5. MODEL DEVELOPMENT AND TRAVEL DEMAND FORECASTING: 2020, 2035 and 2050

Two traffic assignment and operational analysis models were developed to allow quantitative evaluation of alternative corridor alignments and design concepts, and of alternative central intersection and through truck diversion concepts. The first model – a regional travel demand model - was developed for the assignment of regional and local traffic flows to, from and through the study area, and to evaluate the impacts of various alternatives to the regional network. This regional travel demand model covers a wide geographic area to account for the effects of regional travel demands and future changes to the roadway network outside of the study area. This model incorporated external data sources and inputs and was applied in the projection of future condition traffic flows for the 2020, 2035 and 2050 analysis years. The second model – a microsimulation model - was developed to evaluate the operational efficiency of the corridor and central intersection roadway design alternatives at a detailed level.

Various roadway design alternatives were tested through application of these two models to quantify and evaluate the traffic operational conditions along the study corridor itself and the effect of the alternatives on traffic flow patterns throughout the region.

5.1 Regional Travel Demand Modeling

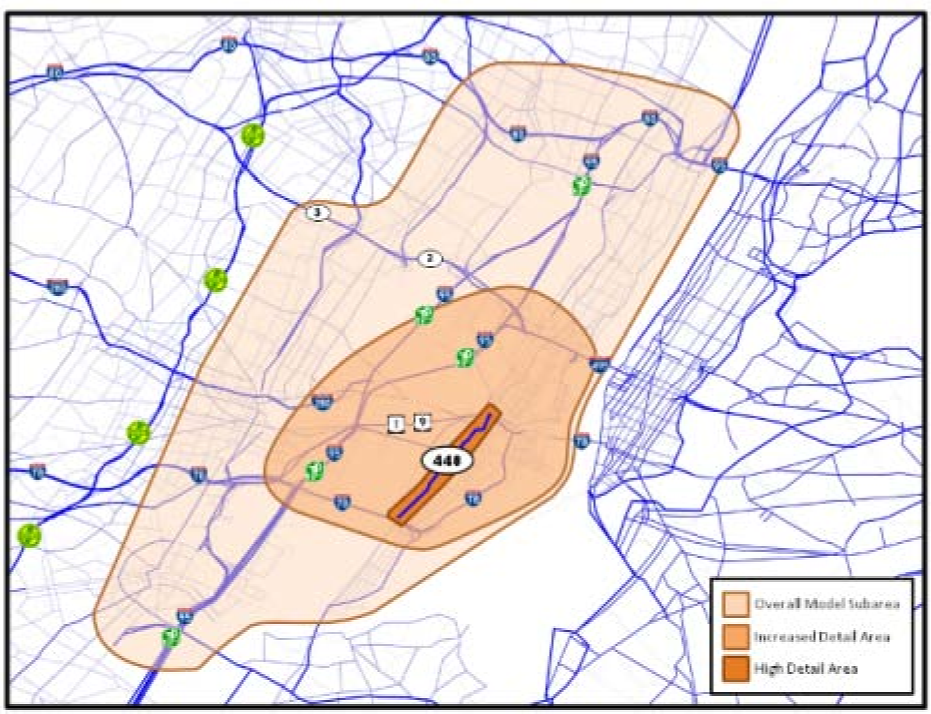
5.1.1 Base Model Network Development

A project-specific regional travel demand model was developed to identify the travel patterns of vehicles traveling to, from and through the study area and to evaluate the impacts of various roadway corridor alternatives for the Route 440/Routes 1&9T corridor. The model was also applied in the evaluation of the through truck diversion alternatives developed as part of this study. The regional travel demand model was developed from a number of data sources, with the final model outputs utilized as input to the traffic microsimulation model of the Route 440/Routes 1&9T corridor and central intersection.

The North Jersey Regional Transportation Model – Enhanced (NJRTM-E), developed by the North Jersey Transportation Planning Authority (NJTPA), was selected as the base upon which to build the project specific travel demand model. The NJRTM-E is a standard four-step model that runs on Citilabs software products CUBE (as an interface) and Voyager. The model's geographic area of coverage includes the thirteen northernmost New Jersey counties, all of New York City and Long Island, portions of southern New Jersey, portions of southern New York State, and portions of eastern Pennsylvania. Within the NJTPA region[1] , the NJRTM-E highway network includes most arterials (major and minor) with most 500 level and 600 level county roads. Collector or local roads are typically not included. Outside the NJTPA region, the highway network is more schematic, generally representing major regional roadways. Traffic volumes are assigned to the roadways in the model based upon Traffic Analysis Zones (TAZs). There are over 2,500 TAZs in the NJRTM-E with over 1,500 located within the NJTPA region. Vehicle trips are defined in the model by assignment from one TAZ to another, representing the trip origins and destinations.

To focus on the study area in detail, a subarea from NJRTM-E model was extracted. The subarea is approximately 150 square miles in area, generally extending from the Goethals Bridge in the south, Tenafly in the north, the Hudson River in the east and Garden State Parkway in the west (Figure 5.1).

Figure 5.1: NJ 440 Network Model - Subarea of the NJRTM-E



[1] Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren counties

As discussed above, the NJRTM-E is macroscopic in nature. As such, the extracted subarea did not contain sufficient detail to allow testing of the concept alternatives to be developed through the course of the study. The sub-area model was enhanced through the addition of roadway details for the three areas depicted in Figure 5.1. The largest area (the Overall Model Subarea) contains only detail found originally in the NJRTM-E model; no links were modified or added in this area. Highway interchanges and major intersections were modified to better represent the actual alignment and curve of highway ramps and intersection approaches in this area. The 'High Detail Area' contains the highest level of model refinement where a number of collectors and local streets were added to the model. Corrections were made to a number of roadway connections that were either not included in the base model, or were not represented in the model in the correct location.

In the network model, traffic volumes are assigned to the roadways in the model based upon TAZs. Each TAZ represents an area where vehicle trips originate or ends. The vehicle trips are organized into a matrix defining the number of vehicle trips that travel from each TAZ to every other TAZ. These matrices are referred to as 'trip tables'.

Similar to the road network, the TAZs represented in the NJRTM-E model are somewhat coarse. A TAZ may be as small as a specific parking lot or cover an entire municipality. The TAZs within the model were modified to provide a greater level of detail within the 'High Detail Area'. TAZs within and proximate to the 'High Detail Area' were split into multiple TAZs to more accurately represent the existing land and local roadway access opportunities in the area, especially considering the existing interconnected street grid within Jersey City itself. The initial trip patterns for the new, smaller zones were developed using the trip patterns of nearby regional NJRTM-E zones with similar land uses. The trips assigned to the new zones were taken as a fraction of the larger parent zone to preserve the total trips and overall Origin-Destination (O-D) pattern of the region.

5.1.2 Roadway Network Model Calibration

Given the coarse nature of the initial O-D table and the subsequent modification and splitting of zones, the initial subarea trip table did not represent the true O-D patterns in the area. The resulting model was subsequently calibrated to ensure that the model travel patterns matched the volume of traffic at the intersections along the corridor, and that the vehicle trip origin-destination patterns reported by the model matched the patterns recorded in the vehicle origin-destination survey.

The tractor-trailer patterns recorded through the origin-destination survey (Section 3.3.2) were held constant in the model, with adjustments made to the non-truck traffic so that the model accurately reflects the observed traffic volumes along the study corridor. Individual origin-destination pairs were subsequently adjusted so that the total volume of traffic at the intersections along the corridor reflected the magnitude of traffic recorded by the intersection turning movement counts conducted along the corridor.

The trip tables were refined via an iterative select link analysis[2] procedure that was repeated until turning movements at all locations were within 10% or 100 vehicles of the observed counts. The origin and destination patterns of the vehicle trips passing along the select link were adjusted until the total link volumes and the intersection turning movement volumes at the intersections along the study corridor reflected observed conditions. The procedure was performed for both the AM and PM peak hours. The result of this process is a roadway network model that replicates existing travel patterns and traffic volumes within the primary study area, forming a baseline for the projection of future traffic volumes and patterns that would result from anticipated redevelopment, growth in the area ports and the various alternative corridor, central intersection, and through truck diversion alignment and design concepts.

5.2 Future Roadway Networks and Travel Demand Forecasting

The transportation network and the demands placed upon it will not remain static over time. Changes in regional demographics, land use patterns and transportation infrastructure will alter the number of trips on the regional roadway system, and the travel paths and specific roadways utilized by motorists to travel between origins and destinations. Transit oriented development, expansions and improvements to mass transit systems and increases in public transit opportunities will affect local auto mode share and the volume of vehicular traffic on the area roadways. All of these factors were accounted for in model development.

[2] A select link analysis looks at a single point on a roadway network (the select link) and illustrates where the traffic on that link came from (the origin) and went to (the destination).

5.2.1 Anticipated Roadway Infrastructure Improvements (No-Build Condition)

The calibrated existing conditions model was modified to replicate the future roadway networks for the three analysis years of 2020, 2035 and 2050. These future-year models represent the no-build condition for this concept development study assuming that regional growth and transportation infrastructure improvements would occur, but no roadway improvements to the Route 440/Routes 1&9T corridor are constructed. These modifications took two forms: incorporation of new roadway links representing planned new roadway connections, which will provide opportunities for alternative travel paths; and modification to existing roadway links representing planned capacity and operational improvements to existing roadway links.

To ensure consistency with other regional planning initiatives, the NJRTM-E future networks were utilized in this study. Validation of the model for the purposes of this study required a review of the projects currently included in the NJRTM-E as well as a review of known future improvement plans advanced by other agencies. This validation process included a search for planned projects in Essex County, Hudson County, and Union County through review of the following resources:

- NJTPA’s list of projects included in the future NJRTM-E networks
- NJDOT’s Transportation Capital Program for Fiscal Year 2011
- NJTPA’s Transportation Improvement Program (TIP) for Fiscal Years 2011 – 2015 (the TIP that was in place prior to calibration of the regional roadway network model)
- Projects under investigation by other agencies such as the NJDOT and the PANYNJ that are not far enough advanced as to be included in the NJRTM-E, but deemed likely for advancement to implementation.

The future condition networks of the NJRTM-E incorporate all of the infrastructure projects listed in the NJTPA’s Transportation Improvement Program (TIP) for Fiscal Years 2011 – 2015 and the NJDOT’s FY 2011 Capital Program (Appendix 5.1). These projects were retained in the network models for the 2035 and 2050 analysis year projections. All of the projects listed in the Capital Program and TIP were incorporated into the 2035 and 2050 networks. Projects with anticipated completion dates subsequent to 2020 were excluded from the 2020 network. The lists include available information such as project description, the project identification number, sponsor, funding source, budget, estimated total cost, phase and completion estimate, and NJRTM-E future scenario year.

