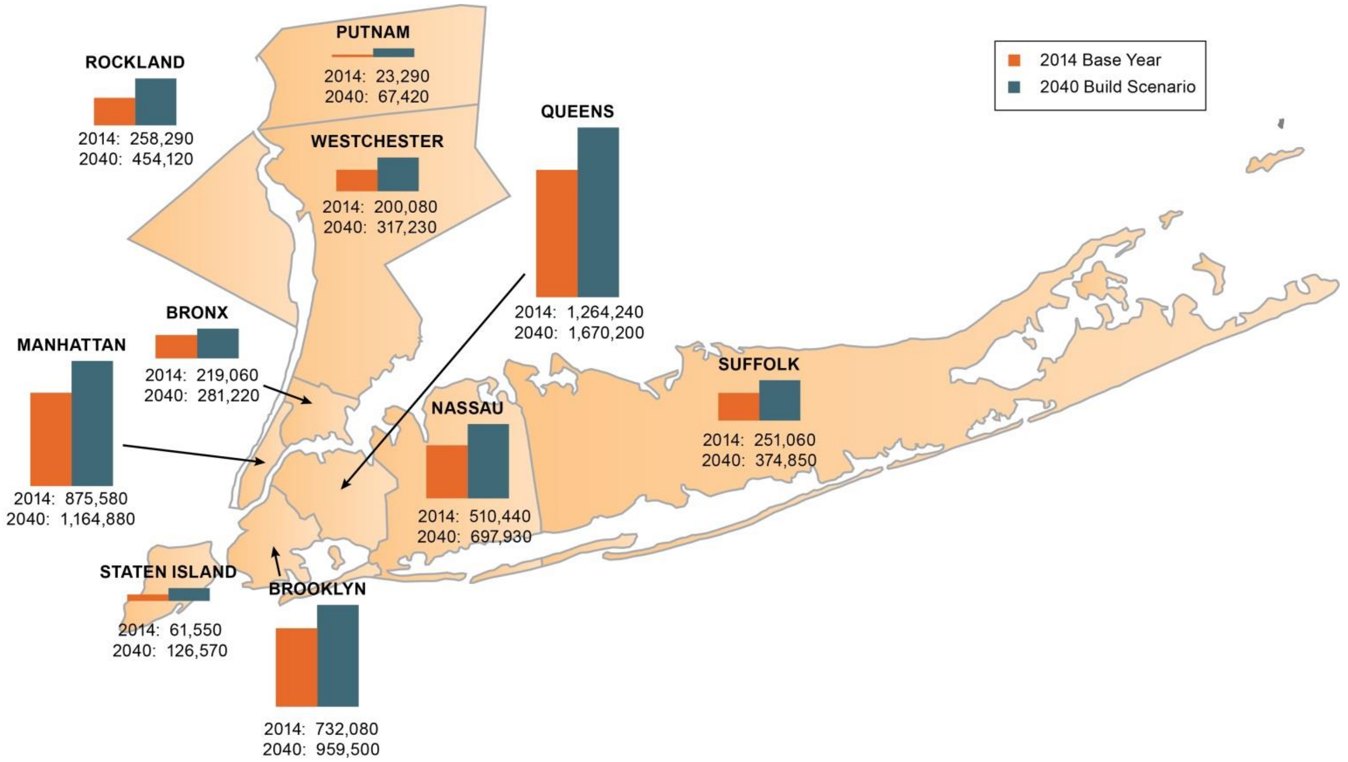


Figure 5.6 NYMTC Planning Area Daily Person Hours of Delay by County

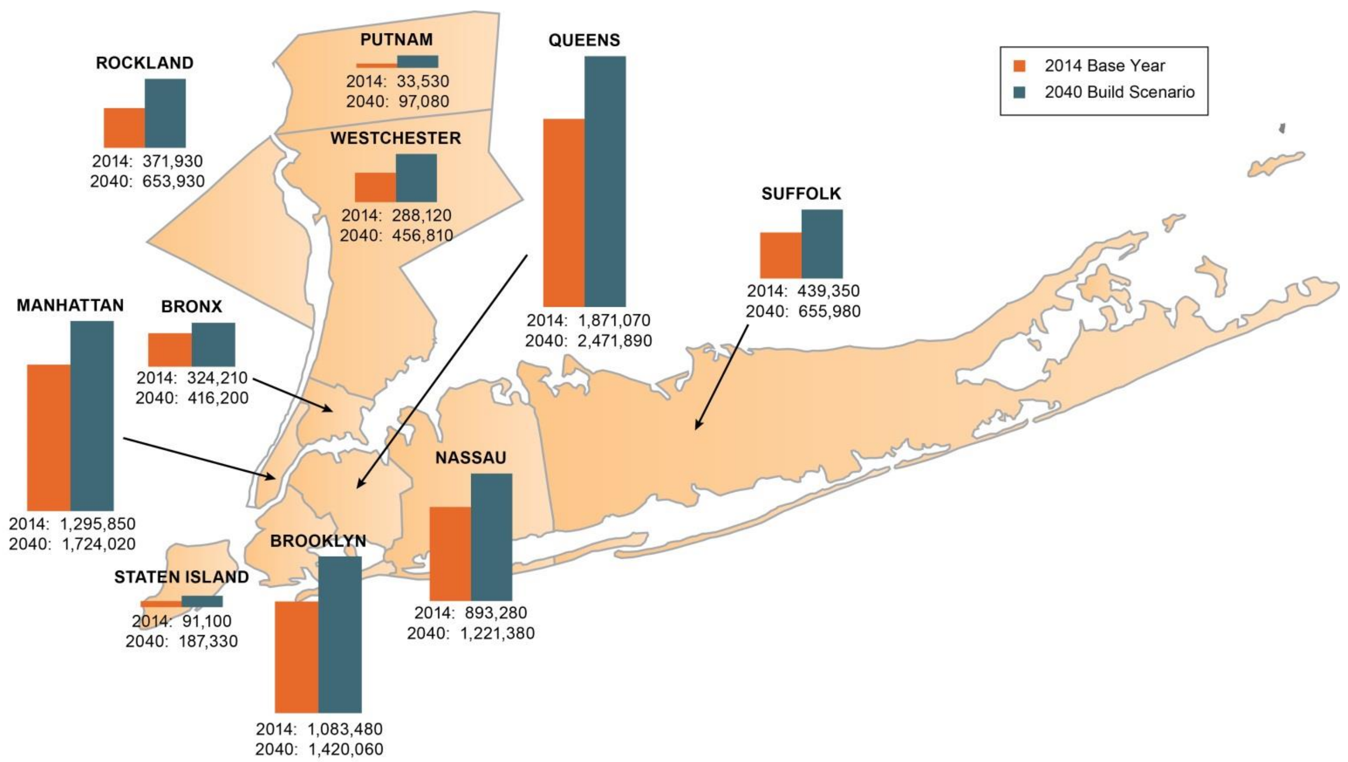
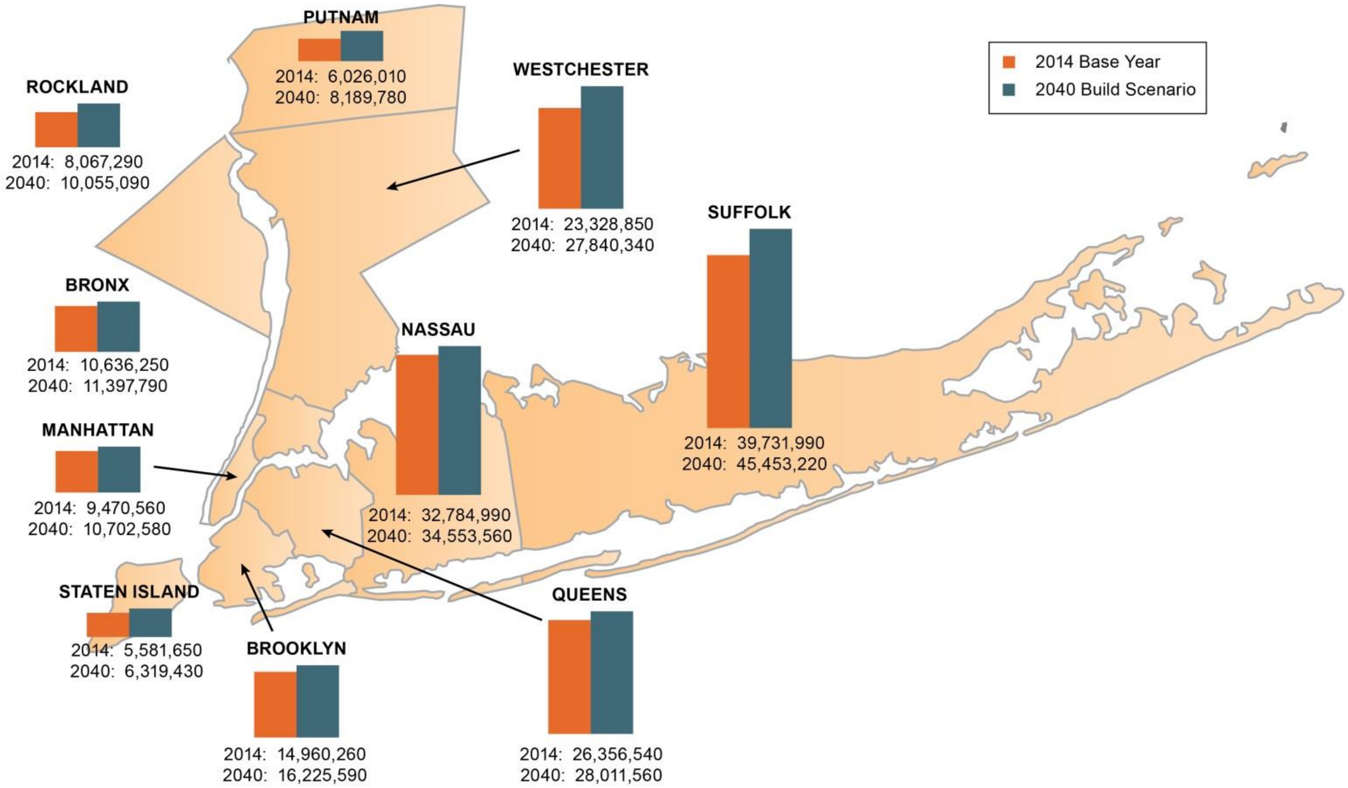


Figure 5.7 NYMTC Planning Area Daily Vehicle Miles Traveled by County



Reliability

Increasingly, transportation agencies are looking to travel time reliability as a measure to capture system performance. Travel time reliability typically refers to the variability of travel times that travelers experience from one day, season, or year to the next. The focus on reliability comes from the recognition that congestion is a function of several root causes, including crashes and other incidents, special events, weather, and normal fluctuations in demand in addition to limited capacity.

A variety of performance measures have been developed to measure reliability, but all of them draw from the distribution of travel times on a given segment, corridor, or system. Common reliability measures in use today include:[5]

- The planning time index (PTI) and other variants of the travel time index. These measures capture the multiple of free flow time (travel time under uncongested conditions) required to complete a given percentage of trips ‘on time.’ The PTI typically considers the 95th percentile of travel time (i.e., a PTI of 3 means that a traveler must allow for a trip that is three times as long as free flow time to be on time 95 percent of the time). The PTI is a special instance of the TTI measure, which typically considers the relationship between average travel time and free flow time. The 95th percentile can be thought of as one day a month. Several agencies also consider the 80th percentile which might be thought of as the travel time that a system user may expect once a week.

[5] The SHRP 2 Reliability program has developed several measures of reliability through a range of projects. SHRP 2 L03, *Analytical Procedures for Determining the Impacts of Reliability Mitigation Strategies*, has the most current published version and can be found at: http://www.trb.org/Main/Blurbs/166935.aspx.

- The semi variance is a one-sided variance that looks at the relative variation of the entire travel time distribution (i.e., the sum of the difference of each observed travel time from free flow, calculated only in one direction).[6]
- The buffer index is similar to the planning time index, except that it compares the 95th percentile of travel time to average travel time.
- Failure measures capture the percent of trips that occur on a segment or corridors above some threshold (e.g., 2.5 times free flow speed).

As one of the largest metropolitan areas in the U.S., the NYMTC region experiences significant unreliability on its road network. A recent study by the Texas A&M Transportation Institute of the most congested highway corridors in the U.S., identified 28 congested highway corridors in the NYMTC region. The TTI data are drawn from continuous travel time data that, to date, has been most effectively collected on limited access facilities. This analysis does not address the reliability of the arterial network, which is of equal concern.

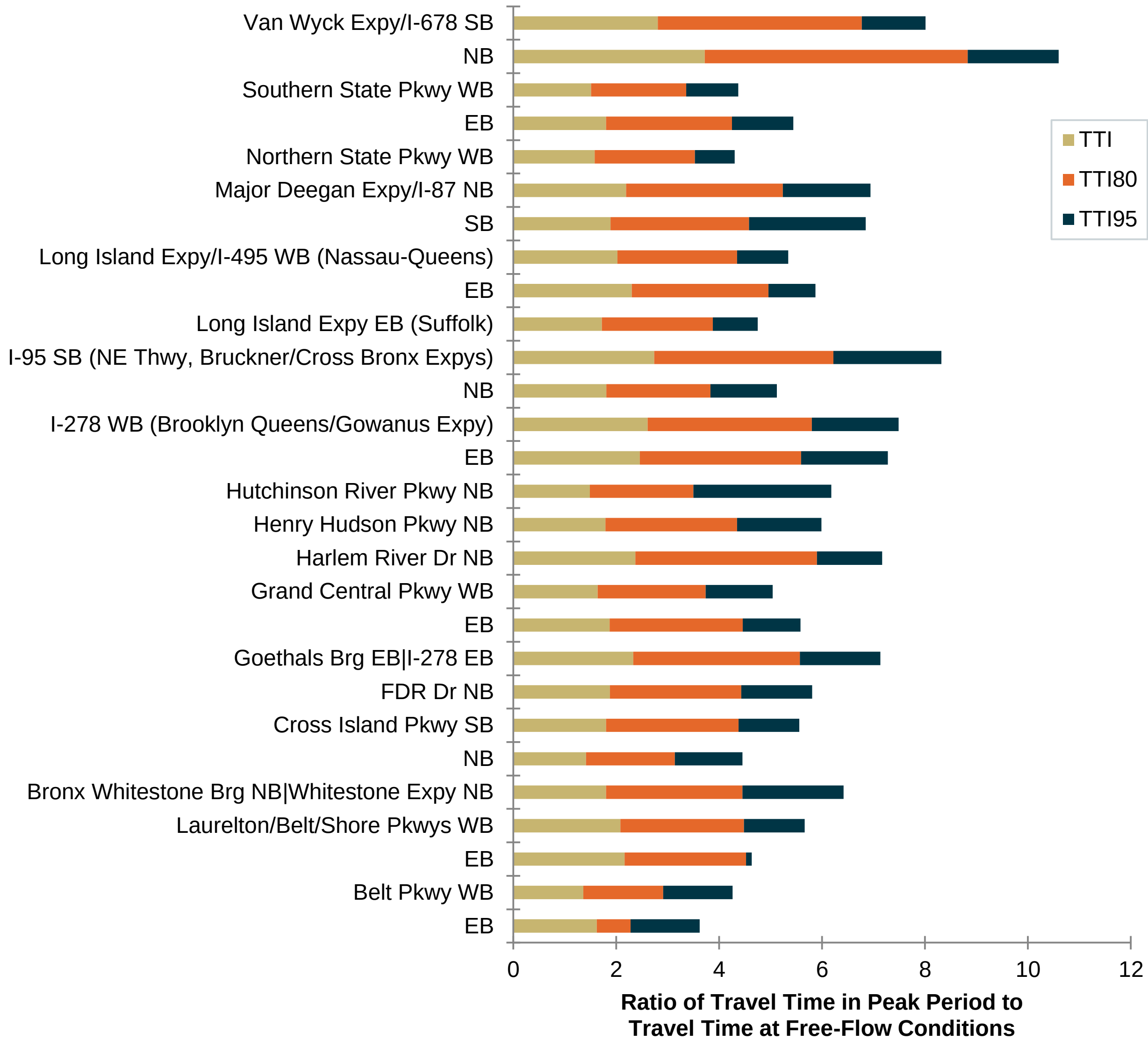
Figure 5.8 presents reliability performance measures drawn from the TTI report for the corridors in the NYMTC region. Three measures are shown:

- TTI – the ratio of average travel time to free flow travel time
- TTI_{80} – the ratio of the 80th percentile of travel time (the 80th worst travel time) to free flow time – this measure captures how unreliable travel is on a corridor roughly once a week
- TTI95 – the ratio of the 95th percentile of travel time to free flow time – this measure captures how unreliable travel is on a corridor roughly once per month.

Nearly all of the corridors identified in this analysis face unreliable conditions. Even average travel times on these corridors takes twice as long as free flow. Put another way, travel on these corridors occurs at best at half the posted speed. At least one day a week (TTI_{80}), travel times on many of these facilities are 3.5 to 4 times longer than free flow or twice again average conditions. Notable exceptions include the Belt Parkway (which has substantially more reliable conditions than the other corridors (while still generally unreliable), I-95 and Harlem River Drive (both of which have a TTI_{80} value of close to 6.0), and the Van Wyck, which experiences severe congestion (TTI_{80} of over 8 in the Northbound direction, meaning that it takes 8 times as long as free flow time to traverse this corridor roughly once a week).

[6] The semi-variance measure was developed by SHRP 2 L02, *Establishing Monitoring Programs for Travel Time Reliability*, http://www.trb.org/Main/Blurbs/168765.aspx.

Figure 5.8 Reliability on Select Highway Corridors in the NYMTC Region



Source: Texas A&M Transportation Institute Congested Corridors Report, 2011. http://mobility.tamu.edu/corridors/.
Note: The indices shown are not additive, but layered one on top of the other for each corridor, illustrating the relative difference amongst the three travel time indices- TTI, TT80 and TTI95.
TTI – the ratio of average travel time to free flow travel time
TTI80 – the ratio of the 80th percentile of travel time (the 80th worst travel time) to free flow time
TTI95 – the ratio of the 95th percentile of travel time to free flow time

Accessibility

Accessibility (or just access) refers to the ease of reaching goods, services, activities and destinations, which together are called opportunities. It can be defined as the potential for interaction and exchange (Hansen 1959; Engwicht 1993). Accessibility can be thought of as having two components- attractiveness and impedance. The attractiveness component is usually measured as the number of opportunities at destinations. For example, when measuring accessibility to jobs, the attraction value can be the number of jobs at the various potential destinations, while for shopping centers this can be the number of shops in the center. The impedance function decreases the probability of being attracted to such destinations based on distance or travel time.[7]

There is no single method to evaluate accessibility. For example, accessibility can be measured by the travel times between two points, the availability of jobs within a certain travel time, the availability of transit options, and so on.

Figures 5.9 and 5.10 illustrate one common measure of accessibility – the availability of jobs from a given zone within 45 minutes in 2014 and 2040, respectively. The region represented by dark red represents traffic analysis zones with access to over 4 million jobs within 45 minutes. The blues and greens represent the other end of the spectrum with access to considerably fewer jobs. In 2040, more of the TAZs turn from green to blue and red to yellows, indicating fewer jobs within 45 minutes. This is a sign of an increasingly congested transportation system, however, the difference does not appear to be dramatic. One reason for this could be that the 2040 alternative contains committed projects planned to alleviate current traffic congestion. One region that could potentially see an accessibility improvement in the future (as measured by access to jobs) is part of Long Island and Queens, partially attributable to the presence of the East Side Access project, linking Long Island and Queens to Grand Central Terminal.

[7] Access to Destinations: Development of Accessibility Measures, Ahmed M. El-Geneidy, David M. Levinson, University of Minnesota.

Figure 5.9 2014 Jobs Accessible Within a 45 Minute Drive During a Morning Peak Commute

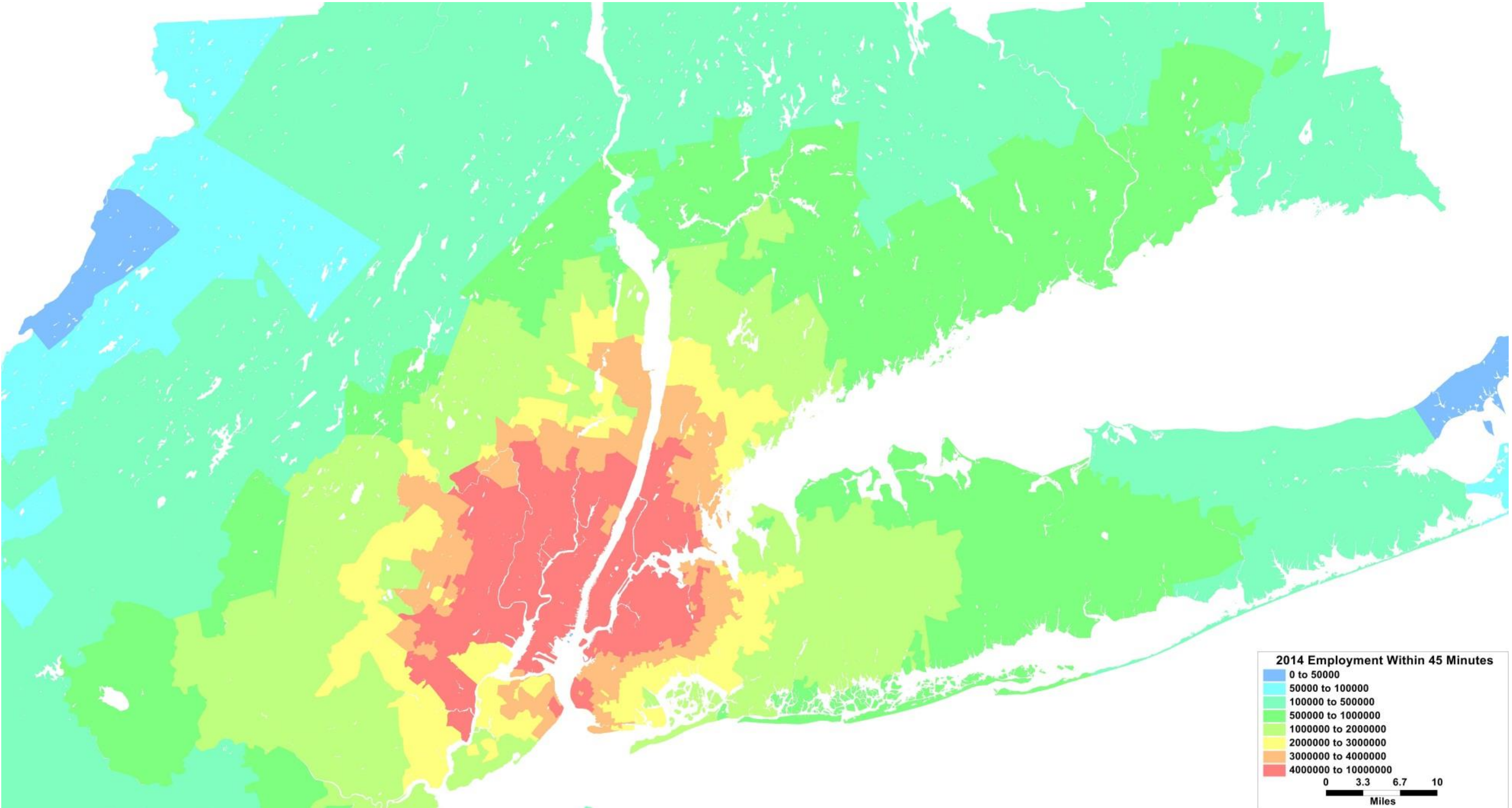
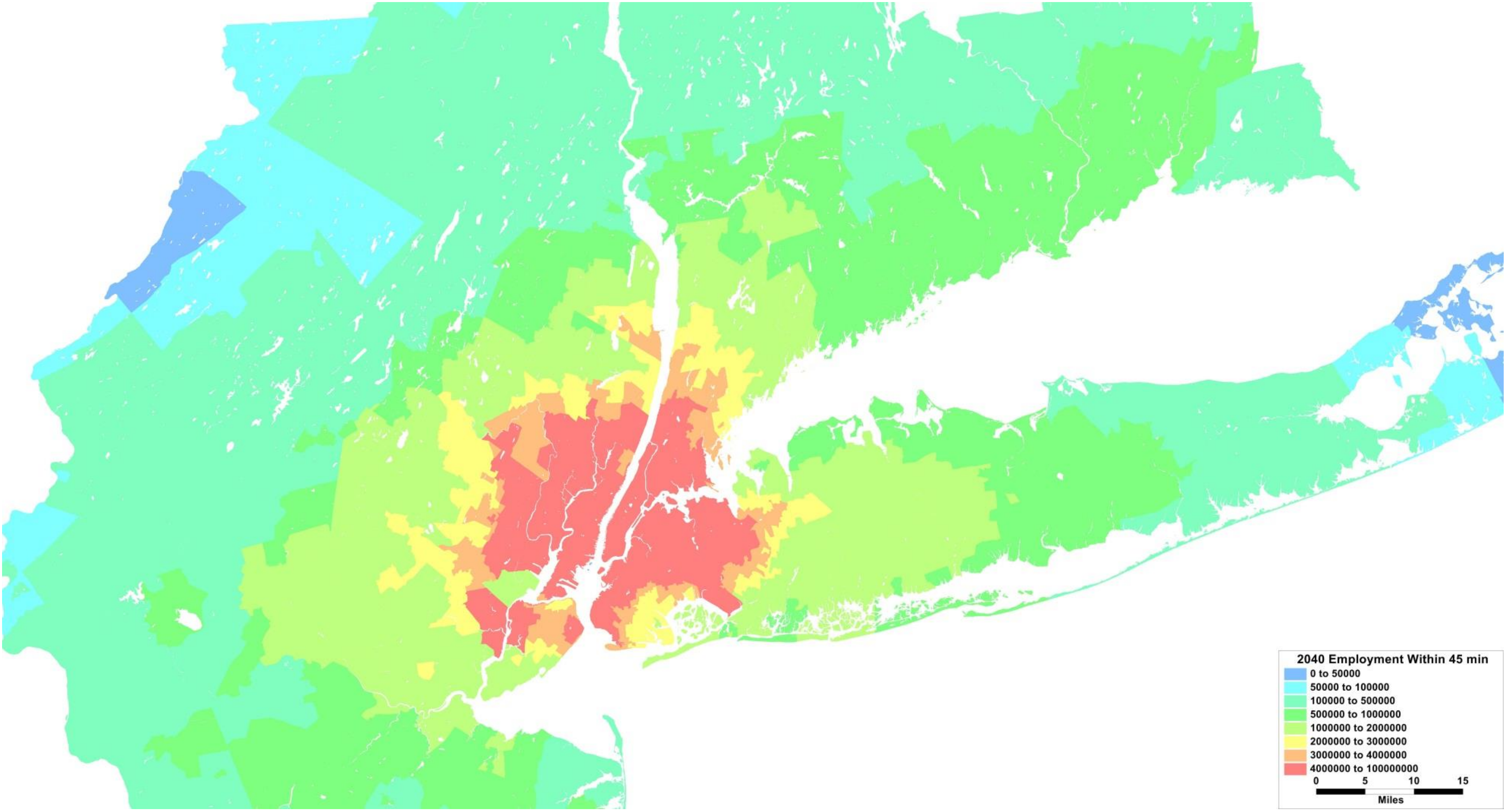


Figure 5.10 2040 Jobs Accessible Within a 45 Minute Drive During a Morning Peak Commute



5.3 Critically Congested Roadway Corridors in 2040

Figures 5.11 through 5.13 present the top congested corridors in the three subareas of NYMTC's planning area based on the most significantly congested corridors. The methodology adopted to identify these corridors is described in Section 4.0 based on four factors - importance, magnitude, intensity, and consistency.

Figure 5.11 Top Congested Corridors
New York City

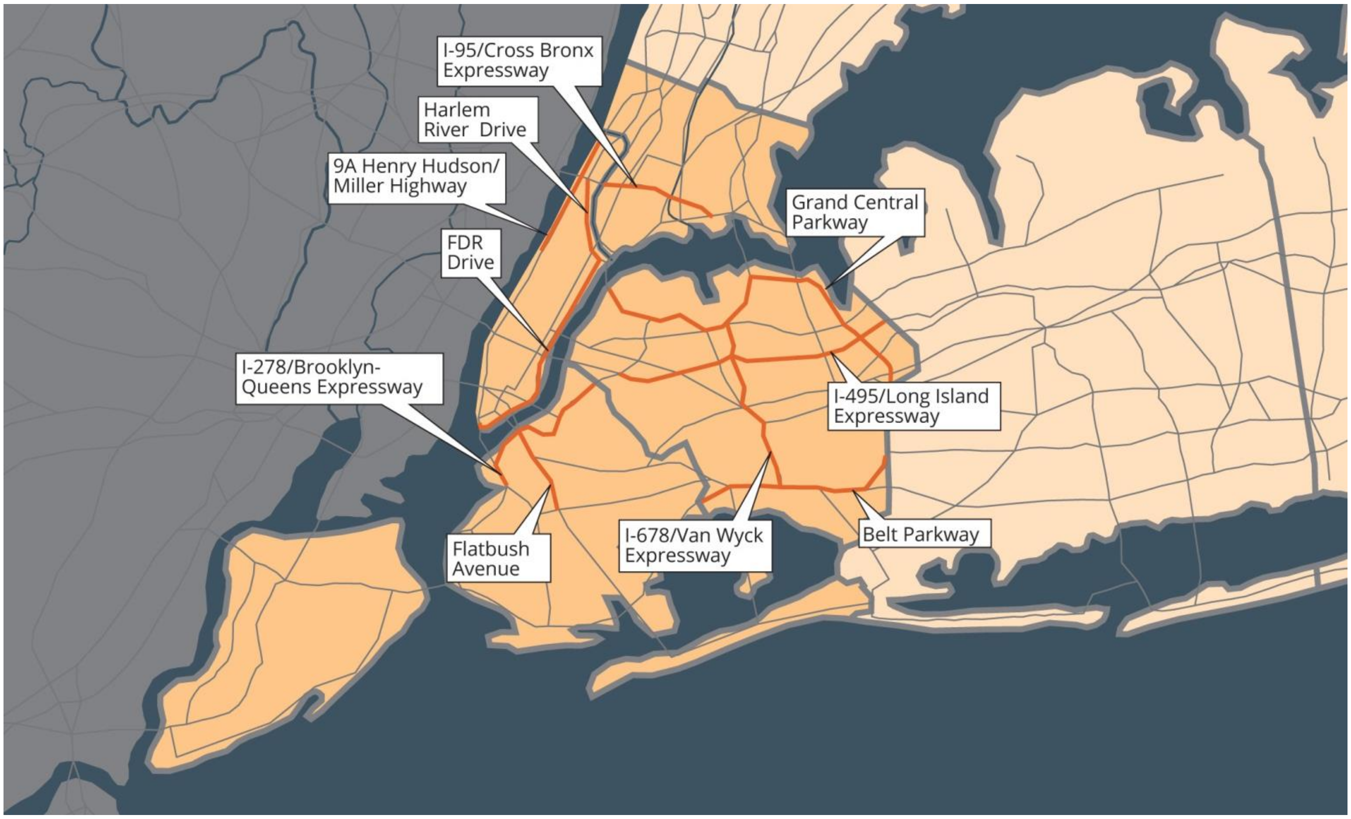
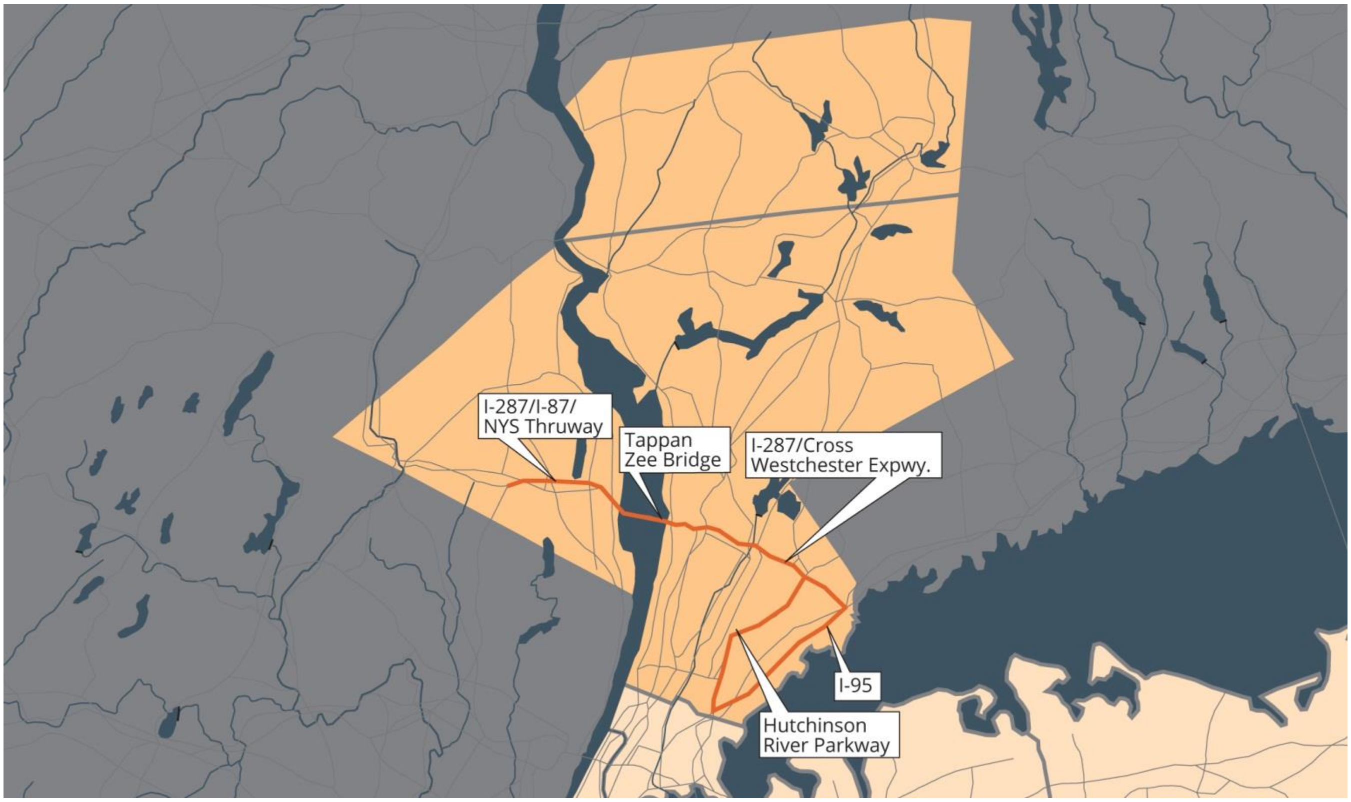


Figure 5.12 Top Congested Corridors
Long Island

Figure 5.13 Top Congested Corridors
Lower Hudson Valley



5.4 Access to Regional Facilities – Airports

The New York Metropolitan is primarily served by three large hub airports – John F. Kennedy International (JFK), LaGuardia (LGA), and Newark Liberty International (EWR). Other airports that offer commercial service to residents of the NYMTC region include Westchester County, (HPN) and Long Island-MacArthur (ISP). Stewart International Airport (SWF), while located just outside the NYMTC region, also serves the NYMTC region (Figure 5.14). This section of the report discusses access to the three major airports – JFK, LaGuardia, and Newark Liberty. Appendix C contains estimated travel times between representative locations throughout the NYMTC region and the six airports mentioned above.

Figure 5.14 Airports in the NYMTC Region

EWR and JFK each offer 33 percent of the flights from the region, LGA offers 29 percent, with the remaining 5 percent of flights are split between the three smaller airports. In terms of available seat miles, a measure of capacity and average flight length, JFK offers 61 percent, Newark Liberty offers 28 percent, and LaGuardia offers 10 percent. The large airports each serve a different mix of markets:

- With a limited number of exceptions, flights to and from LaGuardia Airport are restricted to a perimeter of 1,500 miles from the airport. At the same time, LaGuardia is the closest airport to the region's main population and employment centers. Therefore, airlines at LaGuardia tend to offer frequent services to major hubs and business destinations, focusing on higher-value origin-destination traffic. More than 90 percent of LaGuardia's origin-destination passengers come from the NYMTC region, and the average travel party size is 1.8 (heavily weighted towards solo business travelers, relative to other area airports). Of the total enplanements at LaGuardia, 8 percent of passengers are connecting to another flight and do not use the NYMTC region's ground transportation system.
- JFK has a history of being the main gateway to New York City for international flights. Because of the perimeter rule at LaGuardia, JFK offers the majority of the transcontinental and international seats from the region. In addition, domestic airlines at JFK tend to offer connecting flights from JFK to cities across the U.S. to improve the utilization of capacity on their international flights and improve the viability of

services to certain markets, to the extent seats cannot be filled with local passengers. Finally, extra capacity available at JFK, particularly outside peak hours for international flights, is used by domestic carriers for flights to leisure destinations. About 19 percent of JFK's passengers are connecting to another flight and do not use the NYMTC region's ground transportation system, Of those who have a local origin, two thirds come from the NYMTC region. The average travel party size at JFK is 2.7, influenced by families traveling together on leisure trips to and from the region.

- EWR is also a major international gateway, and it serves as a major connecting hub for United Airlines for both domestic and international flights (27 percent of all passengers at EWR are connecting passengers). While close to 50 percent of EWR's origin-destination passengers are from New Jersey, nearly one third come from the NYMTC region. The average travel party size is 2.3.

The three smaller airports concentrate on service to airline hubs and leisure destinations.[8,9]

John F. Kennedy International (JFK)

John F. Kennedy International Airport is the busiest airport in New York, with over 47 million annual travelers passing through the airports seven airline terminals and over 1.3 million tons of air cargo in 2011. The airport has over 125 aircraft gates for the more than 100 airlines that arrive and depart from the airport. Roughly 36,000 people are employed at the airport, which operates 24 hours per day.

JFK is one of the world's leading international air cargo centers. The airport offers nearly 4 million square feet of modern, state-of-the-art cargo warehouse and office space. The entire air cargo area is designated as a Foreign-Trade Zone. JFK services the world's key air cargo markets though a strong mix of long-haul, direct, and nonstop all-cargo aircraft and wide-body passenger aircraft flights.

The airport offers customers over 5,000 customer parking spaces in a variety of places, including: multilevel parking garages, surface spaces in the Central Terminal Area, a long-term parking, and cell phone lot. A reservation system was introduced in 2011.

The AirTrain service connecting JFK with the Long Island Rail Road (LIRR) and New York City subway and bus lines, was opened in 2003. At the airport, AirTrain provides fast, free connections between terminals, rental car facilities, hotel shuttle areas, and parking lots. In 2011, 5.5 million passengers used AirTrain JFK. Recent improvements include: digital signage; expanded closed-circuit televisions; track, switch, and third-rail heaters to improve reliability in cold weather; and a digital audio recording system for monitoring critical communications in real time.

The I-678/Van Wyck Expressway and the Belt Parkway are the only limited-access highways connecting JFK Airport. The Van Wyck Expressway connects the airport (including its substantial air cargo facilities) and southern Queens/southwestern Nassau County with central Queens – where it connects with I-495, the Grand Central Parkway, Queens Boulevard, Union Turnpike, and the Jackie Robinson Parkway. This portion of I-678 and its northbound Service Road experience severe congestion during many hours of the day due to insufficient mainline capacity, frequent merges and weaves, and heavy truck usage.

The Belt Parkway is the only east-west limited-access highway in southern Queens, primarily serving traffic to/from JFK Airport as well as through trips between Brooklyn and southern Nassau County. The Cross Island Parkway connects to the Belt Parkway just east of JFK and is the only continuous north-south limited-access highway in eastern Queens. The entire length of the Belt Parkway in Queens experiences severe congestion mostly (but not exclusively) during peak commuting periods, due to insufficient mainline capacity, and frequent merges and weaves. The eastbound Belt Parkway in southern Queens and southbound Cross Island Parkway in

[8] http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy10_primary_enplanements_prelim.pdf.

[9] West of Hudson Regional Transit Access Study – Air Passenger Forecasting Report, March 2010.

eastern Queens experience the heaviest congestion in evening peaks. The westbound direction in southern Queens and northbound direction in eastern Queens are heaviest in morning peaks. Trucks are not permitted on these parkways due to low overhead clearances and narrow lanes.

JFK airport is also served by local buses, and premium shuttle bus service from the Port Authority Bus Terminal and Grand Central Terminal. While the airport is accessible by transit, a one seat ride to JFK at present time is limited to private cars, taxis and limousine, and shuttle vans. The transit mode share in 2007 was approximately 19 percent.[10]

LaGuardia (LGA)

LaGuardia Airport is located in the borough of Queens, New York City, bordering on Flushing Bay and Bowery Bay. The airport is 8 miles from midtown Manhattan. The airport has four main terminals with a total of 71 aircraft gates. LaGuardia Airport employs about 10,000 people.

