Essex County
Comprehensive Transportation Plan

FINAL PLAN
Chapters 1-6

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NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Chapter 1: Executive Summary

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The Plan

The Essex County Comprehensive Transportation Plan (hereinafter referred to as Plan) was developed to meet mobility and transportation safety needs across Essex County, New Jersey through the year 2035. The Plan is consistent with and supports the many goals and objectives of the North Jersey Transportation Planning Authority's (NJTPA) Plan 2035. It outlines a vision for a more comprehensive County-wide transportation system that maximizes investments, promotes efficiency and safety and promotes the use of travel mode alternatives to driving alone. Recommendations that were developed for this Plan reflect the priorities of local, state, and regional stakeholders to support economic development, environmental sustainability and mobility throughout the County.

This Plan takes into account the County's existing transportation network and services and land use characteristics. It then evaluates the adequacy of the transportation system to meet travel needs through 2035. The role and potential contribution to meet future needs by every mode of travel including pedestrians, bicyclists, motor vehicles, public transportation, and air travel access and freight movement were established.

Background

The current Essex County Transportation Plan has not been updated since 1984. Transportation planning changes have occurred at all levels of government and most assumptions of the 1984 plan have since become outdated.

Essex County is located in the northeast portion of New Jersey, bordered by Passaic County to the north; Bergen and Hudson County to the east, Union County to the south and Morris County to the west (see Figure 1). It is part of the New York metropolitan area and is the second densest county, behind Hudson County, in New Jersey. The City of Newark is the largest municipality within the state, in population. The Borough of Caldwell is the smallest municipality in terms of land area and Essex Fells has the lowest population in the County. Generally, the eastern portion of the county would generally be considered a mature urban area while the western portion is more suburban and rural. Newark Liberty International Airport is located in the southeast portion of the county and is one of the three New York metropolitan airports, LaGuardia and JFK International Airport, operated by the Port Authority of New York & New Jersey (the Port Authority). Additionally, the Port Authority operates the Port Newark-Elizabeth Marine Terminal in the county, the largest port facility on the East Coast and third largest nationally. The Port Newark-Elizabeth Marine Terminal is located on the Newark Bay and serves as the principal container ship facility for goods entering and leaving the New York-New Jersey metropolitan area.

The County-owned radial roads, including Bloomfield Avenue, Springfield Avenue, Clinton Avenue, and South Orange Avenue, serve both local and regional travel, including travel to and from NYC. It therefore is no surprise that intersections and segments on these road experience recurring congestion that will only worsen as the area grows over the years. Common points of congestion within many parts of the County often occur in areas of high pedestrian activity, with resulting effects on pedestrian mobility and safety and hazardous conditions for bicycle mobility. Part of the challenge to developing this Plan update is that limited opportunities exist to do any widening within County road rights-of-way (ROW) for additions of turn lanes to improve efficiencies for vehicle and bus travel or even bicycle lanes and sidewalk, in some cases. Invariably, these ROWs have long-established properties abutting them as well as a tangle of utilities that require special accommodations. The keys to a successful Plan therefore involve recognizing and managing the constraints that exist along the County ROWs and designing improvements that complement the particular travel characteristics of land uses in the area. Such improvement projects could include not only targeted physical changes to the roadway but also transit and non-motorized programs such as Bike Sharing as well as changes to Site Development regulations to promote site designs that call for less (or more efficient) motorized travel or more travel via other modes.

The Public Planning Process

The planning process for this Plan combined a comprehensive analysis of the transportation

network with an extensive public outreach program to promote dialogue on transportation needs and priorities. Technical findings, stakeholder and public input were integrated to produce a series of maps devoted to each mode of transportation. These maps evolved over the course of the planning process as new information was generated, forming a record of existing conditions and an inventory of the needs assessment. Other factors of technical work included review of the North Jersey Regional Transportation Model - Enhanced (NJRTM-E) travel demand model, municipal master plans and scenario analysis to gauge the impact of demographic shifts on the transportation system through 2035.

The Plan Vision and Goals

The plans vision statement was developed through discussions and meetings with members of the Steering Advisory Committee (SAC), as follows:

> ***Develop a safe coordinated and integrated multimodal transportation system that provides accessibility for all users while promoting connectivity, economic vitality and productivity, our communities' livability, and our ecosystem's viability.***

Five broad goals were developed to achieve the Plan vision, as follows:

1. Maintain a Safe & Efficient Roadway System
2. Increase the Use of Mass Transit
3. Increase and/or provide opportunities for walking & bicycling
4. Connectivity for all modes of Transportation
5. Foster and Support Development & Industrial Growth

The goals are based on analysis of the existing transportation system, modeling of future conditions, discussions with the Steering Advisory Committee (SAC) and Community Stakeholders members.

Key Elements

The framework of this plan was developed based on the following key elements:

1. Complete Streets Policy
2. Multi-modal Existing Inventory
3. Multi-modal Needs Assessment
4. Multi-modal Evaluation and Assessment

These elements were used to compile the existing inventory and needs assessment, as well as, organize the findings and recommendations presented in this plan.

The first key element, Complete Streets Policy, underscores the other elements of the Plan to ensure that all travel modes are sufficiently accounted for and incorporated into a new corridor classification system, according to a Transect Zone. Transect refers to a type of urban form or physical characteristics of an area, generally described as ranging from rural to an urban core. As applied in the ECCTP, a Transect Zone refers to the character of land uses through which a County road traverses. The corridor classification system will be developed as part of an update to the Essex County Land Development Standards, which this Plan supports.

As part of the remaining three key elements of this plan, the project team collected a multi-modal inventory of existing transportation facilities. This information was gathered from available data and through our public outreach program. In a similar fashion, we collected the multi-modal transportation needs. Through an evaluation and assessment criteria established as part of this Plan, the top nine intersections in the greatest need of improvement were analyzed for multimodal enhancements. Recommendations for the nine intersections have been provided as part of this Plan for immediate implementation by the County. Recommendations for all other projects and strategies have been divided into modes of travel and suggested timeframes of implementation.

Conclusion

The Essex County Comprehensive Transportation Plan provides a set of priorities and recommendations to build a comprehensive transportation network for the future of Essex County, which includes roadway, transit, bicycle pedestrian, freight and aviation projects as well as supportive policy recommendations. The key concepts focus potential investments in areas where they can positively impact the environment, economic development, efficiency

of the existing transportation system, and quality of life for all Essex County residents. The Complete Streets Policy sits at the center of all concepts and sets the precedent for safely accommodating opportunities for all users and reinforces the connection between land use and transportation.

Chapter 2: Inventory & Assessment

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Chapter 2: Inventory & Assessment

2.1 Introduction

Sections 2.2 through 2.6 present a comprehensive inventory of existing conditions and transportation facilities, including demographics, land uses and review of the complete streets policy. Section 2.7 provides an assessment of needed enhancements and improvements to the existing system based on analysis of data, travel demand forecasts and stakeholder and community input.

The inventory draws on available geospatial data and previous plans and studies from state, county, regional, and local resources. The needs assessment is based on stakeholders input and various transportation data as well as the North Jersey Transportation Planning Authority (NJTPA) North Jersey Regional Transportation Model- Enhanced (NJTRM-E) to understand existing and future trends and concerns within Essex County.

2.2 Complete Streets Policy

The Essex County Board of Chosen Freeholders adopted Resolution R-2012-00392 on April 25, 2012, thereby making "Complete Streets" an official policy of the County (Appendix D). The Essex County Complete Streets Policy establishes the following goals and objectives:

1. Provide safe and accessible accommodations for existing and future pedestrian, bicycle and transit facilities;

2. Establish a checklist of pedestrian, bicycle and transit accommodations such as accessible sidewalks, curb ramps, crosswalks, countdown pedestrian signals, signs, curb extensions, pedestrian scale lighting, bike lanes, and shoulders for consideration in each project where County jurisdiction applies;

3. In rural areas, paved shoulders or a multi-use path shall be in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day. Paved shoulders provide safety and operational advantages for all road users. Exemptions shall be considered for County and State designated routes such as Scenic Roads, and Historic or Cultural Byways. If there is evidence of heavy pedestrian usage, then sidewalks shall be considered in the project;

4. Establishment of a procedure to evaluate resurfacing projects for Complete Streets inclusion according to length of project, local support, environmental constraints, right-of-way limitations, funding resources, and bicycle and/or pedestrian compatibility;

5. Transportation facilities constructed for long-term use shall anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements;

6. Designs shall address the need for bicyclists and pedestrians to cross corridors, as well as travel along them, in a safe, accessible and convenient manner;

7. Bicycle and pedestrian facilities shall be designed and constructed to the best currently available standards and practices including the New Jersey Roadway Design Manual, the AASHTO Guide for the Development of Bicycle Facilities, AASHTO's Guide for the Planning, Design and Operation of Pedestrian Facilities, the Manual of Uniform Traffic Control Devices and others as related;

8. Provisions shall be made for pedestrians and bicyclists when closing roads, bridges or sidewalks for construction projects as outlined in NJDOT Policy #705 – Accommodating Pedestrian and Bicycle Traffic During Construction;

9. Improvements shall also consider connections for Safe Routes to Schools, Safe Routes to Transit, Transit Villages, trail crossings and areas or population groups with limited transportation options;

10. Improvements shall comply with Title VII Environmental Justice, Americans with Disabilities Act (ADA) and complement the context of the surrounding community, and;

11. Exemptions to the Complete Streets Policy shall be presented for final decision to the County Engineer in writing and

documented with supporting data that indicates the reason for the decision and are limited to the following:

a) Non-motorized users are prohibited on the roadway.

b) Scarcity of population, travel and attractors, both existing and future, indicate an absence of need for such accommodations.

c) Detrimental environmental or social impacts outweigh the need for these accommodations.

d) Cost of accommodations is excessively disproportionate to cost of project.

e) The safety or timing of a project is compromised by the inclusion of Complete Streets.

f) An exemption other than those listed above must be documented with supporting data and must be approved by the County Engineer.

The Essex County Complete Streets Policy sets a mandate for the future design of the County's roads and bridges and provides leadership to the County's municipalities for managing circulation and mobility for all modes of transportation in future development projects.

2.3 Land Use & Development Conditions

2.3.1 Existing Land Use Patterns

Essex County is approximately 130 square miles and is characterized as being primarily developed with urban and suburban characteristics. According to the 2007 New Jersey Department of Environmental Protection (NJDEP) Land Use/Land Cover Geographic Information System (GIS) data layer, approximately 38,000 acres (47%) is primarily residential and approximately 15,000 acres (19%) consist of recreation (see Figure 1).

The 15,000 acres of open space includes numerous open space areas. There are five reservation areas, South Mountain, Eagle Rock, Mills, West Essex Park and Hilltop Reservations, located throughout Essex County. The largest open space area is the South Mountain Reservation which includes approximately 2,000 acres of open space that extends through the municipalities of West Orange, Maplewood, and Millburn, and borders South Orange Village. Commercial uses are the third most dominant use with approximately 10,500 acres (13%). As seen from Figure 1, the commercial uses are located along major roadways including I-280 and numerous Essex County routes. Industrial and transportation uses equal approximately 3,800 (5%) and approximately 5,400 (7%) respectively of the land area within Essex County. Approximately 6,400 (8%) acres are classified as wetlands and are undeveloped. Agriculture and cemetery uses represent the last one percent of the land uses identified within Essex County.

2.3.2 Future Land Use Planning

Figure 2 illustrates the locations of future development which has been approved locally and pending construction. According to municipal representatives, future development areas totaling approximately 270 acres of land are either approved or pending. Assessment of future land uses involved reviewing municipal master plans coupled with site plan information gathered from each municipality. The effort was undertaken to further understand the locations and types of development that are occurring throughout Essex County.

As is evident from the existing land use and the proposed future development represented in Figures 1 and 2, much of Essex County is developed with pockets of vacant land present. As such, much of the future development in Essex County will be redevelopment efforts of property that has been deemed underutilized. Additionally, redevelopment efforts geared towards Transit Oriented Development (TOD) are occurring (see TOD discussion below).

The New Jersey Department of Transportation (NJDOT) and NJ TRANSIT spearheaded a multi-agency Smart Growth partnership known as the Transit Village Initiative where municipalities can apply for a Transit Village designation that brings with it dedicated technical assistance, interagency coordination between State agencies and funding for transit supportive improvements. The Transit Village Initiative creates incentives for municipalities to redevelop or revitalize the areas around transit stations using design standards of TODs. Typically, TOD design standards include mixed-use residential and commercial development

that is designed to take advantage of public transportation access

TODs help municipalities create attractive, vibrant, pedestrian-friendly neighborhoods where people can live, shop, work and play while reducing dependency on automobiles. Planned TODs within a specified area is often called a Transit Oriented District or Transit Village District. Municipalities that are committed to TODs may be eligible for NJDOT Transit Village designation. The Transit Village Initiative is an excellent model for Smart Growth because it encourages growth in areas where infrastructure and public transit already exist. Municipalities must meet the Transit Village Criteria and complete a Transit Village Application in order to be designated a Transit Village. Benefits of Transit Village Designation are as follows:

- State of New Jersey commitment to the municipality's vision for redevelopment.
- Coordination among the state agencies that make up the Transit Village Task Force.
- Priority funding from some state agencies.
- Technical assistance from some state agencies.
- Eligibility for grants from the NJDOT.

In addition to community revitalization, the Transit Village Initiative seeks to reduce traffic congestion and improve air quality by increasing transit ridership. Studies have shown that adding residential housing options within walking distance of a transit facility; typically up to one-half mile radius, increases transit ridership more than any other type of development. Therefore, one of the goals of the Transit Village Initiative is to bring more housing, businesses and people into the neighborhoods around transit stations.

Since 1999, New Jersey has designated 26 Transit Villages in the state. Five of the Transit Villages are located in Essex County and include: the Township of South Orange Village (1999), the Township of Bloomfield (2003), the City of Orange Township (2009), the Township of Montclair (2010), and the City of East Orange (2012). Montclair received $200,000 from the NJDOT Transit Village Initiative in 2011 for streetscape improvements around train stations. The Township of Bloomfield received a grant from the New Jersey Department of State's Office for Planning Advocacy to develop a TOD Plan for the neighborhood around the Watsessing Avenue Station (see Figure A). The proposed TOD District for Watsessing Avenue provides opportunities for brownfield redevelopment for mixed uses within a short walk to the Watsessing Avenue Train Station and a slightly longer walk to the Grove Street Station at the end of the Newark Light Rail System, as well as six NJ TRANSIT bus routes along Bloomfield Avenue.

Municipal Master Plans, which have been updated over the last 10 years, were reviewed to help compile local transportation needs:

Belleville

Based on the 2009 Master Plan and their land uses identified within the town, Belleville is primarily characterized as a bedroom community with only 132 commercial properties. Belleville's goal is to work with Essex County and the state to encourage public transit as well as pedestrian accessibility to serve the needs of Belleville's residents and workers. Specifically, future planning efforts should be focused at Belmont Avenue and Franklin Street. NJ TRANSIT has a train station on the Newark Light Rail line at Belmont Avenue and Franklin Street. As of 2009, the Township requested a study be conducted regarding the feasibility of a Transit Village in this area.

Bloomfield

Based on the 2002 Master Plan and 2008 Master Plan Reexamination and their existing land use, Bloomfield is a stable community with little remaining vacant land. Bloomfield's goals and objectives include the encouragement of a fully intermodal circulation system that integrates roadways, mass transit, pedestrian/bicycle routes, greenway corridors and freight and goods movement facilities. Bloomfield, through the adoption of the Transit-Oriented Development Overlay District (Figure A), is trying to maximize TOD development in and around the Watsessing Avenue NJ TRANSIT station. The purpose of the district is to preserve existing residential and commercial uses while providing the opportunity for TOD that capitalizes upon NJ TRANSIT and the Midtown Direct service.

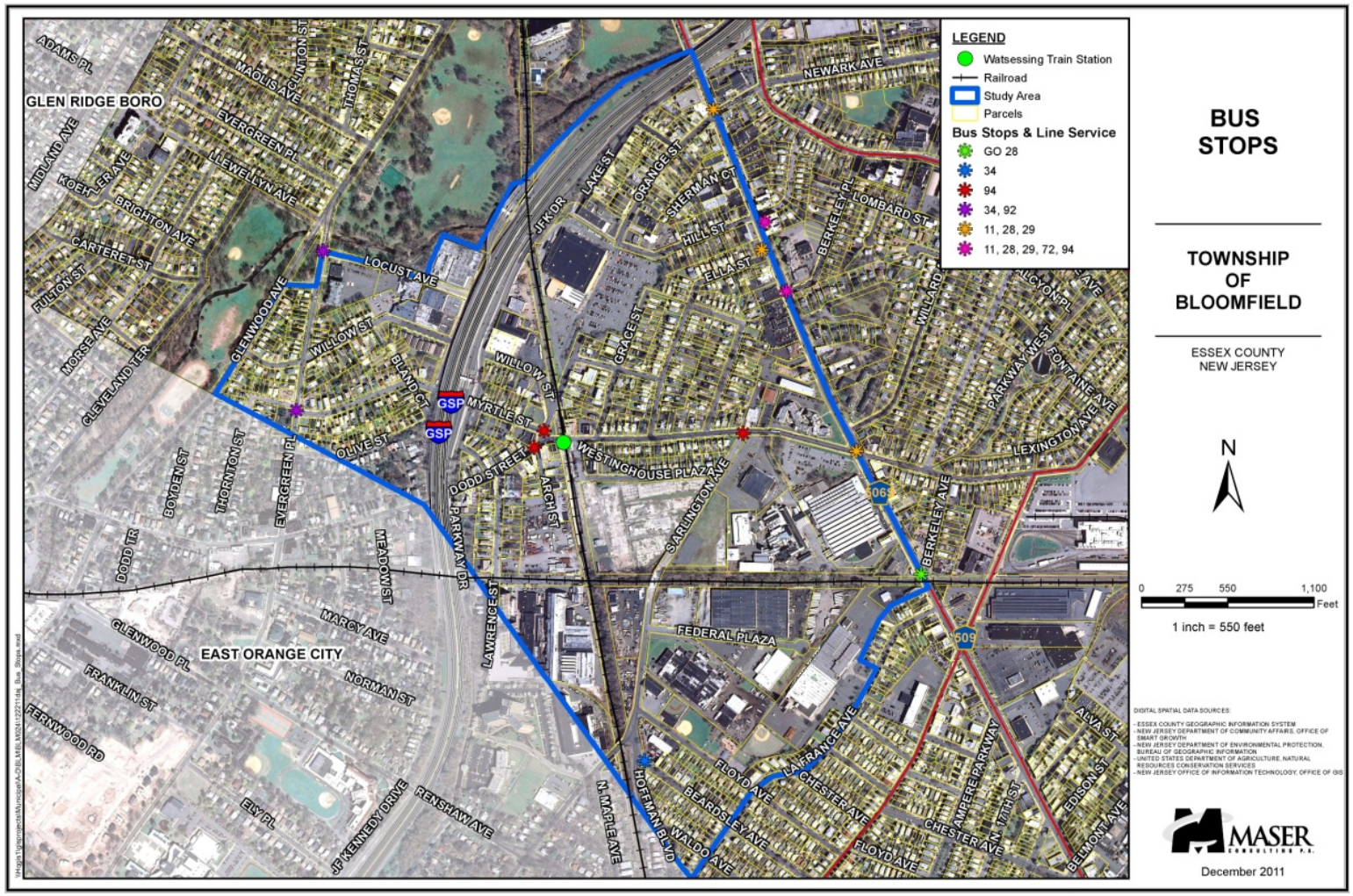


Figure A: Watsessing TOD Study Area in Bloomfield showing the combination of rail, light rail and bus transit within walking distance of existing and proposed mixed-use development.

East Orange

According to the 2006 Master Plan and existing land use, East Orange is a fully developed city with little vacant land. The city has sought to redevelop itself to improve and repair the quality of life for its citizens. East Orange's goals and objectives include the desire to improve on its role as regional center by taking advantage of its Urban Enterprise designation. Furthermore, East Orange is interested in developing an intermodal circulation system that integrates roadways, mass transit, and pedestrian routes. The Master Plan also supports the adoption of the Transit-Oriented Development and Transit Development initiatives around the East Orange and Brick Church Train Stations so as to capitalize on NJ TRANSIT and the Midtown Direct service.

Glen Ridge

According to the 2010 Master Plan Reexamination Report and existing land use, Glen Ridge is primarily a residential community with a very limited business area. Glen Ridge believes an important goal is to increase accessibility and the integration of public transit system into the municipality. As part of the Circulation Plan element, Glen Ridge has the following objectives:

- To encourage the use of mass transportation and reduce the demand for on-street parking.
- To develop techniques for safely managing through traffic on residential streets.
- To encourage intersection improvements and pedestrian safety.
- To identify parking needs and address those needs through appropriate parking techniques.

Livingston

According to the 2007 Reexamination and Comprehensive Revision Report as well as the existing land use, Livingston is almost fully developed with only approximately 84 acres of potentially developable vacant land. Livingston has no rail service and there is no land available for a rail right-of-way that would provide direct or connecting commuter service. Limited bus service provides east-west inter-community carriage within New Jersey and on commuter routes to and from New York City.

A recommendation made in the reexamination report stated the need for commuter park-and-ride facilities and a bus to a commuter train station.

Maplewood

The 2011 Master Plan Reexamination Report proposes future development in the Maplewood Village/Station Area. Specifically, due to its proximity to the NJ TRANSIT Station, Maplewood proposes:

- While there may be different planning and zoning considerations for different parts of this area, Maplewood suggests that this area be addressed as a whole planning area.
- It is strongly recommended that improving the physical connections between both sides of the railroad tracks in the station area should be a key component of any development projects adjacent to the station/and/or improvements to the station property itself.
- Encourage the development and implementation of transportation modes which are alternatives to the use of private passenger motor vehicles, including consideration of extending the Township's jitney service beyond serving the communities railway commuters.

Millburn

According to the 2008 Reexamination of the Master Plan and Development Regulations Report and existing land use patterns, Millburn primarily focuses its attention on development activity in the residential areas. Based on this information, Millburn is primarily a bedroom community. However, limited development activity in non-residential areas has been identified in Millburn. According to the goals outlined in the 2008 Reexamination Plan, it is Millburn's intent to coordinate and integrate appropriate land uses that will promote and preserve a desirable quality of life.

Montclair

The 2013 Montclair Township Unified Land Use and Circulation Plan (Montclair Plan) focuses on five elements, three of which relate most to the ECCTP; the future growth and development of Transit-Oriented, mixed-use development, and the use of Transect-based zoning and Form-

Based Code; and maximized mobility for pedestrians, bicyclists and park-and-ride transit. Review of their Unified Land Use and Circulation Plan revealed the following:

1. The Montclair Plan has six "focus areas". Four areas are defined around existing transit stations on the Montclair-Boonton Line (Bay Street, Upper Montclair, Watchung Plaza and Walnut Street).
2. The public comments revealed a need to focus on improving: service frequency, quality, and pedestrian/bicycle accommodations for transit service (bus and rail). Additionally, the residents need improved pedestrian/transit/jitney accessibility to local areas of interest.
3. A study of Valley Road (CR 621) as a primary north-south bicycle route is recommended.
4. A traffic/circulation study on Valley Road to determine the feasibility of implementing left-turn lanes is recommended.
5. Expanding transit service within the Township is recommended.

In addition to these recommendations, there are a few concepts and ideas which coincide with the strategies and goals of the ECCTP and include the following:

1. The Montclair Plan references a Bicycle Master Plan for Montclair which identifies existing and proposed facilities.
2. The Montclair Plan recommends a Transect Planning approach in their Plan, establishing four local transects.

Newark

The City of Newark serves as a major transportation hub for the movement of people and goods by a variety of modes and facilities. The transportation system consists of rail and bus transit, roadways, parking, rail freight, and seaport and airport passenger and freight facilities serving local, regional, national and international markets. It has been estimated that approximately one-third of the area of the city is dedicated to transportation facilities. The system provides for extraordinary connectivity and accessibility and is perhaps the city's greatest asset. The Newark Master Plan Mobility Element, dated June 2012, includes nine objectives, as follows:

1. Public Transit-Increase the use of all forms of public transit by residents, commuters, and visitors to/ from and within the City.
2. Local Accessibility, Pedestrians, and Bikes- Connect neighborhoods to one another and to the various employment, recreation, entertainment and waterfront destinations within the City.
3. Regional Connectivity-Connect the City outward to the local, regional, and global infrastructure and the opportunities they afford.
4. Traffic Circulation-Adequately accommodates vehicular traffic and minimizes congestion along the City streets and the regional roadway system.
5. Safety-Improve the safety of streets and intersections for all users.
6. Freight-Facilitate the movement of freight through the Port Newark/Elizabeth and Newark Liberty International Airport areas via enhanced freight access and industrial land use policies which support the continued economic growth of these vital assets.
7. Parking-Balance the parking needs and desires of various users (residents, students, workforce, and downtown).
8. Land Use Coordination-Coordinate land use policy and transportation planning.
9. Air Travel-Facilitate the movement of passengers through Newark Liberty International Airport via enhanced transit access and improvements in roadway circulation.

The City of Newark has a concentration of land uses in close proximity to transit facilities such as Newark Penn Station, Broad Street Station, and many light rail stations that are underutilized given their potential to attract future mixed-used, high density development. For example, according to the Business and Industry Element of the Master Plan, there are "more than 20 acres of underutilized land within a half mile walk of Newark Penn Station, which is one of the largest potential assemblages proximate to a Northeast Corridor transit hub".
An additional example of underutilized land proximate to a major transit station is the Newark Liberty International Airport Station which is served by both NJ TRANSIT and Amtrak. Development potential at this station is limited due to the FAA Passenger Facility Charge restriction, which currently limits the use of the station and the monorail to airport patrons.

Additionally, the City of Newark is a municipality within New Jersey that is eligible to participate in the Urban Transit Hub Tax Credit program. This program provides incentive for development within ½ mile of PATH or Newark's NJ TRANSIT commuter/light rail stations. Based on the program requirements and the extensive number of transit stations, the City of Newark has a large amount of area that is eligible for the program (e.g., land around Broad Street Station and the Orange Street Light Rail Station). As of February 7, 2012, six projects had been approved in Newark, including major office developments, such as new headquarters facilities for Panasonic and Prudential.

In order for the City to meet the aspirations set forth in the Newark Master Plan, more needs to be done to leverage the state incentives and the accessibility afforded by the transit stations. Land use factors such as density, mix of uses, parking, and proximity to transit affect travel demand and behavior. New polices must be enacted by the City that promote sustainable development built around an active street life and nodes of multi-modal transportation, in a manner that is consistent with the Land Use and Business & Industry Elements of the Newark Master Plan.

North Caldwell

According to the 2005 Master Plan Reexamination Report and existing land use, North Caldwell is primarily residential with less than one percent of the Borough's land devoted to commercial or industrial uses. Therefore, North Caldwell is primarily a bedroom community consisting of detached single family dwellings. There are development pressures within the community due to a combination of factors. These factors include advantageous mortgage interest rates, and more recently development restrictions located in more rural locations. A significant future development is the Hilltop Redevelopment Plan which includes 40 acres of reservation/conservation areas, residential development and senior housing.

Nutley

According to the 2009 Master Plan Reexamination Report and existing land use, Nutley is a fully developed community with little vacant land. Nutley is interested in promoting development and redevelopment in existing non-residential areas of the community that accommodate alternative modes of transportation and shared parking where possible. Additionally, Nutley encourages opportunities for increases in mass transit ridership where practicable and appropriate. They encourage the coordination of land development with transportation investments which would provide for intermodal connections.

Orange

According to the 2008 Master Plan and existing land use, Orange is a developed community with little vacant land. The Master Plan recommends capitalizing on the location and densities in Orange to promote pedestrian friendly and transit village oriented bus and train access. The land development patterns that are easily walkable from the Orange and Highland Avenue train stations should be dense and mixed uses.

Roseland

According to the 2004 Master Plan Reexamination Report, Roseland primarily focuses on addressing changing needs of various land uses. Specific concerns are related to revising the existing land use zoning districts.

South Orange

According to the 2011 South Orange Reexamination Master Plan and existing land use, the Village of South Orange is a mature, fully developed suburb with less than one percent of vacant land. Approximately 80% of the land uses within the village is residential, 17% is public or quasi-public and only three percent is commercial or mixed use. The commercial areas are located along South Orange Avenue, Irvington Avenue and Valley Street. The Village is well served by public transit. It has two NJ TRANSIT stations, NJ TRANSIT bus service as well as a jitney that services the train stations. Additionally, South Orange was designated a Transit Village in 1999 and has redeveloped the South Orange Avenue Central Business District with mixed use development that draws upon its access to the South Orange Train Station. A goal of the Master Plan is to continue to take advantage of the proximity to public transit and promote the use of the train station as a viable transportation mode to accommodate the growing demand for transit. Additional goals of the Master Plan include:

- Improve parking in the CBDs
- Improve pedestrian linkages in the CBDs
- Improve traffic flow that would enhance the CBD and accommodate pedestrians and bicycles.
- Reduce dependence on automobiles, especially for short trips within the Village.
- Increase safety for pedestrians and bicyclists.
- Improve conditions for people with mobility limitations.
- Provide linkages between origins and destinations within South Orange and points

Verona

The 2009 Master Plan and Reexamination Report describes Verona as consisting primarily of residential development as well as parks and open space. Verona encourages future construction to be consistent with the existing character of the town. Circulation efforts should be made to ensure an efficient transportation system. Specifically, the intersection at Claremont and Pompton Avenues as well as the section of Mount Prospect Avenue extending southerly from Bloomfield Avenue and including the intersection of Sunset Avenue should be studied.

West Orange

The 2010 Master Plan Update and Reexamination Report, Sustainability Plan and Updated Plan Elements encourage appropriate residential development in locations and densities that are consistent with existing zoning and development patterns. Growth that has occurred in the past few years has West Orange approaching full build-out, as there are few remaining vacant and undeveloped properties. West Orange does not have any railroad stations within its borders. However, West Orange does provide shuttle service that connects residents of many of West Orange's neighborhoods to nearby New Jersey Transit railroad station, and some of these stations are accessible to West Orange residents by bicycle or foot. Commuter buses are also very well served in West Orange.

2.3.3 Employment & Retail Centers

Most of Essex County residents work in Essex County. In 2011 estimates from the US Census indicate that 52% of residents work in Essex County, 35% work in other New Jersey Counties, and 13% work outside New Jersey.

Outside of Newark, employment in the county is clustered along Bloomfield Avenue, in established local commercial centers such as Glen Ridge, Montclair, Verona, and in the Fairfield/West Caldwell industrial area. There are other pockets of employment in West Orange, Roseland, Livingston, and along JFK Parkway in Millburn. Adjacent to Essex County are high levels of employment in the urbanized areas of Passaic and Union Counties as well as a cluster of mostly retail employment in East Hanover in Morris County.

Many key travel destinations are within the southeastern quadrant of the county, where the population density is the greatest. The population density in this area includes Irvington with over 18,000 people per square mile as well as over 10,000 people per square mile in Newark and East Orange. Additionally, key destinations are scattered throughout less dense sections of the county. Most of these key destinations are in close proximity to transit service.

Figure 3 shows key destination such as schools, universities, hospitals and medical facilities located in Essex County. Most of these hospitals are located in the eastern half of the county. All of these facilities are located along major transit routes.

2.3.4 Schools

The location of school facilities is an important consideration in County transportation planning. Notable demand on the transportation system occurs at concentrated times in the morning and afternoon due to the school hours of operation and large number s of non-driving students, Therefore, schools require convenient access from the transportation system.

A total of 374 public and private schools are located in Essex County. Figure 3 shows the distribution of the schools within the county. More schools are located closer to each other in the older municipalities in the eastern portion of the county compared to the more spread out schools in the western half of the county.

In addition to the 374 schools there are 10 universities or colleges (UMDNJ consists of multiple locations throughout Essex County) located in Essex County. Table 1 below provides

a list of the educational facilities. A majority of these institutions are located in the City of Newark. The remaining institutions are located in South Orange, Bloomfield, Caldwell and Montclair.

Table 1
Universities and Colleges Located in Essex County

Name	Address	City	Location
Seton Hall University Law School	One Newark Center	Newark	Located on the north side of Raymond Blvd. between McCarter Highway and Mulberry Street.
Essex County College	303 University Avenue	Newark	Located on the northwest side of University Avenue, .07 miles northeast of Market Street. 730 Bloomfield Avenue West Caldwell, NJ 07006
Rutgers University - Newark	249 University Avenue	Newark	On the north corner of Raymond Boulevard and University Avenue.
University Of Medicine And Dentistry Of New Jersey - Newark Campus	65 Bergen Street	Newark	Located on the west side of Bergen Street, between 12th Avenue and Cabinet Street.
New Jersey Institute Of Technology	323 Martin Luther King Junior Boulevard	Newark	On the west side of Martin Luther King Junior Boulevard and Central Avenue.
Berkeley College	536 Broad Street	Newark	.10 miles southeast of McCarter Highway.
Seton Hall University	400 South Orange Avenue	South Orange	.05 miles east of Ward Place on the south side of South Orange Avenue.
Bloomfield College	1 Park Place	Bloomfield	Located on the east side of Park Place, between Liberty Street and Monroe Place.
Caldwell College	9 Ryerson Avenue	Caldwell	.14 miles south of Bloomfield Avenue.
Montclair State University	1 Normal Avenue	Montclair	.07 miles west of Valley Road on the northeast side of Normal Avenue.

2.3.5 Natural & Environmental Resources

Essex County is a complex county that contains a wide range of environmental resources and issues. Through its history, the County has experienced tremendous environmental degradation from decades of sprawl, urbanization and industry. However, Essex County remains host to a rich variety of cultural and natural resources. These resources include a Piedmont geology rich with fossil remains; a vibrant and historic park system; a multitude of historic structures and sites; vital sole source aquifers; sprawling post-glacial freshwater wetland complexes; forested ridges of the Watchung Mountains; and fisheries of the Newark Bay and the Passaic River Watershed.

Water Resources

Essex County contains portions of three Watershed Management Areas (WMA) that roughly divide the county into thirds (see Figure 4); the Upper Passaic, Whippany and Rockaway (WMA #6); the Lower Passaic and Saddle River (WMA #4); and the Arthur Kill (WMA #7).

