

APPENDIX A

Crash Data & Trends

UNION COUNTY SAFE STREETS FOR ALL ACTION PLAN



Background

Union County, New Jersey, comprises 21 municipalities and serves approximately 580,000 residents. While the county's road network includes major arterials such as US Route 1&9, Garden State Parkway, I-78, I-95, I-278, local roads make up a majority of the county's roadway mileage. The county roadway system carries heavy traffic volumes comprised of local trips, daily commuters, and freight movement in a built environment that includes both suburban and urban land uses. This mix of roadways throughout most of the county creates a complex transportation environment shared by drivers, bicyclists, pedestrians, and transit users.

Funded by a grant provided by the United States Department of Transportation's (USDOT's) Safe Streets for All (SS4A) grant program, the County is developing a Safety Action Plan aimed at evaluating current conditions and identifying strategies to reduce the number of fatalities and serious injuries on its roadways. The City of Elizabeth, as a subrecipient on the grant, is partnering with Union County on this effort. The plan's goals are to evaluate recent crash data and identify underlying trends, high-injury corridors, and

key risk factors that contribute to traffic crashes in Union County and in the City of Elizabeth. By assessing these patterns, the County aims to understand where and why crashes are occurring and to evaluate the potential risk levels across its roadway network. This data-driven approach will inform the development of a prioritized list of locations and recommended countermeasures, forming the basis for an implementation plan that proposes targeted safety interventions.

The **“Crash Data & Trends”** technical memorandum presents a detailed analysis of Union County's crash data to support the development of the Safety Action Plan, including crash data specific to the City of Elizabeth. The report outlines data collection and analysis, evaluates crash trends and characteristics, identifies key contributing and environmental factors, and analyzes crash locations. The report also assesses risk for vulnerable users and provides an analytical foundation for the development of safety recommendations.

Data Collection and Methodology

Data Collection and Analysis

DATA OVERVIEW

The safety analysis is based on the most recent five years (2018–2022) of complete crash data available from NJDOT’s Safety Voyager platform. Data for 2023 was incomplete at the time of analysis and therefore excluded. This aligns with the FY25 SS4A Notice of Funding Opportunity, which requires the use of the most recent five-year dataset.

The project team utilized the NJDOT Safety Voyager system to obtain crash data specific to Union County and the City of Elizabeth. To compare and analyze statewide trends, data was gathered from the New Jersey Division of Highway Traffic Safety’s Numetric platform. This approach ensured local datasets and appropriate benchmarks for interpreting trends.

After downloading the data, the data was reviewed, analyzed, and processed. Through this exercise, 371 crashes were found to be geolocated outside the county boundary and excluded from the analysis. This rendered a total of 92,419 total crashes over the five-year period (2018–2022) that were selected for the analysis to ensure that only Union County incidents were considered.

METHODOLOGY

The SS4A Program is focused on reducing “Killed or Seriously Injured” (KSI) crashes. To support this objective, this report examines crash data through two main areas of analysis. First, it reviews overall crash trends to establish a broad understanding of traffic safety conditions across all reported crashes. Second, it focuses on the characteristics and patterns specific to KSI crashes, exploring which characteristics, contributing factors, and environmental factors are most associated with severe outcomes; and analyzes the spatial distribution of KSI crashes to determine whether certain areas exhibit higher concentrations of serious crashes.

The analysis is conducted at two geographic levels: Union County and the City of Elizabeth. For each level, crash patterns are compared to relevant benchmarks, with Union County evaluated against statewide averages, and the City of Elizabeth compared to countywide trends. This comparative approach helps highlight any unique local crash patterns and provides insight into where targeted safety improvements could be most effective.

Crash Trend Analysis

This section will provide an in-depth analysis of crash trends, offering an overview of general crash patterns. Key aspects include the location characteristics of crashes, contributing factors, and environmental conditions.

YEARLY TREND

Table 1 summarizes total crash data from 2018 through 2022 for the City of Elizabeth, Union County, and statewide figures for New Jersey.