The airport provides more than 6,900 public parking spaces, including a 2,900 space, five-level parking garage; E-ZPass Plus in all parking lots; Express Pay machines in Lots 2, 4, and 5; and a 55-space metered lot. A reservation system was introduced in 2011. In 2011, the airport catered to approximately 24 million passengers The Grand Central Parkway provides direct access to LGA. Just west of LGA, the Grand Central Parkway connects to the Robert F. Kennedy Triboro Bridge (which in turn provides access to upper Manhattan, the Bronx, the George Washington Bridge, and Westchester County) and the Brooklyn-Queens Expressway (BQE) (which provides access to midtown and lower Manhattan, Brooklyn, and the Verrazano Narrows Bridge to Staten Island). To the east, the Grand Central Parkway connects to the Whitestone Expressway (which in turn feeds into the Whitestone Bridge to the Bronx, eastern Westchester County, and Connecticut), the Van Wyck Expressway (to southeastern Queens and JFK Airport), and the Long Island Expressway and Northern State Parkway (to Eastern Long Island).

The airport is also accessible via several MTA New York City Transit buses, which provide service to Manhattan and Queens, with connections to New York City subways, Long Island Rail Road, and Metro-North Railroad for destinations beyond. Private shuttle bus services connect LGA to the Port Authority Bus Terminal and Grand Central Terminal. Based on statistics reported in the ACRP Report 4, eight percent of total LGA passengers use transit. A significant share of LGA employees also use transit to commute to their jobs. The majority of passengers drive and park at the airport. The remainder access LGA either via rentals, drop-offs, or shared rides. A recent joint planning effort involving New York City Department of Transportation, MTA New York City Transit, and the Port Authority of New York & New Jersey resulted in plans to improve LGA bus connections, including rail from Queens rail transit nodes at Jackson Heights and Woodside.

Newark Liberty International (EWR)

Opening in 1928, Newark Liberty Airport (EWR) is the nation's oldest airfield and home to the nation's first commercial airline terminal. Located partly in Newark and partly in Elizabeth, Newark is located only 14 miles from Manhattan, serving a critical role for the New York-New Jersey metropolitan area. Approximately 21,000 people are employed at the airport. Newark Liberty has three major terminals and just over 100 gates.

Newark Liberty is the overnight small package center for the New York-New Jersey region, offering a full range of short-, medium-, and long-haul services to domestic and international destinations. The airport expanded its cargo capacity in 2004 with the opening of a 142,000 square-foot facility, which combined with United and Continental's cargo buildings, increases cargo space at the airport to 1.3 million square feet. In 2011, 34 million passengers and 812 thousand tons of cargo passed through EWR.[11]

[10] ACRP, Report 4, Ground Access to Major Airports by Public Transportation.

[11] Port Authority of New York and New Jersey, http://www.panynj.gov/airports/ewr-facts-info.html.

Opened in 2001, AirTrain Newark offers service to the Newark Liberty International Airport train station, where passengers can connect to New Jersey Transit and Amtrak rail links for connections between the airport and New York City, Philadelphia, points across New Jersey, and destinations beyond. Thousands of daily riders also use AirTrain Newark to travel between passenger terminals and to connect to parking lots and rental car areas. In 2011, about two million paid riders used the system to connect to the airport at the Northeast Corridor station. East-west access to EWR is via I-78. The New Jersey Turnpike provides north-south access to the airport. From within New Jersey, EWR can also be reached via U.S. 1 and 9. Transit options include New Jersey Transit buses and trains, and the Port Authority of New York and New Jersey PATH trains, which require transfers either to a bus or New Jersey Transit trains at Newark Penn Station.

Airport Accessibility

Tables 5.5 through 5.8 represent 2014 and 2040 auto travel times to the six regional airports. Tables 5.9 and 5.10 show the modeled differences between the 2014 and 2040 travel times from across the NYMTC region to the six airports in the AM and PM peak periods, based on results from the NYBPM. As indicated in Tables 5.9 and 5.10, auto travel times increase over the 26 year period at different rates, except in select Manhattan markets to JFK and Islip (MacArthur), likely the impact of the Eastside Access Rail project, which could cause a mode shift from auto to rail, improving travel on the access roadways marginally.

Table 5.5 Estimated 2014 Travel Times to Six Regional Airports
AM Peak Period

		Airports					
County	**Location**	**JFK**	**LGA**	**EWR**	**ISP**	**SWF**	**HPN**
Manhattan	Downtown	44	28	46	86	106	62
Manhattan	Midtown	44	25	43	84	93	49
Manhattan	Uptown	27	9	50	71	85	41
Brooklyn	Park Slope	33	29	58	84	115	73
Queens	Jamaica	12	17	82	64	107	46
Staten Island	Staten Island College	46	49	30	104	120	94
Bronx	Botanical Garden	36	22	57	71	86	31
Westchester	White Plains	51	40	76	87	71	15
Rockland	Spring Valley	61	44	66	98	58	40
Nassau	Hempstead	31	48	95	47	130	69
Suffolk	Brentwood	66	71	118	19	152	93
Putnam	Carmel	83	75	114	120	53	45

JFK	John F. Kennedy International Airport
LGA	LaGuardia Airport
EWR	Newark Liberty International Airport
ISP	Long Island MacArthur Airport
SWF	Stewart International Airport
HPN	Westchester County Airport

Table 5.6 Estimated 2040 Travel Times to Six Regional Airports
AM Peak Period

		Airports					
County	Location	JFK	LGA	EWR	ISP	SWF	HPN
Manhattan	Downtown	43	30	55	86	117	62
Manhattan	Midtown	34	30	57	78	106	49
Manhattan	Uptown	28	10	62	78	97	40
Brooklyn	Park Slope	35	32	67	88	129	74
Queens	Jamaica	12	20	83	70	122	47
Staten Island	Staten Island College	49	54	25	110	121	82
Bronx	Botanical Garden	38	24	69	80	92	32
Westchester	White Plains	57	44	91	99	78	15
Rockland	Spring Valley	69	51	80	112	64	44
Nassau	Hempstead	33	51	112	52	147	71
Suffolk	Brentwood	73	80	139	22	176	100
Putnam	Carmel	94	86	133	136	56	50

Table 5.7 Estimated 2014 Travel Times to Six Regional Airports
PM Peak Period

		Airports					
County	Location	JFK	LGA	EWR	ISP	SWF	HPN
Manhattan	Downtown	60	38	37	123	128	70
Manhattan	Midtown	57	34	29	110	114	54
Manhattan	Uptown	33	11	39	96	101	43
Brooklyn	Park Slope	42	36	45	114	136	78
Queens	Jamaica	12	16	63	82	122	44
Staten Island	Staten Island College	50	51	20	130	131	96
Bronx	Botanical Garden	38	21	42	92	94	31
Westchester	White Plains	54	39	61	110	81	14
Rockland	Spring Valley	69	45	54	122	67	34
Nassau	Hempstead	30	46	93	59	144	67
Suffolk	Brentwood	62	67	113	23	163	87
Putnam	Carmel	82	72	95	138	54	42

Table 5.8 Estimated 2040 Travel Times to Six Regional Airports
PM Peak Period

County	Location	Airports					
		JFK	LGA	EWR	ISP	SWF	HPN
Manhattan	Downtown	63	39	39	130	145	77
Manhattan	Midtown	50	37	33	117	130	59
Manhattan	Uptown	34	12	42	103	116	48
Brooklyn	Park Slope	47	40	49	125	154	86
Queens	Jamaica	12	17	66	89	138	49
Staten Island	Staten Island College	61	61	21	147	153	111
Bronx	Botanical Garden	39	23	45	100	112	35
Westchester	White Plains	57	40	65	118	101	15
Rockland	Spring Valley	73	50	59	133	81	38
Nassau	Hempstead	30	47	97	65	160	72
Suffolk	Brentwood	65	73	121	27	185	97
Putnam	Carmel	83	72	97	144	63	42

Table 5.9 Percentage Change between 2014 and 2040 Travel Times to Six Regional Airports
AM Peak Period

County	Location	Airports					
		JFK	LGA	EWR	ISP	SWF	HPN
Manhattan	Downtown	-4%	6%	20%	0%	11%	1%
Manhattan	Midtown	-23%	18%	32%	-7%	13%	1%
Manhattan	Uptown	5%	11%	24%	10%	14%	-2%
Brooklyn	Park Slope	8%	8%	17%	5%	11%	1%
Queens	Jamaica	5%	13%	1%	10%	14%	2%
Staten Island	Staten Island College	7%	12%	-15%	6%	0%	-13%
Bronx	Botanical Garden	7%	8%	22%	12%	8%	1%
Westchester	White Plains	13%	10%	20%	13%	9%	4%
Rockland	Spring Valley	11%	15%	22%	15%	11%	11%
Nassau	Hempstead	6%	5%	18%	11%	13%	3%
Suffolk	Brentwood	10%	11%	18%	15%	15%	8%
Putnam	Carmel	13%	14%	16%	14%	7%	11%

Table 5.10 Percentage Change between 2014 and 2040 Travel Times to Six Regional Airports

PM Peak Period

		Airports					
County	Location	JFK	LGA	EWR	ISP	SWF	HPN
Manhattan	Downtown	6%	2%	6%	5%	14%	9%
Manhattan	Midtown	-14%	8%	15%	7%	14%	11%
Manhattan	Uptown	3%	12%	8%	7%	15%	12%
Brooklyn	Park Slope	11%	10%	8%	10%	13%	11%
Queens	Jamaica	2%	8%	6%	9%	14%	12%
Staten Island	Staten Island College	22%	19%	7%	13%	17%	15%
Bronx	Botanical Garden	3%	10%	6%	8%	19%	14%
Westchester	White Plains	6%	3%	5%	8%	25%	9%
Rockland	Spring Valley	6%	11%	8%	9%	22%	11%
Nassau	Hempstead	0%	3%	4%	10%	12%	7%
Suffolk	Brentwood	6%	9%	8%	16%	13%	11%
Putnam	Carmel	0%	0%	2%	4%	17%	0%

6.0 COUNTY/BOROUGH CONGESTION ANALYSIS

This section provides a county-level summary of congestion estimates for the 2014 Base Year and the 2040 Build Scenario. As discussed in the Methodology section, the 2040 Build Scenario includes all transportation improvements NYMTC has programmed in the TIP and the fiscally constrained element of the Plan 2040 RTP.

For each of the ten counties (five boroughs of New York City and five suburban counties) in the NYMTC planning area, an overview is provided, including background information and travel characteristics for the 2014 Base Year and 2040 Build Scenario. Background information includes population (2014 Base Year, 2040 Build Scenario, and percent change), major portals and roadways. The travel characteristics are derived from the NYBPM (K-Series) as received from NYMTC, and include:

1. **Vehicular Travel –** vehicle miles of travel for the 2014 Base Year and 2040 Build Scenario and the percent change.

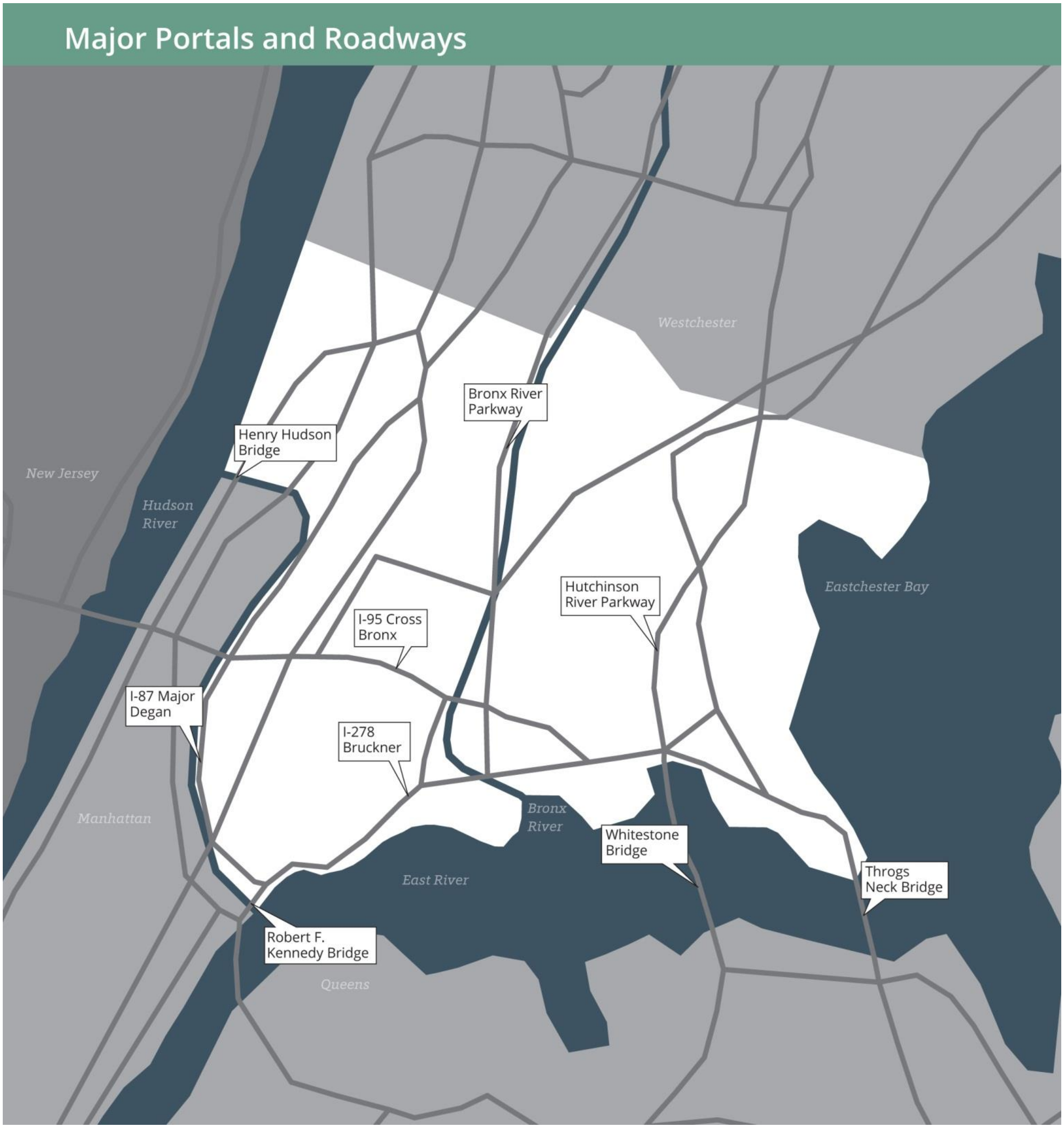
2. **Traffic Congestion –** vehicle hours of delay for the 2014 Base Year and 2040 Build Scenario, and the percent change.

3. **Origins and Destinations –** forecasted intercounty (two-directional) vehicular trips for the year 2040 based on the NYBPM.

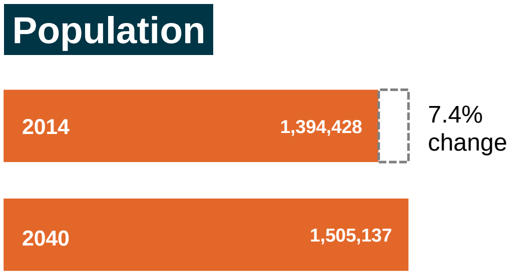
4. **Performance Measures –** the tables summarize the performance measures, as described in the Methodology section, disaggregated by functional class. The first table in each section presents performance measure data for the 2014 Base Year in the AM peak, PM peak, and daily periods. The next table presents performance measure data for the 2040 Build Scenario for the same time periods and the third table presents the percentage difference between the two.

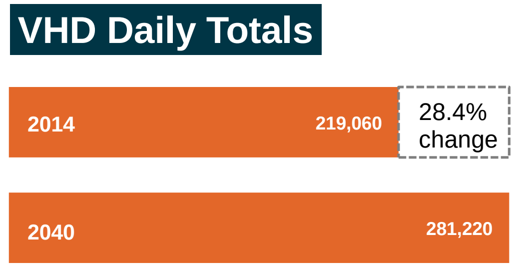
5. **Congestion Patterns and Bottlenecks –** these maps identify congested corridors and bottlenecks for the 2040 Build Scenario. As further described in the Methodology section, using output data from the NYBPM, demand-to-capacity ratio congestion levels are represented for individual links in the roadway system. To account for the levels of areawide congestion, other factors such as length of the congested segment, traffic volume and importance of the roadway were used to identify congested corridors. Congested corridors are shown for the 2040 Build Scenario AM and PM peak periods. Also shown are potential bottleneck locations. Roadway links that experience a D/C ratio greater than 1.0 for a four hour peak period are shown in red, while those with a ratio between 1.0 and 0.8 are shown in blue. Only roadway links that experience a D/C ratio of 0.8 or greater are identified as congested. Using the NYBPM derived measures of congestion, together with our familiarity with the NYMTC regional highway network, and data from the 2011 Texas Transportation Institute Congested Corridors Report (TTI Report), a list of approximately 50 roadway sections were used to develop the top regional congestion hot spots. These roadway sections are listed and discussed below (and in Appendix B) by county/borough**. (Please note that the order is arbitrary and does not imply a ranking.)**

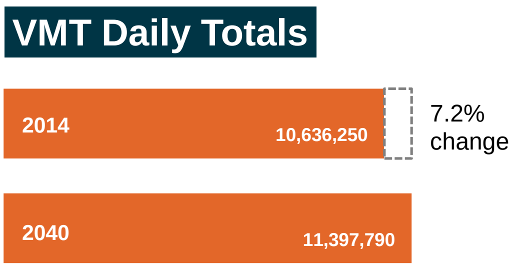
6.1 Bronx

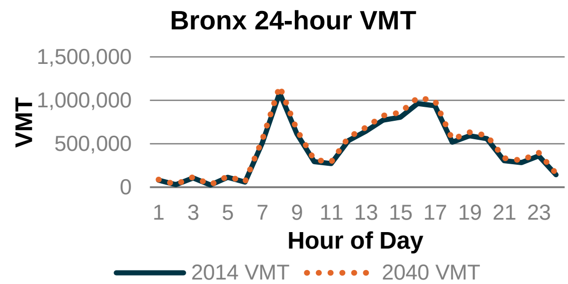

Major Portals and Roadways
Westchester
Bronx River
Parkway
Henry Hudson
Bridge
New Jersey
Hudson
River
Hutchinson
River Parkway
Eastchester Bay
I-95 Cross
Bronx
I-87 Major
Degan
I-278
Bruckner
Manhattan
Bronx
River
Whitestone
Bridge
East River
Throgs
Neck Bridge
Robert F.
Kennedy Bridge
Queens

Population and Travel Characteristics

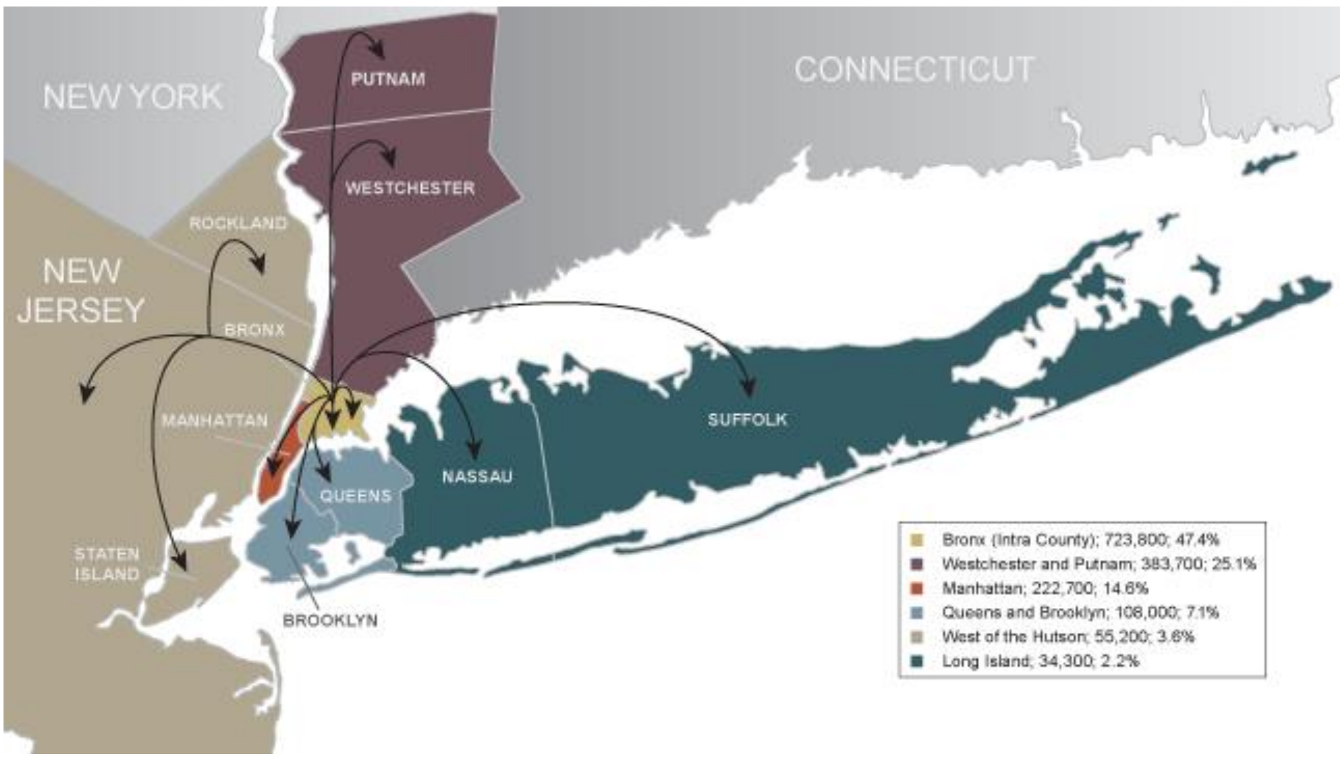








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County (Borough): Bronx (Bronx)

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.60	9%	16%	254.1	1.44	41.4	24,206	35,824	1,330,448
Arterial	0.33	3%	4%	93.1	1.55	16.6	48,361	71,575	594,398
Local	0.20	1%	2%	7.9	1.03	21.2	9,721	14,388	583,424
PM Period (4 to 8 PM)									
Freeway	0.22	2%	3%	46.9	1.06	46.4	1,237	1,831	857,104
Arterial	0.10	0%	0%	10.8	1.11	20.5	6,645	9,835	321,832
Local	0.06	0%	0%	1.7	1.00	21.5	548	811	337,974
Daily Total									
Freeway	0.45	7%	10%	843.5	1.23	43.8	56,120	83,057	5,436,084
Arterial	0.25	2%	3%	318.6	1.35	17.9	145,507	215,350	2,560,066
Local	0.16	1%	1%	25.6	1.01	21.3	17,432	25,800	2,640,103
Total							**219,059**	**324,207**	**10,636,253**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.63	8%	18%	280.0	1.50	40.1	28,826	42,663	1,402,989
Arterial	0.36	4%	6%	124.9	1.65	15.8	64,525	95,496	651,659
Local	0.22	0.02	2%	9.1	1.05	20.8	14,840	21,963	631,011
PM Period (4 to 8 PM)									
Freeway	0.24	2%	3%	68.3	1.07	45.7	2,070	3,063	964,616
Arterial	0.11	0%	0%	14.1	1.12	19.9	7,756	11,479	340,606
Local	0.07	0%	0%	1.8	1.00	21.3	1,163	1,721	358,938
Daily Total									
Freeway	0.48	8%	11%	980.6	1.27	42.9	69,189	102,400	5,822,740
Arterial	0.27	3%	3%	411.1	1.41	17.3	186,477	275,985	2,758,590
Local	0.17	1%	1%	28.7	1.02	21.1	25,553	37,818	2,816,457
Total							**281,219**	**416,204**	**11,397,786**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The “0.8<=DC<=1” and “D/C>1” are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	5%	–	–	10%	4%	-3%	19%	19%	5%
Arterial	9%	–	–	34%	6%	-5%	33%	33%	10%
Local	10%	–	–	14%	2%	-1%	53%	53%	8%
PM Period (4 to 8 PM)									
Freeway	9%	–	–	46%	1%	-1%	67%	67%	13%
Arterial	10%	–	–	30%	1%	-3%	17%	17%	6%
Local	17%	–	–	11%	0%	-1%	112%	112%	6%
Daily Total									
Freeway	7%	–	–	16%	3%	-2%	23%	23%	7%
Arterial	8%	–	–	29%	4%	-4%	28%	28%	8%
Local	6%	–	–	12%	1%	-1%	47%	47%	7%
Total							**28%**	**28%**	**7%**

Bronx – Congested Corridors

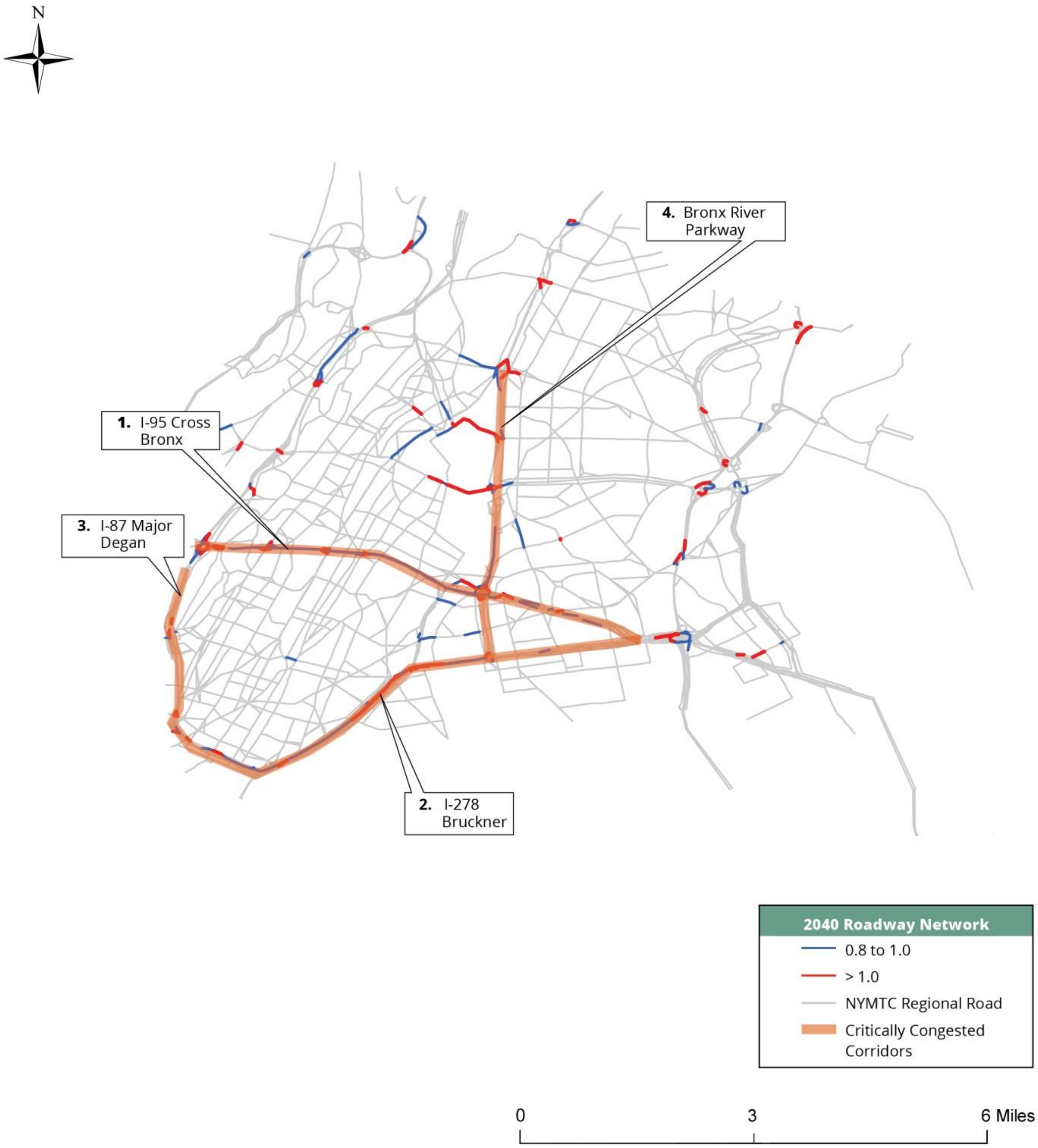
1. **I-95/Cross Bronx Expressway from Harlem River/Alexander Hamilton Bridge to Hutchinson River Parkway/Bruckner Interchange –** This is the "heart" of the 7th highest-ranked corridor in the United States for Congestion Cost in the TTI Report. Congestion is most significant in the westbound direction during both peaks due to sheer volume heading toward Manhattan in the AM and trucks headed toward the George Washington Bridge (GWB) in the PM (exacerbated since 9/11 by the need for trucks entering from I-87/Major Deegan Expressway to immediately weave to the left side for the Upper Level of the GWB, and further since December, 2012 by the rehabilitation work on the Alexander Hamilton Bridge). In addition, there are various choke points in both directions of this highway at various times due to heavy merges and weaves and steep grades. The heavy usage of this road by trucks makes its congestion especially detrimental to the region's economy in terms of both time loss and fuel consumption.

2. **I-278/Bruckner Expressway from the RFK Bridge to the Bruckner Interchange –** This is a major commuter route between Manhattan and Bronx/Westchester/Connecticut. It has several choke points due to heavy merging and weaving at various times, as well as substandard design in sections, including a sharp curve on a section with no shoulders at the I-895/Sheridan Expressway interchange. It also carries high truck volumes as it provides access to/from the Hunts Point Market complex. Congestion occurs mostly southbound in the evening peak and northbound in the morning peak.

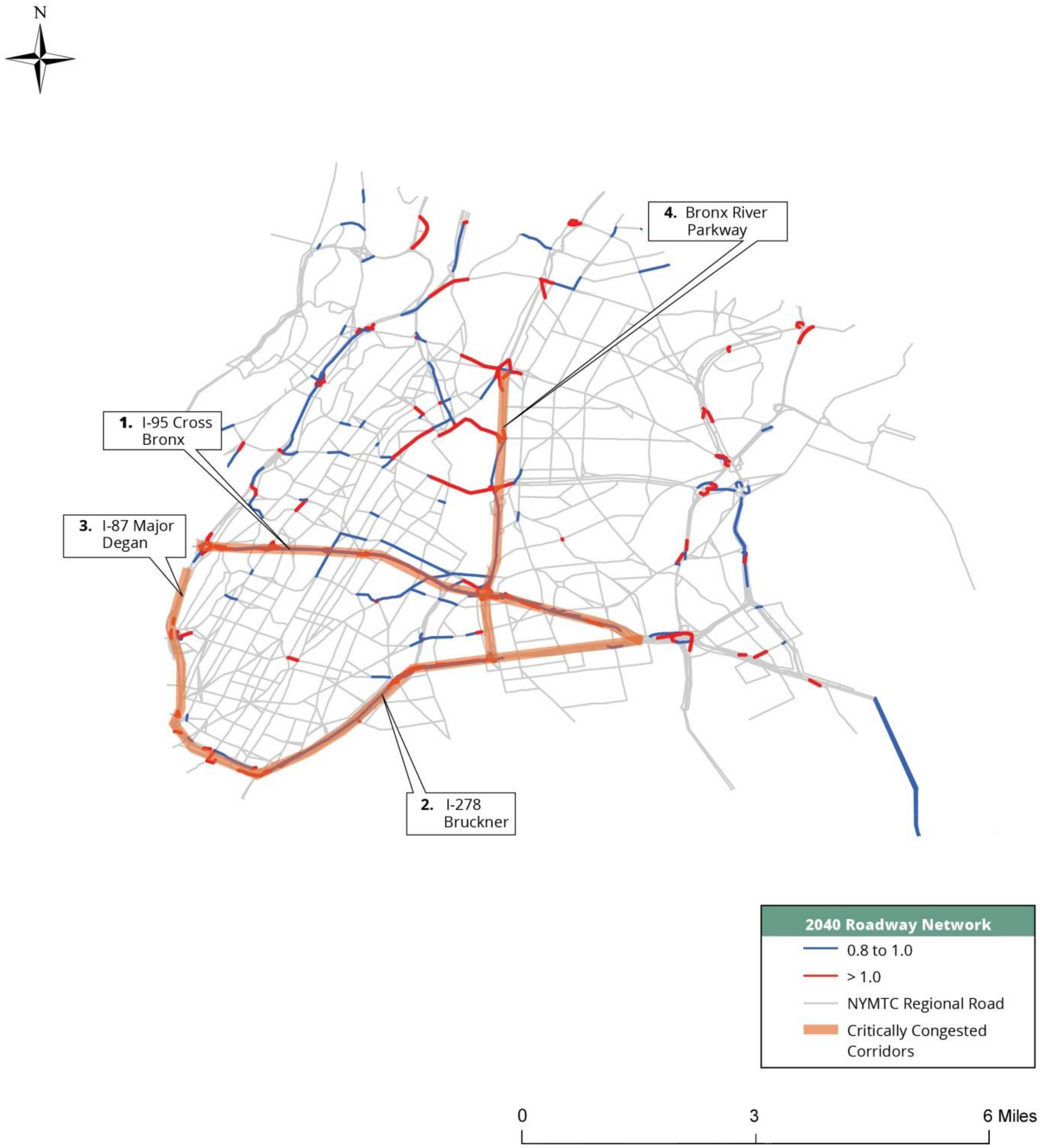
3. **I-87/Major Deegan Expressway from the RFK Bridge to I-95/Highbridge Interchange –** In the northbound direction, this is the 32nd highest-ranked corridor in the United States in terms of delay per mile in the TTI Report. It is one of the three main approaches from Manhattan to the GWB. The main problem is the ramp to southbound I-95 (GWB approach), which backs up onto the I-87 mainline every evening. See 1 above for exacerbating factors. Congestion also occurs on southbound I-87 on the approach to the I-95 interchange in the morning peak. This highway section also abuts Yankee Stadium, which produces heavy congestion in both directions, particularly approaching the Stadium for weeknight Yankee home games (roughly 55 per year, plus postseason games).

4. **Bronx River Parkway from I-95/Cross Bronx Expressway to Westchester County Boundary –** Problems occur at entry and exit points, particularly at I-95, where direct ramp connections are not provided and traffic must mix with local traffic on the service roads. Congestion occurs mostly southbound in the evening peak and northbound in the morning peak.

Bronx: Congested Corridors and Hot Spot Areas (AM Period)

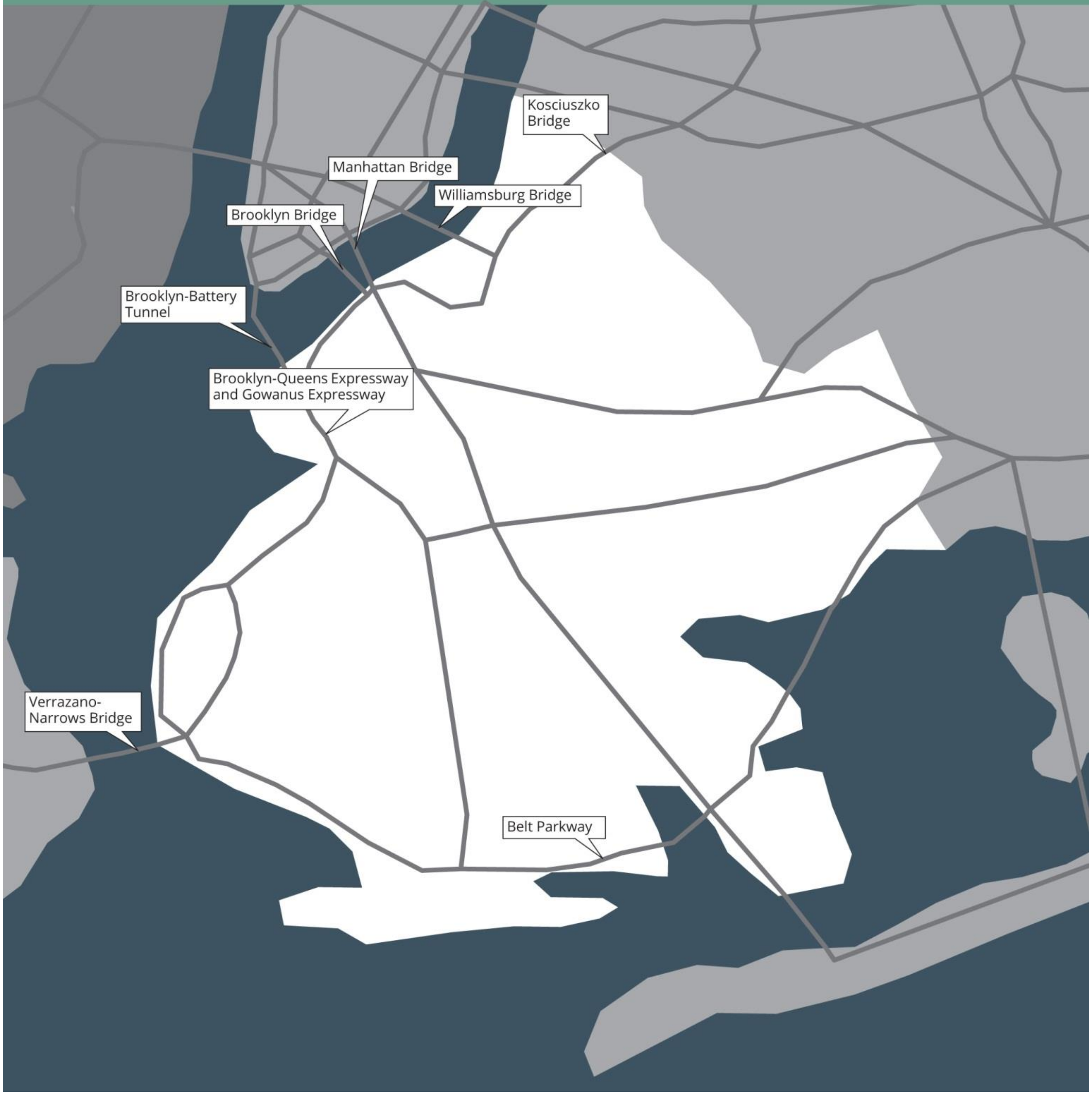


Bronx: Congested Corridors and Hot Spot Areas (PM Period)