Most of Essex County surface hydrology is linked to the Passaic River. The Passaic River is a 90-mile mud and sand bottom river that takes a rather unusual course from Morris County to Newark Bay. It follows the Millington Gorge, forming the Paterson Falls and in the process, defining both the eastern and western boundaries of Essex County. The Passaic River and much of its associated wetlands are the remnants of a huge 11,000 year-old post-glacial lake originally centered in the wetland complexes of Morris County. The lake was the result of meltwater from the retreating Wisconsin Glacier.

The Passaic River headwaters begin in the Borough of Mendham in southern Morris County. The river initially flows through Morristown National Historical Park and the Great Swamp along the Morris/Somerset border. The river then flows northward along the Morris/Union County border and eventually reaches Essex County. Within Essex County, the Passaic River flows from Millburn northward (forming the county's western boundary) through Hatfield Swamp and the Great Piece Meadows of Fairfield before entering Passaic County. Throughout these upstream portions, the Passaic is enveloped by freshwater wetland complexes containing a patchwork of marshes, floodplain forests, and swamps that provide habitat for a multitude of wildlife species including threatened and endangered plants, birds, reptiles and amphibians. The river then flows east, converging with the Pompton River and crossing lower Passaic County forming the impressive Great Falls at Paterson. The river then turns southward, forming a portion of the border between Passaic and Bergen County. The Passaic River continues in a general southward direction reentering Essex County and forming the county's eastern boundary, joining the Hackensack River near downtown Newark and converging with Newark Bay. The Passaic River drains a basin of approximately 935 square miles, of which 787 are in New Jersey (USEPA). The Passaic River Basin is defined by Upper Passaic Whippany and Rockaway WMA 6 and the Lower Passaic and Saddle River WMA 4.

In Essex County, public community water is supplied by various sources from four different sources: wells within the individual system; surface water intakes, such as reservoirs; surface water purchased from an outside location; or groundwater purchased from outside location.
The general distribution of freshwater wetlands in Essex County is depicted on Figure 4. The largest wetland areas in Essex County are Great Piece Meadows and Hatfield Swamp, both of which are associated with the Passaic Meadows complex in northwestern Essex County. Forested wetland floodplains are mapped along the Passaic River in southwestern Essex County south of Hatfield Swamp from Willow Brook to the area around Canoe Brook Reservoir. Within southwest Essex County, wetlands are associated with Passaic River tributaries including Slough Brook, Canoe Brook and Taylor Brook in Millburn Township. In central Essex County, wetlands are primarily limited to smaller areas following creek corridors with some more extensive patches in Eagle Rock Reservation. Mapped wetlands within eastern Essex County are generally limited to small isolated patches.

The preponderance of streams, ponds and lakes requires roads and other transportation facilities frequently to cross on bridges. Such requirements generate environmental concern in that the structures used in these crossings alter natural topography and drainage patterns.

In addition, the construction and widening of roads add impervious surfaces, which concentrate stormwater runoff in certain places and potentially distribute pollutants into the water supply.

Air Quality

Existing ambient air quality for Criteria Pollutants in the Essex County Region was obtained from the 2010 Air Quality Report published by the NJDEP Bureau of Air Monitoring. In New Jersey, there are continuous monitoring stations that monitor six specific criteria air pollutants, which are used as indicators of air quality and for which Ambient Air Quality Standards (AAQS) have been established by the Environmental Protection Agency. These pollutants are listed as carbon monoxide (CO), nitrogen oxides (NO_2), ozone (O_3), sulfur dioxide (SO_2), particulate matter (PM) and lead (Pb). Because ambient levels of lead have dropped far below the standard throughout the state, lead is only monitored through the Bureau of Air Quality Monitoring Network at the New Brunswick station. Ambient air quality data is used as the baseline for evaluating the effect of the construction of new emission sources or of modifications to existing sources. New stationary sources of air contamination require permits from the NJDEP, Bureau of Air Quality.

Air Quality monitoring for criteria pollutants is performed by the NJDEP in eight locations in Region 2 including East Orange in Essex County. According to the 2010 Air Quality Report, the Southern Metropolitan Region had the fewest "good" air quality days (among the nine reporting regions of New Jersey) with 214. There were 136 days within the region ranked as "moderate" and 14 days ranked as "unhealthy for sensitive groups." Based on the NJDEP 2010 Air Quality Monitoring Report, there was one day marked as "unhealthy" overall within the region.

According to NJTPA's Air Quality Conformity Determination from August 2011 Essex County is in maintenance for CO and in non-attainment for NOx, VOCs (8 hour ozone) and PM 2.5 annual and daily. The concentrations of these pollutants from mobile source emissions exceed the National Ambient Air Quality Standards NAAQS however the region has "passed" the conformity test because the current and projected emissions are below the State Implementation Plan (SIP) budgets approved by EPA for the region for these criteria pollutants.

In recent years, climate change has become an important issue with the scientific community coming to a consensus that the climate is in fact changing. The increase in the planet's temperature can be attributed to greenhouse gases (GHG) in the atmosphere. In 2011, NJTPA issued the Regional Greenhouse Gas Emissions Inventory and Forecast which outlines the amount of GHG's that are being emitted into the atmosphere. The study presents a discussion of gas emissions from all major sectors (i.e. transportation; electrical power production; residential, commercial and industrial fuel use; industrial processes; fossil fuel industry; agriculture; land use, land use change and forestry; solid waste management; and wastewater treatment).

This report provided GHG emission estimates for the six primary GHG gases; Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Sulfur Hexafluoride (SF_6), Hydroflourocarbons (HFCs), and Perflourocarbons (PFCs). In general, counties with higher total emissions (Middlesex, Bergen, Monmouth, and Essex) are estimated to have higher direct emissions than consumption or energy cycle emissions. This trend is most likely occurring because direct emissions estimates include through traffic. Counties with larger populations are likely to have more traffic and larger highways going through them, which increases emissions from through traffic.

2.4 Population & Demographic Trends

2.4.1 County Population & Growth Trends

The 2011 census data along with the 2009-2011 American Community Survey provides information and data on the demographic profile of Essex County. According to the 2010 US Census, Essex County has a population of 783,969, which is approximately 9% of the statewide population. It is the third most populous county in the State of New Jersey. The largest municipalities are Newark, East Orange, Irvington and Bloomfield.

Overall, the population density in the county is 6,211 persons per square mile, as compared to the statewide population density of 1,195 persons per square mile (see Table 2). This is consistent with the overall urban nature of Essex County. The highest population densities are in Irvington, East Orange, Orange, Newark and Belleville.

Table 2
Essex County at a Glance 2010-2011

	Essex County	New Jersey
Area	126 square miles	7,406 square mile
2010 Population	783,969	8,791,894
2000 Population	793,633	8,724,560
2010 Population Density	6,211	1,195
Median Household Income (2011)	$51,009	$67,458
Percentage of Persons below the Poverty Line(2011)	17.6%	10.4%
Persons with a Disability age 5 and Older (2011)	11%	10%
Percentage of Population Age 65 or Older (2011)	11.7	17%

Source: US Census of Population and Housing

Table 3 shows the population trends over 60 years of both the County and the City of Newark, which is the largest city and county seat in Essex County. The table shows that the population of the county decreased slightly by one percent, between 2000 and 2010 and the City of Newark's population increasing slightly by one percent. After 20 years of growth in the 1950s and 1960s, the county's population lost approximately 150,000 people in the 1970s and 1980s. Nearly 107,000 of this decrease is attributable to the population decline in the City of Newark. Since 1990, the population for both Essex County and the City of Newark has stabilized. During this 20 year time period, the population for the county increased by nearly 5,700 people while the city's population increased by almost 2,000 people.

According to the 2010 US Census, the majority of the county's population was either White or Black/African American. As illustrated in Table 4, 43 percent of the population was White while 41 percent was Black or African American. The remaining population was Asian, some other race, or two or more races.

The nearly 41 percent of the population that was Black or African American is in sharp contrast to the entire state which had an amount of 14 percent. Essex County had the largest Black population of any county in the state. The White population comprised 43 percent of the county's population, compared with the state which had an amount of 68.6%.

Table 3
Essex County and City of Newark Population Trends

	Essex County	Change in Population	Percent Change	City of Newark	Change in Population	Percent Change
1950	905,949			418,776		
1960	923,545	17,596	2%	405,220	-13,556	-3%
1970	929,986	6,441	1%	381,930	-23,290	-6%
1980	851,116	-78,870	-8%	329,248	-52,682	-14%
1990	778,206	-72,910	-9%	275,221	-54,027	-16%
2000	793,633	15,427	2%	273,564	-1,657	-1%
2010	783,969	-9,664	-1%	277,140	3,576	1%

Source: US Census of Population and Housing

Table 4 2010 Racial Characteristics of Essex County		
White	333,868	43%
Black / African American	320,479	41%
American Indian and Alaska Native	3,056	0%
Asian	35,789	5%
Native Hawaiian and Other Pacific Islander	286	0%
Some Other Race	65,687	8%
Two or More Races	24,804	3%
Total:	783,969	

2.4.2 Income, Housing & Employment

The median household income in Essex County is $51,009. When compared to the 12 surrounding counties in the NJTPA's region, Essex County median household income is right in the middle, but was lower than the median household income for New Jersey which was $67,458. While most of the western, suburban towns had median household incomes well above $100,000; the cities in the urban core: Orange, East Orange, Irvington and Newark were all below $50,000.

In terms of housing tenure, 275,412 households in the County, 127,515 or 46.3 percent are in home ownership with the majority 150,125 or 53.8 percent of houses in renter occupied housing. Of the housing units, 74 percent were built before 1970, with the remaining 26 percent built after 1971. Another indicator of income is the poverty level. Essex County had a 2011 poverty rate of 17.6 percent (see Table 2). In comparison, New Jersey's poverty rate was 10 percent.

Income levels also affect the levels of vehicle ownership as well as the demand for mass transit. In 2011 according to census data, 62,632 households or 23 percent did not have access to a vehicle. In comparison, the entire state of New Jersey had a percentage of households without a car at 12 percent. These figures are similar to the data from the 2000 Census. Generally the cities in the urban core have a higher percentage of households without access to a car while in the western municipalities, car ownership is significantly higher. These statistics also reflect the number of people who are transit dependent.

In 2011 private non-farm employment in Essex County was 343,390. The management professional service and sales sectors accounted for 36.3 percent of all jobs and the service sector accounted for 18.7 percent of jobs. This is a significant decrease from 2000 when these two sectors accounted for nearly 80 percent of all jobs for county residents in the workforce. For the remainder of the workforce: 25.4 percent were employed in the sales and office occupations; the natural resources, construction, and maintenance sector accounted for 7.6 percent of jobs, while the production, transportation and material moving occupation accounted for 12 percent of the jobs.

Due to the recession, the unemployment rate for both the county and state rose sharply in 2008 and 2009. According to the State of New Jersey Department of Labor and Workforce Development, during this time period, the unemployment rate in Essex County was 9.9 percent which is similar to the state rate of 9.8 percent

2.5 Roadway Inventory

2.5.1 Inventory of Major Roadways

Essex County roadways consist of various functional classes and allows for travel between the residential developments and the commercial/business establishments. Major state roadways include the Garden State Parkway which bisects the county and provides access to New Jersey shore destinations to the south and the New York Thruway to the north. I-280 provides access across the county. I-280, which is approximately 18 miles long, is a spur from I-80 in Parsippany-Troy Hills, Morris County to Newark, and I-95 (the New Jersey Turnpike) in Kearny. I-80 crosses the northwest corner of the County and I-78 crosses the southeast corner of the county. In addition to these major roadways, numerous state routes and county routes are present throughout the county (see Figure 5). In total, Essex County has approximately 1,767 miles of roadway.

2.5.2 Functional Classification

Essex County's roads connect the residential development to the remaining roadway network (see Figure 5). Of the 1,767 miles of roads within Essex County, most are classified as local roads (see Table 5).

The table below shows overall centerline mileage per classification type based on NJDOT's road inventory. The different roadway classes include Interstate Highways, US Highways, State Highways, Toll Roads, County Routes (500 and 600 series) and local roads.

The County Route system is defined by two types in New Jersey: the 500 Series County Routes also called state secondary routes (to the state highway) and the 600 Series County Routes are discontinuous across county borders and are contained entirely within the county.

Table 5
Overall Roadway Mileage per Classification

Classification Type	Mileage	Percent
Local Roads	1,380	78.1%
County 600 Series Route	143	8.1%
County 500 Series Route	75	4.2%
Toll Roads	21	1.2%
State Highway	42	2.4%
US Highway	34	2.0%
Interstate Highway	72	4.0%
Total	**1,767**	

2.5.3 Traffic Control Infrastructure

Essex County provides maintenance of 460 signalized intersections and about 30,000 traffic signs. Based on the most recent GIS Inventory of signs on the 500 Series of County Roadways throughout Essex County, the following totals are estimated for the sign types.

- Approximately 3,200 are Warning Signs (W-Series);
- Approximately 1,200 are School Signs (S-Series); and
- Approximately 10,200 are Regulatory Signs (R-Series).

Included in the sign inventory are approximately 1,200 additional signs which were not characterized in the GIS Mapping process. Based on the color scheme of the signs, they are a combination of guide signs, custom signs and modified signs not directly classified by the Manual on Uniform Traffic Control Devices (MUTCD).

2.5.4 Bridges

The assessment of bridge conditions is based on NJDOT Bridge Management System (BMS) data that assures statewide compliance with the National Bridge Inspection Standards (NBIS) as per the Federal Highway Administration (FHWA) regulations. All publicly owned highway bridges on public roads with a span of over 20 feet must adhere to these standards. The NJDOT BMS policy is to inspect the bridges every two (2) years for major bridges and every four (4) years for minor bridges and complete inspections which include documentation with detailed descriptions of all aspects of the bridge.

Essex County's transportation network includes operation and maintenance of four swing bridges over the Passaic River, provides maintenance of 131 stationary bridges and 230 culverts. Approximately 38% of the bridges and culverts in Essex County are inspected using the National Bridge Inspection Standards (NBIS). The bridges and culverts with spans less than 20 feet were last inspected in 2002. These bridges and culverts represent critical nodes that allow traffic to efficiently navigate the region's diverse topography.

As with the roadway network itself, the County's bridge infrastructure is aging. The median construction year for structures with a span of over 20 feet within the County is 1953, as such, the average bridge is approximately 60 years old. Based on recent structural inspection and assessment forms (SI&A) for 38% of the bridges and culverts, approximately 12.4% received a rating of poor or lower while the vast majority, 87.6%, received a rating of fair or higher. The most critical bridges are more than 100 years old and date back to the early 1900's or late 1890's.

2.6 Multi-modal Inventory

Essex County is rich with transit infrastructure, especially within the "Eastern" municipalities. Transit is available in the form of rail, light rail, bus and paratransit (shuttle). The primary purveyor of transit is NJ TRANSIT, which operates a bus and rail hub at Newark Penn Station, as well as the Newark Light Rail (Subway) that links Penn Station with Broad Street Station and Bloomfield.

A summary of transit services within Essex County has been provided in Table 8.

2.6.1 Existing Rail Inventory

The Port Authority Trans Hudson (PATH) system is a subsidiary of the Port Authority of New York & New Jersey. This heavy rail rapid transit system is the nation's 7th largest subway system as identified in the American Public Transportation Association's Ridership Reports. It serves as the primary transit link between Manhattan and neighboring New Jersey urban communities and suburban commuter railroads. The PATH system provides access from Newark Penn Station to the former World Trade Center site, with stops in Harrison, Jersey City and transfers to Hoboken. Transferring at the Jouranal Square and Grove Street Stations offer connections to the Christopher Street, 9th Street, 14th Street, 23rd Street, and 33rd Street Stations in Manhattan, New York. According to the 2012 Newark Master Plan, Mobility Element, prepared for NJTPA, the PATH's four weekday routes handle 250,000 daily passenger trips.

Essex County has approximately 26 miles of railroad track and 21 railroad stations, including Newark Penn Station which is also a hub for Amtrak service. Amtrak is a federally-owned railroad that provides inter-city passenger service to Newark Penn Station, serving more than 680,000 passengers, and Newark Liberty International Airport, serving more than 127,000 passengers, in fiscal year 2012. The Northeast Corridor Line, which is Amtrak's most heavily used service, runs between Washington D.C. and Boston and services other major east coast cities such as New Haven, New York, Trenton, Philadelphia, and Baltimore.

There are five NJ TRANSIT commuter lines that travel through Essex County. These railroad lines primarily serve commuters to the City of Newark and New York City. Additionally, they also enable "reverse commuting" from these urban areas to outlying suburban locations. The five NJ TRANSIT railroad lines are:

- Northeast Corridor: This railroad line runs in a southwestern/northeastern direction through the City of Newark and links to the City of Trenton to the south and New York City to the north. According to the 2012 Newark Master Plan, Mobility Element, during weekdays, 187 trains per day depart from Penn Station in the City of Newark and 149 trains serve the Newark-Liberty Airport rail station. The Northeast Corridor has a total of nearly 115,000 daily passenger trips.

- Raritan Valley Line: This railroad line runs east/west between High Bridge in Hunterdon County and Newark Penn Station. At Newark Penn Station, access to New York City via the Northeast Corridor is available. According to the 2012 Newark Master Plan, Mobility Element, the line carries approximately 21,500 daily passenger trips.

- Morris and Essex Lines: This railroad line includes the Morristown Line, which runs between Hackettstown in Warren County and Hoboken or New York Penn Station via Morristown and Newark's Broad Street Station. Additionally, the Gladstone Branch runs from Gladstone in Somerset County to a connection with the Morristown Line at Summit, west of the City of Newark. According to the 2012 Newark Master Plan, Mobility Element there is approximately 53,000 daily passenger trips.

- Montclair-Boonton Line: This railroad line runs between Hackettstown and New York City via Montclair and the Broad Street Station. According to the 2012 Newark Master Plan, Mobility Element this railroad line carries approximately 15,000 daily passenger trips.

- North Jersey Coast Line: This railroad line runs north-south between New York

City and Hoboken on the northern end and Bay Head in Ocean County at the southern end. Additionally, this railroad line provides service to the Newark-Liberty Airport and Newark Penn Station. According to the 2012 Newark Master Plan, Mobility Element, this railroad line carries approximately 28,000 daily passenger trips.

NJ TRANSIT has a total of 21 stations situated throughout Essex County as listed in Table 6. Additionally, as stated above, Newark Penn Station is an important multi-modal transportation hub serving the northeast corridor (including Amtrak), the Raritan Valley Line, Port Authority Trans-Hudson (PATH), as well as numerous NJ TRANSIT Bus Routes. The station has eight tracks, with seven of these tracks on one level and the eighth track for PATH service on an upper level.

Table 6
NJ TRANSIT Stations

Station Name	Railroad Line
Newark Penn Station	NEC / NJCL / RVL
Newark Airport	NEC / NJCL
Newark Broad Street	Morris & Essex/ Montclair Boonton Line
East Orange	Morris & Essex
Brick Church	Morris & Essex
Orange	Morris & Essex
Highland Avenue	Morris & Essex
Mountain Station	Morris & Essex
South Orange	Morris & Essex
Maplewood	Morris & Essex
Millburn	Morris & Essex
Short Hills	Morris & Essex
Watsessing	Montclair-Boonton Line
Bloomfield	Montclair-Boonton Line
Glen Ridge	Montclair-Boonton Line
Bay Street-Montclair	Montclair-Boonton Line
Walnut Street	Montclair-Boonton Line
Watchung Avenue	Montclair-Boonton Line
Upper Montclair	Montclair-Boonton Line
Mountain Avenue	Montclair-Boonton Line
Montclair Heights	Montclair-Boonton Line

Source: NJ TRANSIT

Newark Penn Station has no official rail commuter parking, but several private parking areas are located nearby. The average weekday passenger boarding's for NJ TRANSIT trains at Newark Penn Station are approximately 18,610. Amtrak annual ridership through this station is over 600,000.

In addition to the NJ TRANSIT commuter railroad system, the City of Newark has a light rail. The Newark Light Rail System consists of two components: the Newark City Subway and the Newark Light Rail Broad Street Extension. The Newark City Subway runs north/south for approximately 4.3 miles between Newark Penn Station and the Grove Street Station in Bloomfield. In 2006, the Newark Light Rail Broad Street Extension opened and is a one-mile, five station light rail line that mostly runs at street level between Newark Penn Station and the Broad Street Station. Newark Light Rail line ridership, for the entire system, is as follows:

- Average Weekday passenger trips: 19,680
- Average Saturday passenger trips: 8,092
- Average Sunday passenger trips: 5,051

2.6.2 Bus Transit

Bus service in Essex County is provided by both public and private operators. Figure 6 show the various bus routes throughout Essex County. Over 80 bus routes are identified to travel throughout Essex County and approximately 4,500 bus stops are located within Essex County. Below is a list of NJ TRANSIT local bus routes with the highest median weekday ridership ranging from 10,000-16,000 passengers:

- #13 (Broad Street—Clinton) route provides service to Irvington and Nutley, Belleville and Clifton.
- #1 (Newark) Route provides service between Newark and Jersey City.
- #94 (Stuyvesant Cross-town) Route provides service from Bloomfield to Irvington

- #27 (Mount Prospect) route runs to Irvington and to Bloomfield as well as Clifton.
- #25 (Springfield Avenue) route provides service between Newark and Maplewood.
- #21 (Main Street) route runs between Newark and West Orange.
- #34(Market Street) route provides service between Newark, Montclair as well as Bloomfield.
- #39 (Chancellor Avenue—Kearney Avenue) route provides service to Irvington and North Arlington

The information above has been derived from Table 7, which contains the latest 13-month (October 2011 thru October 2012) rolling median ridership data for New Jersey Transit directly-operated routes. Values are presented for weekday, Saturday and Sunday. "No Service" indicates no service for a route on that particular operating day. It's important to note that not all trips begin or end solely in Essex County. This is particularly true for bus lines: 59, 67, 72, 191, 194, 195, 308 and 319, where "Essex" ridership is a very small or statistically insignificant element of the line's overall ridership.

Table 7
New Jersey Transit Directly Operated Service
Median Ridership Data
October 2011 thru October 2012

Bus No.	Weekday	Saturday	Sunday
1	14,656	7,775	4,607
5	1,408	705	354
11	3,098	2,053	1,118
13	15,647	9,563	6,040
21	10,128	7,434	4,236
25	12,564	9,345	6,640
26	1,562	473	No Service
27	12,634	9,007	5,785
28	2,605	2,262	1,479
29	4,341	2,657	1,672
30	2,737	1,673	1,194
34	9,604	4,231	2,188
37	1,844	1,320	1,253
39	7,643	4,390	2,974
40	2,190	1,526	860
41	3,984	1,817	1,204
59	5,736	3,189	1,493
62	7,781	5,415	3,568
65	505	60	No Service
66	2,310	896	716
67	1,049	695	622
70	6,548	3,997	2,106
71	2,438	1,603	876
72	3,852	1,743	1,201
73	3,275	2,096	1,320
74	4,782	3,178	2,000
76	5,110	1,828	962
78	599	No Service	No Service
79	506	No Service	107
90	3,209	1,693	1,086
92	2,893	1,460	773
94	13,388	8,044	3,907
96	745	245	No Service
97	338	154	No Service
99	4,567	2,093	1,426
107	3,403	2,119	1,340
108	1,243	901	720
191	1,305	578	468
194	2,125	591	682
195	1,004	611	413
250	841	No Service	No Service
258	3,434	2,942	No Service
308	812	1,554	928
319	800	1,019	843
361	386	No Service	No Service
375	262	No Service	No Service
378	45	No Service	No Service
872	86	No Service	No Service
873	203	97	No Service
Total	**192,220**	**115,029**	**69,154**

Source: NJ TRANSIT

The extensive bus network operated in and through Essex County represents the largest concentration of fixed-route service in the state. This includes forty-nine routes directly operated by NJ TRANSIT (Table 7) as well as services provided by private carriers such as Coach USA and DeCamp Bus Lines as well as several community and TMA shuttles. The NJ TRANSIT No. 11, 28 and 29 lines operate a coordinated headway along the heavily-travelled Bloomfield Avenue Corridor between Montclair Center and the Newark CBD. While the "outer" terminals for these routes vary they come together to form a common "trunk" along Bloomfield Avenue. These services are supplemented between Bloomfield and the Newark business district by the Nos. 72 and 258. Details of a few of the transit lines through Essex County are discussed in the following paragraphs.

Go Bus 28, established in 2009, is Bus Rapid Transit (BRT) service from NJ TRANSIT that links residential areas in Bloomfield and Newark with major employment centers in downtown Newark and at Newark Liberty International Airport, providing direct service to the airport for employees and travelers, with stops at every terminal and nearby work locations. According to the NJ TRANSIT website, Go Bus 28 provides frequent service nearly 24 hours a day along the 12.1-mile corridor between Bloomfield Station and Newark Liberty International Airport. Buses depart every 10 minutes during peak hours and 15 minutes off-peak.

According to NJ TRANSIT, Go Bus 28 provides a faster trip compared to the Nos. 11, 28, 29 and 72 along Bloomfield Avenue and the No. 62 to Newark Liberty International Airport. By eliminating the need to transfer between routes, Go Bus 28 service will provide a one-seat ride to the airport, as well as a connection to existing bus service to the port areas of Elizabeth and Newark.

The 29 line is dubbed "Bloomfield Avenue" and provides service to Parsippany-Troy Hills, Montville, Fairfield, West Caldwell, Caldwell, Verona, Montclair, Glen Ridge, Bloomfield and Newark. There is connecting service to the Montclair-Boonton Line, Morris and Essex Line and Newark Light Rail. The 29 line also stops at Penn Station, which provides connections to the Northeast Corridor Line, North Jersey Coast Line, Raritan Valley Line, PATH and Newark Light Rail.

The 34 line is named "Market Street" and provides service between Montclair, Orange, Bloomfield, East Orange and Newark. It provides connections to the Montclair-Boonton Line, and stops at Penn Station (Northeast Corridor Line, North Jersey Coast Line, Raritan Valley Line, PATH and Newark Light Rail).

The 72 line provides service between Paterson, Bloomfield and Newark. There is connecting service to Bloomfield Avenue Station, Broad Street Station (Morris & Essex Line and Newark Light Rail), Military Park Station (Newark Light Rail) and Penn Station (Northeast Corridor Line, North Jersey Coast Line, Raritan Valley Line, PATH and Newark Light Rail).

The 92 line is dubbed "Orange Cross-town" and serves South Orange, Orange, East Orange, Bloomfield, Belleville and Newark. The line connects to the Montclair-Boonton Line and the Morris and Essex Line.

The 94 line is named "Stuyvesant Cross-town" and provides service between Bloomfield, East Orange, Newark, Irvington, Union, Roselle Park, Roselle and Linden. There is connecting service to the Brick Church Station on the Morris and Essex Line, the Roselle Park Station on the Raritan Valley Line and the Linden Station to the Northeast Corridor Line and North Jersey Coast Line.[1]

Private operators are also a component of the bus system in Essex County. In Newark, the #306 Coach & Tan Tours operate a "loop" between Newark Penn Station and Broad Street. Coach USA also operates routes that service Newark, Elizabeth, Orange, East Orange, West Orange and Livingston. The DeCamp Bus Lines serves West Caldwell, Caldwell, Verona, Montclair, Bloomfield and West Orange. Community Coach provides service from Essex County to NYC. Other private routes include service to Newark, South Orange, and Maplewood. Bus service from Newark Liberty Airport and mid-town and lower Manhattan are also available. The Trans-Bridge Lines also

[1] "Watsessing Center TOD Plan – Community Profile", Maser Consulting, PA, 2012.

provide service between the airport and eastern Pennsylvania.

Paratransit Service

Paratransit services were considered by the ECCTP Steering Committee as a critical cost effective way to enhance access to transit, especially in the western municipalities of Essex County and those who face mobility challenges such as the elderly, disabled, and low-income. Paratransit (shuttle) services are provided by a combination of the County (Office on Aging), Transportation Management Associations (TMAs) and local municipally operated shuttles. Essex County Divisions of Senior Services provided paratranisit service to 86,470 senior and disable residents in 2012. There are two TMAs that serve Essex County. Meadowlink Commuter Services (EZ Ride) serves the urban (eastern) Essex County area, including the "WAVE" route to employment services in Newark using County vehicles and the Fairfield-West Caldwell Shuttle connecting commuters to employment centers along Route 46 from the NJ TRANSIT Bus #29/#71 stop at the intersection of Bloomfield and Passaic Avenues. Both of these routes are sponsored jointly by Essex County and NJ TRANSIT.

TransOptions, Incorporated serves the suburban (western) area of Essex County and operates a regular shuttle between South Orange Train Station and Livingston Mall.

Jitney Service

Many of the more densely developed suburban Essex County towns with train stations have developed their own municipal shuttles (often called "jitneys"). Examples include Bloomfield, Glen Ridge, Maplewood, Montclair, Nutley, South Orange and West Orange. Jitney routes are shown on Figure 6.

The Township of Bloomfield operates its "Bloomfield Shuttle" out of its Recreation Department for a fee paid by its residents. There are two scheduled, one that has a North (Montgomery/Rowe) series of routes (four to Bloomfield Station during the morning commute and five from the Station for the evening return), and the other, South Route (Broad Street), with seven morning and seven evening routes.

The Borough of Glen Ridge, in conjunction with NJ TRANSIT, provides transportation for Glen Ridge commuters to the Glen Ridge Train Station near the intersection of Ridgewood Avenue and Bloomfield Avenue. The shuttle buses make stops throughout the Borough at designated locations. The program has two shuttle buses; the system runs a North End Bus and a South End Bus. The shuttle buses run in loops through each neighborhood (see Figure B).

The Township of Maplewood's Jitney System has expanded to three routes (see Figure C). Ridership of the Jitney's three routes has been increasing steadily since the inception of the service. With the inauguration of the Midtown Direct service with the Montclair Connection, ridership at Maplewood Village increased from 1,200 to 3,000 commuters per day. In preparation for that anticipated influx of commuters, the Township began the Jitney service with one bus on the Hilton Route and added two additional routes with grants from NJ TRANSIT. In the first seven months of the Jitney service operation in 1997, use of the paratransit service increased to 100 riders, both to and from the Station. With the added routes, ridership is now estimated at 345 commuters each way, with six runs in the morning and 7 runs in the evening on each route.

The Township's Transportation Advisory Committee recently studied the extent to which riders on the Jitney were standing due to seats being full and determined that a larger bus was needed, which further highlights the popularity of the program as a more cost effective way to serve commuters as compared to the construction of more commuter parking spaces. [2]

The Township of Montclair operates a morning and evening shuttle to the Bay Street Station at Pine Street (see Figure D).

The Village of South Orange also operates a "Jitney" consisting of three routes through neighborhoods adjacent to the South Orange Station, very similar to the approach in Maplewood. Figure E shows the map downloaded from the Village website showing the color coded routes and stops.

[2] "Maplewood Parking Plan 2011", by Maser Consulting, page 23-24.

The Township of Nutley operates an 18-passenger shuttle bus provided by the Parks & Recreation Department, through a NJ Transit Grant Program, to ease the commute and reduce traffic. The Nutley "Jitney" provides access to the Delawanna Station, located in Clifton. This service is available Monday through Friday, for a fee of $1.50 per ride.

The Township of West Orange provides free jitney service to 2 train stations. The Midtown-Direct train line is only minutes away, bringing riders straight to New York's Penn Station. The town provides free jitney service to Orange Station and South Orange Station.

West Orange Jitney Service is one of the most advanced in Essex County. Four routes are provided Monday through Friday, except major holidays as determined by New Jersey Transit. Route maps taken from the Township's website (www.westorange.org) as Figures F, G, H & I.

