

ATHE

COU



# UNION COUNTY TRUCK MOBILITY STUDY

**Final Report** 





## Disclaimer

The preparation of this report has been financed in part by the U.S. Department of Transportation, North Jersey Transportation Planning Authority, Inc., Federal Transit Administration and the Federal Highway Administration. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or its use thereof.





This page is intentionally blank.





### **Acknowledgments**

#### **Board of County Commissioners**

Alexander Mirabella, Chairman Rebecca L. Williams, Vice Chair Angela R. Garretson Sergio Granados Christopher Hudak Bette Jane Kowalski Lourdes M. Leon Kimberly Palmieri-Mouded Andrea Staten

#### County Manager's Office

Edward T. Oatman, County Manager Amy C. Wagner, Deputy County Manager/Director, Department of Economic Development

#### Truck Mobility Study Technical Advisory Committee

Bridget Anderson – Business Administrator, City of Elizabeth Joseph Chrobak – Supervising Engineer, City of Linden Bernadette Cuccaro – Borough Administrator, Borough of New Providence Sgt. Charles Daly - Summit Police Department Sgt. Anthony D'Amore - Hillside Police Department Officer James Gilleece - Union Township Police Traffic Unit Lt. Christopher Guenther - Linden Police Department Rayna Harris – Borough Administrator, Borough of Fanwood Cpt. Benjamin Niewinski - Hillside Police Department Sgt. Thomas Ostrander - Westfield Police Department Antonios Panagopoulos, PE – Borough Engineer, Borough of Fanwood Mayor Kathleen Miller Prunty - Cranford Township Mayor Donald A. Shaw - Borough of Roselle Thomas Strowe – Downtown Redevelopment Coordinator, Scotch Plains Township Mayor Sara Todisco - Borough of Garwood Sgt. Juan Vargas - Union Township Police Department

#### **Union County Staff**

#### County Project Manager:

#### Liza Betz, AICP/PP, Transportation Planning Manager

Phil Kandl, Director, Division of Strategic Planning Tom Mineo, PE, Director, Division of Engineering Matt Mahan, MBA, GISP, Bureau Chief, Bureau of Geographic Information Systems Luis Gregorich, Department of Public Works Robert Charkowsky, Information Tech. Services

#### NJTPA Staff

#### NJTPA Project Manager:

*Peter Zambito, Principal Planner, Corridor Studies* Blythe Eaman, AICP, Principal Planner, Subregional Planning Studies

#### Consultant Team

#### Consultant Project Manager:

Stephen Chiaramonte, AICP/PP, WSP Carlos Bastida, WSP Himadri Shekhar Kundu, AICP, WSP Charlie Romanow, AICP, WSP Steve McNally, AmerCom Peter Van Den Kooy, AICP/PP, CME Associates Chris Dochney, AICP/PP, CME Associates Steven Gottleib, CME Associates





# **Table of Contents**

1.	Intro	oduct	ion	1
2.	Data	a Coll	ection and Basemap	2
	0.1	Pag	omon	2
	2.1.	Das		2
З.	Data	a Ana	lysis	
	3.1.	Lan	d Use	4
	3.1.	1.	Freight Trends	5
	3.1.	2.	Truck Generators	6
	3	.1.2.1	L. Industrial Properties	7
	3	.1.2.2	2. Approved Developments	
	3.1.	3.	Schools	
	3.2.	Roa	dway Inventory	
	3.2.	1.	Roadway Jurisdiction	
	3.2.	2.	Truck Network	21
	3.2.	3.	Traffic Signals	23
	3.2.	4.	Bridge Clearances	24
	3.2.	5.	Bicycle Compatibility	26
	33	Traf	fic Data	27
	3.3.	1.	Traffic Volumes	30
	3.3.	2.	Truck Volumes	
	0.4	•		22
	3.4.	Cras	Sh Data	
	3.4.	1. 0	Crash Cluster Analysis	
	3.4.	∠.	NJDOT Network Screenings	
	3.5.	Equ	ity Assessment	
	3.5.	1.	Automobile Accessibility	45
	3.5.	2.	Disabilities	
	3.5.	3.	Education	
	3.5.	4.	Elderly	
	3.5.	5.	English Proficiency	
	3.5.	6. -	Foreign Born	
	3.5.	7.	Poverty	
	3.5.	8.	Population Below Double the Poverty Rate	
	3.5.	9. 40	Racial and Ethnic Minority	
	3.5. 2.5	10. 11	Youth	
	ປ.ໆ. ເ	12. 12	TUULII	
	5.5.	12.	Lyuity Assessment Summary	
4.	Iden	tifica	tion of Critical Locations	
5.	Reco	ommo	endation Types	
	5.1.	Incr	eased Capacity	
	5.2.	Sigr	age	





	5.3.	Wayfinding Improvements	.68
	5.4.	Signal Improvements	. 68
	5.5.	Truck Prohibitions	69
	5.6.	Alternate Routing	69
	5.7.	Striping Improvements	.69
	5.8.	Increased Bridge Clearances	. 69
	5.9.	Pedestrian or Bicycle Improvements	.69
	5.10.	Operator Outreach	69
6.	Reco	ommendations	71
	6.1.	Site #1 – Summit Avenue (CR 657), Broad Street (CR 512) to Springfield Avenue – Summit	73
	6.2.	Site #2 – Springfield Avenue (CR 512), Passaic Street/South Street (CR 647) to Academy Street – New Providence.	. 76
	6.3.	Site #3 – Park Avenue (CR 655) at New Providence Road – Scotch Plains	79
	6.4.	Site #4 – Vauxhall Road (CR 630) at Liberty Avenue – Union	83
	6.5.	Site #5 – Vauxhall Road (CR 630) at Stuyvesant Avenue (CR 619) – Union	86
	6.6.	Site #6 – South Avenue (CR 610) at Centennial Avenue (CR 615) – Cranford	89
	6.7.	Site #7 – 1 <sup>st</sup> Avenue (CR 610) at Locust Street (CR 619) – Roselle	93
	6.8.	Site #8 – Elizabeth Avenue (CR 514), Scott Avenue (CR 650) to N. Stiles Street (CR 615) – Linden/Rahway	.96
	6.9.	Site #9 – Wood Avenue (CR 617) at Elizabeth Avenue (CR 514) – Linden	99
	6.10.	Site #10 – Wood Avenue (CR 617) at Linden Avenue – Linden1	103
	6.11.	Policy and Programmatic Improvement Opportunities1	107
7.	Impl	ementation Matrix1	.08
8.	Stak	eholder and Public Outreach1	.14
	8.1.	Wikimap1	114
	8.2.	Project Newsletters	117
	8.3.	Project Email1	117
	8.4.	Bicycle & Pedestrian Focus Group1	118
	8.5.	Municipal Survey	118
	8.6.	Truck Industry Survey1	118
	8.7.	Technical Advisory Committee1	118
	8.8.	Public Meeting1	119
	8.9.	Union County Transportation Advisory Board1	119
9.	Cone	clusion and Next Steps1	.20





# **List of Appendices**

Appendix A: Basemap Data Appendix B: Traffic Counts Appendix C: Critical Locations Appendix D: Public Outreach Materials





# List of Figures

Figure 1: Union County Truck Mobility Study Basemap	3
Figure 2: Highway Network Utilization	6
Figure 3: Outbound Freight Producers (by Tonnage)	7
Figure 4: Inbound Freight Consumers (by Tonnage)	8
Figure 5: Land Use MOD-IV (Industrial Site Use)	9
Figure 6: Freight-Generating Sites (by Sales Volume)	10
Figure 7: Freight-Generating Sites (by Number of Employees)	11
Figure 8: Freight-Generating Clusters	12
Figure 9: Business Square Footage by Industry Type	14
Figure 10: Freight-Generators Calculated by Square Footage	15
Figure 11: Freight Generating Land Uses and Square Footage Clusters	16
Figure 12: Approved Developments	17
Figure 13: Union County Schools	19
Figure 14: Roadway Jurisdiction	20
Figure 15: Truck Access Network	22
Figure 16: Bridge Clearances	24
Figure 17: Bicycle Compatibility Index	26
Figure 18: Traffic Counts Obtained for Union County Roadways	28
Figure 19: Miovision Scout Device Installed on Meisel Avenue, Springfield Township	28
Figure 20: Supplementary Traffic Count Locations	29
Figure 21: Truck Volumes	31
Figure 22: All Crashes	33
Figure 23: County Roadway Crashes	34
Figure 24: Truck Crashes	35
Figure 25: Truck Crash Clusters	37
Figure 26: Cyclist and Pedestrian Crash Clusters	39
Figure 27: NJDOT Network Screening Rankings, 2019	40
Figure 28: NJDOT Network Screening Priority Safety Rankings, 2019	41
Figure 29: Census Tracts	44
Figure 30: Percentage of Zero Car Vehicle Households	45
Figure 31: Percentage of Population with Disabilities	46
Figure 32: Percentage of Population Lacking High School Diploma	47
Figure 33: Percentage of Elderly Population	48
Figure 34: Percentage of Limited English Proficiency Households	49
Figure 35: Percentage of Foreign-Born Population	50
Figure 36: Percentage of Population Below Poverty Level	51
Figure 37: Percentage of Population Living Below Double the Poverty Level	52
Figure 38: Percentage of Racial/Ethnic Minority Population	53
Figure 39: Percentage of Population Age Five Years or Younger	54
Figure 40: Percentage of Population Between Age Five and Seventeen	55
Figure 41: Critical Location Selection Process	57
Figure 42: Existing Land Use, Inbound and Outbound Freight (by Tonnage)	58
Figure 43: Inbound Freight Generation (by Tonnage) and Daily Traffic Volumes	59
Figure 44: Outbound Freight Generation (by Tonnage) and Daily Traffic Volumes	60
Figure 45: Daily Traffic Volumes, Bridge Clearances and Truck Access Network	61
Figure 46: Truck Crash Hotspots and Freight Generators	62
Figure 47: Crash Hotspots and Daily Truck Volumes	63
Figure 48: Truck Crash Hotspots, Bicycle Compatibility, and Schools	64





Figure 49: Preliminary Critical Sites	65
Figure 50: Sites Advanced for Recommendations	72
Figure 51: Site #1 Identified Issues	74
Figure 52: Site #1 Improvements	
Figure 53: Site #2 Identified Issues	77
Figure 54: Site #2 Improvements	
Figure 55: Site #3 Identified Issues	
Figure 56: Site #3 Corridor Improvements	
Figure 57: Site #3 Intersection Improvements	82
Figure 58: Site #4 Identified Issues	
Figure 59: Site #4 Improvements	
Figure 60: Site #4 Vicinity Improvements	
Figure 61: Site #5 Identified Issues	
Figure 62: Site #5 Improvements	
Figure 63: Site #6 Identified Issues	90
Figure 64: Site #6 Corridor Improvements	92
Figure 65: Site #6 Location Improvements	92
Figure 66: Site #7 Identified Issues	94
Figure 67: Site #7 Improvements	
Figure 68: Site #8 Identified Issues	97
Figure 69: Site #8 Improvements	
Figure 70: Sites #9 and #10 Identified Issues	
Figure 71: Sites #9 and #10 Corridor Improvements	
Figure 72: Sites #9 and #10 Location Improvements	
Figure 73: Sites #9 and #10 Identified Issues	
Figure 74: Sites #9 and #10 Corridor Improvements	
Figure 75: Sites #9 and #10 Location Improvements	
Figure 76: Wikimap	





# List of Tables

Table 1: Freight-Generating Sites	
Table 2: Major Approved Developments	
Table 3: Truck Routes	23
Table 4: Substandard Bridge Clearances	25
Table 5: Union County Traffic Count Types	27
Table 6: Highest AADT Counts on County Roadways	
Table 7: Truck Volumes	
Table 8: Crashes in Union County, 2016-2018	
Table 9: Truck Crash Clusters	
Table 10: Cyclist and Pedestrian Crash Hotspots	
Table 11: NJDOT Network Screening Rankings, 2019	41
Table 12: NJDOT Network Screening Priority Safety Rankings, 2019	
Table 13: Equity Assessment Variables	43
Table 14: Preliminary Critical Sites	
Table 15: Potential Improvement Concepts	70
Table 16: Sites Advanced for Recommendations	71
Table 17: Wikimap Categories	
Table 18: Wikimap Interactions	
Table 19: Wikimap Comments by Corridor	
Table 20: Wikimap Comments by Municipality	

# List of Acronyms

AADT	Average Annual Daily Traffic
CR	County Route
EJ	Environmental Justice
EPA	US Environmental Protection Agency
GIS	Geographic Information System
GSP	Garden State Parkway
MOD IV	New Jersey Property Tax System
NAICS	North American Industry Classification System
NJDEP	NJ Department of Environmental Protection
NJDOT	NJ Department of Transportation
NJGIN	New Jersey Geographic Information Network
NJOGIS	New Jersey Office of GIS
NJTPA	North Jersey Transportation Planning Authority
TAB	Union County Transportation Advisory Board
TAC	Technical Advisory Committee





#### 1. Introduction

The Union County Truck Mobility Study stems from the increasing role that freight plays in our daily lives. The study area encompasses the County's 174-mile roadway network that traverses its 21 municipalities. While the Study looks at the entire freight network in the County, it is focused on implementable solutions along the County roadway network that can be quickly deployed, resulting in visible and impactful results.

Initial included work on the study а comprehensive review of existing conditions, including freight generators, land use, traffic data, safety data, and an inventory of the roadway network. This analysis formed the basis for the study outcomes, leading to the identification of 33 critical locations, 10 of which received planning-level recommendations aimed at improving the safe and efficient movement of vehicular freight, traffic, cyclists, and pedestrians. These recommendations serve as a blueprint for future investments in improving truck circulation on Union County's roads and are summarized in Section 6.



For the purpose of this study, the term "truck" includes each of the vehicles pictured above. This study aims to address the needs of each of these users, while also understanding the need to limit conflicts with motor vehicles, pedestrians, and cyclists.

While only 10 sites were advanced to the recommendations phase, the applied concepts are intended to serve as a pilot and template inspiring further recommendations at other locations in need of freight-focused improvements.

The study was supported by a comprehensive public outreach process and included collaboration with a Technical Advisory Committee (TAC) composed of County and municipal representatives, as well as other freight stakeholders in the County. A focus group was held on bicycle and pedestrian issues in order to better understand that the unique needs of the most vulnerable roadway users were reflected in the recommendations. An interactive map (Wikimap) was available online for public comments throughout the study, and individual surveys were conducted with municipal and trucking representatives, respectively, garnering valuable feedback on the concerns of these constituents and stakeholders.

Union County is the center of freight activity in New Jersey and has some of the most substantial freight nodes in the region. Significant origins and destinations of freight in the County include the Bayway Refinery, Merck, Port Newark-Elizabeth Marine Terminal, and Newark Liberty International Airport. Additionally, the New Jersey Turnpike (Interstate 95), Interstate 78, and US 1&9 facilitate the safe and efficient movement of both goods and people through the County, State and region. While freight is a constant and visible presence in Union County, it is also home to nearly 600,000 people. Many more living throughout the region commute to the County daily. Freight needs must coexist with all other modes using transportation infrastructure within the 20th most densely populated county in the United States.





While some roadways and adjacent land uses were constructed with freight in mind, many communities, particularly those with predominantly residential land uses, were not. Depending on origin and destination, many trucks rely only upon higher class roadways, such as the New Jersey Turnpike, without traveling on County or municipal roads. However, with more demand for direct-to-home delivery, trucks are increasingly travelling on local roads and in residential neighborhoods. Freight includes 18-wheelers traveling to and from the Port of Newark/Elizabeth Marine Terminal, as well as a variety of smaller vehicles including delivery trucks, cargo vans, or quarry/construction trucks. As one-day shipping and direct-to-home shipping becomes a more standard practice, freight vehicles have a more visible place on the local and County roadway network. Additionally, each of the businesses in Union County's many vibrant mixed-use downtowns require freight and the ability for vehicles to safely park nearby for the loading and unloading of deliveries

#### 2. Data Collection and Basemap

The project team completed a comprehensive review of available data sources to create a basemap which serves as the platform for further data and subsequent analyses. These data sources were vital for identifying critical sites and developing recommendations.

A variety of data sources were gathered, reviewed and analyzed for inclusion into the Union County Truck Mobility Study. These sources, including those constituting the basemap provide an understanding of the overall transportation and demographic conditions of the County.

Data sources concerning transportation and infrastructure provide an understanding into the County's existing roadway network, how the roadways are used, and where potential concerns and opportunities may exist. These datasets include those found in traditional roadway analyses, including traffic flows and crash data, but also freight-specific data (such as truck flows or industry trends) that provide additional measures necessary to understand how and where trucks move on the County roadway network. Information was added from the New Jersey Department of Transportation (NJDOT) Truck Network Map, bridge clearances, and traffic signals. The analyses included the project team review of the bicycle compatibility data to identify any overlap of bicycle concerns at locations in need of truck-specific improvements.

#### 2.1. Basemap

The basemap layers provide spatial data about basic geographic characteristics. These layers are included on each map of the study and provide geographic reference for identifying locations. The development of maps used throughout the Union County Freight Mobility Study incorporated layers from publicly accessible sources including NJ Geographic Information Network (NJGIN) and the US Census Bureau. The roadways dataset was provided by Union County.

The following basemap layers were compiled, reviewed, and incorporated into this study's maps. The purpose and intended use of each is included in Appendix A. Figure 1 shows the study basemap including each of the layers noted below.

Census Tracts	Roadways		
State, County and Municipal Boundaries	Location of Railroad Stations		
Railroads: the centerlines of railroad tracks	Water: existing bodies of water		
Open Space			







### Figure 1: Union County Truck Mobility Study Basemap





#### 3. Data Analysis

The following sections detail the individual datasets that were analyzed and ultimately served as a key input for the selection of improvement sites. For each analysis type, a summary of key datasets and the resultant analysis is included.