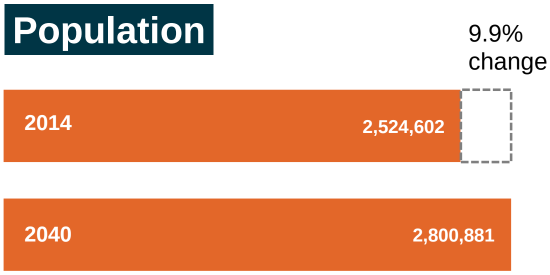


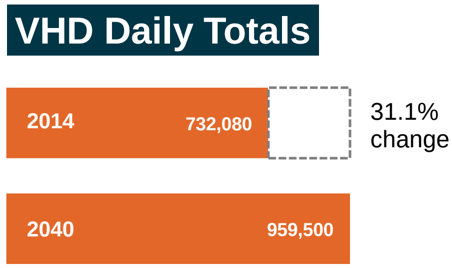
6.2 Brooklyn

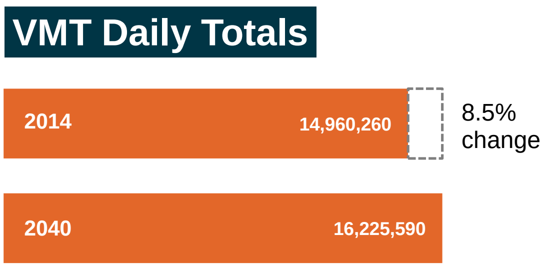
Major Portals and Roadways

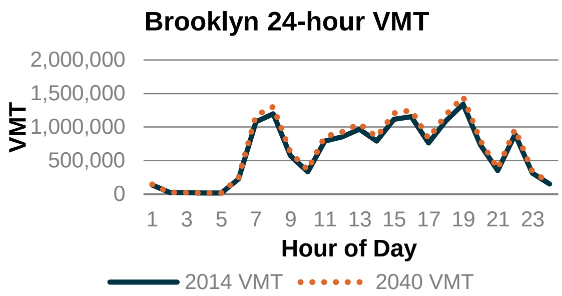


Population and Travel Characteristics

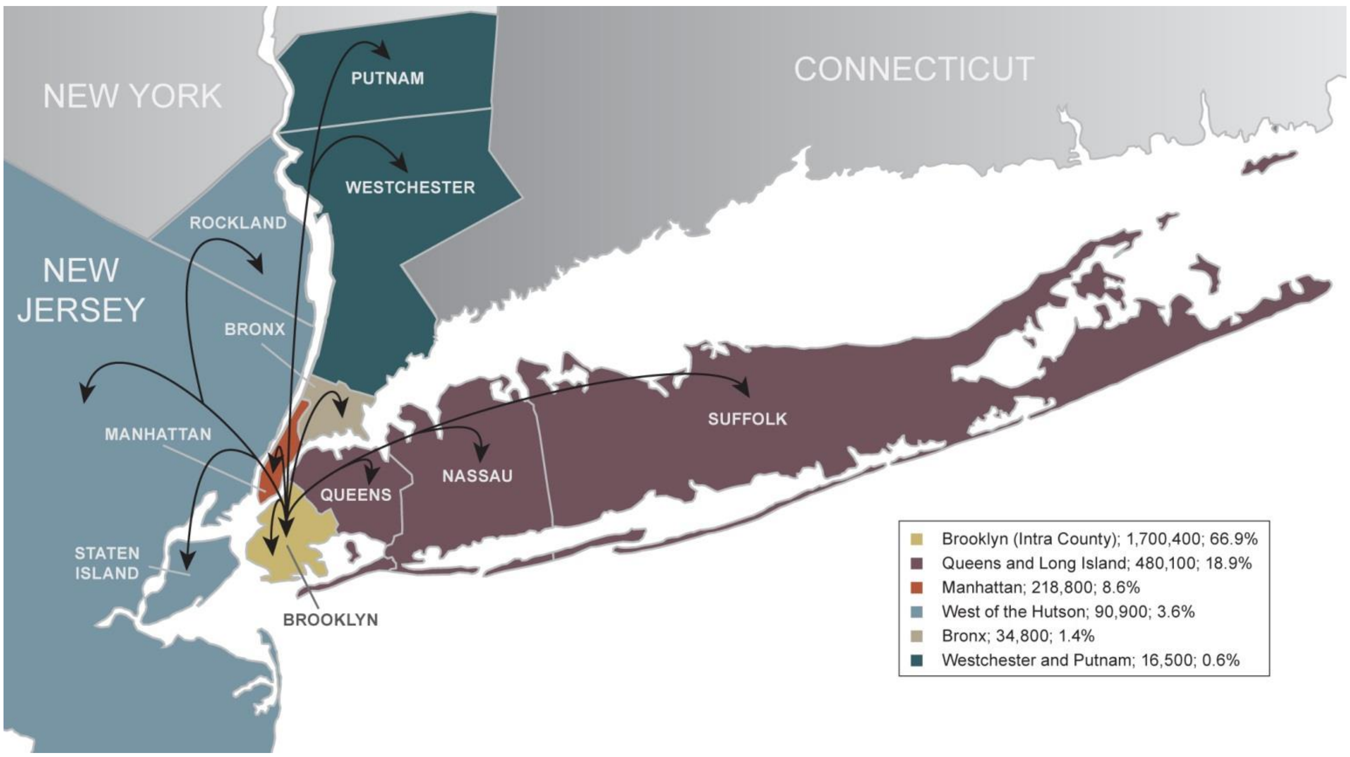








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County (Borough): Kings (Brooklyn)

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.66	13%	21%	242.3	1.46	35.3	14,576	21,573	889,438
Arterial	0.46	7%	9%	562.7	1.73	13.9	141,654	209,648	1,756,137
Local	0.39	8%	3%	9.0	1.11	17.7	5,103	7,552	539,740
PM Period (4 to 8 PM)									
Freeway	0.29	2%	7%	106.2	1.20	38.7	13,771	20,381	641,146
Arterial	0.17	1%	3%	358.6	1.35	18.2	170,351	252,119	1,250,458
Local	0.11	1%	0%	2.5	1.02	18.8	1,490	2,206	269,221
Daily Total									
Freeway	0.55	10%	15%	837.3	1.32	36.6	51,351	75,999	3,985,265
Arterial	0.39	6%	7%	2579.0	1.60	15.1	656,372	971,431	8,393,651
Local	0.32	6%	2%	39.6	1.09	17.9	24,356	36,048	2,581,344
Total							**732,079**	**1,083,477**	**14,960,259**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.70	12%	24%	279.9	1.55	34.0	18,888	27,955	981,158
Arterial	0.52	8%	12%	708.8	1.88	12.8	189,349	280,237	1,882,335
Local	0.47	12%	7%	17.2	1.15	16.0	8,719	12,904	599,355
PM Period (4 to 8 PM)									
Freeway	0.32	3%	7%	125.8	1.22	38.0	16,068	23,780	743,891
Arterial	0.18	1%	3%	406.7	1.41	17.2	212,093	313,898	1,314,241
Local	0.12	1%	1%	3.5	1.03	17.5	3,065	4,536	293,529
Daily Total									
Freeway	0.59	11%	18%	1053.4	1.39	35.5	67,451	99,828	4,447,938
Arterial	0.43	8%	9%	3328.2	1.72	14.0	853,391	1,263,018	8,938,915
Local	0.38	7%	5%	69.3	1.12	16.4	38,655	57,210	2,838,740
Total							**959,497**	**1,420,056**	**16,225,594**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	6%	–	–	15%	6%	-4%	30%	30%	10%
Arterial	13%	–	–	26%	9%	-8%	34%	34%	7%
Local	21%	–	–	91%	4%	-9%	71%	71%	11%
PM Period (4 to 8 PM)									
Freeway	10%	–	–	18%	2%	-2%	17%	17%	16%
Arterial	6%	–	–	13%	4%	-6%	25%	25%	5%
Local	9%	–	–	39%	1%	-7%	106%	106%	9%
Daily Total									
Freeway	7%	–	–	26%	5%	-3%	31%	31%	12%
Arterial	10%	–	–	29%	7%	-7%	30%	30%	6%
Local	19%	–	–	75%	3%	-8%	59%	59%	10%
Total							**31%**	**31%**	**8%**

Brooklyn – Congested Corridors

5. **I-278/Brooklyn-Queens Expressway**, and

6. **I-278/Gowanus Expressway from the Belt Parkway to the Queens County Boundary –** The eastbound and westbound directions of these roadways are the 11th and 13th highest-ranked corridors in the United States, respectively, in terms of Delay per Mile in the TTI Report. In the morning, the main issue is eastbound, where Manhattan-bound traffic runs into several choke points in downtown Brooklyn which are caused by heavy merging and weaving as well as substandard design. The queue formed by this spills back for several miles onto the Gowanus Expressway almost to the Verrazano-Narrows Bridge. According to the TTI report, average travel times are roughly 2.5 times free flow, with travel times over 3 times free flow once per week and 4.8 times free flow once a month.

   In the evening, the main eastbound choke points are the point where traffic from the Williamsburg Bridge merges in, and merging and weaving that takes place east of that point (as the road approaches the steep incline to the peak of the Kosciuszko Bridge and the nearby exit to the Long Island Expressway). The main westbound choke points in the evening are the point where traffic from the Hugh L. Carey (Brooklyn-Battery) Tunnel merges in, and merging and weaving that takes place between that point and the exit for the Prospect Expressway.

   As I-278 is the only limited-access highway traversing Brooklyn that is open to through trucks, it plays a very important role in the regional flow of goods between the ports in New Jersey/Brooklyn and consumers and businesses in Queens and Long Island. Consequently, the economic cost of the congestion on I-278 is very high.

7. **Ocean Parkway from Avenue J to Church Avenue –** This is a six-lane arterial with many signalized intersections, carrying large volumes of traffic between southern Brooklyn and downtown Brooklyn and the bridges to Manhattan. Congestion occurs northbound in the morning peak and southbound in the evening peak.

8. **Flatbush Avenue from Eastern Parkway/Grand Army Plaza to I-278/Brooklyn-Queens Expressway –** This is a six-lane arterial with many signalized intersections, carrying large volumes of

traffic between central Brooklyn and downtown Brooklyn and the Manhattan Bridge. There is a major chokepoint in the morning where traffic from eastbound I-287 (and westbound I-287 via Tillary Street) merges into the Manhattan-bound flow. Flow is also restricted by interactions with major generators along the northern half of this roadway section, such as the Barclays Center, the Brooklyn Academy of Music, and the Long Island University campus. Pedestrian crossings are a significant congestion-causing factor. Congestion occurs mostly southbound in the evening peak and northbound in the morning peak.

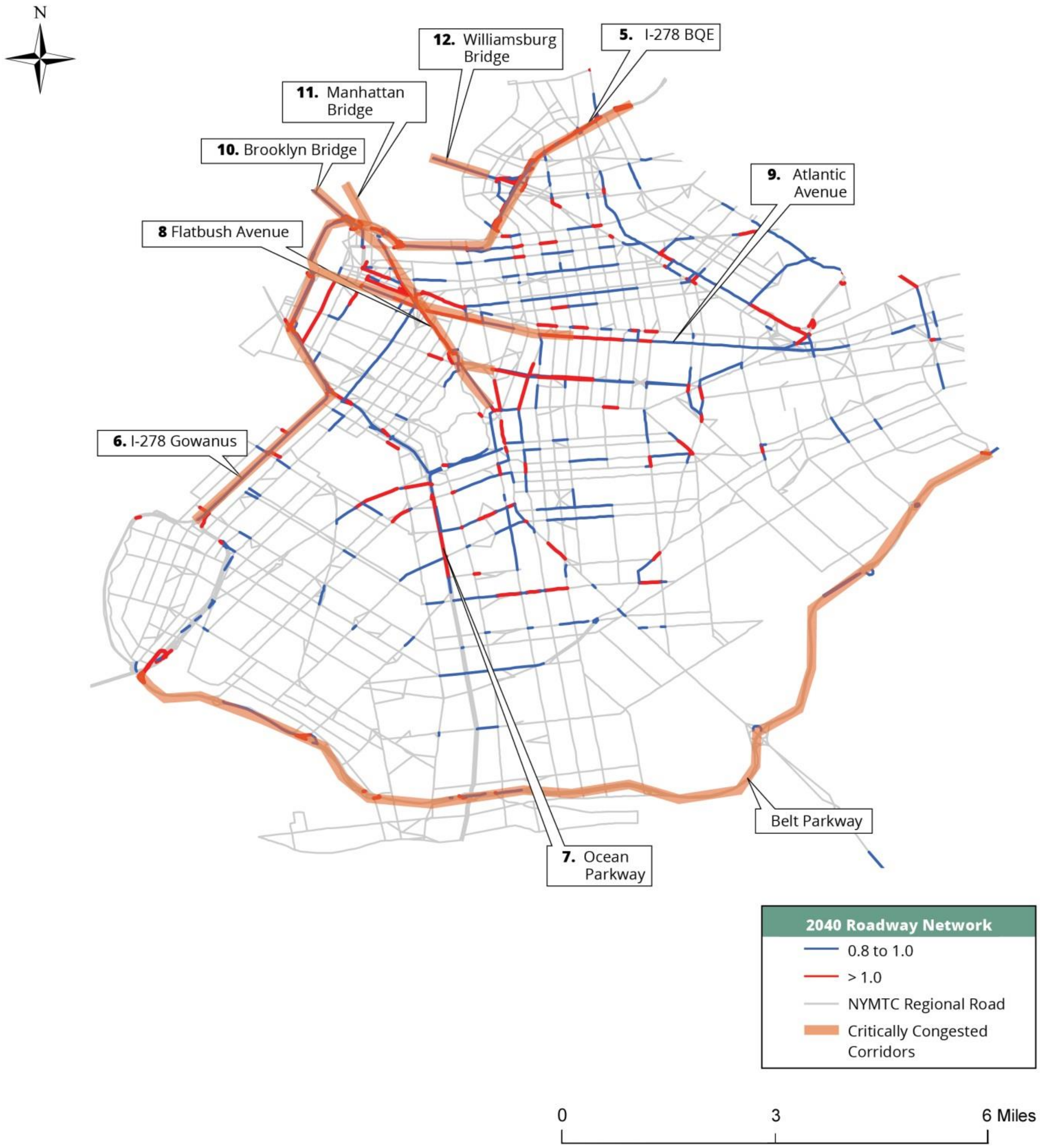
9. **Atlantic Avenue from I-278/Brooklyn-Queens Expressway to Utica Avenue –** This is a six-lane arterial with many signalized intersections, carrying large volumes of traffic between eastern Brooklyn and downtown Brooklyn and (via connecting roadways) the bridges to Manhattan. Again, pedestrian crossings are a significant factor, as Atlantic Avenue traverses several densely developed residential areas. Congestion occurs westbound in the morning peak and eastbound in the evening peak.

10. **Brooklyn Bridge –** The southernmost bridge across the East River connecting Brooklyn with lower Manhattan, it carries 6 lanes of traffic (3 in each direction). These lanes are heavily utilized because the bridge is toll-free and due to the direct or semi-direct connections that exist between the Bridge and I-278 in Brooklyn and the FDR Drive in Manhattan. Congestion occurs at the points where traffic merges onto and off of the Bridge from/to these highways, as well as at other points where Bridge traffic interacts with the Brooklyn and Manhattan street network. Congestion occurs inbound (toward Manhattan) in the morning peak and outbound (toward Brooklyn) in the evening peak.

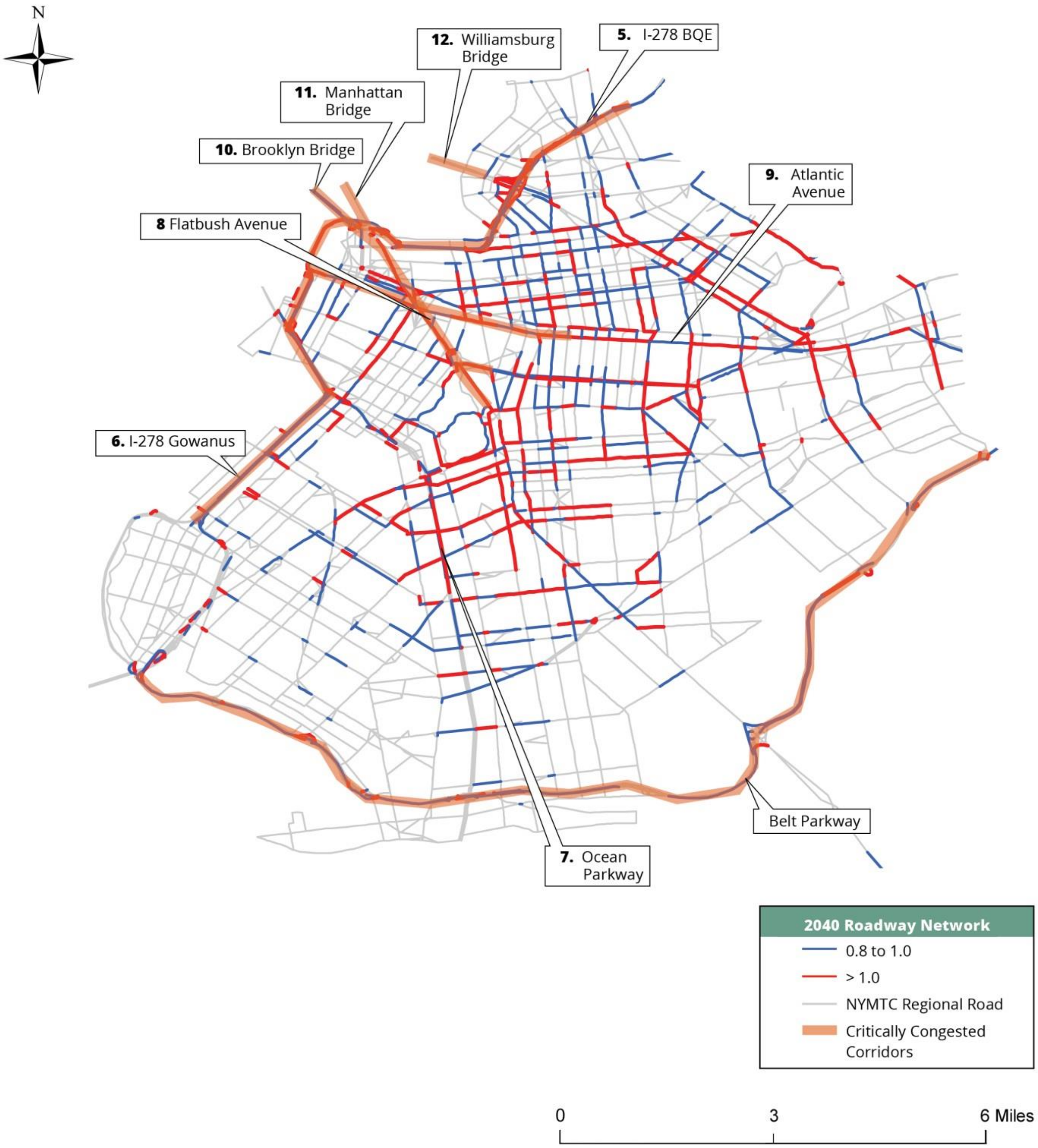
11. **Manhattan Bridge –** This bilevel, toll-free bridge has greater peak period carrying capacity than the Brooklyn Bridge, with two lanes in each direction available at all times plus three reversible lanes to carry peak flows inbound in the morning and outbound in the afternoon. The bridge is part of a direct connection between the Holland Tunnel and Brooklyn. The bridge connects directly to Flatbush Avenue and other major surface arterials in Brooklyn, and it links to major east-west streets and north-south avenues in Manhattan. Most connections to I-278 must be made indirectly via surface streets, and there are no direct connections with the FDR Drive in Manhattan. Consequently, congestion occurs at points where Bridge traffic interacts with the street systems in both boroughs, but normally not on the bridge itself. Congestion occurs inbound (toward Manhattan) in the morning peak and outbound (toward Brooklyn) in the evening peak.

12. **Williamsburg Bridge –** This bridge carries 8 traffic lanes (and a subway line) across the East River. In Brooklyn, it has excellent connections with I-278 to/from the east, but is accessible only via Delancey Street in Manhattan, causing long backups on the Bridge approaching Manhattan in the morning, and heavy delays on Manhattan streets leading to the Bridge in the evening.

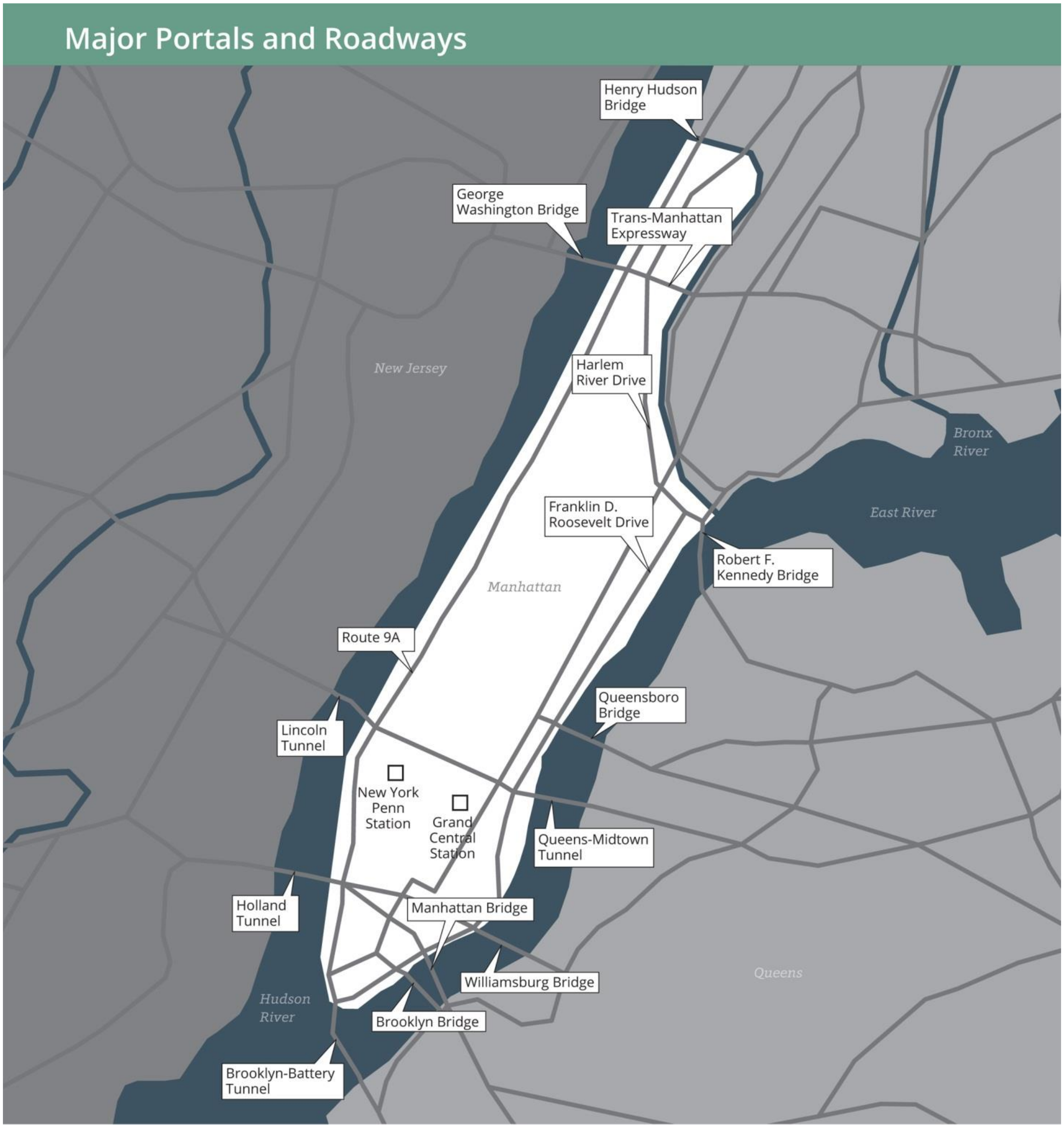
Brooklyn: Congested Corridors and Hot Spot Areas (AM Period)



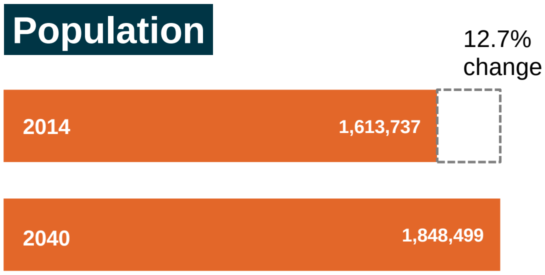
Brooklyn: Congested Corridors and Hot Spot Areas (PM Period)

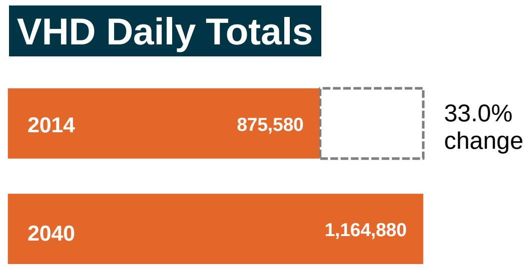


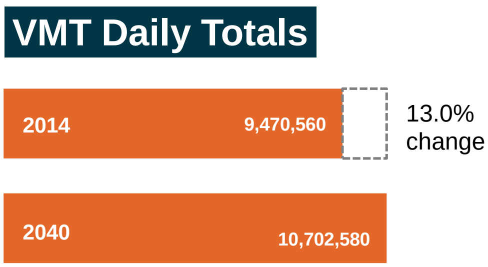
6.3 Manhattan

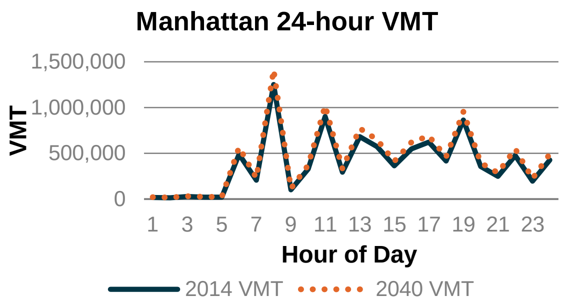


Population and Travel Characteristics

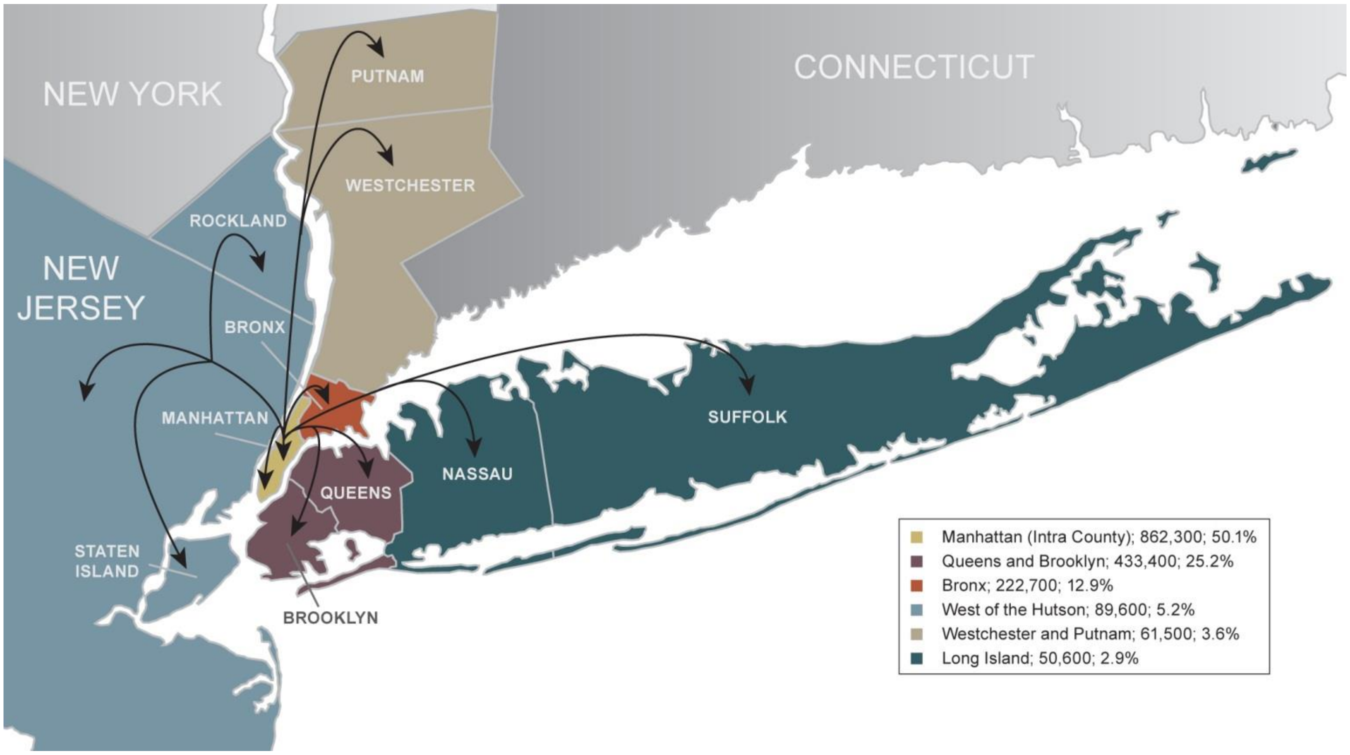








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County (Borough): New York (Manhattan)

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.45	3%	14%	154.6	1.64	29.8	25,766	38,134	612,524
Arterial	0.33	3%	9%	361.2	2.34	14.2	340,320	503,673	847,616
Local	0.25	4%	4%	15.5	1.53	12.4	106,274	157,286	432,493
PM Period (4 to 8 PM)									
Freeway	0.30	3%	9%	190.2	1.37	32.9	20,508	30,351	690,411
Arterial	0.18	3%	2%	244.2	1.35	16.4	72,123	106,742	921,095
Local	0.11	1%	1%	3.0	1.14	13.8	26,341	38,984	341,050
Daily Total									
Freeway	0.42	6%	11%	667.7	1.51	30.4	82,553	122,178	3,091,744
Arterial	0.29	4%	4%	1188.2	1.65	14.5	594,832	880,351	4,315,343
Local	0.21	2%	2%	30.3	1.27	12.8	198,192	293,324	2,063,469
Total							**875,577**	**1,295,854**	**9,470,556**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.49	4%	15%	171.3	1.73	29.3	30,795	45,576	673,824
Arterial	0.36	3%	11%	401.8	2.72	13.8	461,661	683,258	920,385
Local	0.29	3%	7%	20.6	1.67	11.9	146,522	216,853	538,718
PM Period (4 to 8 PM)									
Freeway	0.33	3%	11%	235.2	1.43	32.4	24,776	36,668	772,864
Arterial	0.20	3%	3%	345.9	1.38	16.1	84,161	124,558	1,006,826
Local	0.14	1%	2%	6.4	1.17	13.3	37,940	56,152	471,237
Daily Total									
Freeway	0.46	6%	13%	818.5	1.59	29.8	102,460	151,641	3,429,586
Arterial	0.32	5%	5%	1577.0	1.77	14.1	784,873	1,161,612	4,694,240
Local	0.25	3%	3%	46.7	1.34	12.3	277,546	410,768	2,578,749
Total							**1,164,879**	**1,724,021**	**10,702,575**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	9%	–	–	11%	5%	-2%	20%	20%	10%
Arterial	9%	–	–	11%	16%	-3%	36%	36%	9%
Local	16%	–	–	33%	9%	-4%	38%	38%	25%
PM Period (4 to 8 PM)									
Freeway	10%	–	–	24%	4%	-2%	21%	21%	12%
Arterial	11%	–	–	42%	2%	-2%	17%	17%	9%
Local	27%	–	–	109%	3%	-3%	44%	44%	38%
Daily Total									
Freeway	10%	–	–	23%	5%	-2%	24%	24%	11%
Arterial	10%	–	–	33%	7%	-3%	32%	32%	9%
Local	19%	–	–	54%	6%	-4%	40%	40%	25%
Total							**33%**	**33%**	**13%**

Manhattan – Congested Corridors

Manhattan's traffic congestion patterns are distinctly different from all of the other counties, as the result of two factors:

- Manhattan contains the region's Central Business District and an extremely high concentration of other trip generators.
- Manhattan is an island that can be accessed using a limited number of bridges and tunnels, which tend to constrain the flow of traffic into Manhattan in the morning and out of Manhattan in the evening.

Therefore, there is relatively little traffic congestion within Manhattan in the morning, because entering flows are constrained by the river crossings. Traffic on streets serving major intra-Manhattan traffic flows experience congestion in the middle of the day. In the evening, congestion is present on the main routes leading to the most heavily used exit points from Manhattan (as well as at major evening entertainment and tourism locations – particularly Times Square and the adjacent Theater District).

Key congested locations include;

13. **Harlem River Drive (HRD) from the RFK Bridge to I-95/Trans-Manhattan Expressway –** In the morning, this road is congested southbound approaching the point where traffic flows from the Third Avenue and RFK Bridges merge in and continue south onto the FDR Drive. The traffic queue from these choke points regularly spills back almost to I-95/Trans-Manhattan Expressway. In the evening, the pattern is reversed, with the choke point being where traffic from the HRD merges onto southbound I-95 (approach to the George Washington Bridge). There is also a southbound evening traffic queue at the same location as the morning queue, but much less severe.

14. **I-95/Trans-Manhattan Expressway from the George Washington Bridge (GWB) to the Alexander Hamilton Bridge –** Both the inner and outer roadways are congested all day long due to merging and weaving at and between entrances and exits to/from several major connecting highways and well as local streets.

15. **NY-9A/Henry Hudson Parkway/Joe DeMaggio Highway from West 42nd Street to I-95/Trans-Manhattan Expressway/GWB –** In the morning, this largely elevated expressway is congested southbound approaching the end of the expressway at West 57th Street (at which point Route 9A continues as 12th Avenue, an eight-lane surface arterial with frequent signalized intersections) and the extremely high-volume intersection with West 42nd Street, after which 12th Avenue has only three southbound lanes. The traffic queues spilling back from these choke points regularly extend about two to three miles in the morning peak. In the evening, the choke point is at the ramps to I-95, causing a miles-long northbound queue.

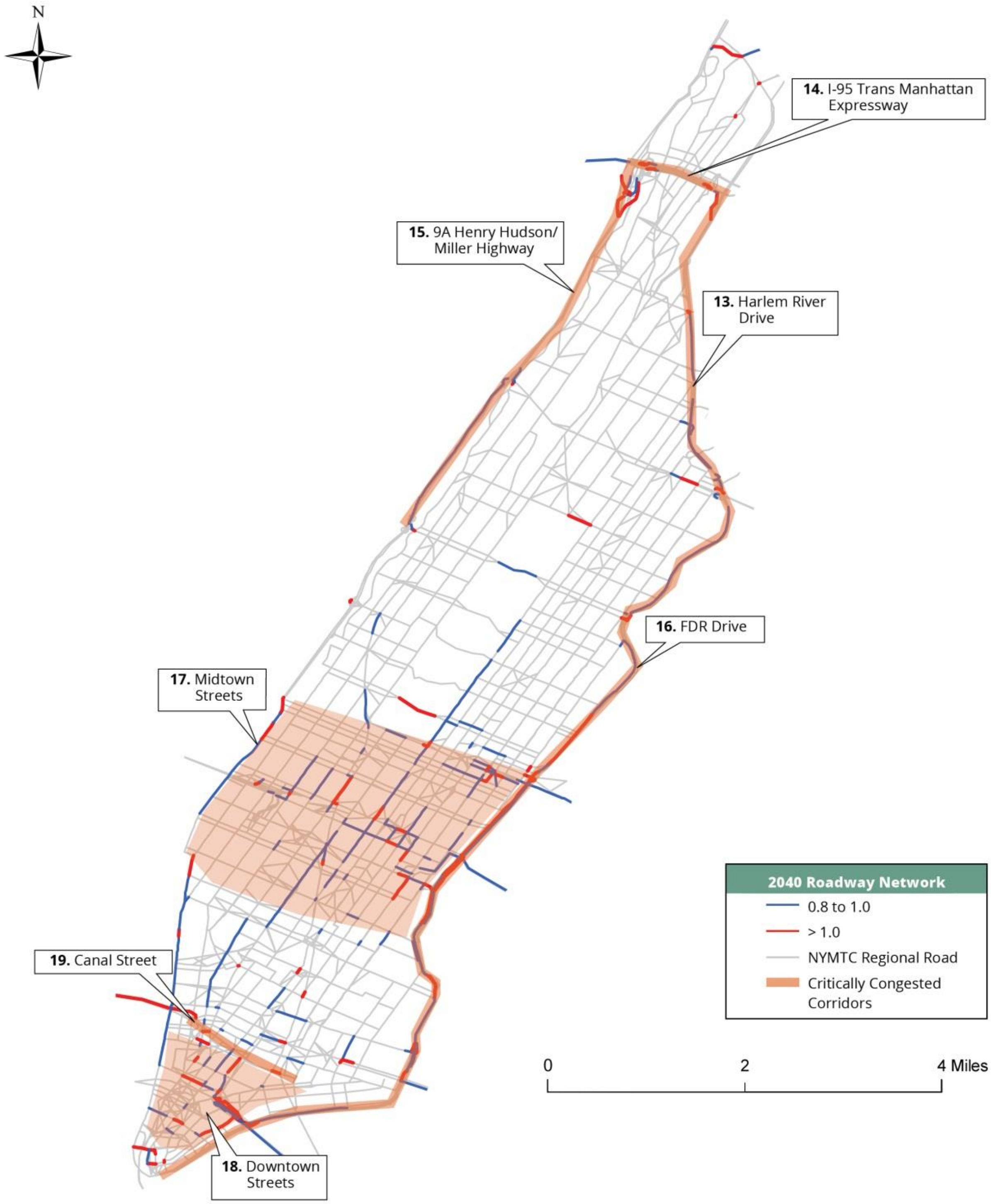
16. **FDR Drive from the Battery to the RFK Bridge –** This expressway carries high volumes of traffic northbound and southbound for its entire length. It is the only limited access highway serving this entire stretch, and the only limited access highway of any kind on the East Side. It has many complex merging, weaving, and substandard sections that create choke points throughout the day. In the morning, southbound congestion eases considerably south of Midtown due to the large portion of traffic exiting in Midtown.

17. Midtown Streets, and

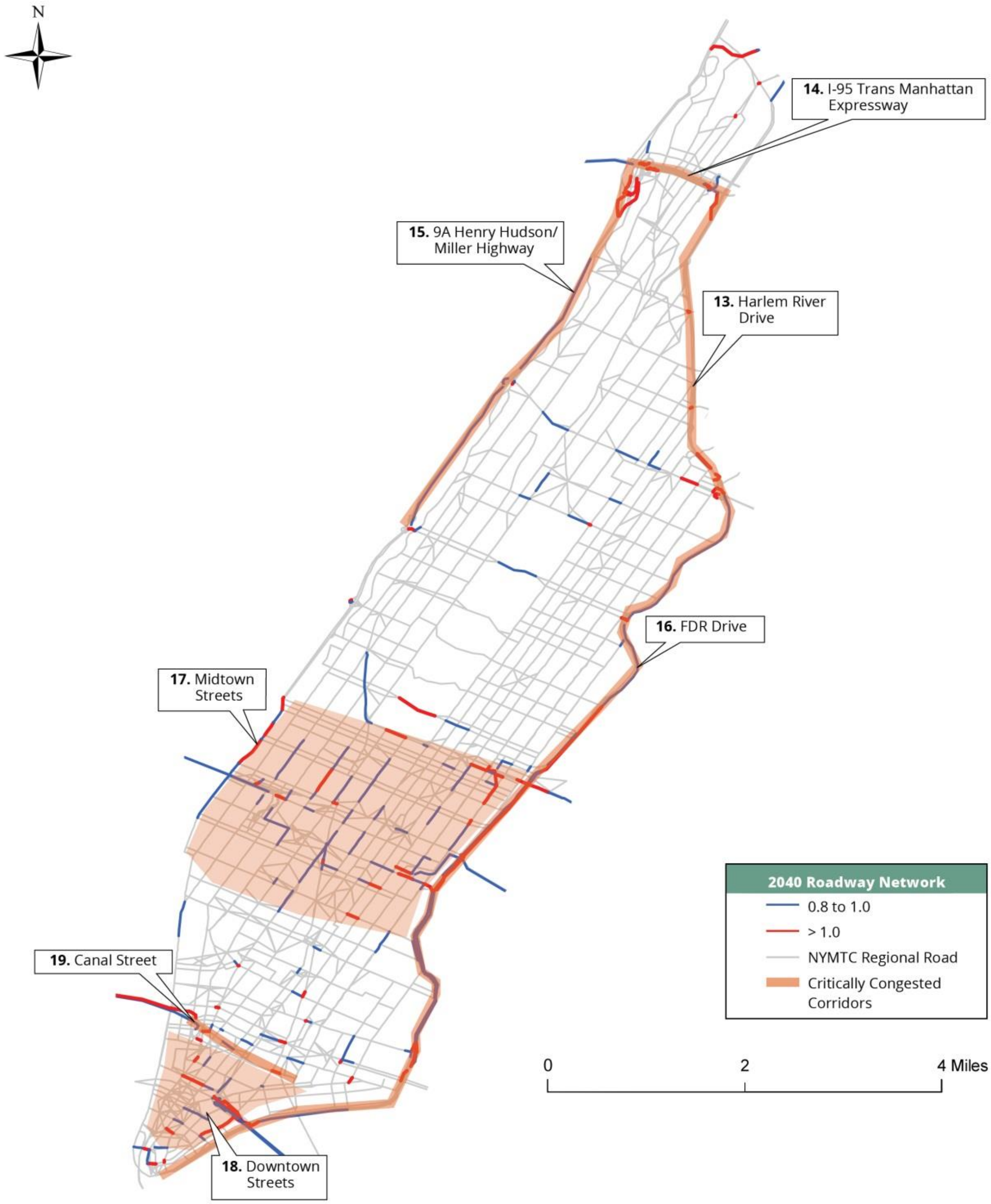
18. **Downtown Streets –** These are congested all day, but especially during the afternoon and evening periods when they are affected by both heavy pedestrian flows and spillbacks from bridges and tunnels leaving Manhattan.

19. **Canal Street from NY-9A/West Street to the Manhattan Bridge –** This downtown roadway is called out for special attention due to its functions as a connector to/from both the Holland Tunnel and the Manhattan Bridge, as well as serving trips within Manhattan. It is also an area of extremely high pedestrian activity, and is a commercial center in its own right that has more intense activity on weekends than on weekdays.