5.2.2 Background Growth

A key component of the future travel demand that will characterize the Route 440/Routes 1&9T corridor is the nature and extent of land development initiatives being advanced in other municipalities throughout the region. The NJTPA maintains and periodically updates growth projections at the municipal level. The population and employment projections are based upon market trends and an understanding of the major land development initiatives being advanced throughout the region. These socio-demographic projections are incorporated into the NJRTM-E through the year 2035.

As discussed previously, the existing condition NJRTM-E was utilized as a base model for the development and calibration of a project-specific roadway network traffic assignment model. Background growth was accounted for in the project-specific network model based upon a comparison of the growth in trips incorporated into the unadjusted NJRTM-E between existing and future (2035) conditions. A total annual growth factor was determined for each Traffic Analysis Zone (TAZ) as a straight algebraic comparison of the trips contained in the existing and future (2035) condition trip tables that make up the NJRTM-E. These growth factors were subsequently applied to the TAZs in the calibrated project-specific network model for all TAZs located outside of the City of Jersey City for the analysis years 2020, 2035 and 2050. Development growth for zones within Jersey City was incorporated as a separate process.

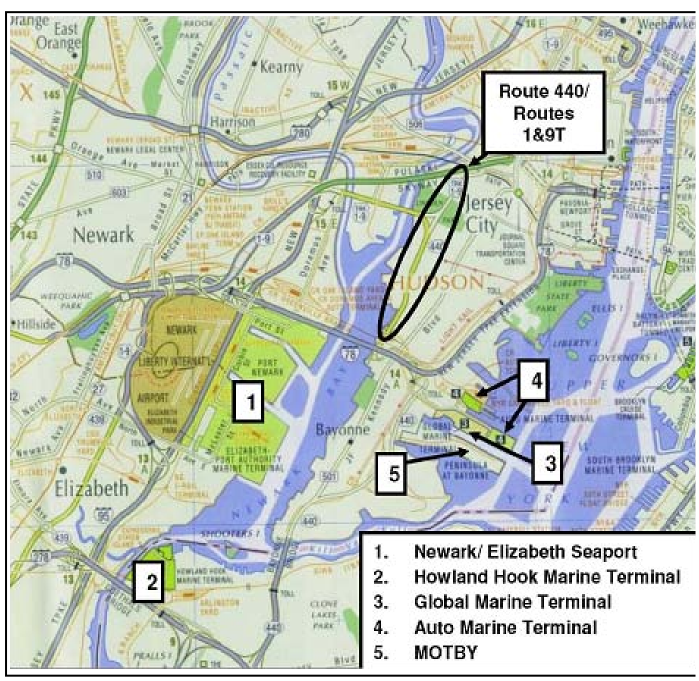
5.2.3 Additional Growth Initiatives Beyond Jersey City

Port Support Zones - There is significant interest in the creation of Port Support Zones at locations proximate to the major maritime terminals in the region. These planning areas cover extensive sections of the City of Newark, as well as smaller areas within the City of Jersey City and the City of Bayonne. The City of Newark has adopted a formal redevelopment plan for some sites while others are still under investigation. While details pertaining to the total nature and extent of development that can be created in these zones have not yet been determined, any significant level of development in these zones will potentially alter the travel patterns along the Route 440/Routes 1&9T corridor. Therefore, a representation of the additional trips that could be generated by these developments was incorporated into the future roadway network models for the 2020, 2035 and 2050 analysis years.

The potential increase in traffic generated by industrial growth within the Port Support Zones was addressed through application of a growth factor to the TAZs in the model that represent those zones. A comparison of the vehicle trips generated in these zones between the existing condition and the future 2035 NJRTM-E models indicated minimal anticipated traffic volume growth in these areas, with the average growth ranging from 10 to 12 percent by the year 2035. At the time of this writing, firm details pertaining to the future land uses expected to be developed in the port support zones were not available. Based upon a review of aerial photographs of these areas, there appears to be considerable potential for development / redevelopment for port support purposes. The volume of goods moved through the area ports is expected to increase by an average of 3.25 percent per year through the year 2050. For the purposes of this study, it was assumed that the activity levels within the port support zones would roughly double by the year 2050. This equates to an annual growth rate of approximately 1.7 percent. Therefore, an annual growth factor of 1.7 percent was applied to both automobiles and trucks volumes in the TAZs representing the port support zones in the project-specific roadway network models developed for this study.

5.2.4 Port Growth

Figure 5.2: Area Marine Terminals



Significant growth in the goods movement industry, particularly related to the activity at the area maritime terminals (Figure 5.2) is expected over the coming decades. Development and growth in the Newark/Elizabeth seaport complex, anticipated growth in port activity in Jersey City and Bayonne (Global Marine Terminal, Greenville Yard expansion, etc), as well as the former Military Ocean terminal – Bayonne (MOTBY) will play a key role in the volume of additional truck traffic that could utilize the Route 440/Route 1&9T corridor. Major investments are being made in the expansion of the area's marine terminals and the development of ExpressRail on-dock and near-dock rail facilities, combined with operational and management improvements will serve to increase the volume of goods moving through the ports. Each container imported or exported through the area marine terminals will need to be moved to or from the terminals from a variety of inland locations. Increases in the volume of containers moved through the area ports will create a commensurate increase in the number of trucks traveling along area roadways.

Goods movement is a market-driven industry, with only limited ability for the public sector to firmly control and manage growth. Overseas projects such as the widening of the Panama and the Suez canals will shift the global transport of maritime goods between east and west coast ports of entry in the United States. In recognition of these uncertainties, the Port Authority of New York and New Jersey provided a range of data defining the potential growth in the volume of goods moved through the ports in the future. The potential growth in port activity (Table 5.1) was calculated in two ways: application of an annual growth rate and assignment of increases in the number of containers that can be moved through the maritime terminal per acre.

The PANYNJ provided data on the potential growth in port activity. The PANYNJ data indicated that annual growth in goods movement could potentially range from 3.0 to 4.5 percent per year through the year 2050, depending on a variety of global market forces and the implementation of new technologies and terminal operations strategies. This range of potential growth equates to a total growth in containers moved through the ports ranging from 335 percent to 607 percent over year 2008 levels by the year 2050. The area ports currently handle approximately 2,000 containers per acre annually. Processing of a total of 6,000 containers per acre per year by the year 2050 is equivalent to an annual growth rate of 3.25 percent. For the purposes of this study, annual growth of 3.25 percent in port activity was applied to forecasts of port-related growth for the 2020, 2035 and 2050 analysis years.

Table 5.1: Area Port Growth Potential

Port Growth Scenario 1				Total Port Container Acres		Alternate Scenario for Port-Wide Capacity (Average Containers per Acre)		
Year	Demand in Containers Under Low, Medium and High Growth Potential			Total Area	Port Jersey (Global Marine Terminal)*	Annual Container Moves Per Acre		
	3.0%	4.0%	4.5%			4,000	5,000	6,000
2008	3,068,935	3,068,935	3,068,935					
2009	2,669,973	2,669,973	2,669,973	1330	100	5,320,000	6,650,000	7,980,000
2010	2,750,073	2,776,772	2,790,122					
2011	2,832,575	2,887,843	2,915,678					
2012	2,917,552	3,003,357	3,046,883					
2013	3,005,079	3,123,491	3,183,993					
2014	3,095,231	3,248,431	3,327,273					
2015	3,188,088	3,378,368	3,477,000	1420	170	5,680,000	7,100,000	8,520,000
2016	3,283,731	3,513,503	3,633,465					
2017	3,382,242	3,654,043	3,796,971					
2018	3,483,710	3,800,205	3,967,835					
2019	3,588,221	3,952,213	4,146,387					
2020	**3,695,868**	**4,110,301**	**4,332,975**	**1460**	**170**	**5,840,000**	**7,300,000**	**8,760,000**
2021	3,806,744	4,274,714	4,527,958					
2022	3,920,946	4,445,702	4,731,717					
2023	4,038,574	4,623,530	4,944,644					
2024	4,159,732	4,808,471	5,167,153					
2025	4,284,524	5,000,810	5,399,675	1460	170	5,840,000	7,300,000	8,760,000
2026	4,413,059	5,200,843	5,642,660					
2027	4,545,451	5,408,876	5,896,580					
2028	4,681,815	5,625,231	6,161,926					
2029	4,822,269	5,850,241	6,439,212					
2030	4,966,937	6,084,250	6,728,977	1460	170	5,840,000	7,300,000	8,760,000
2031	5,115,945	6,327,620	7,031,781					
2032	5,269,424	6,580,725	7,348,211					
2033	5,427,506	6,843,954	7,678,881					
2034	5,590,331	7,117,712	8,024,430					
2035	**5,758,041**	**7,402,421**	**8,385,530**	**1460**	**170**	**5,840,000**	**7,300,000**	**8,760,000**
2036	5,930,783	7,698,518	8,762,878					
2037	6,108,706	8,006,458	9,157,208					
2038	6,291,967	8,326,717	9,569,282					
2039	6,480,726	8,659,785	9,999,900					
2040	6,675,148	9,006,177	10,449,895	1560	170	6,240,000	7,800,000	9,360,000
2041	6,875,403	9,366,424	10,920,141					
2042	7,081,665	9,741,081	11,411,547					
2043	7,294,115	10,130,724	11,925,067					
2044	7,512,938	10,535,953	12,461,695					
2045	7,738,326	10,957,391	13,022,471	1660	170	7,320,000	8,300,000	9,960,000
2046	7,970,476	11,395,687	13,608,482					
2047	8,209,590	11,851,514	14,220,864					
2048	8,455,878	12,325,575	14,860,803					
2049	8,709,554	12,818,598	15,529,539					
2050	**8,970,841**	**13,331,342**	**16,228,368**	**1660**	**170**	**7,320,000**	**8,300,000**	**9,960,000**

Source: PANYNJ *** Included in total Port #s.**

Military Ocean Terminal – Bayonne - Major development initiatives outside of, but proximate to Jersey City hold the potential to generate traffic that will affect the Route 440/Routes 1&9T corridor. Most notable among these is the Bayonne Local Redevelopment Authority's (BLRA) advancement of the redevelopment of the former Military Ocean Terminal – Bayonne (MOTBY). As originally envisioned, this redevelopment project was a mixed-used waterfront development that anticipated up to 6,700 residential units, 1 million square feet of office space and up to 1.5 million square feet of supporting retail throughout the redevelopment area.

In June 2010, the PANYNJ announced their acquisition of approximately 133 acres on the MOTBY peninsula from the BLRA. While the PANYNJ has not shared its plans for the future utilization of this property, for the purposes of this study, it is assumed that the land will be developed as some form of maritime terminal in lieu of the previously anticipated mixed-use development. A smaller scale mixed-use development on unsold land on the peninsula is still anticipated to occur, and would consist of approximately 400 residential dwelling units and up to 500,000 square feet of retail space. The NJRTM-E was adjusted to reflect this increase in MOTBY port development and reduction in residential and retail development.