#### 3.1. Land Use

Land use and freight generation data provides a view into existing land uses in Union County from several perspectives. Each of the following sources was essential for understanding truck demand and ultimately in selecting sites for improvement later in the process.

- 2040 and 2050 Freight Industry Level Forecasts A freight profile for Union County was generated in this freight forecast work completed by the NJTPA. It was one of 28 such profiles, providing an accurate picture of where concentrations of goods movement activity exist, the types of commodities that will be moving, and where strategic investment should be made. The earlier forecasts for 2040, published in 2012, and the most recent 2050 forecasts, published in 2020, were reviewed. These profiles exist for the given reference year (2040 or 2050) and the growth identified can be expected to occur in the region by the reference year. Additionally, the profiles identify the types of commodities that will be moving, and where strategic investments should be made. Variables included in this dataset include site square footage by industry type, inbound and outbound tonnage, employment, sales and industry details. Agglomerations of freight tonnage were used to identify concentrations of freight activity and the potential for large volumes of trucks to be generated.
- Dun and Bradstreet Selectory Database: The Selectory database is a proprietary database maintained by Dun and Bradstreet, a global data and analytics consulting firm. This data was included in NJTPA's 2040 Freight Industry Level Forecast and provides information regarding business activity by location. It is produced and maintained through business surveys and interviews used to collect, verify, and update the information contained therein. The 2010 data used for this study contains business attributes for more than 360,000 businesses statewide. Data variables include address, industry classification, size (area), and the number of employees. Inclusion of industry classification through North American Industry Classification System (NAICS) codes allowed the project team to better isolate businesses in freight-generating industries.
- MOD-IV Land Use Data This dataset from the New Jersey Office of GIS (NJOGIS) provides basic information regarding property type and location, as compatible with the New Jersey Department of Treasury property assessment MOD-IV system. This parcel data provided the basis for spatial analysis of likely truck generators, along with the Selectory and Freight Locator databases, noted below. Parcels are classified into one (1) of fifteen (15) land use categories.
- IHS Global Insight Freight Locator Database This database illustrates known or potential freightgenerating business locations, including industry type, sales, and estimates tonnage of freight by commodity type. The database is maintained through interviews and surveys and estimates inbound and outbound tonnage by commodity based upon the industry type and volume of sales. The data was collected in 2007 and included sites throughout the Northeastern United States.





In addition to these databases, Union County also provided the project team with a list of Planning Board approved development sites. These sites were narrowed down based on their potential to generate freight trips and that subset was included in the analysis.

#### 3.1.1. Freight Trends

Freight is essential to the economic vitality of Union County. Of the 228,000 jobs in Union County, 38 percent are part of industry sectors highly dependent on freight movement including manufacturing, mining and extraction, retail trade, wholesale trade, and logistics. Within Union County, 62 percent of those employed are within an industry which may generate freight but are less dependent upon freight movement. Each year, 66 million tons of domestic freight move into, out of, or within Union County. Of this tonnage, 87 percent is moved by truck. For domestic tonnage with an origin and/or destination in the County, nearly 43 percent consists of energy products, most of which traveled between Union County and elsewhere in North Jersey. Overall, other locations in North Jersey are the primary source or destination of Union County freight-generators.

NJTPA's 2050 Freight Industry Level Forecasts present a snapshot of existing and trending data points for freight within each of NJTPA's counties. The following information and graphic were obtained from the Union County Regional Freight Profile. All projections are made for the 2050 forecast year. Please note that all data forecasting of trends was conducted prior to the COVID-19 pandemic and therefore does not account for cultural and economic shifts stemming from COVID-19.

Figure 2 illustrates 2020 freight traffic flows on the County's highway network developed as part of 2050 Freight Industry Level Forecasts study.

By 2050, the NJTPA estimates the employment in freight-intensive industries is expected to increase by 7 percent. Conversely, the manufacturing and utilities sectors are expected to experience reductions in employment. Retail trade and construction employment are expected to rise 25 percent and 17 percent respectively. Additionally, commodity flows into, out of, and within the County are expected to increase 23 percent.

This expected increase is relatively similar between all identified commodity bundles (chemicals, energy, pharmaceuticals, etc.). The energy sector is expected to continue to have the greatest tonnage while the chemicals sector is expected to have the greatest monetary value of shipped goods. The directional movement of shipments containing the top 10 commodities are expected to remain nearly constant with most shipments beginning/ending in the NJTPA region.

It is expected that trucks will remain the primary means of transporting commodities. The number of trucks traveling on Interstates 95 and 78 is expected to increase by between 500 and 600 per day in each direction by 2050. Commodity truck volumes on US 1&9 and NJ 24 are expected to increase by 200 per day, and truck volumes along US 22 are expected to increase 100 trucks per day.







#### Figure 2: Highway Network Utilization

#### 3.1.2. Truck Generators

Properties likely to be generators of truck traffic include industrial sites and locations with confirmed or pending development approvals. Clusters of these locations with respect to County roadways were identified. Each category of truck generator was used to create an individual GIS shapefile with the same underlying data found in the MOD-IV records detailed in Section 3.1. The following categories were selected for further analysis:

#### Industrial Properties

Those properties in the County that have a tax classification of 4-B (Industrial) and are over five acres in size were identified as larger industrial sites. This includes port facilities at the Port Newark/Elizabeth Marine Terminal.

There are 192 properties in Union County that are over five acres in size and classified as 4-B Industrial for tax purposes. Although these properties are scattered throughout the County, they are generally in clusters. These properties in total encompass over 4,750 acres of industrial lands.





#### **Development Approvals**

This analysis also included locations that submitted recent development applications to the Union County Planning Board. These included data from 2016-2019 and were culled to report large facilities (greater than 50,000 square feet) that are anticipated to generate truck trips (warehouse, commercial, industrial).

#### 3.1.2.1. Industrial Properties

Outbound freight producers are located throughout the County, predominantly along major US, State and County roadways. Several major freight producers are concentrated east of the Northeast Corridor Line in Elizabeth and Linden. Another hub is concentrated in the northern part of the County along the Garden State Parkway in Union, Kenilworth, Roselle Park, and Cranford. Outbound freight-producing sites are shown in Figure 3.







The location of significant freight consumers is similar to producers, with a large concentration in Elizabeth and Linden, closer to major freight corridors such as Interstate 95, Interstate 78, US 1&9 and US 22, and also closer to the ports and the Northeast Corridor. There are also several large freight consumers in Union Township. County businesses produce nearly three times as much freight as they consume (16.2 million tons vs. 5.7 million tons). Inbound freight-producing sites are shown in Figure 4.



Figure 4: Inbound Freight Consumers (by Tonnage)





In addition to reviewing freight producers through the Freight Locator database, the Selectory database was used to identify additional individual freight-producing parcels. This was accomplished by selecting only those properties listed in the MOD-IV land use database with a tax classification of 4-B (Industrial) and encompassing more than five acres. These parcels would be expected to be among the heaviest generators of truck trips in the County. This resulted in the identification of 192 parcels representing 4,750 acres of land within Union County (Figure 5). The analysis was supplemented with additional parcels that are exempt from property taxes, including the Port Elizabeth Marine Terminal, that are known truck generators, shown in yellow in Figure 5.









The Freight Locator database was used to identify clusters of industrial properties that might generate truck traffic. Sales volume figures were used as a proxy to estimate the amount of freight generation and conduct a cluster analysis, shown in Figure 6.



Figure 6: Freight-Generating Sites (by Sales Volume)





An additional method to identify freight generating properties was to review and select specific parcels (and clusters) of industrial properties with large numbers of employees. This was accomplished using the Dun and Bradstreet *Selectory* database, which classifies employers by number of employees. The resultant analysis is illustrated in Figure 7.



Figure 7: Freight-Generating Sites (by Number of Employees)

Sites were further narrowed down to include only those with the highest number of employees and highest sales volume. Establishments that likely represent "back-office" operations, as opposed to those producing truck trips, were removed from the analysis.

Additionally, based on site-specific knowledge, the project team conducted an aerial survey using Google Earth imagery to include further freight-generating properties and validate the results from these analyzes. Figure 8 illustrates these significant freight generators, categorizing them by their means of selection: number of employees (pink), sales volume (red), and identification by visual survey (blue). Some of these





mapped locations represent individual sites while others represent clusters of employment areas (such as a downtown). These sites are also listed in Table 1.

For optimal access to the regional highway network, freight generators tend to be clustered near major freight corridors such as Interstate 78 and Interstate 95. The proximity to these interstate highways is preferable for the operation of these entities and also improves the efficiency of freight movement. It is important because it minimizes travel on local roadways which are less suitable to carry heavy vehicles. Figure 9 identifies the largest freight generating clusters in Union County.



Figure 8: Freight-Generating Clusters





### Table 1: Freight-Generating Sites

Site	Туре	Municipality	Acreage
Port Newark/Elizabeth Marine Terminal	Employment	Elizabeth	1,819
Former GM Plant	Aerial Review	Rahway/Linden	629
Newark Liberty Int'l Airport/Elizabeth	Employment	Elizabeth	418
Interstate 78 GSP - Hillside	Aerial Review	Union/Hillside	337
Union/US 22	Employment	Union	308
Springfield/US 22	Employment	Springfield	241
New Providence	Employment	New Providence	180
Lehigh Avenue/Green Lane	Sales	Union	152
Вауwау	Sales	Linden	104
Merck	Sales	Kenilworth	103
Clark Downtown	Employment	Clark	66
Summit	Employment	Summit	52
Westfield	Employment	Westfield	17
Garwood	Employment	Garwood	17

Source: IHS Global Insight, Dun & Bradstreet, WSP





Using NJTPA's 2050 Freight Industry Level Forecasts, the project team identified additional freightproducing sites and clusters based on industry type (sales, production, logistics) and square footage of the site. These locations provided additional insight as to where truck-generating clusters are present in the County, as shown in Figure 9.









Using the 2050 Freight Industry Level Forecasts, the project team identified additional freight clusters by identifying clusters of large-scale (by square footage) facilities. High square footage sites tend to be located near the Interstate 95 and Interstate 78. The individual sites with the most square footage tend to be located along Interstate 95 and US 1&9 in Elizabeth, Linden, an Rahway. The analysis of freight-producing square footage clusters in presented in Figure 10.









The results of freight generators using each of the above methodologies were mapped upon one another, as shown in Figure 11. There is significant overlap in freight-generating sites between each of the methodologies, including the Port Newark/Elizabeth Marine Terminal Cluster (Elizabeth), Newark Liberty International Airport/Elizabeth, the former General Motors plant (Rahway/Linden), Interstate 78 GSP-Hillside (Union/Hillside), Union/US 22, and New Providence.



Figure 11: Freight Generating Land Uses and Square Footage Clusters





#### 3.1.2.2. Approved Developments

Locations with recent development proposals for facilities greater than 50,000 square feet were identified through the Union County Planning Board and were also identified as sites with the potential to generate truck trips. The largest approved sites are presented in Figure 12 and Table 2. The most substantial sites are in Linden or Elizabeth with several adjacent to the Port Newark/Elizabeth Marine Terminal. Other smaller sites are located throughout the County including locations in Union Township, Cranford, Berkeley Heights, and Plainfield.





#### Table 2: Major Approved Developments

Size (acres)	Location	Municipality
122	Southeast of New Jersey Turnpike	Linden
98	581-683 Kapkowski Rd	Elizabeth
43	1016 W Edgar Rd	Linden
20	1-71 North Ave E	Elizabeth
19	252-308 North Ave E	Elizabeth
14	101-141 North Ave E	Elizabeth
14	686-762 Kapkowski Rd	Elizabeth

Source: Union County Department Planning Board, 2020





#### 3.1.3. Schools

The presence of the more than 150 public and private primary, secondary and tertiary schools were also reviewed in terms of their proximity to existing and future freight generating sites. When reviewing and proposing recognized and de facto truck routes, it is important to consider the presence of children, particularly for schools reached by walking and biking. During the subsequent improvement site selection process, the presence of schools within 0.5 mile of a targeted location was used as a measure to determine greater need for improvements at that location.

The school data within the property data include the following:

- 111 public elementary schools
- 21 public middle/intermediate schools
- 20 public high schools
- 1 public vocational tech school
- 33 private schools
- "other" schools
- universities/colleges (3 UCC campuses and Kean University)

Note that many identified elementary schools include Kindergarten through Grade 8, which overlaps with traditional middle school grades (grades 6 through 8).

Public, private, and parochial schools are located throughout the County (Figure 13). In the heavily freightproducing communities of Linden and Elizabeth, schools tend to be located in the western part of each municipality, closer to residential areas than the industrial properties to the east.





### Figure 13: Union County Schools







#### 3.2. Roadway Inventory

#### 3.2.1. Roadway Jurisdiction

Nearly all roadways in Union County fall under State, County, or municipal jurisdiction. Together, the roadway network aims to provide mobility for all local travel purposes as well as those beyond the County and State. The roadway jurisdiction for all roads in Union County is shown in Figure 14.



Figure 14: Roadway Jurisdiction

This study focuses on truck trips along Union County's 500, 600, and 700 series roadways (shown in orange in Figure 14). These 69 county routes span 174 miles and range in length from less than one tenth of a mile to more than 10 miles. Supporting and linking to State, US, and Interstate roads, the County roadway network forms the backbone of mobility within Union County, connecting travelers between origins or destinations and the regional highway network.

The most prominent roadways in the County tend to run north-south, including the New Jersey Turnpike, the Garden State Parkway, US 1&9, and NJ 27. Several other prominent corridors travel diagonally through





the County, including Interstate 78, US 22, and NJ 28. East-west connections within Union County are mainly facilitated by County and municipal routes.

#### 3.2.2. Truck Network

The County's 2016 Transportation Master Plan was used to confirm and map designated truck routes. Truck routes are identified as "New Jersey Access Network" or "National Highway System" or "Trucks Not Permitted." These routes are consistent with NJDOT's Truck Network Map<sup>1</sup>, which identifies the New Jersey Access Network (NJ Admin Code § 16:32-1.1); a series of routes where double-trailer truck combinations or 102-inch wide trucks are permitted, the National Highway System ( 23 US Code § 103); the Federally designated system of major intra- and interstate roadways; and, New Jersey's "Blue Routes," a series of roadways where trucks are permitted only when making local deliveries (defined in NJ Admin Code § 16:32, Appendix A and B). It is important to note that these networks are codified and subject to change only through an act of the Legislature.

As shown in Figure 15, within Union County, trucks are not permitted on the entirety of the Garden State Parkway. Additional truck prohibitions are present along several other routes within Union County, but limited truck trips are allowed where an origin or destination requires use of these routes. These prohibitions are present on CR 514 between US 1&9 in Rahway to Bay Avenue in Elizabeth (4.65 miles), CR 577 between NJ 24 in Springfield to beyond the Essex/Union County border, and NJ 82 between Kingwood Road and NJ 439 in Union Township (1.83 miles).<sup>2</sup>

Table 3 lists roadways in Union County where 102-inch wide trucks are permitted as part of the New Jersey Access Network. All interstate highways that are part of the National Highway System permit trucks.

 $<sup>^{1}\,</sup>https://www.state.nj.us/transportation/freight/trucking/pdf/largetruckmap.pdf$ 

<sup>&</sup>lt;sup>2</sup> N.J.S.A. 27:1A-5, 27:1A-6, and 39:3-84; 23 CFR Part 658; and P.L. 1991, c. 115., http://liberty.state.nj.us/transportation/about/rules/documents/16-32-Current.pdf











Route	Boundaries		
US 1&9	PA State Line (as US 1)	US 1&9T in Newark (Essex County)	
US 22	Interstate 78 in Clinton (Hunterdon County)	US 1&9 in Newark (Essex County)	
NJ 24	Interstate 287 in Hanover Twp (Morris County)	Interstate 78 in Springfield	
NJ 27	US 206 in Princeton (Mercer County)	NJ 21 in Newark (Essex County)	
NJ 28	Chimney Rock Road in Bridgewater (Somerset County)	NJ 27 in Elizabeth	
NJ 59	CR 610 in Cranford	NJ 28 in Cranford	
NJ 82	NJ 124 in Springfield	Kingswood Rd in Union Twp	
NJ 124	CR 510 in Morristown (Morris County)	CR 601 in Maplewood (Essex County)	
NJ 439	Interstate 78 in Elizabeth	NJ 27 in Elizabeth	
CR 509	North Ave in Westfield	Essex County border	
CR 514	Somerset County border	Essex County border	
CR 527	Somerset County border	Essex County border	
CR 531	Somerset County border	Middlesex County border	

Table 3: Truck Routes

Source: New Jersey Access Network: N.J.A.C. 16:32

The New Jersey Access Network includes some of the highest volume roadways in the state and provides many direct links between communities in Union County, adjacent counties and the region. Within Union County, the New Jersey Access Network tends to direct trucks toward Interstate 78 and Interstate 95.

Truck routes that provide east-west circulation through the county include US 22, NJ 28, NJ 82, CR 509, and CR 512. Truck routes providing north-south connectivity include US 1&9, NJ 27, CR 509, and CR 527. US 1&9 and NJ 27 are two key north-south routes that provide access to the freight clusters in Elizabeth and Linden, but direct connections from the west are circuitous to avoid travelling through downtown Elizabeth.

#### 3.2.3. Traffic Signals

The Union County Division of Engineering Bureau of GIS provided the location of traffic signals on County roadways. The data includes traffic signal location, municipality, type (traffic, fire) and the jurisdiction responsible for maintaining the signal. The data is current as of June 2018. An important distinction about the signals in Union County is that municipalities are responsible for maintenance.