Manhattan: Congested Corridors and Hot Spot Areas (AM Period)



Manhattan: Congested Corridors and Hot Spot Areas (PM Period)

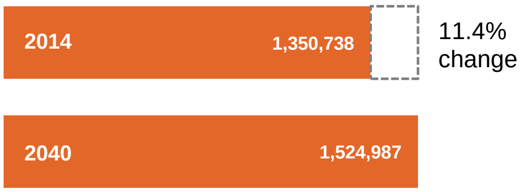


6.4 Nassau

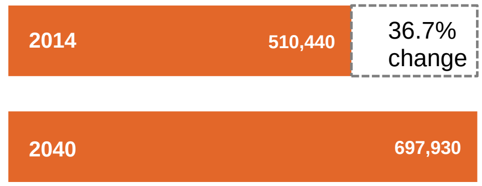
Major Portals and Roadways

Population and Travel Characteristics

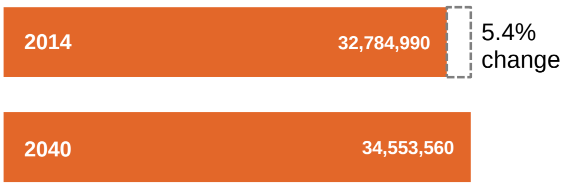
Population

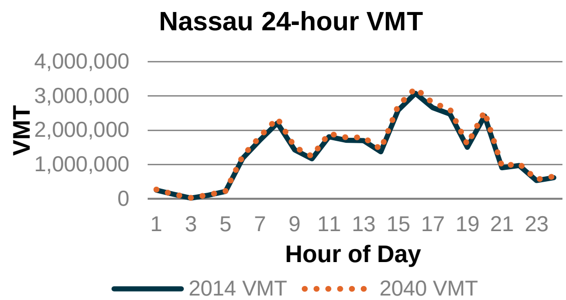


VHD Daily Totals

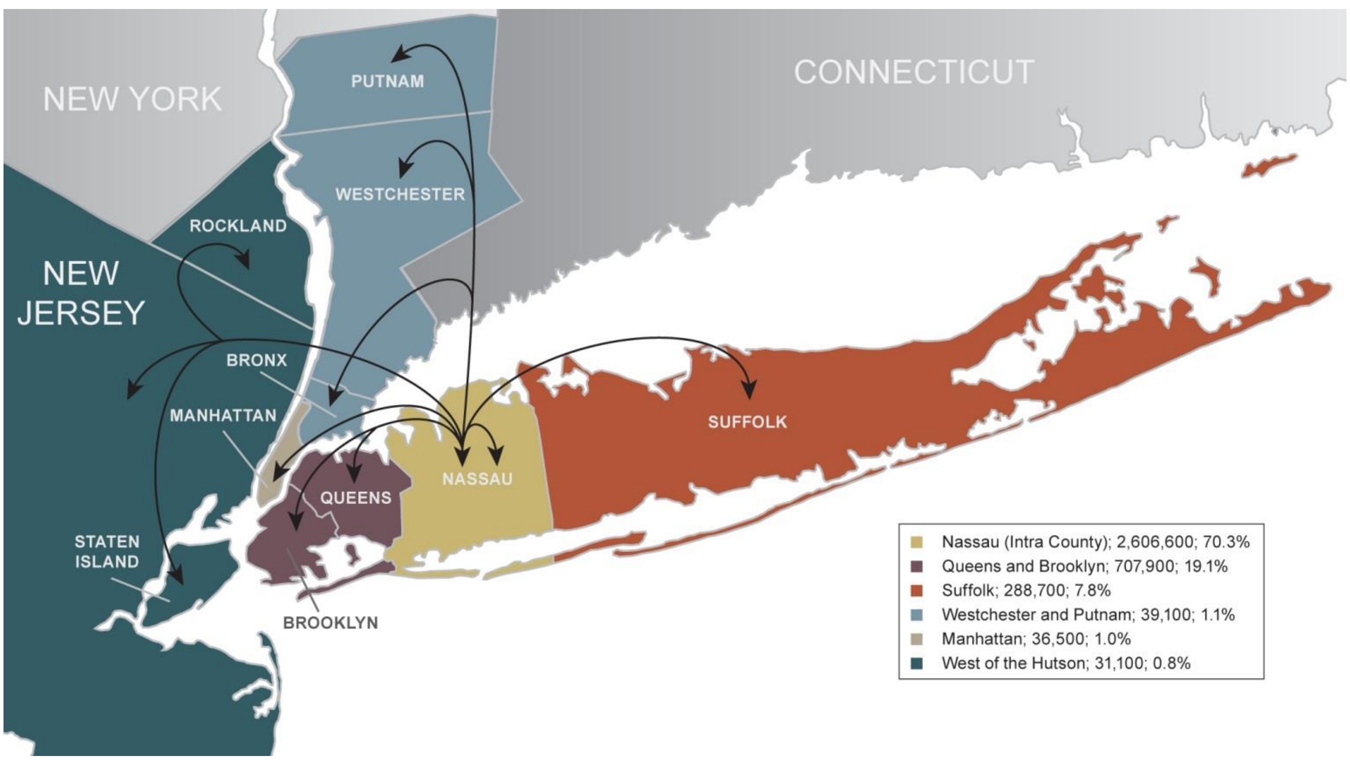


VMT Daily Totals





Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County: Nassau

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.54	11%	9%	383.6	1.22	43.1	14,050	24,587	2,524,246
Arterial	0.37	4%	3%	192.8	1.24	18.5	47,806	83,661	2,579,837
Local	0.24	1%	1%	7.7	1.01	24.5	2,618	4,582	1,416,813
PM Period (4 to 8 PM)									
Freeway	0.27	4%	5%	257.7	1.13	45.4	11,276	19,733	2,243,362
Arterial	0.14	1%	1%	64.3	1.09	22.4	22,491	39,360	1,796,016
Local	0.09	0%	0%	3.3	1.00	24.9	1,207	2,111	921,963
Daily Total									
Freeway	0.48	10%	12%	2355.3	1.28	42.6	119,404	208,956	12,345,835
Arterial	0.32	4%	4%	1742.1	1.26	19.5	362,728	634,774	13,007,431
Local	0.23	2%	2%	82.3	1.02	24.4	28,311	49,545	7,431,725
Total							**510,443**	**893,275**	**32,784,992**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.56	12%	11%	435.1	1.28	41.3	20,316	35,553	2,588,195
Arterial	0.41	5%	4%	303.3	1.29	17.6	65,890	115,307	2,812,380
Local	0.27	2%	2%	8.9	1.02	23.9	3,476	6,083	1,522,269
PM Period (4 to 8 PM)									
Freeway	0.29	4%	6%	332.6	1.18	43.6	18,122	31,714	2,361,340
Arterial	0.15	1%	1%	103.7	1.11	21.6	29,327	51,322	1,904,471
Local	0.10	0%	0%	4.5	1.01	24.3	1,564	2,737	963,022
Daily Total									
Freeway	0.50	10%	13%	2674.3	1.34	40.9	154,401	270,202	12,668,093
Arterial	0.36	5%	5%	2414.1	1.32	18.6	506,509	886,390	13,985,225
Local	0.25	2%	3%	117.4	1.02	23.8	37,021	64,786	7,900,242
Total							**697,930**	**1,221,378**	**34,553,560**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	4%	–	–	13%	5%	-4%	45%	45%	3%
Arterial	11%	–	–	57%	4%	-5%	38%	38%	9%
Local	13%	–	–	15%	1%	-2%	33%	33%	7%
PM Period (4 to 8 PM)									
Freeway	7%	–	–	29%	4%	-4%	61%	61%	5%
Arterial	7%	–	–	61%	2%	-3%	30%	30%	6%
Local	11%	–	–	35%	1%	-2%	30%	30%	4%
Daily Total									
Freeway	4%	–	–	14%	5%	-4%	29%	29%	3%
Arterial	13%	–	–	39%	5%	-4%	40%	40%	8%
Local	9%	–	–	43%	0%	-3%	31%	31%	6%
Total							**37%**	**37%**	**5%**

Nassau – Congested Corridors

20. **I-495/Long Island Expressway from Queens County Boundary to Suffolk County Boundary –** The westernmost portion of this stretch of I-495 (from the Queens County Boundary to Mineola/Willis Avenue) is part of the 16th highest-ranked corridor in the United States in terms of Congestion Cost in the TTI Report. The entire length of I-495 in Nassau County regularly experiences severe congestion mostly (but not exclusively) during peak commuting periods and around summer weekends, due to insufficient mainline capacity, frequent merges and weaves, and heavy truck usage. The eastbound direction is generally heaviest in evening peaks and on summer Fridays. The westbound direction is generally heaviest in morning peaks and on summer Sundays. The heavy usage of this road by trucks (I-495 is the only east-west limited-access highway in Nassau County on which trucks are permitted) causes the economic cost of the congestion on I-495 to be very high.

21. **Northern State Parkway (NSP) from Queens County Boundary to Suffolk County Boundary –** Essentially the same story as 20, except that congestion is not quite as severe and trucks are not permitted on this road.

22. Southern State Parkway from Queens County Boundary to Suffolk County Boundary – Essentially the same story as 21.

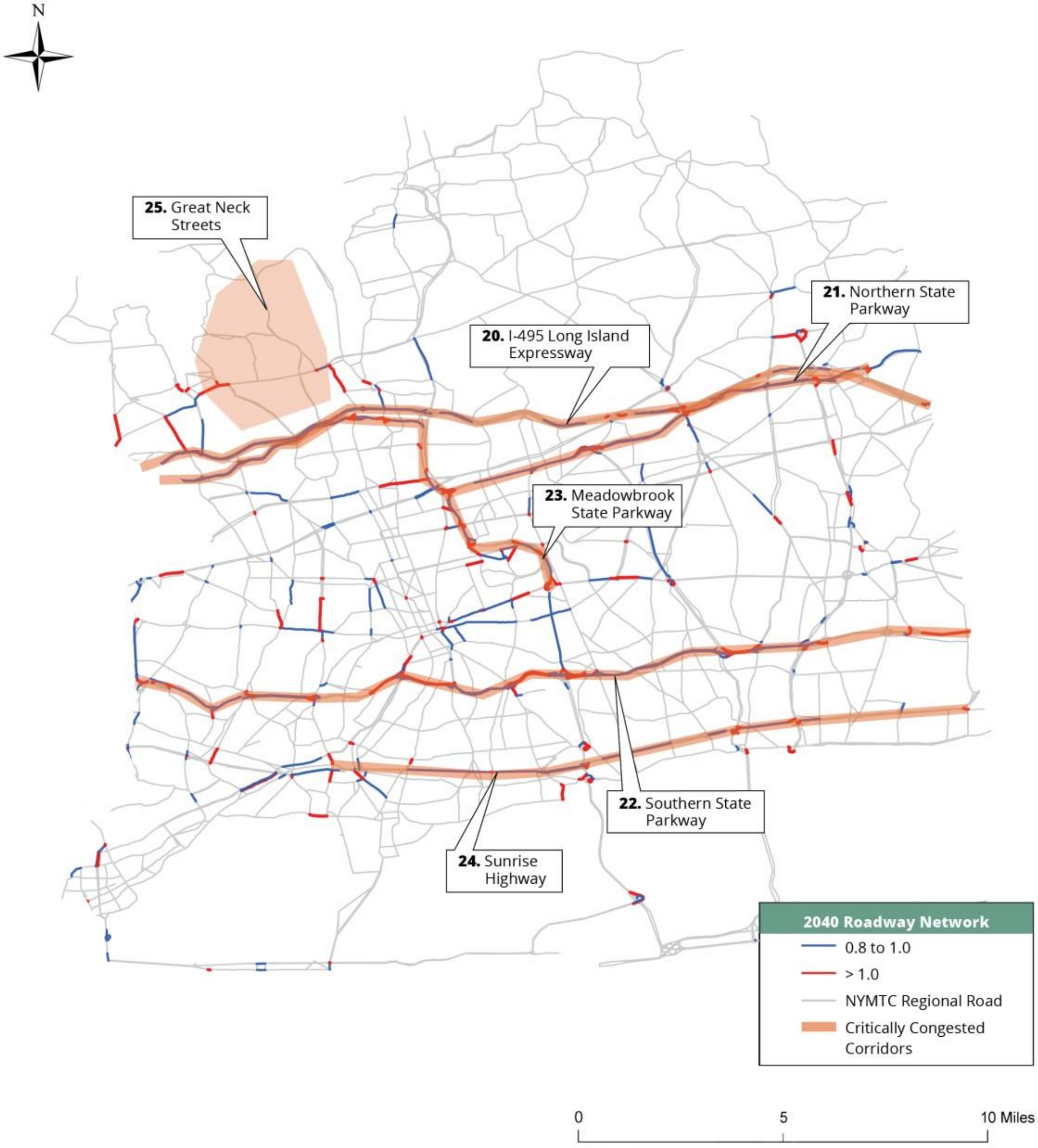
23. **Meadowbrook State Parkway from Hempstead Turnpike to the Northern State Parkway –** Heaviest-traveled north-south road in the county. Abuts the Nassau "Hub" area containing Roosevelt Field, Nassau Community College, the Nassau Veterans Memorial Coliseum, Hofstra University, and other shopping centers and major generators. The northbound direction is generally heaviest in morning peaks and the southbound direction is generally heaviest in evening peaks.

24. **NY-27/Sunrise Highway from Peninsula Boulevard to the Suffolk County Boundary –** This heavily traveled six-lane arterial has frequent signalized intersections and abuts major retail and other commercial centers as well as active Long Island Rail Road (LIRR) stations. It also carries the second highest (after I-495) east-west truck volume among Long Island highways. The eastbound direction is generally heaviest in evening peaks. The westbound direction is generally heaviest in morning peaks. There is significant pedestrian activity, particularly in the vicinity of the LIRR stations.

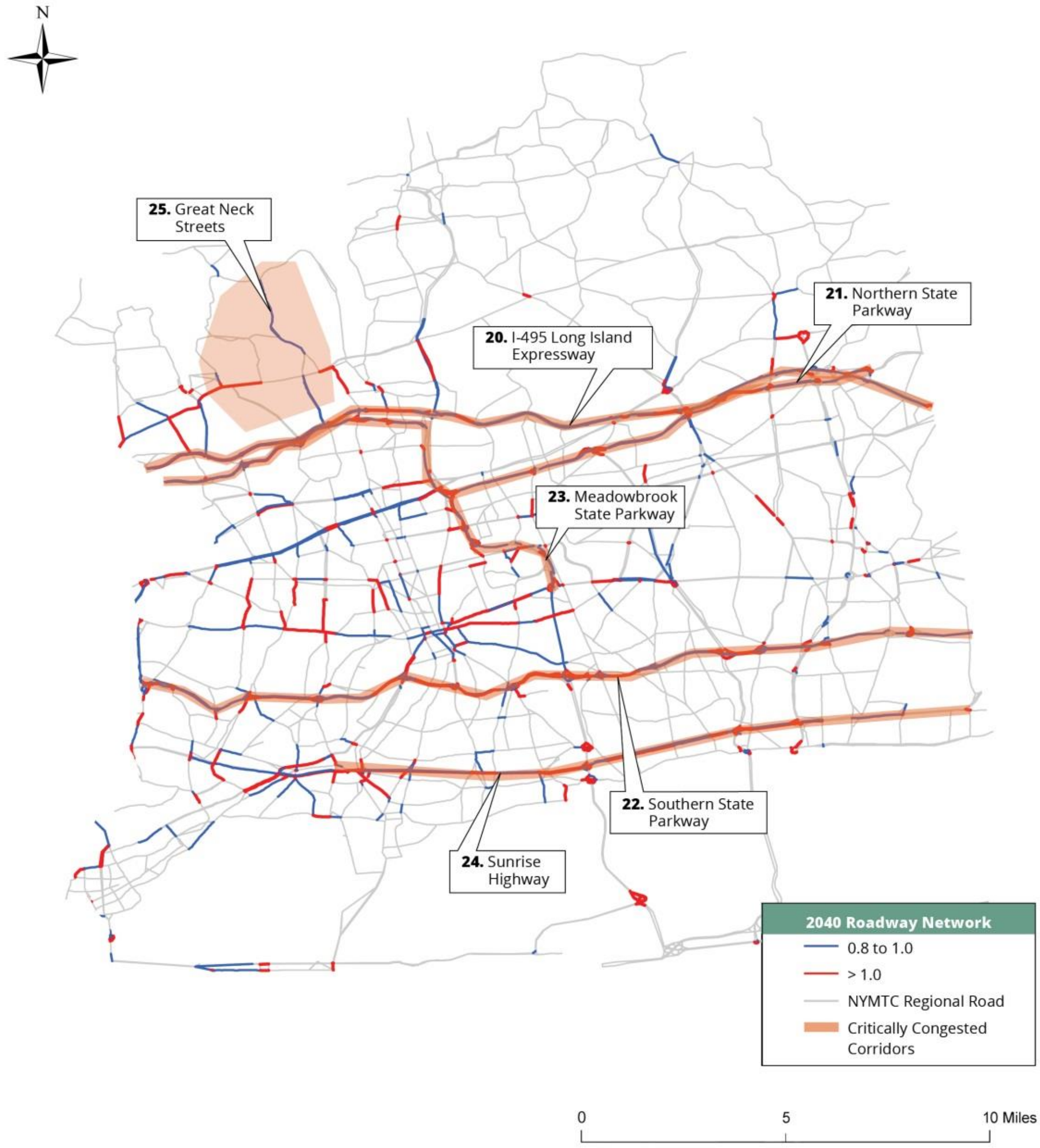
25. **Great Neck/Manhasset Streets –** The Great Neck/Manhasset area is a large employment center with three main centers: first, the area around the Great Neck LIRR station, second, the North Shore University Hospital complex and surrounding medical buildings on Community Drive and Northern Boulevard, and third, the concentration of retail and office space along Northern Boulevard east of

Community Drive. Because this area is a peninsula with access only via a limited number of arterial streets, these streets experience heavy congestion during peak commuting periods (primarily northbound in the morning and southbound in the evening. In addition, NY Route 25A (Northern Boulevard) also traverses this area in an east-west orientation, providing access as well as carrying spillover traffic from I-495 and the NSP.

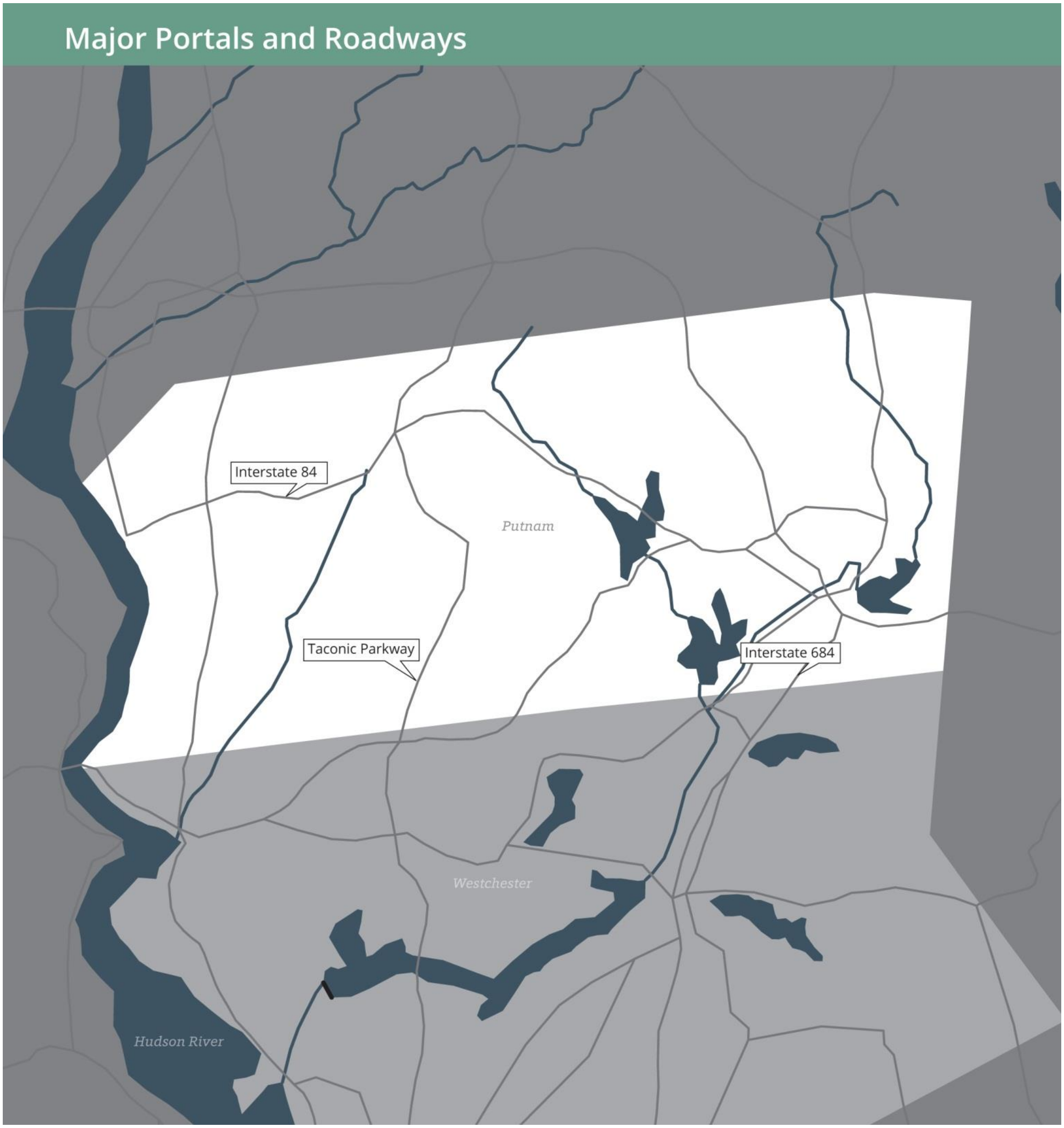
Nassau: Congested Corridors and Hot Spot Areas (AM Period)



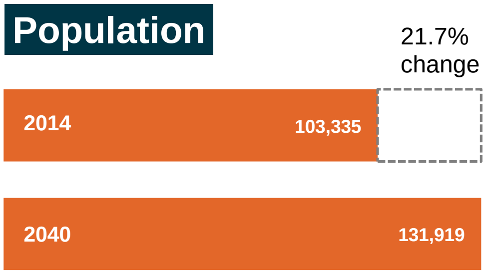
Nassau: Congested Corridors and Hot Spot Areas (PM Period)

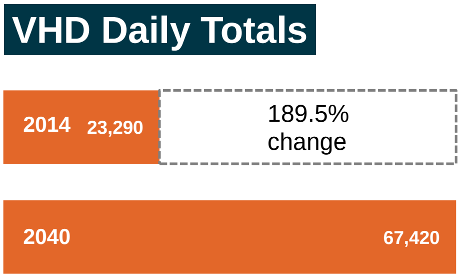


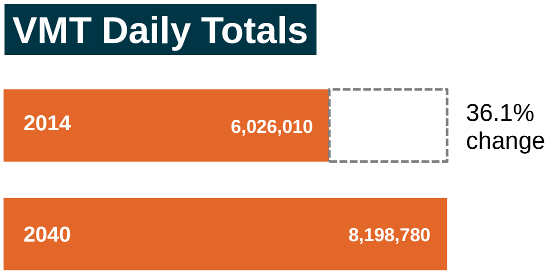
6.5 Putnam

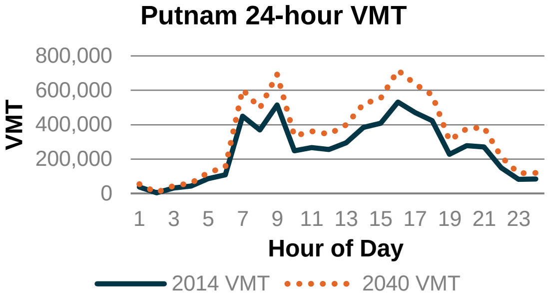

Major Portals and Roadways
Interstate 84
Putnam
Taconic Parkway
Interstate 684
Westchester
Hudson River

Population and Travel Characteristics

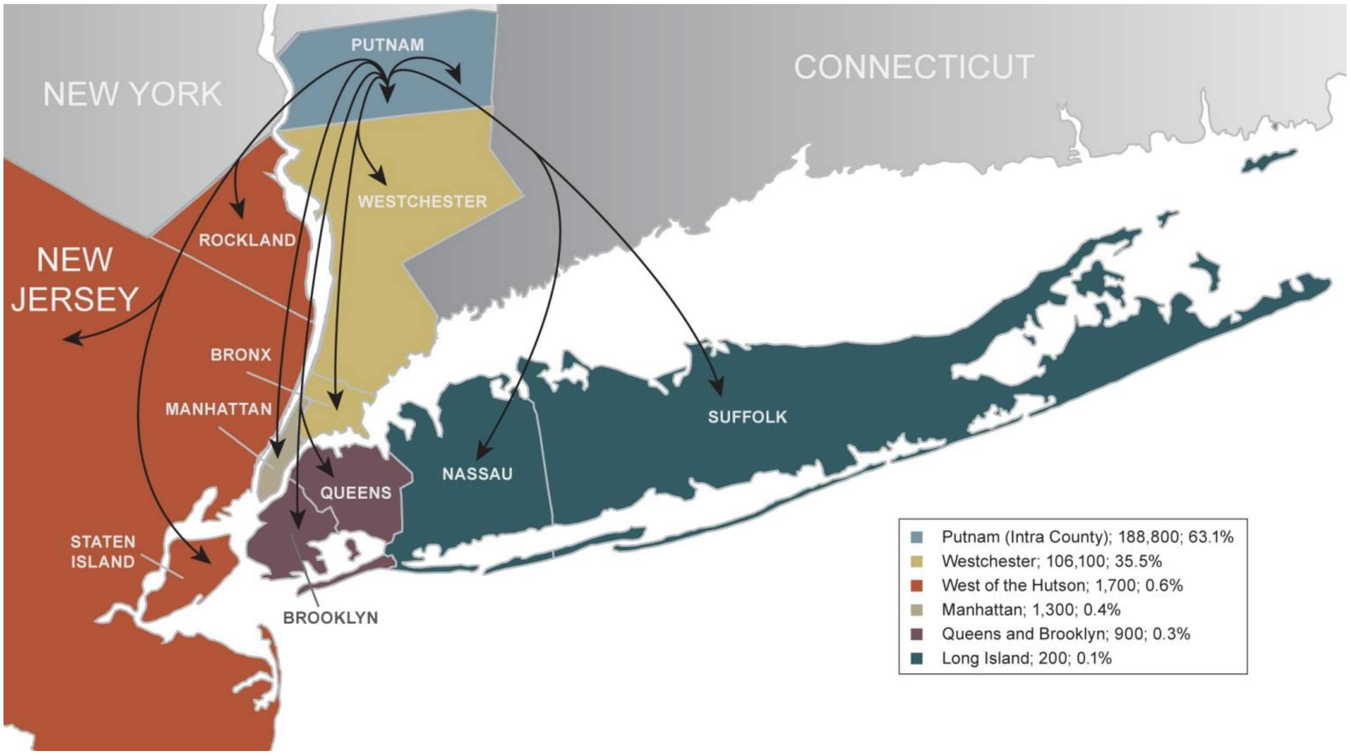








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County: Putnam

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.30	1%	2%	3.6	1.02	56.6	279	401	490,042
Arterial	0.33	3%	7%	57.5	1.13	27.7	9,941	14,314	393,460
Local	0.11	0%	0%	0.0	1.00	29.4	85	123	699,370
PM Period (4 to 8 PM)									
Freeway	0.09	0%	0%	1.8	1.01	57.3	71	102	318,287
Arterial	0.09	0%	0%	14.5	1.02	28.8	740	1,065	212,634
Local	0.03	0%	0%	0.0	1.00	29.5	5	7	368,879
Daily Total									
Freeway	0.19	1%	1%	12.8	1.01	57.0	810	1,166	1,845,303
Arterial	0.22	3%	3%	192.0	1.06	28.3	22,208	31,979	1,459,510
Local	0.08	0%	0%	0.0	1.00	29.4	270	389	2,721,193
Total							**23,288**	**33,535**	**6,026,006**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.39	5%	2%	46.5	1.05	55.8	620	892	629,053
Arterial	0.43	5%	11%	117.0	1.34	26.7	29,203	42,053	536,602
Local	0.14	0%	0%	3.4	1.00	29.3	423	610	961,308
PM Period (4 to 8 PM)									
Freeway	0.14	1%	1%	7.8	1.01	56.9	202	290	485,399
Arterial	0.12	1%	1%	26.3	1.04	28.5	2,780	4,003	288,308
Local	0.04	0%	0%	0.0	1.00	29.4	22	31	507,102
Daily Total									
Freeway	0.26	2%	1%	64.1	1.03	56.5	1,739	2,504	2,542,414
Arterial	0.28	3%	6%	350.7	1.15	27.7	64,593	93,014	1,954,647
Local	0.10	0%	0%	3.4	1.00	29.3	1,083	1,560	3,701,723
Total							**67,415**	**97,078**	**8,198,783**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The “0.8<=DC<=1” and “D/C>1” are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

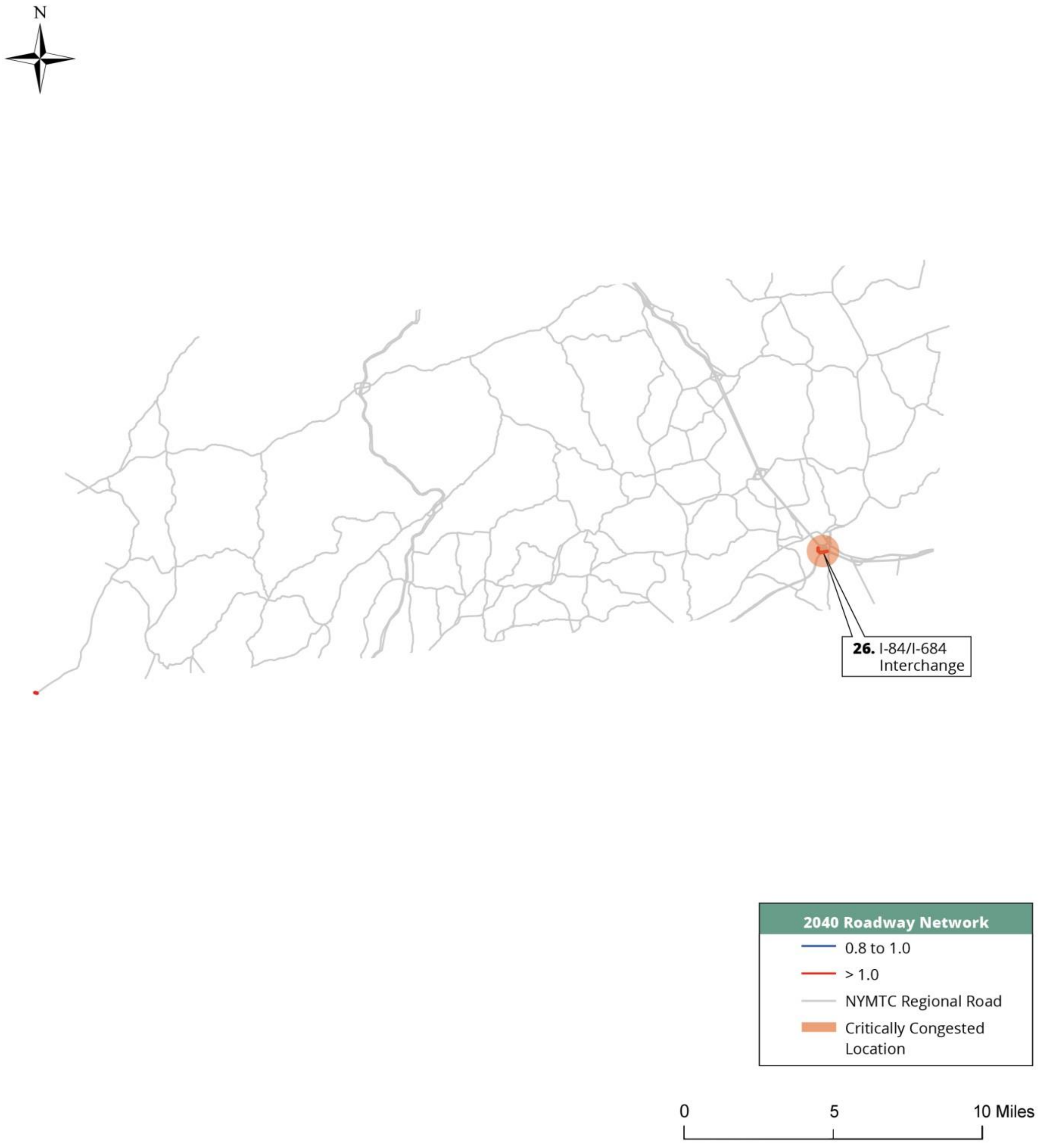
Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	30%	–	–	1199%	3%	-2%	122%	122%	28%
Arterial	30%	–	–	104%	19%	-4%	194%	194%	36%
Local	27%	–	–	-	0%	0%	396%	396%	37%
PM Period (4 to 8 PM)									
Freeway	56%	–	–	333%	0%	-1%	185%	185%	53%
Arterial	33%	–	–	81%	2%	-1%	276%	276%	36%
Local	33%	–	–	-	0%	0%	358%	358%	37%
Daily Total									
Freeway	37%	–	–	399%	2%	-1%	115%	115%	38%
Arterial	27%	–	–	83%	8%	-2%	191%	191%	34%
Local	25%	–	–	-	0%	0%	301%	301%	36%
Total							**189%**	**189%**	**36%**

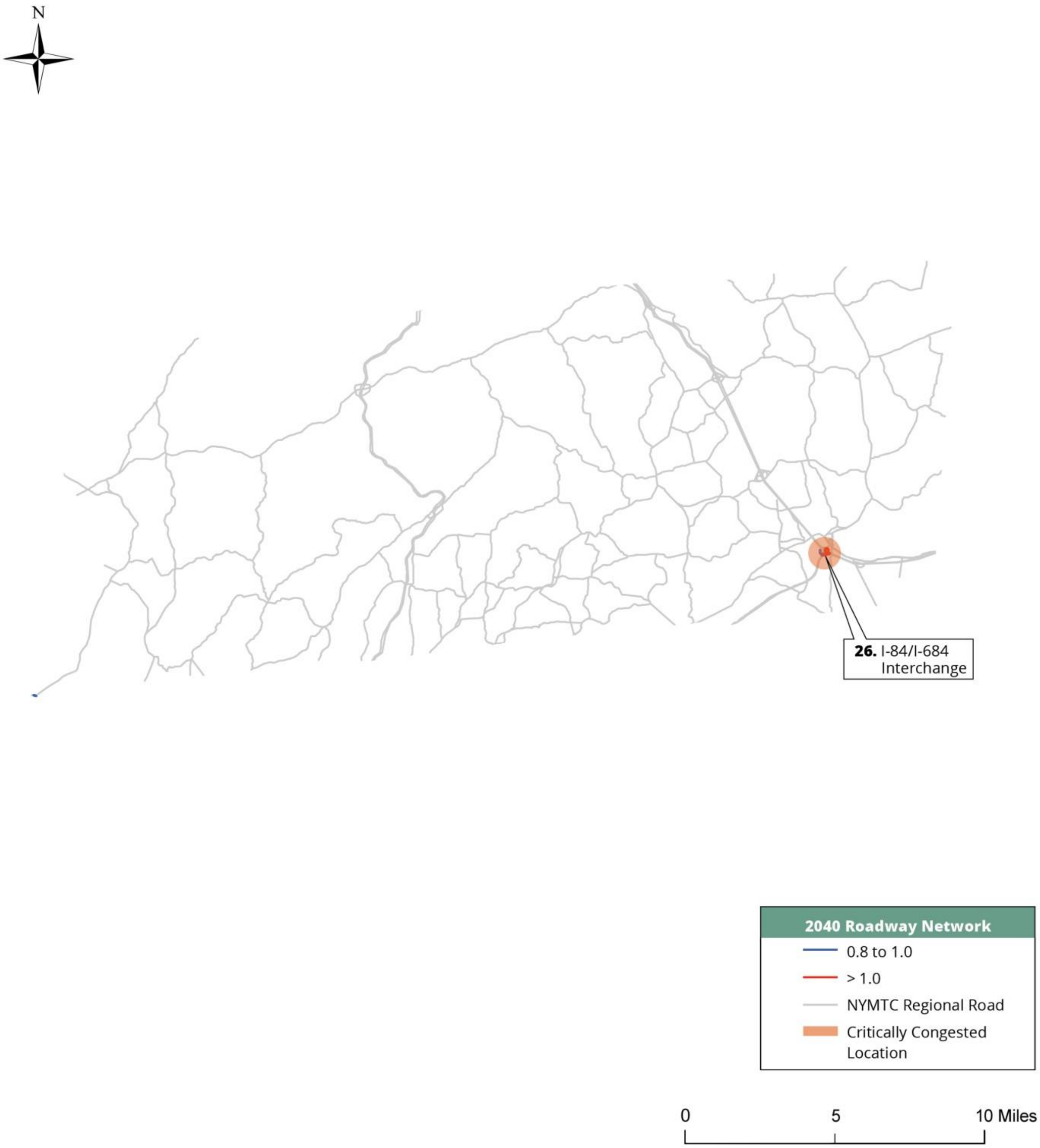
Putnam – Congested Location

26. **I-84/I-684 Interchange –** The NYBPM peak period assignments indicate that the ramps in this Interchange have insufficient capacity, causing queue spillbacks, particularly on northbound I-684 in evening peaks as well as on Fridays in both the winter ski season and the summer.