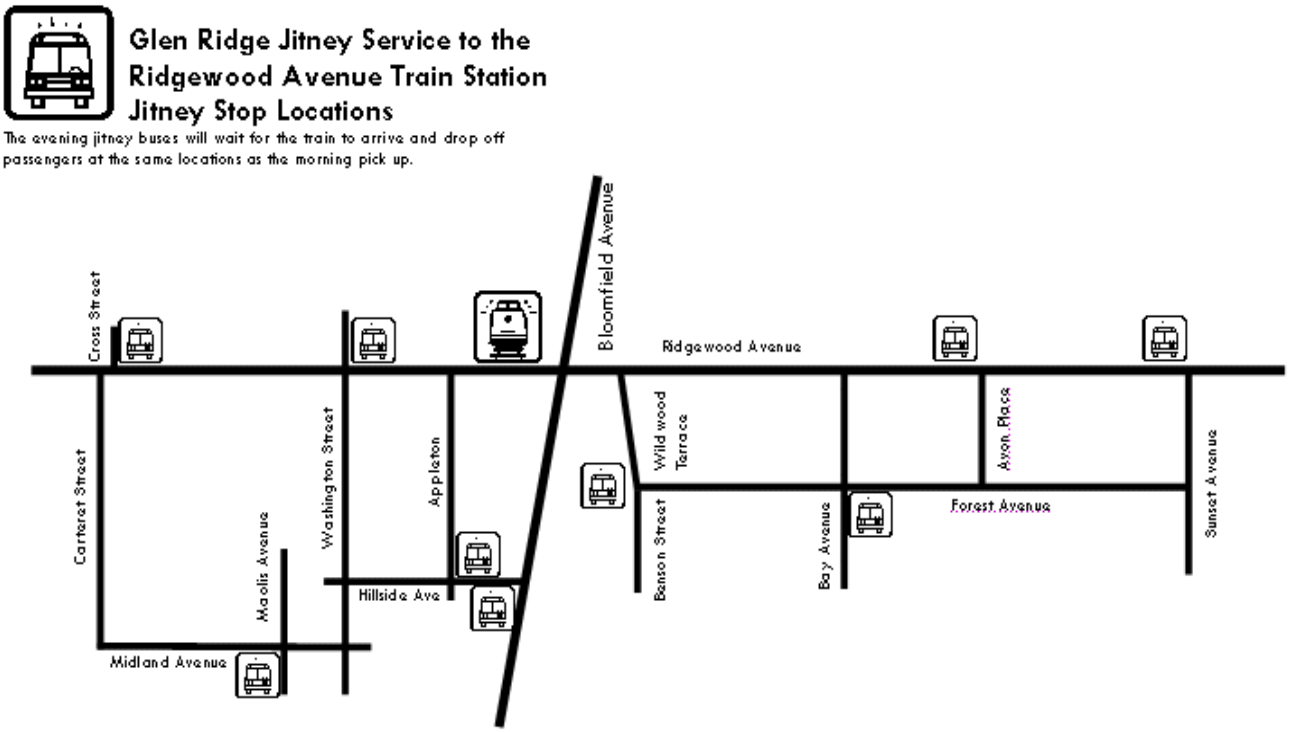


Figure B: Glen Ridge Jitney Service Map (Source: Borough of Glen Ridge)

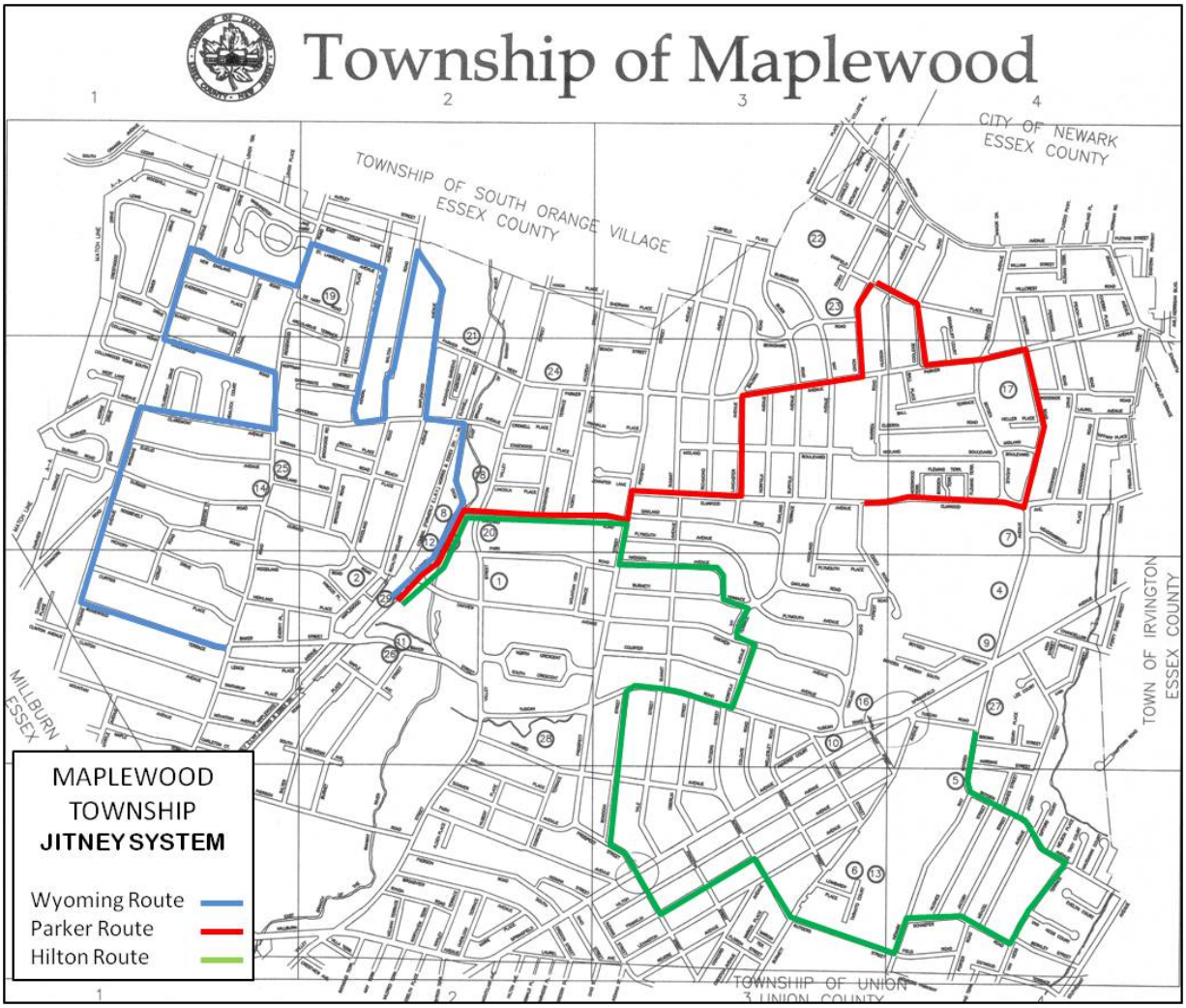


Figure C: Maplewood Jitney System Map (Source: Township of Maplewood)

NJ Transit/Montclair Shuttle

HOW DOES IT WORK?
The Shuttle Bus will provide transportation for Montclair residents in the area of the bus route from the Bay Street Station. (SEE SCHEDULE)

WHERE DOES IT GO?
The morning Shuttle Bus will begin at the intersection of Bloomfield Avenue and South Mountain Avenue, from there it will travel south along South Mountain Avenue to Llewellyn Road, left on Llewellyn Road to Harrison Avenue, across Harrison Avenue to the junction of Llewellyn Road and Orange Road/Elm Street, left on Elm Street to Lincoln Street, right on Lincoln Street to Maple Avenue, left on Maple Avenue across Bloomfield Avenue to Pine Street with a final stop at the New Jersey Transit Bay Street Station. The afternoon service will be in reverse direction, ending at South Mountain Avenue and Bloomfield Avenue The Shuttle Bus will make stops approximately every two blocks.

WHAT IS THE FARE?
The fare is $.50 each way.

In compliance with the (ADA) Americans with Disabilities Act, this Shuttle Bus is equipped with a wheelchair lift.

The Department of Community Services must be notified in advance of any person requiring the accommodation of the wheelchair lift. Please contact DCS at (973) 509-5710.

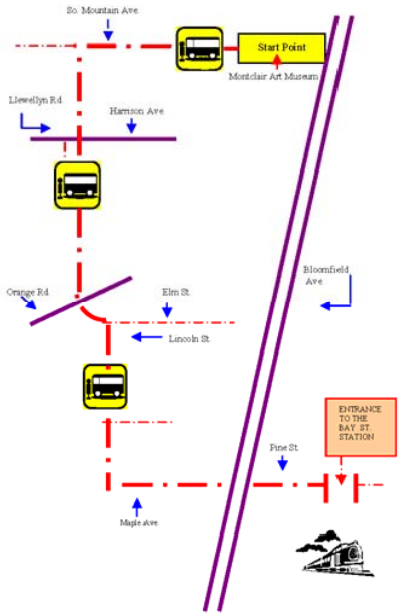
WHAT IS THE SCHEDULE?
The Shuttle Bus will run on weekdays only. No holiday or weekend service will be provided. For your convenience the 2008 Holiday Schedule has been provided for you on this pamphlet.

The Shuttle service will not run if the Montclair Public Schools are closed or scheduled for delayed opening. Bus service will follow the Board of Education's Emergency School Schedule during inclement weather. Radio broadcasts of emergency school closings can be obtained by tuning into WOR 710 AM, WINS 1010 AM, or WNJR 1430 AM from 6:00 a.m. to 10:00 a.m., or logging onto www.wor710.com from 5:00 a.m. to 9:00 a.m. You may also contact the Department of Public Works at 783-5600.

In the event that the Shuttle Bus does not run, riders will be responsible for making private arrangements for their commute.

P.M. SERVICE

Bus Departs Bay Street Station at Pine Street	***Train Arrives*** Bay Street Station at Pine Street
6:20	**6:08**
6:50	**6:46**
7:15	**7:13**
8:11	**8:09**



NOTE:

▪ Denotes travel route.

Future schedule adjustments will be announced in the Montclair Times newspaper, and the Township website at www.to.montclair.nj.us, or you may call the Department of Community Services at (973) 783-5610.

Effective September 2008

Figure D: Diagram of Montclair Shuttle. Source: Montclair Department of Community Services

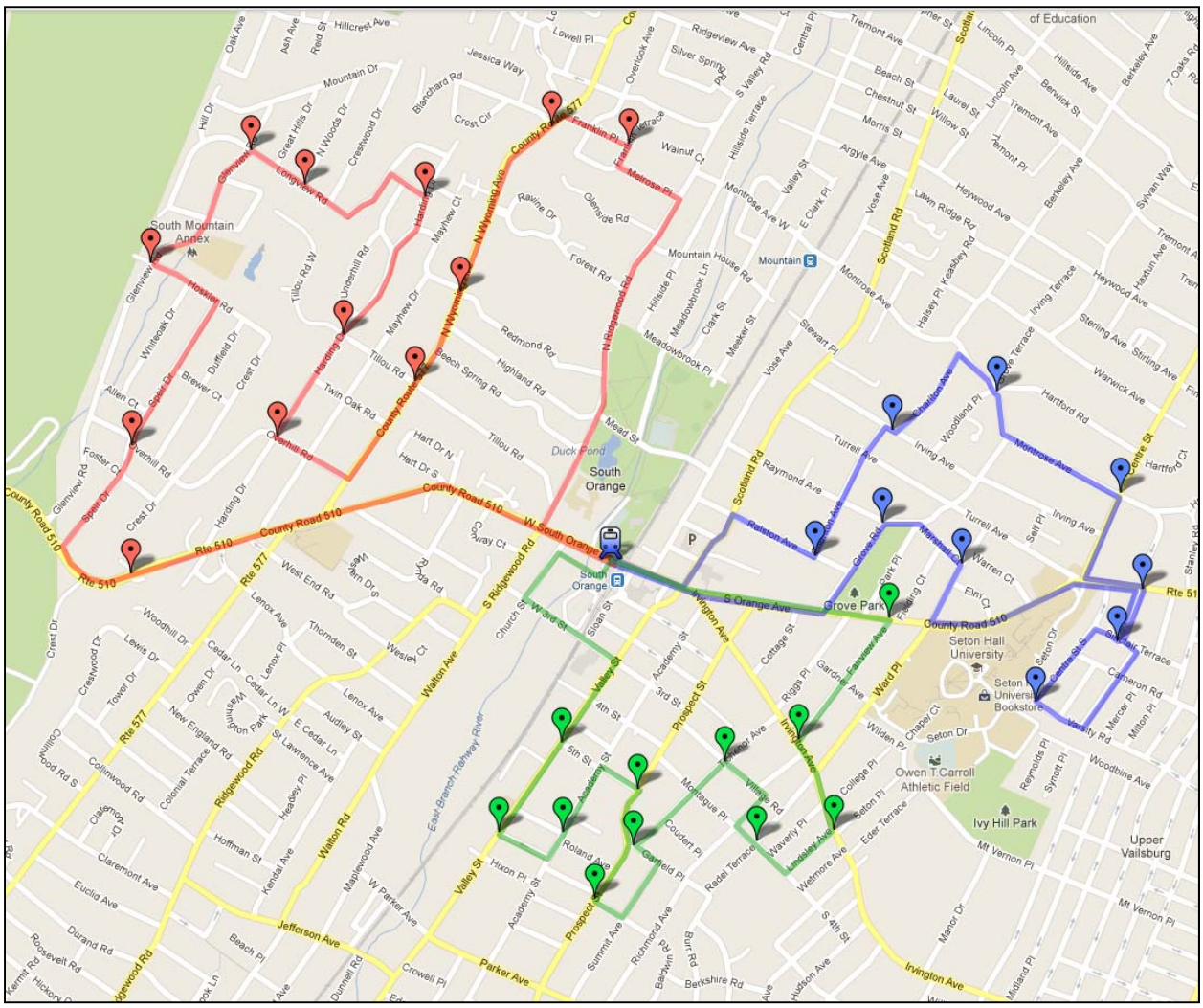


Figure E: Village of South Orange Jitney System (Source: Village of South Orange Website)

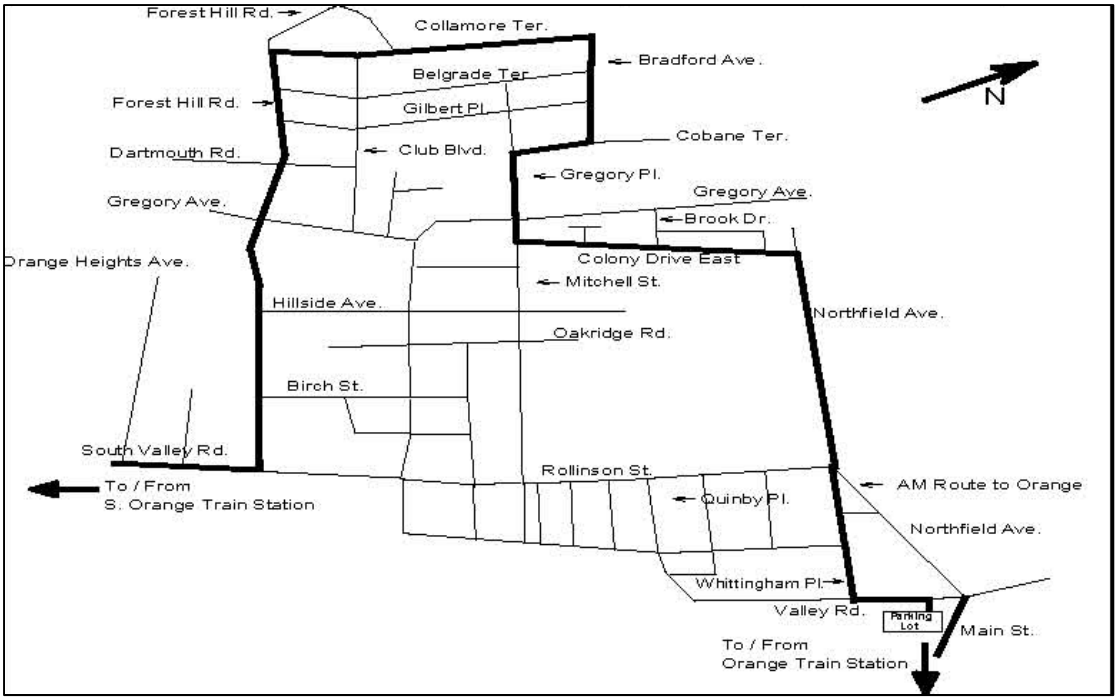


Figure F: West Orange Jitney System
(Source: West Orange Website)

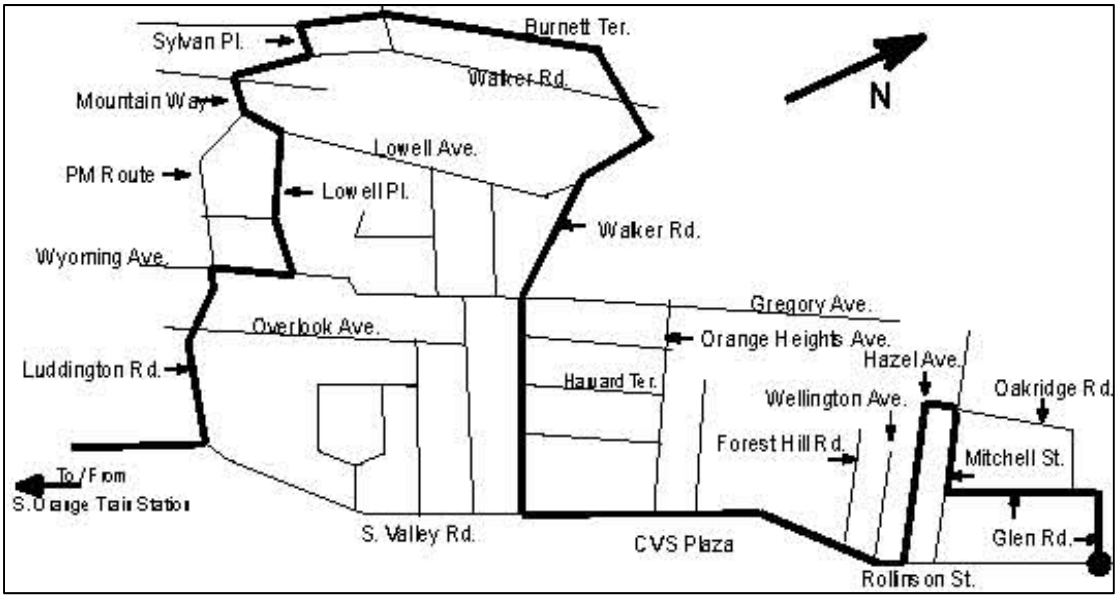


Figure G: West Orange Jitney System
(Source: West Orange Website)

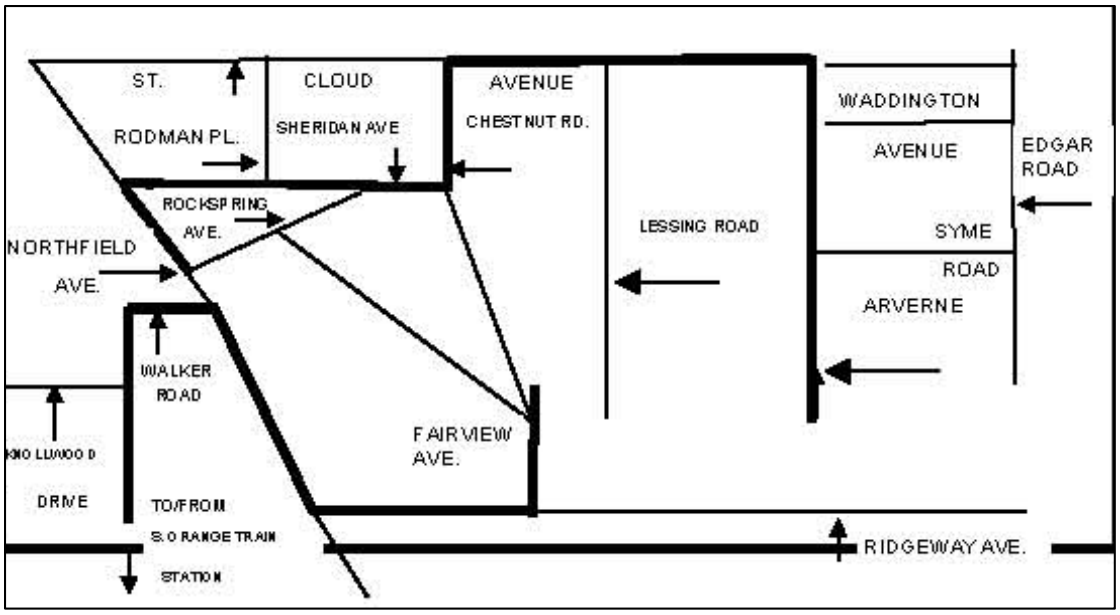


Figure H: West Orange Jitney System
(Source: West Orange Website)

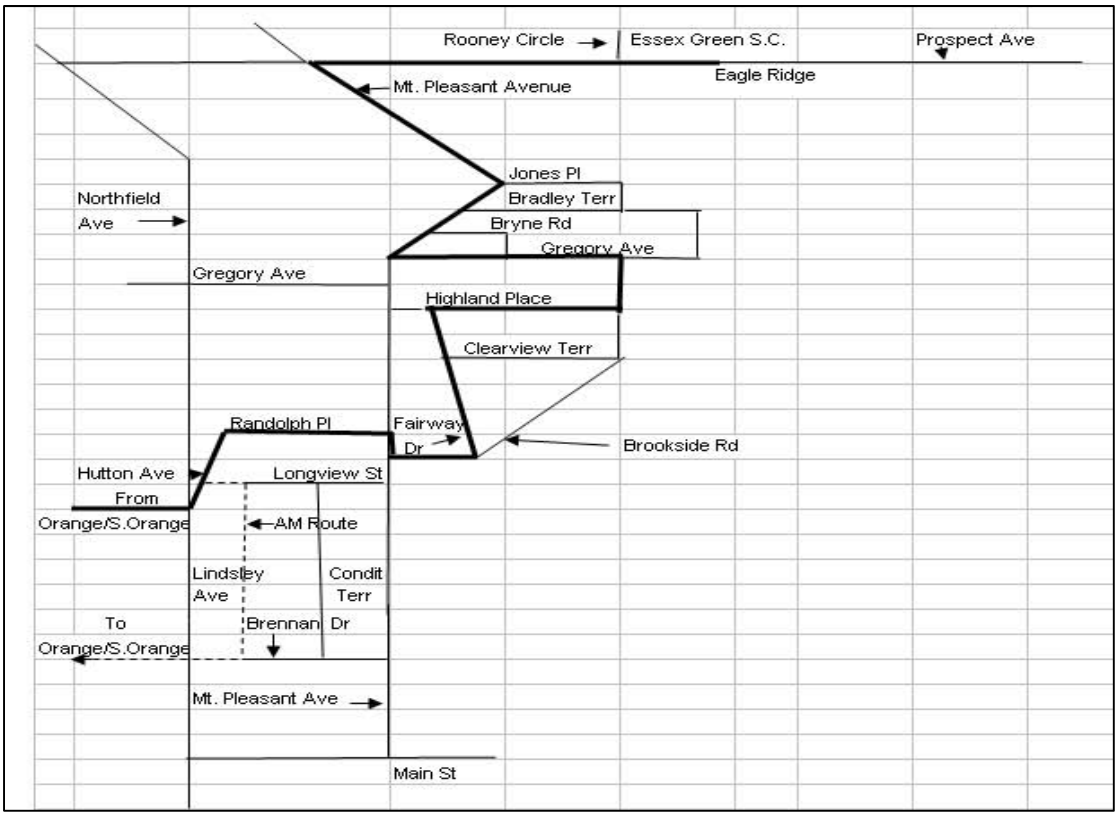


Figure I: West Orange Jitney System
(Source: West Orange Website)

Table 8: Summary of Transit Services

Municipality	Population (2010)[1]	Transit Trips (2011)[2]	Projected Transit Trips (2035)[3]	Light Rail Stations[4]	Rail Stations/ Jitney[4]	Newark Bus Routes[4]	New York Bus Routes[4]
Belleville	35,926	2,882	3,350	1		9	2
Bloomfield	47,315	6,444	7,608	1	2	7	5
Caldwell	7,822	674	785			2	3
Cedar Grove	12,411	916	1,151			2	1
City of Orange	30,134	6,050	7,193		2	10	2
East Orange	64,270	13,398	15,569		2	11	3
Essex Fells	2,113	122	162			1	
Fairfield	7,466	270	307			2	
Glen Ridge	7,527	2,084	2,310		1 / Jitney	4	
Irvington	53,926	10,396	12,122			8	1
Livingston	29,366	2,568	2,752		Jitney	5	1
Maplewood	23,867	6,196	6,291		1 / Jitney	5	1
Millburn	20,149	4,348	4,483		2	1	
Montclair	37,669	8,926	10,587		6	4	6
Newark	277,140	53,990	64,184	15	3[5]	28	4
North Caldwell	6,183	400	477			1	
Nutley	28,370	3,292	3,934		Jitney	5	5
Roseland	5,819	170	184			2	3
South Orange	16,198	4,326	4,940		2 / Jitney	1	1
Verona	13,332	1,116	1,385			3	3
West Caldwell	10,759	360	432			2	5
West Orange	46,207	6,750	7,620		Jitney	5	5
ESSEX COUNTY	783,969	122,678	157,826	17	20	28	16

Sources: 1. US Census; 2. American Community Survey 2007-2011; 3. NJRTM-E growth 2011 to 2035 applied to ACS 2011; 4. NJ TRANSIT; 5. Includes PATH & AMTRAK Service

2.6.3 Park-and-Ride Facilities

Park-and-ride facilities offer commuters a safe location to park their car and utilize mass transit such as bus or rail to their destination. Park-and-ride facilities within Essex County have been included in Table 9. Clifton Commons Park-and-Ride facility, in Passaic County, has also been included in Table 9 since it borders both Essex and Bergen Counties and is used by residents of both.

Table 9 Park-and-Ride Facilities

Facility Name	Municipality	Parking Spaces
Brookdale Service Area	Bloomfield	80
Livingston Mall	Livingston	75
5th Street at Ropes Place	Newark	35
South Orange Parking Authority, Lot #3 and #9	South Orange	181
Eagle Rock (George Quigley) Municipal Lot	West Orange	74
South Mountain Recreation Complex	West Orange	477
Clifton Commons Park-and-Ride	Clifton	156

Source: NJDOT & Essex County

2.6.4 Freight Corridors

Port Newark/Elizabeth Marine Terminal operates as one fully integrated marine terminal that is the third largest nationally and the most comprehensive collection of maritime cargo handling facilities and largest on the east coast of North America. This complex supports more than 279,200 jobs representing nearly $12 billion in annual wages. Meanwhile the port generates more than $5 billion in annual tax revenues to state and local governments. This facility is operated by the Port Authority and is located on the west side of Newark Bay. Port Newark is a flexible multi-purpose cargo center and includes wharves, deep-water ship berths, buildings, roadways, and direct rail access.

The Conrail Lehigh Line is a main east/west route serving the region and one of the busiest rail lines in the Nation. In the City of Newark the railroad enters Oak Island yard, the largest classification yard in the state, and then continues across Newark Bay to Jersey City. West of the Oak Island Yard, the Lehigh Connecting Track links the Lehigh Line with the Passaic & Harsimus Line which runs to the intermodal terminals in Kearney and North Bergen.

The Chemical Coast Secondary is a major north/south railroad line. The Chemical Coast Secondary serves Port Newark/Elizabeth and the intermodal terminal serving the Port Newark Container Terminal (PNCT) at Portside Yard. A new flyover connection between PNCT and Portside allows direct transfer from ship to rail without having to access City streets. Running north from Oak Island are the Brills Lead and the Bay Shore Lead serving the intermodal transfer activities in Brills Yard and various industries along Doremus Avenue.

2.6.5 Aviation

The Port Authority operates the Newark Liberty International Airport (Newark Liberty) under a lease with the City of Newark since 1948. The airport is located in both Newark and Elizabeth between the New Jersey Turnpike, US Routes 1&9, and I-78. The airport consists of approximately 2,000 acres and is about 16 miles from mid-town Manhattan.

Completed in 2009, Newark Liberty completed a redevelopment program that included an extension of the Air Train system, a second international arrivals facility, modernized passenger terminals, improved airport access, additional parking, expanded roadways and improved runways and taxiways.

About 24,000 people are employed at the airport. Newark Liberty contributes about $19 billion in economic activity to the New York-New Jersey metropolitan region including more than $6.8 billion in wages and salaries. About 141,000 jobs are derived from airport activity.

The second airport is the Essex County Airport – CDW (ECA), also known as Caldwell Airport, entirely in the Township of Fairfield in Essex County, New Jersey. The Essex County Airport is owned and operated by Essex County Improvement Authority (ECIA) since September 5, 1975. The ECIA is governed by a seven-member Board of Commissioners appointed by the County Executive with the consent and approval of the Essex County Board of Chosen Freeholders.

ECA is a general aviation facility whose campus is situated on approximately 278 acres of land. It is located 20 miles west of New York City and 10 miles west of Teterboro Airport. ECA is easily accessible from State Highways 23, 46, 80, 280 and 287. Public transportation to the airport is available via NJ TRANSIT bus service and from the Port Authority Bus Terminal in NYC on 42nd Street via the Lakeland Bus Company.

2.6.6 Sidewalks, Paths, & Bicycle Facilities

Sidewalks and Paths

Essex County's roadways include numerous routes that have sidewalks in one or both directions of travel. The presence of sidewalks is largely dependent on surrounding land uses, the presence of pedestrian generators, and the general density of adjacent development, as well as local zoning and development review practices. Sidewalks along County roads fall under municipal jurisdiction, so the presence of sidewalks along these routes is dependent on the level of importance a given municipality places on pedestrian mobility.

NJDOT conducted a sidewalk inventory that was completed in 2007. A vehicle equipped with a Global Positioning System (GPS) and four digital cameras was used to collect images along both directions of each County route. As part of the ECCTP, this information was updated through field reconnaissance of sidewalks along all County routes in January 2013. According to this data, Essex County consists of 442 miles of sidewalks and paths (see Figure 7). These figures identify location of sidewalk or path, the type of material used. Material of the sidewalk and path was classified as either concrete, asphalt or worn earth.

Table 10 illustrates the approximate percentage of County roadways that have sidewalk, by municipality, based on a review of the number of linear miles of existing sidewalk compared to the total linear miles of County roadways.

This approximate percentage indicates the general walkability of County routes within each municipality. Not surprisingly, the eastern municipalities with the highest densities and available transit services have the best sidewalk coverage along County roadways, while those in more rural and suburban areas currently provide significantly less sidewalk coverage. It is more likely that sidewalks have been provided where land uses, directly adjacent to the roadway, encourage and generate pedestrian trips.

Table 10: Sidewalk Coverage along County Routes

	Municipality	Percentage
Eastern Municipalities	East Orange	100%
	Glen Ridge	100%
	Irvington	100%
	Orange	100%
	Newark	100%
	South Orange	91%
	Montclair	89%
	Bloomfield	86%
	Maplewood	65%
	Belleville	63%
	Nutley	61%
	Caldwell	81%
Western Municipalities	Verona	77%
	West Caldwell	66%
	West Orange	56%
	Essex Fells	48%
	Cedar Grove	45%
	Livingston	39%
	Roseland	36%
	Millburn	33%
	Fairfield	31%
	North Caldwell	3%

Sources: NJDOT Sidewalk Inventory, 2007 & field reconnaissance performed in January 2013

Bicycle Facilities

Bicycle circulation is envisioned as a series of separate bike routes consisting of a combination

of paths, lanes, routes and trails, and can be divided into three (3) classes, as follows:

Class 1

The Class 1 bike path provides a completely separated right of way for the exclusive use of bicycles and pedestrians with cross-flow traffic minimized. The trails are marked and landscaped. Fencing encourages use of designated access points. An example of such an opportunity would be the use of abandoned rail right-of-way ("Rails to Trails") and the construction of multipurpose paths through County parks.

Class 2

Class 2 bike lanes provide a striped lane for one-way bike travel on a street or highway. An example of a recently completed class 2 bike lane is in Newark, as described below. Bike lanes are marked with signs and pavement striping. Existing County roads with wide shoulders would be likely candidates. In some instances, County roads may need to be re-striped to create room for Class 2 bike lanes.

Class 3

Class 3 bike routes provide for shared use with pedestrian or motor vehicle traffic, marked with signs for identification purposes. The use of "Sharrows" (usually a road marking with a chevron indicating a shared roadway) would be indicative of a Class 3 bikeway.

Several municipalities have or are in the planning stages of establishing bikeway networks. Based on review of bicycle facility maps and master plans provided by municipalities, the existing and planned bicycle routes have been mapped on Figure 8. These municipalities include Cedar Grove, City of Orange, Livingston, Millburn, Maplewood, South Orange Village, Glen Ridge, Newark and Verona. In 2012, the City of Newark opened its first ever (Class 2) bicycle lane on Washington Street downtown. The bikeway traverses over an eight block area from Raymond Boulevard to Broad Street. The route runs by Rutgers-Newark, the Newark Museum, the Newark Public Library, and Washington Park. The City has constructed six more bike lanes around Newark, which opened in December 2012.

On a larger scale the East Coast Greenway (ECG) is a developing trail system, spanning nearly 3,000 miles as it winds its way between Maine and Key West, linking all the major cities of the eastern seaboard. Over 25 percent of the route is already on safe, traffic-free paths.

The New Jersey portion of the Greenway covers 97 miles between Pennsylvania and New York. It passes through bustling urban areas — Trenton, New Brunswick, Newark, and Jersey City — as well as quiet suburban settings and more rural landscapes than one might expect. The route is currently 55% on traffic-free paths, the second highest percent of completed trail in any Greenway state. The route includes the ECG's longest completed trail segment – the D&R Canal Towpath, which is 34.3 miles long.

Between the end of the D&R Canal Towpath and the northern end of the New Jersey route in Jersey City, travelers alternate between park paths and interim on-road sections. Trail users of the ECG can use the newly completed trail/sidewalk which now creates a bicycle/pedestrian way from Newark to Jersey City and the Hudson River.

2.7 Needs Assessment

The inventory in the preceding sections suggests that the primary needs of Essex County's transportation system extend beyond road-based improvements that benefit motorized travel only. All elements of the existing transportation system needs to be optimized and enhanced to meet the travel needs of the County's future population and to adequately support employment growth.

This section assesses the capabilities of the current transportation system relative to year 2035 population and employment. It seeks to identify where deficiencies in the transportation system exist today and will be exacerbated in the future, or where future shortcomings can be expected to occur. Information obtained from such assessments of needs will be used to develop recommendations for transportation projects and implementation strategies.

2.7.1 Sources Used for Needs Assessment

A. North Jersey Regional Transportation Model - Enhanced (NJRTM-E)

The North Jersey Regional Transportation Model - Enhanced (NJRTM-E) travel demand model was obtained from the North Jersey Transportation Planning Authority (NJTPA) for use in this study. The most recent release of the model was October 2011 and included a base analysis year of 2011 and several future year scenarios to a horizon year of 2035. Separate analysis periods for the morning peak, midday, evening peak, and overnight comprise a typical 24-hour weekday travel condition. The NJRTM-E was used to estimate existing and future travel and assess how travel demands relate to infrastructure capacity. The model estimates the amount of morning and evening peak period travel demand among all zones in the region based on the distribution of existing and future population and employment. The model determines the modal split of travel, either via transit or personal vehicle. The model then assigns the non-transit vehicular traffic to certain routes, represented by links in a network, based on minimum travel time, distance and toll cost. It should be noted that regional models such as the NJRTM-E are typically not validated to a fine level of detail for county routes. Therefore any results provided should be examined for general corridor movement issues only and specific locations should be validated against observed conditions.

The NJRTM-E travel demand model is based on the standard four-step urban transportation planning model similar to many other regional travel demand models. There are two basic inputs to a regional travel demand model. The first input to the model is socioeconomic data specifically existing and future population and employment data. Population and employment are determined on a traffic analysis zone (TAZ) corresponding to census tracts. Population, or household, data is disaggregated by income group. Employment data is disaggregated by four basic employment types. There are 227 traffic analysis zones (TAZs) within Essex County. The second basic input is transportation network data specifically the roadway network and the transit network. All major roadways are included although interchanges are frequently represented by a single point or node. Most major and minor arterials are also included in the network however local streets and collectors are generally ignored. As a result, many major and minor arterial street intersections are typically not included in regional models. There are 4,089 roadway links within Essex County. All rail, light rail, and major bus routes are represented in the model. Some local routes and jitney and paratransit services are typically not included. The four-step planning process consists of:

1. Trip Generation – the population and employment of each zone is used to compute the number of trips generated and attracted to each zone in the model. The output of this step is the number of trips generated (Ti) and attracted (T_j) to each zone.

2. Trip Distribution – the travel time between individual zones is used to connect the trips generated by one zone with trips attracted to another. The output of this step is the number of trips traveling between each zone pair (T_{ij}).