While specific plans and timelines for the development of a marine terminal have not been provided, it is clear that some level of additional truck traffic will be generated by the maritime operations in the future. For the purposes of the current study, it was assumed that 120 of the 133± acres acquired by the PANYNJ would be developed for use as a marine terminal. The volume of truck activity that would be generated by this use was assumed to be proportional to the traffic expected to be generated by the expansion of the Global Marine Terminal on a per-acre basis. Several factors contributed to the selection of the Global Marine Terminal as a comparable facility for the projection of future truck activity resulting from the maritime use of a portion of the MOTBY peninsula. The terminal areas are adjacent to one another, separated by a single marine channel from which both terminals will be served. The terminals are of similar size, and have similar access to the regional roadway network. While the Global Marine terminal is expected to have direct on-dock rail access, the potential exists to create a similar rail link to serve the MOTBY peninsula. The process for projecting the volume of truck traffic that would be generated by the individual port facilities throughout the area is described in the following sections.

Once the total annual growth in port activity was determined for the future analysis years, the annual activity within the terminals was converted to peak hour truck trips for import into the roadway network models. This process included the following steps:

- Distribution of Goods Movement Activity Across Unique Port Facilities
- Conversion of Annual Container Volumes to TEUs (twenty-foot equivalency units)

- Application of Directional Splits (import vs. export)
- Application of Mode Split (truck versus rail)
- Conversion of TEUs to Truck Trips
- Conversion of Annual Activity to Daily Activity
- Assignment of proportion of Daily Activity to Peak Analysis Hours
- Accounting for Empty Backhaul Trips
- Integration into Roadway Network Models

Distribution of Goods Movement Activity Across Unique Port Facilities - Currently, a total of 1,330 acres, most of which comprises the Newark/Elizabeth Seaport complex, actively serve the maritime trade (Table 5.2). The PANYNJ is advancing plans for the expansion of the terminals in the Newark/Elizabeth Seaport complex. While detailed plans are not currently available, it is anticipated that some time after the year 2035, an additional 200 acres will be made available and will be incorporated into the terminal areas.

In 2010, the PANYNJ acquired the 100-acre Global Marine Terminal, additional properties adjacent to the terminal totaling 70 acres and approximately 133 acres of the former Military Ocean Terminal – Bayonne (MOTBY). While details are not currently available, the PANYNJ is advancing a terminal improvement and expansion program that will increase the volume of containers that can be moved through the area marine terminals. A key component of this expansion program is the extension of rail into the Global Marine Terminal to allow the movement of containers to and from the terminal by rail car as opposed to being a truck dependent terminal. It is assumed that similar rail facilities will be included in the maritime facilities to be constructed on the MOTBY peninsula.

Table 5.2: Acres in Individual Port Areas

Year	Acres Per Terminal			
	Newark/ Elizabeth	Global Marine Terminal	MOTBY	Total
2008	1,230	100	0	1,330
2020	1,290	170	120	1,580
2035	1,290	170	120	1,580
2050	1,490	170	120	1,780

*** Assumes 3.25 percent annual growth**

Based upon the total acreage projected to be in use at each terminal during the 2020, 2035 and 2050 analysis years, and assuming that each terminal will have equivalent per-acre container throughput on an annual basis, the total projected volume of containers was allocated across the three primary facility areas. This allocation is summarized in Table 5.3.

Table 5.3: Future Port Activity Growth by Area

Year	Annual Containers			
	Newark/ Elizabeth	Global Marine Terminal	MOTBY	Total
2008	2,838,765	230,170	0	3,068,935
2020	3,355,443	440,307	310,805	4,106,555
2035	5,421,267	711,388	502,156	6,634,811
2050	8,897,659	1,010,647	713,398	10,621,704

The next step in the analysis was the conversion of the annual volumes of containers projected to be handled at each port facility into peak hour truck movements during the 2020, 2035 and 2050 analysis years. Anticipated changes in the management of trucks at the ports will affect the proportion of containers moved by truck, as well as the peaking characteristics of truck activity across the days of the week and hours of the day. These factors were incorporated into the conversion of annual container growth to projection of the increase in trucks during the peak traffic demand periods.

Truck Management Strategies at the Ports - On average, approximately 12 percent of the containers that currently move through area ports are transported to and from the terminals by rail. The remaining 88 percent are moved by truck. Some facilities such as the Global Marine Terminal are currently virtually 100 percent truck dependent, while others like the Newark/Elizabeth Seaport complex operate extensive on-dock rail systems (ExpressRail). The PANYNJ is advancing a number of infrastructure plans and operational strategies to better manage the movement of trucks to, from and through the ports. These plans and strategies range from expansion of near-dock rail infrastructure to assessment of fees based upon the modes utilized to transport containers to vehicle emission standards. In the aggregate, these infrastructure improvements and management strategies are expected to increase the proportion of containers transported by rail to approximately 25 percent.

- Greenville Yard expansion

  The PANYNJ is advancing plans for a major expansion of the Greenville Rail Yard and incorporation of near-dock rail to serve the expanded Global Marine Terminal. In May, 2010, the PANYNJ approved the purchase and revitalization of the Greenville Yards for use as a barge-to-rail trash transfer station. While this acquisition and use will not affect the inland movement of shipping containers moved through the ports, operation of the yard and transfer station is expected to remove approximately 360,000 trucks from the roadway system annually. These trucks originate in New York City, crossing the Hudson River to transport waste through New Jersey to inland landfills.

- Near-Dock Rail System Expansion

  Subsequent to the planned expansion of the terminal, Global will have the capacity to handle approximately 1 million containers annually. The Global Marine Terminal is currently dependent upon trucks to move containers to and from the terminal. In conjunction with the June 2010 acquisition and expansion of the Global Marine Terminal, the PANYNJ has agreed to develop a rail facility on the adjacent Greenville property that could handle up to 250,000 containers per year. This will significantly reduce the volume of trucks that will be generated by the facility as a larger proportion of the total volume of containers moves through the terminal are expected to be transported to and from the terminal by rail as opposed to truck. In addition, planned improvements to rail operations at the Newark/Elizabeth Seaport complex are expected to increase the proportion of containers moved to and from the terminals by rail. The proportion of containers moved to and from the ports by rail is expected to increase from the current 12 percent to 15 percent, 20 percent and 25 percent by the analysis years 2020, 2035 and 2050, respectively.

- Operating Hours and Truck Appointment System

  Currently, the area ports operate their truck gates Monday through Friday for trucks to pick up and deliver containers. As a strategy to reduce the intensity of truck activity during the weekday peak periods, future operations are expected to include operating of the truck gates on Saturdays. This will serve to reduce the volume of trucks that would travel to and from the ports on a given day by spreading the terminal activity over six days as opposed to five days.

In addition to spreading truck activity over more days of the week, Global Marine Terminal is seeking to implement a truck appointment system. Currently, trucks are allowed to arrive at any time the gates are open to pick up or deliver a container. During peak demand periods, this often leads to extensive queuing of trucks and an increase in the average time required to process a pickup or delivery. By the year 2014, it is expected that an appointment system will be in place, with AM versus PM period appointments. By 2015, a modified appointment system with 2-hour block appointments will be offered. This appointment system will serve to reduce the peaking of truck activity throughout a typical day, reducing the proportion of daily trucks that arrive or depart during the current peak hours of gate operations.

- Mode-Based Fees

A range of fees are assessed on a container moved through the ports that vary based upon the mode of inland transportation utilized. Fees assessed to containers transported to or from the terminal by truck include a gate charge for processing into or out of the terminal and a charge for the grounding or mounting of a container (removing from or placing the container on the truck). These fees total approximately $150.00 per container. Containers transported by rail are assessed a different set of fees that include an internal drayage charge (movement of the container between the ship and the rail yard) a charge assessed by the contract operators of the ExpressRail terminal, and a port intermodal lift fee. These fees total approximately $170.00 per container moved to or from the port by rail. These fees add an additional $20.00 cost to each container moved by rail as opposed to those moved by truck.

In January 2011, the PANYNJ announced elimination of the special fees on containers moved by rail, replacing it with a broad infrastructure charge on all cargo moved through the ports regardless of the transportation mode used. This action will eliminate the $57.50 per-lift assessment on containers handled at the ports' ExpressRail terminals, and institute a per-container fee of up to $9.00 per container regardless of the transportation mode utilized. This policy shift will increase the total fees assessed to containers moved by truck to approximately $159.00 while reducing the total fee on containers moved by rail to approximately $121.50.

This shift in assessed fees is expected to increase the cost-competitiveness of rail versus trucks for the transport of containers to and from the ports, increasing the use of rail and reducing the volume of port related trucks on the regional roadway system. This shift in fee structure is projected to generate an increase of between $170 million to $200 million annually for the PANYNJ, with the funds utilized for improvement of both roadway and rail infrastructure supporting port activity and growth.

Tables 5.4 through 5.6 summarize the process by which annual container volume was converted to peak hour truck volumes for the 2020, 2035 and 2050 analysis years for the Newark/Elizabeth Seaport complex, the Global Marine Terminal and the MOTBY terminal, respectively.

The projected annual container volumes (Table 5.3) were converted to Twenty-foot Equivalency Units (TEUs)[3]. This factor was applied to the container volumes, with the resulting TEU volumes split between import and export trade, assuming that approximately 55% of the goods moved through the ports are imports, with the remaining 45% being exports. The resulting volumes are listed in first sections of Tables 6.4 through 6.6.

The portion of TEUs expected to be transported by truck was subsequently converted back to containers on the premise that each container generated one truck trip. While the terminals themselves are typically in operation 365 days per year, they typically accept trucks for container pickup and drop off only during weekdays, with an average of 260 days of gate operations per year. Dividing the annual number of containers transported by truck by 260 yields an average daily volume of containers that are being transported to and from the ports.

Not every truck traveling to or from the port is carrying a container. A portion of the trucks traveling to and from the port will enter the port to deliver a container and then pick up another container for the exit trip. The remaining trucks entering or exiting the port will be making a one-way delivery (either picking up or dropping off a container) with the other half of the trip being made as an empty backhaul trip. An adjustment factor of 1.5 was applied to the total number of containers moved to and from the terminals on a daily basis yielding a projection of the number of one-way truck trip required to execute the container movements. In the absence of specific data related to the proportion of loaded versus non-loaded truck movements to and from a port, application of this industry accepted general conversion factor is similar to the industry accepted practice of applying a general adjustment factor of 1.5 for conversion of total containers to TEUs when the specific mix of container sizes is unknown.

3 Shipping containers vary in size from 20-feet to 53-feet in length. A TEU is a standard measure by which annual volumes of goods moved by container are described when a specific mix of container sizes is unknown. On average, over an extended period of time, one container is equivalent to 1.7 TEUs.