Compared to statewide trends, Union County followed a similar crash trajectory from 2018 to 2021, with a noticeable dip in 2020 likely driven by COVID-19 lockdowns. In both regions, crash percentages fell significantly—New Jersey’s dropped from 24.0% in 2019 to 16.6% in 2020, and Union County’s from 23.3% to 15.4%. However, in 2022, the trends diverged: while New Jersey saw a continued decline in crashes to 15.9%, Union County’s crash share held steady at 19.5%. Over a five-year period in Union County, the total number of crashes decreased by approximately 2,000.

During the same time period, the City of Elizabeth recorded 21,089 crashes, which represented approximately 23% of all crashes in Union County. Given the City’s population of about 135,665 in 2022, roughly 23.7% of the county’s total population, its share of crashes was broadly proportional to its share of residents. Total crashes in the City of Elizabeth noticeably declined in 2020, likely due to reduced travel during the COVID-19 pandemic, before increasing again in 2021 and 2022. Both Union County and the City of Elizabeth saw crashes being reported at a similar level post pandemic, with 23.8% in the City and 19.5 % in the County between 2021 and 2022. However, over the five-year period, contrary to the reduction in crashes seen in the County, the City of Elizabeth saw an increase in total crashes of approximately 1,700.

This overview established a baseline for understanding overall crash patterns in the City of Elizabeth and Union County, providing essential context for more detailed examination in subsequent sections of the report.

Table 1: Total Crashes in the City of Elizabeth, Union County, and New Jersey; 2018–2022

Year	City of Elizabeth		Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
2022	5,013	23.8%	18,009	19.5%	187,950	15.9%
2021	5,020	23.8%	18,002	19.5%	227,527	19.3%
2020	3,603	17.1%	14,192	15.4%	195,613	16.6%
2019	4,139	19.6%	21,545	23.3%	283,210	24.0%
2018	3,314	15.7%	20,671	22.4%	285,312	24.2%
Total	21,089	100%	92,419	100%	1,179,612	100%

SEVERITY

Table 2 presents crashes by injury severity levels in the City of Elizabeth, Union County, and statewide across New Jersey. The severity categories include No Apparent Injury, Possible Injury, Suspected Minor Injury, Suspected Serious Injury, and Fatal Injury.

County trend

In Union County, the majority of crashes resulted in No Apparent Injury, accounting for 78.6% of crashes, closely aligning with the statewide average of 78.2%. Crashes classified as Possible Injury and Suspected Minor Injury together made up around 21% of crashes both in the county and across New Jersey, reflecting a notable share of crashes causing some level of injury, though generally less severe. More serious crashes, including Suspected Serious Injury and Fatal Injury, constitute a smaller portion of total

crashes. Countywide, Suspected Serious Injury crashes accounted for 0.8% of crashes, slightly below the statewide figure of 1.0%, while fatal crashes represented 0.2% of crashes in Union County, also slightly lower than the statewide average of 0.3%.

City trend

The City of Elizabeth showed similar patterns, with 77.2% of crashes resulting in No Apparent Injury, slightly below the county average of 78.6%. Possible Injury and Suspected Minor Injury crashes collectively comprise about 21.4% of the City of Elizabeth's total crashes, consistent with countywide trends. However, the City of Elizabeth reported a somewhat higher share of Suspected Serious Injury crashes at 1.2%, compared to 0.8% for the county overall, suggesting a slightly elevated risk of more severe injuries in the city. The proportion of fatal crashes in the City of Elizabeth was 0.2%, identical to the county average.

Table 2: Crashes by Severity in the City of Elizabeth, Union County, and New Jersey; 2018–2022

Injury Severity	City of Elizabeth		Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
No Apparent Injury	16,284	77.2%	72,676	78.6%	922,203	78.2%
Possible Injury	3,025	14.3%	13,202	14.3%	160,824	13.6%
Suspected Minor Injury	1,487	7.1%	5,616	6.1%	81,901	6.9%
Suspected Serious Injury	259	1.2%	781	0.8%	11,548	1.0%
Fatal Injury	34	0.2%	144	0.2%	3,136	0.3%
Total	21,089	100%	92,419	100%	1,179,612	100%

TYPE

County trend

Table 3 summarizes crash types in Union County compared to statewide figures in New Jersey, showing the total number of crashes and the percentage distribution for each type.