3. Mode Choice – the competing travel times between highway and transit modes is used to determine the percentage of trips that will use each available mode to travel to their destination. As a feature of the NJRTM-E, the highway trips are further divided between free routes and toll routes. The output of this step is the number of trips traveling between each zone pair by each mode (T_{ijm}).

4. Route Assignment – the competing highway travel times among various routes are used to determine the route that each highway vehicle will use to travel to their destination. Equilibrium assignment generally that highway users will seek to minimize their own impedance (travel time and distance) regardless of how it may negatively impact other users of the roadway network. There are two outputs to this step. The first output is the traffic volume assigned to each roadway link in the network. The second output is the route that each highway vehicle uses to

travel between their origin and destination.

Roadway capacity is conventionally defined as the volume of vehicular traffic that a roadway can carry without excessive delays to individual vehicles. A variety of contextual factors, such as interchanges, traffic signals and street intersections, can significantly affect roadway capacity. As indicated earlier, since these factors are typically not well represented in regional travel demand models, roadway level of service is best estimated using a simpler ratio of traffic demand volume to roadway link capacity. The NJRTM-E travel demand model provides some generalized guidance of capacity based on the free-flow travel speed, the average number of intersections within a given distance of roadway or whether the roadway is located in an urban, suburban, or rural setting. These generalized factors are used to estimate roadway capacity and then to calculate the volume-to-capacity (v/c) ratio of a given roadway. A letter-based level of service rating is assigned to different ranges of these ratios. Roadways with v/c ratios less than 1.0 are said to be operating at satisfactory or better conditions (LOS=A, B, C, or D). Roadways with v/c ratios greater than or equal to 1.0 are said to be operating with demand in excess of capacity conditions (LOS=F). The NJRTM-E model was used to determine the v/c ratio of the Essex County roadway network during the morning and evening peak periods for both existing (2011) and future (2035) conditions. There are 241 links in the model that comprise the eight County 500-series routes and there are 379 link segments for the 70 County 600-series routes included in the model.

For each major roadway, defined as all of the County 500-series routes plus all of the four-lane County 600-series routes, a "select link analysis" was done for each municipality using the NJRTM-E. A select link analysis consists of identifying the origins and destinations of all vehicles using the roadway. This analysis was conducted for the 2011 and 2035 analysis years. The select link analysis can then be used to identify the general travel patterns of vehicles using each roadway. Based on these travel patterns, it becomes possible to identify those corridors where bus transit improvements may have the greatest impact to divert drivers from using their autos. For other corridors, improvement strategies may be limited to operational improvements.

In order to perform the travel pattern analysis, the NJRTM-E model area was divided into four districts within Essex County and four external districts. The eight districts are shown in Figure J. The Essex County districts were roughly conceived as quadrants using I-280 and the Garden State Parkway as boundaries. External districts are comprised of groupings of NJRTM-E counties by their orientation in relation to Essex County.

Trips to and from the southeast Essex County quadrant and the External East district were of particular interest because these are the trips that could be diverted to existing transit modes. In contrast, trips to and from the other internal quadrants and external districts have minimal, if any, direct transit options using existing transit modes. To aid in the transit analysis the number and percentage of daily trips traveling to and from both the southeast Essex County quadrant and the external east district was determined for each of the typical roadway links within each corridor. This data for current (2011) conditions and future (2035) conditions is provided in Appendix B. These tables also summarize the number and percentage of daily trips that were external (origin or destination outside of Essex County) and through (both origin and destination outside of Essex County). As mentioned earlier, the NJRTM-E was not validated to this fine level of detail for the County's 500 and 600 level roads, therefore the results provided should be examined for general corridor movement issues and validated against real-world conditions. For trips on Essex County routes that have an origin or destination or both outside Essex County there is little the County can do to divert these trips to transit.

B. Plan4Safety

Plan4Safety is a support tool created by the Rutgers University Transportation Safety Research Center and is a support program for transportation engineers, planners, enforcement, and decision makers in New Jersey's transportation and safety agencies to analyze crash data. Plan4Safety integrates statewide crash data, roadway characteristic data and calculates statistical analyses to better

understand roadway characteristics. The ECCTP used this tool to obtain, evaluate and assess the most recent crash history throughout the County and within specific corridors and intersections.

C. Public Outreach

Needs input from state, regional and local stakeholders was obtained during this project's public outreach and considered in understanding the extent of transportation needs throughout Essex County, described in detail in Section 3 of this plan.

2.7.2 Roadway System Needs

As the foundation of Essex County's overall transportation system, the County roadway network is used most heavily in meeting the County's traffic circulation and accessibility. This needs assessment focuses on roadway capacity, both at the time of this study and based on future projections.

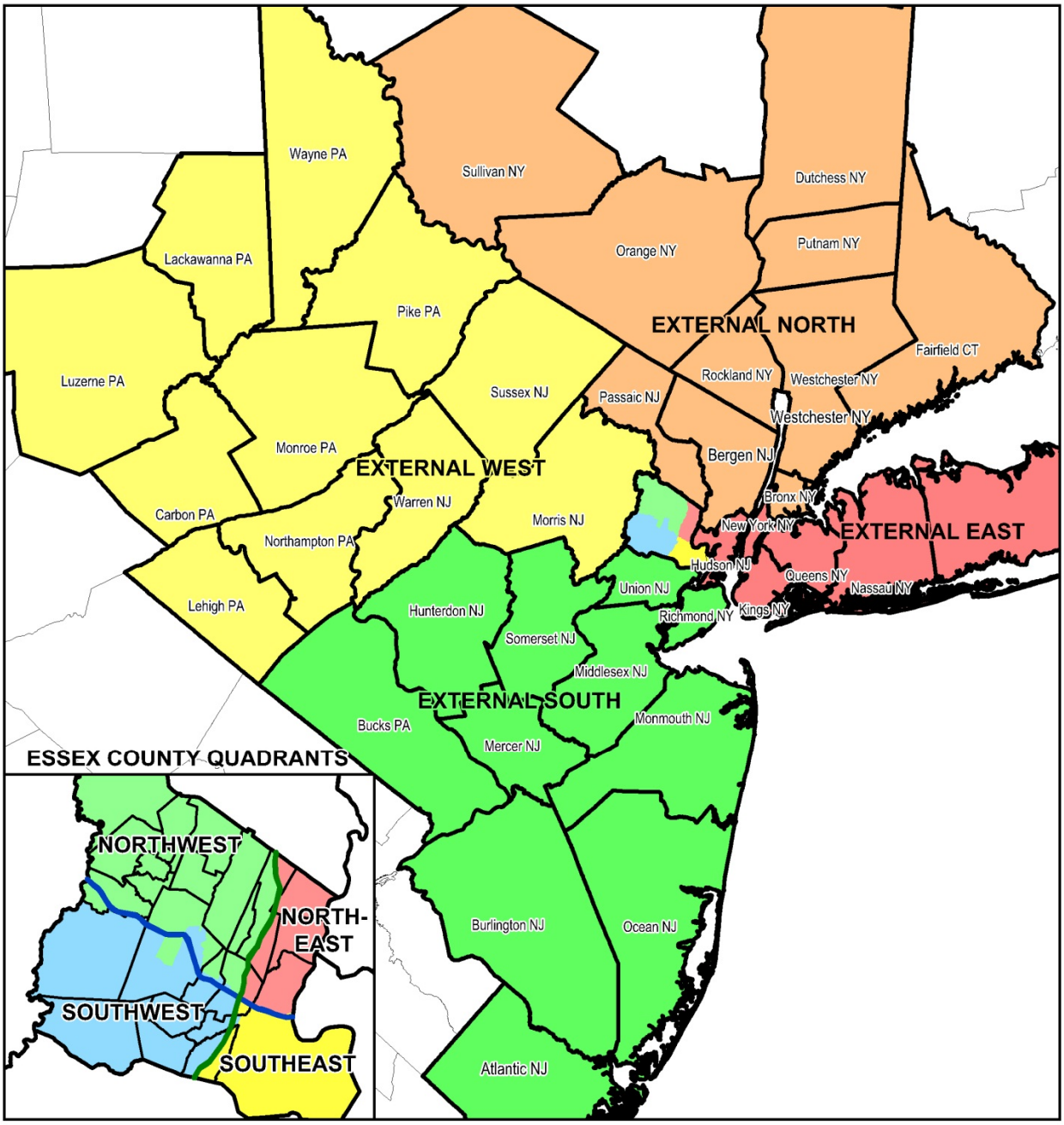


Figure J: NJRTM-E Select Link Analysis Districts

Current Capacity Deficiencies

The traffic assignment results from the NJRTM-E travel demand model for existing (2011) conditions were computed for each of the links that comprise the County 500- and 600-series routes. Capacity deficiencies were evaluated based on the volume-to-capacity (v/c) ratio of the roadway links. A peak hour v/c ratio of 1.0 indicates demand exceeding available capacity. To account for the three hour peak period used in the model, a reduced v/c ratio of 0.8 was used to indicate congested conditions during the morning and evening peak one hour of travel. Of the eight County 500-series routes, all have one or more roadway segments operating with v/c ratio exceeding 0.8 in either the morning and/or

evening peak period. Of the County 600-series routes 55 of 70 have one or more roadway segments operating with v/c ratio exceeding 0.8 in either the morning and/or evening peak period. The results of this analysis are shown graphically in Figures 10 and 11 for existing morning and evening peak periods, respectively. The results were then aggregated to the municipal level in order to identify those corridors that have, as well as those corridors which do not have, current capacity deficiencies. Corridors with maximum peak period v/c ratios less than 0.8 as well as corridors with low daily volumes were not considered to have current deficiencies and were not considered for further study. For those corridors that showed current capacity deficiencies, typical travel patterns were identified for a typical link within each municipality. These travel patterns were used as a first step to identify the appropriate strategies that could be applied to improve conditions within the entire corridor. Existing deficient isolated intersection locations were identified separately by the Essex County Department of Public Works Engineering Department and are addressed in Table 11. The analysis found that all of Essex County's County 500-series routes and less than half of the County 600-series routes had one or more locations with v/c ratios greater than 1.0 during the morning or evening peak period. The complete results from the existing model (2011) are shown for the County 500- and 600-series in Appendix B. Again, the NJRTM-E was not validated to this fine level of detail for the County's 500 and 600 level roads, therefore the results provided should be examined for general corridor movement issues and validated against real world conditions.

The top 10 County Route corridors with the highest v/c ratios during either the morning or evening peak periods during the typical weekday are listed in Table 12.

Table 11: Deficient Intersections identified by Essex County Department of Public Works

Intersection	Municipality
Eisenhower Parkway & Eagle Rock Avenue	Roseland
Eisenhower Parkway & South Orange Avenue	Livingston
Pleasant Valley Way & Northfield Avenue	West Orange
Franklin Street & Broad Street	Newark
Franklin Street & Watsessing Avenue	Bloomfield
West Passaic Avenue & Kingsland Street	Nutley
Coit Street & Chancellor Avenue	Irvington
Coit Street & Grove Street	Irvington
Coit Street & Lyons Avenue	Irvington
Grove Street & Lyons Avenue	Irvington

Source: Essex County Department of Public Works

Table 12: County Route Corridors Maximum Existing V/C Ratio (2011)			
Roadway	**Name**	**Municipality**	**Maximum V/C Ratio 2011**
CR 608	Hobart Gap Rd	Millburn	**3.75**
CR 625	Hollywood Ave	Fairfield	**3.63**
CR 510	South Orange Ave	Newark	**3.33**
CR 508	Northfield Ave	Livingston	**2.43**
CR 659	Main St	West Orange	**2.22**
CR 508	Central Ave	Newark	**2.11**
CR 527	Roseland Ave	Essex Fells	**1.87**
CR 634	Laurel Ave	Livingston/Roseland	**1.71**
CR 638	High St	City of Orange	**1.64**
CR 607	Walnut St	Livingston	**1.59**

Source: NJRTM-E (2011)

Future Capacity Deficiencies

The traffic assignment results from the NJRTM-E travel demand model were then repeated for future (2035) conditions for each of the links that comprise the County 500- and 600-series routes. The results from the future model (2035) are shown in Appendix B. The analysis found that all of Essex County's County 500-series and 90 percent of the County 600-series had one or more locations with v/c ratios greater than 0.8 during the morning or evening peak period. The results of this analysis are shown graphically in Figures 12 and 13 for future morning and evening peak periods, respectively. Similar to the current deficiencies, corridors with maximum v/c ratios less than 0.8 as well as corridors with low daily volumes were not considered for further study. For those corridors that had capacity deficiencies, weekday travel patterns were identified for a typical link within each municipality as a first step toward identifying appropriate strategies.

The County Route locations with the highest v/c ratios at any period during the typical weekday are listed in Table 13.

Table 13: County Route Corridors Maximum Projected Future V/C Ratio (2035)			
Roadway	**Name**	**Municipality**	**Maximum V/C Ratio 2035**
CR 608	Hobart Gap Rd	Millburn	4.14
CR 510	South Orange Ave	Newark	3.72
CR 625	Hollywood Ave	Fairfield	3.56
CR 607	Walnut St	Livingston	2.66
CR 508	Northfield Ave	Livingston	2.64
CR 659	Main St	West Orange	2.62
CR 527	Roseland Ave	Essex Fells	2.24
CR 658	Park Ave	Newark	2.12
CR 508	Central Ave	Newark	2.07
CR 506S	Clay St	Newark	2.04

Source: NJRTM-E (2035)

2.7.3 Transit System Needs

As mentioned earlier, the select link analysis divided the region into eight districts; four within Essex County and four external to the county. Within Essex, the southeast quadrant consists primarily of Newark and is the area within the county best served by existing transit services. Portions of the northeast, northwest and southwest quadrants are served by the Newark Light Rail, Montclair-Boonton and Morris & Essex rail lines. In addition, all quadrants are served by New Jersey Transit bus routes. Essex County residents traveling to and from the Newark area are most likely to be diverted to alternative modes through service improvements. Residents traveling to and from other areas of the county are less likely to be diverted. Trips that originate or are destined to and from the East External district, comprised of Hudson County, Manhattan and points east, are also served by existing transit services. Travel to other areas outside of the County, as well as through trips, are unlikely to be affected by strategies implemented by the County.

County roadways with high percentages of users traveling to or from Newark, Hudson County and Manhattan, represented as the southeast quadrant and East External, would benefit the most if improvements to existing bus service were implemented, since trips made using transit mean fewer vehicles on the County roads. Table 14 shows 15 roadway locations where more than 20 percent of users have an estimated or modeled trip end in one of those transit-rich districts. Locations in Newark were excluded from consideration. Since these locations were identified using a regional model, which is not accurate to the county road level, much more study would be necessary to identify appropriate locations for improved transit service. The complete list of roadway locations analyzed is shown in Appendix B.

Table 15 shows 16 roadway locations where the travel demand model forecasts an increase of 500 or more trips to or from the southeast Essex County quadrant or East External district between 2011 and 2035. As previously noted locations in Newark were excluded. Since these locations were identified using a regional model, which is not accurate to the county road level, much more study would be necessary to identify appropriate locations for improved transit services. These corridors may be candidates for improved transit service in the long-term.

The NJTPA Plan 2035, adopted in August 2009, identified a number of region-wide transit improvement projects that aim to improve transit enhancement, preservation, and expansion defined as follows. The federal SAFETEA-LU legislation definition of transit enhancement "means, with respect to any project or an area to be served by a project, projects that are designed to enhance public transportation service or use and that are physically or functionally related to transit facilities". Transit preservation, as defined by NJTPA, "includes programs and projects that seek to ensure long-term continuation and availability of viable transit facilities and services". Transit expansion refers to new transit services that do not meet the two previous transit project categories. In addition, the plan includes the following specific transit initiatives for Essex County identified in Table 16.

The New Jersey State Rail Plan, a final draft dated December 2012, was developed by the NJDOT and NJ TRANSIT. The plan identified the following transit initiatives in Essex County identified in Table 17.

2.7.4 Safety Needs

When examining traffic safety along roadways, the most reliable measure of effectiveness is recent crash history. Roadway crash statistics provide an objective assessment of the existing driving conditions and roadway operations which may influence the crash frequency along roadways or at intersections.

Crash history evaluations typically investigate intersections independently and attempt to determine the frequency of specific crash types. The main challenge in evaluating crash history with respect to the county-wide roadway system is quantifying the crash frequency and assessing the intersections in need of improvements.

Although the intersections which experienced the highest volume of accidents were identified to determine locations in need of improvements, the county-wide crash history was also obtained and evaluated.

While a statistical analysis of crash data is a reliable tool in assessing safety needs, other factors must also be considered when identifying the safety needs of Essex County. The existing roadway conditions, driver behaviors or traffic control all affect vehicular and pedestrian safety. The ECCTP coordinated Steering Advisory Committee (SAC) and Community Involvement meetings throughout the process to help identify factors that contributed to safety needs. Based on the outcome of these meetings, the primary safety needs are:

- Excessive speeding on County routes, primarily in areas of concentrated pedestrian volumes and high density development.

Improvements to pedestrian access to transit stations and downtown areas and crossing movements across roadways on congested routes.

In addition, an assessment of intersection crash history was performed using *Plan4Safety*. *Plan4Safety* is a crash data delivery and analysis program created by *Rutgers University Transportation Research Center* via the *NJDOT*.

The website (http://plan4safety2.rutgers.edu) serves as a transportation support tool and provides valuable research information to assist in the acquisition of crash data and performance of safety analysis.

Table 14: County Route Locations with High Percentage of Auto Trips with Potential to be Diverted to Transit

Location			2011				2035			
Roadway	Name	Municipality	Trips to/from Southeast Quadrant		Trips to/from East External		Trips to/from Southeast Quadrant		Trips to/from East External	
			Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
CR 509	Grove St	Irvington	8,008	64.0%	1,302	10.4%	9,358	63.1%	1,658	11.2%
CR 508	Central Ave	East Orange	9,934	53.8%	2,847	15.4%	10,555	51.2%	3,805	18.5%
CR 603	Springfield Ave	Irvington	7,553	53.0%	495	3.5%	8,866	52.8%	738	4.4%
CR 506	Bloomfield Ave	Belleville	582	3.8%	6,153	40.1%	536	3.5%	6,451	41.8%
CR 509	Grove St	East Orange	6,145	41.1%	670	4.5%	6,352	41.0%	995	6.4%
CR 645	Franklin Ave	Nutley	710	6.0%	3,901	33.2%	622	4.7%	5,218	39.1%
CR 665	Clinton Ave	Irvington	7,030	32.3%	1,416	6.5%	8,178	33.3%	1,718	7.0%
CR 508	Northfield Ave	West Orange	4,372	17.2%	4,429	17.4%	4,700	16.4%	5,223	18.2%
CR 609	Eisenhower Pkwy	Roseland	2,978	12.0%	4,575	18.4%	3,218	10.9%	5,598	19.0%
CR 622	West Passaic Ave	Bloomfield	360	1.7%	5,333	25.1%	355	1.5%	7,281	31.6%
CR 645	Franklin Ave	Belleville	1,526	13.0%	1,348	11.5%	1,374	11.3%	1,537	12.6%
CR 506S	Bloomfield Ave	Glen Ridge	5,321	19.2%	1,391	5.0%	5,311	18.5%	1,539	5.4%
CR 506S	Bloomfield Ave	Bloomfield	4,840	18.2%	1,593	6.0%	4,696	16.7%	1,958	7.0%
CR 658	Park Ave	East Orange	1,784	18.0%	585	5.9%	1,798	18.0%	726	7.3%
CR 577	Prospect Ave	West Orange	5,794	16.1%	2,665	7.4%	6,051	16.2%	2,918	7.8%

Table 15: County Route Locations with High Growth in Potential Transit Trip Diversion								
	Location		2011 (Trips)		2035 (Trips)		2011 to 2035	
Roadway	Name	Municipality	To / From Southeast Quadrant	To / From East External	To / From Southeast Quadrant	To / From East External	Absolute Change (Trips)	Percent Change (%)
CR 631	Central Ave	North Caldwell	0	15	23	50	58	387%
CR 611	Eagle Rock Ave	Roseland	8	10	57	14	53	294%
CR 506	Bloomfield Ave	Fairfield	65	6	146	57	132	186%
CR 527	Millburn Ave	Millburn	359	116	517	321	363	76%
CR 577	Prospect Ave	West Orange	437	295	634	565	467	64%
CR 607	Passaic Ave	Livingston	322	439	424	715	378	50%
CR 509	Franklin St	Bloomfield	439	154	574	274	255	43%
CR 640	E Bradford Ave	Cedar Grove	123	892	206	1243	434	43%
CR 510	S Orange Ave	Livingston	1,496	1,749	1,975	2,459	1,189	37%
CR 527	Lindsey Rd	Cedar Grove	134	821	171	1,111	327	34%
CR 622	West Passaic Ave	Bloomfield	360	5,333	355	7,281	1,943	34%
CR 613	Passaic Ave	West Caldwell	100	384	125	520	161	33%
CR 649	JFK Pkwy	Millburn	1,927	1,432	2,403	2,039	1,083	32%
CR 670	Franklin St	Bloomfield	685	370	937	454	336	32%
CR 636	Pleasant Valley Way	West Orange	429	339	538	464	234	30%
CR 611	Eagle Rock Ave	West Orange	1,139	539	1,441	733	496	30%

Table 16: NJTPA Plan 2035 – Transit Initiatives			
Project	**Time Frame**	**Location**	**Type**
Bloomfield Intermodal Improvements	Near-Term	Bloomfield	Transit Enhancement
Light Rail Infrastructure Improvements	Near/Mid-Term	Newark to Bloomfield	Transit Preservation
Light Rail Vehicle Rolling Stock	Near/Mid-Term	Newark to Bloomfield	Transit Preservation
Newark Penn Station	Near/Mid-Term	Newark	Transit Preservation

Table 17: New Jersey State Rail Plan – Transit Initiatives			
Project	**Time Frame**	**Location**	**Type**
Newark Airport Interlocking	Near-Term	Newark	Transit Preservation
Hunter Flyover	Near-Term	Newark	Transit Preservation
Portal Bridge Replacement	Near-Term	Newark	Transit Preservation
Newark Penn Station Improvements	Long-Term	Newark	Transit Preservation
Morris & Essex Third Track Project	Long-Term	Millburn	Transit Preservation
Morris & Essex Infrastructure Improvements	Long-Term	Newark to Millburn	Transit Preservation
Montclair-Boonton Infrastructure Improvements	Long-Term	Newark to Montclair	Transit Preservation
Northeast Corridor Gateway Program	Long-Term	Newark	Transit Enhancement

Table 18: Plan4Safety Crash Data		
Intersection	**Municipality**	**No. of Incidents**
Springfield Ave. & Grove St.	Irvington	38
Pompton Ave. & Bloomfield Ave.	Verona	38
McCarter Highway & Clay St.	Newark	34
Franklin Ave. & Mill St.	Belleville	34
Springfield Ave. & Bergen St.	Newark	33
Market Street & 1st St.	Newark	32
Bloomfield Ave. & Grove St.	Bloomfield	32
Rutgers Ave. & Cortland St.	Belleville	32
Central Ave. & Steuben St.	East Orange	32
Springfield Ave. & Elmwood Ave.	Irvington	31

The crash data was collected in November of 2012 and was analyzed for the most recent three years (January 2009 through December 2011). From the data retrieved, the top ten intersections were extracted. The 1st ranked intersection in total accidents was the intersection of Springfield Avenue & Grove Street, which totaled 38 accidents. The 10th highest intersection, Springfield Avenue & Elmwood Avenue, totaled 31 accidents. The complete list of the "Top 10" intersections in the County is detailed in Table 18.

2.7.5 Bicycle & Pedestrian Needs

One of the limitations of regional travel models, such as the NJRTM-E, is the inability to account for most of the shorter trips that would be made by non-motorized modes. This limitation is logical because regional models are used to discuss and decide regional issues. Trips within a single zone or municipality, although large in number, account for a very small percentage of total vehicle-miles of travel in the region. Further, most of these trips occur on local streets which are generally not included in regional models. On the other hand, Regional models are normally not used to identify the bicycle or pedestrian needs whether on County route corridors or other local roads. For this ECCTP, bicycle and pedestrian needs were identified through a geographic analysis of the County roadway network to identify the high potential for bicycle and pedestrian trips due to the presence of: train stations, bus stops, schools, libraries, and/or downtown commercial areas. A table summarizing the location of these facilities within a one-half mile buffer of each of the major routes and municipalities are contained in Appendix B – Tables B-9 and B-10.

Based on the existing inventory of bicycle routes within Essex County and the needs that were identified during the Steering Advisory Committee (SAC) and Community Involvement meetings, there is a strong need for connecting bicycle facilities between adjacent municipalities. There are opportunities to use the County park system to provide connectivity and keep bicyclists off congested County roads. There is also a need for bicycle parking at strategic locations such as transit rail and bus stations, in proximity to schools and universities and public buildings to encourage bicycling.

2.7.6 Aviation & Freight Needs

A large portion of the City of Newark's land area encompasses the Port Newark/Elizabeth Marine Terminals, Newark Liberty International Airport, and the industrial areas that surround them. These are all important elements in the economy of Newark and the region as a whole. Long-term growth is projected in marine cargo volumes at the port, in air passenger and cargo volumes at the airport, and in industrial activity concentrated in the industrial areas along US-1&9 and the New Jersey Turnpike (I-95) in close proximity to the port and airport. Furthermore, marine transportation infrastructure improvements such as the ongoing harbor dredging efforts and the raising of the Bayonne Bridge to accommodate larger cargo vessels are aimed at helping the region meet this growing demand.

While Essex County contains major highways such as U.S. Route 78, U.S. Route 1&9 and the New Jersey Turnpike (I-95), these landside transportation elements are under increasing pressure to meet the competing demands of these uses. Regional highways and railroad lines must accommodate the traffic from these major activity centers even as they are burdened with the growing transportation demands of the nation's largest metropolitan area. The age of this infrastructure is also an issue that must be addressed, as much of the City's transportation network was not designed to handle the forcasted volumes of vehicular and rail traffic and the large trucks that traverse the nation's highway system today.[3]

[3] "Newark Master Plan, Mobility Element", by Sam Swartz Engineering, 2012.

Chapter 3: Public Outreach

Chapter 3: Public Outreach

The ECCTP planning process included an extensive series of efforts in public involvement and outreach. As part of this effort, the project team held Steering Advisory Committee (SAC) and Community Involvement Stakeholders (CIS) meetings. This allowed stakeholders on a regional and local level to participate as well as share ideas that could be incorporated into the development of various transportation projects. This chapter of the ECCTP chronicles the public involvement efforts and identifies the links between community input and development of the candidate project list. Meeting agendas, minutes, attendance sheets and presentation materials for all meetings have been included in Appendix C.

3.1 Early Coordination Efforts

The first major actions of the ECCTP process involved the formation of the guiding committees that were intended to help the project team. This effort began immediately after the project kick-off meeting held in May 2012. The Public Outreach Plan for the ECCTP was anchored by a set of two committees, the SAC and CIS which engaged local and regional government staff who are more directly involved in day-to-day operations to assess transportation issues and decisions.

3.2 Steering Advisory Committee Meetings

The project team built upon an existing list of the stakeholders provided by the Essex County Department of Public Works and identified others that have the desire or need to be involved in this process. The SAC member list was a living document that was updated periodically with approval from Essex County and the NJTPA. The SAC members were tasked with the following:

- Assist the County and the project team in developing the ECCTP's vision statement;
- Identify stakeholders, community groups and partners associated for public participation activities;
- Develop, guide and participate in community involvement activities;
- Guide the development of sections in the ECCTP;
- Review and provide feedback to the Core Team on draft and final ECCTP;
- Review the final report's short, medium and long term transportation projects and strategies, and;
- Ensure that the final report clearly identifies the implementation priorities along with agencies responsible for each project hand-off.

3.2.1 Defining a Vision, Goals & Objectives

The first SAC meeting was held on August 22, 2012 and included representatives from NJTPA, NJDOT, NJ TRANSIT, Essex County Transportation Advisory Board, Essex County Division of Senior Services, Essex County Planning Board, Essex County Environmental Commission, Newark Regional Business Partnership, Maplewood Township Engineer, Cedar Grove Deputy Mayor, and the South Orange/ Lackawanna Coalition. The project team used this meeting to introduce the project process of the ECCTP and gather input. Based on the first SAC meeting, the project team reviewed the minutes of meeting and compiled draft Vision, Goals and Objectives for discussion and consensus at the next SAC meeting. The Vision, Goals and Objectives developed are as follows:

Develop a safe coordinated and integrated multimodal transportation system that provides accessibility for all users while promoting connectivity, economic vitality and productivity, our communities' livability, and our ecosystem's viability.

Goal 1: Maintain a Safe & Efficient Roadway System

- Provide better inter- and intra-county mobility;
- Enhance connections between roadways and other transportation modes;
- Provide safe access and mobility for all roadway users;
- Reduce the negative impacts of vehicle use, and;
- Provide accommodations for freight mobility.

Goal 2: Increase the Use of Mass Transit

- Enhance bus stops and rail/light rail stations with infrastructure and amenities that will meet the needs of all users;
- Improve safe multimodal access to and from stops/stations;
- Market the benefits of transit use;
- Better integrate transit and land use through county subdivision and site plan regulations;
- Provide options for non-drivers, and;
- Reuse of existing abandoned rail lines.

Goal 3: Increase &/or provide opportunities for walking & bicycling

- Designate bicycle routes and/or bike lanes;
- Encourage bike and pedestrian friendly development through revisions to the county subdivision and site plan regulations;
- Promote the adopted complete streets policy;
- Promote the benefits of safe bicycling and walking through advocacy and education, and;
- Ensure a thought-out pedestrian (sidewalk) network.

Goal 4: Connectivity for all modes of Transportation

- Sidewalk connectivity at transit facilities;
- Inter-municipality and Inter-County connectivity of bicycling facilities, and;
- Coordination between bus and rail transit.

Goal 5: Foster and Support Development & Industrial Growth

- Provide for planning policy for development that will support multi-modal connectivity;
- Allow for the safe transport of goods within the County, and;
- Provide for efficient use of land within the County's industrial zone;

A second SAC meeting was held on October 11, 2012 to discuss the Vision, Goals and Objectives derived by the project team from discussions by the SAC at the first meeting, and review of the technical analysis. The SAC members identified intersections within the County that pose operational or safety problem that need to be reviewed as part of the ECCTP, they are as follows:

1. Mount Prospect Avenue and Bloomfield Avenue (Newark)
2. Pedestrian Safety along Bloomfield Avenue (Montclair)
3. Millburn Avenue and Main Street (Millburn)
4. South Orange Avenue between Prospect Street and Springfield Avenue (South Orange)
5. Bloomfield Avenue and Grove Street (Montclair)
6. Springfield Avenue between New Street and Grove Street (Irvington)
7. South Orange Avenue and Prospect Street three blocks towards Newark (South Orange)
8. East Bradford Avenue and Crestmont Road and Woodstone Drive (Cedar Grove)

Information gathered from the SAC meeting has been incorporated into Figure 9 – Needs Assessment – Public Outreach.

3.3 Community Involvement Stakeholder Meetings

The engineers, planners and mayors of each of the 22 municipalities were invited to participate as Community Involvement Stakeholders (CIS). A questionnaire was distributed via email to the attendees for completion prior to the meetings in order to help spur discussion on the transportation needs within their community.

Two meetings were held on December 5, 2012 with the western municipalities attending a morning session and the eastern municipalities attending the afternoon session. A meeting with the City of Newark and Port Authority of NY/NJ was held on December 17, 2012 and a meeting with Verona Township officials on January 11, 2013.

We received completed questionnaires from 10 of the 22 municipalities as follows: Bloomfield, Essex Fells, West Caldwell, Glen Ridge, Livingston, Maplewood, Newark, North

Caldwell, Orange and South Orange Village. In addition, we received input to our needs assessment from the Belleville Township Police Chief and TransOptions Incorporated. Information gathered from these CIS meetings, the questionnaires and additional input have been incorporated into Figure 9 – Needs Assessment – Public Outreach.

3.4 Public Outreach Workshops

Essex County and the NJTPA invited members of the public to share their ideas at workshops during two sessions, on Wednesday, March 13, 2013, from 10:00 am to 1:00 pm and 4:00 pm to 7:00pm at the Essex County Richard J. Codey Arena at South Mountain - Room 1. This input was used in the development of the Essex County Comprehensive Transportation Plan to shape the future of multi-modal connectivity in Essex County.

These workshops were an opportunity for the public to share ideas about building a transportation plan that will build multi-modal connectivity for all users and, in turn, stronger communities and local and countywide economies with better access to transportation, housing, jobs, and educational, cultural, and recreational opportunities. A handout and questionnaire was submitted to each attendee to review the project intent and formally provide input. The completed public questionnaires, handouts, and attendance sheets for both sessions have been included in Appendix C.

The workshops were set up as an open house with various stations describing the existing inventory, needs assessment and technical findings to date. Maps of the 22 municipalities within Essex County were made available at the meeting for the public to mark-up the location of their transportation needs. Projects that were derived from these meetings have been included in the Multi-Modal project list and recommendations in Chapters 5 and 6, respectively, of this plan.

Photo 1: ECCTP Public Workshop

Photo 2: ECCTP Public Workshop

Photo 3: ECCTP Public Workshop

Chapter 4: Identification of Candidate Projects

Chapter 4: Identification of Candidate Projects

4.1 Project Identification

The process of identifying multi-modal candidate projects involved soliciting input from several sources, including the Essex County Department of Public Works, Engineering Department, the ECCTP Steering Advisory Committee (SAC) comprised of members of State and County agencies, and Community Stakeholders comprising of local officials, engineers and/or planners. In addition, technical analyses was completed using the Plan4Safety crash data and North Jersey Transportation Planning Authority (NJTPA) North Jersey Regional Transportation Model – Enhanced (NJRTM-E).

4.1.1 County Candidate Projects

The plan proposed herein is a County-wide initiative to improve travel conditions; Essex County identified ten high priority functionally deficient intersections. The selection of these intersections was based on a multitude of factors, including previously collected data, historical operational concerns, and current safety information. As identified in Chapter 2, the ten intersections selected are listed in Table 19 and shown on Figure 9.