According to the data provided, there are 606 traffic signals on roads in Union County, with the majority of these being standard traffic signals. There are 46 non-standard signals including four lighted stop signs, 27 flashing signals, four flashing crosswalks, one flashing industrial site drive, and 10 fire station signals.





#### 3.2.4. Bridge Clearances

Substandard bridge clearances limit the ability for trucks to utilize certain routes and directly access destinations. he Union County Division of Engineering provided bridge clearance data associated with County roadways in 2020 and posted bridge clearances (measured in feet and inches) were reconfirmed by Division of Engineering staff in 2021. This information was used to identify locations where low clearances prevent truck accessibility or force circuitous detours. T

New Jersey Code (N.J.S.A.27:5G-2) dictates that any bridge on a county roadway with a minimum bridge clearance of less than 14 feet-6 inches shall have the maximum clearance posted. Figure 16 shows all 40 locations where bridge clearances are below that standard, (red, orange, and yellow symbols). Table 4 lists the 23 bridges along County roadways with a height clearance less than 14 feet-6 inches. Note that 19 of these structures are at rail crossings and four are crossings of the Garden State Parkway. Rail crossings are generally more challenging and costly to replace or increase clearances.



Figure 16: Bridge Clearances





Roadway		Crossing Road/Rail	Posted Clearance (feet-inches)	Municipality
Locust St	CR 619	Conrail ROW	11-10	Roselle Park
Wood Ave	CR 617	Northeast Corridor Line	12-4	Linden
New Brunswick Ave	CR 609	North Jersey Coast Line	12-7	Rahway
Scott Ave	CR 652	Northeast Corridor Line	12-9	Rahway
Hazelwood Ave	CR 621	Northeast Corridor Line	12-11	Rahway
Walnut Ave	CR 632	Garden State Parkway	13-6	Clark
Central Ave	CR 613	Raritan Valley Line	13-6	Westfield
Pearl St	CR 614	Northeast Corridor Line	13-7	Elizabeth
Centennial Ave	CR 615	Raritan Valley Line	13-7	Cranford
Faitoute Ave	CR 617	Lehigh Line/RVL	13-8	Roselle Park
Walnut Ave	CR 632	Lehigh Line/RVL	13-10	Cranford
Central Ave	CR 613	Garden State Parkway	13-10	Clark
Central Ave	CR 613	Garden State Parkway	13-10	Clark
Grand Ave	CR 514	Northeast Corridor Line	13-11	Rahway
Passaic Ave	CR 649	Morristown Line	13-11	Summit
Milton Ave	CR 608	Northeast Corridor Line	13-11	Rahway
Chestnut St	CR 627	Lehigh Line/RVL	14-0	Roselle Park
Centennial Ave	CR 615	Lehigh Line/RVL	14-0	Cranford
Locust St	CR 619	Lehigh Line/RVL	14-1	Roselle Park
Plainfield Ave	CR 663	Connell Corp Park	14-3	Berkeley Heights
Stiles St	CR 615	Northeast Corridor Line	14-3	Linden
Conant St	CR 630	Lehigh Line/RVL	14-3	Hillside
Galloping Hill Rd	CR 616	Lehigh Line/RVL	14-4	Roselle Park

## Table 4: Substandard Bridge Clearances

Source: Union County, NJDOT




## 3.2.5. Bicycle Compatibility

A bicycle compatibility analysis was conducted as part of Union County's Comprehensive Bicycle Master Plan in 2007. While this dataset is more than 10 years old, it is the most currently available county-wide analysis of bicycle compatibility. A bicycle compatibility index is a measure rating the suitability of a roadway for bicyclists based on lane widths, traffic volumes, speed limits, presence of on-street parking, surrounding land uses, and roadway classification. Based on these criteria, each roadway was given an indexed score from A to E with A representing the greatest comfort for cyclists under existing conditions. The data was used in this study together with traffic count data to determine potential conflicts between truck and bicycle traffic. The only roads receiving a grade of A are CR 527 and CR 645. Seventy percent of segments were deemed C or D. A map of bicycle compatibility along County roadways is shown in Figure 17



Figure 17: Bicycle Compatibility Index





#### 3.3. Traffic Data

Traffic count data was used to determine truck traffic patterns and identify specific locations for potential improvements. Traffic counts on Union County roadways recorded between 2017 and 2019, inclusive, were obtained from the NJDOT Traffic Monitoring System. Multiple types of traffic counts were collected including simple volume counts utilizing automatic traffic recorders and more complex classification counts that classify specific vehicle types. Summary data points include average annual daily traffic (AADT), the number of trucks, and the number of single and combination trucks traveling on each direction of a roadway.

The project team identified 96 locations where NJDOT collected one of four different types of traffic counts, as detailed in Table 5. A total of 224 counts were made at these locations. A map of traffic count locations is provided in Figure 18.

	Count	Individual
Traffic Count Type	Locations	Counts
48-Hour Class	39	40
48-Hour Volume	33	41
7-Day Volume	21	22
Majors	3	121

Table 5: Union County Traffic Count	Types <sup>3</sup>
-------------------------------------	--------------------

<sup>&</sup>lt;sup>3</sup> The 48-Hour Class counts classify vehicles by type (passenger vehicle, motorcycle, tractor-trailer, etc.) over a 48-hour period. Volume counts tabulate the number of vehicles along the segment at given intervals. Major counts are conducted several times per year along a selection of high-volume roadways across the State.









The project team identified 16 sites along County routes to conduct supplemental vehicle classification counts as part of this study. Potential sites were identified based on a review of existing counts and expected truck traffic generators. This review identified locations where existing traffic count data was not sufficient to determine truck travel patterns. Ultimately, 10 of these 16 sites were chosen for classification counts and are shown in Figure 15. These 10 supplementary counts were performed in December 2020, with one count location redone in January of 2021 due to equipment malfunction.

The traffic data collection was completed utilizing Miovision Scout video data collection units. These portable machines (illustrated in Figure 19) count traffic electronically by mounting to a pole and



Figure 19: Miovision Scout Device Installed on Meisel Avenue, Springfield Township





getting a clear view of the roadway. The video processing can identify various types of vehicles traveling through a corridor. The data breakdown identified classed vehicles distinguishing Motorcycles, Automobiles, Buses, Single-Unit Trucks, and Articulated Trucks. Further details about Miovision and summaries of the supplemental count program for each of the 10 sites are included in Appendix B.



Figure 20: Supplementary Traffic Count Locations





#### 3.3.1. Traffic Volumes

As shown in Table 6, some of the highest volumes along County roadways are found along the periphery of the County in the municipalities of Elizabeth, Union, and Linden. For the purpose of this study, traffic is measured by AADT, which illustrates typical traffic volumes for a 24-hour period on a given roadway. Other mid-to-high volume corridors include CR 607 in Linden (18,525 AADT), CR 613 in Westfield (17,714 AADT), CR 514 in Rahway (16,506 AADT), and CR 638 in Union (16,156 AADT). Most County roadways exhibit traffic counts between 8,000 and 12,000 AADT.

Corridor	Boundaries		AADT	Municipality	Year
CR 624	Earhart Drive	NJ Turnpike Overpass	29,973	Elizabeth	2018
CR 630	Chilton Pl	Doris Ave	25,224	Union Twp	2018
CR 649	Greenfield Ave	Butler Pkwy	24,254	Summit	2017
CR 509	Park Dr	Mohican Dr	23,886	Westfield	2019
CR 509	Central Ave	Mountain Ave	22,669	Westfield	2017
CR 615	Fuller Rd	Henry St	20,599	Linden	2019

# Table 6: Highest AADT Counts on County Roadways

Source: NJDOT





## 3.3.2. Truck Volumes

The classification counts gathered from NJDOT were used to identify truck volumes at 24 locations along 20 County routes. These data include light and medium trucks (blue) and heavy trucks (orange). Daily truck volumes for these sites are mapped in Figure 21. The roadways with truck volumes greater than 500 per day are listed in Table 7.







					Truck Traffic as	
Corridor	Boundaries		Municipality	Trucks	% of All Traffic	
CR 616	Bedle Pl	Brunswick Ave	Linden	1,246	13.16%	
CR 514	E Hazelwood Ave	Randolph Ave	Rahway	998	5.43%	
CR 610	Aldene Rd	Garden State Pkwy Overpass	Cranford	841	6.09%	
CR 509	S Springfield Ave	Twin Oake Bd	Springfield	721	4 1 2 %	
Spur	S Springheid Ave		Springheid	731	4.1270	
CR 615	Riverbend Dr	Fernwood Terr	Linden	679	3.09%	
CR 615	Forest Dr	Academy Terr	Linden	583	3.39%	
CR 638	Arcadia Pl	Brunswick Ave	Union	565	3.24%	
CR 621	Leesville Ave	Capobianco Plz	Rahway	562	4.83%	
CR 610	Ridge Way	Shasta Pass	Fanwood	537	4.69%	
CR 610	Stockton St	Witherspoon St	Rahway	535	5.52%	

## Table 7: Truck Volumes

Source: NJDOT

The data highlighted in Table 7 was used to identify County routes with the most substantial truck flows documented by count data. While these routes carry substantial truck volumes, these volumes are dwarfed by truck volumes found on major regional routes, including the New Jersey Turnpike (16,000 trucks daily), Interstate 78 (10,000 trucks daily), and US 1&9 and NJ 24, each of which carry 4,000 trucks each day.

#### 3.4. Crash Data

Crash data for incidents on County roadways, particularly those involving trucks or cyclists and pedestrians, was utilized to determine crash patterns. NJDOT's Safety Voyager database was used to gather all crash records<sup>4</sup> within Union County from 2016 through 2018, the most recent three-year dataset available at the time of the analysis. Following an initial comprehensive crash analysis, the team focused on crashes involving trucks, crashes on County roadways, and truck crashes on County roadways. There were 61,817 crashes in Union County between 2016 and 2018, including 18,212 crashes on County routes and 1,618 crashes involving trucks (880 on County roads).

Figure 22 below presents the location of crash records. Additionally, Table 8 expresses crash totals in each of the three years, showing general consistency between each year for each of the given categories. Crash locations on County routes are displayed in Figure 23 and Figure 24 shows the location of crash records involving trucks.

<sup>&</sup>lt;sup>4</sup> Each crash record includes crash include day, time, year, municipality, day of the week, severity, crash type, and weather conditions.





Table 8: Crashes in Union County, 2016-2018

	2016	2017	2018	Totals
Total Crashes, All Roadways	20,578	20,488	20,751	61,817
Crashes on County Routes	5,380	5,163	5,065	15,608
Crashes on County Routes Involving Trucks	305	283	292	880



# Figure 22: All Crashes







# Figure 23: County Roadway Crashes





# Figure 24: Truck Crashes







#### 3.4.1. Crash Cluster Analysis

A hotspot analysis was conducted to identify corridors and intersections where there are a high number of truck crashes or crashes involving cyclists and pedestrians on County roadways. The hotspot analyses group clusters of individual crash incidents together, resulting in a "heat map" of areas with a high density of crashes.<sup>5</sup> The presence of a crash cluster weighed substantially into the selection of critical improvement sites.

The analysis identified 15 hotspots for truck crashes, as shown in Figure 25 and Table 9. Each hotspot on the map is labeled with an ID number corresponding to the table. The 15 areas with the highest number of crashes were identified as hotspots and are illustrated in red. Other areas on the map (those in yellow) indicate smaller clusters of crashes, but at a lower rate than the 15 identified hotspots.

Several hotpots are located in the southeastern portion of the County in Linden and Rahway. These densely populated communities have high traffic volumes and are proximate to significant freight generators (detailed in Section 3.1.2). Additionally, several of the most significant hotspots are in the vicinity of US 1&9 which is a major regional truck corridor. A detailed analysis of crashes by type was not performed, but further analysis for locations with the highest crash incidence may be appropriate as potential traffic improvements are advanced.

Location ID	Intersection		Municipality	# of Truck Crashes
1	US 1&9	CR 615 (Stiles Ave)	Linden	45
2	US 1&9	CR 617 (Wood Ave)	Linden	36
3	US 1&9	CR 608 (E. Milton St)	Rahway	23
4	CR 609 (New Brunswick Ave)	East/West Inman Ave	Rahway	19
5	Interstate 78	CR 630 (Vauxhall Road)	Union Twp	20
6	US 1&9	CR 613 (E Grand Ave)	Rahway	15
7	CR 509 (E Broad St)	CR 613 (Mountain Ave)	Westfield	17
8	CR 514 (N Elizabeth Ave)	CR 617 (N Wood Ave)	Linden	16
9	NJ 124 (Springfield Ave)	CR 630 (Vauxhall Rd)	Union Twp	20
10	CR 613 (S Wood Ave)	Garden State Pkwy	Clark	13
11	CR 617 (S Wood Ave)	Pennsylvania Ave	Linden	15
12	CR 623 (N Broad St)	Central Ave/ Evans Terminal	Hillside	27
13	CR 509 (Liberty Ave)	CR 628 (Hillside Ave)**	Hillside	12
14	NJ 439 (Elmora Ave)	CR 610 (W Grand St)	Elizabeth	12
15	CR 615 (S Stiles St)	Linden Ave	Linden	19

## Table 9: Truck Crash Clusters

Source: NJDOT, WSP

\* - Intersection area also includes Paterson Street

\*\* - Intersection area also includes Florence Avenue and Salem Road

<sup>&</sup>lt;sup>5</sup> Clusters with the highest concentrations of crash incidence are illustrated in red. Less prominent clusters are shown in a descending color scale from orange to yellow.







Figure 25: Truck Crash Clusters





The examination of cyclist and pedestrian crashes resulted in the identification of 12 hotspots, as illustrated in Figure 26 and Table 10. The 12 areas with the highest number of crashes were selected as hotspots and are indicated in red in the map. Other areas on the map (those in yellow) indicate a smaller cluster of cyclist/pedestrian crashes. As with the truck crash clusters, cyclist/pedestrian crash clusters are mainly located in the eastern portion of the County in Elizabeth, Linden, and Rahway. Higher crash clusters tend to be located near train stations including Linden, Elizabeth, Rahway, and Plainfield, indicative of expected higher pedestrian volumes in the vicinity of those stations.

Two locations were identified as both a truck and cyclist/pedestrian crash hotspot: CR 514 (N Elizabeth Ave) at CR 617 (N Wood Ave) in Linden, and NJ 439 (Elmora Ave) at CR 610 (W Grand St) in Elizabeth. This is notable since it illustrates high levels of truck and bicycle/pedestrian traffic at these locations, but also indicates that all three modes have specific safety challenges present.

Location ID	Intersection		Municipality	# of Bike/Ped Crashes
1	NJ 27 (Westfield Ave)	CR 629 (Morris Ave)*	Elizabeth	17
2	CR 614 (S Pearl St)	South St	Elizabeth	10
3	NJ 439 (Elmora Ave)	CR 610 (W Grand St)	Elizabeth	10
4	CR 618 (Orchard St)	CR 629 (Morris Ave)	Elizabeth	8
5	NJ 27 (St George's Ave)	CR 617 (N Wood Ave)	Linden/Roselle	8
6	CR 514 (Elizabeth Ave)	CR 617 (N Wood Ave)	Linden	7
7	NJ 27 (St George's Ave)	CR 602 (W Inman Ave)	Rahway	11
8	NJ 27 (St. George's Ave)	CR 621 (Hazelwood Ave)	Rahway	5
9	NJ 28 (W. 5th St)	CR 531 (Park Ave)	Plainfield	5
10	CR 610 (W. 1st Ave)	CR 619 (Locust St)	Roselle	5
11	CR 623 (S. Broad St)	CR 614 (Pearl St)	Elizabeth	5
12	NJ 27 (St. George's Ave)	CR 619 (Chestnut St)	Linden	4

## Table 10: Cyclist and Pedestrian Crash Hotspots

Source: NJDOT, WSP

\* - Intersection area also includes Union Street







Figure 26: Cyclist and Pedestrian Crash Clusters





#### 3.4.2. NJDOT Network Screenings

In addition to the crash analysis detailed above, the project team also reviewed and incorporated the NJDOT's safety ranking of corridors within the County, as provided by NJTPA. This ranking system uses the crash severity (i.e. fatal, incapacitating, non-incapacitating, possibly injury, property damage only) of each incident and assigns a dollar amount to each category to compute a weighted score for roadway segments or intersections. This attempts to place a more substantial weight on fatal and incapacitating crashes, understanding that human impacts are more substantial than those crashes involving property damage only.

These rankings are intended to supplement the findings of the crash analysis performed for the Truck Mobility Study. Overall ranked intersections are shown in Figure 27. Intersections ranked for cyclist and pedestrian safety are shown in Figure 28. The NJTPA gives priority to intersections with a higher ranking (1 being the highest). Additionally, intersections of County roadways falling within the top 10 of either ranking are presented in Table 11 and Table 12.







County Rank*	Interse	Municipality	
1	CR 615 (Centennial Ave)	CR 607 (Raritan Rd)	Cranford
2	CR 624 (North Ave)	Dowd Ave	Elizabeth
3	CR 637 (Springfield Rd)	US 22	Union Twp
4	CR 615 (Centennial Ave)	CR 610 (South Ave)	Cranford
6	CR 612 (East 3 <sup>rd</sup> Ave)	CR 616 (Linden Rd)	Roselle
8	CR 514 (Elizabeth Ave)	CR 615 (S Stiles St)	Linden
9	CR 613 (Central Ave)	CR 607 (Raritan Rd)	Clark

# Table 11: NJDOT Network Screening Rankings, 2019

Source: NJTPA \* - Locations that are not on the County roadway network have been purposely omitted from this table.