While the truck gates are typically active throughout the day, the morning period represents the peak activity period for container pickup by trucks. Currently, approximately 9 percent of the total daily volume of trucks entering the port occurs during the AM roadway peak hour. During the PM roadway peak hour, the total truck gate activity currently represents approximately 5 percent of the daily total activity. As an operational strategy to maximize the volume of containers that can be accommodated at the ports on an annual basis, advance scheduling of trucks for pick-up and drop-off is becoming a more common practice. This operational strategy serves to move a portion of the activity away from the congested AM peak period and shift it towards the less congested PM peak period. Based on shifts in the temporal distribution of truck activity at the terminal gates developed as part of the planning for the expansion of the Global Marine terminal, by the year 2020, with terminal management strategies such as truck scheduling in place, the proportion of the maritime terminal truck activity during the AM and PM peak hours will shift to 8 percent and 7 percent, respectively. These peak hour factors were applied to the daily truck activity totals resulting in the peak hour port-related truck volumes incorporated into the models.

Table 5.4: Conversion of Annual Port Activity to Peak Hour Truck Trips
Newark / Elizabeth Seaport

YEAR		2008	2020	2035	2050
Annual Volume (Import)					
	Container (TEU's)	2,654,246	3,137,339	5,068,884	8,319,312
Annual Volume (Export)					
	Container (TEU's)	2,171,655	2,566,914	4,147,269	6,806,709
Landside Mode - Truck % (Import)					
	Container (TEU's)	88%	85%	80%	75%
Landside Mode - Truck % (Export)					
	Container (TEU's)	88%	85%	80%	75%
Landside Mode - Rail % (Import)					
	Container (TEU's)	12%	15%	20%	25%
Landside Mode - Rail % (Export)					
	Container (TEU's)	12%	15%	20%	25%
Annual Import Trucks					
	Container	1,373,963	1,568,670	2,385,357	3,670,285
Annual Export Trucks					
	Container	1,124,151	1,283,457	1,951,656	3,002,960
Annual Rail Moves (Import)					
	Container	318,510	470,601	1,013,777	2,079,828
Annual Rail Moves (Export)					
	Container	260,599	385,037	829,454	1,701,677
Annual Trucks - round trips (includes 50% empty backhaul)					
	Import	2,060,944	2,353,004	3,578,036	5,505,427
	Export	1,686,226	1,925,186	2,927,484	4,504,440
	Total Round Trips	3,747,170	4,278,190	6,505,520	10,009,867
Daily Trucks (260 gate-days annually)					
	Import	7,927	9,050	13,762	21,175
	Export	6,485	7,405	11,260	17,325
	Total Round Trips	14,412	16,455	25,022	38,500
Percent during AM peak hour		9.0%	8.0%	8.0%	8.0%
Percent during PM peak hour		5.0%	7.0%	7.0%	7.0%
AM Peak Hour Trucks - Inbound		**1297**	**1316**	**2002**	**3080**
AM Peak Hour Trucks - Outbound		**1297**	**1316**	**2002**	**3080**
PM Peak Hour Trucks - Inbound		**721**	**1152**	**1752**	**2695**
PM Peak Hour Trucks - Outbound		**721**	**1152**	**1752**	**2695**

Table 5.5: Conversion of Annual Port Activity to Peak Hour Truck Trips
Port Jersey - Global Marine Terminal

YEAR		2008	2020	2035	2050
Annual Volume (Import)					
	Container (TEU's)	215,209	411,687	665,148	944,955
Annual Volume (Export)					
	Container (TEU's)	176,080	336,835	544,212	773,145
Landside Mode - Truck % (Import)					
	Container (TEU's)	100%	85%	80%	75%
Landside Mode - Truck % (Export)					
	Container (TEU's)	100%	85%	80%	75%
Landside Mode - Rail % (Import)					
	Container (TEU's)	0%	15%	20%	25%
Landside Mode - Rail % (Export)					
	Container (TEU's)	0%	15%	20%	25%
Annual Import Truck Moves					
	Container	126,594	205,844	313,011	416,892
Annual Export Truck Moves					
	Container	103,576	168,418	256,100	341,093
Annual Rail Moves (Import)					
	Container	0	61,753	133,030	236,239
Annual Rail Moves (Export)					
	Container	0	50,525	108,842	193,286
Annual Trucks - round trips (includes 50% empty backhaul)					
	Import	189,890	308,765	469,516	625,338
	Export	155,365	252,626	384,150	511,640
	Total Round Trips	345,255	561,391	853,666	1,136,978
Daily Trucks (260 gate-days annually)					
	Import	730	1,188	1,806	2,405
	Export	598	972	1,478	1,968
	Total Round Trips	1,328	2,160	3,284	4,373
Percent during AM peak hour		9.0%	8.0%	8.0%	8.0%
Percent during PM peak hour		5.0%	7.0%	7.0%	7.0%
AM Peak Hour Trucks - Inbound		**120**	**173**	**263**	**350**
AM Peak Hour Trucks - Outbound		**120**	**173**	**263**	**350**
PM Peak Hour Trucks - Inbound		**66**	**151**	**230**	**306**
PM Peak Hour Trucks - Outbound		**66**	**151**	**230**	**306**

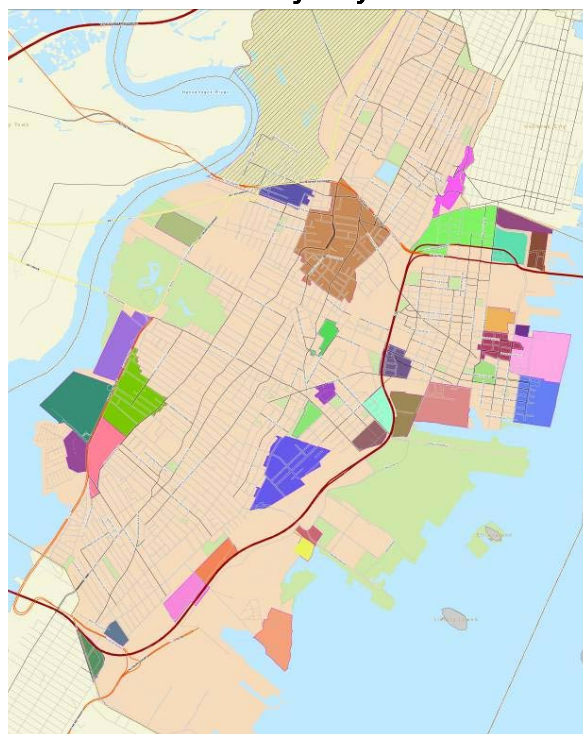
Table 5.6: Conversion of Annual Port Activity to Peak Hour Truck Trips
MOTBY – Peninsula at Bayonne Harbour

YEAR		2008	2020	2035	2050
Annual Volume (Import)					
	Container (TEU's)	0	290,603	469,516	667,027
Annual Volume (Export)					
	Container (TEU's)	0	237,766	384,149	545,750
Landside Mode - Truck % (Import)					
	Container (TEU's)	100%	85%	80%	75%
Landside Mode - Truck % (Export)					
	Container (TEU's)	100%	85%	80%	75%
Landside Mode - Rail % (Import)					
	Container (TEU's)	0%	15%	20%	25%
Landside Mode - Rail % (Export)					
	Container (TEU's)	0%	15%	20%	25%
Annual Import Trucks					
	Container	0	145,302	220,949	294,277
Annual Export Trucks					
	Container	0	118,883	180,776	240,772
Annual Rail Moves (Import)					
	Container	0	43,590	93,903	166,757
Annual Rail Moves (Export)					
	Container	0	35,665	76,830	136,438
Annual Trucks - round trips (includes 50% empty backhaul)					
	Import	0	217,952	331,423	441,415
	Export	0	178,325	271,164	361,158
	Total Round Trips	0	396,277	602,587	802,573
Daily Trucks (260 gate-days annually)					
	Import	0	838	1,275	1,698
	Export	0	686	1,043	1,389
	Total Round Trips	0	1,524	2,318	3,087
Percent during AM peak hour		9.0%	8.0%	8.0%	8.0%
Percent during PM peak hour		5.0%	7.0%	7.0%	7.0%
AM Peak Hour Trucks - Inbound		**0**	**122**	**185**	**247**
AM Peak Hour Trucks - Outbound		**0**	**122**	**185**	**247**
PM Peak Hour Trucks - Inbound		**0**	**107**	**162**	**216**
PM Peak Hour Trucks - Outbound		**0**	**107**	**162**	**216**

5.2.5 Jersey City Development Growth

The final component of growth for integration into the network models consists of land development and redevelopment activity within the City of Jersey City. In April 2009, the Jersey City Planning Board adopted the Circulation Element of the Jersey City Master Plan to guide the development of the City's transportation network through 2050. The Circulation Element identified the existing and future transportation needs of the City in anticipation of continued development over the next four decades. The plan identified 36 anticipated growth areas (Figure 5.3) throughout the City where extensive development is expected to occur, collectively resulting in the creation of:

Figure 5.3: Anticipated Growth Areas in Jersey City



- 80,000 + Residential Units
- 10 + Million Square Feet Commercial Office Space
- 3.1 Million Square Feet Commercial Retail/Restaurant Space
- Expanded open space, bicycle and pedestrian facilities
- Expanded mass transit infrastructure and services

A significant portion of the anticipated growth is expected to occur within the Western Waterfront of Jersey City including:

- 19,000+ Residential Units
- 700,000+ Square Feet Commercial Office Space
- 1.3+ Million Square Feet Commercial Retail/Restaurant Space
- Expanded open space, bicycle and pedestrian facilities
- Waterfront Walkway, Parks and Open Space
- HBLR Network and Service Expansion

A total of six (6) redevelopment and growth areas within the Western Waterfront of Jersey City were identified in the Circulation Element of the Jersey City Master Plan (Figure 5.4). At the time the Circulation Element was prepared, development within these growth areas by the year 2050 was expected to include:

- **Bayfront** – 8,000 residential units, 350,000 square feet retail, 700,000 square feet commercial office
- **K-Mart site** – 500 residential units
- **Hudson Mall** – 5,000 residential units, 390,000 square feet retail
- **Route 440 Northeast** – 3,000 residential units, 135,000 square feet retail (inclusive of the New Jersey City University (NJCU) West Campus Redevelopment)
- **Route 440 Southeast** – 2,000 residential units, 30,000 square feet retail
- **Hackensack River Edge** – 880,000 square feet high-cube warehouse

Figure 5.4: Anticipated Growth Areas on the Western Waterfront

The Bayfront I Redevelopment Plan (February 13, 2008) set forth an estimate of anticipated development including 8,100 residential dwelling units, conditioned on the construction of an extension of the Hudson Bergen Light Rail (HBLR) to Bayfront. The travel demand forecasts developed in this study assume development of 8,650 residential units within the Bayfront development based on figures provided by Bayfront, LLC. This assumption does not represent a modification of the existing Bayfront I Redevelopment Plan ordinance.