Table 19: Deficient Intersections identified by Essex County Department of Public Works

Intersection	Municipality
Eisenhower Parkway & Eagle Rock Avenue	Roseland
Eisenhower Parkway & South Orange Avenue	Livingston
Pleasant Valley Way & Northfield Avenue	West Orange
Franklin Street & Broad Street	Newark
Franklin Street & Watsessing Avenue	Bloomfield
West Passaic Avenue & Kingsland Street	Nutley
Coit Street & Chancellor Avenue	Irvington
Coit Street & Grove Street	Irvington
Coit Street & Lyons Avenue	Irvington
Grove Street & Lyons Avenue	Irvington

Source: Essex County Department of Public Works – Engineering Department

4.1.2 Plan4Safety Candidate Projects

To identify locations of potential mitigation, an assessment of intersection crash history was performed using Plan4Safety. Plan4Safety is a crash data delivery and analysis program created by Rutgers University Transportation Research Center. The website (http://plan4safety2.rutgers.edu) serves as a transportation support tool and provides valuable research information to assist in the acquisition of crash data and performance of safety analysis.

The crash data was collected in November 2012 and was analyzed for the most recent three years (January 2009 through December 2011). From the data retrieved, the top ten intersections were extracted. The 1st ranked intersection, by total accidents, was Springfield Avenue and Grove Street, which totaled 38 accidents. The 10th highest intersection, Springfield Avenue and Elmwood Avenue, totaled 31 accidents. The complete list of the "Top 10" intersections in the County is listed in Table 20.

Table 20: Essex County Plan4Safety Crash Data		
Municipality	**Intersection**	**No. of Incidents**
Irvington	Springfield Avenue & Grove Street	38
Verona	Pompton Avenue & Bloomfield Avenue	38
Newark	McCarter Highway & Clay Street	34
Belleville	Franklin Avenue & Mill Street	34
Newark	Springfield Avenue & Bergen Street	33
Newark	Market Street & 1st Street	32
Bloomfield	Bloomfield Avenue & Grove Street	32
Belleville	Rutgers Avenue & Cortland Street	32
East Orange	Central Avenue & Steuben Street	32
East Orange	Springfield Avenue & Elmwood Avenue	31

Source: Essex County Plan4Safety Crash Records

4.1.3 SAC Candidate Projects

As part of the Essex County Comprehensive Plan, a Steering Advisory Committee (SAC) was established to assist in the development of the ECCTP goals and objectives. During the second SAC Meeting, held on October 11, 2012, the committee members were asked to identify potential candidate projects within the County to be investigated as part of the ECCTP. The locations identified by the SAC at this meeting are listed in Table 21 and shown on Figure 9.

Table 21: Deficient Intersections identified by SAC	
Intersection	**Municipality**
Mount Pleasant Avenue in proximity to Bloomfield Avenue	Newark
Pedestrian Safety along Bloomfield Avenue	Montclair
Millburn Avenue and Main Street	Millburn
South Orange Avenue between Prospect Street and Springfield Avenue	South Orange
Bloomfield Avenue and Grove Street	Montclair
Springfield Avenue from New Street and Grove Street	Irvington
South Orange Avenue and Prospect Street three blocks towards Newark	South Orange
Bradford Avenue and Tremont Street	Cedar Grove

Source: SAC Meeting October 11, 2013

4.1.4 Public Outreach Candidate Projects

To determine potential projects within the 22 municipalities in Essex County, a series of Community Involvement Stakeholders (CIS) meetings were held by the ECCTP team. The goal of these meetings was to present the ECCTP to the community representatives, discuss the goals and objectives of the plan and identify projects and implementation strategies that would address and enhance multi-modal connectivity within Essex County for incorporation into the ECCTP. These meetings developed multiple projects, goals and initiatives to be investigated as part of the ECCTP. In addition, questions were distributed to all the municipalities to determine local transportation needs. The questionnaires received, included in Appendix C, were reviewed for potential projects which have been included in this plan.

4.1.5 Regional Travel Demand Model-Derived Candidate Projects

The North Jersey Regional Transportation Model – Enhanced (NJRTM-E) was used to identify locations, or County road segments, that have or are expected to have operational and/or capacity issues based on an assessment of volume/capacity ratios (V/C). The NJRTM-E is the regional transportation model for Northern

New Jersey and is maintained by the North Jersey Transportation Planning Authority (NJTPA). The model is used as part of the annual air quality conformity process to evaluate existing and future year traffic conditions. The model roadway network includes nearly all of the Essex County routes, although many minor street intersections are not included.

The NJRTM-E model for 2011, representing current conditions, was used to rank the roadway segments with the highest V/C ratio during the three-hour morning and evening peak periods. The top ten locations with V/C ratios greater than 0.80 are listed in Tables 22 & 23, for morning (AM) and evening (PM), respectively.

Table 22: County Route Corridors
Maximum V/C Ratio Existing – Morning Peak Period (2011)

Roadway	Milepost Range	Name	Municipality	Maximum V/C Ratio
CR 608	0.05 – 0.00	Hobart Gap Rd	Millburn	**2.05**
CR 508	10.37 - 10.48	Central Ave	Newark	**1.76**
CR 634	1.07 - 1.48	Laurel Ave	Livingston/Roseland	**1.53**
CR 508	6.19 - 6.22	Northfield Ave	West Orange	**1.42**
CR 659	0.70 - 0.51	Main St	West Orange	**1.42**
CR 508	9.23 - 9.35	Central Ave	East Orange	**1.37**
CR 604	0.67 - 0.73	Lindsley Ave	Cedar Grove	**1.37**
CR 509	14.78 - 14.30	Watsessing Ave	Bloomfield	**1.36**
CR 527	79.92 - 80.09	Roseland Ave	Essex Fells	**1.31**
CR 655	1.06 - 0.66	Watchung Avenue	Glen Ridge /Bloomfield	**1.25**

Source: NJRTM-E (2011)
[1]Multiple adjacent segments ranked within the top 10 and are combined with the highest ranked segment.

Table 23: County Route Corridors
Maximum V/C Ratio Existing - Evening Peak Period (2011)

Roadway	Milepost Range	Name	Municipality	Maximum V/C Ratio
CR 608	0.05 – 0.00	Hobart Gap Rd	Millburn	**3.75**
CR 625	1.36 - 2.02	Hollywood Ave	Fairfield	**3.63**
CR 510	28.25 - 28.1	South Orange Ave	Newark	**3.33**
CR 508	2.59 - 3.08	Northfield Ave	Livingston	**2.43**
CR 659	0.70 - 0.51	Main St	West Orange	**2.22**
CR 508	10.37 - 10.48	Central Ave	Newark	**2.11**
CR 527	79.92 - 80.09	Roseland Ave	Essex Fells	**1.87**
CR 634	1.05 - 0.97	Laurel Ave	Livingston/Roseland	**1.71**
CR 638	4.81 - 4.95	High St	City of Orange	**1.64**
CR 607	2.00 - 1.92	Walnut St	Livingston	**1.59**

Source: NJRTM-E (2011)
[1]Multiple adjacent segments ranked within the top 10 and are combined with the highest ranked segment.

Similarly, the NJRTM-E for 2035, representing future conditions, was used to rank the roadway segments with the highest V/C ratios, greater than 0.80. Several locations already identified in 2011 were noted but not removed from the 2035 lists. The top ten locations are listed in Tables 24 & 25 for morning and evening, respectively.

Table 24: County Route Corridors
Maximum Projected Future V/C Ratio - Morning Peak Period (2035)

Roadway	Milepost Range	Name	Municipality	Maximum V/C Ratio
CR 608	0.05 – 0.00	Hobart Gap Rd	Millburn	2.79
CR 506 Spur	4.16 - 4.30	Clay Street	Newark	2.34
CR 658	3.16 - 3.62	Park Ave	Newark	2.12
CR 508	10.17 - 9.94	Central Avenue	Newark	2.07
CR 510	29.1 - 29.27	Market Street	Newark	1.66
CR 659	0.70 - 0.51	Main St	West Orange	1.62
CR 527	79.92 - 80.09	Roseland Ave	Essex Fells	1.60
CR 603	2.91 - 3.28	Springfield Ave	Newark	1.60
CR 634	1.07 - 1.48	Laurel Ave	Livingston/Roseland	1.56
CR 619	1.98 - 1.62	Stuyvesant Ave	Irvington	1.55

Source: NJRTM-E (2011)
[1]Multiple adjacent segments ranked within the top 10 and are combined with the highest ranked segment.

Table 25: County Route Corridors
Maximum Projected Future V/C Ratio - Evening Peak Period (2035)

Roadway	Milepost Range	Name	Municipality	Maximum V/C Ratio
CR 608	0.05 – 0.00	Hobart Gap Rd	Millburn	4.14
CR 510	28.25 - 28.10	South Orange Ave	Newark	3.72
CR 625	1.75 - 2.02	Hollywood Ave	Fairfield	3.56
CR 607	2.00 - 1.92	Walnut St	Livingston	2.66
CR 508	2.59 - 3.08	Northfield Ave	Livingston	2.64
CR 659	0.70 - 0.51	Main St	West Orange	2.62
CR 527	79.92 - 80.09	Roseland Ave	Essex Fells	2.24
CR 506 Spur	4.30 - 4.16	Park Ave	Newark	2.12
CR 509	13.73 - 14.30	Central Ave	Newark	2.07
CR 604	0.73 - 0.67	Clay St	Newark	2.04

Source: NJRTM-E (2011)
[1]Multiple adjacent segments ranked within the top 10 and are combined with the highest ranked segment.

4.1.6 Project Classification

Input from the sources described in Sections 4.1.1 to 4.1.5 was used to compile a multi-modal project list consisting of Roadway System, Transit System, Bicycle, Pedestrian & Safety, and Aviation & Freight projects and strategies, as listed in Chapter 5, Tables 28 to 31.

Each of the projects were evaluated for its implementation timeline based on anticipated activities required for its planning, design, community acceptance and construction, as much as on its funding requirements. They were also evaluated against the ECCTP goals and objectives identified in Chapter 3. The projects were then classified in 3 tiers—i.e. Tier 1 being Short- Range implementation; Tier 2 as Medium- Range implementation; and Tier 3 as Long- Range implementation.
Short, Medium and Long-range projects were defined based on the following two factors:

Project Priority was developed using the prioritization number established by the operational and safety data, as well as other information and data available from the NJTPA, Essex County and Municipal public outreach, and;
Implementation Feasibility was considered a function of time and effort for each candidate project.

Utilizing these factors, the projects selected for inclusion in the ECCTP were divided into the three categories, or tiers:

Tier 1 – Short Range Projects
Short range projects are projects that are of a safety and operational nature, do not require significant investments to design and construct, are generally acceptable to the community and promise a high benefit-cost ratio. An implementation timeframe of approximately 18 months or less is expected.

Tier 2 – Medium Range Projects
Medium range projects are projects with substantial project priority, but would likely require more time, effort and investment to realize. An implementation timeframe between approximately 18 months to three years is expected.

Tier 3 – Long Range Projects
Long range projects were considered those projects with the most complex implementation possibilities due to funding, effort, number and variety of stakeholders and/or community acceptance. An implementation timeframe over five years is expected.

4.2 Technical Projects

Input from the sources described in Sections 4.1.1 to 4.1.5 was also used to identify the top 10 intersection locations for technical evaluation which includes, data collection and micro-analysis, and specific recommendations that may include system optimization, roadway improvements, and intersection enhancements.

The process to identify the technical projects required ranking the numerous projects identified in Section 4.1. These projects include roadway, transit, pedestrian and bicycling improvements to address all modes of transportation. A methodology for project selection was developed using an engineering technique known as *Indexing*.

4.2.1 Project Indexing Approach

The anticipated future growth of Essex County will result in higher travel demands throughout the various municipalities. As a result, more travel options need to be made available to the public and improvements made to all travel mode options to support the future demand in a safe and efficient manner.

Transportation improvement programs for multi-modal networks are continually being developed in locations throughout the State of New Jersey including Essex County. However, the demand for improvement projects often exceeds the capability, both logistically and economically; to implement these proposed improvement projects.

Indexing is a traffic planning and evaluation tool utilized to rank study locations, creating a prioritized list of improvement projects for implementation, also known as candidate projects. Typically, indexing refers to ranking intersections based on existing traffic and safety conditions. Other traffic operational conditions, such as level of service (LOS), average vehicle delay and volume-to-capacity (v/c) ratio, can

also be considered to develop the indexing process.

For the development of the ECCTP, an evaluation of existing conditions, including V/C ratios, accident data, and public outreach were utilized. In addition to these criteria, the ECCTP evaluated the potential for future improvements by identifying the proximity of locations to existing and/or proposed mass transit service.

4.2.2 Indexing Methodology and Criteria

As stated previously, the ECCTP Project Identification produced a variety of potential candidate projects. In order to objectively create a candidate project prioritization list, indexing methodology relies on the capability of applying a singular methodology to each potential candidate project. However, it is not practical to assess potential roadway intersection and corridor, transit, pedestrian and bicycling improvement projects uniformly. To this end, the criteria developed as part of the technical project evaluation was developed for intersection improvement projects.

Intersection improvement projects were isolated for the indexing methodology so the short-term improvement candidates could be identified and improvements recommended as part of this plan. The projects identified in Section 4.2, will be assessed as part of the ECCTP as short, medium or long-range improvement projects. These projects will have recommendations made as part of the ECCTP, but will not be included in the technical evaluation section of the ECCTP. The Indexing methodology and criteria utilized in the ranking of the technical projects are as follows:

Intersection Control Type
Intersection Control Type is the current traffic control present at an intersection. An intersection is controlled in one of two ways, stop-control or signal control. The signalized intersections were considered a higher priority for this analysis, as signalized improvement alternatives consist of short-term improvements which are easily implemented and cost-effective. Conversely, unsignalized intersection improvements often require geometric improvements or signalized control, which do not meet the short-term project goals.

Project Identification
Public Outreach was a key component in candidate project identification. As such, the indexing methodology included this as criteria for project prioritization. The indexing distinguished whether a candidate project was identified by the Essex County Department of Public Works – Engineering Department, the Steering Advisory Committee, the Community Involvement Stakeholder, and general public meetings.

For the purpose of this analysis, the projects identified through the Steering Advisory Committee and Community Stakeholder Meetings were grouped into a single category, entitled Public Outreach. The locations considered as candidate projects identified though the public outreach process included all intersections directly identified by individual Municipalities, as well as intersection locations which included two corridors identified by the public outreach. Additionally, intersections in close proximity along a single county corridor were grouped into a single location.

Operational Analysis
Operational analysis was evaluated based on the volume-to-capacity (v/c) ratio of the study location. The v/c ratio assessed as part of this methodology was provided by the NJRTM-E existing conditions for base year 2011. A peak hour v/c ratio of 1.0 indicates a LOS=F. Since the model evaluates conditions over a three hour peak period, the maximum v/c ratio threshold for failing operations was established by the ECCTP Team as 0.80 and was evaluated for the AM and PM peak periods. Locations were identified as meeting these criteria if one of the intersection approaches exceeded the 0.80 maximum.

Plan4Safety Crash Data
The Plan4Safety Crash Data was another criteria established for the project approach and methodology. The Plan4Safety data was applied in two modes. The first mode was to identify if a candidate project was within the top 10 crash occurrence location in Essex County; and the second was to identify if a candidate project had a crash occurrence history exceeding 15 crashes in 3 years (annual occurrence of 5 per year). This value was established based on the Manual

on Uniform Traffic Control Devices (MUTCD) Signal Warrant 7, Crash Experience.

The MUTCD states that if an intersection is subject to over 5 crashes in a 12 month period which are correctable by implementing signal control, than signalization is warranted. The Intersection Indexing Methodology applied the same criteria; however, applying it to justify intersection improvements rather than traffic control signal implementation.

Multi-Modal Value Weighting

As part of the County's decision process regarding the investment of limited resources in capital improvements in projects intended to relieve congestion and improve safety for motorists, bicyclists and pedestrians, the ECCTP uses an additional analysis to identify the top 10 technical projects based on proximity to transit. The analysis is related to the plotting of walking distances within a quarter-mile of the NJ TRANSIT train stations, bus stops or light rail in Essex County to identify potential intersections improvements that could enhance multi-modal access to transit, if designed appropriately. Projects with such potential would receive additional weight in the project identification and priority selection process.

4.2.3 Candidate Project Prioritization

Using the indexing criteria detailed in Section 4.2.3, the ECCTP prioritized a list of 33 projects. These locations were categorized by the geographic locations utilized in the strategy for Community Stakeholders Involvement (eastern municipalities, western municipalities and City of Newark). Overall, 15 locations in the Eastern Municipalities, 13 locations in the Western Municipalities and 5 locations in the City of Newark were evaluated.

It is also important to note that the Project Identification and Priority list does not consider all candidate projects for the ECCTP, just the operational projects considered for the technical evaluation as part of this project.

The ranking of locations was performed based on the total sum of assessment categories (represented by '●' symbol) shown on Table 26, which includes, Project Identification, Operational Analysis, Plan4Safety, and Mass Transit columns. The locations were ranked based on the total sum of assessment categories compared to other locations within the same geographic location. The project ranking shown in Table 26 is as follows:

Signal Control – The column was assigned the '●' symbol if the location operates with a traffic signal;

Project Identification: The column was assigned the '●' symbol if the location was identified by 'Essex County' Department of Public Works - Engineering Department and/or the 'Public Outreach' consisting of input from the Steering Advisory Committee and Community Involvement Stakeholders.

Operational Analysis: The column was assigned the '●' symbol if the location operates with a maximum v/c ratio along a County route greater than 0.80. The v/c ratio was also provided for ratios below 0.80, if available.

Plan4Safety: The column was assigned the '●' symbol if the location had an overall crash occurrence greater than 15, and if an intersection or segment of intersections are within the Top 10 in Essex County. The number of crashes is also listed for each intersection, if available.

Mass Transit: The column was assigned the '●' symbol if the location identified mass transit capability within a ¼ mile of the intersection or group of intersections. The mass transit availability was based on a hierarchy of (1) Rail, (2) Light Rail, and (3) Bus Stop derived from the NJRTM-E.

In locations where the total sum of hits from the indexing columns was identical, ranking was based on the following hierarchy: (1) Project Identification, (2) Plan4Safety: Top 10, (3) Plan4Safety: Sum of crashes for intersection or group of intersections, and (4) Operational Analysis v/c ratio.

4.2.4 Technical Evaluation Project List

The Project Selection for the technical evaluation projects was determined using the ranking shown in Table 26. The remaining projects were then added to the multi-modal project list in Chapter 5 and divided into short, medium and long range projects. Top ranking projects were

TABLE 26: CANDIDATE PROJECT LIST AND PRIORITY

Region	Location No.	Candidate Project Location			No. of Intersections	Traffic Signal Control	ASSESMENT CATEGORIES									Total Identified Assement Categories[5]	Rank[6]
							Project Identification[1]		Operational Analysis[2]		Plan4Safety[3]			Mass Transit[4]			
		Municipality	Major Street	Minor Street			Essex County	Public Outreach	v/c > 0.80	Max v/c ratio	Crashes > 15	# of Crashes	Top 10	< 1/4 Mile	Type		
EASTERN MUNICIPALITIES	1	Belleville Township	Rutgers Street (CR 506)	Cortland Street	1	●					●	32	●	●	Bus Stop	3	10
	2	Belleville Township/ City of Newark	Franklin Avenue (CR 645)	Belleville Avenue (CR 506)	3	●		●		0.57	●	26		●	Bus Stop	4	3
				Mill Street				●		0.37	●	34	●				
				Clara Maas Drive				●		N/A		8					
	3	Bloomfield Township	Bloomfield Avenue (CR 506)	Grove Street (CR 509)	1	●		●	●	1.02	●	32	●	●	Light Rail	5	**2**
	4	Bloomfield Township	Broad Street/Franklin Street (CR 509)	CR 663/Broad Street/ Liberty Street	1	●	●	●	●	0.96				●	Rail	4	9
	5	Bloomfield Township	Franklin Street (CR 509)	Watsessing Avenue (CR 509)	1	●	●	●	●	0.94		7		●	Bus Stop	4	8
	6	Nutley Township	West Passaic Avenue/ Darling Avenue (CR 622)	Kingsland Street (CR 644)	1	●	●		●	1.07		9		●	Bus Stop	3	12
	7	City of Orange	Central Avenue (CR 508)	Scotland Road (CR 658)	2	●		●		0.66		11		●	Rail	2	15
				South Central Street				●		N/A							
	8	East Orange City	Central Avenue (CR 508)	Stueben Street/18th Street	1	●			●	0.95	●	32	●	●	Bus Stop	4	5
	9	Irvington Township	Coit Street (CR 509)	Chancellor Avenue (CR 601)	2	●	●		●	0.93	●	28		●	Bus Stop	4	6
				Lyons Avenue (602)			●		●	1.02							
	10	Irvington Township	Grove Street (CR 509)	Coit Street (CR 509)	2	●	●		●	0.98	●	17		●	Bus Stop	4	4
				Lyons Avenue (602)			●		●	0.90	●	20					
	11	Irvington Township	Springfield Avenue (CR 603)	Clinton Road (CR 665)	2	●		●	●	0.97	●	30		●	Bus Stop	5	**1**
				Grove Street (CR 509)				●	●	0.88	●	38	●				
	12	Irvington Township	Springfield Avenue (CR 603)	Elmwood Avenue	1	●					●	31	●	●	Bus Stop	3	11
	13	Montclair Township	Watchung Avenue (CR 655)	Valley Road (CR 621)	2	●		●		0.69		12		●	Bus Stop	2	13
				Grove Street (CR 623)				●		0.68		13					
	14	Montclair Township/ Glen Ridge Borough	Watchung Avenue (CR 655)	Ridgewood Avenue (653)	2	●		●	●	1.08		6				2	14
				Grove Street (CR 623)				●	●	0.82		12					
	15	South Orange Village Township	South Orange Avenue (CR 510)	Scotland Rd/Valley St (CR 658)	1	●		●	●	0.90	●	25		●	Rail	4	7
WESTERN MUNICIPALITIES	16	Cedar Grove Township	Bradford Avenue (CR 640)	Cresmont Street	2			●		N/A						1	13
				Woodstone Drvie				●		N/A							
	17	Essex Fells Township	Roseland Avenue (CR 527)	Runnymede Road (CR 633)	2			●	●	1.02				●	Bus Stop	3	11
				Borough Place				●		N/A							
	18	Livingston Township	Passaic Avenue (CR 607)	South Orange Avenue (CR 510)	2	●		●	●	0.89	●	15		●	Bus Stop	4	5
				Parsonage Hill Road (CR 606)				●		0.70							
	19	Livingston Township	South Orange Avenue (CR 510)	Eisenhower Pkwy (CR 609)	1	●	●			0.72	●	19		●	Bus Stop	3	7
	20	Millburn Township	Main Street (CR 527)	Millburn Avenue (CR 577)	2	●		●	●	1.04	●	26		●	Rail	4	**2**
				Essex Street				●	●	1.04							

TABLE 26: CANDIDATE PROJECT LIST AND PRIORITY

Region	Location No.	Candidate Project Location			No. of Intersections	Traffic Signal Control	ASSESMENT CATEGORIES									Total Identified Assement Categories[5]	Rank[6]
							Project Identification[1]		Operational Analysis[2]		Plan4Safety[3]			Mass Transit[4]			
		Municipality	Major Street	Minor Street			Essex County	Public Outreach	v/c > 0.80	Max v/c ratio	Crashes > 15	# of Crashes	Top 10	< 1/4 Mile	Type		
WESTERN MUNI-CIPALITIES	21	North Caldwell Borough	Central Avenue/ Grandview Avenue (CR 631)	W. Greenbrook Road (CR 628)	2			●				6				1	12
				E. Greenbrook Road						N/A							
	22	Roseland Borough	Eagle Rock Avenue (CR 611)	Eisenhower Pkwy (CR 609)	2	•	●	●		0.79	●	18				4	4
				Passaic Avenue (CR 613)				●	●	0.85							
	23	Roseland Borough	Roseland Avenue/South Livingston Avenue (CR 527)	Harrison Avenue (CR 656)	2	•		●	●	1.11				●	Bus Stop	3	10
				Eagle Rock Avenue (CR 611)				●		0.71		6					
	24	Verona Township	Bloomfield Avenue (CR 506)	Mount Prospect Ave. (CR 577)	1	•		●	●	0.84	●	38	●	●	Bus Stop	5	**1**
				State Route 23 (Pompton Av.)													
	25	West Caldwell Township	Passaic Avenue (CR 613)	Bloomfield Avenue (CR 506)	2	•		●		0.74				●	Bus Stop	3	8
				Clinton Road (CR 614)						0.57	●	16					
	26	West Orange Township	Eagle Rock Avenue (CR 611)	Main Street (CR 659)	1	•		●		0.57		10		●	Bus Stop	3	9
	27	West Orange Township	Main Street (CR 659)	Washington Street (CR 671)	2	•		●		0.57		8		●	Bus Stop	3	6
				Park Avenue (CR 658)				●		0.74		14					
	28	West Orange Township	Pleasant Valley Way (CR 508)	Northfield Avenue (CR 508)	1	•	●		●	1.08	●	23		●	Bus Stop	4	**3**
CITY OF NEWARK	29	City of Newark	Central Avenue (CR 508)	1st Street	3	•		●	●	1.05	●	24		●	Light Rail	4	2
				Norfolk Street				●		0.44		5					
				Dr. Martin Luther King Drive				●		0.55		10					
	30	City of Newark	Market Street	1st Street	1	•					●	32	●	●	Bus Stop	3	5
	31	City of Newark	Bloomfield Avenue (CR 506S)	Mount Prospect Ave.	2	•		●	●	0.89	●	23		●	Bus Stop	4	**1**
				Park Avenue/MLK Blvd/Crittenden Street (CR 658)				●	●	0.93	●	17		●	Bus Stop	4	
	32	City of Newark	McCarter Highway (SR 21)	Clay Street	1	•					●	34	●	●	Bus Stop	3	4
	33	City of Newark	Springfield Avenue (CR 603)	Bergen Street	1	•			●	0.96	●	33	●	●	Bus Stop	4	3

NOTES:
1. Technical evaluations of intersections highlighted in blue will be completed as part of the ECCTP development.
2. Project Identification: Lists projects identified by the 'Essex County' Department of Public Works -Engineering Department and/or the 'Public Outreach' consisting of the Steering Advisory Committee and Community Stakeholders.
3. Operational Analysis: Max v/c Ratio along County Route.
4. Plan4Safety: Indicates overall crash occurrence and if an intersection or segment of intersections are within the Top 10 in Essex County.
5. Mass Transit: Identified within a ¼ mile of the intersection or group of intersections based on a hierarchy of 1. Rail, 2. Light Rail or 3. Bus Stop derived from NJ Transit GIS .
6. Sum of assesment categories '●' from Project Identification, Operational Analysis, Plan4Safety and Mass Transit columns.
7. Ranking based on hierarchy of assesment categories: 1. Project Identification, 2.Plan4Safety: Top 10, 3. Plan4Safety: Sum of crashes for intersection or group of intersections, & 4. Operational Analysis in each region: eastern municipalities, western municipalities and the City of Newark.

selected from each geographic location, totaling 9 intersections and advanced to a detailed technical evaluation.

The technical evaluation of these projects will consist of analyzing the existing capacity and operational conditions of the locations. It will also assess the existing traffic signal equipment and perform a review of existing signing and striping conditions. The objective of the analysis is to provide short-term recommendations to improve traffic signal operations and identify the potential to improve the existing pedestrian, bicycle, or multi-modal capabilities and safety.

The selection of Technical Evaluation Candidate Project List was limited to nine (9) intersections. All of these projects are categorized as Tier 1 – Short Range Projects. Table 27 details the six locations, totaling nine intersections, selected for Technical Evaluation.

Table 27: Technical Evaluation Project List

Region	Location No. (from Table 26)	Municipality	Major Street	No. of Intersections	Hits	Rank
Eastern	3	Bloomfield Twp.	CR 506	1	5	2
	11	Irvington Twp.	CR 603	2	5	1
Western	20	Millburn Twp.	CR 527	2	4	2
	24	Verona Twp.	CR 506	1	5	1
	28	West Orange Twp.	CR 508	1	4	3
Newark	31	City of Newark	CR 506S	2	4	1

Chapter 5: Evaluation and Assessment

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Chapter 5: Evaluation and Assessment

5.1 Project Evaluation Introduction

The projects that were identified in Chapter 4 were filtered through several quantitative and qualitative screens. Quantitative screens included the North Jersey Regional Transportation Model (NJRTM-E) of the NJTPA, the Plan4Safety support tool of the Rutgers University Transportation Safety Research Center, and the top ten intersections identified by the Essex County Department of Public Works as having the greatest need of improvement based on information obtained during our public outreach. Qualitative screens included interviews and group meetings with municipal engineers and planners, responses to questionnaires and a separate multimodal proximity analysis of intersections within ¼ mile of a train station.

5.2 Project Evaluation Criteria

Once the projects that surfaced from the quantitative and qualitative evaluations described in Section 5.1 above were identified, they were evaluated as to their consistency with the Vision: "A safe, coordinated and integrated multimodal transportation system that provides accessibility for all users while promoting connectivity, economic vitality and productivity, our communities' livability and our ecosystem's viability", and the five goals outlined in Section 3.2.1

The value of the various projects identified for Short-, Medium- and Long range action in achieving one or more of the five goals of the ECCTP and implementing the County's Complete Streets Policy is discussed below. This review is intended to ensure that the implementation of the ECCTP will enable the County to realize the Plan's Vision.

Projects have been identified in Tables 28- 31 and are listed in alphabetical order by municipality.

5.2.1 Goal 1 – Maintain a Safe and Efficient Roadway System

Maintaining a safe and efficient roadway system has always been a goal of traditional transportation plans and circulation elements of master plans. However, with the adoption of the Complete Streets Policy by the Essex County Board of Chosen Freeholders, reaching this goal extends beyond minimizing automobile accidents and reducing traffic congestion to reasonable levels.

Safe Roadway System – A safe roadway system under a Complete Streets rubric includes not only the "*location and design of transportation routes which will promote the free flow of traffic while discouraging location of such facilities and routes which will result in congestion or blight*"[4]. If a street is truly "complete" the safety of pedestrians and cyclists and accommodation for transit and freight must also be weighed in the balance. The Plan4Safety accident data analyzed in Chapter 4 of the ECCTP included both vehicular and pedestrian accidents and intersections were evaluated for both. In some cases, the same intersection may have been among the most dangerous for both vehicular collisions and collisions between vehicles and pedestrians. While accident data linked to bicycle use was not included in the Plan4Safety analysis, bicycle mobility along roadway links and through intersections can be evaluated using other metrics. To the extent that bicycles share the road with motor vehicles, they are treated as a motor vehicle. Once a cyclist dismounts, he or she is a pedestrian walking with a bicycle and is treated accordingly with regard to safety improvements.

Based on the above, improvements made to intersections rated as hazardous, both for number of crash occurrences and annual crash occurrence (five or more accidents per year over three years), as well as for accidents involving pedestrians, would increase safety for motorists and pedestrians, and by extension, for cyclists passing through the intersection. Such improvements would need to be designed to balance safe performance for vehicular turning movements at the intersection with appropriate pedestrian phases in the signalization scheme so that conflicts between vehicles and pedestrians is minimized.

[4] Municipal Land Use Law (NJSA 40:55D-2h)

Another design consideration along roadway links is the regulated speed limit. Decisions on speed limits should be based on the application of the Complete Streets Policy organized according to Transect Zone, see Figure K. For example, roadway links classified by the County as traversing T-4, T-5 or T-6 should have the speed limit adjusted to the appropriate level for safe sharing of the street (i.e., 35mph in T-4 (Suburban), 30 mph in T-5 (Urban Center) and 25mph in T-6 (Urban Core)) Roadways with speed limits of 25mph or less are considered appropriate for sharing between motor vehicles and bicycles. Roadways with speed limits of 20mph or less are considered safe for sharing by all modes without the need for separation.

Figure K: Transect Zones T 1 thru T6. ***Source: SmartCode***

Efficient Roadway System- The second part of Goal 1 is to maintain an efficient roadway system. This part of the goal is again focused on balancing the "free flow of traffic" across all modes of transportation (pedestrian, bicycle, transit and vehicular). There are a variety of metrics for the efficiency of vehicular traffic. The operational analysis in Chapter 4 uses a volume-to-capacity (v/c) ratio. Conventional traffic impact studies also measure the "Level of Service" (LOS) of intersections based on the delay experienced to get through the intersection. Intersections with one or more approaches with a volume exceeding 80% of capacity (v/c ratio of >0.80) and/or a LOS of "E" (at capacity and unstable) or "F" (failure) would be considered congested and inefficient.

In order to apply the Complete Streets rubric to the evaluation of an efficient roadway system, future roadway improvements will need to be evaluated on a more diverse set of metrics that balance vehicular efficiency with pedestrian, transit and bicycle efficiency. The ECCTP proposes to use Transect-based criteria to distribute the efficiency between modes of transportation. For example, an intersection improvement in Transect 5 (Urban Center), such as in downtown Bloomfield or downtown East Orange might require equal efficiency for signal phasing for vehicular turning movements and pedestrian crossings and require additional signage for bicycle mobility, depending on the speed limit (if >25 mph). An intersection improvement in Transect 6 (Urban Core), such as Central Avenue in Newark, may favor pedestrian mobility due to the heavy pedestrian activity in that area and bicycles will share the road with motor vehicles because of a 25 mph speed limit. Conversely, an intersection in

Transect 3 (Suburban) might have approaches with dedicated bike lanes or a multi-purpose path (Complete Streets Policy #3), a shorter, button activated pedestrian phase at the signal and speed limits of 45 mph or more in order to relate modal efficiency to the Transect Zone.

As the Transect Zones described in the ECCTP apply to County roads, the extent to which freight transportation is addressed will depend on the need to service commercial and industrial land uses that would be most likely accessed from county roads in Transect Zones 4 through 6. Generally, freight traffic that is passing through Essex County will be traveling to or from Port Newark and Newark Liberty International Airport and should be using state or federal highways. Likewise, Transect Zones 1 through 3 are predominantly either open space or residential areas and county roads in those Transect Zones should not be routes for freight traffic. In the Transect Zones where local freight trips are needed for pickup or delivery, the trucks and passenger vehicles will be designed for together in a Complete Streets design while pedestrians, bicycles, and sometimes buses, will either have dedicated exclusive or multipurpose paths or lanes. Complete Street design, however, should anticipate the need for loading zones, perhaps during regulated hours, and turning radii for trucks at intersections where local deliveries are expected.