Putnam: Congested Location and Hot Spot Areas (AM Period)



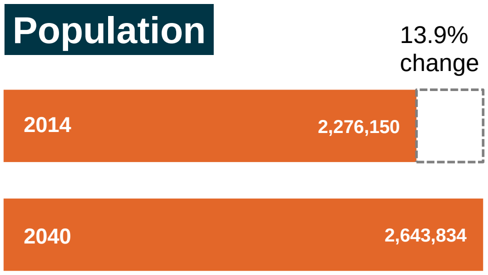
Putnam: Congested Location and Hot Spot Areas (PM Period)

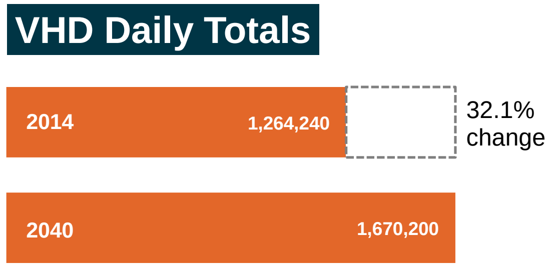


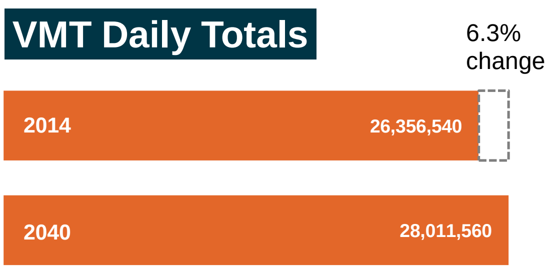
6.6 Queens

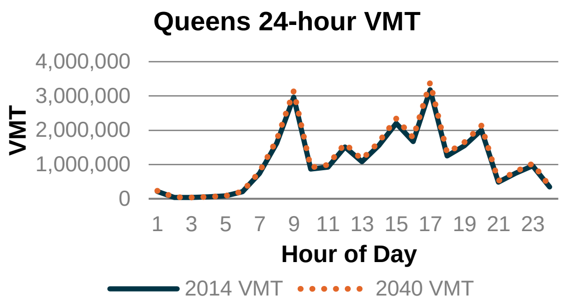
Major Portals and Roadways

Population and Travel Characteristics

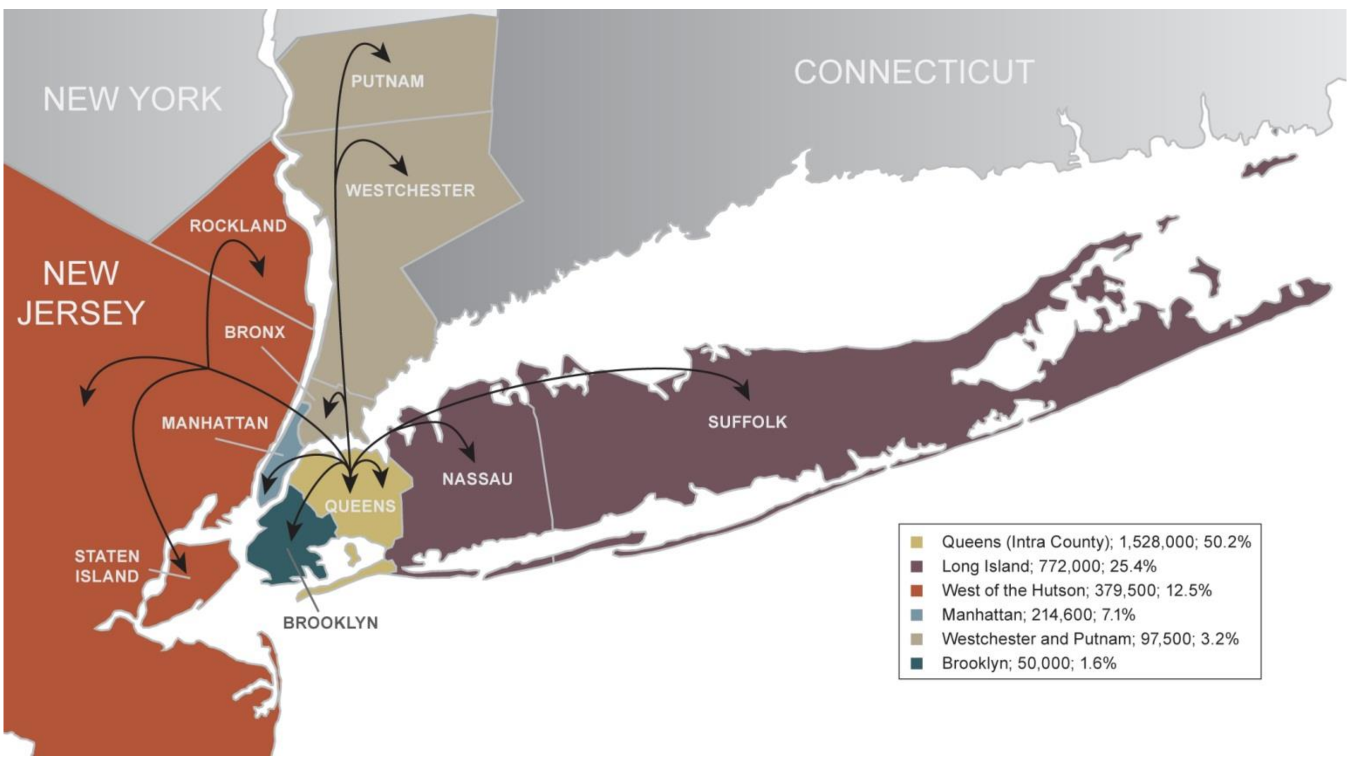








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County (Borough): Queens (Queens)

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.73	8%	24%	640.8	1.78	35.0	94,157	139,353	2,732,257
Arterial	0.45	6%	10%	676.5	2.02	15.3	351,868	520,765	2,181,634
Local	0.47	4%	13%	3.4	1.11	19.6	33,433	49,481	1,289,120
PM Period (4 to 8 PM)									
Freeway	0.26	2%	5%	217.5	1.15	41.2	16,171	23,933	1,654,621
Arterial	0.12	1%	1%	101.9	1.13	20.2	31,636	46,821	1,056,487
Local	0.11	1%	0%	0.1	1.00	21.5	454	672	485,047
Daily Total									
Freeway	0.54	8%	16%	2388.8	1.44	37.8	237,948	352,164	11,248,583
Arterial	0.33	4%	6%	2377.4	1.57	17.0	930,727	1,377,476	9,298,150
Local	0.35	5%	8%	11.1	1.05	20.3	95,561	141,431	5,809,807
Total							**1,264,237**	**1,871,070**	**26,356,540**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.75	8%	25%	683.5	1.82	34.1	102,230	151,301	2,863,377
Arterial	0.50	6%	12%	811.3	2.29	14.6	473,259	700,423	2,349,079
Local	0.51	4%	16%	3.6	1.12	19.1	37,118	54,934	1,353,760
PM Period (4 to 8 PM)									
Freeway	0.27	3%	6%	253.6	1.18	40.4	19,944	29,518	1,779,930
Arterial	0.13	1%	1%	139.5	1.15	19.7	39,175	57,979	1,125,141
Local	0.11	1%	0%	0.1	1.00	21.1	536	794	502,922
Daily Total									
Freeway	0.56	9%	17%	2633.1	1.48	36.9	269,418	398,739	11,843,305
Arterial	0.37	5%	8%	2941.5	1.72	16.4	1,258,794	1,863,015	9,984,903
Local	0.38	6%	10%	14.6	1.07	19.8	141,985	210,138	6,183,352
Total							**1,670,197**	**2,471,892**	**28,011,559**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	3%	–	–	7%	2%	-3%	9%	9%	5%
Arterial	11%	–	–	20%	13%	-5%	34%	34%	8%
Local	9%	–	–	7%	1%	-3%	11%	11%	5%
PM Period (4 to 8 PM)									
Freeway	4%	–	–	17%	3%	-2%	23%	23%	8%
Arterial	8%	–	–	37%	2%	-3%	24%	24%	6%
Local	0%	–	–	0%	0%	-2%	18%	18%	4%
Daily Total									
Freeway	4%	–	–	10%	3%	-2%	13%	13%	5%
Arterial	12%	–	–	24%	10%	-4%	35%	35%	7%
Local	9%	–	–	31%	2%	-3%	49%	49%	6%
Total							**32%**	**32%**	**6%**

Queens – Congested Corridors

27. **I-495/Long Island Expressway from the Queens-Midtown Tunnel to the Nassau County Boundary –** The stretch of I-495 from Maurice Avenue/Exit 18 to the Nassau County Boundary is part of the 16th highest-ranked corridor in the United States in terms of Congestion Cost in the TTI Report. The entire length of I-495 in Queens County regularly experiences severe congestion mostly (but not exclusively) during peak commuting periods, due to insufficient mainline capacity, frequent merges and weaves, and heavy truck usage. The eastbound direction is heaviest in evening peaks. The westbound direction is heaviest in morning peaks. The heavy usage of this road by trucks (I-495 is the only east-west limited access Queens highway on which trucks are permitted) causes the economic cost of the congestion on I-495 to be very high.

28. **Grand Central Parkway (GCP) from the RFK Bridge to the Nassau County Boundary –** The entire length of the GCP regularly experiences severe congestion mostly (but not exclusively) during peak commuting periods, due to insufficient mainline capacity, and frequent merges and weaves. The eastbound direction is heaviest in evening peaks. The westbound direction is heaviest in morning peaks. Trucks are not permitted on this road.

29. **I-678/Van Wyck Expressway from JFK Airport to the GCP –** In the northbound direction, this stretch of I-678 is the 4th highest-ranked corridor in the United States in terms of Delay per Mile in the TTI Report. In the southbound direction, it is the 19th highest-ranked corridor in the United States in terms of Delay per Mile. The only limited-access highway connecting JFK Airport (including its substantial air cargo facilities) and southern Queens/southwestern Nassau County with central Queens – where it connects with I-495, the GCP, Queens Boulevard, Union Turnpike, and the Jackie Robinson Parkway (JRP) – this portion of I-678 and its northbound Service Road experience severe congestion during many hours of the day due to insufficient mainline capacity, frequent merges and weaves, and heavy truck usage.

30. **Belt Parkway from Brooklyn Boundary to the Bronx-Whitestone Bridge –** The only east-west limited-access highway in southern Queens (primarily serving traffic to/from JFK Airport as well as through trips between Brooklyn and southern Nassau County) and the only continuous north-south limited-access highway in eastern Queens, the entire length of the Belt Parkway in Queens experiences severe congestion mostly (but not exclusively) during peak commuting periods, due to insufficient mainline capacity, and frequent merges and weaves. The eastbound direction in southern Queens and southbound direction in eastern Queens are heaviest in evening peaks. The westbound direction in southern Queens and northbound direction in eastern Queens are heaviest in morning peaks. Trucks are not permitted on this road.

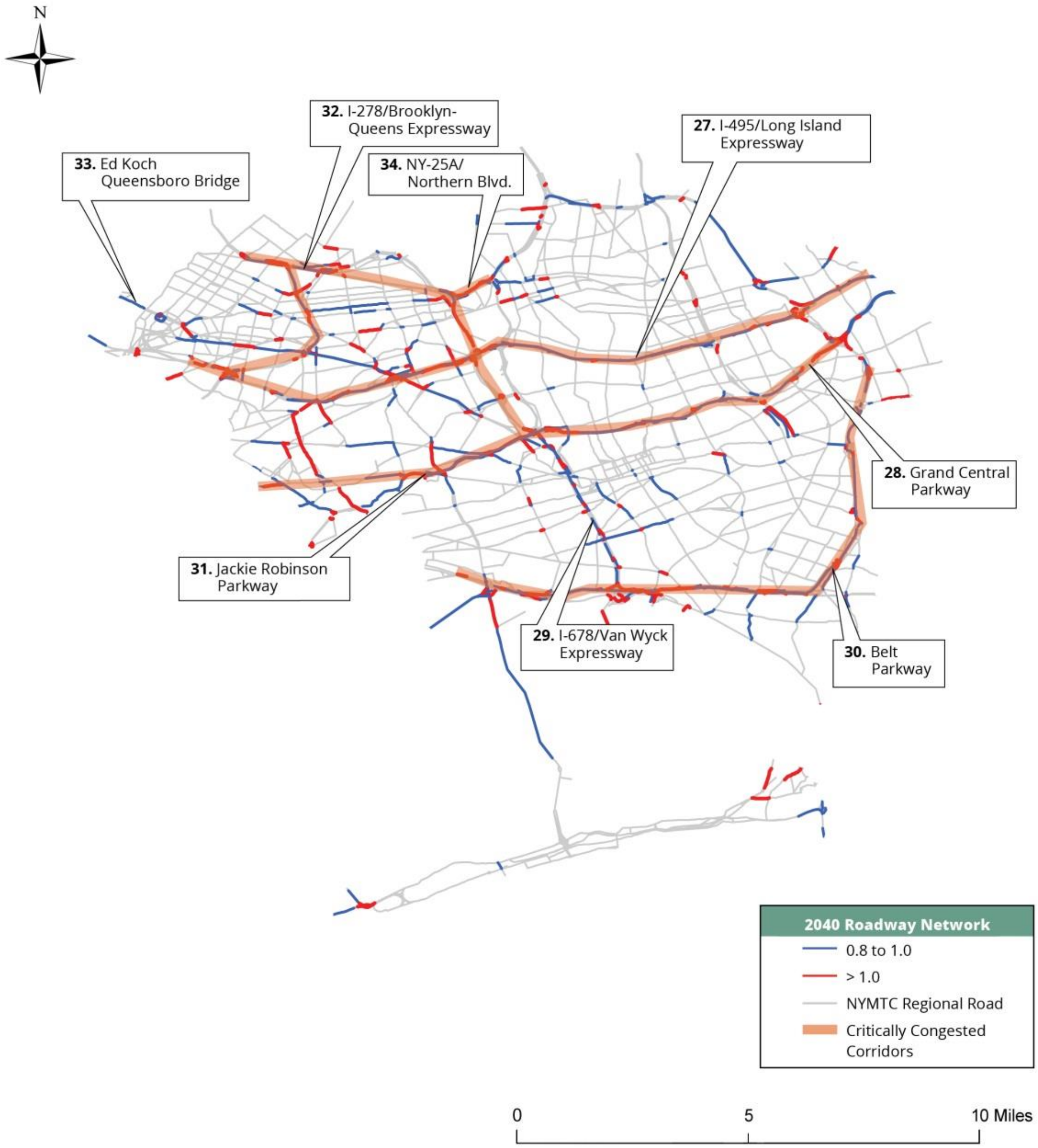
31. **Jackie Robinson Parkway (JRP) from the Brooklyn Boundary to the GCP –** The only limited-access highway connecting eastern Brooklyn with central Queens – where it connects with the GCP, Queens Boulevard, Union Turnpike, and I-678/Van Wyck Expressway – the entire length of the JRP in Queens experiences severe congestion during peak commuting periods, due to insufficient mainline capacity, and frequent merges and weaves. The eastbound direction is heaviest in evening peaks. The westbound direction is heaviest in morning peaks. Trucks are not permitted on this road.

32. **I-278/Brooklyn-Queens Expressway from the Brooklyn Boundary to the RFK Bridge –** The southern portion of this stretch of I-278 (from the Kosciuszko Bridge to NY-25A/Northern Boulevard) is part of the 13th highest-ranked corridor in the United States in terms of Delay per Mile in the TTI Report. The only north-south limited access highway in western Queens, I-278 experiences heavy congestion during peak commuting periods due to insufficient mainline capacity, heavy merges and weaves, and heavy truck usage, and spillbacks from congestion on the GCP/RFK Bridge approach. The eastbound/northbound direction is heaviest in evening peaks. The westbound/southbound direction is heaviest in morning peaks.

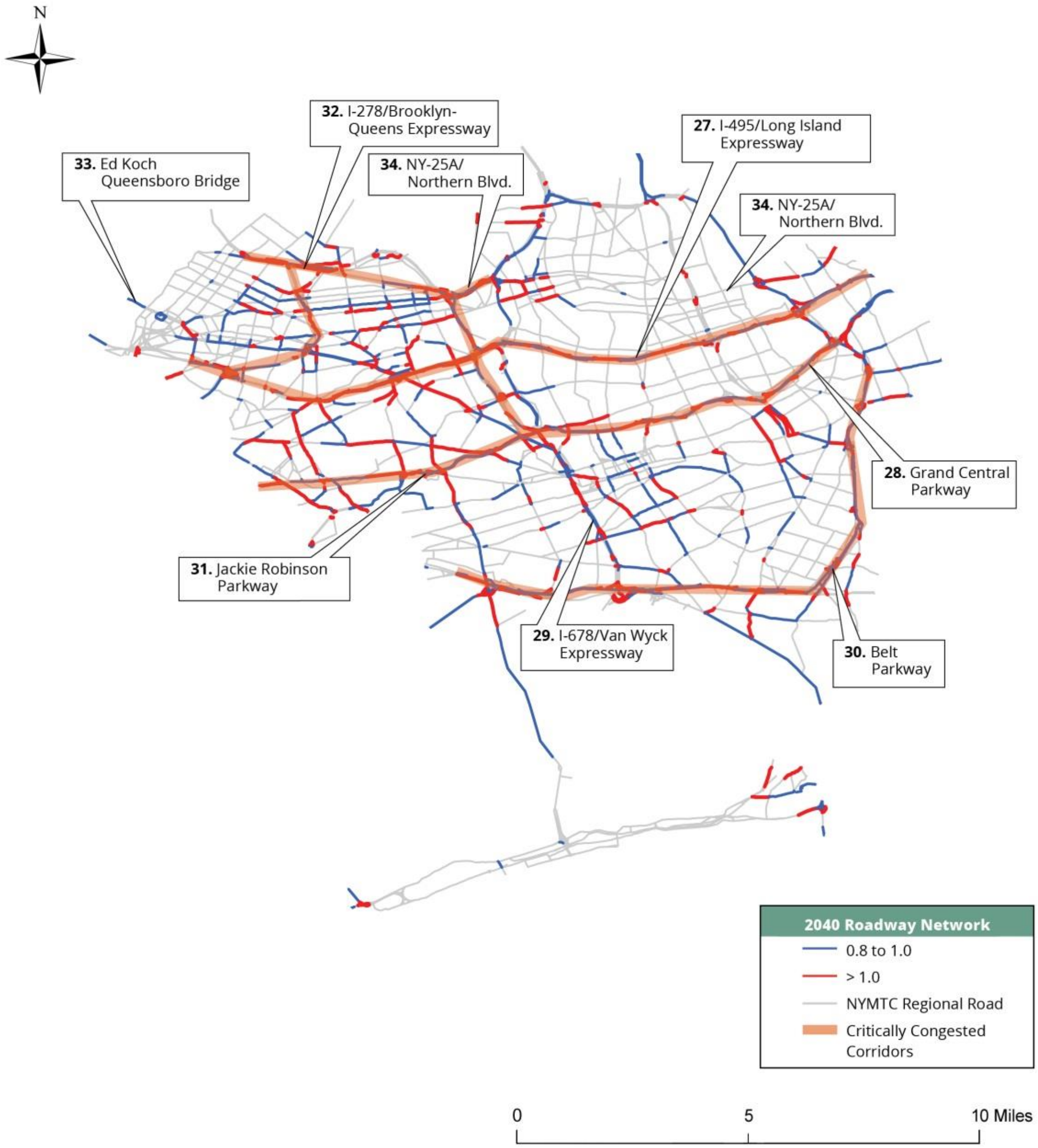
33. **Ed Koch Queensboro Bridge –** The only toll-free East River crossing between Queens and Manhattan, this Bridge (also known as the 59th Street Bridge) experiences heavy congestion primarily (but not exclusively) during peak commuting periods due to insufficient mainline capacity, and interactions with the street systems on both ends (it has no direct connections with limited-access highways on either side). The eastbound (outbound) direction is heaviest in evening peaks. The westbound (inbound) direction is heaviest in morning peaks.

34. **NY-25A/Northern Boulevard from the GCP to I-678/Van Wyck Expressway/Whitestone Expressway –** This section of Northern Boulevard provides connections between the GCP (providing access to LaGuardia Airport, I-278, and the RFK Bridge), Northern Boulevard, and Astoria Boulevard on the west and I-678 (providing access to the Bronx-Whitestone Bridge), Northern Boulevard, and downtown Flushing on the east. It experiences heavy congestion during peak commuting periods due to heavy merging and weaving. The eastbound direction is heaviest in evening peaks. The westbound direction is heaviest in morning peaks.

Queens: Congested Corridors and Hot Spot Areas (AM Period)

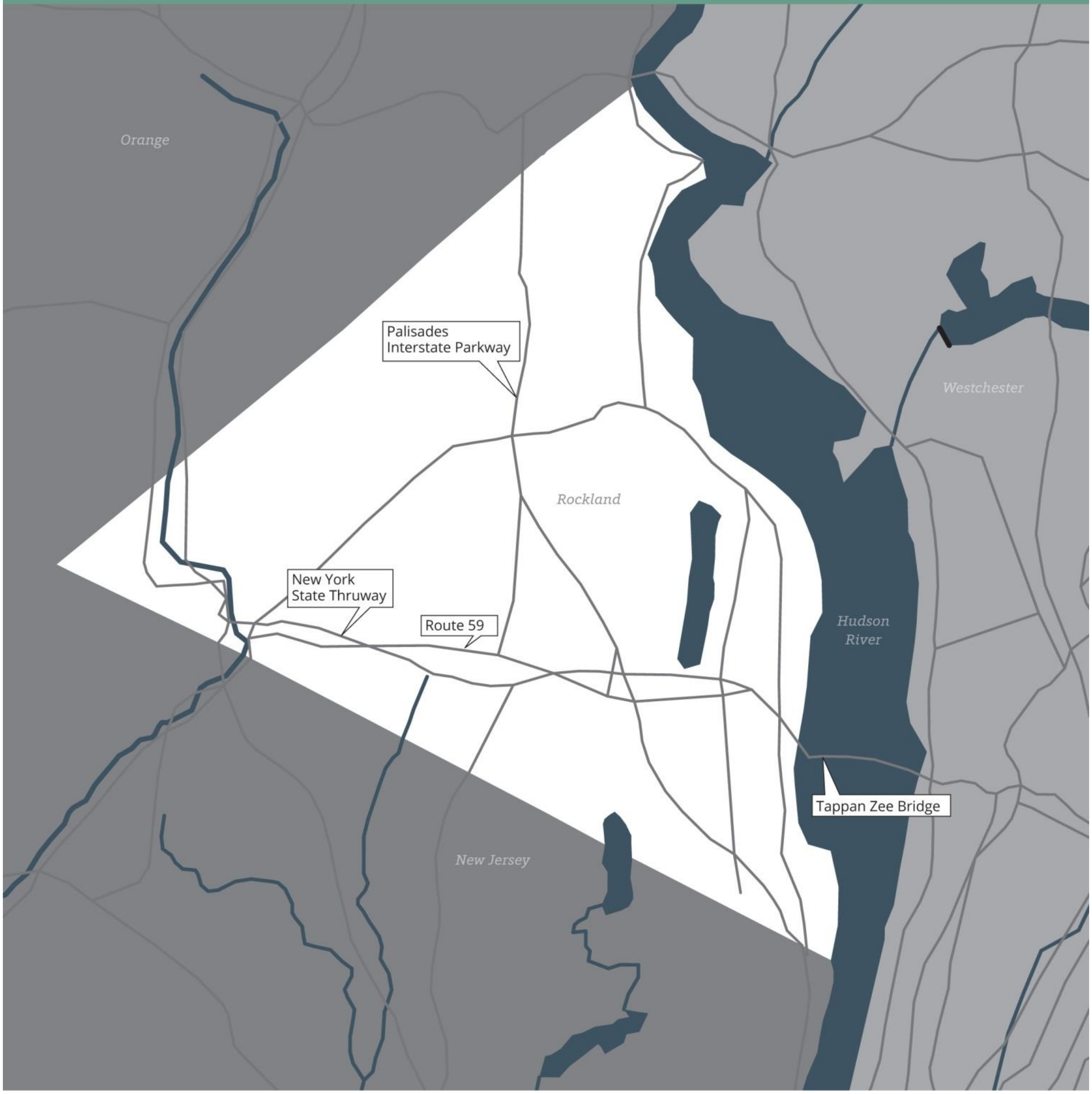


Queens: Congested Corridors and Hot Spot Areas (PM Period)

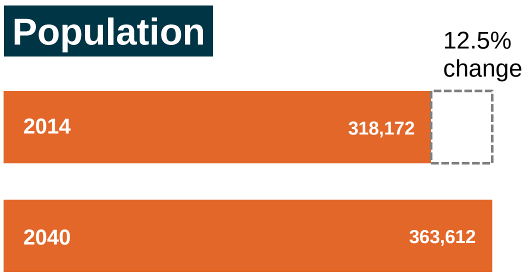


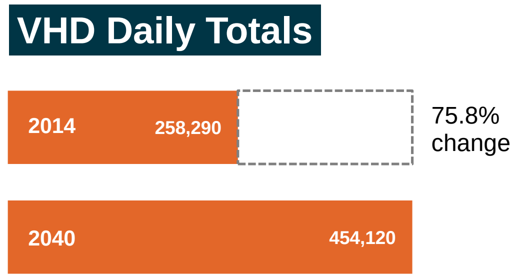
6.7 Rockland

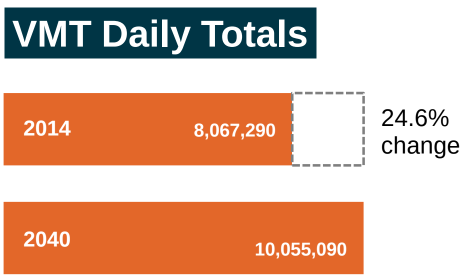
Major Portals and Roadways

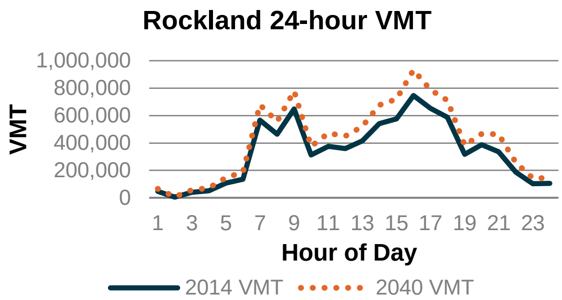


Population and Travel Characteristics

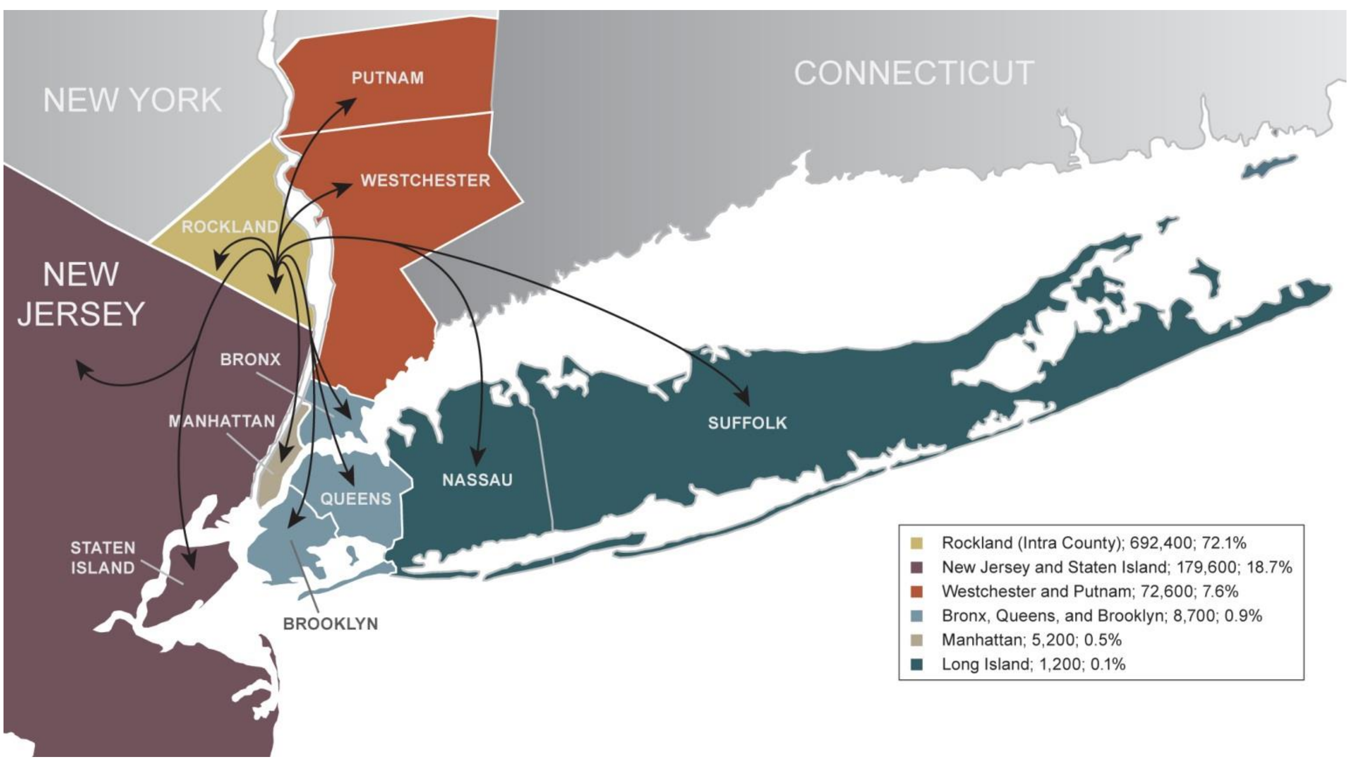








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County: Rockland

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.50	7%	8%	67.0	1.21	44.8	2,573	3,705	934,089
Arterial	0.25	1%	1%	14.2	1.11	23.4	5,754	8,285	659,157
Local	0.20	0%	2%	3.3	1.24	22.1	40,758	58,692	397,200
PM Period (4 to 8 PM)									
Freeway	0.14	1%	1%	8.1	1.04	49.3	512	737	495,404
Arterial	0.08	0%	0%	7.0	1.04	26.4	2,060	2,967	387,404
Local	0.06	0%	0%	1.4	1.04	23.8	4,543	6,543	236,909
Daily Total									
Freeway	0.33	4%	4%	165.2	1.11	47.0	6,547	9,427	3,532,455
Arterial	0.18	1%	1%	81.6	1.09	24.6	25,845	37,217	2,776,494
Local	0.15	0%	2%	14.2	1.21	22.7	225,897	325,291	1,758,343
Total							**258,288**	**371,935**	**8,067,292**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.60	14%	12%	160.9	1.32	42.8	6,275	9,036	1,144,913
Arterial	0.29	2%	2%	30.9	1.13	23.5	7,659	11,029	788,406
Local	0.23	0%	3%	3.3	1.42	21.0	91,445	131,680	456,258
PM Period (4 to 8 PM)									
Freeway	0.21	1%	2%	55.9	1.07	48.4	1,895	2,729	824,686
Arterial	0.09	0%	0%	10.6	1.04	26.6	2,663	3,835	453,152
Local	0.07	0%	0%	1.4	1.05	22.8	8,163	11,754	268,340
Daily Total									
Freeway	0.43	7%	7%	495.9	1.19	45.5	17,818	25,659	4,757,855
Arterial	0.21	2%	1%	143.6	1.10	24.7	33,625	48,421	3,268,144
Local	0.18	0%	2%	14.2	1.31	21.7	402,675	579,852	2,029,094
Total							**454,119**	**653,931**	**10,055,092**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The “0.8<=DC<=1” and “D/C>1” are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

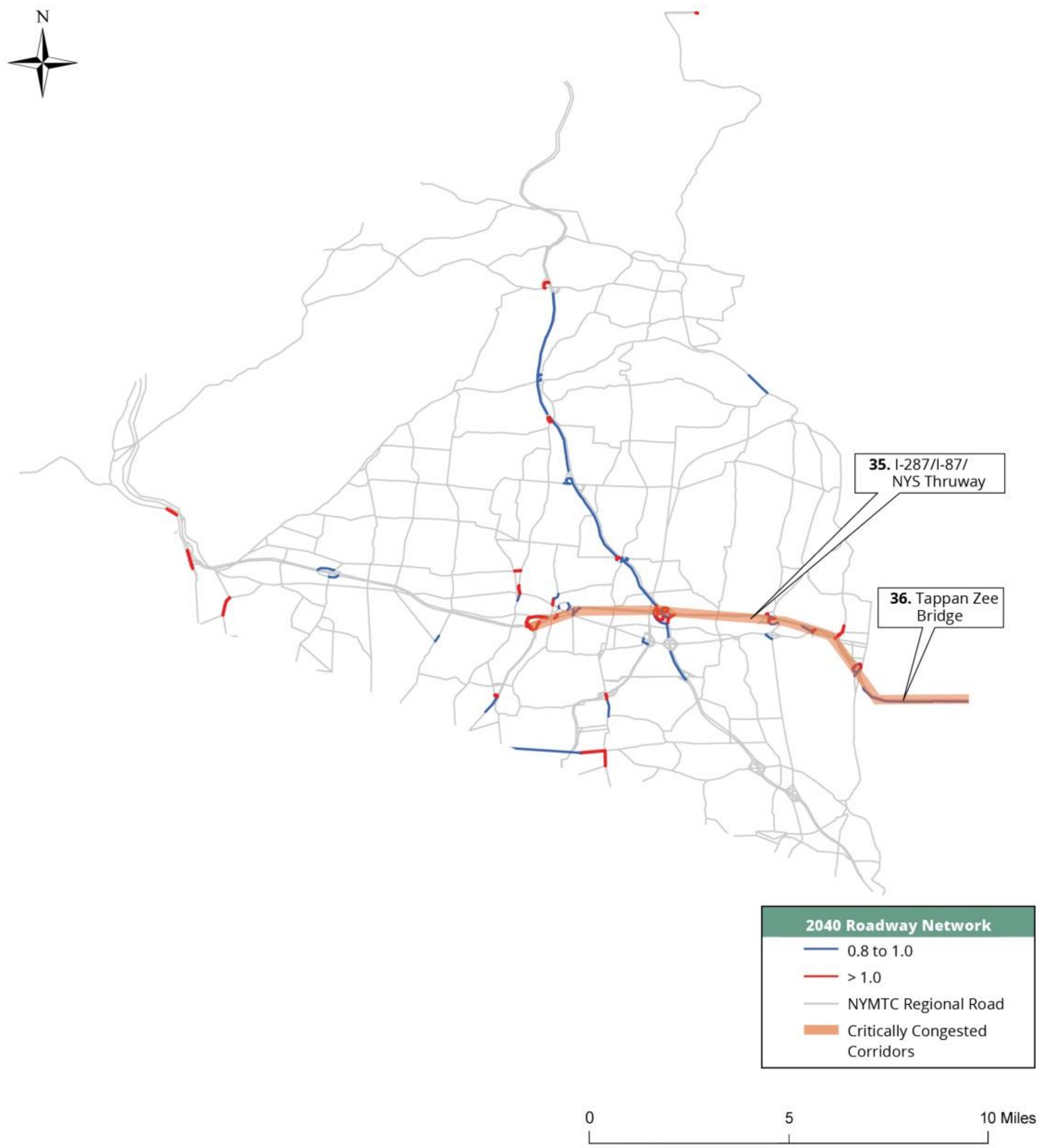
Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	20%	–	–	140%	9%	-4%	144%	144%	23%
Arterial	16%	–	–	118%	2%	1%	33%	33%	20%
Local	15%	–	–	0%	15%	-5%	124%	124%	15%
PM Period (4 to 8 PM)									
Freeway	50%	–	–	592%	3%	-2%	270%	270%	66%
Arterial	13%	–	–	51%	0%	1%	29%	29%	17%
Local	17%	–	–	0%	1%	-4%	80%	80%	13%
Daily Total									
Freeway	30%	–	–	200%	7%	-3%	172%	172%	35%
Arterial	17%	–	–	76%	1%	1%	30%	30%	18%
Local	20%	–	–	0%	8%	-4%	78%	78%	15%
Total							**76%**	**76%**	**25%**

Rockland – Congested Corridors

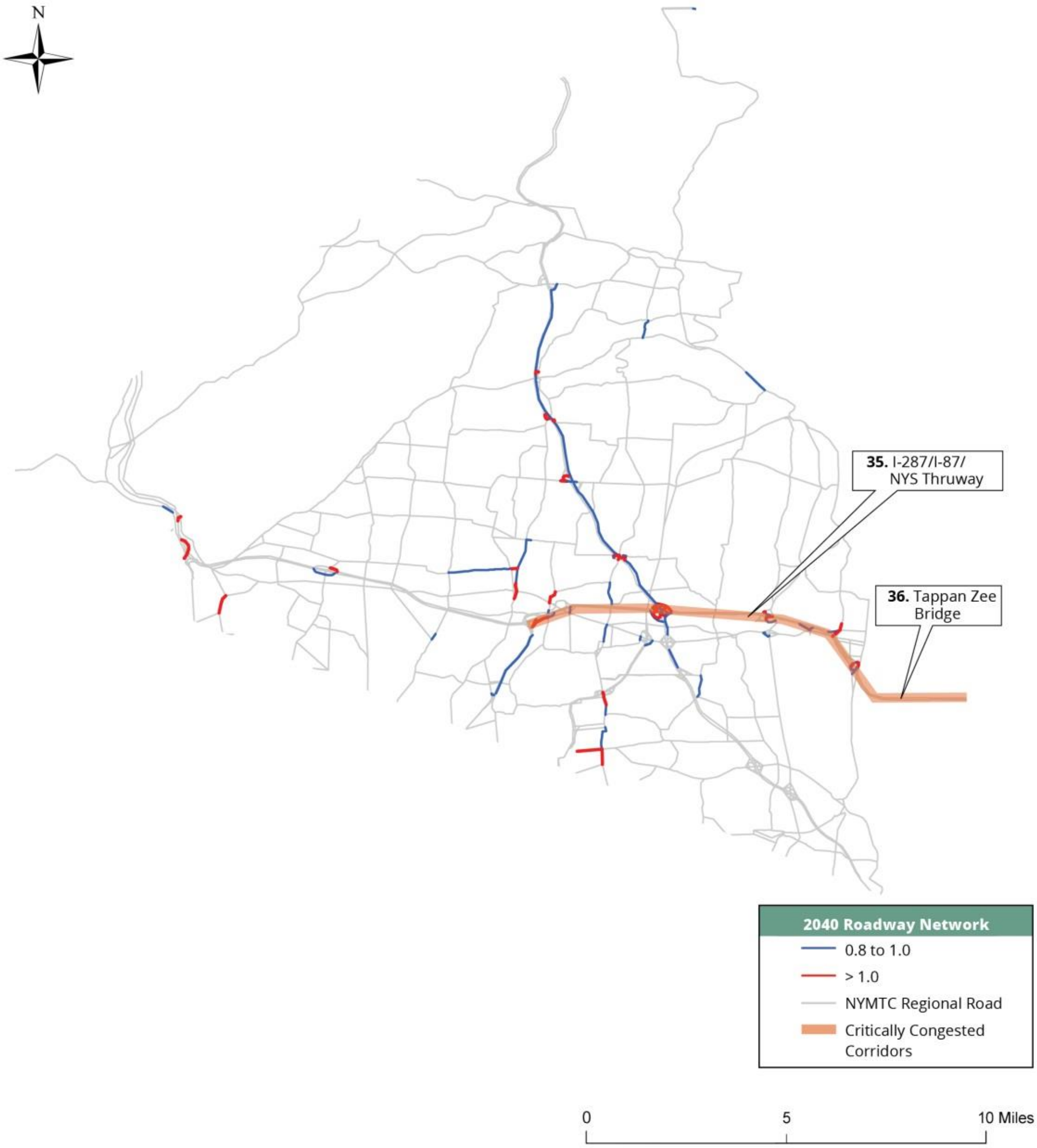
35. **I-287/I-87/NYS Thruway from the Garden State Parkway to the Tappan Zee Bridge –** I-287/I-87 is the only east-west limited-access highway in Rockland County. The subject section of this highway experiences heavy congestion during peak commuting periods and summer weekends due to insufficient mainline capacity, heavy merging and weaving, and steep grades. The eastbound direction is heaviest in morning peaks and on summer Sundays. The westbound direction is heaviest in evening peaks.

36. **Tappan Zee Bridge (TZB) –** The only relatively high-capacity crossing of the Hudson River in the northern part of the New York City region, this Bridge experiences heavy congestion during peak commuting periods and summer weekends due to insufficient mainline capacity and toll plaza area issues. The eastbound direction is heaviest in morning peaks and on summer Sundays. The westbound direction is heaviest in evening peaks. Construction of a replacement for the TZB is expected to start in early 2013, take five years, and cost about $4 billion. Congestion may not ease substantially, however, as there will still be four travel lanes in the peak direction in peak traffic periods.