# Figure 28: NJDOT Network Screening Priority Safety Rankings, 2019





County Rank*	Inter	Municipality	
2	CR 619 (Stuyvesant Ave)	CR 630 (Vauxhall Rd)	Union
3	CR 610 (North Ave)	Tuttle Pkwy	Westfield
5 (Tie)	CR 615 (N Stiles St)	W Blancke St	Linden
5 (Tie)	CR 611 (Terrill Rd)	CR 620 (E Front St)	Plainfield
5 (Tie)	CR 630 (Vauxhall Rd)	Hilton Ave	Union
8	CR 623 (Broad St)	W Grand St	Elizabeth
9 (Tie)	CR 615 (Springfield Ave)	Pawnee Rd	Cranford
9 (Tie)	CR 615 (Centennial Ave)	CR 610 (South Ave)	Cranford
9 (Tie)	CR 627 (Chestnut St)	Carolyn Rd	Union
9 (Tie)	CR 613 (Central Ave)	Laurel Pl	Westfield
9 (Tie)	CR 619 (Roselle St)	E Elm St	Linden
9 (Tie)	CR 627 (Chestnut St)	W Grant Ave	Roselle Park
9 (Tie)	CR 612 (E 3 <sup>rd</sup> Ave)	CR 616 (Linden Rd)	Roselle
9 (Tie)	CR 630 (Vauxhall Rd)	Overlook Terr	Union
9 (Tie)	CR 613 (Central Ave)	Cacciola Pl	Westfield

# Table 12: NJDOT Network Screening Priority Safety Rankings, 2019

Source: NJTPA

\* - Locations that are not on the County roadway network have been purposely omitted in this table.





#### 3.5. Equity Assessment

An equity assessment (also known as an environmental justice analysis) was conducted to identify the presence and location of communities that have been traditionally underserved and underrepresented in the planning process. The United States Environmental Protection Agency (EPA) defines environmental justice (EJ) as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

In this effort, datasets concerning 11 indicators from the United States Census Bureau's 2015-2019 Five-Year American Community Survey were obtained and subsequently used to identify the presence and location of communities that have been traditionally underserved and underrepresented in the planning process. A brief description of each variable, along with respective Statewide and Countywide rates are illustrated in Table 13. This represents the most recent five-year dataset available at the time of this study. The analysis detailed below illustrates notable gaps in wealth, education, and access to automobiles within Union County. Each of these factors impacts daily circulation opportunities for County residents. While this analysis was not used explicitly to identify potential improvement sites, it is important to understand and balance potential improvements within historically underserved and underrepresented communities. Thus the project team worked to ensure that improvement concepts were identified at locations within these disproportionately underrepresented communities.

Variable	Census Table	Description	State Rate	County Rate
Automobile Accessibility	S0801	Percent of households with no access to an automobile	6.4%	6.9%
Disabilities	S1810	Percent of residents who have a disability	10.3%	9.1%
Education	S1501	Percent of residents aged 25 and older lacking a high school diploma	10.2%	13.7%
Elderly	DP05	Percent of residents aged 65 years or older	16.6%	14.7%
English Proficiency	S1602	Percent of households in which no member 14 years old and over speaks only English or speaks a non-English language and speaks English "very well."	7.0%	12.0%
Nativity	B05002	Percent of residents born outside of the United States.	22.4%	30.1%
Poverty	S1701	Percent of households whose income is below the federal poverty level	10.0%	9.5%
Living Below Double the Poverty Level	S1701	Percent of households whose income is below double the federal poverty level	22.9%	24.8%
Racial Minority	DP05	Percent of residents identifying as anything other than "Non-Hispanic, White Only"	44.6%	60.5%
Young Children	DP05	Percent of residents below the age of five	5.9%	6.3%
Youth	DP05	Percent of residents between the ages of five and seventeen	16.2%	17.2%

Table	13:	Equity	Assessment	Variables
-------	-----	--------	------------	-----------

зy,





The indicators were chosen based on inclusion in the EPA's EJ Screen tool, and NJTPA's Equity Assessment Guide. The data was collected for all 108 census tracts in Union County, each averaging approximately 0.98 square miles and 5,151 residents. Figure 29 shows a map of census tracts in the County to provide insight into the scale of the analysis. Together, these 11 variables (shown in Table 13) help provide a clearer picture of the presence and location of potentially disadvantaged communities.



Figure 29: Census Tracts

Union County is home to a diverse population across all equity assessment variables, with indicators varying across the 21 municipalities. In the following sections, the results and a summary of each variable are illustrated and discussed. Within each of the maps, values for each census tract were rounded to the nearest whole number.





#### 3.5.1. Automobile Accessibility

Areas with more prevalence of zero-vehicle households tend to be located near train stations, particularly in Elizabeth, Linden, Rahway, Summit, and Plainfield. Elizabeth and Plainfield each have one census tract where a majority of households lack access to a vehicle. Households lacking access to a vehicle are much more reliant on walking, biking and public transportation. As pedestrians and cyclists, they are more vulnerable to crashes, particularly severe crashes and those involving heavy vehicles.

Conversely, throughout much of central Union County (including parts of Springfield, Mountainside, Cranford, Union Township, and Clark), less than 1 percent of household's lack access to a vehicle. Zero vehicle households can be seen in Figure 30.

Of note – large parcels with lower population densities associated with Newark Liberty International Airport, the Port Elizabeth Marine Terminal, or Watchung Reservation exhibit low rates of automobile access for large swaths of land.



# Figure 30: Percentage of Zero Car Vehicle Households





#### 3.5.2. Disabilities

Parts of Linden, Elizabeth, Clark, Cranford and Roselle have more than 15 percent of residents living with a disability<sup>6</sup>. People with disabilities are more likely to rely on public transportation, including NJ TRANSIT's Access Link program and the Union County Paratransit System.

Conversely, concentrations of areas with a low percentage of residents with disabilities are present throughout the County, including portions of Westfield, Union Township, Summit, Plainfield, and Elizabeth. The percent of residents with disabilities is mapped in Figure 31.



Figure 31: Percentage of Population with Disabilities

<sup>&</sup>lt;sup>6</sup> The American Community Survey defines disabled persons as those who have serious difficulty in at least one of four basic areas of functioning – hearing, vision, cognition, and ambulation.





#### 3.5.3. Education

A review of education data in Union County shows a vast range of residents that do not possess a high school diploma depending on where they live. Education is correlated with several other equity assessment variables including poverty and access to a vehicle. Those lacking a high school diploma are more likely to be vulnerable transportation users and have historically been more excluded from the planning process.

In much of Elizabeth and Plainfield, more than a third of adults lack a high school diploma. The percentage of residents aged 25 and older that lack a high school diploma in Elizabeth and Plainfield is 26.6 percent and 24.2 percent respectfully. In much of central and western Union County, including Summit, Berkeley Heights, New Providence, Mountainside, Westfield, Scotch Plains, and Fanwood most census tracts indicate a population where less than 5 percent of adults lack a high school diploma. The percent of adults aged 25 and older lacking a high school diploma is shown in Figure 32. Those areas with higher educational levels are shown in lighter shades, while those areas with lower education levels are shown in darker shades.



Figure 32: Percentage of Population Lacking High School Diploma





### 3.5.4. Elderly

Elderly residents are more likely to rely on public transportation and walking for their day-to-day mobility. Central Union County has the highest concentrations of elderly residents, most notably in Mountainside, Cranford, and Clark, where one in five residents are elderly. In the more densely populated, transitdependent communities of Elizabeth, Linden, Rahway, Roselle, and Plainfield, 5-12 percent of residents are elderly. The percentage of residents aged 65 and older is mapped in Figure 33.



Figure 33: Percentage of Elderly Population





#### 3.5.5. English Proficiency

Communities with a higher portion of limited English proficiency households tend to be in more densely populated, transit-dependent communities. Those with limited English proficiency have historically been more excluded from the planning process and face greater challenges when trying to participate in public outreach events.

In Elizabeth, Linden, Roselle, and Plainfield more than one in five households have limited-English proficiency. In central Elizabeth, this rate ranges from one in three to slightly more than half. In Scotch Plains, Westfield, Clark, Cranford, Mountainside, Summit, New Providence, and Berkeley Heights, fewer than 5 percent of households lack English proficiency. The percentage of households without an adult who speaks English "very well" is shown in darker shades in Figure 34.











#### 3.5.6. Foreign Born

In parts of Elizabeth and Plainfield, more than half of residents were born outside of the United States. Due to limited English proficiency and/or less familiarity with the American planning process, those born outside of the United States have historically been less involved from the planning process and face challenges participating in public outreach.

In municipalities in central Union County including Mountainside, Westfield, Scotch Plains, and Cranford, fewer than 15 percent of residents were born in another country. The percentage of residents born outside of the United States is shown in Figure 35.



Figure 35: Percentage of Foreign-Born Population





## 3.5.7. Poverty

Those living in poverty are more likely to rely on public transit, biking and walking for their mobility. As such, they are more likely to be vulnerable transportation users. People living in poverty may also be more likely to be unable to attend public outreach events due to other commitments or access issues.

The poverty rate is highest in Elizabeth and Plainfield where more than one quarter of residents live in poverty. The poverty rate for each census tract correlates with limited English proficiency populations. Most of central and western Union County has poverty rates of less than 5 percent. The percentage of residents living below the federal poverty level is shown in Figure 36.



Figure 36: Percentage of Population Below Poverty Level





#### 3.5.8. Population Below Double the Poverty Rate

While the poverty rate is more often used as an equity measure, it is also helpful to review areas where people live below double the poverty rate as they may have similar issues to those living in poverty.

More than half of residents in census tracts in Elizabeth and Plainfield live below double the poverty line. In parts of central and western Union County including Westfield, Scotch Plains, Cranford, Mountainside, Berkeley Heights, and New Providence the rate is below 5 percent. The percentage of residents living below double the federal poverty level is shown in Figure 37.



Figure 37: Percentage of Population Living Below Double the Poverty Level





#### 3.5.9. Racial and Ethnic Minority

Racial and ethnic minorities have historically been underrepresented in the planning outreach process. Thus improvements developed as part of this effort should include locations within these communities that improve overall connectivity and circulation for all modes.

Communities with the highest percentage of racial or ethnic minorities are concentrated in seven communities: Elizabeth, Hillside, Linden, Plainfield, Rahway, Roselle, and Union. Elizabeth has over 50 percent of its population classified as a racial or ethnic minority and 75 percent of the population in Hillside, Roselle, and Plainfield are classified as a racial or ethnic minority. These communities exhibit percentages of racial or ethnic populations higher than the County average, noted in Table 13. Throughout much of central and western Union County municipalities, the percentage of residents that are a racial minority ranges from less than 10 percent to over 30 percent. The percentage of residents categorized as a racial or ethnic minority is shown in Figure 38.



Figure 38: Percentage of Racial/Ethnic Minority Population





#### 3.5.10. Young Children

Children are considered vulnerable transportation users, as they are unable to drive, have less cognitive development, and are more likely to rely on biking and walking.

Communities with a higher percentage of residents under the age of five include Elizabeth, Rahway, Plainfield, Mountainside and Summit. In these communities, more than 8 percent of residents are under five years old. Portions of Westfield, Union, Cranford, Linden, Clark, and Plainfield each have less than 4 percent of residents under the age of five. The percentage of residents who are below the age of five is shown in Figure 39.



Figure 39: Percentage of Population Age Five Years or Younger





#### 3.5.11. Youth

More than 20 percent of residents in portions of Elizabeth, Westfield, Summit, Scotch Plains, and Plainfield are between the ages of 5 and 17. Census tracts in Rahway, Clark, and Union have fewer than 13 percent of residents between the ages of 5 and 17. The percentage of residents who are between the ages of 5 and 17. The percentage of residents who are between the ages of 5 and 17.









#### 3.5.12. Equity Assessment Summary

While certain trends are apparent, the diverse set of communities in Union County represent both extremes of the spectrum for each variable. The more densely populated, transit-dependent communities of Elizabeth, Linden and Rahway along Interstate 95 and the Northeast Corridor rail line, as well as Plainfield, tend to have less accessibility to an automobile, less formal education, less English proficiency, a higher poverty rate, and have more foreign-born residents. Based on analysis of traffic volumes and freight generators in earlier sections of this report, these areas (mainly Linden, Elizabeth, and Rahway) also face higher traffic and truck volumes and are in closer proximity to significant freight generators such as Port Newark, Newark Liberty International Airport, and the Bayway Refinery. Improvements for freight circulation, including those that simultaneously benefit other modes, should be advanced within historically underrepresented communities where needs are greatest.





#### 4. Identification of Critical Locations

The datasets described in Section 3 were reviewed and analyzed to inform the selection of critical sites. This process consisted of first identifying corridors or individual locations where high levels of truck activity is present or might occur in the future.

To understand truck traffic levels, it was necessary to review freight generation in the County; and thus, investigate the correlation between current land use and its contribution to freight activity. Additionally, inbound and outbound tonnage characteristics were studied because truck traffic is also dependent on the origin and destination of the cargo being transported (Figure 42). This relationship was not only useful to understand current truck traffic levels but also to identify critical connections to the roadway system. Figure 43 and Figure 44 show existing traffic volumes overlaid with inbound and outbound tonnage, respectively.

Each of these pieces proved vital in understanding the traffic and freight volumes and movement patterns in the County. Traffic counts (with truck volumes) were particularly essential in serving as a means of comparing and confirming traffic flows with expectations garnered from the identification of freight generating sites and tonnage volumes.

This identification process is illustrated in Figure 41.



Figure 41: Critical Location Selection Process







Figure 42: Existing Land Use, Inbound and Outbound Freight (by Tonnage)







Figure 43: Inbound Freight Generation (by Tonnage) and Daily Traffic Volumes







Figure 44: Outbound Freight Generation (by Tonnage) and Daily Traffic Volumes





The next step of the process was developing an understanding of the relationship between the roadway network and truck routing patterns. For this purpose, truck traffic volumes were mapped against bridge clearances and the truck access network (Figure 45).

Figure 45: Daily Traffic Volumes, Bridge Clearances and Truck Access Network






Once truck volumes and routing patterns were identified it was necessary to examine the impacts of the truck activity to the County roadway system. For example, the impact of truck traffic and routing on roadway safety. This causal relationship was studied by looking at truck trip generation and crash hotspots (Figure 46 and Figure 47).











# Figure 47: Crash Hotspots and Daily Truck Volumes





Another causal relationship explored was the impact of truck traffic on pedestrian and cyclist circulation. To better understand this relationship, schools were mapped with crash hotspots involving pedestrians and/or bicyclists (Figure 48). Identified crash hotspot critical locations were cross-referenced against the NJTPA Priority Safety Rankings, which prioritizes locations based on crash severity, i.e. fatal, injured, and property damage only, to supplement the results. This allowed for a clearer understanding of not only where crashes involving trucks are most prevalent, but also provided a defined focus on locations where severe crashes are more likely to occur.









After truck activity and its impact on the County roadway system was gathered, the final step in the selection of the preliminary critical locations was flagging intersections and/or roadway segments where issues overlap. From this process, a list of 33 preliminary critical locations was developed. This list was cross-referenced with public comments, feedback from focus group participants, and input from the County to capture information not otherwise borne out through the data collection process. Figure 49 and Table 14 show each of the sites included in the preliminary list. The ID contained in the table corresponds to the location label shown in the figure. The final column of the table provides information about which of the above criteria was met by each site. Additional details regarding each of the preliminary sites is included in Appendix C.

This list was provided to Union County and the NJTPA staff for further examination and prioritization. Using local input and following an additional review of the analysis and areas surrounding each preliminary site, a list of 10 locations were selected for advancement to develop mitigation strategies. Potential mitigation strategies are detailed in Section 5. The application of those strategies for each of the 10 locations advanced for detailed recommendations is summarized for each site in Section 6.