The Circulation Element of the Jersey City Master Plan anticipated future development within the Hackensack River Edge growth area to include 880,000 square feet of high cube warehouse.

In anticipation of a potential alternative development of big box retail, which would generate higher travel demand, this study assumed that a total of 327,000 square feet of big box retail development is developed within the Hackensack River Edge growth area.

The city-wide development (Table 5.7) represents full build-out of Jersey City. This development is expected to occur in stages over the next 40 years, with some transportation infrastructure improvements required immediately while other improvements may be postponed until such time as the level of development renders them necessary. Therefore, it was necessary to assess the level and location of anticipated development in interim years for the staging of Route 440 / Routes 1&9T corridor improvements which are anticipated to occur in phases as development and travel demand needs dictate.

Table 5.7: Anticipated Development in Jersey City – 2050

Growth Area	Anticipated New Development				Displaced Development			Net-New Development				
	Residential (Units)	Retail (SF)	Office (SF)	Industrial (SF)	Retail (SF)	Industrial (SF)	Logistics Ind. (SF)	Residential (Units)	Retail (SF)	Office (SF)	Industrial (SF)	Logistics Ind. (SF)
Bayfront *	8,650	350,000	700,000			250,000	150,000	8,650	350,000	700,000	(250,000)	(150,000)
K-Mart *	500	120,000			200,000			500	(80,000)			
Hudson Mall *	5,000	390,000			300,000			5,000	90,000			
Route 440 Northeast *	3,000	135,000			50,000	589,000	236,000	3,000	85,000		(589,000)	(236,000)
Route 440 Southeast *	2,000	30,000			15,000	370,000		2,000	15,000		(370,000)	
Burma Road	500	30,000				134,000		500	30,000		(134,000)	
Canal Crossinq	5,000	100,000				744,000	744,000	5,000	100,000		(744,000)	(744,000)
LSP Park and Ride	1,000	65,000						1,000	65,000			
Village)	2,000	15,000					192,000	2,000	15,000			(192,000)
Newport NW (Target, Modell site)	3,000	250,000			250,000			3,000				
Jersey Avenue	4,000	150,000				638,000	319,000	4,000	150,000		(638,000)	(319,000)
Metro Plaza (Shoprite todav)	4,000	300,000			255,000			4,000	45,000			
Hackensack River Edge *		327,000					200,000		327,000			(200,000)
Marion Works	3,000					268,000		3,000			(268,000)	
Bates (Foodtown today)	1,500	150,000			100,000	94,000		1,500	50,000		(94,000)	
Bayonne Border (HC zone today)	500	70,000			70,000	18,000		500			(18,000)	
Chapel Hill	1,000	15,000						1,000	15,000			
Whitlock Cordaqe	330							330				
The Beacon	1,000	25,000						1,000	25,000			
New Neiqhborhood	1,000	15,000						1,000	15,000			
Residence at Liberty	1,000							1,000				
Port Liberte	1,000							1,000				
Grand/Jersey	2,500	50,000						2,500	50,000			
Libertv Harbor North	5,000	150,000						5,000	150,000			
Newport NE	3,000	50,000						3,000	50,000			
Newport NE		30,000	2,000,000						30,000	2,000,000		
Powerhouse Arts District	2,000	150,000						2,000	150,000			
Hoboken Yards/LCOR/ Hudson Crossing	5,000	200,000						5,000	200,000			
Hoboken Yards/LCOR/ Hudson Crossing			1,200,000							1,200,000		
Avalon Cove	2,000	100,000						2,000	100,000			
Harborside Plaza 8 and 9		140,000	1,225,000						140,000	1,225,000		
Journal Square	10,000	375,000			125,000			10,000	250,000			
Journal Square			1,000,000							1,000,000		
30 Montgomery		50,000	1,000,000		10,000			0	40,000	1,000,000		
Colgate (Goldman Sachs)		20,000	1,000,000					0	20,000	1,000,000		
77 Hudson	1,000	20,000						1,000	20,000			
Vacant lots in Colgate - Merrill Lynch Surface Parking		10,000	1,000,000						10,000	1,000,000		
Gregorv Park	1,500	40,000						1,500	40,000			
Berrv Lane Park												
Meadowlands-Rockefeller Warehouse				539,000							539,000	
Total	**80,980**	**3,922,000**	**9,125,000**	**539,000**	**1,375,000**	**3,105,000**	**1,841,000**	**80,980**	**2,547,000**	**9,125,000**	**(2,566,000)**	**(1,841,000)**

* Development located within Western Waterfront

5.2.6 Jersey City Development - Interim Years – 2020 and 2035

While the Circulation Element of the Jersey City Master Plan identifies a number of growth areas and quantifies the magnitude of development that is expected by the year 2050, details pertaining to the timing of the future development within each growth area are not available at this time. While this study seeks to identify a preferred alternative for the reconstruction of the Route 440/Routes 1&9T Corridor in a manner that will support the 2050 growth vision articulated in Master Plan, the improvements will likely be constructed in stages as development progresses within individual growth areas. For the purpose of this study, it was necessary to develop projections of not only the magnitude of development expected to occur by the interim years 2020 and 2035, but also the distribution of this growth across Jersey City. Socio-demographic projections developed by the NJTPA were utilized as a basis for the projection and distribution of growth in Jersey City in the interim analysis years.

The NJTPA maintains projections of socio-demographic trends for the purpose of projecting travel demand throughout the NJTPA 13-county region. These data are developed in five-year increments and are aggregated on a municipal level. Current projections extend through the year 2035, and predict 16,058 new households in Jersey City by 2020 and 35,145 new households by 2035. The Circulation Element of the Jersey City Master Plan forecasts 80,974 new households by 2050 (Table 5.8).

Table 5.8: NJTPA Demographic Projections – Jersey City Household Growth

Year	Households						
	City-Wide Households	City-Wide Growth	Western Waterfront (23.65%)	Balance to be Distributed in Jersey City	Bayfront	NJCU	Balance to be Distributed in Western Waterfront
2010	100,665	0	0	0	0	0	0
2020	116,723	16,058	3,798	12,260	2,163	232	1,403
2035	135,810	35,145	8,312	26,833	6,055	232	2,025
2050 *	181,639	80,974	19,150	61,824	8,650	232	10,268

* Source: Jersey City Master Plan - Circulation Element

The NJTPA projections for 2020 and 2035 were allocated across the growth areas that are identified in the Circulation Element of the Jersey City Master Plan. The six (6) growth areas within the Western Waterfront are expected to house approximately 23.65 percent of the total Jersey City growth. Accordingly, 23.65 percent of total anticipated household growth within

Jersey City was allocated to the Western Waterfront growth areas, with the balance allocated proportionately across the remaining Jersey City growth areas.

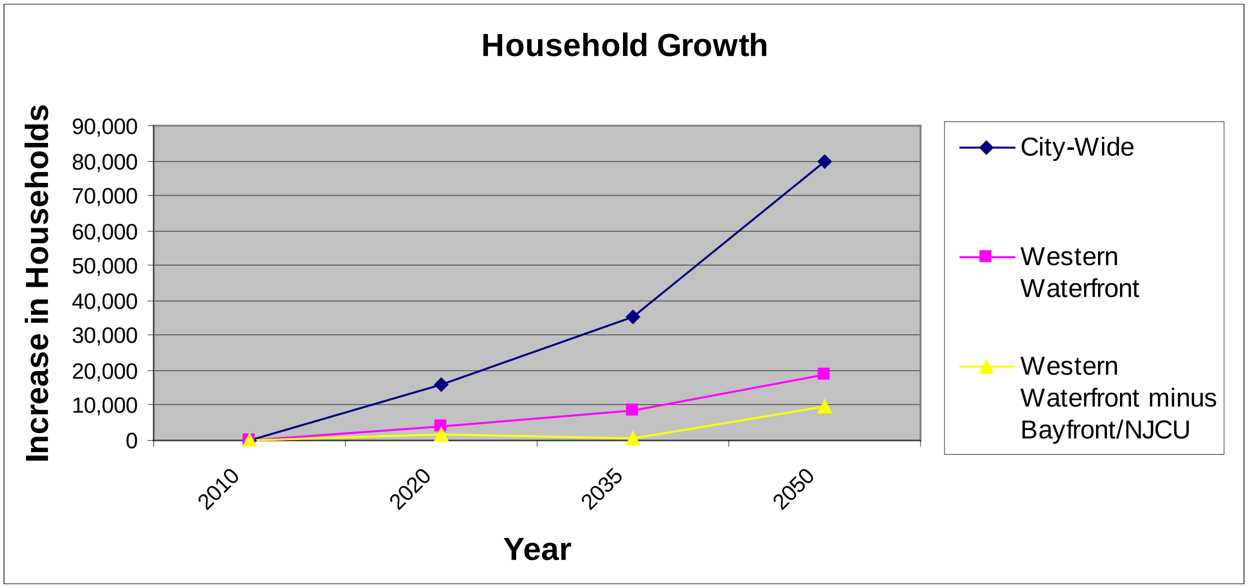
Within the Western Waterfront, there are two (2) growth areas for which redevelopment plans have been formally adopted and for which development is schedule to occur prior to 2020. The Bayfront I Redevelopment Plan anticipates a total of 8,100 residential dwelling units upon completion. Based upon a block by block analysis of potential development yields within the zoning governing the property, this study utilized an assumption that up to 8,650 residential units could be constructed within Bayfront. For purposes of this study, it was assumed that by the year 2020, approximately 25 percent of the Bayfront development would be constructed. By 2035, an additional 45 percent of development would be completed, with the remaining 30 percent constructed after 2035. The West Campus is one of four (4) redevelopment areas within the 440 Northeast Growth Area. Build out of the New Jersey City University (NJCU) West Campus (within the Route 440 Northeast Growth Area) is expected to be complete by the year 2020. Construction schedules of the remaining growth areas are uncertain at this time.

The projected increases in households within Jersey City (Table 5.8) were allocated proportionally across individual growth areas for the years 2020, 2035 and 2050. The allocation utilized three categories: growth within Bayfront and NJCU; growth within the remaining areas of the Western Waterfront; and growth in other areas within Jersey City. The portion of the growth allocated to the Bayfront development was based upon estimates of the anticipated proportion of the total development expected to be completed in each of the analysis years. The portion of growth allocated to the NJCU redevelopment was based upon an expectation that the entire redevelopment would be complete by the year 2020.

Additional development was allocated across the other four Western Waterfront Growth Areas such that the total development within the Western Waterfront (inclusive of the growth within Bayfront and NJCU) equaled 23.65 percent of the total anticipated growth within Jersey City for each of the analysis years. The remaining anticipated development was allocated evenly across the remaining Jersey City Growth Areas, proportional to the total development density anticipated in each zone (Figure 5.5).