5.2.2 Goal 2 –Increase the Use of Mass Transit

In addition to making streets safer and more efficient in conveying all modes of transportation, Goal 2 seeks to convert as many trips as possible from automobile to transit. Greater use of bus and rail transit provides a wide range of benefits such as:

- Reduction of traffic congestion and rush hour delays;
- Reduction of Vehicle Miles Traveled (VMT), which reduces Green House Gas (GHG) emissions and increases air quality;
- Reduction of fossil fuel consumption;
- Increased efficiency in public transit, and;
- Greater economic viability of land uses surrounding train stations and near bus stops.

In many instances, achieving one goal will effectuate the achievement of another. For example, in Section 2.7.4 of this Plan, the ECCTP Steering Advisory Committee identified excessive speeding on County roads in areas of concentrated pedestrian activity and high density development (Transects 5 and 6) as the primary safety issue and improvements to pedestrian access to transit stations as another (Goal 1). Successfully addressing both of these issues through traffic calming, implementation of the Complete Streets Policy and prioritizing pedestrian crossings at intersections near transit will also increase the use of mass transit.

Because of the character of many Essex County towns as fully developed mature suburbs (Bloomfield, Glen Ridge and Montclair), outer-ring urban areas (Hillside, Irvington, Orange, and East Orange), much of the implementation of Goal 2 will come from redevelopment and rehabilitation projects near transit. Redevelopment sites within a quarter mile walking distance of a train station or bus depot (such as the Irvington Bus Terminal), or even a Newark Light Rail station, would attract mixed-use development of a higher density. Development in less proximate areas of a town might need to rely on paratransit and might support lesser levels of development.

Finally, the strategic increase in capacity and service of NJ TRANSIT train service will need to be coordinated with efforts to make it safer and more convenient to access transit facilities. The ridership capacity of individual trains and/or adding trains to the lines during the peak commuting periods would facilitate an increase in the use of mass transit.

5.2.3 Goal 3 – Increase and/or provide more opportunities for Walking & Bicycling

The Essex County Complete Streets Policy provides several requirements for incorporation of opportunities for walking and bicycling as an alternative to the automobile as the mode of "choice" to travel throughout the County. Policy #2 charges the County with "*developing a list of pedestrian, bicycle and transit accommodations*

such as accessible sidewalks, curb ramps, crosswalks, countdown pedestrian signals, signs, curb extensions, pedestrian scale lighting, bike lanes, and shoulders for consideration in each project where County jurisdiction applies". Policy #4 calls for a procedure to "*evaluate resurfacing projects for Complete Streets inclusion according to length of project, local support, environmental constraints, right-of-way limitations, funding resources, and bicycle and/or pedestrian compatibility*". Policy #5 requires that transportation facilities intended for long-term use "*anticipate likely future demand for bicycling and walking facilities*". Policy #9 links Complete Streets to "*connections for Safe Routes to Schools, Safe Routes to Transit, Transit Villages, trail crossings and areas or population groups with limited transportation options*".

It is evident that the implementation of the Complete Streets Policy will also implement Goal 3, however, specific action steps that could be taken could include:

- Incorporate LEED-ND practices and standards into the development regulations of the County and its more urban municipalities;[5]
- Expand the rail-trail network using underutilized or abandoned freight rail right-of-way that is not targeted for reactivation for passenger or freight use, and;
- Develop public education materials for incorporation of new design techniques for "pedestrianizing" streets, such as "parklets", safety islands, etc.

Photos 4 and 5: Example of "Parklets", which are becoming increasingly popular in cities like San Francisco and Oakland, CA and Boston. The example at left shows a parklet within the side street parking area. In Manhattan (right), parklets have been created within former turning lanes, center medians or even travel lanes as part of road diet treatments.

[5] LEED 2009 for Neighborhood Development Rating System, Site Location & Linkage, Credit 3 – Locations with Reduced Automobile Dependence; Credit 4 – Bicycle Network & Storage; Neighborhood Pattern & Design, Credit 1 – Walkable Streets, Credit 6 – Street Network.

5.2.4 Goal 4 – Connectivity for all modes of Transportation Intra-County Connectivity

Goal 4 emphasizes connectivity as an overall goal of the ECCTP, but with the facilitation of multimodal trips and links between modes within a trip as a specific desired outcome. Section 3.2.1 summarizes the intent of the Steering Advisory Committee (SAC) to:

- Improve pedestrian facilities around transit facilities;
- Improve inter-municipal and inter-county linkages of bicycle pathways, rail trails and Complete Street treatments, and;
- Improve linkages between bus and rail transit.

Many of the strategies for linking bike-ped to transit involve resolution of conflicts between modes of travel and filling the gaps in bike-ped pathway networks (sidewalks, bike lanes). Others focus on accommodations for bike-ped commuters (shelters, bicycle storage, bicycle carrying apparatus on buses and trains, etc.).

Improving linkages between bus and rail transit in Essex County will most effectively be achieved in two ways:

- Improving paratransit service between areas unserved by transit and bus stops and/or train stations;
- Encouraging new development and redevelopment within walking distance of bus stops and train stations and improving pedestrian connections to transit.

Photos 6 and 7: Bicycle links to bus (left) and train (right) transit.

5.2.5 Goal 5 – Foster and Support Development & Industrial Growth

Goal 5 emphasizes the critical role of a robust, multimodal transportation network to encourage and sustain future development and redevelopment, as well as the need for employment and economic development created by industrial growth, which is enhanced by the freight and aviation facilities within Essex County. This goal will be achieved by encouraging new development and redevelopment around transit facilities, as well as through the planned expansion of the port and Newark Liberty International Airport. In addition, the County can facilitate these improvements by developing a County truck route to aide in the movement of goods and service.

5.3 Multi-Modal Projects

The projects that were identified in Chapter 4 were divided into the following transportation system project lists:

- Roadway System;
- Transit System;
- Bicycle, Pedestrian and Safety Systems, and;
- Aviation and Freight System Projects.

5.3.1 Roadway System Projects

Table 28 details the evaluation of the Roadway Systems Projects, which classifies the selected projects by Tier (Short, Medium and Long) and identifies the ECCTP goal each project supports.

Table 28: Roadway System Projects

	Project	Municipality	Tier	Goals				
				1	2	3	4	5
1.	Intersections of Franklin Avenue with Belleville Avenue, Mill Street and Clara Mass Drive	Belleville & Newark	1	●	●			●
2.	Rutgers Street and Cortland Street	Belleville	1	●	●			●
3.	Intersections of Franklin Street with Broad Street/Liberty Street and Watsessing Avenue	Bloomfield	1	●	●			●
4.	Intersections of Bradford Avenue with Crestmont Street and Woodstone Drive	Cedar Grove	2	●		●	●	●
5.	Intersection of Springfield Avenue and Elmwood Avenue	East Orange	1	●	●			●
6.	Intersections of Central Avenue with Scotland Road, South Central Street and Steuben Street/18th Street	East Orange & Orange	1	●	●			●
7	Unsignalized intersections of Roseland Avenue with Runnymede Road and Borough Place	Essex Fells	2	●	●	●	●	●
8.	Ridgewood Avenue (CR 653) Corridor (MP 0.00 – 3.20)	Glen Ridge	1		●			●
9.	Watchung Avenue Corridor between Valley Road and Ridgewood Avenue (MP 0.66 – 1.06)	Glen Ridge & Montclair	2	●	●	●	●	●
10.	Intersections of Coit Street with Lyons Avenue and Chancellor Avenue	Irvington	1	●	●			●
11.	Proposed Eisenhower Parkway Extension	Livingston	2/3	●				●
12.	Intersections of West Mount Pleasant Avenue & Livingston Avenue	Livingston	2	●	●			●
13.	Passaic Avenue (CR 613) Corridor	Livingston, Roseland, & West Caldwell	2	●	●	●	●	●

14.	Intersections of South Orange Avenue with Scotland Road/Valley Street, Passaic Avenue & Eisenhower Parkway	Livingston & South Orange	2	•	•			•
15.	Central Avenue Corridor (MP 13.73 – 14.30)	Newark	1	•	•			•
16.	West Greenbrook Road between Passaic Avenue and Central Avenue/Grandview Avenue	North Caldwell	2	•		•	•	•
17.	Intersection of Mountain Avenue and Gould Avenue	North Caldwell	2	•				•
18.	Intersections of West Passaic Avenue/Darling Avenue and Kingsland Street	Nutley	1	•	•			•
19.	Centre Street (CR 648) Corridor	Nutley	2	•	•		•	
20.	Intersections of Eagle Rock Avenue with Eisenhower Parkway, Passaic Avenue, Roseland Avenue & Pleasant Valley Way	Roseland/ West Orange	2	•		•	•	•
21.	Intersections of Main Street with Eagle Rock Avenue, Washington Street & Park Avenue	West Orange	1	•	•			•
22.	Pleasant Valley Way (CR 636) Corridor	West Orange	2	•	•			
23.	South Orange Avenue (CR 510) Corridor	Multiple Municipalities	2	•	•			•
24.	Valley Street (CR 638) Corridor MP 0.00 – MP 3.06	Multiple Municipalities	2	•	•			•
25.	Bloomfield Avenue (CR 506/506S) Corridor	Multiple Municipalities	2	•	•			•
26.	Intelligent Transportation System (ITS) County Routes	Multiple Municipalities	2	•	•			•
27.	Garden State Parkway and New Jersey Turnpike	Multiple Municipalities	2	•				•
28.	Essex County Land Development Regulation Standards	Multiple Municipalities	2	•	•	•	•	•

5.3.2 Transit System Project

Table 29 details the evaluation of the Transit Systems Projects, which classifies the selected projects by Tier (Short, Medium and Long) and identifies the ECCTP goal each project supports.

Table 29: Transit System Projects

	Project	Municipality	Tier	Goals				
				1	2	3	4	5
1.	Conversion of abandoned rail lines within Essex County	Multiple Municipalities	3	●	●			●
2.	Essex County Land Development Regulation	Multiple Municipalities	1/2		●			●
3.	Disabled & Senior Transport Services	Multiple Municipalities	1	●	●			●
4.	Jitney Shuttle Services	Multiple Municipalities	1		●			●
5.	Go Bus at Glen Ridge Station	Glen Ridge	1		●			●
6.	Maplewood Train Station	Maplewood	2	●	●		●	●
7	Increased Train Station Service	Multiple Municipalities	2		●			●
8.	River Road & East White Terrace Bus Stops	Nutley	1		●	●		●
9.	Genesis Tower Train Station	Newark	1		●			●
10.	Relocation of Bus Stops	Multiple Municipalities	1		●	●	●	●
11.	NJ TRANSIT Bus Stops Bloomfield Avenue with Linn Drive and Sunset Avenue	Verona	1		●	●		●
12.	Bus Rapid Transit	Multiple Municipalities	2		●			●
13.	Newark Light Rail	Bloomfield, Belleville, Glen Ridge, Montclair & Maplewood	2		●			●
14.	NJ TRANSIT Midtown Direct Service	South Orange, East Orange & Orange	1		●			●

15.	Orange and Highland Avenue Train Stations	Orange	2		•	•	•	•

5.3.3 Bicycle, Pedestrian & Safety System Projects

Table 30 details the evaluation of the Bicycle, Pedestrian & Safety Systems Projects, which classifies the selected projects by Tier (Short, Medium and Long) and identifies the ECCTP goal each project supports.

Table 30: Bicycle, Pedestrian & Safety Systems Projects

	Project	Municipality	Tier	Goals				
				1	2	3	4	5
1.	Develop a detailed county-wide bike plan using the Essex County Park system	Multiple Municipalities	1/2			•	•	•
2.	Conversion to a greenway for Morris Canal and the Boonton rail line	Multiple Municipalities	2/3	•		•	•	•
3.	Bicycle Sharing at Colleges, Transit Stations & other strategic locations	Multiple Municipalities	2		•	•	•	•
4.	Update the Essex County Land Development Regulation	Multiple Municipalities	1/2	•	•	•	•	•
5.	City of Newark Pedestrian Safety Action Plan	Newark	2			•	•	•
6.	River Road (CR 624) and Centre Street Corridors	Nutley	1	•		•	•	•
7	Hobart Avenue and Highland Avenue in proximity to the Short Hills Train Station and Glen Avenue in the proximity to the Millburn Train Station	Millburn	1		•	•	•	•
8.	Wyoming Avenue (CR 577)	Millburn	1	•	•	•	•	
9.	Grove Street (CR 623)	Montclair	1	•	•	•	•	
10.	Broad Street (CR 509) Corridor	Bloomfield	1			•	•	•
11.	Bloomfield Avenue (CR 506/506S) Corridor	Multiple Municipalities	2	•	•	•	•	•
12.	Franklin Avenue (CR 645) Corridor	Belleville	1			•	•	•

13.	Ridgewood Avenue (CR 653) and Belleville Avenue (CR 506) Corridors	Glen Ridge/ Maplewood	1	•		•	•	•
14.	Glen Ridge Train Station	Glen Ridge	1			•	•	•
15.	Watchung Avenue (CR 655) from Ridgewood Avenue(CR 653) to Hawthorne Avenue	Glen Ridge	1	•		•	•	•
16.	County Routes	Livingston	2			•	•	•
17.	Maplewood Train Station	Maplewood	1		•	•	•	•
18.	Valley Street (CR 638) and Wyoming Avenue (CR 577) Corridors	Maplewood	1	•		•	•	•
19.	Intersection of Bloomfield Avenue (CR 506) and Seymour Street	Montclair	1	•		•	•	•
20.	South Orange and Mountain Avenue Train Stations	South Orange	1		•	•	•	•
21.	Intersection of Eagle Rock Avenue (CR 611) and Eisenhower Parkway (CR 609)	Roseland	1	•		•	•	•
22.	South Orange Avenue (CR 510) Corridor	South Orange	1	•		•	•	•
23.	Train Station Lighting Improvements	Multiple Municipalities	2			•	•	•
24.	Verona Park	Verona	1			•	•	•
25.	Intersection of Fairview Avenue (CR 637) and Personette Avenue	Verona	2	•		•	•	•
26.	Bloomfield Avenue (CR 506) intersection with Oakridge Road, Fells Road, Fairview Avenue and Linn Drive	Verona	1	•		•	•	•
27.	Sidewalk Facilities on County Routes within ¼ mile of School	Multiple Municipalities	1			•	•	•
28.	Passaic Avenue(CR 613) Corridor	West Caldwell	1	•		•	•	•
29.	Northfield Avenue (CR 508) Sidewalk Improvements	West Orange	1		•	•	•	

30.	Route 280 Crossings	Multiple Municipalities	2	•		•		•
31.	Bicycle Facilities at Train Stations	Multiple Municipalities	1		•	•	•	•

5.3.4 Aviation & Freight System Projects

Table 31 below details the evaluation of the Aviation & Freight Systems Projects, which classifies the selected projects by Tier (Short, Medium and Long) and identifies the ECCTP goal each project supports.

Table 31: Aviation & Freight Systems Projects

Project		Municipality	Tier	Goals				
				1	2	3	4	5
1.	Implementation of County-wide truck route and delivery system including addressing rail/roadway clearance issues (e.g. Avenue P) and truck parking needs	Multiple Municipalities	1	•				•
2.	Explore potential rail oriented industrial development in the vicinity of Oak Island Yard	Multiple Municipalities	3					•
3.	Identify off airport cargo facilities, needs that may result in the displacement of existing on-airport facilities under proposed runway or terminal expansion initiatives at Newark International Airport	Multiple Municipalities	3	•				•
4.	Identify trucking support facilities and warehousing opportunities for brownfield redevelopment areas	Multiple Municipalities	3	•				•
5.	Improve Port/Airport Signage	Multiple Municipalities	1	•				•
6.	Improve truck parking and rail bottleneck along the Lehigh Valley Line	Multiple Municipalities	3	•				•

5.4 Technical Evaluation Projects

The following section of the report details the evaluation process of the technical projects, results and conclusions for the six locations (9 intersections) identified through the indexing methodology of the Candidate Project Prioritization List. An overview of the Candidate Project List is included in Table 32.

Table 32: Technical Evaluation Projects						
Region	**Location No.**	**Municipality**	**Major Street**	**No. of Intersections**	**Hits**	**Rank**
Eastern	3	Bloomfield Twp.	CR 506	1	5	2
	11	Irvington Twp.	CR 603	2	5	1
Western	20	Millburn Twp.	CR 527	2	4	2
	24	Verona Twp.	CR 506	1	5	1
	28	West Orange Twp.	CR 508	1	4	3
Newark	31	City of Newark	CR 506S	2	4	1

5.4.1 Data Collection and Gathering

To perform operational analysis of the six locations, traffic volume data was gathered from previous counts on file with Essex County. The County provided count data at three of the nine locations, and previous data was on file for two intersections in Millburn Township. As a result, additional data collection was necessary at four of the nine intersections. This data was collected on March 4, 2013 and March 5, 2013, respectively. Table 33 details the traffic data collection.

Table 33: Technical Evaluation Projects Traffic Count Data					
Region	**Location No.**	**Municipality**	**Major Street**	**No. of Intersections**	**Date of Traffic Counts**
Eastern	3	Bloomfield Twp.	CR 506	1	3/4/2013
	11	Irvington Twp.	CR 603	2	1/19/2006 3/4/2013
Western	20	Millburn Twp.	CR 527	2	2007
	24	Verona Twp.	CR 506	1	10/6/2009
	28	West Orange Twp.	CR 508	1	3/5/2013
Newark	31	City of Newark	CR 506S	2	3/5/2013 2/6/2008

5.4.2 Existing Conditions Assessment

The project team performed a field investigation and review of the signal operations and timings at each of the nine intersections. This investigation included an evaluation of the existing signal timings to determine the existing vehicle and pedestrian clearance times, as well as a detailed crash-type breakdown at each location based on Plan4Safety data.

This information will be combined with the operational data analysis to develop future improvements and recommendations at each location. The following sections detail the assessment of the existing conditions.

A. Existing Deficiencies

The project team reviewed the existing conditions at the nine intersections to determine deficiencies related to safety, operations and capacity. Members of the team visited each of the intersections and evaluated site conditions, existing plans, traffic signal timing directives, capacity analysis and crash records to identify the issues at each location.

Bloomfield Avenue (CR 506) and Grove Street (CR 509) in Bloomfield Township

- Missing advance lane assignment signs on the westbound approach to Grove Street;
- Faded and worn pavement markings on Grove Street approaches, missing double yellow center roadway striping;
- An insufficient number of three (3) pedestrian push buttons provided for Bloomfield Avenue crossing;
- Driveway overlapping along with bus stop locations on Grove Street westbound approach causing congestion, and;
- 8-inch traffic signal indications on some approaches which is a MUTCD Violation.

Springfield Avenue (CR 603) and Clinton Road (CR 665) in Irvington Township

- Faded and worn pavement markings throughout intersection including crosswalks;
- No pedestrian push buttons;
- High pedestrian traffic, jaywalking prevalent throughout this intersection;
- Traffic signal transformer base is not the correct breakaway type;
- Double parking prevalent throughout intersection;
- Signal phasing causes conflict between Clinton Road eastbound and Nye Avenue eastbound approaches;
- Congestion due to bus terminal;
- Vehicles making prohibited turning movement, and;
- Bus stops at corners causing congestion.

Springfield Avenue (CR 603) and Grove Street (CR 509) in Irvington Township

- MUTCD sign violations for sizes and types;
- Faded and worn pavement markings throughout intersection, including crosswalks;
- Broken mast arm street name sign, Grove Street;
- No pedestrian push buttons, and;
- NJ TRANSIT bus stop on southwest corner causing congestion.

Main Street (CR 527) and Millburn Avenue (CR 577) in Millburn Township

- Faded and worn pavement markings throughout intersection, including crosswalks;
- No pedestrian push buttons;
- High pedestrian traffic;
- Police presence at intersection to help with school traffic, causes congestion;
- No vehicle detection, and;
- Pedestrian indication far from crosswalk on northwest corner of intersection.

Main Street (CR 527) and Essex Street, in Millburn Township

- Faded and worn pavement markings throughout intersection, including crosswalks;
- No pedestrian push buttons;

- High pedestrian traffic;
- Police presence at intersection to help with school traffic, causes congestion; and
- No vehicle detection.

Bloomfield Avenue (CR 506) and State Route 23/ Mount Prospect Ave. (CR 577), in Verona Township

- Some signal indicators are rotated and not facing approaches correctly;
- Traffic signal transformer base is not the correct breakaway type;
- Some conflicting signal indications can be seen from other approaches, and;
- MUTCD sign violations for sizes and types.

Pleasant Valley Way (CR 508) and Northfield Avenue (CR 508), in West Orange Township

- Excessive speeding through intersection;
- Excessive number of signal indications causing motorist confusion;
- Some conflicting signal indications can be seen from other approaches;
- Signals missing visors;
- MUTCD sign violations for sizes and types, and;
- Eastbound right turn ramp is signalized but also has a Yield Sign which is an MUTCD violation.

Bloomfield Avenue (CR 506S) and Mount Prospect Ave, in Verona Township

- Pedestrian push button present on one corner of the intersection;
- Double parking prevalent along with illegal parking at corners, and;
- Traffic signal indications on Bloomfield Ave northbound approach only 25 feet from stop bar which is an MUTCD violation.

Bloomfield Avenue (CR 506S) and Park Avenue/MLK Blvd/Crittenden Street (CR 658), in the City of Newark

- Improper school crossing warning signs;
- 8-inch Traffic Signal Indications on some approaches which is a MUTCD violation;
- Faded and worn pavement markings throughout intersection, including crosswalks, and;
- No pedestrian push buttons.

B. Crash Type Analysis

The *Plan4Safety* program was one of the parameters use in determining the "high-priority" intersection locations in Essex County and accurately assess and rank candidate improvement projects. Following the selection of the nine intersections for technical evaluation, the project team requested detailed crash-type breakdown for each intersection from the *Plan4Safety* program. This request included all crash data reported at the intersections, as well as crash data approaching the intersections.

The following figures are the crash-type breakdown for eight of the nine intersections studied as part of the technical evaluation. The ninth intersection (Main Street and Essex Street), was not available through Plan4Safey.

Figure L

Location No. 03: Bloomfield Avenue (CR 506) and Grove Street
Municipality: Bloomfield Township
County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000506 AND CRASH.MILEPOST between 6.66 AND 6.68] OR [CRASH.SRI = 07000623 AND CRASH.MILEPOST between 0.0 AND 0.01]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	15	15	35.71	35.71
Same Direction - Side Swipe	10	25	23.81	59.52
Right Angle	5	30	11.9	71.43
Opposite Direction - Side Swipe	1	31	2.38	73.81
Left Turn / U Turn	7	38	16.67	90.48
Backing	1	39	2.38	92.86
Pedalcyclist	3	42	7.14	100

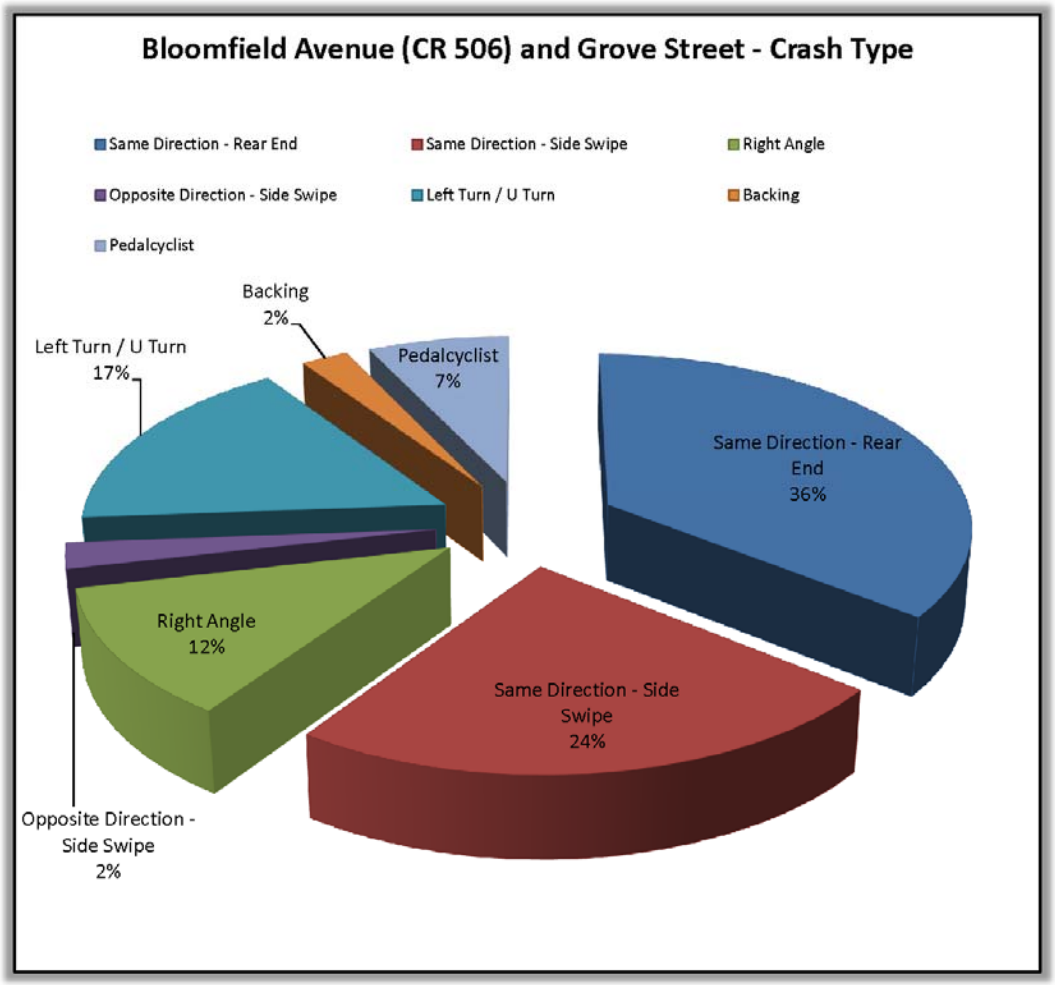


Figure M

Location No. 11: Springfield Avenue (CR 603) and Grove Street (CR 509)
Municipality: Irvington Township
County: Essex

[CRASH.CRASH_YEAR in {2009, 2010, 2011) AND [[CRASH.SRI = 07000603 AND CRASH.MILEPOST between 1.52 AND 1.54] OR [CRASH.SRI = 00000509 AND CRASH.MILEPOST between 10.32 AND 10.34]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	14	14	23.33	23.33
Same Direction - Side Swipe	11	25	18.33	41.67
Right Angle	5	30	8.33	50
Opposite Direction - Head On/Angular	1	31	1.67	51.67
Opposite Direction - Side Swipe	3	34	5	56.67
Struck Parked Vehicle	3	37	5	61.67
Left Turn / U Turn	12	49	20	81.67
Backing	2	51	3.33	85
Fixed Object	1	52	1.67	86.67
Pedestrian	8	60	13.33	100

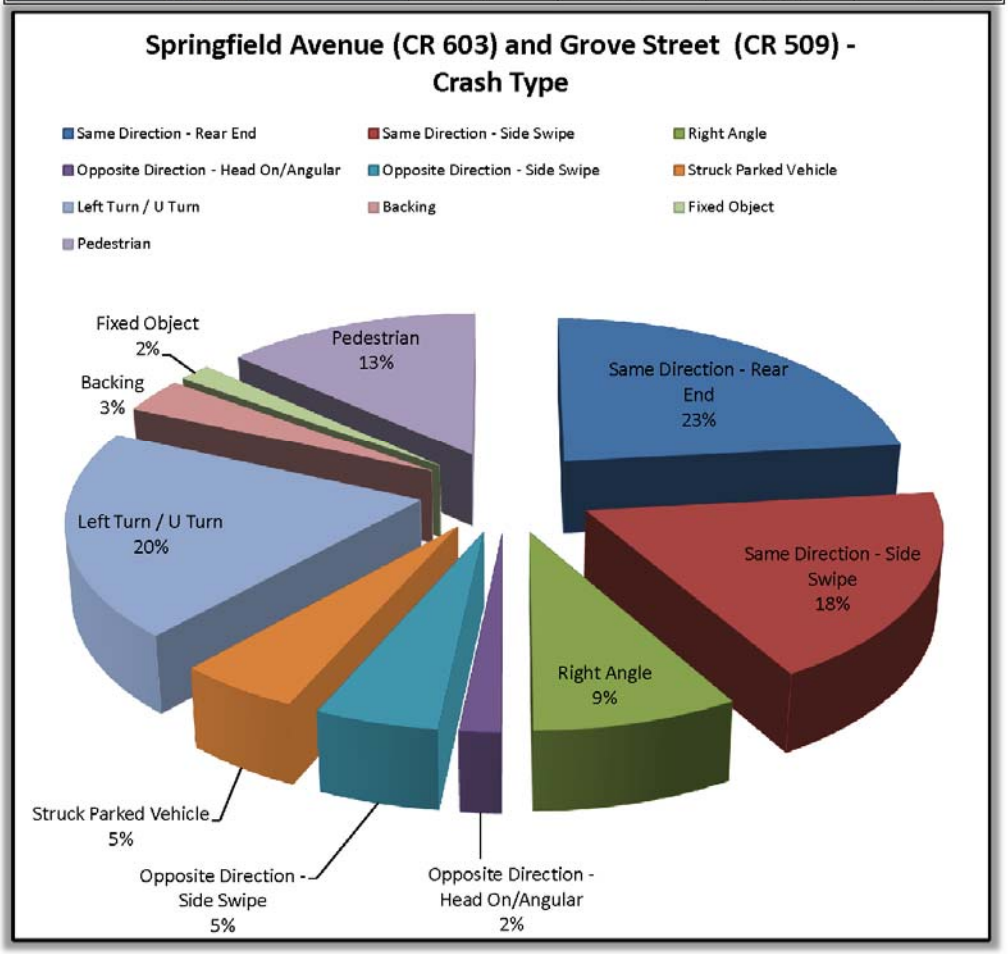


Figure N

Location No. 11: Springfield Avenue (CR 603) and Clinton Avenue
Municipality: Irvington Township
County: Essex

[CRASH.CRASH_YEAR in {2009, 2010, 2011} AND [[CRASH.SRI = 07000603 AND CRASH.MILEPOST between 1.10 AND 1.12] OR [CRASH.SRI = 07000665 AND CRASH.MILEPOST between 2.21 AND 2.23] OR [CRASH.SRI = 07091822 AND CRASH.MILEPOST between 1.74 AND 1.76]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	14	14	41.18	41.18
Same Direction - Side Swipe	5	19	14.71	55.88
Right Angle	7	26	20.59	76.47
Opposite Direction - Head On/Angular	1	27	2.94	79.41
Struck Parked Vehicle	2	29	5.88	85.29
Fixed Object	1	30	2.94	88.24
Pedestrian	4	34	11.76	100

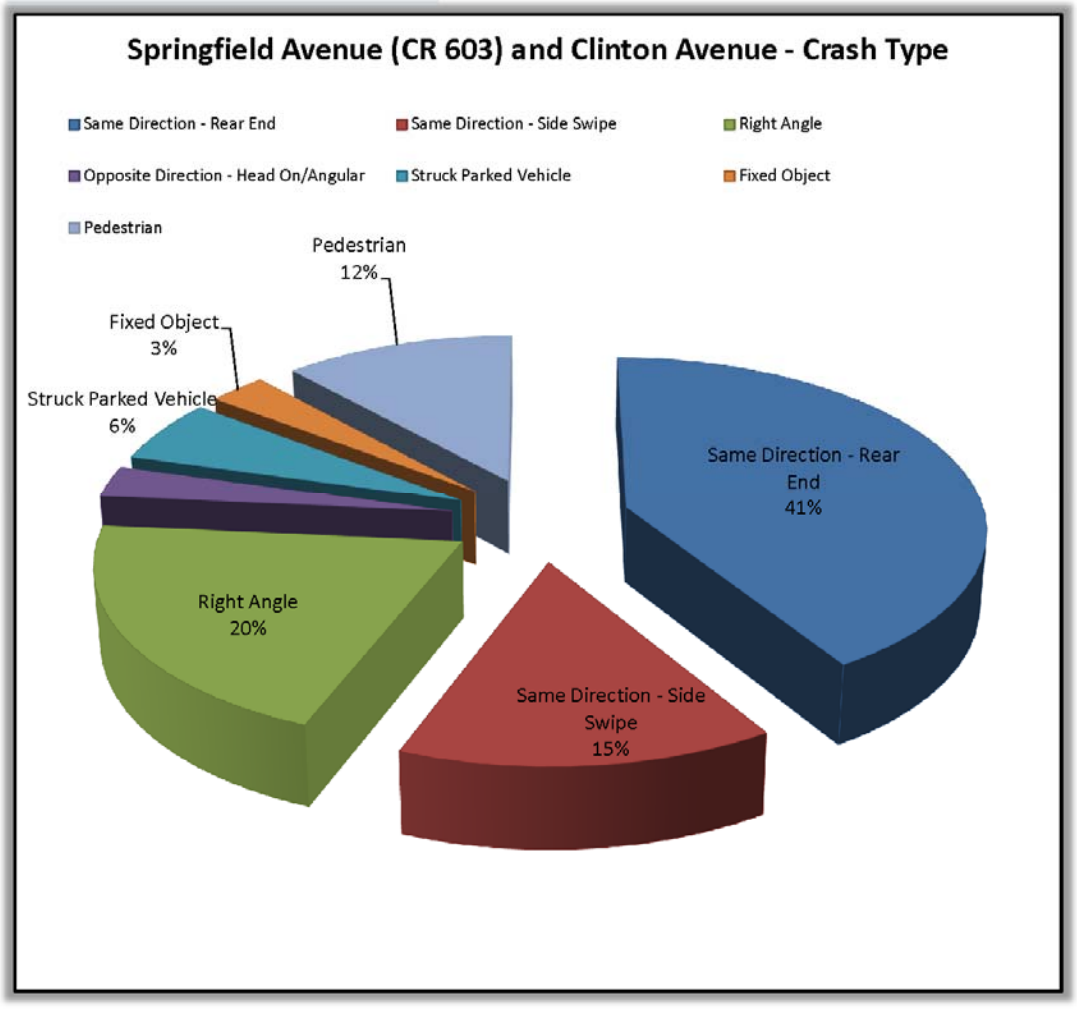


Figure O

Location No. 20: Main Street (CR 527) and Millburn Avenue (CR 577)
Municipality: Millburn Township
County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000577 AND CRASH.MILEPOST between 0.91 AND 0.93] OR [CRASH.SRI = 00000527 AND CRASH.MILEPOST between 71.18 AND 71.20]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	18	18	31.03	31.03
Same Direction - Side Swipe	21	39	36.21	67.24
Right Angle	2	41	3.45	70.69
Struck Parked Vehicle	5	46	8.62	79.31
Left Turn / U Turn	2	48	3.45	82.76
Backing	3	51	5.17	87.93
Fixed Object	2	53	3.45	91.38
Pedestrian	4	57	6.9	98.28
Pedalcyclist	1	58	1.72	100