In Union County, the most common crash type was Same Direction - Rear End, accounting for 28.5% of all crashes, closely mirroring the statewide figure of 28.8%. Same Direction - Sideswipe crashes represented a notably higher share in Union County (19.3%) than across New Jersey (15.8%), suggesting potential issues with lane discipline or congestion in the county. Right Angle crashes were similarly proportioned in both regions, making up about 15% locally and 14% statewide.

Striking parked vehicles comprised 13.2% of crashes in Union County, slightly above the statewide share of 11.3%. Conversely,

crashes involving Fixed Objects were somewhat less common in Union County (8.9%) than in New Jersey overall (11.9%).

Other crash types, including those involving pedestrians (1.7% county vs. 1.6% state), pedalcyclists (0.8% vs. 0.7%), and head-on collisions (1.2% vs. 1.5%), generally showed similar proportions between Union County and statewide averages. However, animal-related crashes were considerably less frequent in Union County (1.0%) compared to New Jersey (4.0%), likely due to Union County more urban environment.

Overall, Union County’s crash profile broadly aligned with statewide trends, though certain types, particularly sideswipe and parked-vehicle crashes, occurred with greater frequency, highlighting specific areas for potential traffic safety focus.

Table 3: Crashes by Type in Union County and New Jersey; 2018–2022

Crash Type	Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Same Direction - Rear End	26,352	28.5%	339,349	28.8%
Same Direction - Sideswipe	17,845	19.3%	185,986	15.8%
Right Angle	13,891	15.0%	165,218	14.0%
Struck Parked Vehicle	12,156	13.2%	133,804	11.3%
Fixed Object	8,216	8.9%	140,283	11.9%
Backing	4,853	5.3%	51,661	4.4%
Left Turn/U Turn	2,010	2.2%	24,576	2.1%
Pedestrian	1,584	1.7%	18,316	1.6%
Opposite Direction (Head On)	1,120	1.2%	18,017	1.5%
Animal	960	1.0%	47,704	4.0%
Opposite Direction (Sideswipe)	914	1.0%	12,131	1.0%
Non-fixed Object	823	0.9%	13,813	1.2%
Pedalcyclist *	722	0.8%	8,742	0.7%
Other	469	0.5%	8,635	0.7%
Overtuned	238	0.3%	6,324	0.5%
Encroachment	223	0.2%	4,293	0.4%
Unknown	41	~0.0%	160	~0.0%
Total	92,419	100%	1,179,612	100%

* Pedalcyclist is the technical crash terminology that covers bicyclists

City trend

Table 4 provides a detailed breakdown of crash types in the City of Elizabeth compared to Union County overall.

In the City of Elizabeth, Same Direction - Sideswipe crashes were the most frequent, making up 24.2% of crashes, notably higher than the county’s 19.3%. This suggested that frequent lane changes and limited maneuvering space in the city’s dense traffic, where vehicles often park along both sides of the street, contributed to higher sideswipe risks. Conversely, Same Direction - Rear End crashes were more dominant at the county level, accounting for 28.5% of crashes compared to 21.0% in the City of Elizabeth.

Right Angle crashes represented a more significant share in the City, comprising 18.5% of crashes in the City of Elizabeth, compared to 15.0% in Union County. Striking parked vehicles also occurred at similar rates, 13.4% in the City of Elizabeth and 13.2% countywide, highlighting the urban parking challenges in both contexts.

The City recorded higher proportions of Pedestrian crashes (2.9%) and Pedalcyclist crashes (1.0%) compared to Union County (1.7% and 0.8%, respectively), a reflection of increased vulnerable road user activity in the city’s urban core. Meanwhile, Animal-related crashes were far less common in the City of Elizabeth (0.1%) than in the county (1.0%).

Overall, crash patterns in the City of Elizabeth showed a greater prevalence of crashes found in denser, more urban environments, including sideswipe collisions and crashes involving vulnerable road users, whereas the broader County area experienced higher rates of rear-end and animal-related crashes, reflecting its more suburban character.