Based upon the NJTPA household projections, an additional 1,403 residential dwelling units are expected to be constructed in the Western Waterfront by 2020 in addition to the anticipated development within Bayfront and the NJCU West Campus. It was assumed that these additional units would be constructed within the Route 440 Northeast growth area, with no new development within the other Western Waterfront growth areas.

Figure 5.5: Distribution of Jersey City Household Growth



The remaining 12,260 residential dwelling units for 2020 were distributed proportionately across the other growth areas throughout Jersey City. It was assumed that the total anticipated retail, restaurant and commercial office growth within these areas would occur in proportion to the projected residential growth (Table 5.9).

Table 5.9: Anticipated Jersey City Development – 2020

Growth Area	Percent Development Completed by 2020	Anticipated New Development - 2020				Displaced Development - 2020		
		Residential (Units)	Retail (SF)	Office (SF)	Industrial (SF)	Retail (SF)	Industrial (SF)	Logistics Ind (SF)
Bayfront *	25%	2,163	87,500	175,000	0	0	250,000	150,000
K-Mart *	0%	0	0	0	0	0	0	0
Hudson Mall *	0%	0	0	0	0	0	0	0
Route 440 Northeast *	55%	1,650	74,250	0	0	27,500	323,950	129,800
Route 440 Southeast *	0%	0	0	0	0	0	0	0
Burma Road	20%	99	5,943	0	0	0	26,545	0
Canal Crossinq	20%	991	19,810	0	0	0	147,386	147,386
LSP Park and Ride	20%	198	12,877	0	0	0	0	0
Danforth Avenue (Danforth Transit Village)	20%	396	2,972	0	0	0	0	38,035
Newport NW (Target, Modell site)	20%	594	49,525	0	0	49,525	0	0
Jersey Avenue	20%	792	29,715	0	0	0	126,388	63,194
Metro Plaza (Shoprite todav)	20%	792	59,430	0	0	50,516	0	0
Hackensack River Edge *	100%	0	327,000	0	0	0	0	200,000
Marion Works	20%	594	0	0	0	0	53,091	0
Bates (Foodtown today)	20%	297	29,715	0	0	19,810	18,621	0
Bayonne Border (HC zone today)	20%	99	13,867	0	0	13,867	3,566	0
Chapel Hill	20%	198	2,972	0	0	0	0	0
Whitlock Cordaqe	20%	65	0	0	0	0	0	0
The Beacon	20%	198	4,953	0	0	0	0	0
New Neiqhborhood	20%	198	2,972	0	0	0	0	0
Residence at Liberty	20%	198	0	0	0	0	0	0
Port Liberte	20%	198	0	0	0	0	0	0
Grand/Jersey	20%	495	9,905	0	0	0	0	0
Libertv Harbor North	20%	991	29,715	0	0	0	0	0
Newport NE	20%	594	9,905	0	0	0	0	0
Newport NE	20%	0	5,943	396,200	0	0	0	0
Powerhouse Arts District	20%	396	29,715	0	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	20%	991	39,620	0	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	20%	0	0	237,720	0	0	0	0
Avalon Cove	20%	396	19,810	0	0	0	0	0
Harborside Plaza 8 and 9	20%	0	27,734	242,673	0	0	0	0
Journal Square	20%	1,981	74,288	0	0	24,763	0	0
Journal Square	20%	0	0	198,100	0	0	0	0
30 Montgomery	20%	0	9,905	198,100	0	1,981	0	0
Colgate (Goldman Sachs)	20%	0	3,962	198,100	0	0	0	0
77 Hudson	20%	198	3,962	0	0	0	0	0
Vacant lots in Colgate - Merrill Lynch Surface Parking	20%	0	1,981	198,100	0	0	0	0
Gregorv Park	20%	297	7,924	0	0	0	0	0
Berrv Lane Park	100%	0	0	0	0	0	0	0
Meadowlands-Rockefeller Warehouse	100%	0	0	0	539,000	0	0	0
Total by 2020		16,059	997,870	1,843,993	539,000	187,962	949,547	728,415

In a similar fashion, new development anticipated by the year 2035 was allocated across the Western Waterfront and the other Jersey City growth areas (Table 5.10).

Table 5.10: Anticipated Jersey City Development – 2035

Growth Area	Percent Development Completed by 2035	Anticipated New Development - 2035				Displaced Development - 2035		
		Residential (Units)	Retail (SF)	Office (SF)	Industrial (SF)	Retail (SF)	Industrial (SF)	Logistics Ind (SF)
Bayfront *	70%	6,055	245,000	490,000	0	0	250,000	150,000
K-Mart *	10%	50	12,000	0	0	200,000	0	0
Hudson Mall *	10%	500	39,000	0	0	300,000	0	0
Route 440 Northeast *	55%	1,650	74,250	0	0	27,500	323,950	129,800
Route 440 Southeast *	5%	100	1,500	0	0	750	18,500	0
Burma Road	43%	217	12,996	0	0	0	58,049	0
Canal Crossing	43%	2,166	43,320	0	0	0	322,301	322,301
LSP Park and Ride	43%	433	28,158	0	0	0	0	0
Danforth Avenue (Danforth Transit Village)	43%	866	6,498	0	0	0	0	83,174
Newport NW (Target, Modell site)	43%	1,300	108,300	0	0	108,300	0	0
Jersey Avenue	43%	1,733	64,980	0	0	0	276,382	138,191
Metro Plaza (Shoprite today)	43%	1,733	129,960	0	0	110,466	0	0
Hackensack River Edge *	100%	0	327,000	0	0	0	0	200,000
Marion Works	43%	1,300	0	0	0	0	116,098	0
Bates (Foodtown today)	43%	650	64,980	0	0	43,320	40,721	0
Bayonne Border (HC zone today)	43%	217	30,324	0	0	30,324	7,798	0
Chapel Hill	43%	433	6,498	0	0	0	0	0
Whitlock Cordage	43%	143	0	0	0	0	0	0
The Beacon	43%	433	10,830	0	0	0	0	0
New Neighborhood	43%	433	6,498	0	0	0	0	0
Residence at Liberty	43%	433	0	0	0	0	0	0
Port Liberte	43%	433	0	0	0	0	0	0
Grand/Jersey	43%	1,083	21,660	0	0	0	0	0
Liberty Harbor North	43%	2,166	64,980	0	0	0	0	0
Newport NE	43%	1,300	21,660	0	0	0	0	0
Newport NE	43%	0	12,996	866,400	0	0	0	0
Powerhouse Arts District	43%	866	64,980	0	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	43%	2,166	86,640	0	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	43%	0	0	519,840	0	0	0	0
Avalon Cove	43%	866	43,320	0	0	0	0	0
Harborside Plaza 8 and 9	43%	0	60,648	530,670	0	0	0	0
Journal Square	43%	4,332	162,450	0	0	54,150	0	0
Journal Square	43%	0	0	433,200	0	0	0	0
30 Montgomery	43%	0	21,660	433,200	0	4,332	0	0
Colgate (Goldman Sachs)	43%	0	8,664	433,200	0	0	0	0
77 Hudson	43%	433	8,664	0	0	0	0	0
Vacant lots in Colgate - Merrill Lynch Surface Parking	43%	0	4,332	433,200	0	0	0	0
Gregory Park	43%	650	17,328	0	0	0	0	0
Berry Lane Park	100%	0	0	0	0	0	0	0
Meadowlands-Rockefeller Warehouse	100%	0	0	0	539,000	0	0	0
Total by 2035		35,140	1,812,074	4,139,710	539,000	879,142	1,413,799	1,023,466

5.2.7 Jersey City Growth Area Vehicle Trip Generation

For integration into the roadway network models, the vehicle trips that would be generated by each of the growth areas within Jersey City for each of the analysis years of 2020, 2035 and 2050 were projected. This projection process began with application of the vehicle trip generate rates set forth in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th edition. The ITE data is a compilation of trip generation studies and observations conducted at numerous sites throughout the United States and Canada. The average trip generation rates represent the weighted averages of the results of these studies conducted primarily at suburban locations having little or no transit service, nearby pedestrian amenities or travel demand management (TDM) programs. The ITE trip generation rates utilized in this study for the land use types that are anticipated to be developed in Jersey City's growth areas (Table 5.11).

Table 5.11: ITE Vehicle Trip Generation Rates

Land Use Type	Vehicle Trip Generation Rate			
	AM In	AM Out	PM In	PM Out
Residential (LU Code 230)	0.070	0.370	0.350	0.170
Retail (LU Code 820)	0.628	0.401	1.800	1.950
Free-Standing Discount Store (LU Code 815)	0.721	0.339	2.500	2.500
Office (LU Code 710)	1.360	0.186	0.253	1.237
Industrial *	0.015	0.006	0.006	0.015
Industrial Logistics *	0.028	0.011	0.011	0.028

* Trip Generation Rates as developed by the Traffic Impact Study - Proposed Pulaski Distribution Center, March 2006

ITE Land Use Code 230 includes residential condominiums and townhouses. These units are typically a mix of low, mid and high rise buildings, with multiple units in each building.

ITE Land Use Code 820 was applied to represent the commercial retail components expected to be developed throughout Jersey City. While it is anticipated that a range of retail and restaurant types will be developed throughout Jersey City, it cannot be determined with certainty at this time what the eventual mix of retail types will be. Land Use Code 820 – Shopping Center encompasses a variety of sizes of retail facilities that are planned, developed and often managed as a unit. The facilities surveyed as part of the ITE data ranged in size from

1,700 square feet to several locations in excess of 1 million square feet, and include retail stores as well as restaurant activities.

ITE Land Use Code 815 encompasses retail facilities that offer a variety of customer services, centralized cashiering, sell a variety of products and are typically open 7 days a week with extended hours.

ITE Land Use Code 710 represents general office uses and locations where affairs of business, commercial or industrial organizations, or professional persons or firms are conducted. These buildings often contain a mix of tenants including professional services, insurance companies, investment brokers, banks, etc.

The ITE Trip generation data reflects the vehicle trip generation characteristics of primarily suburban, automobile-dependent areas. Therefore, the ITE vehicle trip generation rates may be viewed as equivalent to person-trip generation rates. Jersey City is not a suburban location, and a significant portion of the residents not owning or having access to an automobile. Adjustments were made to the base ITE trip generation rates to reflect the local travel characteristics in Jersey City.

As part of the preparation of the Circulation Element of the Jersey City Master Plan, a travel characteristics survey was conducted. The findings of the survey were documented in the report *2050 Jersey City Mobility Study*, *March 3, 2009*.