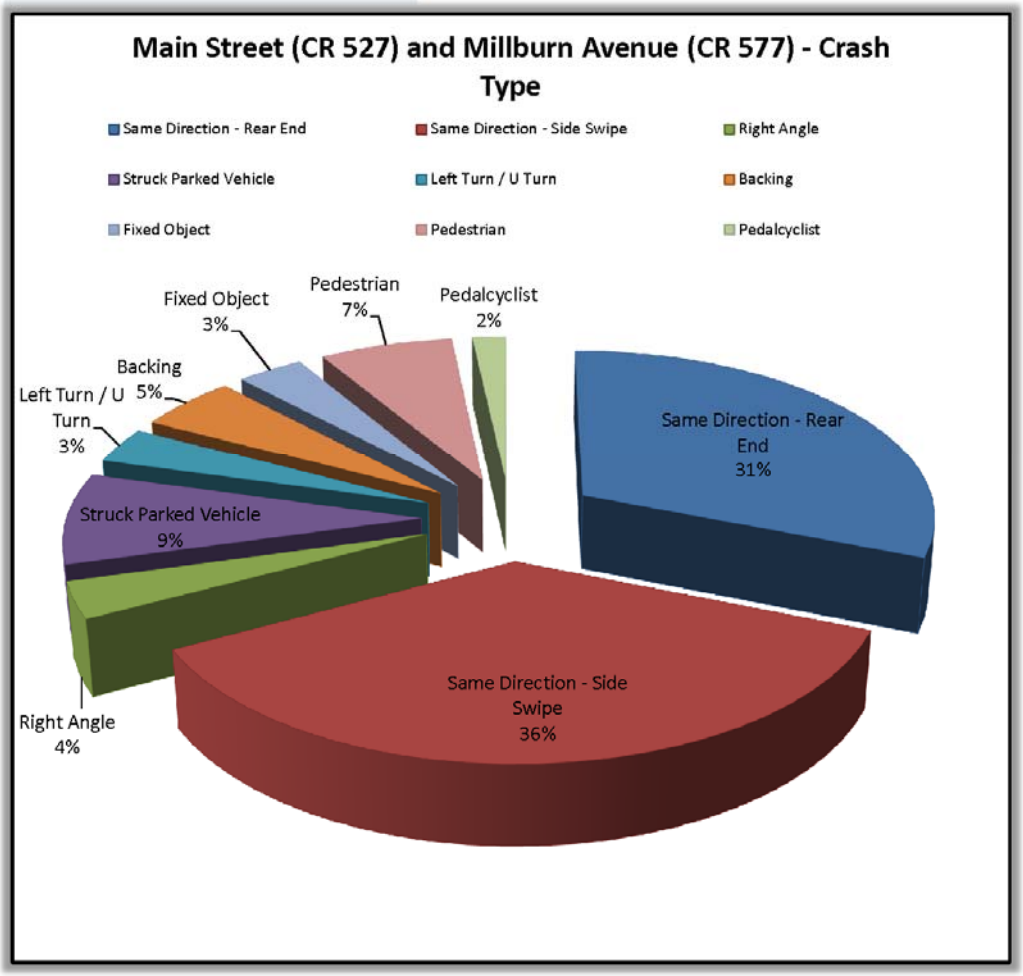


Figure P

Location No. 24: Bloomfield Avenue (CR506) and State Route 23/Pompton Avenue
Municipality: Verona Township
County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000023 AND CRASH.MILEPOST between 0.0 AND 0.01] OR [CRASH.SRI = 00000506 AND CRASH.MILEPOST between 5.21 AND 5.23] OR [CRASH.SRI = 00000577 AND CRASH.MILEPOST between 9.95 AND 9.97]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	29	29	34.94	34.94
Same Direction - Side Swipe	29	58	34.94	69.88
Right Angle	7	65	8.43	78.31
Opposite Direction - Head On/Angular	1	66	1.2	79.52
Opposite Direction - Side Swipe	1	67	1.2	80.72
Struck Parked Vehicle	1	68	1.2	81.93
Left Turn / U Turn	5	73	6.02	87.95
Backing	2	75	2.41	90.36
Encroachment	1	76	1.2	91.57
Fixed Object	6	82	7.23	98.8
Other	1	83	1.2	100

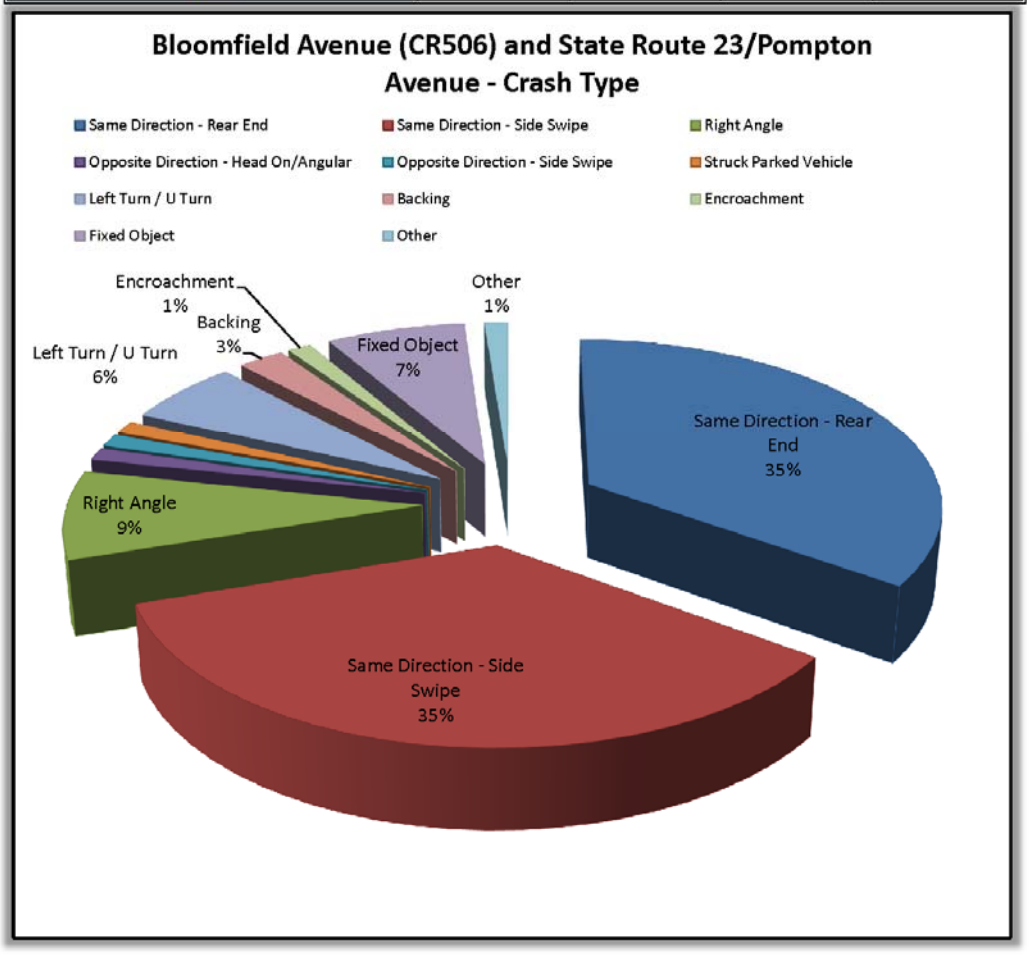


Figure Q

Location No. 28: Northfield Avenue (CR 508) and Pleasant Valley Way/Cherry Hill Lane
Municipality: West Orange Township
County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000508 AND CRASH.MILEPOST between 3.86 AND 3.88] OR [CRASH.SRI = 07000636 AND CRASH.MILEPOST between 0.0 AND 0.01]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	12	12	34.29	34.29
Same Direction - Side Swipe	4	16	11.43	45.71
Right Angle	4	20	11.43	57.14
Left Turn / U Turn	14	34	40	97.14
Fixed Object	1	35	2.86	100

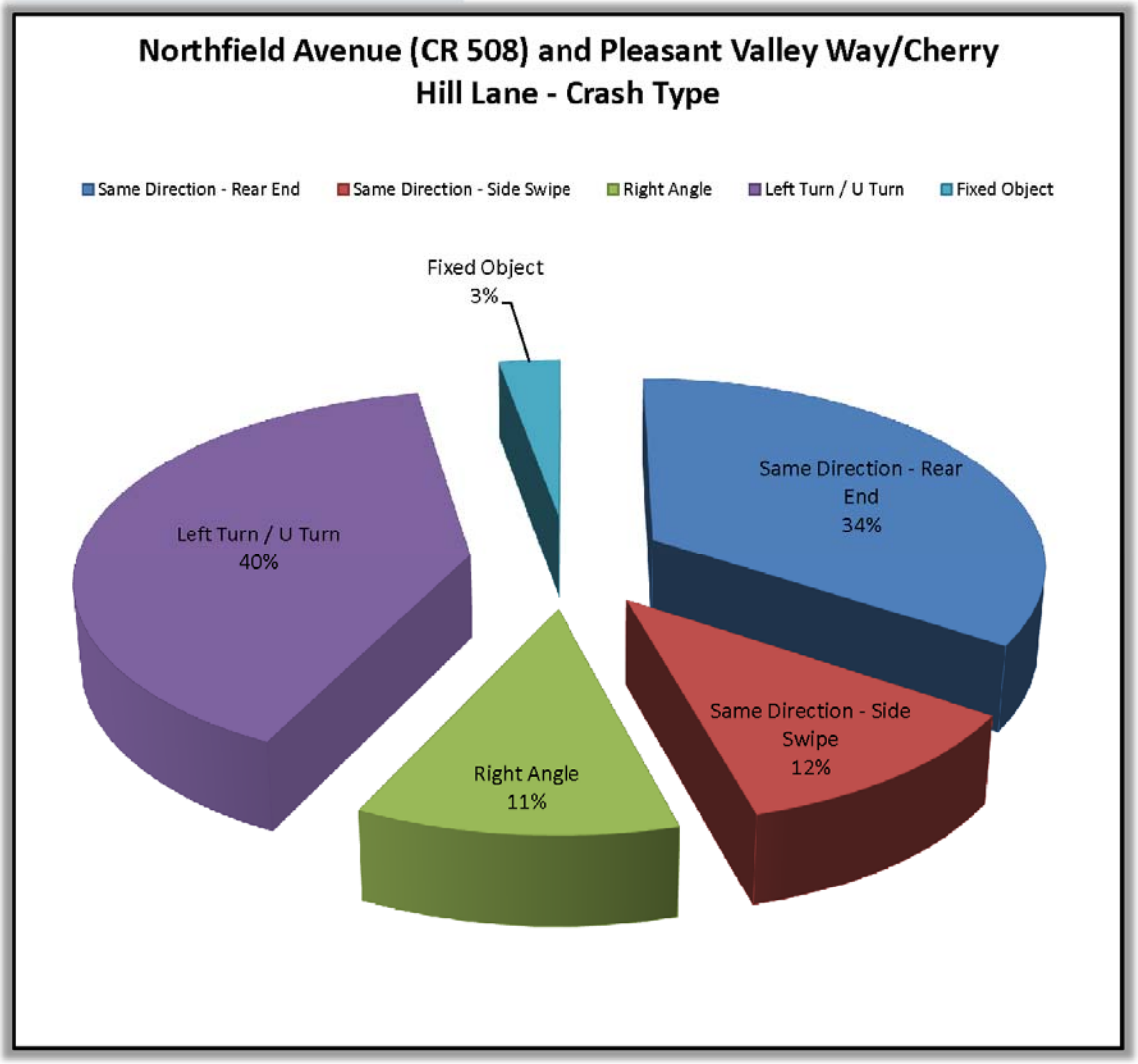


Figure R

Location No. 31: Bloomfield Avenue (CR506) and Mount Prospect Avenue
Municipality: City of Newark
County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000506S AND CRASH.MILEPOST between 3.50 AND 3.52] OR [CRASH.SRI = 07141926 AND CRASH.MILEPOST between 0.16 AND 0.18]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	8	8	22.22	22.22
Same Direction - Side Swipe	6	14	16.67	38.89
Right Angle	4	18	11.11	50
Opposite Direction - Side Swipe	1	19	2.78	52.78
Struck Parked Vehicle	1	20	2.78	55.56
Left Turn / U Turn	5	25	13.89	69.44
Backing	2	27	5.56	75
Pedestrian	9	36	25	100

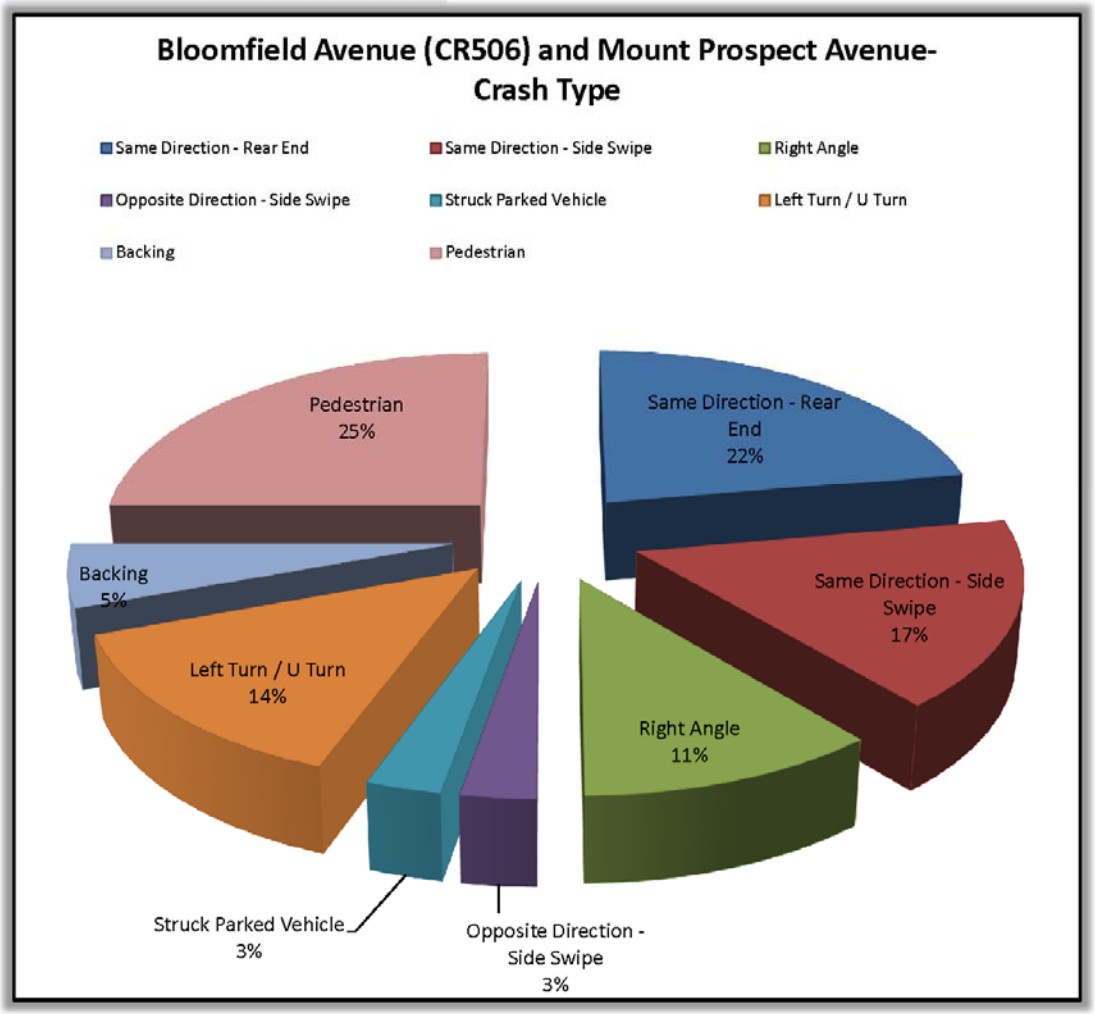


Figure S

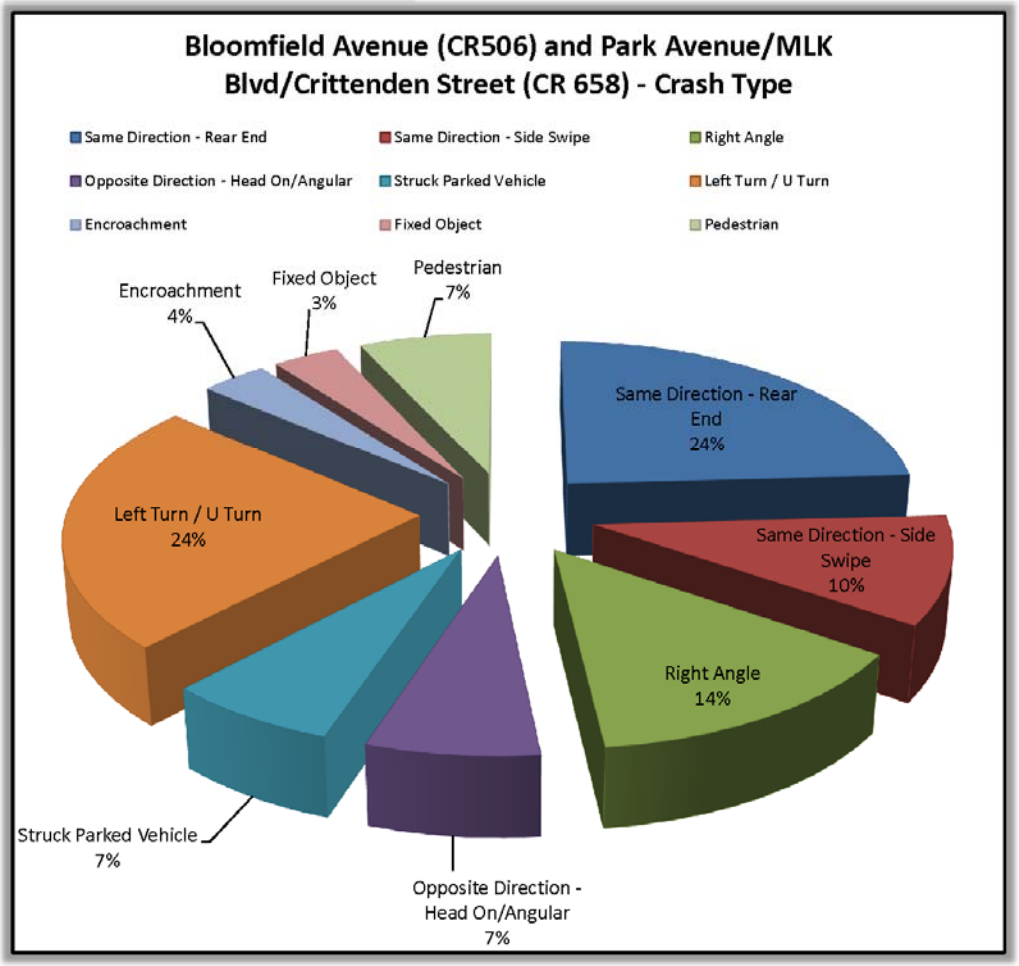
Location No. 31: Bloomfield Avenue (CR506) and Park Avenue/MLK Blvd/Crittenden Street (CR 658)

Municipality: City of Newark

County: Essex

[CRASH.CRASH_YEAR in (2009, 2010, 2011) AND [[CRASH.SRI = 00000506S AND CRASH.MILEPOST between 3.50 AND 3.52] OR [CRASH.SRI = 07141926 AND CRASH.MILEPOST between 0.16 AND 0.18]]]

Crash Type	Frequency	Cum. Freq.	Percentage	Cum. Percent.
Same Direction - Rear End	7	7	24.14	24.14
Same Direction - Side Swipe	3	10	10.34	34.48
Right Angle	4	14	13.79	48.28
Opposite Direction - Head On/Angular	2	16	6.9	55.17
Struck Parked Vehicle	2	18	6.9	62.07
Left Turn / U Turn	7	25	24.14	86.21
Encroachment	1	26	3.45	89.66
Fixed Object	1	27	3.45	93.1
Pedestrian	2	29	6.9	100



5.4.3 Operational Capacity Analysis

The peak hour traffic operations within the project vicinity were evaluated at the study intersection. The analyses were performed using the latest version of *Synchro Trafficware, Version 8.0*; a traffic analysis and simulation program. The results of these analyses provide Level of Service (LOS), volume/capacity (v/c) descriptions and average seconds of delay for the intersection movements.

The efficiency with which an intersection operates is a function of volume and capacity. The capacity of an intersection is the volume of vehicles it can accommodate during a peak hour. Level of Service is a qualitative measure describing operational conditions within a traffic stream in terms of traffic characteristics such as freedom to maneuver, traffic interruption, comfort and convenience. Six LOS are defined for each type of facility with analysis procedures available. Levels of Service range from "A" through "F", with "A" representing excellent conditions with no delays and failure and deficient operations denoted by Level "F". The Highway Capacity Software (HCS) 2000 LOS criteria for intersections are summarized in Table 34.

Table 34 – 2010 Highway Capacity Manual LOS/Delay Criteria

Level of Service	Average Seconds of Delay
A	< 10
B	> 10 - 20
C	> 20 - 35
D	> 35 – 55
E	> 55 – 80
F	> 80

The results of the operational analysis are summarized for each location during the AM and PM peak hours within Table 35.

Table 35 – Eastern Municipalities LOS/Delay Summation						
Intersection Description			AM Peak Hour		PM Peak Hour	
Location	Roadway	Approach	LOS	Delay (Seconds)	LOS	Delay (Seconds)
No. 3	Grove Street (CR 509)	NB	C	30.8	F	206.9
		SB	C	31.5	F	265.2
	Bloomfield Avenue (CR 506S)	EB	B	12.0	B	13.6
		WB	B	12.0	B	14.1
	Intersection		**B**	**17.3**	**F**	**119.4**
No. 11	Grove Street (CR 509)	NB	C	22.4	C	29.1
		SB	B	19.5	C	21.3
	Springfield Avenue (CR 603)	EB	C	29.6	D	37.2
		WB	B	19.5	C	21.8
	Intersection		**C**	**24.0**	**C**	**28.1**
	Clinton Road (CR 665)	NB	B	20.0	C	22.4
		SB	C	21.5	B	20.0
	Nye Ave.	NEB	B	18.4	B	19.0
	Springfield Avenue (CR 603)	EB	D	54.4	D	36.8
		WB	C	26.3	C	28.8
	Intersection		**C**	**34.8**	**C**	**28.0**

Table 35 – Western Municipalities LOS/Delay Summation (continued)

Intersection Description			AM Peak Hour		PM Peak Hour	
Location	**Roadway**	**Approach**	**LOS**	**Delay (Seconds)**	**LOS**	**Delay (Seconds)**
No. 20	Main Street (CR 527)	NB	D	39.8	D	35.3
		SB	C	23.3	C	20.4
	Millburn Avenue (CR 577)	EB	C	21.7	C	20.4
		WB	-	-	-	-
	Intersection		**C**	**27.4**	**C**	**24.2**
	Main Street (CR 577)	NB	B	13.1	B	14.0
		SB	C	26.4	D	52.9
	Essex Street	EB	-	-	-	-
		WB	B	12.9	B	11.5
	Intersection		**B**	**17.4**	**C**	**28.2**
No. 24	Mt. Prospect Ave.	NB	E	76.3	F	111.3
	Route 23	SB	D	36.7	D	37.1
	Bloomfield Avenue (CR 506S)	EB	D	42.3	D	51.6
		WB	C	32.8	D	36.0
	Intersection		**D**	**46.0**	**E**	**56.3**
No. 28	Pleasant Valley Way (CR 636)	NB	D	39.6	C	31.2
		SB	D	37.3	D	38.1
	Northfield Avenue (CR 508)	EB	B	14.4	B	15.1
		WB	C	22.8	B	19.7
	Intersection		**C**	**28.4**	**C**	**25.4**

Table 35 – City of Newark LOS/Delay Summation (continued)						
Intersection Description			**AM Peak Hour**		**PM Peak Hour**	
Location	**Roadway**	**Approach**	**LOS**	**Delay (Seconds)**	**LOS**	**Delay (Seconds)**
No. 31	Mount Prospect Avenue	NB	-	-	-	-
		SB	D	36.0	C	24.9
	Bloomfield Avenue (CR 506S))	EB	B	10.2	B	19.8
		WB	A	9.5	C	22.3
	Intersection		**B**	**15.3**	**C**	**21.8**
	Park Avenue	NB	D	47.9	D	39.3
	Crittenden Street	SB	**F**	**171.3**	**F**	**113.9**
	MLK Dr.	NWB	D	47.9	D	46.3
	Bloomfield Avenue (CR 506S)	EB	C	28.9	C	25.5
		WB	E	57.2	D	35.9
	Intersection		**E**	**61.3**	**D**	**46.3**

5.4.4 Multi-Modal Value Assessment

In the candidate project prioritization table (Table 26), the mass transit availability for each location was identified using a radius of ¼ of a mile from the study intersection(s). The technical evaluation investigated these mass transit services more closely.

This investigation attempted to identify the existing bus routes located in the vicinity of the location of the candidate project, approximate the walking distance from the intersection to the nearest rail station, and determine if there was mass transit connectivity (i.e. bus to rail) from the intersection to a rail station.

These criteria were utilized to qualify the multi-modal "value" of the intersection and support potential improvements and recommendations. Table 36 summarizes the multi-modal value assessment for each location in the technical project list.

Table 36 – Technical Projects Multi-Modal Assessment						
Region	**Location No.**	**Municipality**	**Major Street**	**No. of Bus Lines**	**Rail Walking Distance**	**Bus-to-Rail Connection**
Eastern	3	Bloomfield Twp.	CR 506	7	0.1 (Light)	Yes (90)*
	11	Irvington Twp.	CR 603	3	3.7 (Rail)	Yes (25)*
Western	20	Millburn Twp.	CR 527	4	0.2 (Rail)	Yes (25)*
	24	Verona Twp.	CR 506	1	0.3 (Rail)	No
	28	West Orange Twp.	CR 508	1	0.2 (Rail)	No
Newark	31	City of Newark	CR 506S	1	1.3 (Rail)	Yes (29)*

**NJ Transit Bus Number.*

It should be noted that for the weighing of mass transit, LEED uses ¼ mile walking distance to a bus stop served by two or more bus lines or two bus stops served by at least one bus line; ¼ mile walk to light rail; and ½ mile walking distance to rail, BRT or ferry. This criterion is an important aspect of the existing assessment and future improvements.

5.4.5 Summary and Recommendations

The following section summarizes the Technical Evaluation of the Candidate Project List with respect to existing deficiencies, crash data and operational analysis.

A. Location No. 3: Bloomfield Township

Existing Deficiencies

- Substandard signing, striping and signal equipment present on multiple approaches.

Crash Occurrence

- The most prevalent crash types reported were same direction – rear end (15), and same direction – sideswipe (10), which accounted for 60% of crashes.
- The left-turn/U-turn (7) and right angle (5) crash types accounted for an additional 29%.

Traffic Operations

- There is an existing failing condition (LOS "F") on the Northbound and Southbound approaches of Grove Street (CR 509).

Multi-Modal/Mass Transit Assessment

Qualifies for LEED Credit (located within ¼ mile walking distance of light rail and ¼ mile walking distance of bus stops serving two lines).

B. Location No. 11: Irvington Township

Existing Deficiencies

- A high volume of illegal/jaywalking pedestrian movements reported during field investigation.
- Bus stop locations, double-parked vehicles and terminal location results in congestion.
- Signal Phasing Conflicts between Clinton Road and Nye Avenue.
- Sign types and sizes are non-compliant with MUTCD at Grove Street.

Crash Occurrence

- The most prevalent crash types reported at Springfield Avenue and Grove Street was in the same direction – rear end (14), left-turn/U-turn (12) and same direction – sideswipe (10), which accounted for 62% of crashes.
- Eight pedestrian crashes were recorded at the intersection of Springfield Avenue and Grove Street, accounting for 13.33%of crashes.
- Same direction – rear end (14) crashes were the most prevalent crash type reported at Springfield Avenue and Clinton Road (41.18% of crashes).
- Right-Angle Crashes (7, or 20.59%) were the second-most occurring crash type.

Traffic Operations

- The existing traffic operations of Springfield Avenue and Grove Street are acceptable, with the highest delay (LOS "D"/37.2 sec/veh) experienced on the eastbound approach of Springfield Avenue (603) during the PM Peak Hour.
- The Eastbound approach of Springfield Avenue at Clinton Road experiences the highest delay (LOS "D") during both the AM and PM Peak Hour.

Multi-Modal/Mass Transit Assessment

Qualifies for LEED Credit (located within ¼ mile walking distance to a bus stop served by two or more bus lines or two bus stops served by at least one bus line).

C. Location No. 20: Millburn Township

Existing Deficiencies

- Pre-timed signals with high pedestrian traffic and no push-button actuation.
- No vehicle detection and police presence result in traffic congestion during school hours.

Crash Occurrence

- Same direction – rear end (18) and same direction – sideswipe (21) crashes accounted for 67% of crash types.
- Four pedestrian crashes were recorded at the intersection of Main Street and Millburn Avenue.
- There were five crashes which included parked vehicles.

Traffic Operations

- The northbound approach of Main Street and Millburn Avenue operates at LOS "D" with a delay of 39.8 sec/veh in the AM Peak Hour.
- There is a significant southbound traffic volume along Main Street during the PM Peak Hour, which results in LOS "D" operating conditions at both intersections of Main Street.

Multi-Modal/Mass Transit Assessment

Qualifies for LEED credit (located within ½ mile walking distance of rail and ¼ mile walking distance of bus stops serving two lines).

D. Location No. 24: Verona Township

Existing Deficiencies

- MUTCD sign and signal non-compliance.

Crash Occurrence

- Same direction – rear end (29) and same direction – sideswipe (29) crashes accounted for 70% of crash types.
- Seven right-angle and six left-turn/U-turn crashes were reported at this intersection.

Traffic Operations

- The Northbound approach of Pompton Avenue operates with the highest delay and lowest LOS, LOS "E" during the AM Peak Hour and with failing conditions (LOS "F") during the PM Peak Hour.

Multi-Modal/Mass Transit Assessment

Qualifies for LEED credit (located within ½ mile walking distance of rail).

E. Location No. 28: West Orange Township

Existing Deficiencies

- Excessive speeding through intersection.
- MUTCD sign type, size and placement non-compliant.
- Signal indication placement and number conflicting and confusing.
- Eastbound channelized right-turn has yield sign posted and signal control (MUCTD violation).

Crash Occurrence

- Left-turn/U-turn crashes (14) and same direction – rear end (12) accounted for 75% of crash types.
- Only five individual crash types were reported at this location, the lowest of the nine intersections evaluated.

Traffic Operations

- The southbound approach of the intersection operates at LOS "D" during both peak hours; with the northbound approach operating at LOS "D" during the AM Peak Hour.
- Overall intersection progression is acceptable, with LOS "C" experienced during both peak hours.

Multi-Modal/Mass Transit Assessment

Qualifies for LEED credit (located within ½ mile walking distance of rail).

F. Location No. 31: City of Newark

Existing Deficiencies

- Limited pedestrian push-button provisions at both locations.
- Improper school crossing signs.
- Traffic signal placement and indication size (8") are non-compliant.

Crash Occurrence

- There were nine pedestrian accidents reported at the intersection of Bloomfield Avenue and Mount Prospect Avenue; two pedestrian accidents were reported at the intersection of Bloomfield Avenue and Park Avenue/MLK Blvd/Crittenden Street (CR 658).
- The most prevalent crash type occurring at these two intersections were same direction – rear end (8 crashes and 7 crashes, respectively).
- These two intersections had the highest dispersion of crash-types, as no singular crash-type exceed 10 occurrences or accounted for more than 25% of total crashes.

Traffic Operations

- The Crittenden Street southbound approach operates with failing conditions during both peak hours.
- The eastbound approach of Bloomfield Avenue is the only approach which operates at LOS "C"; all other approaches operate with LOS "D" or lower.

Multi-Modal/Mass Transit Assessment

May qualify for LEED Credit (¼ mile walking distance from two bus stops served by at least one bus line).

Chapter 6: Plan Recommendations

Chapter 6: Plan Recommendations

6.1 Project Recommendations

Using the input from the ECCTP public outreach program, the multi-modal and technical projects identified in Chapter 4, and based on the project evaluation detailed in Chapter 5, the project team developed a series of plan and policy recommendations to improve transportation for all users throughout the County. The following sections summarize these improvements. The projects have been listed in alphabetical order by municipality.

6.1.1 Roadway System Project Recommendations

Table 37 details the Roadway Systems Project recommendations. The proposed recommendations include signal, roadway and corridor improvement studies and analysis.