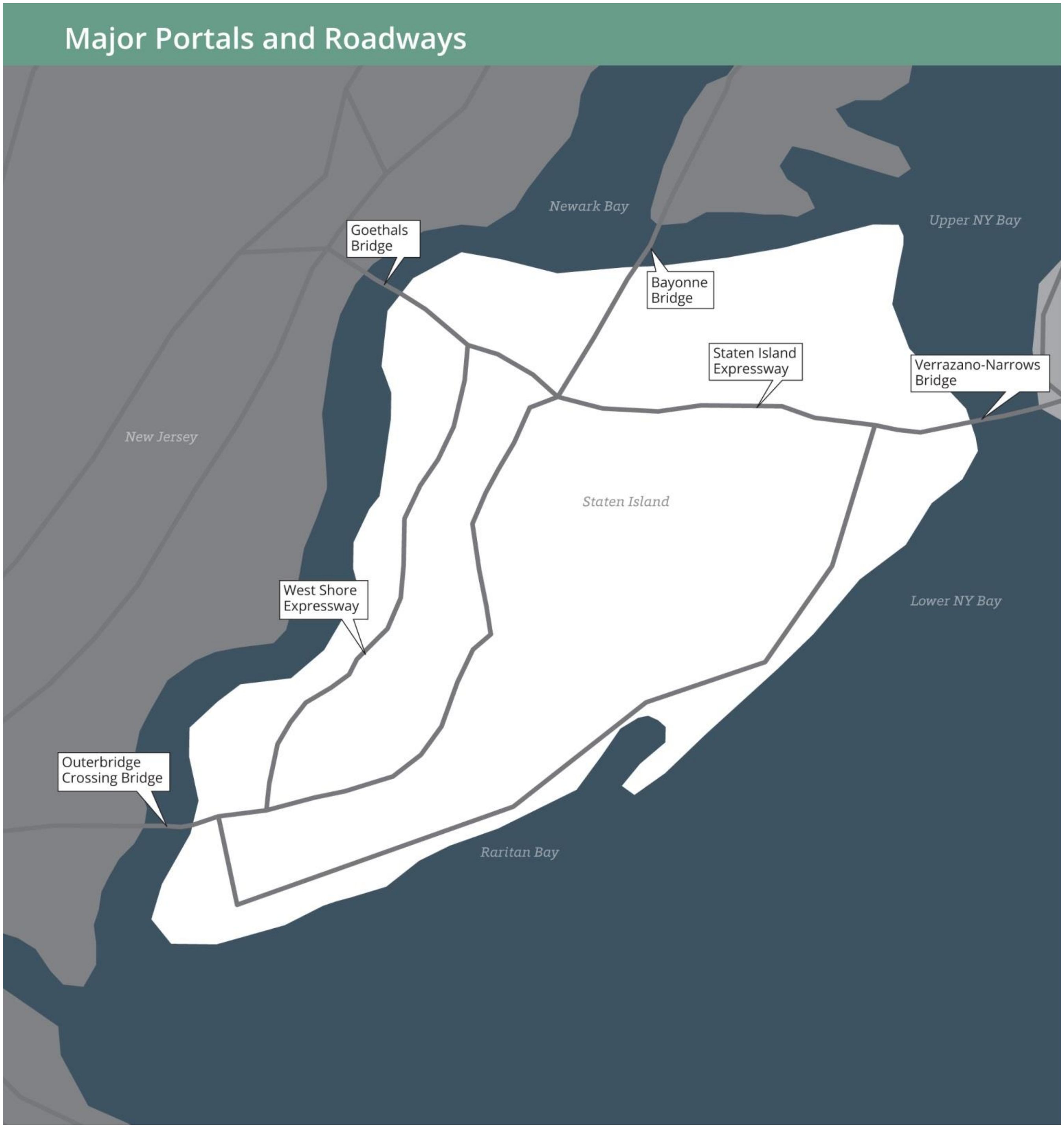
Rockland: Congested Corridors and Hot Spot Areas (AM Period)



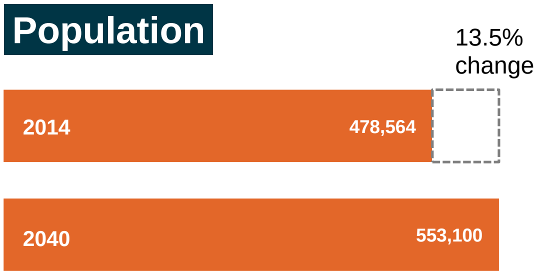
Rockland: Congested Corridors and Hot Spot Areas (PM Period)

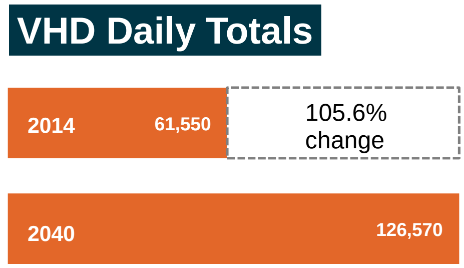


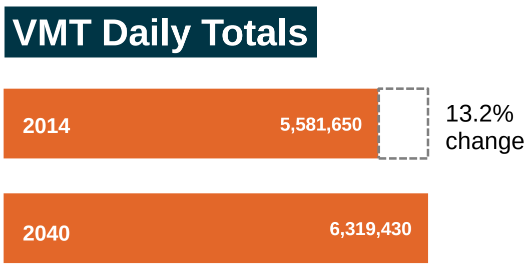
6.8 Staten Island

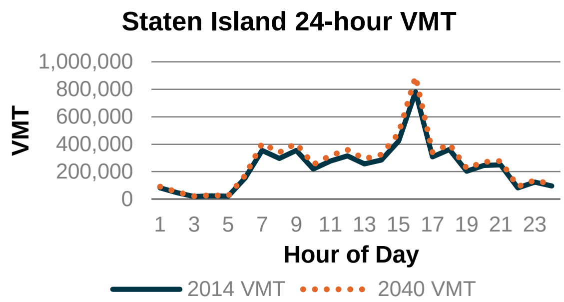


Population and Travel Characteristics

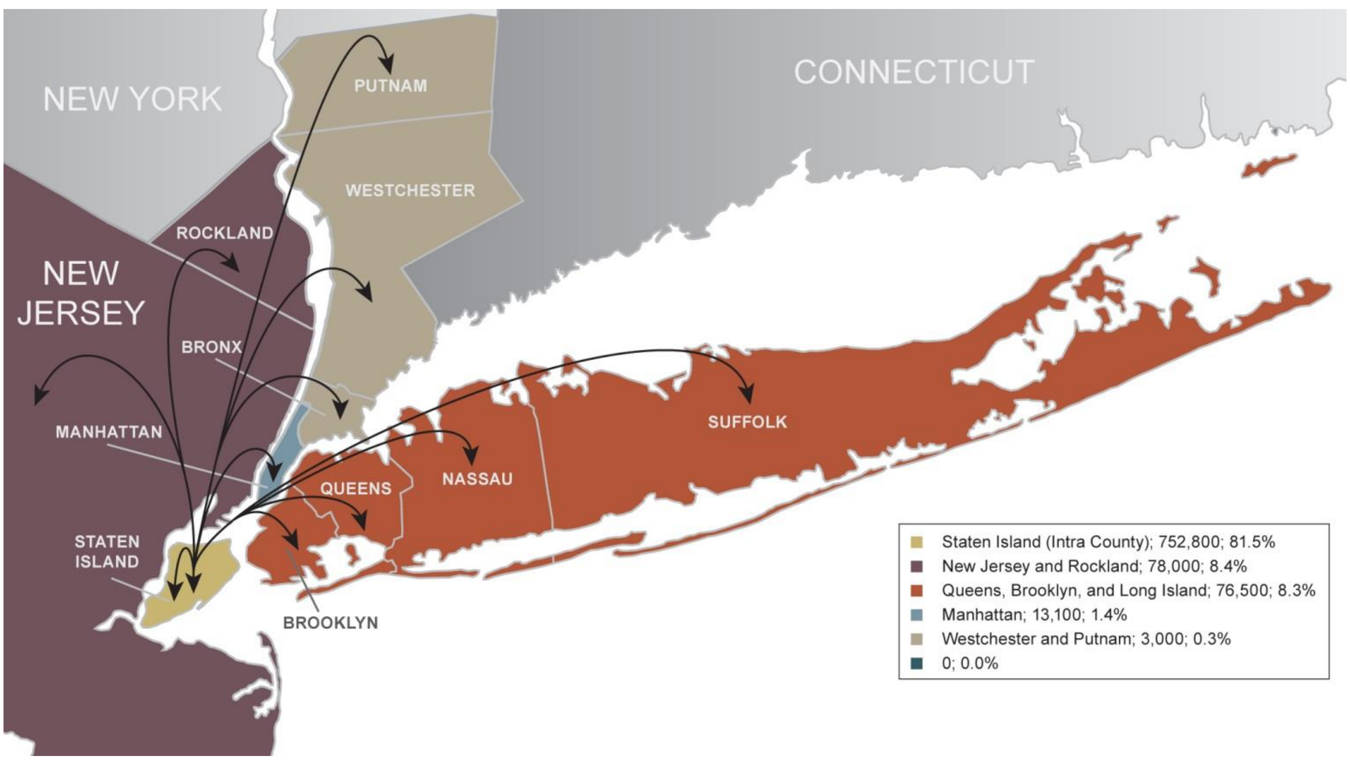








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County (Borough): Richmond (Staten Island)

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.48	8%	6%	50.9	1.11	44.3	1,103	1,632	447,242
Arterial	0.25	1%	0%	5.5	1.09	22.0	3,325	4,921	444,364
Local	0.28	3%	0%	0.0	1.01	24.2	241	357	334,336
PM Period (4 to 8 PM)									
Freeway	0.22	2%	2%	19.5	1.03	46.1	531	785	380,693
Arterial	0.10	0%	0%	5.1	1.04	23.5	1,782	2,637	321,668
Local	0.09	0%	0%	0.0	1.00	24.7	23	34	199,167
Daily Total									
Freeway	0.39	5%	6%	218.8	1.14	44.7	18,200	26,936	2,013,828
Arterial	0.22	1%	1%	154.5	1.11	22.3	40,424	59,828	2,069,443
Local	0.21	2%	1%	1.0	1.01	24.2	2,927	4,333	1,498,381
Total							**61,551**	**91,096**	**5,581,652**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.52	12%	8%	60.6	1.14	42.0	1,897	2,808	487,926
Arterial	0.33	3%	1%	30.8	1.13	20.6	5,764	8,531	544,881
Local	0.35	3%	0%	0.0	1.02	22.6	681	1,007	372,069
PM Period (4 to 8 PM)									
Freeway	0.25	2%	3%	39.3	1.09	43.9	2,984	4,416	439,916
Arterial	0.12	0%	0%	14.8	1.05	22.5	2,755	4,078	363,742
Local	0.12	0%	0%	0.0	1.00	23.0	82	121	205,583
Daily Total									
Freeway	0.43	6%	7%	276.6	1.18	42.3	26,346	38,992	2,228,879
Arterial	0.27	2%	2%	282.1	1.18	21.1	84,916	125,676	2,447,091
Local	0.28	2%	2%	1.9	1.04	22.6	15,312	22,662	1,643,459
Total							**126,574**	**187,330**	**6,319,429**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	8%	–	–	19%	3%	-5%	72%	72%	9%
Arterial	32%	–	–	462%	4%	-6%	73%	73%	23%
Local	25%	–	–	-	1%	-7%	183%	183%	11%
PM Period (4 to 8 PM)									
Freeway	14%	–	–	101%	6%	-5%	462%	462%	16%
Arterial	20%	–	–	191%	1%	-4%	55%	55%	13%
Local	33%	–	–	-	0%	-7%	254%	254%	3%
Daily Total									
Freeway	10%	–	–	26%	4%	-5%	45%	45%	11%
Arterial	23%	–	–	83%	6%	-6%	110%	110%	18%
Local	33%	–	–	90%	3%	-7%	423%	423%	10%
Total							**106%**	**106%**	**13%**

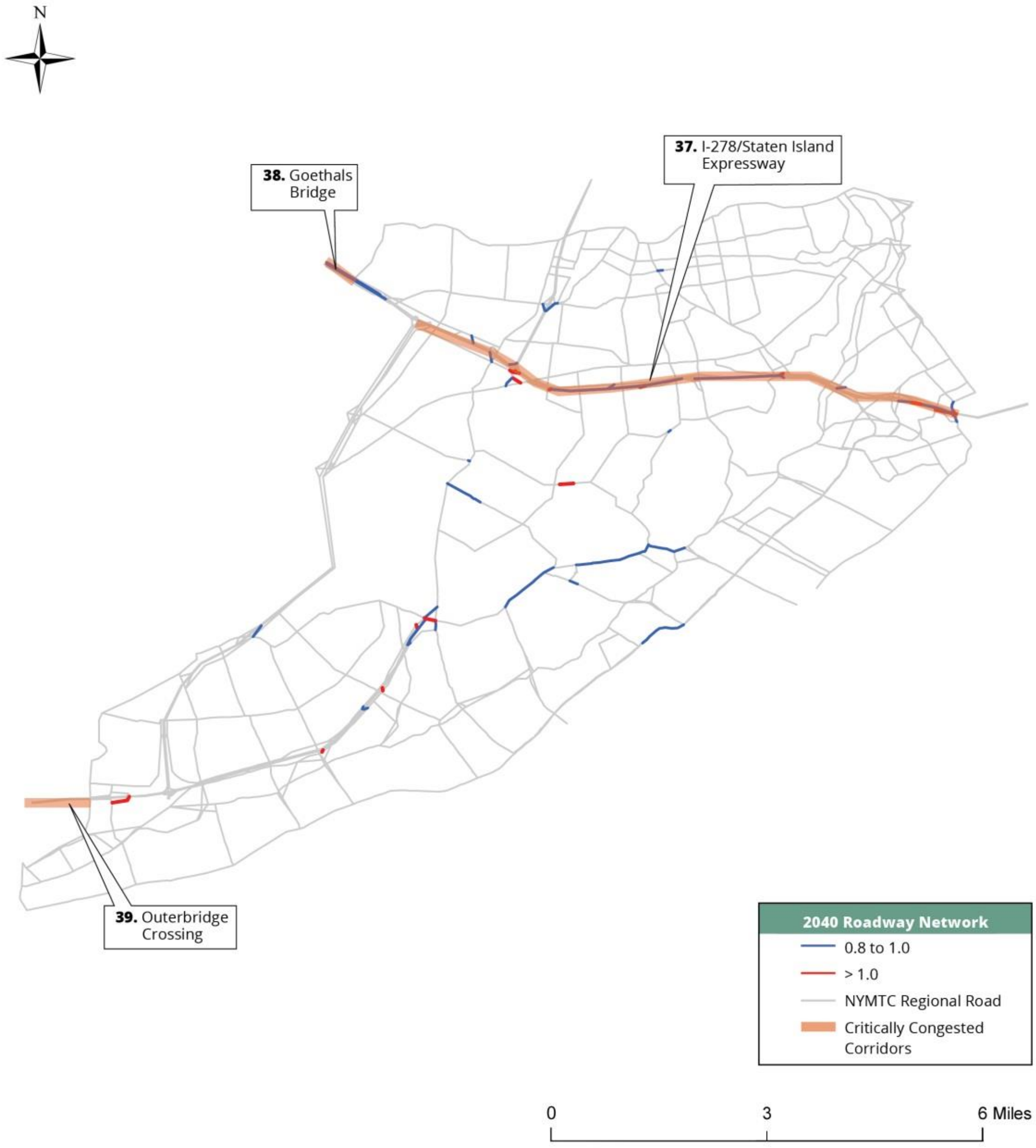
Staten Island – Congested Corridors

37. **I-278/Staten Island Expressway from the Goethals Bridge to the Verrazano-Narrows Bridge –** The western portion of this stretch of I-278 is tied for the 39th highest-ranked corridor in the United States in terms of Delay per Mile in the TTI Report. I-278 is the only east-west limited access highway on Staten Island, and also carries a high volume of through traffic between north-central New Jersey and Brooklyn. It is also the route used by trucks carrying cargo between Ports Newark and Elizabeth and Brooklyn, Queens, and Long Island. Consequently, I-278 experiences heavy congestion during peak commuting periods and on summer weekends due to insufficient mainline capacity, heavy merges and weaves, heavy truck usage, and steep grades. The eastbound direction is heaviest in both peaks and on summer Sundays, approaching the upgrade between Bradley Avenue and Clove Road. The westbound direction is heaviest on summer Fridays.

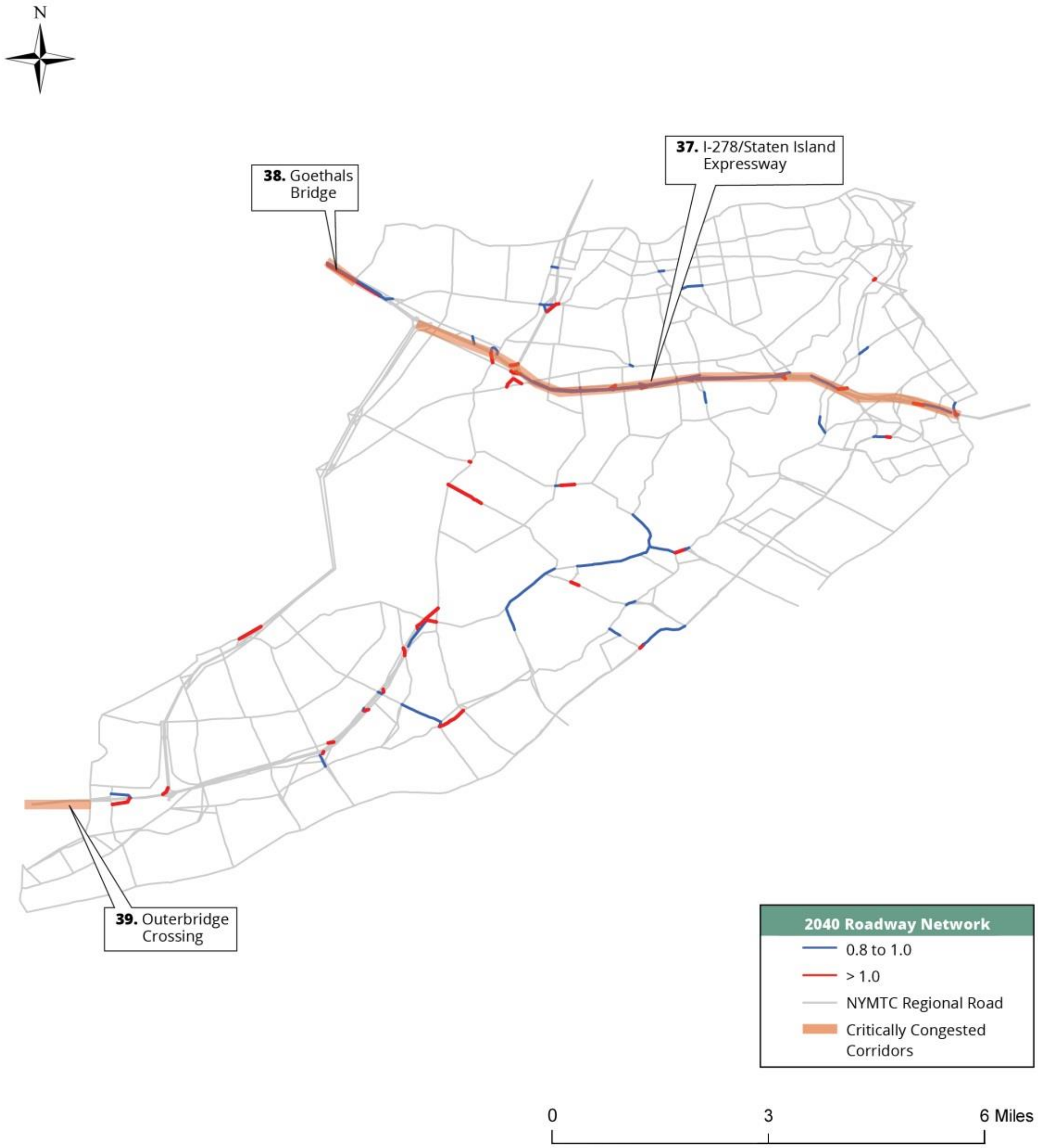
38. **Goethals Bridge –** One of the two bridges connecting north-central New Jersey and Staten Island (and points east), this Bridge experiences heavy congestion during peak commuting periods and on summer weekends due to insufficient mainline capacity (two 10-foot lanes per direction), and heavy truck usage. The westbound direction is heaviest in morning peaks and on summer Fridays. The eastbound direction is heaviest in evening peaks and on summer Sundays.

39. **Outerbridge Crossing –** Same as 38, but with substantially less truck usage.

Staten Island: Congested Corridors and Hot Spot Areas (AM Period)



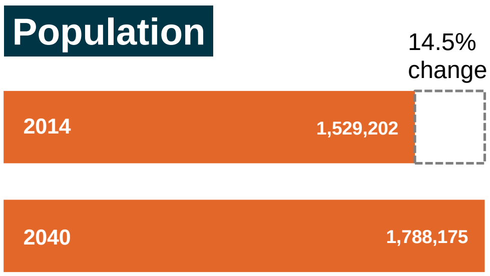
Staten Island: Congested Corridors and Hot Spot Areas (PM Period)

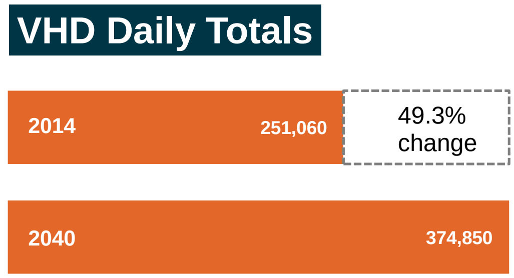


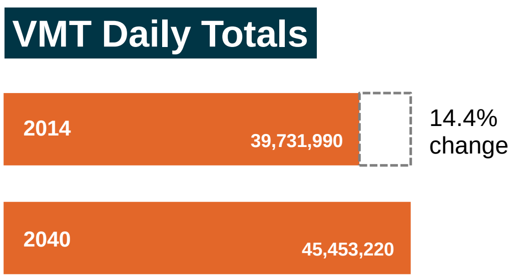
6.9 Suffolk

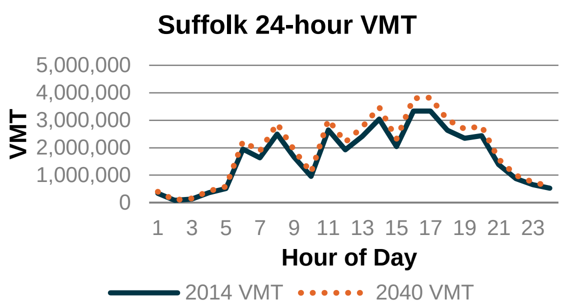
Major Portals and Roadways

Population and Travel Characteristics

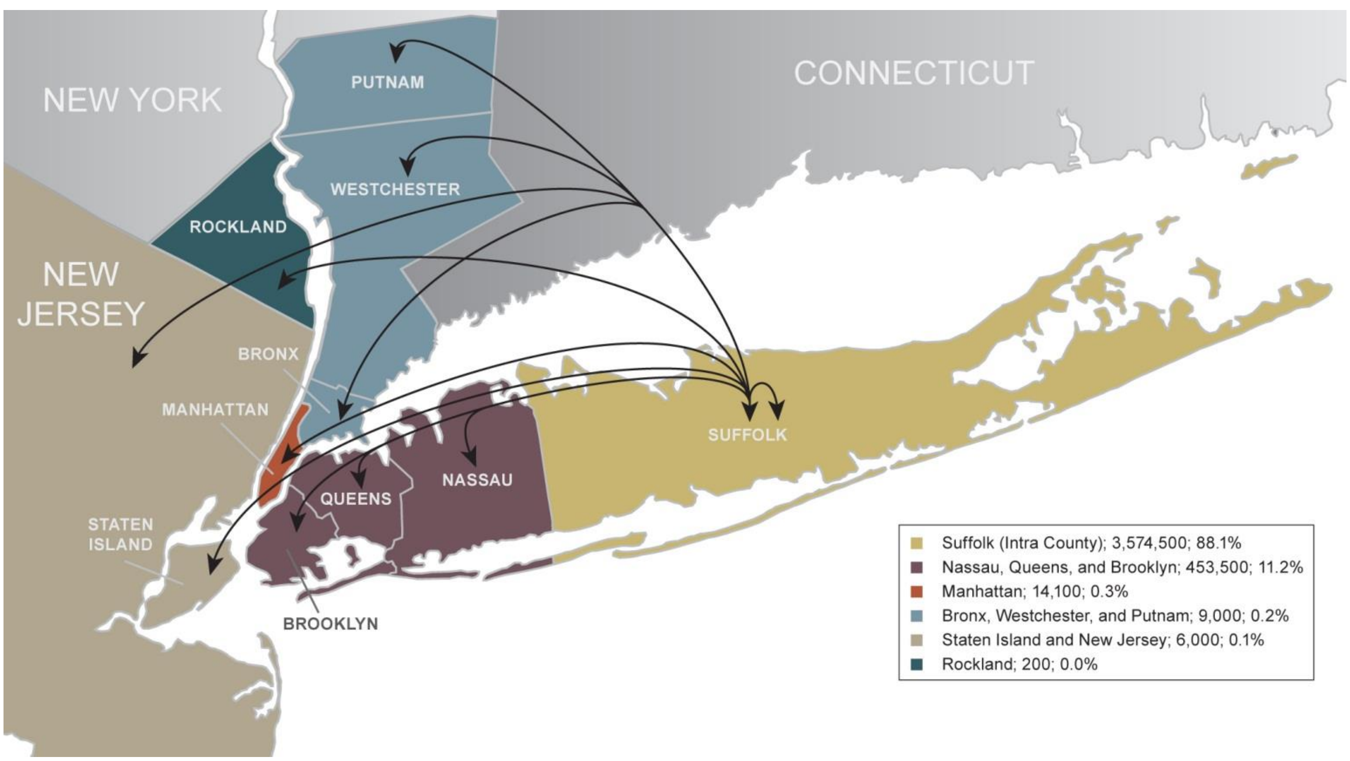








Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County: Suffolk

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.35	4%	3%	69.3	1.05	46.1	1,924	3,367	2,264,891
Arterial	0.23	1%	1%	69.9	1.11	22.6	23,451	41,040	2,672,237
Local	0.13	0%	0%	0.6	1.00	27.1	523	916	1,793,567
PM Period (4 to 8 PM)									
Freeway	0.22	2%	3%	158.2	1.08	46.2	11,073	19,378	2,346,218
Arterial	0.13	1%	1%	160.2	1.07	24.8	33,233	58,157	2,819,698
Local	0.07	0%	0%	3.0	1.00	27.1	871	1,524	1,688,471
Daily Total									
Freeway	0.36	5%	6%	799.9	1.10	45.3	29,531	51,678	12,653,227
Arterial	0.25	2%	2%	1031.0	1.13	22.7	213,338	373,341	16,066,272
Local	0.14	1%	0%	30.7	1.00	27.0	8,188	14,328	11,012,491
Total							**251,056**	**439,348**	**39,731,989**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.38	5%	4%	130.9	1.06	45.3	2,733	4,783	2,499,579
Arterial	0.26	2%	1%	120.3	1.13	21.8	33,169	58,047	3,089,880
Local	0.16	1%	0%	3.9	1.00	26.7	1,420	2,485	2,175,657
PM Period (4 to 8 PM)									
Freeway	0.24	2%	4%	207.3	1.09	45.5	14,221	24,887	2,644,945
Arterial	0.15	1%	1%	244.1	1.08	24.2	45,198	79,096	3,193,168
Local	0.08	0%	0%	8.3	1.00	26.7	2,163	3,785	1,977,667
Daily Total									
Freeway	0.40	6%	7%	1191.9	1.12	44.4	42,109	73,690	14,016,245
Arterial	0.28	3%	2%	1590.0	1.16	21.9	311,325	544,819	18,316,293
Local	0.17	1%	0%	64.9	1.01	26.6	21,413	37,472	13,120,685
Total							**374,847**	**655,982**	**45,453,222**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	9%	–	–	89%	1%	-2%	42%	42%	10%
Arterial	13%	–	–	72%	2%	-3%	41%	41%	16%
Local	23%	–	–	569%	0%	-1%	171%	171%	21%
PM Period (4 to 8 PM)									
Freeway	9%	–	–	31%	1%	-1%	28%	28%	13%
Arterial	15%	–	–	52%	1%	-3%	36%	36%	13%
Local	14%	–	–	176%	0%	-1%	148%	148%	17%
Daily Total									
Freeway	11%	–	–	49%	2%	-2%	43%	43%	11%
Arterial	12%	–	–	54%	3%	-3%	46%	46%	14%
Local	21%	–	–	111%	1%	-1%	162%	162%	19%
Total							**49%**	**49%**	**14%**

Suffolk – Congested Corridors

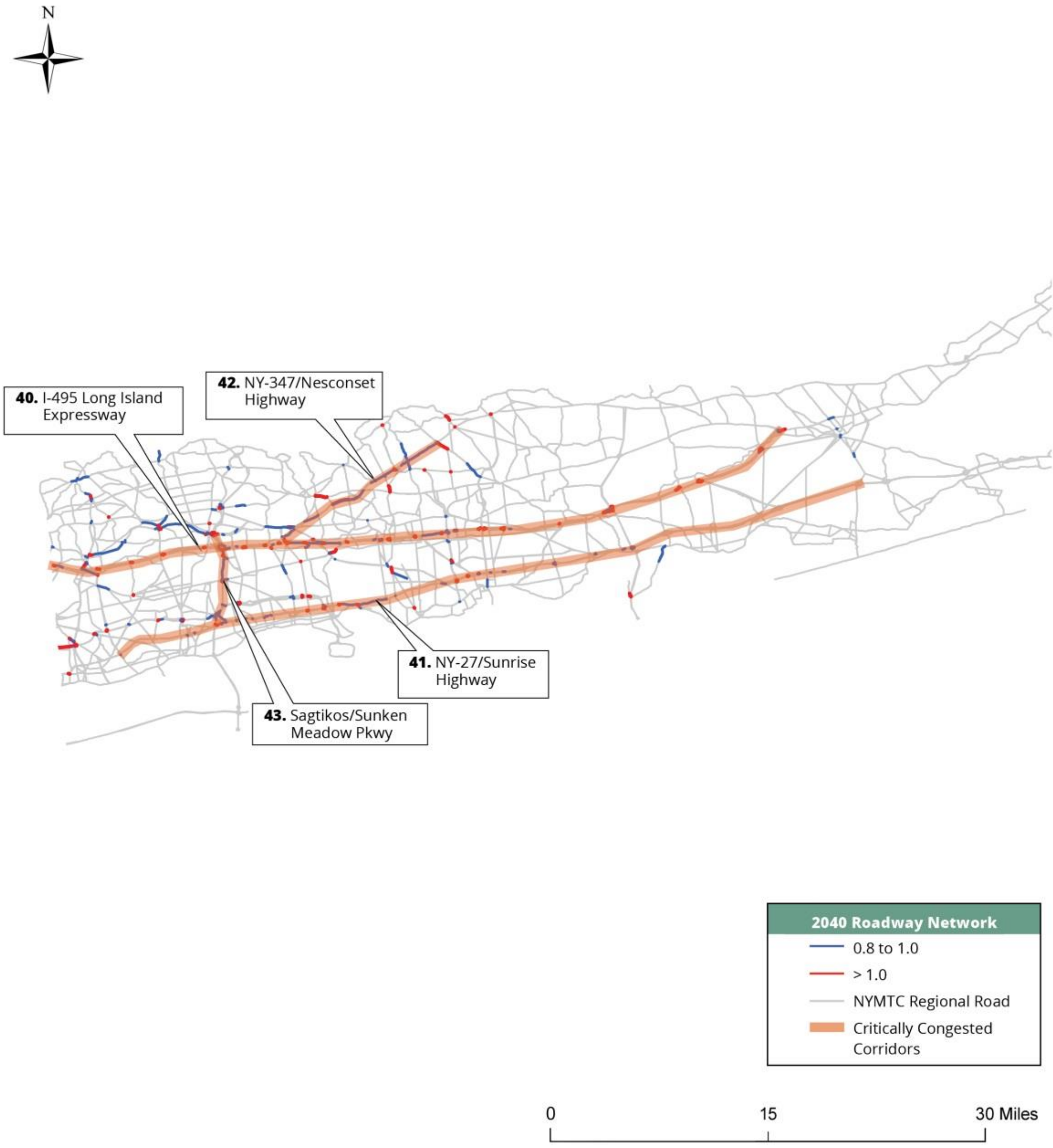
40. **I-495/Long Island Expressway from the Nassau County Boundary to the Eastern Terminus –** While not as severe as the sections of I-495 in Nassau and Queens Counties, I-495 in Suffolk experiences heavy congestion during peak commuting periods and around summer weekends, due to insufficient mainline capacity, frequent merges and weaves, and heavy truck usage. The eastbound direction is generally heaviest in evening peaks and on summer Fridays. The westbound direction is generally heaviest in morning peaks and on summer Sundays. The heavy usage of this road by trucks (I-495 is the only continuous east-west limited-access Long Island highway on which trucks are permitted) causes the economic cost of the congestion on I-495 to be very high.

41. **NY-27/Sunrise Highway from the Southern State Parkway (SSP) to Patchogue –** The only east-west limited-access highway in southern central Suffolk County, this road experiences heavy congestion during peak commuting periods and around summer weekends, due to insufficient mainline capacity, frequent merges and weaves, and relatively heavy truck usage. The eastbound direction is generally heaviest in evening peaks and on summer Fridays. The westbound direction is generally heaviest in morning peaks and on summer Sundays.

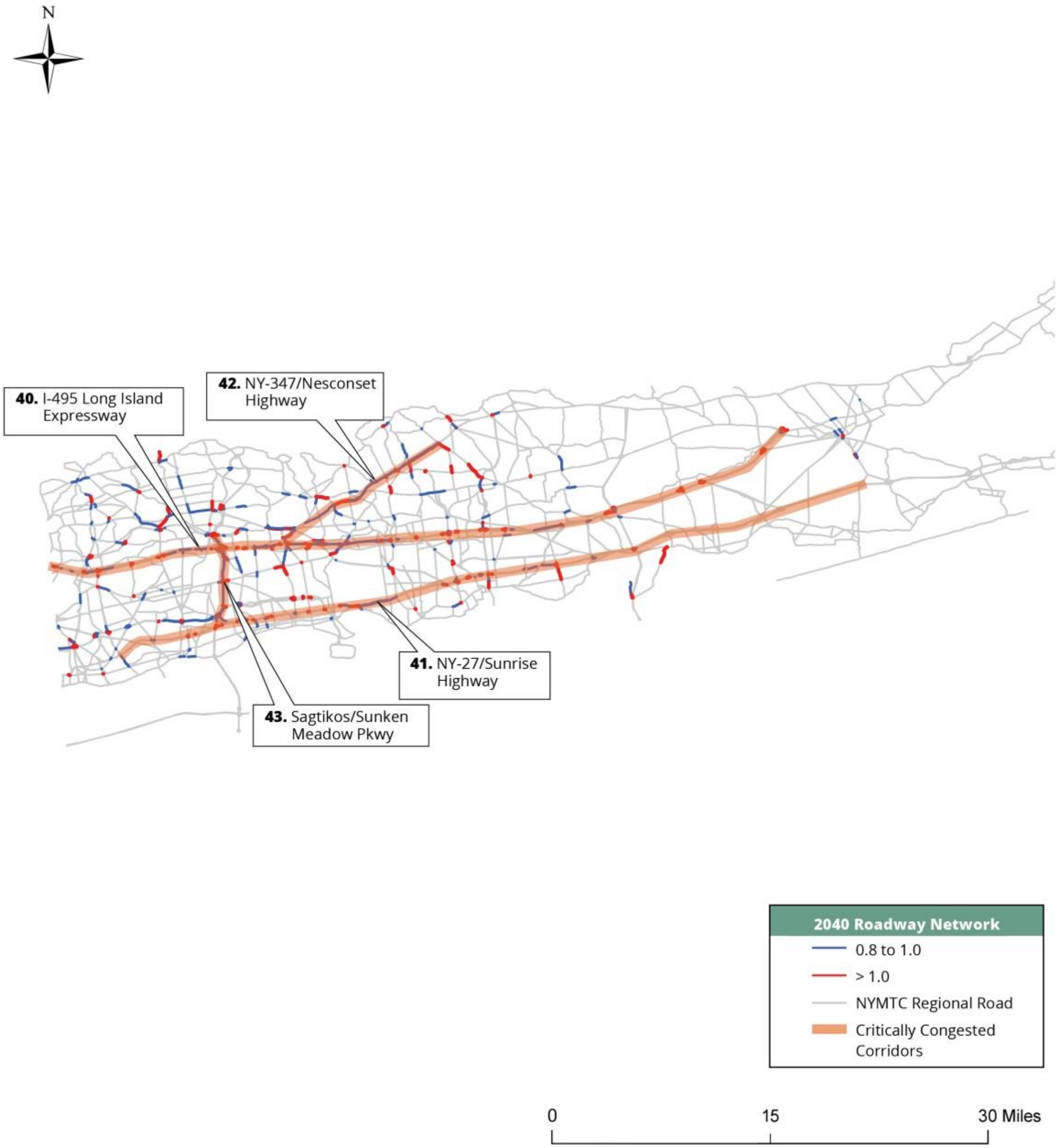
42. **NY-347 from Northern State Parkway (NSP) to Old Town Road –** This five-to-six-lane primary arterial is the main roadway connecting western Suffolk County and communities along the northern shore of central Suffolk County. It abuts several major traffic generators, including both County and State offices as well as the Smith Haven Mall. It also provides access to the SUNY at Stony Brook campus. It experiences heavy congestion during peak commuting periods due to insufficient mainline capacity and frequent signalized intersections. The eastbound direction is generally heaviest in evening peaks. The westbound direction is generally heaviest in morning peaks.

43. **Sagtikos Parkway/Sunken Meadow Parkway from NY-27/Sunrise Highway to NY-25/Jericho Turnpike –** The only north-south completely limited-access highway in Suffolk County, this highway provides connections between NY-27, the SSP, I-495, the NSP, and NY-25. It also abuts the Suffolk County Community College campus and various shopping centers and provides access to the Tanger Outlet Mall in Deer Park. It experiences heavy congestion during peak commuting periods primarily due to heavy merging and weaving sections as well as interactions with local streets and land uses.