Table 4: Crashes by Type in the City of Elizabeth and Union County; 2018–2022

Crash Type	City of Elizabeth		Union County	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Same Direction - Sideswipe	5,095	24.2%	17,845	19.3%
Same Direction - Rear End	4,421	21.0%	26,352	28.5%
Right Angle	3,896	18.5%	13,891	15.0%
Struck Parked Vehicle	2,824	13.4%	12,156	13.2%
Fixed Object	1,461	6.9%	8,216	8.9%
Backing	1,288	6.1%	4,853	5.3%
Pedestrian	606	2.9%	1,584	1.7%

Crash Type	City of Elizabeth		Union County	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Left Turn/U Turn	367	1.7%	2,010	2.2%
Opposite Direction (Head On)	297	1.4%	1,120	1.2%
Opposite Direction (Sideswipe)	229	1.1%	914	1.0%
Pedalcyclist	202	1.0%	722	0.8%
Non-fixed Object	160	0.8%	823	0.9%
Other	96	0.5%	469	0.5%
Overturned	77	0.4%	238	0.3%
Encroachment	38	0.2%	223	0.2%
Animal	24	0.1%	960	1.0%
Unknown	8	~0.0%	41	~0.0%
Total	21,089	100%	92,419	100%

Crash Location

This section examines key characteristics of crashes that occurred in Union County and in the City of Elizabeth, focusing on the specific attributes related to the locations where crashes happened.

ROADWAY CLASSES

County trend

Table 5 summarizes crash occurrences by roadway classification in Union County. It also details crashes involving pedalcyclists and pedestrians, the percentage these vulnerable user crashes represent of the total crashes of each roadway class, as well as system mileage and crash rates per mile for each roadway class.

This statistical breakdown is not included in the Numetric system; thus, a statewide comparison was not performed.

The data showed notable variations in crash patterns across different roadway classes. Local roads had the highest total crashes, with 24,878 occurrences, but their crash rate per mile was relatively low at 21.0. State highways and county roads reported fewer total crashes but had higher crash rates per mile (350.2 and 107.5, respectively). This reflected greater exposure and risk associated with these roads. Crashes involving pedalcyclists and pedestrians were more prevalent on county and local roads, accounting for 3.44% and 3.51% of total crashes, respectively, indicating these roads had higher interactions with vulnerable road users.

Table 5: Crashes by Roadway Classification in Union County; 2018–2022

	Total Crashes	Crashes with Pedalcyclists Involved	Crashes with Pedestrians Involved	% Pedestrian/ Pedalcyclist Crashes	System Mileage	Total Crashes per Mile
Interstate	7,085	1	7	0.11%	21.3	333.1
Garden State Parkway	7,734	1	7	0.10%	8.5	909.9
State	21,818	135	356	2.25%	62.3	350.2
County	20,498	237	468	3.44%	190.7	107.5
Local	24,878	297	576	3.51%	1,186.7	21.0
Private Property Facility	2,297	6	18	1.04%	-	-
No Coordinates	230	3	6	3.91%	-	-
Unknown	7,855	36	117	1.95%	-	-
Unknown	24		1	4.17%	-	-
Total	92,419	716	1,556	2.46%	1,469.5	62.9

City trend

Table 6 presents crash occurrences by roadway classes within the City of Elizabeth.

The data for the City of Elizabeth showed that local roads experienced the highest total number of crashes, with 9,596 reported, followed by state roads with 5,247 crashes. Crashes

involving pedalcyclists and pedestrians accounted for a notable share of total crashes, particularly on local roads by crash occurrences. Local roads had the lowest crash rate per mile, 81.4, among all roadway classes.

Table 6: Crashes by Roadway Classification in the City of Elizabeth; 2018–2022

	Total Crashes	Crashes with Cyclists Involved	Crashes with Pedestrians Involved	% Pedestrian/Pedalcyclist Crashes	System Mileage	Total Crashes per Mile
Interstate	3,233	-	2	0.06%	4.6	695.7
State	5,247	51	186	4.52%	11.5	456.3
County	1,747	23	89	6.41%	10.1	172.4
Local	9,596	132	298	4.48%	117.9	81.4
Private Property	1,204	2	8	0.83%	-	-
Facility	57	-	1	1.75%	-	-
Unknown	5	-	-	0.00%	-	-
Total	21,089	208	584	3.76%	26.3	802.5

Crash Contributing Factors

This section explores the underlying factors that contribute to crashes in Union County and the City of Elizabeth, focusing primarily on human and driver factors as well as contributing circumstances

HUMAN/DRIVER ACTIONS BY SEVERITY

County trend

Table 7 summarizes the distribution of human and driver actions contributing to crashes in Union County compared to statewide data for New Jersey. It shows the total number of crashes associated with each specific action and their percentage share of all recorded actions.