Figure 49: Preliminary Critical Sites





Table 14: Preliminary Critical Sites

					Relevant Criteria							
ID	Roadway	Roadway Name	Intersection/Extents	Municipality	Crashes	Geometry	Generators	Traffic Flow	Connecting Routes	Points of Interest	Future Developme	Public Input
1	CR 512	Broad St	Middle Ave	Springfield	Х	Х						
2	CR 512	Broad St	Summit Ave (CR 657)	Summit	Х		Х					
3	CR 651	Morris Ave	Glenside Ave (CR 527)	Summit	Х	Х	Х					Х
4	CR 512	Springfield Ave	Passaic St (CR 647)	nic St (CR 647) New Providence			Х			Х		
5	CR 655/ CR 641	Park Ave/ Bonnie Burn Rd	New Providence Rd	Scotch Plains X X		х	х			х		
6	CR 601	7 <sup>th</sup> St	Park Ave (CR 531)	Plainfield	Х				Х			
7	CR 577	Main St	Springfield Ave (NJ 124)	Springfield	Х	Х	Х	Х				
8	CR 577	S Springfield Ave	Hillside Ave (CR 654)	Springfield	Х		Х	Х		Х		
9	CR 509	Broad St	Mountain Ave (CR 613)	Westfield	Х	Х	Х			Х	Х	
10	CR 610	South Ave	Central Ave (CR 613)	Westfield	Х		Х	Х		Х	Х	
11	CR 630	Vauxhall Rd	Liberty Ave	Union	Х	Х	Х	Х		Х		
12	CR 630	Vauxhall Rd	Stuyvesant Ave (CR 619)	Union	Х		Х			Х		
13	CR 617	S Michigan Ave	Kenilworth Blvd (CR 509)	Kenilworth	Х		Х			Х		
14	CR 610	South Ave	Centennial Ave (CR 615)	Cranford	Х	Х		Х		Х		
15	CR 613	Central Ave	Raritan Rd (CR 607)	Clark	Х	Х	Х	Х		Х		
16	CR 509	Galloping Hill Rd	Salem Rd (CR 509)/ Chestnut St/Tucker Ave (CR 619)/ Galloping Hill Rd (CR 616)/ Delaware Ave/ Walton Ave	Union	х	Х	Х					





					Relevant Criteria							
ID	Roadway	Roadway Name	Intersection/Extents	Municipality	Crashes	Geometry	Generators	Traffic Flow	Connecting Routes	Points of Interest	Future Developme	Public Input
17	CR 610	1 <sup>st</sup> Ave	Gordon St/Amsterdam Ave (CR 617)	Roselle	Х			Х				
18	CR 610	1 <sup>st</sup> Ave	Locust St (CR 619)	Roselle	Х			Х		Х		
19	CR 615	N Stiles St	Raritan Rd (CR 607)	Cranford	Х	Х						
20	CR 615	N Stiles St	Valley Rd (CR 608)	Linden	Х	Х				Х		
21	CR 623	N Broad St	Hillside Ave (CR 628)	Hillside	Х	Х	Х			Х		
22	CR 610	W Grand St	NJ 439/West End Ave	Elizabeth		Х	Х	Х				
23	NJ 27	St. Georges Ave	Wood Ave (CR 617)	Roselle/Linden	Х		Х			Х		
24	CR 623	S Broad St	Pearl St (CR 614) Elizabeth		Х	Х				Х		
25	CR 514	E Linden Ave	Park Ave	Linden	Х	Х	Х					
26	CR 514	Elizabeth Ave	Wood Ave (CR 617)	Linden	Х		Х			Х		
27	CR 617	Wood Ave	Linden Ave	Linden	Х		Х			Х		
28	CR 514	Elizabeth Ave	N Stiles St (CR 615)	Linden	Х	Х	Х	Х				
29	CR 514	Elizabeth Ave	Between Scott Ave (CR 65) and N Stiles St (CR 615)	Linden	Х		Х	Х				
30	CR 609	New Brunswick Ave	W Inman Ave	Rahway	Х	Х						
31	CR 514	Woodbridge Rd	W Hazelwood Ave (CR 621)	Rahway	Х		Х	Х		Х		
32	CR 655	Lake Ave	Oak Ridge Rd (CR 607)	Clark		Х						Х
33	CR 577	Meisel Ave	Between NJ 82 and US 22	Springfield			Х	Х				Х





# 5. Recommendation Types

Ten locations from Table 16 were selected for design improvement concepts based on input from the TAC, focus groups, public outreach, and County planning and engineering staff. While only these 10 received site-specific planning-level recommendations, documentation of the additional 23 sites within this study indicates their worthiness for further analysis.

The planning-level improvements focus on lower-cost, implementable, and highly impactful concepts, though larger capital improvements may be recommended where short-term concepts may not achieve desired outcomes. Improvements are focused on addressing three primary deficiencies:

- Demand Management Addressing congestion through non-capacity increasing measures
- Circulation Ensuring that trucks remain on appropriately scaled roadways
- Safety Alleviating conflicts that may result in crashes, near-misses, or feeling unsafe

The potential improvement concepts detailed below are summarized in Table 15.

## 5.1. Increased Capacity

Improvements in this category may increase throughput, including roadway widenings, adding turn bays at intersections, and new roadways, intersections, or interchanges. These projects have a general goal of improving traffic flow through a reduction in congestion and/or increased mobility.

## 5.2. Signage

These recommendations focus on improving or increasing signage at a targeted location or locations. Roadway signage provides information and/or direction for targeted users. These improvements are generally location- or corridor-specific, while larger deployments of signage programs would be classified as "Wayfinding Improvements" below. These recommendations can benefit overall circulation and safety but must be deployed carefully to avoid sign pollution.

## 5.3. Wayfinding Improvements

A large-scale wayfinding scheme can be deployed for areas where multiple origins or destinations require a coordinated signage program. Properly branded wayfinding campaigns provide consistent information and support designated truck routes while attempting to reduce or minimize the impacts of heavy vehicles on residential communities. Truck wayfinding is particularly important in providing connections between multiple routes and major freight generating nodes.

## 5.4. Signal Improvements

Recommendations for new or improved signalization can address circulation or safety issues at intersections or along key corridors. These improvements may include upgrades to existing signals and equipment, the optimization of existing signal timings and phases, or the installation of new signals at targeted locations.





# 5.5. Truck Prohibitions

A truck prohibition generally results in limiting through truck trips on specific routes. Truck prohibitions are advanced in locations where local governments require codified restrictions to support enforcement. These are most suitable for downtown corridors or residential neighborhoods where through truck trips are deemed a nuisance. It is important to distinguish any truck prohibition with supporting truck route signage. To further support these designations, the County or its municipal partners can reach out to local operators who frequently use inappropriate roadways.

# 5.6. Alternate Routing

Alternate routes provide operators of large vehicles with redundancy and options for making frequent trips. These routes should be signed and promoted, where possible. Alternate routes can serve any number of purposes – to bypass downtown areas and substandard structures, or to provide capacity for recurring delay (congestion) or nonrecurring delay (crashes or other events).

## 5.7. Striping Improvements

Recommendations for new or improved roadway striping should be advanced for locations where unclear or poor condition lane designations or markings results in challenging roadway conditions. When deployed in tandem with new or proposed signage, striping improvements can reinforce routing or other guidance.

## 5.8. Increased Bridge Clearances

Substandard bridge clearances are prevalent throughout Union County, including numerous rail crossings. Bridge clearances may impact route choices or result in trucks becoming stuck or in extreme cases, result in bridge strikes. An increased clearance can be achieved by raising the deck of a bridge, replacing a structure, or lowering of the roadway profile.

## 5.9. Pedestrian or Bicycle Improvements

While this project is wholly focused on improving truck circulation along the County roadway network, the project team has worked to identify locations where conflicts between trucks and bicyclists or pedestrians exist. Improvements at these locations may include upgraded crosswalk markings, upgraded sidewalks, curb extensions (including mountable installations), shared-lane markings, or bicycle lanes.

## 5.10. Operator Outreach

In addition to the physical improvements detailed above, outreach and open dialogues with industry partners can be a powerful tool to address truck circulation issues. This scheme is most successful when a partnership is built between County and/or municipal stakeholders and trucking companies that rely on the County roadway network. Providing mapping or information may be more effective than traditional enforcement to change behaviors in locations where trucking companies consistently operate in challenging and/or inappropriate residential areas or downtown corridors.





		Focus Area							
		Capacity	Demand Management	Circulation	Safety	Bicycle/ Pedestrian			
	Increased Capacity	Х		Х					
d)	Signage		Х	Х	Х				
ype	Wayfinding Improvements			Х	Х				
Improvement T	Signal Improvements	Х		Х	Х				
	Truck Prohibitions		Х	Х	Х	Х			
	Alternate Routing			Х	Х	Х			
	Striping Improvements			Х	Х				
	Increased Bridge Clearances		Х	Х					
	Bicycle or Pedestrian Improvements			Х	Х	Х			
	Operator Outreach		Х	Х					

# Table 15: Potential Improvement Concepts

This list is not exhaustive and some improvements listed above may not be appropriate for any of the 10 advanced locations. Additionally, site-specific improvements not already identified may be advanced. However, it is anticipated that the County will seek to focus on improvements that have proven successful in other locations throughout New Jersey.





#### 6. Recommendations

From the 33 identified preliminary sites, 10 sites were chosen to advance for recommendations based on input from the TAC, public outreach, and County staff. The 10 sites include corridors and intersections and are intended to encompass the diverse geography of the County. The recommendations for these sites serve as an initial template for other locations, including the remaining 23 identified sites.

Each site is intended to serve as an individual project location that can be advanced incrementally or as a more comprehensive project. Each site discussion includes general characteristics and context, a summary of identified issues, and proposed recommendations. Each narrative is supported by summary graphics.

The site selection process was illustrated earlier in Figure 41 and the 10 sites are listed and mapped in Figure 50. A summary of the sites and notable selection criteria is illustrated inTable 16. In addition to the engineering and traffic-focused concepts detailed above, policy and programmatic improvements follow the individual locations.

Recommendations for each site should consider the needs of disproportionately impacted communities identified in the equity analysis, including racial and ethnic minorities, residents with disabilities, or residents lacking a high school diploma.

				Crash	sh Truck Connector		High	
Site	Street Name	Cross Street	Municipality	Hotspot	Generators	Route	Volume	Point of Interest
1	Summit Ave (CR 657)	Broad St (CR 512) to Springfield Ave	Summit	Truck/ BikePed	Y	NJ 24	Ν	
2	Springfield Ave (CR 512)	Passaic St (CR 647) to Academy St	New Providence	Truck	Y	NJ 24	N	New Providence HS
3	New Providence Rd	Park Ave (CR 655)/ Bonnie Burn Rd (CR 641)	Scotch Plains	Truck	Y	I-78/ US 22	N	Weldon Concrete/ School
4	Vauxhall Rd (CR 630)	Liberty Ave	Union Township	Truck	Y	I-78/ US 22	Y	Jefferson Elem. School
5	Vauxhall Rd (CR 630)	Stuyvesant Ave (CR 619)	Union Township	Truck/ BikePed	Y	I-78/ US 22/ NJ 82/ NJ 28	Ν	
6	South Ave (CR 610)	Centennial Ave (CR 615)	Cranford	Truck	Ν	US 1&9/ NJ 28	Y	Lincoln School
7	1st Ave (CR 610)	Locust St (CR 619)	Roselle	Truck/ BikePed	Ν	US 22/ NJ 28/ NJ 27	Y	
8	Elizabeth Ave (CR 514)	Scott Ave (CR 650) to N Stiles St (CR 615)	Linden	Truck	Y	CR parallel to US 1&9/NJ 27	Y	Former GM Plant
9	Elizabeth Ave (CR 514)	Wood Ave (CR 617)	Linden	Truck/ BikePed	Y	US 1&9/ NJ 27/ NJ 28/US 22	-Y	Linden Train Station
10	Wood Ave (CR 617)	Linden Ave	Linden	Truck/ BikePed	Y	US 1&9/ NJ 27/ NJ 28/US 22	-Y	Linden Train Station

Table 16: Sites Advanced for Recommendations







Figure 50: Sites Advanced for Recommendations





#### 6.1. Site #1 – Summit Avenue (CR 657), Broad Street (CR 512) to Springfield Avenue – Summit

#### Location Context

This segment of Summit Avenue (CR 657) extends between Broad Street (CR 512) and Springfield Avenue in the City of Summit. It includes the intersections of Summit Avenue with Railroad Avenue, Union Place/Franklin Place and Bank Street. It is approximately 1,000 feet in length and operates east/west through downtown Summit as part of the City's central business district. The NJ TRANSIT Gladstone Branch and Morristown Line bisects this corridor, traveling below grade, north/south between Railroad Avenue and Union Place. Summit Train Station can be directly accessed from Union Place. Downtown retail and commercial uses operate along the corridor and surrounding streets. Each of the many commercial enterprises require freight shipments along Summit Avenue's busy and narrow streets. Summit Avenue provides a connection to NJ 24, a limited-access highway that travels southeast to Interstate 78 and northwest to Morris County. Interstate 78 is located approximately one mile south of the corridor.

The signalized intersection of Summit Avenue and Broad Street includes several adjacent vehicularoriented uses with multiple access points. These uses include a parking garage (northeast corner), Summit Village Green (northwest and southwest corners), and a gas station (southeast corner). An eastbound bus stop is located on the corner of Summit Avenue and Broad Street west of the intersection.

Traveling north, an unsignalized intersection is present at Union Place/Franklin Place. Union Place, to the west, operates with a raised planted median and provides access to a small parking lot adjacent to the Train Station. Left turns to Summit Avenue are prohibited from Union Place.

The signalized intersection of Summit Avenue at Springfield Avenue is within the walkable commercial core of Summit.

Within the corridor, Summit Avenue operates with one travel lane northbound and southbound, with dedicated left turn lanes at the signalized intersections with Springfield Avenue and Broad Street. On-street parking is allowed on both sides of Summit Avenue north of Union Place/Franklin Place and appears to be highly used.

There are pedestrian crossings throughout this segment. All four legs of the intersection of Summit Avenue and Broad Street have ladder-style crosswalks. There is a continental crosswalk across Railroad Avenue at Summit Avenue. There is a standard crosswalk crossing Union Place at Summit Avenue, with standard crosswalks with brick surfaces on the north, east and south legs of this intersection. At the intersection of Bank Street and Summit Avenue, there is a standard crosswalk crossing Bank Street and a standard crosswalk with a brick surface north of the intersection crossing Summit Avenue. At the intersection of Summit Avenue and Springfield Avenue, the west and east legs have standard crosswalks and the north and south legs have standard crosswalks with brick surfaces.

#### Identified Issues

Several concerns were identified within this segment. Hotspot clusters for crashes involving trucks or cyclists/pedestrians are present throughout this segment. Pedestrian and cyclist activity is significant within this segment due to the presence of numerous businesses within the central core of Summit, as





well as the Summit Train Station. Truck traffic within this segment is substantial as well, given the number of and overall density of commercial uses within Summit. Further, Summit Avenue is a key connector for trips north (via NJ 24) and south (via Interstate 78). A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 51

- Truck and bicycle/pedestrian crash hotspot
  - $\circ$   $\;$  Significant number of conflict points within short segment
- Summit Avenue provides link to NJ 24 and I-78
- Adjacent to numerous trip generators (Summit Train Station and downtown Summit)
- AADT on Summit Avenue north of Springfield Avenue: 10,200 vehicles (2017)
- AADT on Summit Avenue between Springfield Avenue and Broad Street: 9300 vehicles (2019)
- Truck AADT on Summit Avenue north of Union Place: 200 trucks (2017)

Figure 51: Site #1 Identified Issues



Summit Ave (CR 657)

Broad St (CR 512) to Springfield Ave City of Summit



#### Crash Hotspot

Truck/ Bike-Ped
High number of conflict points



#### Connector Route

Connects Freight Generators to NJ 24



• Summit Train Station

Downtown Summit





## Recommendations

The primary concepts at this location focus on improving turning movements in the intersection of Summit Avenue and Union Place/Franklin Place. This can enhance the pedestrian environment along Summit Avenue to better fit the downtown context and improve the visibility of non-motorized traffic for large vehicles through this corridor. A summary of the recommendations follows and is illustrated in Figure 52:

- Short Term (0-6 months)
  - Review stop bar locations, particularly for westbound approach to left turn lane
  - Investigate improvements that will increase visibility of pedestrian crossings along Summit Avenue, including leading pedestrian intervals
- Mid-Term (6 months 2 years)
  - Investigate making the exit to the Chase Bank driveway and alleyways on Summit Avenue right-turn only to reduce conflict points
  - o Investigate improvements to street lighting along Summit Avenue

# Figure 52: Site #1 Improvements







# 6.2. Site #2 – Springfield Avenue (CR 512), Passaic Street/South Street (CR 647) to Academy Street – New Providence

#### Location Context

This segment of Springfield Avenue (CR 512) extends between Passaic Street/South Street (CR 647) and Academy Street in New Providence Borough. It is approximately 700 feet in length, connecting west into Somerset County and east into Summit before terminating at NJ 24. This corridor is predominantly commercial/retail, with residential uses located to the north and east.

The focus area for this segment is the signalized intersection of Springfield Avenue and Passaic Street/South Street, where there is a large shopping center on the southeast corner and smaller shopping areas to the northeast and southwest. Each shopping center can be accessed through several driveways on each roadway. At the intersection, all four approaches expand to a dedicated left turn lane and have a thru/right lane. The southwest corner of the intersection has an eastbound bus stop on Springfield Avenue.

In addition to the shopping areas detailed above, additional notable land uses are present south of the intersection, including a cluster of freight generating land uses (one-half mile south) and the Murray Hill Train Station (0.76 miles south). Two schools are located within a quarter-mile of the intersection, including the Lincoln School (1,000 feet east of Passaic Street) and New Providence High School (0.25 miles south of Springfield Avenue). Interstate 78 is located less than 2 miles south of the intersection via South Street.

#### Identified Issues

Several concerns within this corridor were identified based on the data analysis effort. Several truck crash hotspots were identified, many of which are associated with the significant number of conflict/access points along Springfield Avenue and Passaic Street/South Street. Pedestrian activity at this intersection is significant given the proximity to the schools and truck volumes are substantial given the proximity of industrial uses.

A summary of identified concerns based on the analysis of several data sets follows and are illustrated in Figure 53.

- Truck crash hotspot
  - Significant number of conflict points within short segments
- South Street provides link to Interstate 78
- Two schools are located within walking distance of intersection:
  - Lincoln School on Academy Street nearly 1000 feet to the east of Passaic Street
  - New Providence High School on South Street a quarter mile south of Springfield Avenue
- AADT on Passaic Street north of Springfield Avenue is 10,600 vehicles (2019)
- AADT on Springfield Avenue west of Passaic Street is 11,900 vehicles (2019)
- Truck AADT on Springfield Avenue west of Passaic Street is 280 trucks (2019)





# Figure 53: Site #2 Identified Issues







## Recommendations

The primary concepts at this location focus on improving turning movements and pedestrian circulation at the intersection of Springfield Avenue and Passaic Street/South Street. Additionally, consolidating the number of access points at the shopping centers may reduce crashes associated with conflict points through these corridors. A summary of the recommendations follows and is illustrated in Figure 54:

- Short-term (0-6 months)
  - Install bollards on all corners of the Springfield Avenue and Passaic Street/South Street intersection to channel pedestrians to crosswalks and protect curbing
- Mid-term (6 months 2 years)
  - Implement leading pedestrian interval at the intersection of Springfield Avenue and Passaic Street/South Street or "No Turn on Red" for trucks
  - Investigate consolidating parking/driveways and revised internal circulation for consolidated parking in retail areas along Springfield Avenue east of Passaic Street/South Street



# Figure 54: Site #2 Improvements





## 6.3. Site #3 – Park Avenue (CR 655) at New Providence Road – Scotch Plains

#### Location Context

This site is centered on the signalized intersection of Park Avenue (CR 655) and New Providence Road in Scotch Plains Township. This location includes connections to US 22, located less than 500 feet west of the intersection, which is a four-lane divided highway that traverses Union County and provides local and regional connections to numerous residential and commercial uses located along intersecting roadways, as well as immediate access to retail and restaurant uses along the corridor.