Table 37: Roadway System Project Recommendations

	Project	Municipality	Recommendation
1.	Intersections of Franklin Avenue with Belleville Avenue, Mill Street and Clara Mass Drive	Belleville & Newark	Traffic Signal Coordination and Improvement Study
2.	Rutgers Street and Cortland Street	Belleville	Traffic Signal Improvement Study
3.	Intersections of Franklin Street with Broad Street/Liberty Street and Watsessing Avenue	Bloomfield	Traffic Signal Improvement Study
4.	Intersections of Bradford Avenue with Crestmont Street and Woodstone Drive	Cedar Grove	Safety Assessment/Improvement Project
5.	Intersection of Springfield Avenue and Elmwood Avenue	East Orange	Traffic Signal Improvement Study
6.	Intersections of Central Avenue with Scotland Road, South Central Street and Steuben Street/18th Street	East Orange & Orange	Traffic Signal Coordination and Improvement Study
7	Unsignalized intersections of Roseland Avenue with Runnymede Road and Borough Place	Essex Fells	Safety Assessment/Signal Warrant Analysis
8.	Ridgewood Avenue (CR 653) Corridor (MP 0.00 – 3.20)	Glen Ridge	Resurfacing Project & Traffic Calming Investigation
9.	Watchung Avenue Corridor between Valley Road and Ridgewood Avenue (MP 0.66 – 1.06)	Glen Ridge & Montclair	Corridor Traffic Analysis
10.	Intersections of Coit Street with Lyons Avenue and Chancellor Avenue	Irvington	Traffic Signal Improvement Study
11.	Proposed Eisenhower Parkway Extension	Livingston	Roadway Improvement Feasibility Study

12.	Intersections of West Mount Pleasant Avenue & Livingston Avenue	Livingston	Roadway Improvement Study
13.	Passaic Avenue (CR 613) Corridor	Livingston, Roseland, & West Caldwell	Corridor Safety and Operational Optimization Study
14.	Intersections of South Orange Avenue with Scotland Road/Valley Street, Passaic Avenue & Eisenhower Parkway	Livingston & South Orange	Traffic Signal Coordination and Improvement Study
15.	Central Avenue Corridor (MP 13.73 – 14.30)	Newark	Corridor Safety and Operational Optimization Study
16.	West Greenbrook Road between Passaic Avenue and Central Avenue/Grandview Avenue	North Caldwell	Traffic Signal, Safety & Circulation Improvements
17.	Intersection of Mountain Avenue and Gould Avenue	North Caldwell	Intersection Improvement Study
18.	Intersection of West Passaic Avenue/Darling Avenue and Kingsland Street	Nutley	Traffic Signal Improvement Study
19.	Centre Street (CR 648) Corridor	Nutley	Corridor Safety and Operational Optimization Study
20.	Intersections of Eagle Rock Avenue with Eisenhower Parkway, Passaic Avenue, Roseland Avenue & Pleasant Valley Way	Roseland/ West Orange	Traffic Signal Improvement Study
21.	Pleasant Valley Way (CR 636) Corridor	West Orange	Traffic Signal Coordination & Pedestrian Safety Improvements
22.	Intersections of Main Street with Eagle Rock Avenue, Washington Street & Park Avenue	West Orange	Traffic Signal Coordination and Improvement Study
23.	South Orange Avenue (CR 510) Corridor	Multiple Municipalities	Complete Street Analysis
24.	Valley Street (CR 638) Corridor MP 0.00 – MP 3.06	Multiple Municipalities	Corridor Safety and Operational Optimization Study
25.	Bloomfield Avenue (CR 506/506S) Corridor	Multiple Municipalities	Corridor Safety and Operational Optimization Study
26.	Intelligent Transportation System (ITS) on County Routes	Multiple Municipalities	Implementation of ITS Systems
27.	Garden State Parkway and New Jersey Turnpike	Multiple Municipalities	Evaluate existing connections and Study proposed access improvements

28.	Essex County Land Development Regulation Standards	Multiple Municipalities	Development and adoption of policy to include transect oriented design standards, access management plan and complete streets policy.

The following descriptions provide details for several of the recommendations listed in Table 37 for the Roadway Systems Projects.

A. Traffic Signal Improvements

Traffic signal improvements should consider improving signal operations for all road users of all ages and ability, including motorists, pedestrians and bicyclists.

B. Traffic Signal Coordination/Optimization

Along extended corridors in Essex County, operational delays at intersections may be addressed by improving progression between signalized intersections. As such, traffic signal coordination/optimization studies and analysis is an effective traffic engineering tool which can identify existing operational problems and maximize potential improvements.

C. Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) are the next step in traffic signal improvement and optimization. The ITS utilize advanced communication technologies implemented along roadways to improve transportation safety and mobility through the integration of advanced communications technologies into the transportation infrastructure. The ITS encompass a broad range of wireless and wire line communications-based information and electronics technologies.

D. Safety Assessment/Improvement Project

Safety conditions at intersections or along roadway corridors are to be studied and implemented in order to improve safety for all road users of all ages and ability, including motorists, pedestrians and bicyclists.

6.1.2 Transit System Project Recommendations

Table 38 details the Transit Systems Project recommendations. The proposed recommendations include enhancement of safety conditions at Train Stations and Bus Stops, enhanced NJ TRANSIT and Jitney services, implementation of Bus Rapid Transit (BRT) and the reopening of abandoned rail lines.

Table 38: Transit System Project Recommendations

Project		Municipality	Recommendation
1.	Conversion of abandoned rail lines within Essex County	Multiple Municipalities	Feasibility Study to convert abandoned rail lines within Essex County to passenger & freight lines
2.	Essex County Land Development Regulation	Multiple Municipalities	Update and Adopt Regulation to include design standards for development to require bus accommodations such as, bus shelters, curb cuts, pull off areas and turning radius
3.	Disabled & Senior Transport Services	Multiple Municipalities	Public Outreach on available County-wide Disabled & Senior Transport Services
4.	Jitney Shuttle Services	Multiple Municipalities	Feasibility Study to expand successful Jitney Shuttle Services

5.	Bus Service at Glen Ridge Station	Glen Ridge	Feasibility Study of Go Bus at Glen Ridge Station
6.	Maplewood Train Station	Maplewood	Study need to construct a commuter parking lot for the Maplewood Train Station
7	Increased Train Station Service	Multiple Municipalities	Study to increase service at the Bloomfield, Glen Ridge, Maplewood & South Orange train stations
8.	River Road & East White Terrace Bus Stops	Nutley	Construction of bus shelters at River Road & East White Terrace Bus Stops
9.	Genesis Tower Train Station	Newark	Feasibility Study on reopening the NJ TRANSIT Roseville Train Station at Genesis Tower
10.	Relocation of Bus Stops	Multiple Municipalities	Feasibility Study for Relocation of Bus Stops to increase public safety
11.	NJ TRANSIT Bus Stops Bloomfield Avenue with Linn Drive and Sunset Avenue	Verona	Installation of bus shelters at Bloomfield Avenue with Linn Drive and Sunset Avenue
12.	Bus Rapid Transit	Multiple Municipalities	Feasibility Study to implement BRT
13.	Newark Light Rail	Bloomfield, Belleville, Glen Ridge, Montclair & Maplewood	Feasibility Study of extension of Newark Light Rail along the old Boonton Line
14.	NJ TRANSIT Midtown Direct Service	South Orange, East Orange & Orange	Feasibility Study to enhance NJ TRANSIT Midtown Direct Service
15.	Orange and Highland Avenue Train Stations	Orange	Upgrades to the Orange and Highland Avenue Train Station to include pedestrian safety improvements, bicycle parking areas, and bus staging areas

6.1.3 Bicycle, Pedestrian & Safety Project Recommendations

Table 39 details the Bicycle, Pedestrian & Safety Project recommendations. The proposed recommendations include the study and implementation of an inter-municipal and intra-county connected bicycle route, regulations to encourage developers to provide bicycle facilities and amenities, rails to trails implementation, and pedestrian safety improvements throughout the County.

Table 39: Bicycle, Pedestrian & Safety Project Recommendations			
	Project	**Municipality**	**Recommendation**
1.	Develop a detailed county-wide bike plan using the Essex County Park system	Multiple Municipalities	Develop a detailed county-wide bike plan to provide off road connectivity.
2.	Conversion to a greenway for Morris Canal and the Boonton rail line	Multiple Municipalities	Greenway Feasibility Study
3.	Bicycle Sharing at Colleges, Transit Stations & other strategic Locations	Multiple Municipalities	Bike Sharing Feasibility Study
4.	Update the Essex County Land Development Regulation	Multiple Municipalities	Update and Adopt the Essex County Land Development Regulation to include design standards for development to require, maximum parking requirements and encourage sidewalks, and bicycle amenities and facilities at schools & bus stops
5.	City of Newark Pedestrian Safety Action Plan	Newark	City of Newark Pedestrian Safety Action Plan
6.	River Road (CR 624) and Centre Street Corridors	Nutley	Pedestrian Safety improvements
7.	Hobart Avenue and Highland Avenue in proximity to the Short Hills Train Station and Glen Avenue in the proximity to the Millburn Train Station	Millburn	Construction of sidewalk facilities in the proximity to the Millburn Train Station
8.	Wyoming Avenue (CR 577)	Millburn	Pedestrian Safety, Sidewalk & Bicycle Improvements
9.	Grove Street (CR 623)	Montclair	Pedestrian Safety, Sidewalk & Bicycle Improvements
10.	Broad Street (CR 509) Corridor	Bloomfield	Pedestrian safety improvement and ADA compliant curb ramps
11.	Bloomfield Avenue (CR 506/506S) Corridor	Multiple Municipalities	Corridor study including Complete Streets Analysis and pedestrian safety/traffic calming upgrades
12.	Franklin Avenue (CR 645) Corridor	Belleville	Implement Pedestrian Safety Improvements
13.	Ridgewood Avenue (CR 653) and Bellevue Avenue (CR 506) Corridors	Glen Ridge/ Maplewood	Pedestrian Safety and Bicycle Improvement project including crosswalks

14.	Glen Ridge Train Station	Glen Ridge	Lighting & Bicycle Facilities Improvements at the Glen Ridge Train Station
15.	Watchung Avenue (CR 655) from Ridgewood Avenue(CR 653) to Hawthorne Avenue	Glen Ridge	Sidewalk Improvements
16.	Comprehensive Safety Improvements on County Routes	Livingston	Pedestrian Safety Improvements
17.	Maplewood Train Station	Maplewood	Pedestrian Safety Improvements
18.	Valley Street (CR 638) and Wyoming Avenue (CR 577) Corridors	Maplewood	Pedestrian Safety and Sidewalk Improvements
19.	Intersection of Bloomfield Avenue (CR 506) and Seymour Street	Montclair	Pedestrian Safety Improvements
20.	South Orange and Mountain Avenue Train Stations	South Orange	Pedestrian Safety Improvements
21.	Intersection of Eagle Rock Avenue (CR 611) and Eisenhower Parkway (CR 609)	Roseland	Pedestrian Safety Improvements
22.	South Orange Avenue (CR 510) Corridor	South Orange	Pedestrian Safety Improvements/Traffic Calming Techniques
23.	Train Station Lighting Improvements	Multiple Municipalities	Lighting Improvements at the Glen Ridge, Maplewood, Montclair, South Orange & Mountain Avenue Train Stations
24.	Verona Park	Verona	Pedestrian Access Improvements to Verona Park
25.	Intersection of Fairview Avenue (CR 637) and Personette Avenue	Verona	Pedestrian Safety Improvements
26.	Bloomfield Avenue (CR 506) intersection with Oakridge Road, Fells Road, Fairview Avenue and Linn Drive	Verona	Installation of bike racks
27.	Sidewalk Facilities on County Routes within ¼ mile of School	Multiple Municipalities	Construction of Sidewalk Facilities on County Routes within ¼ mile of Schools
28.	Passaic Avenue Corridor (CR 613)	West Caldwell	Pedestrian Safety Improvements

29.	Northfield Avenue (CR613)	West Orange	Sidewalk Improvements
30.	Bicycle Facilities	Multiple Municipalities	Bicycle facilities at all train stations with improved security
31.	Route 280 Crossings	Multiple Municipalities	Pedestrian and Bicycle Safety Improvements along County Routes which cross Route 280

The following descriptions provide details for several of the recommendations listed in Table 39 for the Bicycle, Pedestrian & Safety Projects.

A. Pedestrian Safety Improvements

The locations which indicate the need for pedestrian safety improvements should implement, but not be limited to, the following improvements,

- Curbing
- Sidewalk
- Pedestrian Push Buttons
- Countdown Signal Heads
- ADA Compliant Curb Ramps
- Crosswalks
- Signage

B. Pedestrian Safety Initiatives

Traffic calming measures typically attempt to improve pedestrian safety indirectly by reducing or restricting vehicular traffic. "Pedestrian Safety Initiatives" focus on short-range improvement projects which implement improvements designed to directly improve pedestrian safety and connectivity. These improvement projects include curb extensions, pedestrian refuge islands (raised medians) and textured/raised crosswalks.

- **Curb Extensions** – Also referred to as "bulb-outs", are areas of extended curbing at intersections or mid-block crossings. These extensions are designed to decrease the crossing distance for pedestrians, but have several ancillary impacts on transportation conditions. These improvements include protecting on-street parking, improving pedestrian visibility to motorists and improving line-of-sight for pedestrians.

  Curb extensions are an appropriate traffic calming measure on roadways with an Average Daily Traffic (ADT) of 15,000 vehicles per day (approximate) and posted speed limits up to 40 MPH. However, a traffic engineering investigation should be performed to assess the impact on operations, specifically at signalized intersections.

- **Median Islands/Pedestrian Refuge** – The median island utilized for pedestrian refuge is a narrow curbed median between travel lanes intended to protect and support pedestrian crossing movements. These islands reduce the crossing distance by permitting pedestrians to perform two shorter crossing movements in lieu of a single crossing movement of substantial distance.

  These improvements can be implemented at intersections or at mid-block locations and should provide a refuge area width of six to eight feet. The roadways impacted should have posted speed limits up to 40 MPH and there implementation at mid-block crossing should be supported with a Traffic Engineering Investigation.

- **Textured/Raised Crosswalks** – A textured crosswalk uses pavers, imprinted concrete/asphalt or other material to demarcate and identify crossing locations to all road users. Raised crosswalks utilize the same technique for demarcation while elevating the pedestrian crossing three to six inches above street level. These

improvements are often utilized in tandem.

- **Speed-Limit Reductions** is a favorable technique as it is a relatively inexpensive improvement method; however, speed-limit reductions are not a "quick-fix" technique and should be supported by traffic engineering analysis. Speed-limit reductions are often considered in areas where there is a high volume of pedestrian traffic.

It should be noted that all pedestrian safety initiatives and improvement projects recommended herein shall include the necessary signing and striping improvements as designed, recommended and guided by the MUTCD.

6.1.4 Aviation and Freight Project Recommendations

Table 40 details the Aviation and Freight Project Recommendations. The proposed recommendations include the study of additional land area for cargo storage, rail oriented industrial development and an efficient way to distribute goods within the County.

Table 40: Aviation and Freight Project Recommendations

	Project	Municipality	Recommendation
1.	Vehicular Freight Transportation	Multiple Municipalities	Implementation of County-wide truck route/ system and delivery guidelines
2.	Rail Freight Transportation	Newark	Encourage railroad industry representatives to explore potential rail oriented industrial development in the vicinity of Oak Island Yard
3.	Aviation Freight Transportation	Newark	Identify off airport cargo facilities needs that may result from the displacement of existing on-airport facilities under proposed runway or terminal expansion initiatives at Newark International Airport

6.1.5 Technical Project Recommendations

The following section summarizes the improvements and recommendations for the technical project as described and evaluated in Chapter 5. The ECCTP recommended improvements divided into four categories:

1. Intersection Improvements/Recommendations: General roadway geometry, signing, striping and construction improvements and recommendations developed based on field observations and exiting deficiencies detailed in Chapter 5.

2. Crash Occurrence Countermeasures: Developed for the most prevalent crash types at each intersection. Overall, a total of five crash-types occurred most often. As such, a comprehensive crash occurrence countermeasure table and figure has been provided to address these occurrences at all locations studied in Chapter 5.

3. Operational Improvements/Recommendations: Constructed from the simulation model and operational analysis performed within Synchro Trafficware, Version 8.0. The improvements include revised phasing, timing, initial green time, MUTCD vehicular and pedestrian clearance time and/or cycle lengths. It should be noted that the proposed improvements were performed to optimize both vehicular and pedestrian

traffic progression. As such, certain existing vehicular delays may be increased to support pedestrian traffic volumes.

4. Multi-Modal/Mass Transit: Based on the existing conditions, pedestrian activity observed pedestrian crash occurrence and multi-modal/mass-transit valuing assessment.

6.2 Policy Recommendations and Implementation Strategies

6.2.1 Complete Streets Policy

The ECCTP policy recommendations advance the Essex County Complete Streets Policy by weaving the notion of streets providing passage for multiple modes of transportation rather than as the exclusive domain of motor vehicles. Specifically, the policy recommendations and implementation strategies of the Plan address the Essex County Complete Streets Policy, which was adopted on April 25, 2012, in Table 41.

Table 41: Policy Recommendations

Complete Streets Policy[1] Resolution #R-2012-00392		ECCTP Plan Recommendations	ECCTP Goals				
			1	2	3	4	5
1.	Provide safe and accessible accommodations for existing and future pedestrian, bicycle and transit facilities;	Identifies of Tier 1 through Tier 3 Projects addressing roadway, transit and bike-pedestrian improvements.	●	●	●	●	
2.	Establish a checklist of pedestrian, bicycle and transit accommodations such as accessible sidewalks, curb ramps, crosswalks, countdown pedestrian signals, signs, curb extensions, pedestrian scale lighting, bike lanes, and shoulders for consideration in each project where County jurisdiction applies;	Identifies series of locations using quantitative and qualitative evaluation methods and recommends Tier 1 improvements to a number of locations throughout the County. Multimodal improvements are focused along County roads that are in Transect Zones T-4 through T-6.		●	●	●	
3.	Additionally, in rural areas, paved shoulders or a multi-use path shall be in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day. Paved shoulders provide safety and operational advantages for all road users. Exemptions shall be considered for County and State designated routes such as Scenic Roads, and Historic or Cultural Byways. If there is evidence of heavy pedestrian usage, then sidewalks shall be considered in the project;	County roads identified as being within Transect Zones T-2 (rural) or T-3 (suburban) will be evaluated as Tier 2 projects for Class 2 bike lanes. The Essex County Site Plan and Subdivision Resolutions have been substantially revised as new Land Development Standards based on the use of transects.	●	●	●	●	
4.	Establishment of a procedure to evaluate resurfacing projects for	The ECCTP includes a comprehensive analysis and	●	●	●	●	●

	Complete Streets inclusion according to length of project, local support, environmental constraints, right-of-way limitations, funding resources, and bicycle and/or pedestrian compatibility;	ranking of roadway improvements for short range (Tier 1), medium range (Tier 2), and long range (Tier 3) projects, including Complete Street redesign.					
5.	Transportation facilities constructed for long-term use shall anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements;	The ECCTP includes projects and strategies for linking modes of transportation and for incorporation of bike-ped facilities based on Transect Zone.		•	•	•	•
6.	Designs shall address the need for bicyclists and pedestrians to cross corridors, as well as travel along them, in a safe, accessible and convenient manner;	The ECCTP includes projects and strategies for pedestrian crossings at key locations along County roads, as well as corridor planning.	•	•	•	•	
7.	Bicycle and pedestrian facilities shall be designed and constructed to the best currently available standards and practices including the New Jersey Roadway Design Manual, the AASHTO Guide for the Development of Bicycle Facilities, AASHTO's Guide for the Planning, Design and Operation of Pedestrian Facilities, the Manual of Uniform Traffic Control Devices and others as related;	The Draft Land Development Standards developed in conjunction with the ECCTP provide for and incorporate AASHTO design standards.	•	•	•	•	
8.	Provisions shall be made for pedestrians and bicyclists when closing roads, bridges or sidewalks for construction projects as outlined in NJDOT Policy #705 – Accommodating Pedestrian and Bicycle Traffic During Construction;	To the extent that the ECCTP advances the goals of mobility for all modes of transportation, the accommodation of mobility during construction is also encouraged"				•	
9.	Improvements shall also consider connections for Safe Routes to Schools, Safe Routes to Transit, Transit Villages, trail crossings and areas or population groups with limited transportation options;	ECCTP recommends projects and strategies for improving routes to transit and supports Transit Villages in Bloomfield, Montclair and South Orange. The Draft Land Development Standards require pedestrian studies in Transects T-5 and T-6.		•	•	•	
10.	Improvements shall comply with Title VII Environmental Justice, Americans with Disabilities Act (ADA)	The ECCTP provides projects and strategies for short-range (Tier 1) implementation of		•	•	•	

	and complement the context of the surrounding community	intersection improvements inclusive of ADA. Enhanced paratransit is recommended.					
11.	Exemptions to the Complete Streets Policy shall be limited to the following: a) Non-motorized users are prohibited on the roadway. b) Scarcity of population, travel and attractors, both existing and future, indicate an absence of need for such accommodations. c) Detrimental environmental or social impacts outweigh the need for these accommodations. d) Cost of accommodations is excessively disproportionate to cost of project. e) The safety or timing of a project is compromised by the inclusion of Complete Streets. f) An exemption other than those listed above must be documented with supporting data and must be approved by the County Engineer.	The ECCTP anticipates very few, if any, instances where some form of Complete Streets would meet the allowable exemptions on County roads with the possible exception of Exemption "d". Class 2 bike lanes would be appropriate along County roads in Transect Zones T-1 through T-4, while Class 3 bike lanes (sharrows) should be considered in Transect Zones T-4 through T-6. Pedestrian improvements could be part of street design in Transect Zones T-2 through T-6.		•	•	•	

1. See Appendix D for Essex County Complete Streets Policy Adopted on April 25, 2012.

6.2.2 Access Management

The ECCTP anticipates the use of Transect Zones to inform the future design of County road improvements, including the projects identified for Tier 1 through Tier 3 implementation in Chapters 4 and 5. Transect Zones are designed to articulate the appropriate "Complete Streets" treatment of various roadway types based on the surrounding land use context (context sensitive) and the corresponding modes of transportation to be accommodated by that particular segment

of the County road and its connections to other non-County segments of the network.

Roadway Type Classification: Roadway Type Classification describes both the function and the character of a roadway. The two primary classifications used within this manual include:

a. Functional Classification: Roadways function as arterials, collectors, or local streets. A roadway of a specific functional classification may contain various Transect Zone segments dependent upon the Character Classification of the land uses through which the roadway traverses.

b. Character Classifications: (Transect Zones) Transects are a system of ordering human habitats in a range from the most natural to the most urban. There are six Transect Zones (T-Zones) which describe the physical character of place at any scale according to the intensity of land use, as determined by the SmartCode model integrated development code. Land use types are of somewhat lesser importance in T-Zones. The County has adapted the Transect-based planning descriptions from the SmartCode. The design elements and criteria in this Resolution have been correlated to the T-Zone through which a road runs. The variation of standards according to the T-Zones will balance the needs of travelers with the needs of the community, thereby producing an optimal human environment. For example, design elements applicable to a T-5 or T-6 transect zone emphasize pedestrian safety and mobility, which will be the dominant Character Classification for the eastern Essex County towns. Transect Zones are defined as follows:

i. T-1 Natural Zone: Consists of lands approximating or reverting to a wilderness condition, including lands unsuitable for settlement due to topography, hydrology or vegetation. An example of this zone would be County Route (CR) 510, South Orange Avenue, located within the South Mountain Reservation. Generally speaking, transect zone T-1 is rare for Essex County Roads and will not apply to development review applications.

ii. T-2 Rural Zone: Consists of open space, farmland, or generally sparsely settled areas. Access densities will generally be at or below 15 access points per mile. Examples of these environments would include CR 611, Eagle Rock Avenue and CR 634, Laurel Avenue as they pass between the Crestmont and Essex Fells Country Club properties and Prospect Avenue (CR 577) adjacent to the Essex County Country Club.

iii. T-3 Sub-Urban Zone: Consists of low density residential subdivisions with possible retail and public use. These are typically the newer developed areas with residences situated on large lots with increased access spacing. Often access densities will be found in a range of 20 to 30 access points per mile. Marginal roads and reverse access roads are often incorporated into the development schemes. An example of this would include CR 611, Eagle Rock Avenue, in Roseland near Prudential Drive.

iv. T-4 General Urban Zone: Includes various residential, commercial and public uses, possibly intermixed. Residential uses are typically developed on smaller lots which are generally less than one acre in size. The areas will have high access densities often between 30 to 50 access points per mile. Examples would include CR 509, Broad Street, north of Bay Avenue (CR 654) in Bloomfield and Ridgewood Avenue (CR 653) in Glen Ridge.

v. T-5 Urban Center Zone:

Consists of mixed use building types that accommodate retail, offices and apartments with compact site plans. In Essex County examples would include segments of Bloomfield Avenue (CR 506) through the downtown areas of the Caldwells, Verona, Montclair and Bloomfield, with many of the following features: small lots, minimal building setbacks, adjacent sidewalks, on street parking, and streetscapes that encourage pedestrian movements. They will have a high access density along the roadway frontage, often between 50 to 75 access points per mile.

vi. T-6 Urban Core: these are the most vibrant urban places with the greatest variety of mixed use buildings. T-6 zones generally have continuous visually interesting building facades that transform a street into a true public space. This ambiance, sometimes referred to as a "Streetscape", will include common Center amenities such as minimal building setbacks, walking distance between buildings, sidewalks, on street parking, street furniture such as decorative lampposts and public seating; and a strong sense of place. All movement must feel at home to the pedestrians, such that movements of vehicles can be a steady flow, but be compatible with a walking pace. In Essex County, T-6 zones would include portions of Springfield Avenue (CR 603), South Orange Avenue (CR 510) and Central Avenue (CR 508) in downtown Newark, as well as portions of Park Avenue in East Orange.

vii. SD: Special Districts: Includes sections of County Routes not contained within the previous transect zones or those sections specifically defined by the County as having other requirements or alternate importance. This would include other roads within the South Mountain Reservation, as an example.

While these T-Zones are found to be intuitively recognizable, streets will be officially assigned with T-Zones by County staff based on the ECCTP, or with new applications if needed. Note that T-Zones are NOT determined for each individual lot, but rather determined by the character of the neighborhood, with the character of the proposed development being taken into strong consideration.

Figure T: Transect Zones - Source: SmartCode

Figure U: Essex County Transect Zone Examples: Top - T1 & T2; Bottom - T3 & T4

Figure V: Essex County Transect Zone Examples: Left – T5, Bloomfield Avenue (Five Points), Bloomfield; Right- T6, Central Avenue (NJIT), Newark

Access management and roadway design in Essex County will be based upon the eventual adoption of the Land Development Standards that have been prepared in conjunction with the this ECCTP. Standards such as lane width, turning radii, shoulder dimensions, number of access points along a County road, etc., will be guided by the Transect Zone assigned to the segment of a County road upon which a development project fronts. An example of one of two tables from the Draft Land Development Standards is shown as Table 42 and 43.

Table 42: Lane and Shoulder Widths (feet) See Notes 1-4 below					
Functional Classification: Arterial					
Transect	**T-1 or T-2**		**T-3 or T-4**		**T-5 or T-6**
Speed	< 2000 ADT	>2000 ADT	<2000 ADT	>2000 ADT	All
25	na	na	10-4	10-4	10-4
30	na	na	10-4	11-3	11-4
35	11-6	12-8	11-3	11-4	11-4
40	11-6	12-8	11-4	11-6	12-6
45	11-6	12-8	11-4	12-6	12-6
50	11-6	12-8	11-4	12-8	12-8
55	11-6	12-8	12-4	12-8	12-8
Dedicated Median Lanes					
All	12	11	11		
Functional Classification: Collector					
Transect	**T-1 or T-2**		**T-3 or T-4**		**T-5 or T-6**
Speed	< 2000 ADT	>2000 ADT	<2000 ADT	>2000 ADT	< 2000
25	10-4	10-4	10-4	10-4	10-3
30	10-4	10-4	10-4	10-4	10-3
35	11-4	11-4	10-4	11-4	10-4
40	11-4	11-4	10-4	11-4	11-4
45	12-4	12-4	11-4	11-6	11-6
50	12-6	12-6	12-4	11-6	na
Dedicated Median Lanes					
All	12		11		10

Notes:

1) ***On Street Parking, when permitted by the County Engineer, can be provided in lieu of the minimum required shoulder width. Minimum of 8 feet parking isle shall be provided in lieu of the shoulder.***
2) ***Shoulder widths may be increased as needed to accommodate other desirable characteristics such as pedestrian or bicycle compatibility.***
3) ***The table denotes lane width and shoulder width as follows: 11-4 is descriptive of an 11 foot lane and 4 foot shoulder.***
4) ***Eleven foot desirable, 10-foot minimum.***

Table 43: Bicycle Compatible Roadway Preferred Minimum Pavement Width			
Design Speed	**T-4, T-5, T-6 With On-Street Parking**	**T-4, T-5, T-6 Without On-Street Parking**	**T-1, T-2, T-3**
ADT below 2000			
30 or below	(12 ft SL)	14 ft SL, (11 ft SL)	10ft SL (11 ft SL)
31-40	(14 ft SL)	5 ft BL, (14 ft SL)	4 ft SH (12 ft SL)
41-50	(15 ft SL)	5 ft BL, (15 ft SL)	6 ft SH (3 ft SH)
Over 50	Na	6 ft BL, (6 ft SH)	6 ft SH (4 ft SH)
ADT of between 2000 and 10,000			
30 or below	14 ft SL, (12 ft SL)	12 ft SL, (12 ft SL)	4 ft SH (12 ft SL)
31-40	6 ft BL, (14 ft SL)	5 ft SH, (14 ft SL)	4 ft SH (3 ft SH)
41-50	6 ft BL, (15 ft SL)	6 ft SH, (15 ft SL)	6 ft SH (4 ft SH)
Over 50	Na	6 ft SH, (6 ft SH)	8ft SH (6 ft SH)
ADT above 10,000 or Trucks over 5%			
30 or below	5 ft SH, (14 ft SL)	5 ft SH, (14 ft SL)	4 ft SH (14 ft SL)
31-40	6 ft BL, (14 ft SL)	5 ft BL, (4 ft SH)	6 ft SH (4 ft SH)
41-50	6 ft BL, (15 ft SL)	6 ft BL, (6 ft SH)	6 ft SH (6 ft SH)
Over 50	Na	6 ft BL, (6 ft SH)	8 ft SH (6 ft SH)

Legend: SL = Shared Lane, SH = Shoulder, BL=Bike Lane

Source: NJDOT Bicycle Compatible Roadways and Bikeways, Planning and Design Guidelines. Numbers before parenthesis are the standard for bike routes and otherwise used whenever possible. Table widths may warrant increases as needed to accommodate substandard sight distances, truck traffic or steep grades.

6.2.3 Transportation Demand Management

Transportation demand management is the employment of a variety of different strategies by owners and developers of employment centers such as office complexes and industrial parks to reduce the need for parking, vehicle miles traveled (VMT) and the trips generated by their development. Examples of such strategies include:

1. Developer sponsored transit (shuttles/jitneys) – Developers sponsor a shuttle from at least one central point in their project to a major transit facility (train station or bus terminal), and/or other destinations such as a retail or employment center. Service should be adequate to effectively reduce motor vehicle trips (45 daily weekday trips and 30 daily weekend trips, depending on the type of project[6]);
2. Van pooling – Provision of a multi-passenger vehicle for joint use by multiple employees;
3. Car sharing/bicycle sharing – Provision of a vehicle or bicycle for temporary use on a reservation basis with preferred parking and shared by multiple employees/residents;
4. Telecommuting – Provision of a specific telecommuting policy and procedure designed to reduce trips to the place of employment;
5. Transit passes – Provision of transit passes to bus, light rail, rail or other transit. Transit passes should be valid for at least one year and be subsidized

[6] LEED 2009 for Neighborhood Development, Neighborhood Pattern & Design (NPD) Credit 8, Option 3.

to a minimum of 50% of the regular cost.[7]

6. Unbundling of parking – For 90% of multifamily residential units and/or nonresidential square footage, the associated parking spaces are sold or leased separately (unbundled) from the dwelling units and/or commercial space. The intent is to create an economic incentive to not need to store a vehicle in a project by not including the parking (charging extra for the parking) in the rent or sales price of the dwelling unit or commercial space.

The ECCTP recommends that larger (more than 100 units and/or 100,000 square feet of commercial space) development and redevelopment projects requiring approval by the Essex County Planning Board include a draft Transportation Demand Management Plan prepared by a qualified transportation professional. A TDM Plan, if determined by the County Planning Board to provide a measurable reduction in parking demand, should be considered as a basis for reducing the parking requirement for the project.

6.2.4 Public Transit Service

While many of the recommendations in the ECCTP are geared toward improving mobility to transit and mixing residential and commercial uses within walking distance to transit, the ECCTP also recommends that there be a commensurate increase in transit service by NJ TRANSIT to meet the existing and future demand. Service can be increased by adding more train cars to existing trains to increase seating capacity during morning and evening rush hours, increasing the availability of bicycle storage on trains and buses, increasing bus frequency along the most heavily used routes, adding bus routes to connect underserved areas of the County, and increasing paratransit and jitney services.

6.2.5 Transportation Services for the Elderly and Disabled

Currently transportation services for County residents with mobility challenges are provided by the County's Division of Senior Services in the Department of Citizen Services. In addition, some of the County's municipalities without a broader shuttle system provide a "dial-a-ride" service for senior citizens and the disabled.

It is recommended that linkages between current dial-a-ride services provided by the County and municipalities and regular transit (bus and train) be increased through expanded paratransit service to fill gaps in coverage and to increase convenience.

6.2.6 Land Use

While it is acknowledged that the control of land use rests with municipal government, the ECCTP encourages Essex County towns with transit assets to identify opportunities through changes in zoning, or future redevelopment areas or rehabilitation area designations, to apply transit-friendly planning that blends residential development with convenient retail goods and services within walking distance of transit facilities. These initiatives are already evident in the municipalities that have been designated as "Transit Villages" by the New Jersey Department of Transportation (Montclair, Bloomfield, South Orange and Orange).

Besides promoting Transit-Oriented-Development where transit is available, the ECCTP recognizes the importance of the appropriate location and development of job-producing commercial and industrial land uses in Essex County. Encouraging such development near existing or potentially re-activated freight rail service can facilitate such uses without unduly burdening the local road network with truck traffic. The continued redevelopment of brownfield sites with freight-forwarding and distribution facilities that increase the capacity of Port Newark to handle the ever-increasing flow of containers through the Port will also help the County's major economic engine and provide living-wage employment.

[7] LEED 2009 for Neighborhood Development, Neighborhood Pattern & Design (NPD) Credit 8, Option 2.

6.2.7 Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) are applications of telecommunications and other computer driven technologies provide real time information, direction or enforcement leading to more efficient traffic management. ITS enables users to be better informed and make safer, more coordinated, and 'smarter' use of transportation networks. Most common and familiar ITS includes car navigation; traffic signal control systems; container management systems; variable message signs; automatic number plate recognition and speed cameras. More advanced applications integrate live data and feedback from a number of sources, such as parking guidance and information systems; weather information; bridge deicing systems; and the like. Additionally, predictive techniques are being developed to allow advanced modeling and comparison with historical baseline data. [8]

As streets become more "complete" and are designed to channel all modes of transportation (cars, trucks, buses, BRT, bicycles and pedestrians), ITS can be expected to become more prevalent as a way of equipping drivers, cyclists and pedestrians to navigate safely through Essex County. The ECCTP recommends that new improvements to the County roadway network incorporate ITS where appropriate to operate at maximum efficiency for all users.

[8] Wikipedia.com