Driver inattention emerged as the most prevalent contributing factor, involved in approximately a quarter of all crashes in both the county and the state. Following too closely and failure to yield

the right of way were also notable contributors, representing around 6% and 4% of crashes respectively for both county and state. Improper lane changes contributed to roughly 3% of crashes, likely due to the lack of lane discipline and lack of signaling. Other driver or pedalcyclist actions, unsafe speed, and improper turning also appeared with lower but significant frequencies.

In terms of crashes with pedestrians and pedalcyclists involved, driver inattention was a significant contributor, accounting for 16.2% of such incidents, compared to 6.5% statewide. Other notable trends included a higher rate of crashes due to other pedestrian factors (14.2% vs. 9.1% statewide) and failures to yield the right of way (8.3% vs. 3.4% statewide). Conversely, certain factors such as crossing where prohibited and running across traffic were less prevalent in Union County than statewide.

It is worth noting that the “None” category accounts for a large share of total Human/Driver Actions, which is reflective of the lack of apparent Human/Driver Actions as recorded by police.

Overall, these patterns indicated that human factors related to attention, judgment, and adherence to traffic rules dominate crash causation.

Table 7: Crashes by Human/Driver Action in Union County and New Jersey; 2018–2022

Human/Driver Actions	Union County		New Jersey	
	All Actions	% Actions	All Actions	% Actions
Driver Inattention	47,940	25.5%	549,630	23.2%
Following Too Closely	11,836	6.3%	155,967	6.6%
Failed to Yield Right of Way to Vehicle/Pedestrian	6,994	3.7%	109,114	4.6%
Improper Lane Change	6,604	3.5%	75,733	3.2%
Other Driver/Pedalcyclist Action	3,757	2.0%	28,774	1.2%
Unsafe Speed	3,554	1.9%	68,788	2.9%
Backing Unsafely	3,255	1.7%	45,881	1.9%
Improper Turning	2,913	1.6%	41,560	1.8%
Improper Passing	2,457	1.3%	29,422	1.2%
Failure to Obey Stop Sign	2,301	1.2%	21,144	0.9%
Failed to Obey Traffic Signal	2,054	1.1%	27,766	1.2%
Road Surface Condition	1,790	1.0%	31,777	1.3%
Improper Parking	944	0.5%	9,814	0.4%
Other	7,105	3.8%	17,429	47.2%
None	84,275	44.9%	55,321	2.3%
Total	187,779	100%	2,367,098	100%

City trend

Table 8 presents the distribution of crashes in the City of Elizabeth and the comparison with Union County.

In the City of Elizabeth, driver inattention was the leading contributing factor in crashes, accounting for 21.8% of all incidents. This share was significant but slightly lower than the countywide figure of 25.5%, suggesting that while inattention remained a primary issue throughout Union County, it might be somewhat less dominant in the urban environment of the City of Elizabeth compared to broader county patterns.

Other driver or pedalcyclist actions contributed to 4.9% of crashes in the City of Elizabeth, which was notably higher than the 2.0% observed countywide. This difference indicated that a wider variety of driving behaviors, potentially linked to the city's busier and more complex traffic conditions, played a role in crashes within the City of Elizabeth.

Following too closely was involved in 4.6% of crashes in the City of Elizabeth, slightly lower than the 6.3% countywide average, while actions like failing to yield the right of way, improper lane changes,

unsafe speed, and improper turning each accounted for around 1.6% to 3.0% of the City of Elizabeth's crashes, aligning with county trends.

If only focused on crashes involving pedalcyclists and pedestrians, driver inattention was a notably dominant factor, cited in 33.7% of incidents, which was more than double the countywide share of 16.2%. Similarly, failure to yield the right of way appeared in 15.4% of the City of Elizabeth crashes, significantly higher than the 8.3% seen countywide. These trends indicated that driver behaviors such as distraction and yielding violations were particularly critical issues in the City of Elizabeth's urban traffic environment.

Similar to the county table, the "None" category reflects the absence of any apparent Human/Driver Actions as observed by the police.