Areas east of the intersection in Scotch Plains and Fanwood are predominantly residential. Watchung Borough (Somerset County) is located directly west of this intersection, where a major freight generator (Weldon Materials) is present. Park Avenue travels southeast into Scotch Plains before becoming North Martine Avenue through downtown Fanwood, where it passes the Fanwood Train Station. West of the intersection, Park Avenue terminates at US 22 eastbound.

From its terminus at Park Avenue, New Providence Road travels west on structure over US 22, where access to/from US 22 westbound is available via a right-in/right-out ramp. New Providence Road continues northwest into Somerset County, as well as Interstate 78 and the Watchung Reservation. Access to Blue Star Shopping Center, a major regional plaza, is located on New Providence Road one quarter-mile west of the intersection.

At the study intersection, the Park Avenue eastbound approach has two through travel lanes and a channelized right turn to New Providence Road. The two-lane approach continues east through the adjacent signalized intersection with Mountain Avenue where eastbound traffic merges into a single travel lane, approximately 500 feet east of New Providence Road. The Park Avenue westbound approach is two lanes, with a dedicated left turn lane, and a shared left-turn/through lane. The New Providence Road northbound approach is two lanes, with a left-turn lane and a yield-controlled channelized right-turn lane to Park Avenue eastbound. Continental crosswalks are provided across the northbound and westbound approaches, as well as the ramp from Park Avenue eastbound to New Providence Road southbound.

#### Identified Issues

Numerous issues were identified at and approaching this intersection. Truck crash hotspots, particularly sideswipe crashes, are evident at the intersections of Park Avenue at New Providence Road and at Mountain Avenue. Insufficient lane designation signage was identified as a potential cause of driver confusion, particularly on Park Avenue westbound. This intersection carries significant truck volumes given the proximity to US 22 and Interstate 78. The turning radius of the westbound left-turn from Park Avenue to New Providence Road was identified as potentially challenging for large vehicles. The channelized right-turn from New Providence Road to Park Avenue was identified as having sight-distance issues, particularly given that this movement is yield-controlled.

Stakeholder outreach confirmed local concerns at this intersection, including the substantial presence of quarry trucks associated with Weldon Concrete. Additional comments from Union County indicated that a previous corridor study had identified Terrill Road as a potential alternate truck route to shift trips off of Park Avenue.





A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 55.

- Truck crash hotspot sideswipe crashes
- Connector route to NJ 28, US 22 and Interstate 78
- Insufficient lane designation, particularly on Park Avenue
- Poor sight distance and turning radii
- Park Middle School is located a half mile to the southeast along Park Avenue
- Through public outreach, several comments were made about congestion at the intersection and along Park Avenue
- Truck traffic volumes were not available along either corridor



# Figure 55: Site #3 Identified Issues



Park Ave (CR 655) at New

**Providence Rd** 

## Recommendations

Several recommendations have been identified at this intersection. In the short-term, the primary goal at this location should be to improve lane designation signage and striping along Park Avenue. A longer-term goal should be to revisit past traffic optimization efforts along Park Avenue to identify alternate parallel truck routes, thus minimizing truck trips through this intersection and south into Fanwood Borough, A summary of the recommendations follows and is illustrated in Figure 56 and Figure 57:

• Short-term (0-6 months)





- Provide advance lane designation signage for northbound approach indicating US 22 westbound (left lane) and US 22 eastbound (right lane); consider using pavement markings to further reinforce appropriate behaviors
- Consolidate advance signage for Park Avenue/New Providence Road on US 22 eastbound off-ramp
- Mid-term (6 months-2 years)
  - o Investigate converting Park Avenue southbound configuration to only one through travel lane
  - Signalize channelized right turn from New Providence Road and reposition crosswalk to increase visibility of pedestrians at this location
  - Investigate improving turning radii for northbound left turns to New Providence Road and consider extending the existing island on the eastbound approach to provide a pedestrian refuge island. This improvement should consider a mountable curb to allow large vehicles to make the left turn from New Providence Road to Park Avenue northbound
  - Perform detailed traffic analysis to investigate rerouting truck traffic from CR 655 (Park Ave/Martine Avenue) to Terrill Road (CR 611) via Raritan Road (CR 611)/US 22 as per Park Avenue Truck Restriction Study



Figure 56: Site #3 Corridor Improvements





# Figure 57: Site #3 Intersection Improvements







## 6.4. Site #4 - Vauxhall Road (CR 630) at Liberty Avenue - Union

#### Location Context

The signalized intersection of Vauxhall Road (CR 630) at Liberty Avenue is located in Union Township, in the northern part of the County. The intersection is nearly adjacent to Interstate 78, which is a primary route for freight in Union County and the state and region, providing the most direct east-west connection to Newark Liberty International Airport and Port Newark, as well as connections west to the Lehigh Valley.

Vauxhall Road (CR 630) travels through Union Township, primarily through residential areas, continuing south to an interchange with the Garden State Parkway, US 22, and NJ 82. Liberty Avenue travels southwest through Union Township, connecting with NJ 82 and many retail establishments along US 22. Vauxhall Road travels across Interstate 78, where off-ramps from Interstate 78 westbound merge onto Vauxhall Road. The intersection provides a direct connection to Interstate 78 eastbound.

The portion of Vauxhall Road at the intersection and extending north across Interstate 78 has two travel lanes in either direction north of the intersection. South of the intersection, Vauxhall Road is predominantly a two-lane roadway. Liberty Avenue is a two-lane roadway and provides a connection into a predominantly residential community as well as an additional on-ramp to Interstate 78 eastbound. Left turns from Vauxhall Road southbound onto the Interstate 78 on-ramp are prohibited. The south and west legs of the intersection have ladder-style crosswalks while the east leg has a standard-style crosswalk.

#### Identified Issues

Several concerns that impact truck and pedestrian flows were identified at this location. Most notably, the northwest corner of the intersection exhibits significantly damaged fencing associated with Interstate 78. This area appears to have been repaired/replaced multiple times yet continues to be struck by large vehicles making the right turn from Vauxhall Road onto Liberty Avenue. Public outreach indicated that the pedestrian signal on this corner has been damaged frequently, indicating safety concerns for pedestrians on that corner and at that crossing. This damage indicates a substandard turning radius, particularly given the current placement of the stop bar on Liberty Avenue eastbound. Finally, this location is significant given its proximity to Interstate 78, as well as NJ 124, NJ 82, and US 22, each of which provides significant regional mobility for truck traffic. A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 58.

- Truck crash hotspot Property damage crashes
- Connector route to NJ 124, NJ 82, US 22 and Interstate 78
- In need of intersection geometry improvements: Poor sight distance and turning radii
- Proximate to Jefferson Elementary School, 1000 feet to the northeast across Interstate 78
- AADT on Liberty Avenue west of intersection: 13,600 vehicles (2019)
- AADT on Vauxhall Road north of Interstate 78: 31,600 vehicles (2018)
- Truck traffic volumes not available along either corridor
- Through public outreach, comments were made about congestion at the intersection, as well as repeated occurrences of trucks damaging the pedestrian signal on the northwest corner and general safety issues for crossing pedestrians







# Figure 58: Site #4 Identified Issues

#### Recommendations

Improvements have not only been identified at the study intersection, but areas south and southeast of the intersection as well, The primary goal for this intersection is to direct trucks destined for Interstate 78 to alternate access points to reduce the number of trucks using the intersection. Additionally, physical improvements on the northwest corner will promote safe crossings for pedestrians and reduce maintenance needs associated with repairing or replacing damaged fencing. A summary of the recommendations follows and is illustrated in Figure 59 and Figure 60:

- Short term (0-6 months)
  - Install bollards on northwest corner of intersection to better define turning space for trucks turning from southbound Vauxhall Road to westbound Liberty Avenue
  - Pull stop bar back on eastbound approach of intersection to better facilitate truck turns from southbound Vauxhall Road to westbound Liberty Avenue
- Mid-term (6 months 2 years)
  - Investigate advance signage for westbound truck traffic on CR 630 and CR 633 at Burnet Ave to direct to Interstate 78 eastbound ramp via Burnet Avenue (CR 633) approaching intersection of Burnet Ave and Vauxhall Road
  - Investigate improvements to turning radii of Interstate 78 eastbound on-ramp at Burnet Avenue to better accommodate trucks
  - Conduct warrant analysis for HAWK beacon or rectangular rapid flashing beacons on Burnet Avenue at Interstate 78 eastbound on-ramp to promote improved pedestrian connection to bus stops





Figure 59: Site #4 Improvements



Figure 60: Site #4 Vicinity Improvements







## 6.5. Site #5 – Vauxhall Road (CR 630) at Stuyvesant Avenue (CR 619) – Union

#### Location Context

The signalized intersection of Vauxhall Road (CR 630) and Stuyvesant Avenue (CR 619) is located in Union Township, in the northern portion of the County. Within this study area, Vauxhall Road is primarily a residential corridor, while Stuyvesant Avenue is predominantly commercial. Both roadways include NJ TRANSIT bus routes, with stops located on three of four corners at the intersection. Commercial uses at the intersection include a grocery (northeast), retail plaza (southeast and northwest), and convenience store (southwest). This intersection provides linkages to NJ 82 and Interstate 78, as well as the Garden State Parkway.

Vauxhall Road is primarily two lanes, but widens to four lanes within the study area. Stuyvesant Avenue also operates as a two lane roadway along most of its length, but widens approaching the intersection from the north. On-street parking is present on Stuyvesant Avenue within the study area. All four traffic signal heads at the intersection are in a horizontal format, as opposed to the more common and current standard vertical signal format. The eastbound, westbound, and southbound approaches of the intersection have ladder-style crosswalks, while the northbound approach has a skewed continental (piano key) -style crosswalk.

#### Identified Issues

This intersection exhibited crash clusters for truck as well as bicycle and pedestrian crashes. Sideswipe crashes were the most common crash type, indicating that lane designation, particularly for turning vehicles, may be insufficient. There are numerous conflict points located in close proximity to the intersection, including those associated with the property on the northwest corner. At this location, driveways are nearly adjacent to the intersection. A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 61.

- Truck and bicycle/pedestrian crash hotspot
  - Frequent sideswipes
  - Excessive number of conflict points
- Connector route to arterials
- Proximal to two schools
  - o Burnet Middle School is 0.33 mile to the west
  - o St. Michael's School is a quarter mile to the west along Vauxhall Road
- AADT on Stuyvesant Avenue north of intersection: 14,100 vehicles (2019)
- Truck AADT on Stuyvesant Avenue north of intersection: 390 trucks (2019)





# Figure 61: Site #5 Identified Issues







# Recommendations

Proposed concepts at this intersection are primarily focused on formalizing existing lanes and turning movements, to reduce potential vehicular conflicts. A summary of the recommendations follows and is illustrated in Figure 62:

- Short-term (0-6 months)
  - Investigate marking Vauxhall Road approaches to intersection with dedicated left-turn lanes and thru-right lanes with appropriate signage
  - Pull back stop bars on all approaches of intersection to promote truck turning movements and consider formalizing left-turn lanes with pavement markings and lane designation signage
- Mid-term (6 months 2 years)
  - o Investigate consolidation of access driveways to minimize conflict points

5 Improvements Vauxhall Rd (CR 630) **Union Township** Investigate consolidation of access stigate feasibility to inst линич Vauxhall Rd 124 Кеу Мар MAJIMUN Pull back STOP bars on all approaches. Consider/ formalize left-turn lanes (L/TR approaches on all four legs) and provide pavement markings/ lane designation signage 59 E

# Figure 62: Site #5 Improvements





# 6.6. Site #6 – South Avenue (CR 610) at Centennial Avenue (CR 615) – Cranford

#### Location Context

The signalized intersection of South Avenue (CR 610) at Centennial Avenue (CR 615) is located in Cranford Township. South Avenue is primarily a commercial corridor that connects several downtowns and NJ TRANSIT Train Stations including Cranford, Garwood, Westfield, Fanwood, and Netherwood. The Cranford Train Station is accessed from South Avenue 800 feet to the west of the intersection. The corridor also provides access to many adjacent residential neighborhoods.

Centennial Avenue provides a connection beneath the NJ TRANSIT Raritan Valley Line, terminating at NJ 28 (North Avenue) approximately 500 to the north. South of the intersection with South Avenue, Centennial Avenue is primarily residential, traveling through Cranford and terminating at Raritan Road/North Stiles Street.

Both corridors mainly operate with one travel lane in each direction; at the intersection each widens to accommodate turn lanes. A yield-controlled slip lane west of the intersection serves as a channelized right turn from South Avenue to Centennial Avenue. This also provides access to Lincoln Park Avenue. All traffic from Lincoln Park East must turn right into the channelized right turn lane between South Avenue and Centennial Avenue.

Commercial uses are present on three corners, including a convenience store (northwest), bank (northeast), and gas station (southeast). The north, west and south legs of the intersections have ladderstyle crosswalks, as do the entrance and exit to the eastbound South Avenue to Centennial Avenue slip lane.

#### Identified Issues

This intersection exhibited crash clusters for truck as well as bicycle and pedestrian crashes. Sideswipe crashes were the most common crash type, indicating that lane designation, particularly for turning vehicles, may be insufficient. Similar crash types and clusters were noted at Centennial Avenue and North Avenue. An additional crash cluster was identified 200 feet north of the intersection at the Raritan Valley Line overpass, which has a posted 13-foot-7-inch clearance.

There are numerous conflict points located in close proximity of the intersection, including those associated with the property on the northwest corner. At this location, a driveway is nearly adjacent to the intersection.

Truck-generating land uses are prevalent east of the intersection, and Centennial Avenue is a primary connection for vehicles wishing to cross beneath the Raritan Valley Line.

A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 63.

- Truck and bicycle/pedestrian crash hotspot Frequent sideswipe crashes
- Significant number of conflict points within short segments
- Connector route to Interstate 78, US 22 and US 19





- Cranford Train Station located within walking distance of intersection
- Substandard bridge clearance (13-foot-7-inch) located north of intersection
- AADT on Centennial Avenue south of intersection: 16,600 vehicles (2018)
- Truck AADT on South Avenue east of intersection: 840 vehicles (2019)
- There are several small freight-generating land uses to the east of the intersection surrounding the Garden State Parkway in Cranford, Roselle and Roselle Park
- Through public outreach, several requests were made for bike facilities along CR 610 that would connect various communities



Figure 63: Site #6 Identified Issues





## Recommendations

The primary goal at this location is to optimize existing pavement and improve lane designation. Additionally, reducing conflict points through the consolidation or removal of existing turning movements will result in an overall safety improvement in this area. Finally, a more comprehensive approach to advance warning signage for the bridge clearance restriction should be installed. A summary of the recommendations follows and is illustrated in Figure 64 and Figure 65.

- Short-term (0-6 months)
  - Pull back stop bars on east and west approaches along South Avenue to better accommodate right turning trucks along northbound and southbound approaches
  - Install advance signage for the Raritan Valley Line underpass height restriction; install for southbound traffic on Springfield Avenue at North Avenue, eastbound traffic on North Avenue at Centennial Avenue, northbound traffic on Centennial Avenue at South Avenue and northbound traffic on Centennial Avenue mid-block south of the intersection with South Avenue
- Mid-term (6 months 2 years)
  - Investigate installing a curb extension for channelized right turn from eastbound approach of South Avenue to slow turning speeds and shorten crossing; Prohibit turns from Lincoln Park East to South Avenue
  - Investigate improving turning radii for trucks on southwest corner of Centennial Avenue at North Avenue (NJ 28), and northwest corner of Springfield Avenue at North Avenue (NJ 28)
  - Review feasibility of improving or coordinating signal phasing between the intersections of Centennial and Springfield Avenues at NJ 28
  - Install improved pedestrian crossing treatments, including pedestrian signal heads, leading pedestrian intervals and thermoplastic crosswalk striping
  - o Investigate consolidating access driveways to reduce conflict points







# Figure 64: Site #6 Corridor Improvements

# Figure 65: Site #6 Location Improvements







# 6.7. Site #7 - 1st Avenue (CR 610) at Locust Street (CR 619) - Roselle

#### Location Context

The signalized intersection of 1<sup>st</sup> Avenue (CR 610) and Locust Street (CR 619) is located in Roselle Borough, in the central portion of the County. In Roselle, the north side of 1st Avenue is primarily a commercial corridor, while the south side is predominantly residential. Land uses along Locust Street are primarily residential, connecting to the Roselle Park Train Station located approximately one-half mile to the north. Locust Street traverses beneath an inactive rail line owned by Conrail, 300 feet north of the intersection. This structure has an 11-foot-10-inch posted height. North of the inactive rail line, NJ 28 parallels 1<sup>st</sup> Avenue and provides regional access for trips throughout Union County and the region.

Within the study area, 1<sup>st</sup> Avenue and Locust Street generally operate with one travel lane in each direction. The 1<sup>st</sup> Avenue approaches to the intersection have two lanes in either direction with no signage or markings indicating turning lane designations. Both approaches of Locust Street widen to a dedicated leftturn lane and thru/right lane at the intersection.