A key component of the mobility study was quantification of the modes of travel utilized by people who live and/or work in Jersey City. The data provides the travel mode choices of individuals who live elsewhere and work in Jersey City, live in Jersey City but work elsewhere, and both live and work in Jersey City. For the purpose of this study, average transit versus non-transit splits presented in the survey findings were utilized as a baseline for conversion of the base ITE trip generation rates in the development of vehicle trip forecasts reflective of local conditions, both today and in the future. Adjustments were made in the transit versus non-transit splits applied to individual growth areas based upon a review of the locations proximity to public transit.

Not all areas of Jersey City exhibit the same mass transit utilization rates. Utilization rates are dependent upon a number of factors such as density and character of development, availability and convenience of public transit opportunities, and proximity of supporting retail amenities, etc. In consultation with Jersey City and NJ Transit staff, each of the growth areas in Jersey City was reviewed and assigned one of six (6) transit utilization codes (Table 5.12), based upon proximity and access to mass transit, and the anticipated robustness of the mass transit service to be provided, as measured by the number and type of mass transit systems to be provided. Each growth area was assigned a code that was utilized in the assignment of a transit share to the base ITE vehicle trips projected to be generated by anticipated development in each zone, as well as the existing development expected to be displaced as part of the redevelopment activities. Different automobile utilization rates were assigned to each code for application to new development versus displaced development. Within the Western Waterfront, the growth areas that are anticipated to be served by both a light rail transit (LRT) extension on a east-west axis and a new Bus Rapid Transit (BRT) connection on a north-south axis to Journal Square were assigned a transit utilization code of very high (VH). Growth areas that were not within short walking distance to this anticipated robust two-system service were assigned lower transit utilization codes.

Table 5.12: Transit Use Codes Assigned to Growth Areas

Growth Area	Transit Utilization Category - New and Displaced Development				
	Residential	Retail	Office	Industrial	Logistics Industry
Bayfront *	VH	VH	VH	MIN	MIN
K-Mart *	VH	VH	VH	MIN	MIN
Hudson Mall *	VH	M	VH	MIN	MIN
Route 440 Northeast *	VH	VH	VH	MIN	MIN
Route 440 Southeast *	H	H	H	MIN	MIN
Burma Road	M	M	M	MIN	MIN
Canal Crossinq	H	M	M	MIN	MIN
LSP Park and Ride	H	M	M	MIN	MIN
Danforth Avenue (Danforth Transit Village)	M	M	M	MIN	MIN
Newport NW (Target, Modell site)	H	H	H	MIN	MIN
Jersey Avenue	M	M	M	MIN	MIN
Metro Plaza (Shoprite todav)	VH	M	M	MIN	MIN
Hackensack River Edge *	MIN	MIN	VL	VL	VL
Marion Works	M	VH	VH	MIN	MIN
Bates (Foodtown today)	M	M	M	MIN	MIN
Bayonne Border (HC zone today)	L	L	VL	MIN	MIN
Chapel Hill	M	M	M	MIN	MIN
Whitlock Cordaqe	H	M	M	MIN	MIN
The Beacon	M	M	M	MIN	MIN
New Neiqhborhood	M	M	M	MIN	MIN
Residence at Liberty	L	VL	VL	MIN	MIN
Port Liberte	L	VL	VL	MIN	MIN
Grand/Jersey	H	H	H	MIN	MIN
Libertv Harbor North	VH	VH	VH	MIN	MIN
Newport NE	VH	VH	VH	MIN	MIN
Newport NE	VH	VH	VH	MIN	MIN
Powerhouse Arts District	VH	M	M	MIN	MIN
Hoboken Yards/LCOR/Hudson Crossing	VH	VH	VH	MIN	MIN
Hoboken Yards/LCOR/Hudson Crossing	VH	VH	VH	MIN	MIN
Avalon Cove	VH	M	M	MIN	MIN
Harborside Plaza 8 and 9	VH	H	H	MIN	MIN
Journal Square	VH	VH	VH	MIN	MIN
Journal Square	VH	VH	VH	MIN	MIN
30 Montgomery	VH	H	H	MIN	MIN
Colgate (Goldman Sachs)	VH	H	H	MIN	MIN
77 Hudson	VH	M	M	MIN	MIN
Vacant lots in Colgate - Merrill Lynch Surface Parking	VH	H	H	MIN	MIN
Gregorv Park	VH	VH	VH	MIN	MIN
Berrv Lane Park	MIN	MIN	MIN	MIN	MIN
Meadowlands-Rockefeller Warehouse	MIN	MIN	VL	VL	VL

Many of the future developments, particularly on the Western Waterfront are envisioned to be mixed-use developments, combining residential, retail, restaurant and commercial uses in a single development. Additionally, the development is envisioned to have interconnected networks of streets, small block sizes, and complete streets with bicycle, pedestrian and mass transit accommodations. This type of mixed-use, walkable and bike friendly development with robust mass transit access reduces dependence on the single occupant vehicle (SOV), relying in part upon public transit utilization and the ability of people to walk or bike to local amenities rather than driving.

The Circulation Element of the Jersey City Master Plan envisions significant expansion of and enhancement to public transit systems and integration of bicycle accommodations citywide. These public transit and bicycle path network improvements include extension of the Hudson Bergen Light Rail (HBLR) in multiple locations, integration of Bus Rapid Transit systems, and enhancement of local bus operations. Accordingly, automobile utilization rates were reduced from existing rates for application to planned growth areas citywide. Table 5.13 summarizes the automobile utilization rate associated with each code for application to the existing development that will be displaced by future redevelopment. Table 5.14 summarizes the automobile utilization rate associated with each code for application to the anticipated new development in the year 2020. These utilization rates assume that the extension of the HBLR will be complete by the year 2020. While the potential exists for the BRT service to be in place by the year 2020 as well, the utilization rates assumed that BRT service would not be initiated by the year 2020. Table 5.15 summarizes the automobile utilization rate associated with each code for application to the anticipated new development in the years 2035 and 2050, assuming that both the HBLR extension and the BRT service will be in place by 2035.

Table 5.13: Transit Use Codes and Associated Automobile Usage – Displaced Existing Uses

Transit Use Level/Code		Percent Automobile Usage				
		Residential	Retail	Office	Ind	Log.
Very High	VH	28%	13%	27%	27%	27%
High	H	38%	23%	37%	37%	37%
Medium	M	48%	33%	47%	47%	47%
Low	L	58%	43%	57%	57%	57%
Very Low	VL	68%	53%	67%	67%	67%
Minimal	MIN	90%	90%	90%	90%	90%

Table 5.14: Transit Use Codes and Associated Automobile Usage – New Development by Year 2020

Transit Use Level/Code		Percent Automobile Usage				
		Residential	Retail	Office	Ind	Log.
Very High	VH	26%	11%	25%	25%	25%
High	H	36%	21%	35%	35%	35%
Medium	M	46%	31%	45%	45%	45%
Low	L	56%	41%	55%	55%	55%
Very Low	VL	66%	51%	65%	65%	65%
Minimal	MIN	90%	90%	90%	90%	90%

Table 5.15: Transit Use Codes and Associated Automobile Usage – New development by Years 2035 and 2050

Transit Use Level/Code		Percent Automobile Usage				
		Residential	Retail	Office	Ind	Log.
Very High	VH	23%	13%	22%	22%	22%
High	H	33%	23%	32%	32%	32%
Medium	M	43%	33%	42%	42%	42%
Low	L	53%	43%	52%	52%	52%
Very Low	VL	63%	53%	62%	62%	62%
Minimal	MIN	90%	90%	90%	90%	90%

The base ITE trip generation rates and the automobile percent utilization factors were applied to the anticipated development in each zone within Jersey City. The resulting net-new vehicle trip projections (Tables 5.16 through 5.18) were incorporated into the roadway network models for projection of the anticipated future travel demand in 2020, 2035 and 2050.

Table 5.16: Jersey City New Development Induced Vehicle Trips - 2020

Growth Area	Model Trips (Auto)				Model Trips (Truck)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
Bayfront *	79	213	216	143	-8	-4	-4	-8
K-Mart *	0	0	0	0	0	0	0	0
Hudson Mall *	0	0	0	0	0	0	0	0
Route 440 Northeast *	4	153	149	53	-9	-3	-3	-9
Route 440 Southeast *	0	0	0	0	0	0	0	0
Burma Road	1	17	18	9	0	0	0	0
Canal Crossinq	-4	125	125	40	-6	-3	-3	-6
LSP Park and Ride	8	28	32	20	0	0	0	0
Danforth Avenue (Danforth Transit Village)	10	66	65	29	-1	0	0	-1
Newport NW (Target, Modell site)	15	78	73	34	0	0	0	0
Jersey Avenue	11	133	138	59	-4	-2	-2	-4
Metro Plaza (Shoprite todav)	16	76	75	38	0	0	0	0
Hackensack River Edge *	192	97	766	745	-6	-2	-2	-6
Marion Works	16	100	95	43	-1	0	0	-1
Bates (Foodtown today)	10	51	52	26	0	0	0	0
Bayonne Border (HC zone today)	3	21	18	7	0	0	0	0
Chapel Hill	7	34	34	17	0	0	0	0
Whitlock Cordaqe	2	9	8	4	0	0	0	0
The Beacon	7	35	35	18	0	0	0	0
New Neiqhborhood	7	34	34	17	0	0	0	0
Residence at Liberty	8	41	39	19	0	0	0	0
Port Liberte	8	41	39	19	0	0	0	0
Grand/Jersey	13	67	66	34	0	0	0	0
Libertv Harbor North	20	96	96	50	0	0	0	0
Newport NE	12	57	56	28	0	0	0	0
Newport NE	135	18	26	124	0	0	0	0
Powerhouse Arts District	13	42	53	36	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	21	97	98	52	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	81	11	15	74	0	0	0	0
Avalon Cove	11	40	47	30	0	0	0	0
Harborside Plaza 8 and 9	120	18	31	116	0	0	0	0
Journal Square	41	194	195	104	0	0	0	0
Journal Square	67	9	13	61	0	0	0	0
30 Montgomery	95	14	22	90	0	0	0	0
Colgate (Goldman Sachs)	95	13	19	88	0	0	0	0
77 Hudson	5	19	20	11	0	0	0	0
Vacant lots in Colgate - Merrill Lynch Surface Parking	94	13	19	87	0	0	0	0
Gregorv Park	6	29	29	15	0	0	0	0
Berrv Lane Park	0	0	0	0	0	0	0	0
Meadowlands-Rockefeller Warehouse	37	17	17	37	8	3	3	8
Total by 2020	**1,266**	**2,106**	**2,833**	**2,377**	**-27**	**-11**	**-11**	**-27**