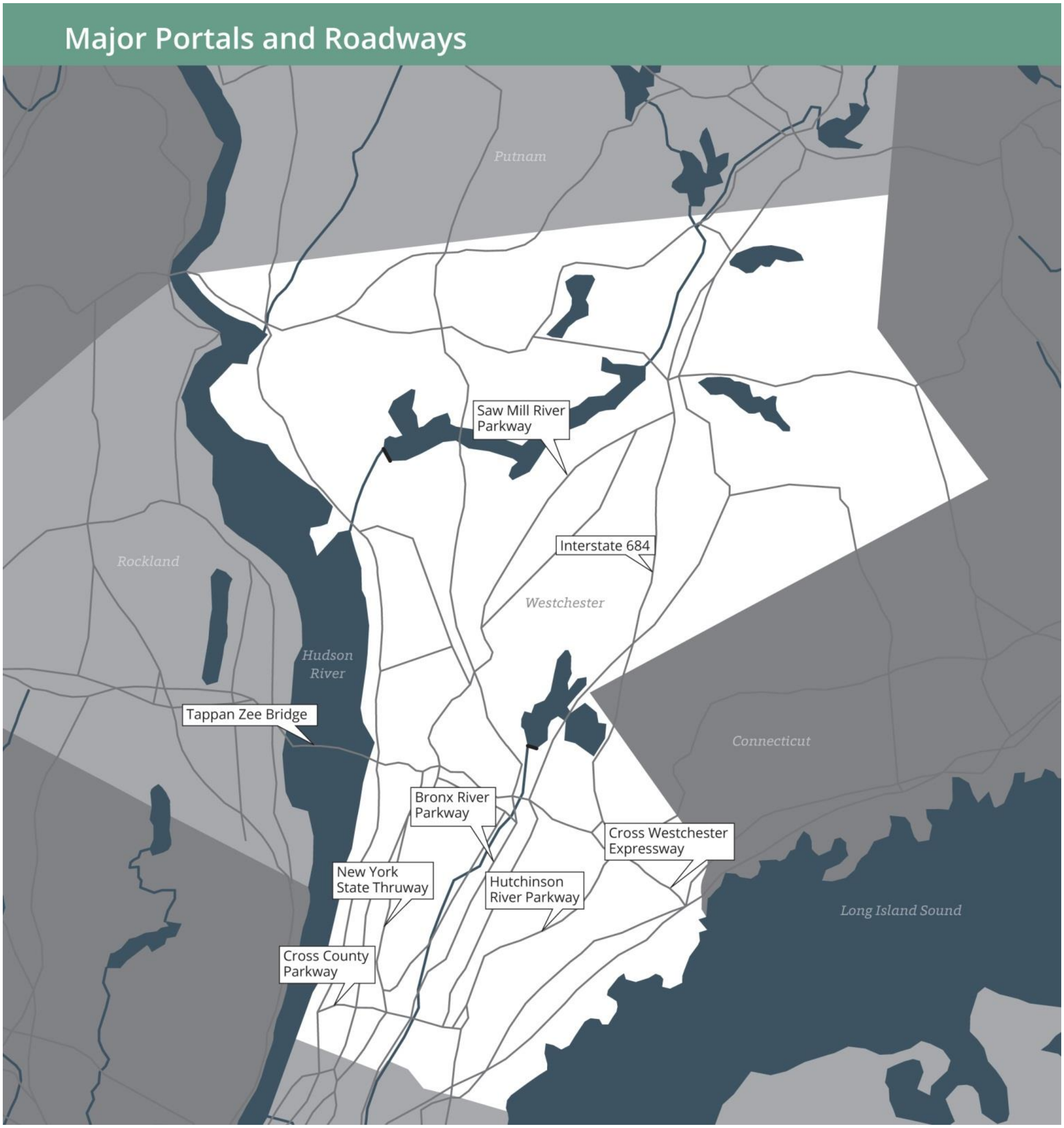
Suffolk: Congested Corridors and Hot Spot Areas (AM Period)



Suffolk: Congested Corridors and Hot Spot Areas (PM Period)

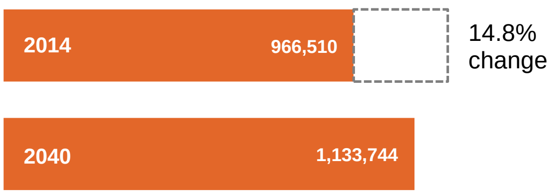


6.10 Westchester

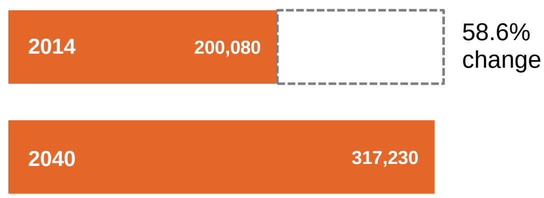


Population and Travel Characteristics

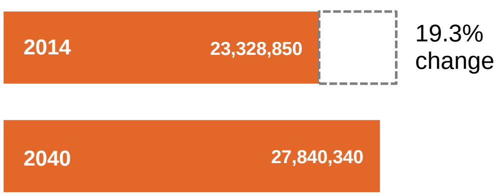
Population



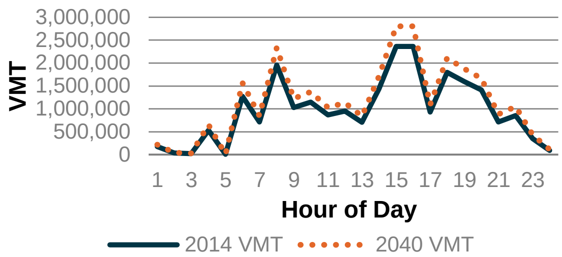
VHD Daily Totals



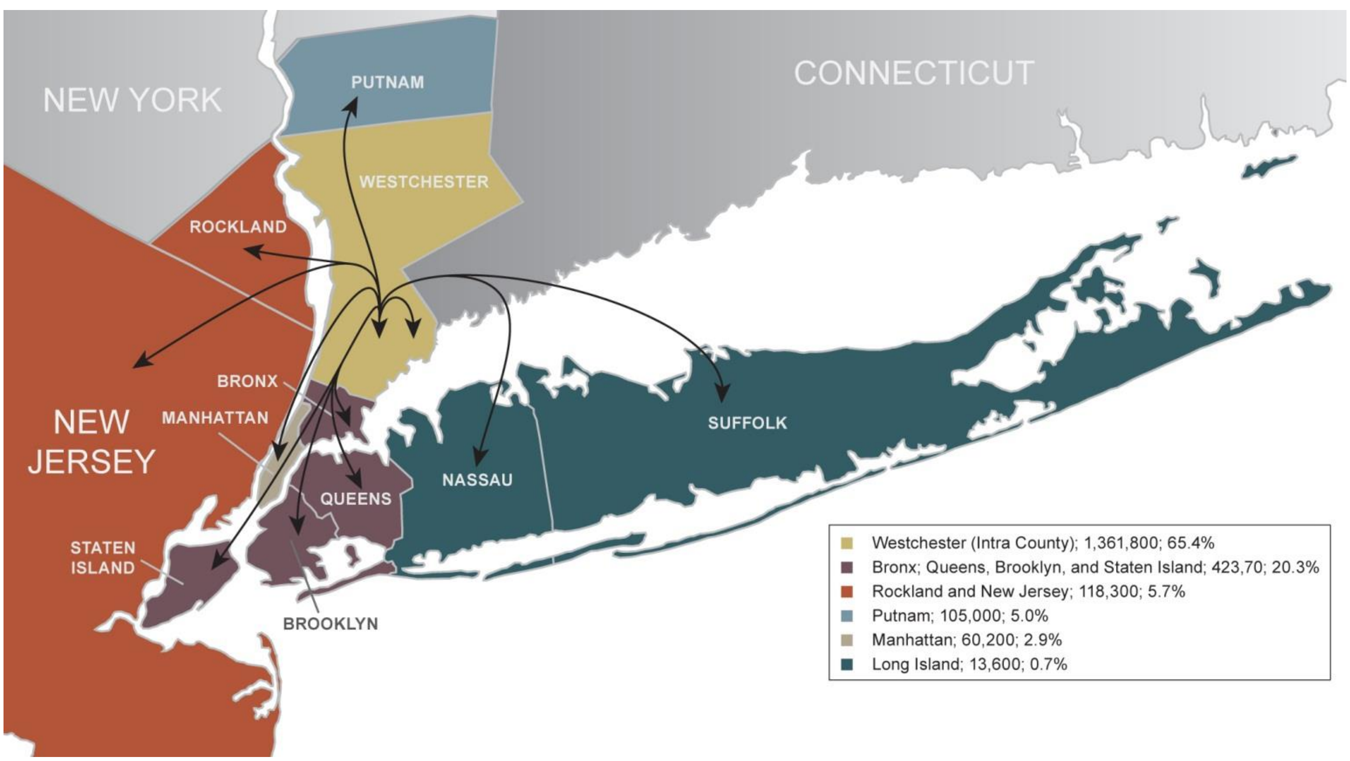
VMT Daily Totals



Westchester 24-hour VMT



Two-Way Trips between The Bronx and Other Counties in the New York Metro Area



Performance Measures
County: Westchester

Scenario 2014

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.37	4%	4%	159.0	1.14	41.4	10,302	14,835	2,659,216
Arterial	0.20	1%	1%	27.8	1.11	21.6	13,121	18,895	1,147,745
Local	0.13	0%	0%	0.1	1.04	22.8	4,369	6,292	1,040,245
PM Period (4 to 8 PM)									
Freeway	0.18	1%	2%	104.6	1.06	44.7	7,435	10,706	2,336,859
Arterial	0.10	1%	1%	44.2	1.06	23.7	16,177	23,295	940,122
Local	0.06	0%	0%	0.3	1.02	24.3	3,141	4,523	781,011
Daily Total									
Freeway	0.32	4%	5%	913.3	1.13	42.2	62,792	90,420	12,464,733
Arterial	0.19	1%	1%	286.5	1.12	22.0	107,675	155,052	5,700,448
Local	0.12	1%	0%	1.9	1.04	23.2	29,614	42,644	5,163,667
Total							**200,080**	**288,116**	**23,328,847**

Scenario 2040

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT
AM Period (6 to 10 AM)									
Freeway	0.42	5%	5%	278.4	1.18	40.0	15,945	22,960	3,075,583
Arterial	0.24	2%	1%	52.3	1.14	20.7	18,728	26,968	1,376,737
Local	0.17	1%	1%	0.6	1.05	22.0	8,039	11,576	1,329,080
PM Period (4 to 8 PM)									
Freeway	0.22	2%	3%	290.5	1.10	43.3	17,962	25,866	3,029,428
Arterial	0.11	1%	1%	71.3	1.07	23.1	22,758	32,771	1,059,470
Local	0.07	0%	1%	1.5	1.03	23.7	6,835	9,843	912,202
Daily Total									
Freeway	0.37	5%	6%	1602.8	1.18	40.7	107,521	154,830	14,926,427
Arterial	0.22	2%	2%	471.9	1.14	21.3	150,364	216,524	6,605,602
Local	0.15	1%	1%	7.2	1.05	22.4	59,344	85,455	6,308,310
Total							**317,228**	**456,809**	**27,840,339**

D/C = Demand to Capacity; LMC = Lane Miles of Congestion; TTI = Travel Time Index; ATS = Average Travel Speed; VHD = Vehicle Hours of Delay; PHD = Person Hours of Delay; VMT = Vehicle Miles Traveled

Note: D/C = average Demand to Capacity for the particular facility type and period. The "0.8<=DC<=1" and "D/C>1" are the percent of travel that occurs in various conditions (somewhat congested and very congested).

Percentage Difference Between 2040 and 2014 Performance Measures

Facility Type	D/C	0.8<= D/C<=1	D/C>1	LMC	TTI	ATS	VHD	PHD	VMT

AM Period (6 to 10 AM)									
Freeway	14%	–	–	75%	4%	-3%	55%	55%	16%
Arterial	20%	–	–	88%	3%	-4%	43%	43%	20%
Local	31%	–	–	455%	1%	-4%	84%	84%	28%
PM Period (4 to 8 PM)									
Freeway	22%	–	–	178%	4%	-3%	142%	142%	30%
Arterial	10%	–	–	61%	1%	-3%	41%	41%	13%
Local	17%	–	–	470%	1%	-3%	118%	118%	17%
Daily Total									
Freeway	16%	–	–	75%	4%	-4%	71%	71%	20%
Arterial	16%	–	–	65%	2%	-4%	40%	40%	16%
Local	25%	–	–	285%	1%	-3%	100%	100%	22%
Total							**59%**	**59%**	**19%**

Westchester – Congested Corridors

44. **Westchester Expressway from the Tappan Zee Bridge to I-95 –** The only east-west limited-access highway in central Westchester, this highway provides connections between the Tappan Zee Bridge (and many points West of the Hudson River to both the north and south), I-87/New York State Thruway to the south and New York City, the Saw Mill River Parkway, the Sprain Brook Parkway, I-684, the Hutchinson River Parkway (HRP), and I-95 (and points north and east). In addition, it provides easy access to the Tarrytown Metro-North Railroad station (via U.S.-9), to central White Plains (via NY-119, NY-22, and Westchester Avenue) with its many major traffic generators (including Westchester County Center, the White Plains Metro-North Railroad station, White Plains Mall, The Galleria at White Plains, Pace Law School, The Westchester Mall, and New York-Presbyterian Hospital in Westchester), and to Manhattanville and SUNY-Purchase Colleges (via the HRP). Consequently, the entire length of I-287 in Westchester County regularly experiences severe congestion during peak commuting periods, due to insufficient mainline capacity, frequent heavy merges and weaves, and spillbacks from connecting roadways. The eastbound direction is heaviest in morning peaks. The westbound direction is heaviest in evening peaks.

45. **Hutchinson River Parkway (HRP) from the Bronx County Boundary to I-287 –** This is one of the two main north-south commuter highways (the other being I-95) in the eastern part of densely developed southern Westchester County. It also carries through traffic between New York City and Connecticut. It regularly experiences severe congestion during peak commuting periods and summer weekends, due to insufficient mainline capacity, frequent heavy merges and weaves (especially at the Cross County Parkway), and spillbacks from connecting roadways. The southbound direction is heaviest in morning peaks and summer Sundays. The northbound direction is heaviest in evening peaks and summer Fridays.

46. **I-87/New York State Thruway from the Bronx County Boundary to Tuckahoe Road –** The highest-quality north-south highway in the western part of densely developed southern Westchester. It regularly experiences congestion during peak commuting periods, due to insufficient mainline capacity and heavy merges and weaves (especially at the Cross County Parkway). The southbound direction is heaviest in morning peaks. The northbound direction is heaviest in evening peaks.

47. **I-95/New England Thruway from the Bronx County Boundary to the Connecticut State Line –** Same as 45., except that I-95 is also a major regional truck route, further adding to congestion, which bears a high economic cost.

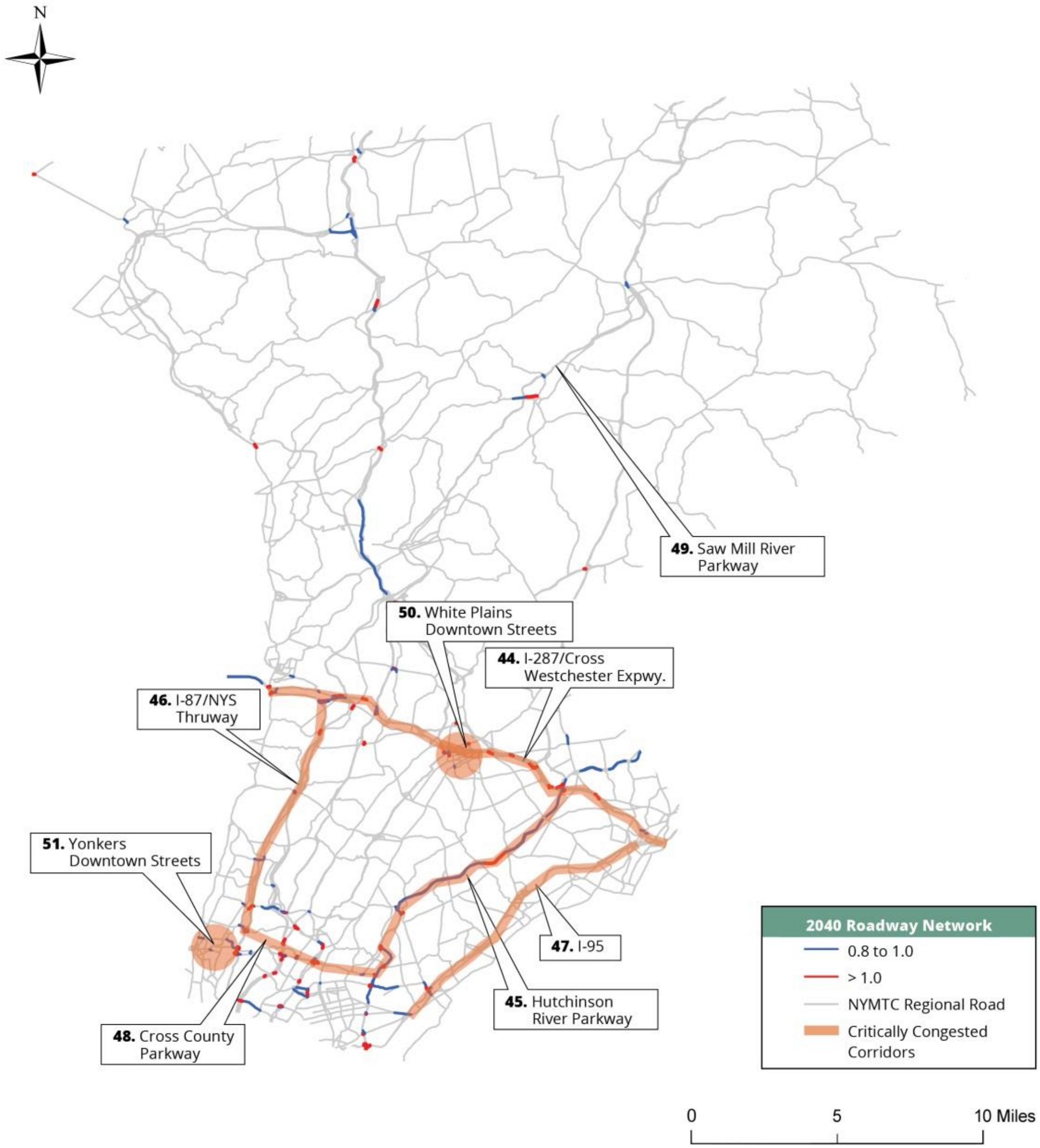
48. **Cross County Parkway (CCP) from the Saw Mill River Parkway to the HRP –** The only east-west limited-access highway in southern Westchester, this highway provides connections between the Saw Mill River Parkway, I-87/New York State Thruway, the Bronx River Parkway (thereby providing access to the Sprain Brook Parkway), and the Hutchinson River Parkway (HRP). It also abuts the Cross County Shopping Center and adjacent major retail and entertainment sites. The entire length of the CCP regularly experiences severe congestion in both directions during peak commuting periods, due to heavy merges and weaves, and spillbacks from connecting roadways.

49. **Saw Mill River Parkway from the CCP to Tuckahoe Road –** The continuation of the Henry Hudson Parkway north of New York City, this narrow (2 lanes/direction) limited-access highway carries heavy commuter flows to/from New York City. The southbound direction is heaviest in morning peaks. The northbound direction is heaviest in evening peaks.

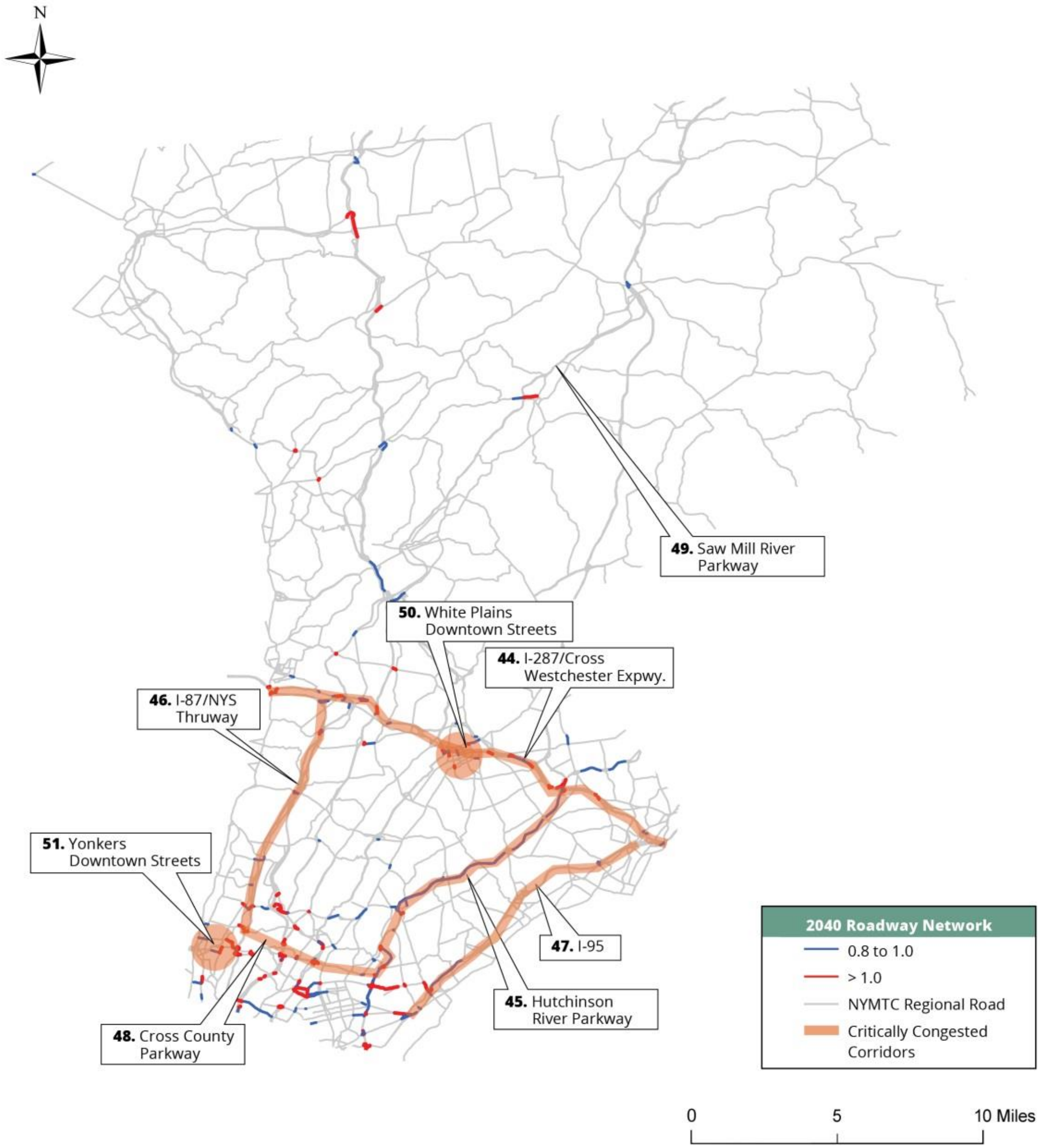
50. **Downtown White Plains Streets –** These are congested all day, but especially during the afternoon and evening periods when they are affected by heavy pedestrian flows and backups on roads leading to I-287.

51. **Downtown Yonkers Streets –** These are congested all day as they try to serve the many major traffic generators in downtown Yonkers, including the St. Joseph's Medical Center, the City of Yonkers municipal offices, the Greenway Shopping Center, Westchester County offices, the Yonkers Metro-North Railroad station, the main Yonkers Post Office, and the New York State DMV office. Heavy pedestrian flows interfere with traffic flows.

Westchester: Congested Corridors and Hot Spot Areas (AM Period)



Westchester: Congested Corridors and Hot Spot Areas (PM Period)



7.0 Congestion Management Strategies

This section provides an overview of potential strategies for facilitating the movement of people and goods by alleviating congestion in the NYMTC planning area, consistent with the goals outlined in NYMTC's Plan 2040. As part of the CMP, Federal regulations require MPO in transportation management areas to identify potential strategies to reduce congestion and evaluate the expected effectiveness of those strategies in improving the efficiency and safety of existing and future transportation systems. Moreover, because NYMTC's planning area is part of air quality nonattainment areas designated by the Clear Air Act Amendments of 1990, the use of Federal funds for the expansion of the transportation system's capacity to move single-occupancy vehicles (SOV) is precluded unless it is documented that travel demand reduction and operational management strategies cannot fully satisfy the need for the additional capacity.

Recognizing a wide range of strategies are available to address mobility challenges, NYMTC has developed a CMP Toolbox of strategies for use in planning congestion-reduction measures around the region. The CMP Toolbox is divided into nine categories of congestion management strategies:

1. **Transportation Demand Management Strategies –** The objective of demand management strategies is to influence travel behavior for both commute and noncommute trips. Subcategories of Transportation Demand Management strategies include:

   – Alternative Commute Programs – Promotes alternatives to single-occupancy commuter travel through employer-based programs or other regional initiatives.

   – Pricing/Managed Facilities – Imposes restrictions or fees for the use of specific lanes/roadways with the common goal of reducing the amount of single-occupancy vehicles.

2. **Transportation System Management and Operations Strategies (TSM&O) –** Operational management strategies contribute to a more effective and efficient use of existing systems. Many of these operations-based strategies are supported by the use of enhanced technologies or Intelligent Transportation Systems (ITS). TSM strategies were exclusively used as solutions for improving roadway congestion. However, with a growing population in the outer boroughs of New York City that requires access to Manhattan's central business district and declining federal and state investment in the transportation network, TSM strategies are becoming increasingly applicable to improving transit capacity and efficiency, as indicated in Plan 2040. The NYMTC RTP breaks down TSM strategies into seven categories, which are individually detailed as part of the CMP Toolbox Strategies (Appendix A). The strategies include, Intelligent Transportation Systems, Traveler Information, Incident Management, Work Zone Management, Access Management, Congestion Pricing, and Active Transit and Traffic management. The toolbox further subcategorizes TSM&O strategies as follows:

   – Highway/Freeway Operations – Strategies to increase throughput and alleviate the causes of recurring and nonrecurring congestion.

   – Arterial and Local Roads Operations – Strategies to improve traffic flow through the existing network of local roads and intersections.

   – Other Operations Strategies – General operations strategies that can be applied on a regional scale.

3. **Transit Strategies –** Strategies aimed at making transit more attractive or accessible can help to reduce the number of vehicles on the road. Transit strategies commonly supplement the demand

management and TSM&O strategies described above. The CMP Toolbox includes the following subcategories of transit strategies:

- Fare Strategies – Encourages additional transit use through fare policies, employer-based incentive programs, or universal farecards/payment systems.

- Operations Strategies – Includes service adjustments to better align transit service with ridership markets. Similar to traffic operations, ITS features often enhance transit operations as well.

- Capacity Strategies – Expands transit coverage and/or frequencies to make transit more accessible and attractive to use.

4. **Accessibility Strategies –** Improves access to transit facilities by both auto and nonauto travel modes.

5. **Bicycle and Pedestrian Strategies –** Strategies that promote nonmotorized travel through the provision of safer bicycle and pedestrian-oriented facilities and amenities.

6. **Access Management Strategies –** Includes policies, facilities, and design criteria that minimize the number of driveways and intersecting roads accessing a main thoroughfare.

7. **Land Use Strategies –** Policies to support/encourage mixed-use development, transit-oriented design, and incentives for high-density development.

8. **Parking Strategies –** Strategies to manage the availability and cost of parking and promote access to transit.

9. **Regulatory Strategies –** Closely tied to the strategies described above, regulatory strategies restrict vehicle movements or enforce congestion-management policies.

10. **Road Capacity Strategies –** Addresses improvements to specific bottlenecks (such as interchanges and intersections), as well as the need for more base capacity to the existing road network when all of the other congestion-reduction strategies described above cannot fully satisfy demand.

Descriptions of specific strategies within each of these nine categories are included in Appendix A, including a qualitative assessment of congestion and mobility benefits, costs and impacts, and implementation timeframe. Also included in Appendix A are existing TSM and TDM strategies in the NY Region, as reported in Plan 2040. Additionally, NYMTC's Plan 2040 includes a number of system enhancement projects that will help to alleviate congestion in the NYMTC planning area. A list of these projects is also found in Appendix A.

APPENDICES

A. CMP Toolbox Strategies

B. Congested Corridor Screening Worksheet

A. CMP Toolbox Strategies

Table A.1 Transportation Demand Management Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
ALTERNATIVE COMMUTE PROGRAMS			
1a. Compressed Work Week/Flexible Work Schedules Allows workers to arrive and leave work outside of the traditional commute period. It can be on a scheduled basis or a true flex-time arrangement.	• Decrease peak-period VMT • Improve travel time among participants	• No capital costs • Agency costs for outreach and publicity • Employer costs associated with accommodating alternative work schedules (including collaborative technologies)	Employer-based Short-term: 1 to 5 years
1b. Telecommuting Policies Allows employees to work at home or in a regional telecommute center instead of traveling to the worksite. They might do this all the time, or only one or more days per week.	• Decrease work VMT • Decrease SOV trips	• First-year implementation costs for private-sector (per employee for equipment and collaborative technologies) • Second-year costs tend to decline	Employer-based Short-term: 1 to 5 years
1c. Ridesharing Programs Includes carpooling, vanpooling, and ride-matching services; typically arranged/encouraged through employers or transportation management agencies (TMA). The Vanpool Sponsorship Program offers financial incentives for vanpooling in areas where public transportation is not readily available or feasible.	• Decrease work VMT • Decrease SOV trips	• Savings per carpool and vanpool riders • Costs per year per free parking space provided • Administrative costs • Agency costs for outreach and publicity	Employer-based Short-term: 1 to 5 years
1d. Guaranteed Ride Home Policies Provides a guaranteed ride home at no cost to the employee in the event an employee or a member of their immediate family becomes ill or injured, requiring the employee to leave work	• Decrease work VMT • Decrease SOV trips	• Requires administrative support from employers • Potential to be costly	Employer-based Short-term: 1 to 5 years
PRICING/MANAGED FACILITIES			
1e. Road Pricing Involves pricing facilities to encourage off-peak or HOV travel, and includes time-variable congestions pricing and cordon (area) tolls, high-occupancy/ toll (HOT) lanes, and vehicle-use fees.	• Decrease peak period VMT • Decrease SOV trips	• First-year implementation costs for public-sector	Short-term: 1 to 5 years

Table A.2 Transportation System Management and Operations Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
HIGHWAY/FREEWAY OPERATIONS			
2a. Reversible Traffic Lanes Appropriate where traffic flow is highly directional.	• Increase peak direction capacity • Decrease peak travel times • Improve mobility	• Barrier separated costs per mile • Operation costs per mile • Maintenance costs variable	Short-term: 1 to 5 years
2b. Ramp Metering Regulates the rate and spacing of traffic entering the freeway, allowing freeways to operate at their optimal flow rates.	• Decrease travel time • Decrease accidents • Improve traffic flow on major facilities	• O&M costs • High costs associated with enhancements to centralized control system • Capital costs for meters, sensors, and communication equipment	Medium-term: 5 to 10 years
2c. Freeway Incident Detection and Management Systems Typically includes video monitoring, incident detection, dispatch systems, and emergency response to alleviate nonrecurring congestion.	• Decrease accident delay • Decrease travel time • Decrease VHT and PHT	• Capital costs variable and substantial • Annual operating and maintenance costs	Medium- to long-term: 10 years or more
2d. Service Patrols Service vehicles patrol heavily traveled segments and congested sections of the freeways that are prone to incidents to provide faster and anticipatory responses to traffic incidents and disabled vehicles.	• Reduce incident duration time • Restore full freeway capacity • Reduce the risks of secondary accidents to motorists	• Costs vary based on the number of vehicles used by the patrol, number of routes that the patrol operates, and the population of the area in which the program operates	Short-term: 1 to 5 years
ARTERIAL AND LOCAL ROADS OPERATIONS			
2e. Traffic Signal Coordination Optimizes traffic flow and reduces emissions by minimizing stops on arterial streets.	• Improve travel time • Decrease the number of stops • Decrease VMT, VHD and PHT by vehicle miles per day, depending on program	• O&M costs per signal • Signalized intersections per mile costs variable	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
ARTERIAL AND LOCAL ROADS OPERATIONS (continued)			
2f. Restricting Turns at Key Intersections Limits turning vehicles, which can impede traffic flow and are more likely to be involved in crashes.	• Increase capacity, efficiency on arterials • Improve mobility on facility • Improve travel times and decrease delay for through traffic • Decrease incidents	• Implementation and maintenance costs vary; range from new signage and striping to more costly permanent median barriers and curbs	Short-term: 1 to 5 years (includes planning, engineering, and implementation)

Table A.2 Transportation System Management and Operations Strategies (continued)

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
2g. Converting Streets to One-Way Operations Establishes pairs of one-way streets in place of two-way operations. Most effective in downtown or very heavily congested areas.	• Increase traffic flow	• Conversion costs include adjustments to traffic signals, striping, signing and parking meters • May create some confusion, especially for nonlocal residents	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
OTHER OPERATIONS STRATEGIES			
2h. Traveler Information Systems Provides travelers with real-time information, such as incidents, speed and travel time estimates, that can be used to make trip and route choice decisions; Information accessible on the web, dynamic message signs, 511 systems, Highway Advisory Radio (HAR), or handheld wireless devices.	• Decrease travel times and delay • Some peak-period travel and mode shift	• Design and implementation costs variable • Operating and maintenance costs variable	Medium-term: 5 to 10 years
2i. Targeted and Sustained Enforcement of Traffic Regulations Improves traffic flow by reducing violations that cause delays; Includes automated enforcement (e.g., red light cameras).	• Improve travel time • Decrease the number of stops	• Increased labor costs per officer	Short-term: 1 to 5 years
OTHER OPERATIONS STRATEGIES (continued)			
2j. Special Events and Work Zone Management Includes a suite of strategies, including temporary traffic control, public awareness and motorist information, and traffic operations.	• Minimize traffic delays • Improve mobility • Maintain access for businesses and residents	• Design and implementation costs variable	Short-term: 1 to 5 years
2k. Road Weather Management Identifying weather and road surface problems and rapidly targeting responses, including advisory information, control measures, and treatment strategies.	• Improve safety due to reduced crash risk • Increased mobility due to restored capacity, delay reductions, and more uniform traffic flow	• Design and implementation costs variable • Operating and maintenance costs variable	Short-term: 1 to 5 years

Table A.2 Transportation System Management and Operations Strategies (continued)

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
2I. Traffic Surveillance, Control Systems, and Active Traffic Management Often housed within a Traffic Management Center (TMC), monitors volume and flow of traffic by a system of sensors, and further analyzes traffic conditions to flag developing problems, and implement adjustments to traffic signal timing sequences, in order to optimize traffic flow estimating traffic parameters in real-time. Currently, the dominant technology traffic surveillance is that of magnetic loop detectors, which are buried underneath roadways and count automobiles passing over them. Video monitoring systems for traffic surveillance may provide vehicle classifications, travel times, lane changes, rapid accelerations or decelerations, and length queues at urban intersections, in addition to vehicle counts and speeds.	• Decrease travel times and delay • Some peak-period travel and mode shift	• Design and implementation costs variable • Installation of video surveillance cameras may be less expensive than magnetic loop detectors, which require disruption and digging of the road surface	Medium-term: 5 to 10 years

Table A.3 Transit Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
FARE STRATEGIES			
3a. Reducing Transit Fares Encourages additional transit use.	• Decrease daily VMT • Decrease congestion • Increase ridership	• Loss in revenue per rider • Capital costs per passenger trip • Operating costs per passenger trip • Operating subsidies needed to replace lost fare revenue • Alternative financial arrangements need to be negotiated with donor agencies	Short-term: Less than 1 year
3b. Employer Incentive Programs Encourages additional transit use through transit subsidies of mass transit fares provided by employers.	• Increase transit ridership • Decrease travel time • Decrease daily VMT	• Cost of incentives to employers offering employee benefits for transit use	Short-term: 1 to 5 years
3c. Electronic Payment Systems and Universal Farecards Interchangeable smartcard payment system (including RFID) that can be used as a fare payment method for multiple transit agencies throughout the region.	• Increase transit ridership • Decrease travel time	• Considerably high, but expected to decrease • Implementation costs vary based on system design and functionality	Short-term: 1 to 5 years
OPERATIONS STRATEGIES			
3d. Realigned Transit Service Schedules and Stop Locations Service adjustments to better align transit service with ridership markets.	• Increase transit ridership • Decrease daily VMT	• Operating costs per trip	Short-term: 1 to 5 years
3e. Intelligent Transit Stops Ranges from kiosks, which show static transit schedules, to real-time information on schedules, locations of transit vehicles, arrival time of the vehicle, and alternative routes and modes.	• Decrease daily VMT • Decrease congestion • Increase ridership	• Capital costs per passenger	Medium-term: 5 to 10 years (includes planning, engineering, and construction
OPERATIONS STRATEGIES (continued)			
3f. Transit Signal Priority Often combined with dedicated rights-of-way for transit and/or bus rapid transit routes.	• Decrease travel time	• Implementation costs vary based on system design and functionality and type of equipment	Short-term: 1 to 5 years (includes planning, engineering, and construction)
3g. Enhanced Transit Amenities Includes vehicle replacement/upgrade, which furthers the benefits of increased transit use.	• Decrease daily VMT • Decrease congestion • Increase ridership	• Capital costs • Addition of clean fuel bus fleets may be incorporated as part of regular vehicle replacement programs	Short-term: 1 to 5 years (includes planning, engineering, and construction)

Table A.3 Transit Strategies (continued)

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
CAPACITY STRATEGIES			
3h. Increasing Transit Frequencies or Hours of Service Increased frequency makes transit more attractive to use.	• Increase transit ridership • Decrease travel time • Decrease daily VMT	• Operating costs per trip • New bus purchases likely	Short-term: 1 to 5 year (includes planning, engineering, and construction)
3i. Expanding Bus Route Coverage Provides better transit accessibility to a greater share of the population.	• Increase transit ridership • Decrease daily VMT	• Capital costs per passenger trip • Operating costs per trip • New bus purchases likely	Short-term: 1 to 5 year (includes planning, engineering, and construction)
3j. Expanding Rail Service Rail transit serves dense urban centers where travelers can walk to their destinations; Can be enhanced from suburban areas by providing park-and-ride lots.	• Increase transit ridership • Decrease daily VMT	• Capital costs per passenger • New systems require large up-front capital outlays and ongoing sources of operating subsidies, in addition to funds that may be obtained from Federal sources, under increasingly tight competition	Long-term: 10 or more years (includes planning, engineering, and construction)
3k. Dedicated Rights-of-Way for Transit Reserved travel lanes or rights-of-way for transit operations, including use of shoulders during peak periods.	• Increase transit ridership • Decrease travel time	• Costs vary by type of design	Medium-term: 5 to 10 years (includes planning, engineering, and construction)
ACCESSIBILITY STRATEGIES			
3l. Implementing Park-and-Ride Lots Encourages HOV use for longer distance commute trips.	• Decrease congestion by increasing vehicle occupancy rate • Increase mobility and transit efficiency	• Structure costs for transit stations	Medium-term: 5 to 10 years (includes planning, engineering, and construction)
3m. Improved Bicycle and Pedestrian Facilities at Transit Stations Includes improvements to facilities that provide access to transit stops as well as provisions for bicycles on transit vehicles and at transit stops (bicycle racks and lockers).	• Increase bicycle mode share • Decrease motorized vehicle congestion on access routes	• Capital and maintenance costs for bicycle racks and lockers	Short-term: 1 to 5 years (includes planning, engineering, and construction)

Table A.4 Bicycle and Pedestrian Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
4a. New Sidewalks and Designated Bicycle Lanes on Local Streets Enhances the visibility of bicycle and pedestrian facilities; increases the perception of safety.	• Increase mobility and access • Increase nonmotorized mode shares • Separate slow-moving bicycles from motorized vehicles • Decrease incidents	• Design and construction costs for paving, striping, signals, and signing • ROW costs if widening needed • Bicycle lanes may require improvements to roadway shoulders to ensure acceptable pavement quality	Short-term: 1 to 5 years (includes planning, engineering, and construction)
4b. Improved Bicycle Facilities at Transit Stations and Other Trip Destinations Increases safety with the addition of bicycle racks and bike lockers at transit stations and other trip destinations; Additional amenities such as locker rooms with showers at workplaces provide further incentives for using bicycles.	• Increase bicycle mode share • Decrease motorized vehicle congestion on access routes	• Capital and maintenance costs for bicycle racks and lockers, locker rooms	Short-term: 1 to 5 years (includes planning, engineering, and construction)
4c. Design Guidelines for Pedestrian-Oriented Development Encourages pedestrian activity through the use of design guidelines (i.e., maximum block lengths, building setback restrictions, and streetscape enhancements).	• Increase pedestrian mode share • Discourage motor vehicle use for short trips • Decrease VMT • Decrease emissions	• Capital costs largely borne by private sector; developer incentives may be needed • Public sector may be responsible for some capital and/or maintenance costs associated with right-of-way improvements • Ordinance development and enforcement costs	Short-term: 1 to 5 years
4d. Improved Safety of Existing Bicycle and Pedestrian Facilities Increases safety by maintaining lighting, signage, striping, traffic control devices, pavement quality; installing curb cuts and extensions, median refuges, and raised crosswalks.	• Increase nonmotorized mode share • Decrease incidents • Increase monitoring and maintenance costs	• Capital costs of sidewalk improvements and additional traffic control devices	Short-term: 1 to 5 years

Table A.4 Bicycle and Pedestrian Strategies (continued)

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
4e. Exclusive Non-Motorized Rights-of-Way Use abandoned rail rights-of-way and existing parkland for medium- to long-distance bike trails, improving safety and reducing travel times.	• Increase mobility • Increase nonmotorized modes • Decrease congestion on nearby roads • Separate slow-moving bicycles from motorized vehicles • Decrease incidents	• Right-of-way costs • Construction and engineering costs • Maintenance costs	Medium-term: 5 to 10 years (includes planning, engineering, and construction)
4f. Bike Sharing Programs Short-term bicycle rental program supported by a network of automated rental stations.	• Increase nonmotorized mode share • Discourage motor vehicle use for short trips • Decrease VMT	• Capital and maintenance costs for bicycles and rental stations	Short-term: 1 to 5 years

Table A.5 Access Management Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
5a. Curb Cut and Driveway Restrictions Limits turning vehicles, which can impede traffic flow and are more likely to be involved in crashes.	• Increase capacity, efficiency on arterials • Improve mobility on facility • Improve travel times and decrease delay for through traffic • Decrease incidents	• Implementation and maintenance costs vary; range from new signage and striping to more costly permanent median barriers and curbs	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
5b. Turn Lanes and New, Shared, or Relocated Driveways and Exit Ramps In some situations, increasing or modifying access to a property can be more beneficial than reducing access.	• Increase capacity, efficiency • Improve mobility and safety on facility • Improve travel times and decreased delay for all traffic	• Additional right-of way costs • Design, construction, and maintenance costs	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
5c. Minimum Intersection/Interchange Spacing Decreases number of conflict points and merging areas, which in turn decreases incidents and delays.	• Increase capacity, efficiency • Improve mobility on facility • Improve travel times and decrease delay for through traffic • Decrease incidents	• Part of design costs for new facilities and reconstruction projects	Medium-term: 5 to 10 years (includes planning, engineering, and implementation)
5d. Frontage Roads and Collector-Distributor Roads Directs local traffic to major intersections on both super arterials and freeways (parallel frontage roads); Separate exiting, merging, and weaving traffic from through traffic at closely spaced interchanges (collector-distributor).	• Increase capacity, efficiency • Improve mobility on facility • Improve travel times and decreased delay for through traffic • Decrease incidents due to fewer conflict points	• Additional right-of way costs • Design, construction, and maintenance costs	Medium-term: 5 to 10 years (includes planning, engineering, and implementation)
5e. Roadway Restrictions Closes access during rush hours (AM and PM peak hours) and aids in the increase of safety levels through the prevention of accidents at problem intersections; This measure may be effective along mainline segments of a highway, which operate at poor service levels.	• Increase capacity, efficiency on arterials • Improve mobility on facility • Improve travel times and decrease delay for through traffic • Decrease incidents	• Implementation and maintenance costs vary	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
5f. Access Control to Available Development Sites Coordination of access points to available development sites allows for less interference in traffic flow during construction and/or operation of new developments.	• Increase capacity, efficiency on arterials • Improve mobility on facility • Improve travel times and decrease delay for through traffic • Decrease incidents	• Implementation and maintenance costs vary	Short-term: 1 to 5 years (includes planning, engineering, and implementation)

Table A.6 Land Use Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
6a. Mixed-Use Development Allows many trips to be made without automobiles People can walk to restaurants and services rather than use their vehicles.	• Increase walk trips • Decrease SOV trips • Decrease in VMT • Decrease vehicle hours of travel	• Public costs to set up and monitor appropriate ordinances • Economic incentives used to encourage developer buy-in	Long-term: 10 or more years
6b. Infill and Densification Takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area.	• Decrease SOV • Increase transit, walk, and bicycle • Doubling density decreases VMT per household • Medium/high vehicle trip reductions	• Public costs to set up and monitor appropriate ordinances • Economic incentives used to encourage developer buy-in	Long-term: 10 or more years
6c. Transit-Oriented Development Clusters housing units and/or businesses near transit stations in walkable communities.	• Decrease SOV share • Shift carpool to transit • Increase transit trips • Decrease VMT • Decrease in vehicle trips	• Public costs to set up and monitor appropriate ordinances • Economic incentives used to encourage developer buy-in	Long-term: 10 or more years