Commercial uses are present on all four corners, including gas stations (northwest and southeast), a fast food restaurant with drive-thru (southeast) and lumber supply (northeast). The gas stations and fast food restaurant have access points nearly adjacent to the intersection along both 1<sup>st</sup> Avenue and Locust Street. All four legs of the intersection have ladder-style crosswalks.

#### Identified Issues

This intersection exhibited crash clusters for truck as well as bicycle and pedestrian crashes. A significant number of conflict points, particularly those close to the intersection, create the potential for increased crash incidence. A significant crash cluster is present at the Locust Street rail bridge, indicative of bridge strikes associated with the low clearance structure. Advance warning for the low clearance is inadequate given the number of large vehicles that traverse this location. A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 66.

- Truck and bike/ped crash hotspot
- Significant number of conflict points within short segments
- Connector route to US 22, NJ 28 and US 1&9
- Located nearly adjacent to Roselle Park Train Station
- Located nearly adjacent to 11-foot-10-inch railroad bridge clearance restriction
- Insufficient advance warning signage for substandard clearance
- AADT on 1<sup>st</sup> Avenue west of intersection: 11,700 (2019)
- AADT on Locust Street south of intersection: 2,500 vehicles (2018)
- Truck AADT on 1<sup>st</sup> Avenue west of intersection: 840 vehicles (2019)
- Through public outreach, several requests were made for bike facilities along CR 610 that connect various communities





# Figure 66: Site #7 Identified Issues







#### Recommendations

The primary concepts at this intersection are focused on providing advance signage related to the substandard bridge clearance. Secondary goals at this location include improvements to pedestrian and bicycle circulation and a reduction in conflict points approaching the intersection. A summary of the recommendations follows and is illustrated in Figure 67:

- Short-term (0-6 months)
  - Install advance signage for rail crossing height restriction; install for Locust Street northbound traffic approaching 1<sup>st</sup> Avenue at intersection and mid-block south of 1<sup>st</sup> Avenue
- Mid-term (6 months 2 years)
  - Install improved pedestrian crossing infrastructure including pedestrian signal heads, leading pedestrian intervals and thermoplastic crosswalk striping
  - o Investigate consolidating access driveways along all four approaches of intersection
- Long-term (More than 2 years)
  - Review long-term feasibility of improving or removing the rail bridge overpass on Locust Street

Figure 67: Site #7 Improvements







## 6.8. Site #8 – Elizabeth Avenue (CR 514), Scott Avenue (CR 650) to N. Stiles Street (CR 615) – Linden/Rahway

#### Location Context

This 1.04-mile segment of Elizabeth Avenue (CR 514) is located between Scott Avenue (CR 650) and North Stiles Street (CR 615) in Linden and Rahway Cities. The segment includes eight unsignalized intersections at West Lincoln Avenue, Kearny Avenue, Jones Place, Bradford Avenue, Lexington Avenue, Marion Avenue, Lindegar Street and Laurita Street. The segment exhibits two distinct land use contexts: north of Jones Place, Elizabeth Avenue is predominantly industrial and commercial, with numerous driveways and several segments of uncontrolled access. South of Jones Place, the western side of Elizabeth Avenue is residential, while the eastern side is primarily industrial or commercial.

US 1&9 parallels Elizabeth Avenue 0.7 miles to the east and is a primary freight route through Union County and New Jersey. NJ 27 parallels Elizabeth Avenue 0.7 miles to the west, traveling through many residential communities in Union County. North Stiles Street travels east to Linden Airport and the Bayway Refinery, as well as other major freight generators, including recently redeveloped GM Plant parcel. This area includes several large warehousing and fulfillment centers.

The segment of the corridor north of Marion Avenue has few intersections, which may encourage higher travel speeds. Elizabeth Avenue provides one travel lane in each direction with on-street parallel parking along both sides. Parking utilization appears more highly used in the residential area to the south in Rahway.

A midblock crossing is present at the intersection with Marion Avenue. There are no additional marked pedestrian crosswalks on Elizabeth Avenue between North Stiles Street and Scott Avenue.

The equity analysis detailed in Section 3.5 identified this area as dependent on transit or bicycle/pedestrian circulation. Therefore, improvements within this area should be sensitive to interactions between trucks, cyclist, and pedestrians.

## Identified Issues

This segment is a challenging corridor with approximately 50 access points for commercial properties in addition to cross streets and the presence of on-street parking. This agglomeration of conflict points leads to higher crash incidence, which is evident in the crash cluster analysis. Elizabeth Avenue is a wide roadway with no defined parking lane, creating opportunities for higher speed travel, particularly in areas where on-street parking is not heavily utilized. A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 68.

- Truck and bicycle/pedestrian crash hotspots
- Significant number of conflict points within segment
- Parallel route to US 1&9 and NJ 27
- Linden Train Station located within walking distance of North Stiles Street intersection.
- 14-foot-3-inch height-restricted rail crossing on North Stiles Street and 12-foot-9-inch height-restricted rail crossing on Scott Avenue
- AADT on Elizabeth Avenue south of Scott Avenue: 8600 vehicles (2017)





- AADT on Elizabeth Avenue north of North Stiles Street: 10,600 vehicles (2020)
- Truck AADT on Elizabeth Avenue north of North Stiles Street: 600 vehicles (2020)
- High percentage of racial/ethnic minority population

Figure 68: Site #8 Identified Issues






### Recommendations

The primary goal for this segment is to reduce turning conflicts and crashes through the optimization of the existing roadway. This may be accomplished largely through improved striping and signage, but a corridor-wide analysis will allow the County to identify ways to rethink the existing cross-section. Additionally, striping improvements may provide opportunities for enhancing pedestrian mid-block crossing opportunities. A summary of the recommendations follows and is illustrated in Figure 69.

- Mid-term (6 months 2 years)
  - $\circ$   $\,$  Conduct Elizabeth Avenue corridor study to examine opportunities to optimize existing cross-section
    - Jones Place to East Grand Avenue Focus on pedestrian crossings and parking access for residents
    - Jones Place to North Stiles Street Focus on access for industrial properties.
  - Investigate installing mid-block pedestrian crossing infrastructure along corridor at targeted locations.



## Figure 69: Site #8 Improvements





## 6.9. Site #9 – Wood Avenue (CR 617) at Elizabeth Avenue (CR 514) – Linden

#### Location Context

The signalized intersection of Wood Avenue (CR 617) at Elizabeth Avenue (CR 514) is located in Linden, in the southeastern portion of the County. The intersection is located approximately one-half mile west of US 1&9, providing access to Newark Liberty International Airport, and connections to the New Jersey Turnpike, Bayway Refinery and other industrial and freight-generating uses in Elizabeth, Linden and Rahway. The Linden Train Station is immediately east of the intersection and the Northeast Corridor rail line travels above South Wood Avenue. Within downtown Linden, Wood Avenue provides access to commercial uses while to the northwest and southeast, the corridor is predominantly residential. Elizabeth Avenue exhibits a mix of commercial and residential uses.

Wood Avenue and Elizabeth Avenue each operate with one travel lane in each direction. At the intersection, Wood Avenue westbound operates with dedicated left-turn, thru, and right-turn lanes. Eastbound traffic operates with two undesignated travel lanes. Surrounding land uses are a mix of residential, retail and office. There is a small shopping center on the southeast corner with a driveway exiting onto Wood Avenue close to the intersection. On-street parallel parking is provided on both sides of each approach of the Wood Avenue. There are bus stops east of the intersection on both sides of Wood Avenue, and south of the intersection along southbound Elizabeth Avenue. There are ladder-style crosswalks on all legs of the intersection.

East of the intersection, Wood Avenue travels beneath the Northeast Corridor, which has a posted clearance of 12 feet-4 inches.

The equity analysis detailed in Section 3.5 identified this area as dependent on transit or bicycle/pedestrian circulation. Therefore, improvements within this area should be sensitive to interactions between trucks, cyclist, and pedestrians.

#### Identified Issues

This intersection exhibited crash clusters for truck as well as bicycle and pedestrian crashes. A significant number of conflict points, particularly those close to the intersection, creates the potential for increased crash incidence. Current advance warning signage for the substandard clearance of the Northeast Corridor Structure is insufficient given the high truck volumes present in this corridor – notable crash clusters are present at the structure.

This intersection carries significant freight traffic given the proximity to major truck generators throughout the eastern section of the County. Pedestrian activity at this intersection is also high given the proximity to the Linden Train Station and residential areas within the City.

A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 70.

- Truck and bicycle/pedestrian crash hotspot
- Connector route to US 1&9, NJ 28 and US 22





- Adjacent to Linden Train Station
  - 12-foot-4-inch height-restricted rail crossing on Wood Avenue
    - Insufficient advance warning signs for height-restricted rail crossing
- AADT along Elizabeth Avenue south of intersection: 11,600 vehicles (2018)
- AADT along Wood Avenue west of intersection: 13,700 vehicles (2020)
- Through public outreach, several comments were received concerning heavy congestion during peak hours at the intersection, as well as high pedestrian volumes and a frequent occurrence of trucks hitting the height-restricted railroad bridge
- High percentage of racial/ethnic minority population
- High percentage of population with disabilities



## Figure 70: Sites #9 and #10 Identified Issues





### Recommendations

The primary goal at this intersection is to improve advance signage and reroute large vehicles to North Stiles Street. Additionally, a multimodal corridor study should be advanced for Wood Avenue within Linden to improve conditions for pedestrian traffic that accesses the train station daily. A summary of the recommendations follows and is illustrated in Figure 71 and Figure 72:

- Short-term (0-6 months)
  - o Install advance signage for Northeast Corridor rail line underpass height restriction;
    - Wood Avenue eastbound approaching Elizabeth Avenue
    - Wood Avenue westbound approaching West Stimpson Avenue
    - US 1&9 southbound at Wood Avenue: direct oversized vehicles traveling west to North Stiles Street
- Mid-term (6 months 2 years)
  - Conduct a multimodal corridor study along CR 617 (Wood Avenue) between US 1&9 and CR 610/NJ 28 to improve truck mobility, mitigate congestion and improve safety.



## Figure 71: Sites #9 and #10 Corridor Improvements













#### 6.10. Site #10 - Wood Avenue (CR 617) at Linden Avenue - Linden

#### Location Context

The signalized intersection of Wood Avenue (CR 617) and Linden Avenue is in Linden, in the southeastern portion of the County. The intersection is located approximately one-half mile west of US 1&9, providing access to Newark Liberty International Airport, and connections to the New Jersey Turnpike, Bayway Refinery and other industrial and freight-generating uses in Elizabeth, Linden and Rahway. The Linden Train Station is immediately west of the intersection and the Northeast Corridor rail line travels above South Wood Avenue. Within downtown Linden, Wood Avenue provides access to commercial uses while to the northwest and southeast, the corridor is predominantly residential. Elizabeth Avenue exhibits a mix of commercial and residential uses.

Wood Avenue and Linden Avenue both operate with one travel lane in each direction. At the intersection, both approaches of Wood Avenue and the northbound approach of Linden Avenue operate with a single lane. The southbound approach on Linden Avenue operates with a dedicated left-turn lane and a thru/right-turn lane. Surrounding land uses are a mix of residential, retail and office. Land uses at the intersection include are a mix of retail, restaurant, residential and office. There is on-street parallel parking on both sides of each approach of the street. There are ladder-style crosswalks with angled hash lines (rather than perpendicular) on all legs of the intersection.

West of the intersection, Wood Avenue travels beneath the Northeast Corridor, which has a posted clearance of 12 feet-4 inches.

The equity analysis detailed in Section 3.5 identified this area as dependent on transit or bicycle/pedestrian circulation. Therefore, improvements within this area should be sensitive to interactions between trucks, cyclist, and pedestrians.

#### Identified Issues

This intersection exhibited crash clusters for truck as well as bicycle and pedestrian crashes. A significant number of conflict points, particularly those close to the intersection, creates the potential for increased crash incidence. Current advance warning signage for the substandard clearance of the Northeast Corridor Structure is insufficient given the high truck volumes present in this corridor – notable crash clusters are present at the structure.

This intersection carries significant freight traffic given the proximity to major truck generators throughout the eastern section of the County. Pedestrian activity at this intersection is also high given the proximity to the Linden Train Station and residential areas within the City.

A summary of identified concerns based on the analysis of several data sets follows and is illustrated in Figure 73.

- Truck and bicycle/pedestrian crash hotspot
- Connector route to US 1&9, NJ 28 and US 22
- Adjacent to Linden Train Station





- 12-foot-4-inch height-restricted rail crossing on Wood Avenue
- Insufficient advance warning signs for height-restricted rail crossing
- AADT along Wood Avenue west of intersection: 13,700 vehicles (2020)
- Truck traffic volumes were not available along either corridor
- Through public outreach, several comments were received concerning heavy congestion during peak hours at the intersection, as well as high pedestrian volumes and a frequent occurrence of trucks hitting the height-restricted crossing of the railroad tracks
- High percentage of racial/ethnic minority population
- High percentage of population with disabilities



## Figure 73: Sites #9 and #10 Identified Issues





### Recommendations

The primary goal at this intersection is to improve advance signage and reroute large vehicles to North Stiles Street. Additionally, a multimodal corridor study should be advanced for Wood Avenue within Linden to improve conditions for pedestrian traffic that accesses the train station daily. A summary of the recommendations follows and is illustrated in Figure 74 and Figure 75:

- Short-term (0-6 months)
  - o Install advance signage for Northeast Corridor rail line underpass height restriction;
    - Wood Avenue eastbound approaching Elizabeth Avenue
    - Wood Avenue westbound approaching West Stimpson Avenue
    - US 1&9 southbound at Wood Avenue: direct oversized vehicles traveling west to North Stiles Street
- Mid-term (6 months 2 years)
  - Conduct a multimodal corridor study along CR 617 (Wood Avenue) between US 1&9 and CR 610/NJ 28 to improve truck mobility, mitigate congestion and improve safety.



## Figure 74: Sites #9 and #10 Corridor Improvements













### 6.11. Policy and Programmatic Improvement Opportunities

The proposed concepts detailed above that focus on physical infrastructure improvements are only part of the process. Underlying County or municipal policies and programs, as well as partnerships with nongovernmental organizations or local businesses, can help foster open dialogues about transportation. Efforts may include outreach, education, or increased enforcement. Appropriate travel behaviors and practices among all users, including passenger vehicles, trucks, bicyclists, or pedestrians are essential to creating safe and accessible communities.

Outreach with industry partners is a powerful tool that Union County and its municipal partners can leverage to encourage appropriate behaviors on the County roadway network. This outreach may be as simple as direct interaction between the County and a specific operator or multiple operators. However, a more comprehensive approach would provide the County with a consistent forum to address current and future transportation concerns related to freight. The County should consider creating a proactive freight committee that includes County and municipal representatives, as well as freight industry partners. This committee would allow for open discussion amongst stakeholders that collectively seek to advance and understand the needs of the freight industry within Union County.

Additional outreach opportunities may include providing mapping or information to key stakeholders. This is often more effective than enforcement to reduce or shift traffic from locations where trucking companies consistently operate in challenging and/or inappropriate residential areas or downtown corridors.

Another option for encouraging appropriate behaviors by freight traffic is a truck prohibition. This generally limits through truck trips on specific routes where they are perceived to not align with desired trip patterns. Truck prohibitions are most successfully advanced in locations where local governments (municipal or county) require codified restrictions to support enforcement. These are most suitable for downtown corridors or residential neighborhoods where through truck trips are deemed incompatible with adjacent land uses. However, for a truck prohibition to be successful, it is important to support freight trips by ensuring that a suitable alternative path is present, without a substantial detour. This includes clear and visible truck route signage at key decision points. Outreach and communication with local operators that are most impacted by a truck prohibition or found to be frequently using inappropriate roadways can further support these designations.

A large-scale wayfinding scheme can be deployed for areas where multiple origins or destinations warrant it. Properly branded wayfinding campaigns provide consistent information and support designated truck routes while attempting to reduce or minimize the impacts of heavy vehicles on residential communities. Truck wayfinding is particularly important in providing connections between multiple routes and major freight generating nodes.





#### 7. Implementation Matrix

The following implementation matrix provides a list of improvements elaborated upon in the recommendations section of this report, beginning on page 71. The recommendations are grouped by site and include order-of-magnitude material cost estimates, an implementation timeframe<sup>7</sup>, and lead and supporting agencies.

Site	Location	Recommendation	Туре	Cost	Timeframe <sup>2</sup>	Lead Jurisdiction(s)	Supporting Entities
		Review stop bar locations, particularly for westbound approach to left turn lane	Striping Improvement	\$50	Short	County	
1	Summit Ave (CR 657) – Broad St (CR 512)	Investigate making the exit to the Chase Bank driveway on the southeast corner on Summit Avenue as right turn only to reduce conflict points	Alternate Routing	\$300	Medium	Municipality & County	Property/ Business Owner(s)
-	and Springfield Ave (City of Summit)	Investigate improvements to pedestrian crossings along Summit Avenue	Pedestrian Improvements	\$2,000	Short	County	
		Performing lighting analysis and investigate improvements to street lighting along Summit Avenue	Pedestrian Improvements	\$20,000	Medium	County	
2	Springfield Ave (CR 512) – Passaic St (CR 647) and Academy St (New Providence Borough)	Consider installing bollards on all corners of intersection of Springfield Avenue and Passaic Street/South Street to channel pedestrians to crosswalks and protect curbing	Pedestrian Improvements	\$6,000	Short	County	
		Consider implementing leading pedestrian interval at intersection of Springfield Avenue and Passaic Street/South Street or "No Right Turn on Red" for trucks	Pedestrian Improvements	\$5,000	Medium	County	
		Investigate consolidation of parking/driveways and new internal circulation for consolidated parking in retail areas north and south of Springfield Avenue east of Passaic Street/South Street	Alternate Routing	\$73,000	Medium	Municipality & County	Property/ Business Owner(s)

<sup>7</sup> Implementation timeframes include Short-term (less than one year), Medium-term (one to two years), and Long-term (more than two years) opportunities.