Table 5.17: Jersey City New Development Induced Vehicle Trips – 2035

Growth Area	Model Trips (Auto)				Model Trips (Truck)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
Bayfront *	238	541	562	406	-8	-4	-4	-8
K-Mart *	-14	-5	-40	-46	0	0	0	0
Hudson Mall *	-46	8	-115	-148	0	0	0	0
Route 440 Northeast *	2	135	134	48	-9	-3	-3	-9
Route 440 Southeast *	0	12	12	5	0	0	0	0
Burma Road	4	35	39	17	-1	0	0	-1
Canal Crossing	-13	251	252	77	-14	-6	-6	-14
LSP Park and Ride	16	57	67	42	0	0	0	0
Danforth Avenue (Danforth Transit Village)	18	137	131	58	-2	-1	-1	-2
Newport NW (Target, Modell site)	30	159	150	73	0	0	0	0
Jersey Avenue	19	273	284	122	-8	-4	-4	-8
Metro Plaza (Shoprite today)	32	149	151	81	0	0	0	0
Hackensack River Edge *	192	97	766	745	-6	-2	-2	-6
Marion Works	32	205	193	87	-2	-1	-1	-2
Bates (Foodtown today)	19	105	109	57	-1	0	0	-1
Bayonne Border (HC zone today)	7	43	40	19	0	0	0	0
Chapel Hill	14	70	69	36	0	0	0	0
Whitlock Cordage	3	17	17	8	0	0	0	0
The Beacon	15	70	71	39	0	0	0	0
New Neighborhood	14	70	69	36	0	0	0	0
Residence at Liberty	16	85	80	39	0	0	0	0
Port Liberte	16	85	80	39	0	0	0	0
Grand/Jersey	28	134	134	71	0	0	0	0
Liberty Harbor North	40	187	189	101	0	0	0	0
Newport NE	23	112	110	56	0	0	0	0
Newport NE	260	36	51	239	0	0	0	0
Powerhouse Arts District	27	83	109	76	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	42	189	194	107	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	156	21	29	141	0	0	0	0
Avalon Cove	23	80	96	62	0	0	0	0
Harborside Plaza 8 and 9	240	38	68	237	0	0	0	0
Journal Square	83	377	387	210	0	0	0	0
Journal Square	130	18	24	118	0	0	0	0
30 Montgomery	192	28	44	181	0	0	0	0
Colgate (Goldman Sachs)	190	27	39	175	0	0	0	0
77 Hudson	9	38	40	23	0	0	0	0
Vacant lots in Colgate - Merrill Lynch Surface Parking	190	26	37	173	0	0	0	0
Gregory Park	11	56	56	29	0	0	0	0
Berry Lane Park	0	0	0	0	0	0	0	0
Meadowlands-Rockefeller Warehouse	37	17	17	37	8	3	3	8
Total by 2035	**2,295**	**4,066**	**4,745**	**3,876**	**-43**	**-18**	**-18**	**-43**

Table 5.18: Jersey City Development Induced Vehicle Trips – 2050

Growth Area	Model Trips (Auto)				Model Trips (Truck)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
Bayfront *	351	776	808	591	-8	-4	-4	-8
K-Mart *	2	39	21	-1	0	0	0	0
Hudson Mall *	100	438	457	254	0	0	0	0
Route 440 Northeast *	2	245	244	85	-16	-7	-7	-16
Route 440 Southeast *	16	237	226	85	-6	-2	-2	-6
Burma Road	6	80	88	41	-2	-1	-1	-2
Canal Crossinq	-29	580	581	177	-32	-12	-12	-32
LSP Park and Ride	36	131	155	98	0	0	0	0
Danforth Avenue (Danforth Transit Village)	42	314	303	134	-5	-2	-2	-5
Newport NW (Target, Modell site)	69	366	347	168	0	0	0	0
Jersey Avenue	44	628	655	281	-19	-8	-8	-19
Metro Plaza (Shoprite todav)	73	346	349	185	0	0	0	0
Hackensack River Edge *	192	97	766	745	-6	-2	-2	-6
Marion Works	73	472	446	202	-4	-2	-2	-4
Bates (Foodtown today)	45	243	252	132	-1	-1	-1	-1
Bayonne Border (HC zone today)	16	97	92	42	0	0	0	0
Chapel Hill	33	161	160	83	0	0	0	0
Whitlock Cordaqe	8	40	38	19	0	0	0	0
The Beacon	35	162	166	89	0	0	0	0
New Neiqhborhood	33	161	160	83	0	0	0	0
Residence at Liberty	37	196	186	90	0	0	0	0
Port Liberte	37	196	186	90	0	0	0	0
Grand/Jersey	65	310	310	162	0	0	0	0
Libertv Harbor North	93	434	438	234	0	0	0	0
Newport NE	52	258	254	130	0	0	0	0
Newport NE	600	84	118	552	0	0	0	0
Powerhouse Arts District	63	190	250	175	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	97	436	450	247	0	0	0	0
Hoboken Yards/LCOR/Hudson Crossing	359	49	67	327	0	0	0	0
Avalon Cove	53	183	220	142	0	0	0	0
Harborside Plaza 8 and 9	553	86	157	548	0	0	0	0
Journal Square	192	871	893	486	0	0	0	0
Journal Square	299	41	56	272	0	0	0	0
30 Montgomery	442	65	102	418	0	0	0	0
Colgate (Goldman Sachs)	438	62	89	405	0	0	0	0
77 Hudson	20	88	93	52	0	0	0	0
Vacant lots in Colgate - Merrill Lynch Surface Parking	436	61	85	400	0	0	0	0
Gregorv Park	27	130	130	69	0	0	0	0
Berrv Lane Park	0	0	0	0	0	0	0	0
Meadowlands-Rockefeller Warehouse	37	17	17	37	8	3	3	8
Total by 2050	**5,047**	**9,370**	**10,415**	**8,329**	**-91**	**-38**	**-38**	**-91**

5.3 Traffic Microsimulation Model Development

Traffic microsimulation is the most detailed form of transportation modeling, allowing for the most accurate operational analysis of a wide variety of transportation infrastructure possible on a system-wide basis. Using the Paramics software suite, a microsimulation model of the Route 440/Routes 1&9T corridor and central intersection was developed and applied in the detailed operational analysis and refinement of corridor and intersection improvement alternatives developed and tested throughout this study. All microsimulation modeling of the corridor and central intersection alternatives assumed that there is no implementation of any of the through truck diversion alternatives.

5.3.1 Roadway Network Coding

As an initial step in the model development process, the physical road network along the study corridor was laid out in Paramics on high resolution orthophotography of the study area. The precision of the network coding and how vehicles use the facilities was aided through site visits, photographs, and the use of internet-based mapping tools. Each link in the existing roadway network was coded with a series of defining attributes such as physical dimensions (length, lane widths, etc), vehicle carrying capacity, lane utilization and travel speeds. Where these links intersect, traffic control devices were coded into the network. Traffic control devices generally consist of stop signs, yield signs and traffic signals. At each signalized intersection, the signal phasing and timing was coded into the model based upon field observations.

The base model was expanded to reflect the future roadway network anticipated to be created within the Western Waterfront. The first component of this expanded network consisted of integration of the local street grids to be constructed as part of two approved redevelopment plans in the Western Waterfront. The Bayfront I Redevelopment Plan and the New Jersey City University West Campus Redevelopment Plan both include significant changes to the local roadway network. The new and expanded roadways defined in these plans were integrated into the simulation model.

The second component of this expanded network consisted of integration of an interconnected network of streets that was developed along both sides of much of the length of the corridor by this study. Creation of a comprehensive local street grid serves multiple purposes (see Chapter

8). To allow development and analysis of alternative corridor improvement concepts, it was necessary to integrate this proposed network of local streets into the simulation model. This network included both east-west streets that intersect with the corridor and north-south streets that are parallel to the corridor.

Zones were defined throughout the network representing geographic areas that either generate or attract vehicle trips. Zones may be defined for large geographic areas that feed traffic into the study area roadway network via a single roadway, or for highly localized points such as a parking garage. A range of zones were defined within the model representing existing vehicle specific trip generators such as the Home Depot and the Hudson Mall. Additional zones were integrated into the model representing neighborhoods or portions of neighborhoods such as Society Hill. Where a zone represents a discrete user with a single roadway or driveway access point, the zone was connected to a single roadway in the model network. For zones that represent larger neighborhoods or geographic areas, the zones were connected to multiple roadways to provide a realistic distribution of traffic volumes throughout the area. The roadway network model produced the future traffic volumes and vehicle origin / destination trip tables for loading into the Paramics simulation model.

Links, nodes and attributes within the Paramics model can be modified to test the effects of any changes in the roadway corridor design or operational controls, and evaluate a wide range of alternative corridor design concepts. In an iterative process, future traffic traveling between the defined zones was loaded into the model. The model assigned these trips to the roadways coded into the model, and provided a real time visual display of traffic flows on the roadway network. Locations where unacceptable traffic operations, vehicle queuing and congestion occur were identified in the model, with roadway and intersection control refinements incorporated into the model with the future traffic traveling between the defined zones loaded into the model again to test the effectiveness of the refinements. This iterative process was continued until the improvement concept was either refined to the point of providing efficient traffic operations, or it was determined that the concept was not feasible. Figure 5.6 depicts one of the numerous microsimulation networks developed in the process of evaluating Route 440 / Routes 1&9T corridor improvement alternatives.

Figure 5.6: Future Condition Roadway Network Alternative Paramics Model - Sample

5.3.2 Vehicle Trip Assignment

Paramics microsimulation models assign traffic volumes to the individual roadways and paths coded into the model via an O-D table just as in the CUBE travel demand model discussed previously (Section 5.1.1). The O-D table for each Paramics alternative was extracted from the travel demand model using subarea extraction procedures similar to those used in the initial creation of the travel demand model. Details of the proposed alternatives were coded into the

CUBE model as appropriate to determine travel demand. As the Paramics model covers a much smaller area than the CUBE model, a polygon was created depicting the roads contained in the simulation model. This polygon was then used to 'cut out' subarea information for the integration into the Paramics model. The resultant 'cut out' subarea trip table was then used directly in the Paramics model. This subarea extraction procedure allows the larger regional effects of the alternatives to be estimated by the travel demand model, which then passed the appropriate trip levels down to the Paramics model for detailed analysis of the corridor.

Within the Paramics model, individual vehicle trips are assigned stochastically based upon a generalized cost equation. Alternative travel paths between an origin and a destination are assigned a "cost" based upon travel time, travel distance, tolls, impedances, etc. As more and more trips are assigned to a particular travel path, operations within the model become degraded, which increases the calculated cost of using the route. When the cost is sufficiently increased, the model begins assigning the trips to alternate travel paths. With each trip assigned, the costs for competing routes are recalculated with subsequent trips assigned to the route that is most attractive (least costly) at that time. In this manner, the model replicated real-world travel conditions with drivers taking the path of least resistance. Results of the detailed modeling of the alternatives are presented in Chapter 7.

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