Table A.7 Parking Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
7a. On-Street Parking and Standing Restrictions Enforcement of existing regulations can substantially improve traffic flow in urban areas Peak-period parking prohibitions can free up extra general purpose travel lanes or special bus or HOV "diamond" lanes.	• Increase peak-period capacity • Decrease travel time and congestion on arterials • Increase HOV and bus mode shares	• Design, construction, and maintenance costs for signage and striping • Rigid enforcement of parking restrictions	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
7b. Employer/Landlord Parking Agreements Employers can negotiate leases so that they pay only for the number of spaces used by employees; Alternatively, employers can provide cash-out options for employees not utilizing subsidized parking spaces.	• Decrease work VMT • Increase nonauto mode shares	• Economic incentives used to encourage employer and landlord buy-in	Short-term: 1 to 5 years
7c. Parking Management and Pricing Strategies include reducing the availability of free parking spaces, particularly in congested areas, or providing preferential or free parking for HOVs; Provides an incentive for workers to carpool.	• Decrease work VMT • Increase vehicle occupancy	• Relatively low costs, primarily for the private sector, include signing, striping, and administrative costs	Short-term: 1 to 5 years
7d. Location-Specific Parking Ordinances Encourages transit oriented and mixed-use development Parking requirements can be adjusted for factors such as availability of transit, a mix of land uses, or pedestrian-oriented development that may reduce the need for on-site parking.	• Decrease VMT • Increase transit and nonmotorized mode shares	• Economic incentives used to encourage developer buy-in	Long-term: 10 or more years
7e. Park and Ride Lots Park-and-Ride lots provide parking in areas that are convenient to other modes of transportation, and are commonly located adjacent to train stations, bus lines, or HOV lane facilities.	• Increase transit use and ridesharing • Decrease VMT	• Land acquisition, construction and maintenance are necessary for park-and-ride lots.	Medium-term: 5 to 10 years
7f. Advanced Parking Systems Helps drivers find or reserve parking using real-time information about the status of parking availability.	• Decrease congestion on local streets • Some peak-period travel and mode shift	• Costs vary based on system complexity	Short-term: 1 to 5 years

Table A.8 Regulatory Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
8a. Trip Reduction Ordinance Draws commuters to use other ways to travel to work besides driving alone.	• Improve air quality • Decrease traffic congestion • Minimize energy consumption	• Requires employers to promote commute alternatives	Medium-term: 5 to 10 years
8b. Congestion Pricing Controls peak-period use of transportation facilities by charging more for peak-period use than for off-peak.	• Decrease VMT • Increase transit and nonmotorized mode shares	• Implementation and maintenance costs vary	Medium-term: 5 to 10 years
8c. Auto Restriction Zones (Pedestrian Malls) Allows for a more equitable community, where all residents have an equal access to services within the area. Provides commercial access for pedestrians and noncar users. The most common form of an auto-restriction zone (pedestrian zones) in large cities is the pedestrian mall. Pedestrian malls generally consist of a storefront-lined street that is closed off to most automobile traffic. Emergency vehicles would have access at all times, while delivery vehicles may be restricted to limited delivery hours or entrances on adjacent back streets.	• Increase capacity • Decrease travel times • Increase safety • Improve bicycle and pedestrian-friendly roadways	• Design, construction, and maintenance costs	Medium-term: 5 to 10 years
8d. Truck Restrictions Aims to separate trucks from passenger vehicles and pedestrians. Prohibits trucks from traveling on certain roadways, and may call for weight restrictions on certain bridges.	• Increase capacity • Decrease travel times • Increase safety • Improve bicycle and pedestrian-friendly roadways	• Implementation and maintenance costs vary	Medium-term: 5 to 10 years
8e. Arterial Access Management Involves the application of local and state planning, and regulatory tools in efforts to preserve and/or enhance the transportation functions of roadways. Includes land use ordinances and techniques, corridor preservation, transportation improvements, and techniques in finance.	• Increase capacity • Decrease travel times • Increase safety • Improve bicycle and pedestrian-friendly roadways	• Requires government legislation • Implementation and maintenance costs vary	Medium-term: 5 to 10 years

Table A.9 Road Capacity Strategies

Strategies/Projects	Congestion and Mobility Benefits	Costs and Impacts	Implementation Timeframe
9a. Increasing Number of Lanes within Existing Cross Section Takes advantage of excess width in the highway cross section used for break-down lanes or median.	• Increase capacity	• Construction and engineering • Maintenance	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
9b. Geometric Design and Bottleneck Improvements Includes a range of improvements such as widening to provide shoulders, additional turn lanes at intersections, realignment of intersecting streets, auxiliary lanes to improve merging and diverging at entrance/exit ramps, and interchange modifications to decrease weaving sections on a freeway.	• Increase mobility • Decrease congestion by improving bottlenecks • Increase traffic flow • Decrease incidents due to fewer conflict points	• Design, implementation, operations and maintenance (O&M) costs vary by type of design	Short-term: 1 to 5 years (includes planning, engineering, and implementation)
9c. High-Occupancy Vehicle (HOV) Lanes Increases corridor capacity while at the same time providing an incentive for single-occupancy drivers to shift to rideshares. Most effective as part of a comprehensive effort to encourage HOVs, including publicity, outreach, park-and-ride lots, and rideshare matching services.	• Decrease congestion by reducing VMT • Increase vehicle occupancy • Decrease regional trips • Improve travel times • Increase transit use and improve bus travel times	• HOV, separate ROW costs • HOV, barrier separated costs • HOV, contra flow costs • Annual operations and enforcement • Can create environmental and community impacts	Medium-term: 5 to 10 years (includes planning, engineering, and construction)
9d. Super Street Arterials Involves converting existing major arterials with signalized intersections into "super streets" that feature grade-separated intersections.	• Increase capacity • Improve mobility	• Construction and engineering substantial for grade separation • Maintenance varies based on area	Medium-term: 5 to 10 years (includes planning, engineering, and implementation)
9e. Highway Widening by Adding Lanes Adds new highway lanes (including truck climbing lanes on grades); traditional way to deal with congestion.	• Increase capacity • Improve mobility	• Costs vary by type of highway constructed • Can create environmental and community impacts	Medium-term: 10 or more years (includes planning, engineering, and construction)

Table A.10 Major Transportation Systems Management Projects/Operations in the NYMTC Planning Area

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC/Regional ITS Architecture Strategy
Traffic signal priority (TSP) for buses	To create a 100% wireless centrally-controlled TSP system which could be deployed anywhere in NYC. Within several years 100% of traffic signals will have state-of-the-art controllers connected through a wireless network to the central NYC traffic computer. The MTA will initially equip 200 buses to communicate with the central NYC traffic computer.	Initially 200 buses; ultimately the entire bus fleet	Active Traffic and Transit Management	Advanced Traffic Management and Advanced Public Transportation Systems
Bus Security Cameras	Bus security camera systems are currently being installed in MTA buses. The purpose of these cameras is to serve as a deterrent to criminal activity, thereby improving the efficiency and safety of the bus system. In the event of an incident, the video recorded on the cameras can help to explain what transpired and serve as evidence.		Active Transit Management	Advanced Public Transportation
Bus lane enforcement cameras	This automated enforcement project will record the license plate number of vehicles that violate bus lane regulations, and send a summons which is not a moving violation to the owner. The cameras do not capture an image of the people in the vehicle, only the license plate number.	All SBS bus operations	Active Transit Management	Advanced Public Transportation
Rail Control Center (RCC) and Automatic Train Supervision (ATS)	Automatic Train Supervision to monitor service and route subway trains to the right tracks. The RCC also centralizes the management of subway maintenance disciplines and customer information systems in stations. Future infrastructure is intended through the installation of advanced signal systems like Communications-Based Train Control or through adoption of new service monitoring technologies.	In the coming years, NYCT is looking to expand ATS-like capabilities to additional subway lines (lettered lines and the 7)	Active Transit Management	Advanced Public Transportation
Communications-Based Train Control (CBTC)	The computer-based Communications-Based Train Control allows subway trains to safely operate closer together and at higher speeds, resulting in an increase in maximum track capacity by approximately ten percent.	CBTC is now under construction on the 7 and planned for additional lines as they come due for signal modernization	Active Transit Management	Advanced Public Transportation
Bus Time	Bus Time is a real-time bus information system for customers. The system can provide next bus information by bus stop or bus route, using computer, handheld or text message. It has the capability to be expanded to offer fixed displays at bus stops. Today the system informs customers where the next bus is (i.e. two stops away);currently there is no predictive algorithm to inform that a bus is three minutes away.	To be expanded system wide by the end of 2013. Also in development would be an expansion of the Bus Time system to offer customers on board a bus both a variable message sign and audio announcement of the next bus stop.	Automatic Vehicle location (AVL) and Traveler Information	Advanced Public Transportation

Table A.10 Major Transportation Systems Management Projects/Operations in the NYMTC Planning Area (continued)

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC/Regional ITS Architecture Strategy
Automatic Train Supervision (ATS)	This system transmits train location information to the Central Rail Control Center. The ability to see where all trains in the system are located assists train dispatchers with identifying delays and managing incidents that impede train service.	the B-Division (lettered) subway lines and the 7 line.	Incident Management	Advanced Public Transportation and Emergency Management Systems
Public Address/ Customer Information Screens (PACIS)	Building upon its ATS and CBTC systems, these are variable message signs which provide real-time train-arrival information to passengers waiting on station platforms and mezzanines.	PA/CIS will be installed on other segments of the system as they are outfitted with ATS, CBTC, or other technologies enabling real-time information.	Traveler Information	Advanced Traveler Information Systems
Advanced Solid State Traffic Controllers	The new controllers support complex intersections with phase skipping and real-time traffic responsive operation. The new controllers are able to adapt to the variety of communication media and protocols (fiber, coaxial, twist pairs and wireless) in order to support federal NTCIP standards. The ASTC is capable of being computerized, controlled by the TMC and implementing all of the central system timing patterns, scheduled by time of day and as holiday’s event. The new ASTC’s are also capable of implementing various traffic patterns for different traffic situations.	Expansion to include all NYC 12580 traffic signals. NYSDOT has also a program to replace old traffic controllers.	Active Traffic Management	Advanced Traffic Management Systems
Midtown in Motion	This system optimizes traffic mobility in midtown Manhattan via a set of field sensors and software equipment, which communicate wirelessly (via NYCWiN) with the joint traffic managements center (JTMC) and adjust signal timing appropriately in real time. The system utilizes ASTC controllers and includes 100 microwave sensors, 32 traffic video cameras and E-Z Pass readers at 23 intersections to measure traffic volumes, congestion, and travel times.	If necessary, future expansion of this system could include other areas in NYC.	Active Traffic Management	Advanced Traffic Management Systems
Regional Signal Timing and Coordination	This corridor based traffic signal retiming project improves traffic mobility and safety. It optimizes arterial traffic flow capacity, discourages speeding, and increases pedestrian walk times at crosswalks.	If necessary, it could be expanded to other arterials in the future.	Active Traffic Management	Advanced Traffic Management Systems
Smart Lights (Adaptive Control System)	This pilot project has been implemented at the entrance to the Staten Island College at Victory Blvd. This is a good signal timing option for improving traffic flow on limited size local areas, where traffic patterns are inconsistent and unpredictable. Smart lights are connected with field sensors to monitor changes in traffic flow and via wireless communication receive signal timing changes from the JTMC almost immediately.		Active Traffic Management	Advanced Traffic Management Systems

Table A.10 Major Transportation Systems Management Projects/Operations in the NYMTC Planning Area (continued)

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC/Regional ITS Architecture Strategy
Highway Intelligent Transportation System (ITS)	This system uses traffic cameras and electronic message boards to monitor and improve traffic flows, as well as to inform drivers. The deployment includes fiber and wireless communication to support video traffic cameras, variable message signs (VMS), radio (RFID) readers and travel time signs. All NYC major construction projects require Mobil ITS deployment to support maintenance and protection of traffic management. Current implementation includes the Korean Veteran Parkway, Belt Parkway, FDR Dr., and the East River bridges. Construction projects using ITS deployment included all East River Bridges and the 2nd Avenue Subway and Lower Manhattan projects.	Future expansion could include other NYC areas.	Active traffic Management	Advanced Traffic Management Systems and Maintenance and Construction Operations
Freight Weight-In-Motion (WIM)	The goal of this research project is to quantify the damage and the corresponding cost to NYC's infrastructure caused by heavy vehicles, utilizing WIM sensors placed at strategic locations. The project also obtains data on existing axle weights of heavy vehicles and quantifies the annual damage caused by overweight vehicles using PaveDAT, a FHWA software. The project also examines using WIM and License Place Reader (LPR) technologies along with overview cameras for enforcement.	One permanent WIM site will be installed on the Alexander Hamilton Bridge. Three other temporary WIM sites will be established at selected locations on NYC through-truck routes.	Active traffic Management	Advanced Traffic Management Systems and Commercial Vehicle Operations Systems
INFORM (Information FOR Motorists)	The system is one of the nation's largest and most advanced transportation management systems, and consists of electronic monitoring, communications, signing and control components, providing motorist information for warning and route diversion, ramp control, and signal control. All operations are monitored and controlled by the TMC in Hauppauge. It includes more than 4000 vehicle detectors, 206 overhead and 48 portable variable message signs, 1080 traffic signals (500 under central control), 91 ramp meters, 228 closed circuit television cameras, managed lanes, and other ITS features.	The Region intends on eventually having approximately 360 centerline miles of instrumented roadway. (see Figure 4-1.)	Active Traffic Management	Advanced Traffic Management Systems
511NY	This system is available via phone by dialing 511 or via the web. It provides information via text and maps for current traffic and transit conditions, transit route trip planning, rideshare and other services. http://www.511ny.org.	The system would include additional travel information elements	Traveler Information	Advanced Traveler Information Systems
Highway Emergency Local Patrol (HELP)	Patrol Vehicles/Trucks on major roadways provide motorist assistance as necessary. They also communicate with local TMC to coordinate the response for roadway incidents.	The system would be expanded as necessary to include additional roadways	Incident Management	Emergency Management Systems

Table A.10 Major Transportation Systems Management Projects/Operations in the NYMTC Planning Area (continued)

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC/Regional ITS Architecture Strategy
NYSDOT R-11, Regional ITS Deployment	The ITS deployment covers all interstate highways in NYC, including partial coverage along many of the City's Parkways. It includes an extensive electronic monitoring and communications network that provides motorist information about traffic incidents, road construction, travel time, and other traffic conditions. It includes 76 variables message signs, 260 closed circuit television cameras, more than 600 vehicular detectors, 8 highway advisory radio frequencies, managed lanes, and other components.	The system would be expanded in Eastern Queens, Manhattan and southern Brooklyn. Improvements would also include integration via new technologies (i.e., cross-agency via TMCs and vehicle-infrastructure communications).	Active Traffic Management	Advanced Traffic Management Systems
E-ZPass Customer Service Center	This system includes several Customer Service Centers (CSC) linked with various Toll Collection subsystems. The centers manage toll transactions and interface with a Financial Institution.	The system could be expanded as necessary	Active Traffic Management	Advanced Traffic Management Systems
Long Island Municipal/County Local Traffic Operation Center (TOC)	The center monitors, analyzes and stores traffic data and controls traffic conditions. The center exchanges highway-rail intersection information with rail operations centers. Its operations include regional traffic management, wide area alerts, and work zone management and coordination.	The system could be expanded as necessary	Active Traffic Management, Incident Management	Advanced Traffic Management and Emergency Management Systems Maintenance and Construction Operations
Mid Hudson South Municipal/County Local TMC (Hudson Valley TMC)	The TMC operations include incident dispatch, coordination and communication, and multimodal coordination, including signal coordination along a particular transit route.	The system could be expanded as necessary. Future ITS instrumentation would cover the 1-84 from Route 17 in Middletown to 1-684	Active Traffic Management, Incident Management	Advanced Traffic Management and Emergency Management Systems Maintenance and Construction Operations
MTA Bridges and Tunnels Facility Operation Centers	The center operations include traffic surveillance, commercial vehicle operations, emergency management, regional traffic management, environmental information management, work zone operations, etc.	The system could be expanded as necessary	Active Traffic and Transit Management, and Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems Maintenance and Construction Operations
MTA LIRR Operations Center Systems	The center operations include rail and bus dispatch operations, vehicle tracking and scheduling systems and emergency management.	The system could be expanded as necessary	Active Transit Management and Incident Management	Advanced Public Transportation and Emergency Management Systems Maintenance and Construction Operations
MTA Metro-North Operations Center Systems	The center operations include rail and bus dispatch operations, vehicle tracking and scheduling systems and emergency management.	The system could be expanded as necessary	Active Transit Management and Incident Management	Advanced Public Transportation and Emergency Management Systems Maintenance and Construction

Operations

Table A.10 Major Transportation Systems Management Projects/Operations in the NYMTC Planning Area (continued)

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC/Regional ITS Architecture Strategy
New York City Joint Transportation Management center (JTMC)	The center operations include traffic and transit network control and monitoring, emergency management, emissions management, and maintenance and construction management.	The system could be expanded as necessary	Active Traffic, Transit Management, and Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems Maintenance and Construction Operations
NYC Office of Emergency Management (OEM) Watch Command Center	This is the emergency operations center for the City of New York. The command center is responsible for coordinating responses between the various agencies operating within New York City during major incidents and events.	The system could be expanded as necessary	Incident Management	Emergency Management Systems
PANYNJ Airports Communication desk/operations center	This includes central operations for coordination and communication systems as well as facility- based ITS servers. The functional areas include traffic surveillance, incident management, traffic and transit information services, multi-modal coordination, transit center security, work zone management, etc.	The system could be expanded as necessary	Active traffic and transit management, and Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems Maintenance and Construction Operations
TRANSCOM OpenReach Servers	The TRANSCOM regional architecture is a program. It coordinates the collection and redistribution of traffic flow, origin-destination, incident, construction, equipment status and special event information data between transportation management centers running the TRANSCOM regional architecture.	The system could be expanded as necessary	Active traffic and transit management, Incident Management, and traveler information	Advanced Traffic Management, Public Transportation, Emergency Management and Traveler information Systems Maintenance and Construction Operations

Source: Plan 2040: NYMTC Regional Transportation Plan, Chapter 4.

Table A.11 Major Transportation Demand Management Projects and Operations in the NYMTC Planning Area

Name	Description/Aim	TOM Category	Website
Access-A-Ride	Special mobility services: adapted vehicles provide demand-response transportation for passengers with special needs such as the disabled and the elderly.	Para transit	http://www.mta.info/nyct/paratran/
Guaranteed Ride Home	Non-driving employees are provided with a transportation back-up option in case they need to leave work outside of regular hours in areas served by MetroNorth. This program is funded by NYSDOT-Region 8 and is offered via 511 NY Rideshare for usage for up to four times in a year.	Employer Program Vehicle Sharing	http://www.mta.info/mnr/html/guaranteed/guaranteed.htm
MTA Transit Oriented Development Office	"To promote and coordinate TOD initiatives among its operating agencies, to work closely with local land use jurisdictions and to support initiatives at the regional scale to coordinate land use and transportation planning."	Bike/Pedestrian Enhancement	http://www.mta.info/sustainability/pdf/MTA%20Smart%20Growth-TOD%2010%2029%2008.pdf
Employer Preferred Parking	Several employers in Long Island, Westchester and Putnam counties provide parking benefits for their stuff.	Employer Programs	
Westchester SMART Commute Program	This program informs commuters and employers of various strategies to increase the use of transit alternatives in order to reduce congestion and improve air quality.	Marketing/Employer Programs	http://transportation.westchestergov.com/commuter-services/smart-commute
PARK Smart Pilot	Performance-based parking pricing (pilot project). Parking prices have been increased. The goal is to optimize parking availability, increase turnover rates, and reduce "cruising" in order to reduce traffic volumes. Currently in 2-3 NYC neighborhoods.	Parking Management	http://www.nyc.gov/html/dot/html/motorist/parksmart.shtml
Parking Availability Technology Pilot	Sensors embedded into parking space enables wireless real-time transmission of information on parking availability, rates, and rules. 177 parking spots on Arthur Avenue and East 187th Street in the Bronx.	Parking Management	http://www.nyc.gov/html/dot/html/motorist/prkintro.shtml
Ancillary Park&Ride Lots	In Putnam County, Temple Beth Elohim and Carmel Bowl&Temple Beth Shalom lease parking spaces to supplement parking supply near existing Park&Ride lots.	Parking Management	
511NY Rideshare	Outreach program to demonstrate the benefits of rideshares and promote alternative travel choices. Outreach to promote and educate employers about pre-tax commuter benefit options	Paratransit/Marketing/ Employer Programs	www.511nyridesha re.org
Regional Commuter Choice Program (RCCP)	A program that delivers benefits to travelers who use TDM services in the NYMTC planning area.	Paratransit	
Bicycle Racks	Bike racks exist throughout the NYMTC planning area, including train stations, business centers, and areas with significant share of bicycle use	Bike/ped enhancement	http://www.mta.info/ http://www.nyc.gov/html/dot/html/bicyclists/cityrack-suggest.shtml

Table A.11 Major Transportation Demand Management Projects and Operations in the NYMTC Planning Area (continued)

Name	Description/Aim	TOM Category	Website
Bicycle Locker Program	Provision of secure bicycle lockers. Currently at 20 LIRR stations in Long Island, SUNY Stony Brook, Suffolk State Office Building in Brookhaven, Riverhead Town Hall. Seven locations administered by NYSDOT, seventeen are municipally owned. Bike lockers also exist at selected Metro-North stations.	Bike/ped enhancement	http://www.511ny.org/rideshare/ridesharesub.aspx?contentID=238 http://www.mta.info/bike/
Vanpool and shuttle services	511NY Rideshare TDM team coordinates with targeted employers to facilitate and establish rideshare services for employees. NYSDOT-Region 8 coordinates with Rockland and Westchester counties to facilitate rideshare and other transportation services for employees. Over 20 Metro-North station shuttles are supported by employers in Westchester County. Several employers in Long Island and Westchester provide employer paid vanpools and shuttles to LIRR and Metro- North stations. SUNY Purchase, Hofstra University and Bard and Marist & Vassar colleges offer ridesharing programs.	Paratransit/Marketing/Vehicle Sharing/Employer programs	
Telework	Many employers across the NYMTC planning area offer forma l and informal telework programs. Some of the large programs include IBM in Westchester and Putnam counties and Empire Blue Cross & Blue Shield, CA Technologies, and Aer Lingus in Long Island.	Employer Programs	
Other employer related financial incentives	The New York City Commute Enhancement Grant (NYCCE) is available to organizations in NYC to help fund work site transportation related projects designed to reduce congestion and improve air quality. The Long Island Region Improving Commuting Grant (LIRIC) is a public service to help employers in LI to promote commuting alternatives to driving alone, including carpooling, teleworking, etc.	Employer Programs	
Toll Pricing	The Port Authority of New York and New Jersey offers E-ZPass toll discounts for carpools on its bridges and tunnels. Off- peak toll discounts are also offered for vehicles with two axles and single rear wheels. Tappan Zee Bridge tolls provide discounts for carpool commuters and certain types of hybrid vehicles. The toll is higher for commercial vehicles during the morning peak period and for cash paying customers.	Marketing/Vehicle Sharing	
Complete Streets Legislation	To "accommodate and facilitate safe travel by pedestrians, bicyclists, and motorists of all ages and abilities and allow pedestrian and motor traffic to easily coexist."	Bike/Pedestrian Enhancement	http://www.nysenate.gov/press-release/senate-passes-complete-streets-legislation
Commuter Tax Benefit	Many employers across the NYMTC planning area provide various financial incentives or tax-free transportation benefits to their employees to encourage the use of more efficient travel modes to and from work.	Employer Program Incentives	

Table A.11 Major Transportation Demand Management Projects and Operations in the NYMTC Planning Area (continued)

Name	Description/Aim	TOM Category	Website
Bike Share Programs	Bicycles are made available for shared use to individuals on a short term basis in to supplement public transit and automobile transport. CitiBike, the New York City Bike Share program, launched in May of 2013 with 6,000 bikes at 330 locations throughout the city. On Long Island, the City of Long Beach and SUNY Stony Brook have already launched bike share programs.	Bike/Pedestrian Enhancement	http://decobikelbny.com/http:// www.stonybrook.edu/sustainability/ greenmap/details/bike-shareprogram.shtml http://www.citibikenyc.com/
Ferry services to Metro North stations	Region 8 and Metro North finance ferry companies that provide ferry services to Ossining and Beacon Metro North stations.	Paratransit	
Suburban Express Bus	Region 8 Express Bus routes include OWL (Middletown- White Plains), Tappan Zee Express, Poughkeepsie- White Plains Express, IBus (Stamford- White Plains), Route 77 (Putnam- White Plains).		
Railroad Station Shuttles	Danbury Brewster, Fairfield CT-Katonah, Mahopac-Croton Falls, White Plains-Westchester avenue, Newburgh- Beacon.		

Source: Plan 2040: NYMTC Regional Transportation Plan, Chapter 4.

Table A.12 System Enhancement Projects (estimated costs in billions of year of expenditure (YOE) dollars)

Plan #/PIN #	Category/Item	Total Programmed Dollars
	Minor projects	**$ 2.728**
	Major Projects (itemized)	
PIN: G609/01/AA 09	MTA LIRR East Side Access Project	$ 1.020
PIN: X82266	Moynihan Station Phase 1	$ 0.067
PIN: X77047	Goethals Bridge Replacement	$ 1.500
PIN: L603/04/ TX 03	MTA LIRR Ronkonkoma Branch Second Track	$ 0.129
PIN: X76416; PLAN: NYCMB247C	Manhattan Bridge Cables & Suspenders	$ 0.388
PIN: X09629	Bayonne Bridge Clearance Project	$ 1.000
PIN: 005418, 005409, OT2155, 005410, OT2156, 005412, OT2493, 005411, OT2305; PLAN: NSSC646C; NSSC647C: NSSC649C: NSSC650C	NY 347 Safety, Mobility, and Environmental Enhancements	$ 0.855
PHASE 2 PIN: X72977: PLAN: NYCMB569C; NYCMB571C	Kosciuszko Bridge Replacement Project	$ 0.290
PIN: X77283: PLAN: NYCQ1686C	Ed Koch Queensboro Bridge Seismic Retrofit	$ 0.150
PIN: G610-01AA	MTA NYCT Second Avenue Subway Phase 1	$ 0.804
PLAN: NYCM2013V	MTA NYCT Second Avenue Subway Phases 2-4	$12.776
PIN: 8TZ101; PLAN: MHSMC1590C	Tappan Zee Hudson River Crossing Project	$ 3.900
	Transportation Demand Management	$ 0.286
PLAN: NYCMB584C	Bus Rapid Transit Routes in New York City	$ 0.180
	TOTALS	$**26.073**

B. Congested Corridor Screening Worksheet

Table B.1 Congested Corridors by County
Final Screening

							Direction of Primary Congestion in Peak Periods						Daily Modeled Volume			Hot Spot Scoring Parameters					
County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	AM	PM	Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	EB/SB	WB/NB	Total Volume	Consistency	Intensity	Magnitude	Importance	Score	Rank
Manhattan																					
1	1	Harlem River Drive	RFK Bridge	I-95/Trans-Manhattan Expwy	Freeway	Mainline and Ramps	SB	NB		12	0.870	3.15	65,800	82,000	147,800	0.079	0.6444	0.68	1.0	66.63	**24**
1	2	I-95/Trans Manhattan Expressway	George Washington Bridge	Harlem River	Freeway	Mainline and Ramps	EB	EB		11	0.840	0.82	89,000	96,500	185,500	0.021	0.6222	0.80	1.0	67.35	**22**
1	3	NY-9A/ Henry Hudson Parkway	W. 42nd Street	I-95/Trans-Manhattan Expwy	Expressway	Mainline and Ramps	SB	NB		12	0.500	6.00	60,600	73,500	134,100	0.150	0.3704	0.61	1.0	52.23	**40**
1	4	FDR Drive	Battery	RFK Bridge	Expressway	Mainline and Ramps	SB	NB		12	1.100	9.15	82,100	84,000	166,100	0.229	0.8148	0.70	1.0	76.98	**4**
1	5	Canal Street	NY-9A/West Street	Manhattan Bridge	Arterial	Signals and Pedestrians	Both	Both	Weekends	14	0.900	1.09	25,950	25,950	51,900	0.027	0.6667	0.22	0.8	53.92	**39**
1	6	Downtown Streets[a]	South of Delancey Street		Local	Signals and Pedestrians		All												-	-
1	7	Midtown Streets[a]	14th Street	59th Street	Local	Signals and Pedestrians		All	Weeknights – Times Square/ Theatre District											-	-
Queens																					
2	8	I-495/ Long Island Expressway	Queens Midtown Tunnel	Nassau County Boundary	Freeway	Mainline and Ramps	WB	EB		11	0.930	11.60	114,000	111,600	225,600	0.290	0.6889	0.95	1.0	76.28	**5**
2	9	Grand Central Parkway	RFK Bridge	Nassau County Boundary	Expressway	Mainline and Ramps	WB	EB		12	1.130	14.00	91,000	93,200	184,200	0.350	0.8370	0.77	1.0	80.83	**2**
2	10	I-678/ Van Wyck Expressway	JFK Airport	Grand Central Parkway	Freeway	Mainline and Ramps	NB	Both		11	0.900	3.77	99,600	93,100	192,700	0.094	0.6667	0.83	1.0	70.82	**14**

Table B.1 Congested Corridors by County

Final Screening (continued)

County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	Direction of Primary Congestion in Peak Periods		Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	Daily Modeled Volume			Hot Spot Scoring Parameters				Score	Rank
							AM	PM					EB/SB	WB/NB	Total Volume	Consistency	Intensity	Magnitude	Importance		
Queens (continued)																					
2	11	Belt Parkway	Brooklyn Boundary	Bronx-Whitestone Bridge	Expressway	Mainline and Ramps	WB/NB	EB/SB		12	1.040	15.40	102,800	97,000	199,800	0.385	0.7704	0.85	1.0	79.44	**3**
2	12	Jackie Robinson Parkway	Brooklyn Boundary	Grand Central Parkway	Expressway	Mainline and Ramps	WB	EB		12	1.009	4.55	51,400	58,800	110,200	0.114	0.7474	0.49	1.0	68.28	**19**
2	13	I-278/Brooklyn-Queens Expwy.	Brooklyn Boundary	RFK Bridge	Freeway	Mainline and Ramps	WB	EB		11	1.005	4.79	72,600	84,200	156,800	0.120	0.7444	0.70	1.0	72.41	**12**
2	14	Ed Koch Queensboro Bridge			Crossing	Mainline and Access	WB	EB		14	1.010	0.97	97,800	97,800	195,600	0.024	0.7481	0.81	0.8	69.90	**16**
2	15	NY-25A/ Northern Blvd.[a]	Grand Central Pkwy.	Whitestone Expressway	Arterial	Mainline and Ramps	WB	EB												-	-
Brooklyn																					
3	16	I-278/Brooklyn-Queens Expressway	Prospect Expressway	Queens County Boundary	Freeway	Mainline and Ramps	EB	WB		11	1.008	6.90	97,500	99,000	196,500	0.173	0.7466	0.82	1.0	75.50	**6**
3	17	I-278/Gowanus Expressway	Belt Parkway	I-278 BQE		Mainline	EB	WB		11	0.910	5.91	81,700	92,600	174,300	0.148	0.6741	0.77	1.0	70.56	**15**
3	18	Ocean Parkway	Avenue J	Church Avenue	Arterial	Signals	NB	SB		14	1.130	1.80	48,100	48,100	96,200	0.045	0.8370	0.40	0.8	66.29	**26**
3	19	Flatbush Avenue	Eastern Parkway	I-278 BQE	Arterial	Signals and Pedestrians	NB	SB		14	1.330	2.07	52,700	52,700	105,400	0.052	0.9852	0.44	0.8	74.53	**10**
3	20	Atlantic Avenue	I-278 BQE	Utica Avenue	Arterial	Signals and Pedestrians	WB	EB		14	1.190	3.77	48,200	48,200	96,400	0.094	0.8815	0.40	0.8	69.02	**17**
3	21	Brooklyn Bridge			Crossing	Mainline and Access	Inbound	Outbound		14	0.820	1.11	67,100	63,900	131,000	0.028	0.6074	0.56	0.8	57.79	**36**

Table B.1 Congested Corridors by County

Final Screening (continued)

County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	Direction of Primary Congestion in Peak Periods		Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	Daily Modeled Volume				Hot Spot Scoring Parameters			Score	Rank
							AM	PM					EB/SB	WB/NB	Total Volume	Consistency	Intensity	Magnitude	Importance		
Brooklyn (continued)																					
3	22	Manhattan Bridge			Crossing	Mainline and Access	Inbound	Outbound		14	0.600	1.12	40,500	40,500	81,000	0.028	0.4444	0.34	0.8	45.23	**41**
3	23	Williamsburg Bridge			Crossing	Access	Inbound	Outbound		14	0.850	1.26	70,500	67,100	137,600	0.032	0.6296	0.59	0.8	59.51	**33**
Bronx																					
4	24	I-95/Cross Bronx Expressway	Harlem River	Hutchinson River Parkway	Freeway	Mainline and Ramps	WB	Both		11	1.004	4.80	100,250	99,200	199,450	0.120	0.7437	0.83	1.0	75.04	**7**
4	25	I-278/Bruckner Expressway	RFK Bridge	I-95	Freeway	Mainline	SB	NB		11	1.006	4.70	66,500	82,600	149,100	0.118	0.7452	0.69	1.0	72.16	**13**
4	26	I-87/Major Deegan Expressway	RFK Bridge	I-95/Cross Bronx Expwy	Freeway	Mainline and Ramps	SB	NB	Weeknight Yankee games – both directions	11	0.890	3.44	65,000	47,800	112,800	0.086	0.6593	0.54	1.0	64.62	**28**
4	27	Bronx River Parkway	I-95/Cross Bronx Expwy	Westchester County Boundary	Expressway	Ramps and Access	SB	NB		12	0.730	4.34	65,300	64,700	130,000	0.109	0.5407	0.54	1.0	58.97	**34**
Staten Island																					
5	28	I-278/Staten Island Expressway	Goethals Bridge	Verrazano-Narrows Bridge	Freeway	Mainline, Ramps, Grades	EB	Both	Summer: Fridays WB/ Sundays EB	11	0.930	6.52	99,000	87,800	186,800	0.163	0.6889	0.82	1.0	72.52	**11**
5	29	Goethals Bridge			Crossing	Mainline	WB	EB		11	1.090	1.68	46,100	42,100	88,200	0.042	0.8074	0.38	1.0	68.45	**18**
5	30	Outerbridge Crossing			Crossing	Mainline	WB	EB		11	1.040	1.15	42,900	40,100	83,000	0.029	0.7704	0.36	1.0	65.93	**27**

Table B.1 **Congested Corridors by County**
Final Screening (continued)

County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	Direction of Primary Congestion in Peak Periods		Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	Daily Modeled Volume			Hot Spot Scoring Parameters				Score	Rank
							AM	PM					EB/SB	WB/NB	Total Volume	Consistency	Intensity	Magnitude	Importance		
Nassau																					
6	31	I-495/Long Island Expressway	Queens County Boundary	Suffolk County Boundary	Freeway	Mainline and Ramps	WB	EB	Summer: Fridays EB/ Sundays WB	11	0.960	15.40	90,200	93,300	183,500	0.385	0.7111	0.77	1.0	74.90	**8**
6	32	Northern State Parkway	Queens County Boundary	Suffolk County Boundary	Freeway	Mainline and Ramps	WB	EB	Summer: Fridays EB/ Sundays WB	14	0.930	9.66	60,900	54,900	115,800	0.242	0.6889	0.51	0.8	62.98	**30**
6	33	Southern State Parkway	Queens County Boundary	Suffolk County Boundary	Freeway	Mainline and Ramps	WB	EB	Summer: Fridays EB/ Sundays WB	12	1.050	16.30	120,400	114,100	234,500	0.408	0.7778	1.00	1.0	82.96	**1**
6	34	Meadowbrook State Parkway	Hempstead Turnpike	Northern State Parkway	Expressway	Ramps and Access	NB	SB		12	0.880	3.53	85,800	87,500	173,300	0.088	0.6519	0.73	1.0	68.01	**21**
6	35	Sunrise Highway	Peninsula Boulevard	Suffolk County Boundary	Arterial	Mainline and Signals	WB	EB		14	0.930	13.40	76,000	75,400	151,400	0.335	0.6889	0.63	0.8	66.42	**25**
6	36	Great Neck/ Manhasset Streets[a]	North of NSP		Arterial	Mainline	NB	SB												-	-
Suffolk																					
7	37	I-495 Long Island Expressway	Nassau County Boundary	Eastern Terminus	Freeway	Ramps	WB	EB	Summer: Fridays EB/ Sundays WB	11	0.820	40.00	86,100	80,900	167,000	1.000	0.6074	0.72	1.0	74.67	**9**
7	38	NY-27/Sunrise Highway	Southern State Parkway	Patchogue	Freeway	Ramps	WB	EB	Summer: Fridays EB/ Sundays WB	12	0.780	21.70	77,900	76,000	153,900	0.543	0.5778	0.65	1.0	67.25	**23**

Table B.1 Congested Corridors by County
Final Screening (continued)

County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	Direction of Primary Congestion in Peak Periods: AM	Direction of Primary Congestion in Peak Periods: PM	Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	Daily Modeled Volume: EB/SB	Daily Modeled Volume: WB/NB	Daily Modeled Volume: Total Volume	Hot Spot Scoring Parameters: Consistency	Hot Spot Scoring Parameters: Intensity	Hot Spot Scoring Parameters: Magnitude	Hot Spot Scoring Parameters: Importance	Score	Rank
Suffolk (continued)																					
7	39	NY-347	Northern State Parkway	Old Town Road	Arterial	Mainline and Signals	WB	EB		14	0.900	13.60	50,800	54,000	104,800	0.340	0.6667	0.45	0.8	61.70	**31**
7	40	Sagtikos/Sunken Meadow Pkwy[a]	NY-27/ Sunrise Highway	NY-25/Jericho Turnpike	Expressway	Ramps	Both	Both												-	-
Westchester																					
8	41	I-287/Cross Westchester Expwy.	Tappan Zee Bridge	I-95	Freeway	Mainline and Ramps	EB	WB		11	0.710	13.00	83,200	70,400	153,600	0.325	0.5259	0.69	1.0	63.37	**29**
8	42	Hutchinson River Parkway	Bronx County Boundary	I-287	Expressway	Mainline and Ramps	SB	NB	Summer: Fridays NB/ Sundays SB	12	0.940	6.20	70,200	62,300	132,500	0.155	0.6963	0.58	1.0	68.03	**20**
8	43	I-87/NYS Thruway	Bronx County Boundary	Tuckahoe Road	Freeway	Mainline and Ramps	SB	NB		11	0.250	11.30	18,800	25,700	44,500	0.283	0.1852	0.21	1.0	36.35	**42**
8	44	I-95	Bronx County Boundary	Connecticut State Line	Freeway	Mainline and Ramps	SB	NB	Summer: Fridays NB/ Sundays SB	12	0.620	11.30	60,100	66,400	126,500	0.283	0.4593	0.55	1.0	56.82	**37**
8	45	Cross County Parkway	Saw Mill River Parkway	Hutchinson River Parkway	Expressway	Ramps	Both	Both		12	0.660	3.00	63,900	56,000	119,900	0.075	0.4889	0.53	1.0	55.81	**38**
8	46	Saw Mill River Parkway[a]	Cross County Parkway	Tuckahoe Road			SB	NB												-	-

Table B.1 Congested Corridors by County

Final Screening (continued)

County	Location ID	Corridor Name	From	To	Facility Type	Nature of Congestion	Direction of Primary Congestion in Peak Periods: AM	Direction of Primary Congestion in Peak Periods: PM	Comments	Functional Class	Worst Demand/ Capacity Ratio	Length (Miles)	Daily Modeled Volume: EB/SB	Daily Modeled Volume: WB/NB	Daily Modeled Volume: Total Volume	Hot Spot Scoring Parameters: Consistency	Hot Spot Scoring Parameters: Intensity	Hot Spot Scoring Parameters: Magnitude	Hot Spot Scoring Parameters: Importance	Score	Rank
Westchester (continued)																					
8	47	Downtown White Plains Streets[a]			Local	Signals and Pedestrians	In-bound	Out-bound												-	-
8	48	Yonkers Streets[a]			Arterials	Signals and Pedestrians	In-bound	Out-bound												-	-
Rockland																					
9	49	I-287/I-87/NYS Thruway	Garden State Pkwy.	Tappan Zee Bridge	Freeway	Ramps and Grades	EB	WB	Summer: Fridays WB/ Sundays EB	11	0.700	14.00	71,800	69,600	141,400	0.350	0.5185	0.60	1.0	61.35	**32**
9	50	Tappan Zee Bridge			Crossing	Mainline, Ramps, and Toll Plaza	EB	WB	Summer: Fridays WB/ Sundays EB	11	0.700	3.20	71,800	69,600	141,400	0.080	0.5185	0.60	1.0	58.65	**35**
Putnam																					
10	51	I-84/I-684 Interchange[a]			Interchange	Ramps	SB	NB												-	-

Note: Highlight ten locations with the highest congestion rank.
[a]Congested locations/areas where rank was not calculated.

Length	D/C	Volume	FC
Weight, %			
15%	**25%**	**45%**	**15%**