Site	Location	Recommendation	Туре	Cost	Timeframe <sup>2</sup>	Lead Jurisdiction(s)	Supporting Entities
	Park Ave (CR 655) at New Providence Rd (Scotch Plains Township)	Investigate improving turning radii for westbound left turns to New Providence Road and consider extending the existing curbed median on New Providence Road eastbound to provide a pedestrian refuge island. Consider using a mountable curb to allow large vehicles to make the left turn from New Providence Road to Park Avenue northbound	Signal Improvements	\$7,700	Medium	State & County	
		Provide advance lane designation signage for northbound approach indicating US 22 westbound (left lane) and US 22 eastbound (right lane); consider using pavement markings to support signage	Striping Improvements	\$5,300	Short	State & County	
3		Signalize channelized right turn from New Providence Road and reposition crosswalk to increase visibility of pedestrians at this location	Signal Improvements	\$35,000	Medium	State & County	
		Investigate converting Park Avenue southbound configuration to allow only one through travel lane	Striping Improvements	\$600	Medium	State & County	
		Consolidate advance signage for Park Avenue/New Providence Road on US 22 eastbound off-ramp	Signage	\$200	Short	State & County	
		Revisit Park Avenue Truck Restriction Study and consider performing a detailed traffic analysis to investigate rerouting truck traffic from CR 655 (Park Ave/Martine Avenue) to Terrill Road (CR 611) via Raritan Road (CR 611)/US 22	Alternate Routing	\$100,000	Medium	County	Municipal Partners





Site	Location	Recommendation	Туре	Cost	Timeframe <sup>2</sup>	Lead Jurisdiction(s)	Supporting Entities
		Install bollards on northwest corner of intersection to better define turning space for trucks turning from southbound Vauxhall Road to westbound Liberty Avenue	Signal Improvement	\$6,000	Short	County	
		Pull stop bar back along eastbound approach of intersection to better facilitate truck turns from southbound Vauxhall Road to westbound Liberty Avenue	Striping Improvement	\$50	Short	County	
4	Vauxhall Rd (CR 630) at Liberty Ave (Union Township)	Investigate installing advance signage for northbound truck traffic on CR 630 and CR 633 at Burnet Avenue to use Interstate 78 eastbound ramp from Burnet Avenue	Signage	\$500	Medium	County	
		Investigate improvements to turning radii of Interstate 78 eastbound on-ramp at Burnet Avenue to better accommodate trucks	Alternate Routing	\$150,000	Medium	County	
		Investigate installing HAWK signal or rectangular rapid flashing beacons on Burnet Avenue at Interstate 78 eastbound on-ramp to promote improved pedestrian connection to bus stops	Pedestrian Improvements	\$25,000	Medium	County	TLN
	Vauxhall Rd (CR 630)	Investigate feasibility of installing dedicated left- turn lanes and thru-right lanes with appropriate signage for both approaches along Vauxhall Road	Striping Improvement	\$900	Short	County	
5	at Stuyvesant Ave (CR 619)	Pull back stop bars on all approaches of intersection to promote truck turning movements	Striping Improvement	\$200	Short	County	
	(Union Township)	Investigate consolidating access driveways to minimize conflict points	Alternate Routing	\$5,000	Medium	County	Property/ Business Owner(s)





Site	Location	Recommendation	Туре	Cost	Timeframe <sup>2</sup>	Lead Jurisdiction(s)	Supporting Entities
		Investigate installing curb extension between South Avenue eastbound and Lincoln Park East, slowing turning speeds and shortening crossing; forbid turns from Lincoln Park East to South Avenue	Signal Improvements	\$27,600	Medium	Municipality & County	
		Pull back stop bars on west and east legs of intersection to better accommodate right turning trucks along northbound and southbound approaches	Striping Improvement	\$600	Short	County	
		Investigate improving turning radii for trucks on southwest corner of Centennial Avenue at North Avenue (NJ 28), and northwest corner of Springfield Avenue at North Avenue (NJ 28)	Signal Improvements	\$20,000	Medium	State & County	
	South Ave (CR 610) at Centennial Ave (CR	Review feasibility of improving or consolidating the intersections of NJ 28 with Centennial Avenue and Springfield Avenue	Signal Improvements	\$40,000	Medium	State & County	
6	615) (Cranford Township)	Install advance signage for Raritan Valley Line underpass height restriction; install for southbound traffic on Springfield Avenue at North Avenue, eastbound traffic on North Avenue at Centennial Avenue, northbound traffic on Centennial Avenue at South Avenue and northbound traffic on Centennial Avenue mid-block south of intersection with South Avenue, and for northbound traffic on Centennial Avenue at Raritan Road	Signage	\$1,000	Short	County	
		Investigate installing improved pedestrian crossing treatments including pedestrian signal heads, leading pedestrian intervals and thermoplastic crosswalk striping	Pedestrian Improvement	\$71,500	Medium	State & County	
		Investigate consolidating access driveways to minimize conflict points	Alternate Routing	\$60,000	Medium	State & County	Property/ Business Owner(s)





Site	Location	Recommendation	Туре	Type Cost		Lead Jurisdiction(s)	Supporting Entities
		Investigate installing improved pedestrian crossing treatments including pedestrian signal heads, leading pedestrian intervals and thermoplastic crosswalk striping	Pedestrian Improvements	\$23,300	Medium	County	
	1st Ave (CR 610) at	Review long-term feasibility of improving or removing the rail bridge overpass on Locust Street	Bridge Clearance	\$100,000	Long	County	Conrail
7	Locust St. (CR 619) (Roselle Borough)	Investigate consolidating access driveways along all four approaches of intersection	Alternate Routing	\$75,000	Medium	Municipality & County	Property/ Business Owner(s)
		Install advance signage for rail crossing underpass height restriction; install for Locust Street northbound traffic approaching 1st Avenue at intersection and mid-block south of 1st Avenue	Signage	\$200	Short	County	
8	Elizabeth Ave (CR 514) - Scott Ave (CR 650) and N Stiles St	Conduct corridor study to review opportunities to optimize Elizabeth Avenue.	Study	\$100,000	Medium	County	Municipalities/ Residents/Pro perty Owners
U	(CR 615) (City of Linden/City of Rahway)	Investigate installing mid-block pedestrian crossing infrastructure along corridor	Pedestrian Improvements	\$57,800	Short	County	
9	Wood Ave (CR 617) at Elizabeth Ave (CR 514) (City of Linden)	Install advance signage for Northeast Corridor rail underpass height restriction; install for eastbound traffic approaching Elizabeth Avenue on Wood Avenue, westbound traffic approaching West Stimpson Avenue on Wood Avenue, and southbound traffic on US 1&9 at Wood Avenue; direct oversized vehicles on westbound Wood Avenue to cross Northeast Corridor rail line along North Stiles Street	Signage	\$500	Short	State & County	
		Conduct a corridor study of Wood Avenue between US 1&9 and CR 610/NJ 28 to improve truck mobility, mitigate congestion and improve safety	Study	\$100,000	Medium	County	





Site	Location	Recommendation	Туре	Cost	Timeframe <sup>2</sup>	Lead Jurisdiction(s)	Supporting Entities
		Conduct a corridor study of Wood Avenue between US 1&9 and CR 610/NJ 28 to improve truck mobility, mitigate congestion and improve safety	Study	\$100,000	Medium	County	
10	Wood Ave (CR 617) at Linden Ave (City of Linden)	Install advance signage for Northeast Corridor rail underpass height restriction; install for eastbound traffic approaching Elizabeth Avenue on Wood Avenue, westbound traffic approaching West Stimpson Avenue on Wood Avenue, and southbound traffic on US 1&9 at Wood Avenue; direct oversized vehicles on westbound Wood Avenue to cross Northeast Corridor rail line along North Stiles Street	Signage	\$500	Short	State & County	





### 8. Stakeholder and Public Outreach

Several methods were leveraged to engage County, municipal, industry, and public stakeholders. Public outreach was focused on the Wlkimap, an interactive online tool that allowed County residents to identify the locations of concerns or issues and offer comments on specific locations on a map. These comments were further supported through the TAC, targeted focus groups and surveys, as well as two project newsletters. Finally, a public meeting was held to provide residents and stakeholders with a summary of project work and the subsequent recommendations detailed earlier.

The Public Outreach effort for this project was impacted by the COVID-19 pandemic. As a result of the New Jersey declaration of a public health emergency in March 2020 and continuing through June 2021, the holding of in-person, indoor meetings were subject to health mandated restrictions. As a result of the State and County policies regarding gatherings, meetings for this project were held virtually using the Zoom technology. During the course of the project and there was more reliance on surveys and the Wikimapping and the project information on the County website.

Supporting documentation of the public outreach process is included in Appendix D. This includes presentation slide decks, meeting minutes, newsletters, survey documents, and Wikimap comments.

#### 8.1. Wikimap

An online interactive map (Wikimap) was created for the Union County Freight Mobility Study to collect place-based comments about stakeholder's interaction with freight in the County. The web interface allows users to mark-up a virtual map of the County by identifying corridors and spot locations by categories: congestion, safety, bicycle, pedestrian, and other general concerns. Users created unique comments and could add statements to the comments of other users. This tool allowed stakeholders who may be otherwise unable to attend a virtual meeting, to have an opportunity to engage in the study. Instructions for the tool were provided in English and Spanish.

The Wikimap was open for public comment for an eight-month period between August 1, 2020 and March 30, 2021. An image of the completed (after the site was closed to comments) Wikimap site is shown in Figure 76.







Figure 76: Wikimap

A total of 136 responses and 146 interactions were gathered via Wikimap. "Interactions" refers to original comments as well as those commenting on other's comments. Users added point and line comments using one of five categories, the number of responses of which are shown in Table 17. Additionally, interactions were categorized more specifically by the content of the comment. Many interactions focused on specific issues were included in multiple categories as shown in Table 18.

Comments were also categorized by municipality and corridor, as shown in Table 19 and Table 20. A complete list of Wikimap comments is included in Appendix D.





# Table 17: Wikimap Categories

Category	Responses
Congestion	36
Pedestrian	36
Concern	31
Bicycle	18
Safety	15

# Table 18: Wikimap Interactions

Issue	Responses
Pedestrian	56
Safety	50
Traffic	49
Trucks	30
Bike	23
Turns	14
Children	13
Maintenance	9
Speed	8
Enforcement	7
Signage	5
Parking	4

# Table 19: Wikimap Comments by Corridor

Corridor	Responses	Roadway Name		
CR 655	21	Park Ave/Martine Ave/Lake Ave		
CR 615	15	Stiles St/Springfield Ave		
CR 509	12	Kenilworth Blvd/Boulevard/E Broad St/Liberty Ave/Hillside Ave/Salem Rd		
CR 617	11	Wood Ave/Faitoute Ave		
CR 630	9	Conant St		
CR 514	7	Elizabeth Ave/Linden Ave		
US 1&9	5			
NJ 27	5			
CR 509 Spur	5	Springfield Ave/Meisel Ave		





Municipality	Comments
Clark	2
Cranford	8
Elizabeth	6
Fanwood	4
Garwood	2
Hillside	26
Kenilworth	2
Linden	41
Plainfield	3
Roselle	7
Roselle Park	7
Scotch Plains	19
Springfield	5
Union Twp	7
Westfield	11

# Table 20: Wikimap Comments by Municipality

#### 8.2. Project Newsletters

Two newsletters were created to provide updates to the public. They were distributed to Union County residents electronically via social media as well as from TAC members to their constituencies.

The first newsletter was developed as a project fact sheet and served three key purposes. First, it outlined the purpose of the plan, detailing the importance of freight to Union County while acknowledging the impact of large vehicles on the County roadway network. Second, it outlined the draft project goals, focusing on safety, e-commerce, growth, maximizing investments, and supporting economic vitality. Finally, the newsletter provided links to two key outreach elements – the project email and Wikimap.

The second newsletter was developed to provide a high-level summary of the project outcomes, including the 10 sites selected for proposed recommendations. It also was used to promote the public meeting and summarized work progress prior to the meeting.

A copy of each newsletter, in English and Spanish, is included in Appendix D.

#### 8.3. Project Email

A project email account (UCTruck@projectsolvemail.com) was created to allow stakeholders or residents to ask questions of the project team. This method was promoted by County staff and within Project Newsletter #1. Questions were also invited to the email of the County project manager. The contact information was provided on the two project Newsletters, on the project information page of the Union County website, and at the conclusion of each formal presentation made throughout the study period.





## 8.4. Bicycle & Pedestrian Focus Group

A focus group with bicycle and pedestrian professionals and advocates was conducted on February 26, 2021. The purpose of the focus group was to elicit feedback concerning the location and nature of conflict points between trucks and non-motorized users (cyclists and pedestrians) to help identify focus intersections and segments for which engineering recommendations would be developed.

A substantial portion of the discussion concerned speeding on local roads and near schools. Several suggestions were made to mitigate speeding including implementing Complete Streets infrastructure. These improvements may include curb extensions to promote visibility of pedestrians or dedicated bike lanes to narrow the width for traveling motorists while providing a safer means of travel for cyclists. Other issues discussed included bridge clearances, sidewalk gaps, and proper design guidelines.

The presentation slide deck and a summary of the focus group discussion is included in Appendix D.

#### 8.5. Municipal Survey

Surveys were emailed to representatives from each of the County's 21 municipalities. Fifteen responses were provided from 14 municipalities. Respondents included police officers, business administrators, elected officials, engineers or other municipal staff. Survey questions concerned the perception of trucks in the municipality, expectations of growth in freight, and the challenges facing trucks. Key findings from the survey included that 13 of 15 respondents answered that trucks are a concern in their municipality, while eight of the 13 respondents noted that the perception of trucks has worsened in 2020. Additionally, eight of 14 representatives answered that truck-generating land uses are expected to grow in the next five years.

An example of the survey element provided to municipal stakeholders is included in Appendix D.

#### 8.6. Truck Industry Survey

Surveys were emailed to representatives of the local private trucking industry through the New Jersey Motor Truck Association. Seven industry members responded to the survey. Most respondents were owners or presidents of the business. Survey questions were focused on roadway challenges facing freight, local impediments and bottlenecks, and how the County and local municipalities can better support trucking. Three of seven respondents cited inconsistent or incorrect mapping information as pushing oversized vehicles onto residential streets. Other concerns mentioned included traffic controls, signage, and loading zones.

An example of the survey element provided to freight industry stakeholders is included in Appendix D.

#### 8.7. Technical Advisory Committee

A project-specific TAC was gathered to provide input and technical expertise into the project. The committee included representatives from Union County Transportation Planning and Engineering, NJTPA, and municipal officials. Committee members brought knowledge to the success of the study and helped develop recommendations.





Two meetings of the TAC took place. Summaries are provided below with minutes and presentation slide decks for each included in Appendix D.

The first meeting was held August 12, 2020 and introduced the significance of freight within the County, the study's draft goals and schedule, and the intended approach to elicit feedback and engage stakeholders, while gathering feedback to best direct the study team's work. The first project newsletter was prepared ahead of this meeting to prepared and inform those invited to attend. As part of the outreach, all mayors, business administrators and clerks were invited.

The second meeting was held on March 30, 2021. During this meeting, the project team discussed progress made on the study to date, including public outreach efforts, data collection and analysis, and an introduction of initial recommendation concepts. The second project newsletter was added to the TAC invitations.

#### 8.8. Public Meeting

Union County hosted a virtual public meeting for this study on May 26, 2021 using the *Zoom* platform. The meeting was widely promoted using email and social media blasts, as well as through the dissemination of project newsletter #2. The meeting included on a summary of the overall project effort but was primarily focused on the concepts associated with the recommendations developed for the 10 identified sites. 34 participants, representing 14 municipalities, attended the approximately 80 minute presentation and subsequent question and answer period. Following the meeting, attendees were provided with a copy of the slide deck and offered an opportunity to provide additional feedback to the project team.

A copy of the presentation slide deck as presented during the public meeting is included in Appendix D.

#### 8.9. Union County Transportation Advisory Board

The Union County Transportation Advisory Board (TAB) provides local and citizen input on transportation policies and programs and serves as an advisory to the County Board of Commissioners. Representatives from each of the County's 21 municipalities are invited to participate on the Board that meets six times a year. The Truck Mobility Project Team formally presented the Study to the TAB on September 9, 2020 as part of the overall project outreach efforts and inform ongoing work and recommendations.

At the meeting, the project team reinforced the significance of freight within the County, the project's draft goals and schedule, and the intended approach to elicit feedback and engage stakeholders, while gathering feedback to best direct the project team's work.

The TAB was regularly updated on the course of this project from its kickoff in April 2020 through the completion of the project is June 2021.

A copy of the presentation slide deck as presented to the TAB is included in Appendix D.





#### 9. Conclusion and Next Steps

The proposed recommendations outline a range of engineering and outreach-focused concepts and strategies to improve mobility for trucks, reduce conflicts with other modes (particularly cyclists or pedestrians), and provide clear information for drivers at key decision points. Prioritized and implemented over time, as funding is available, they will ultimately result in a more robust and better functioning County roadway network for all users. The County should work alongside its municipal partners, the NJTPA, and NJDOT to advance proposed improvements. With the Union County Truck Mobility Study complete, the County can move forward with obtaining funding for the implementation of recommendations and further study. This Truck Mobility Study serves as a resource and guide for implementation and should be considered in all future land use and transportation studies undertaken by the County or its municipal partners.