Overall, while the City of Elizabeth's crash patterns fit broadly with countywide trends, certain factors such as varied driver or pedalcyclist actions stood out more prominently in the city's urban setting.

Table 8: Crashes by Human/Driver Action in the City of Elizabeth and Union County; 2018–2022

Human/Driver Actions	City of Elizabeth		Union County	
	All Actions	% Actions	All Actions	% Actions
Driver Inattention	8,837	21.8%	47,940	25.5%
Other Driver/Pedalcyclist Action	1,984	4.9%	3,757	2.0%
Following Too Closely	1,886	4.6%	11,836	6.3%
Failed to Yield Right of Way to Vehicle/Pedestrian	1,202	3.0%	6,994	3.7%
Improper Lane Change	1,192	2.9%	6,604	3.5%
Unsafe Speed	873	2.2%	3,554	1.9%
Backing Unsafely	718	1.8%	3,255	1.7%
Improper Turning	649	1.6%	2,913	1.6%
Improper Passing	636	1.6%	2,457	1.3%
Failed to Obey Traffic Signal	586	1.4%	2,054	1.1%
Failure to Obey Stop Sign	473	1.2%	2,301	1.2%
Improper Parking	345	0.8%	944	0.5%
Road Surface Condition	216	0.5%	1,790	1.0%
Other	1,647	4.1%	7,105	3.8%
None	19,347	47.7%	84,275	44.9%
Total	40,591	100%	187,779	100%

Environmental Factors

This section examines how environmental conditions contribute to crash occurrence and severity in Union County. Environmental factors refer to elements outside of driver behavior, such as lighting conditions, weather, and road surface conditions at the time of the crash. These elements can influence driver visibility, vehicle control, and pedestrian safety, particularly for vulnerable road users like pedalcyclists and pedestrians.

LIGHTING CONDITIONS / TIME OF DAY

County trend

Table 9 presents the distribution of crashes in Union County and statewide in New Jersey by lighting condition. Categories include daylight, various low-light conditions, and times of transition such as dawn and dusk. This comparison helps illustrate how lighting environments influence overall crash occurrence across different geographic scales.

In both Union County and New Jersey, the majority of crashes occurred during daylight, representing about 70% of all crashes (69.9% in Union County and 69.2% statewide). Low-light conditions, which include any crashes that happened under other than daylight condition, collectively accounted for roughly 30% of crashes in both regions, indicating similar exposure to nighttime or low-visibility driving environments.

Within low-light conditions, Union County recorded a higher proportion of crashes under continuous street lighting (19.4%) than the statewide average (16.5%). However, the county saw lower proportions than the state for crashes occurring in dark areas with no streetlights (2.2% in Union County vs. 4.1% statewide) and under spot street lighting (2.9% vs. 4.3%).

Dusk and dawn conditions each accounted for a small share of crashes in both Union County and the state, with similar percentages overall. The proportion of crashes where lighting conditions were unknown remains low in both datasets, under 1.5%.

In Union County, 39.9% of pedalcyclist and pedestrian crashes occurred in low-light conditions, compared to 38.6% statewide. Most of these incidents happened under continuous street lighting—26% of total crashes in Union County and 23.3% statewide.

Overall, the lighting distribution in Union County closely mirrored statewide patterns, with daylight crashes being predominant and continuous street-lit conditions representing the largest share of low-light crashes.

Table 9: Crashes by Lighting Condition in Union County and New Jersey; 2018–2022

Lighting Condition	Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Daylight	64,586	69.9%	816,225	69.2%
Dark (street lights on, Cont)	17,936	19.4%	194,299	16.5%
Dark (street lights on, Spot)	2,681	2.9%	50,479	4.3%
Dusk	2,320	2.5%	30,593	2.6%
Dark (no street lights)	2,030	2.2%	48,176	4.1%
Dawn	1,135	1.2%	17,626	1.5%
Unknown	1,115	1.2%	8,818	1.1%
Dark (street lights off)	616	0.7%	13,396	0.7%
Total	92,419	100%	1,179,612	100%

City trend

Table 10 shows the distribution of crash occurrences in the City of Elizabeth and Union County by lighting conditions.

In both the City of Elizabeth and Union County, most crashes occurred during daylight hours. However, the City of Elizabeth had a lower share of daylight crashes (64.8%) compared to the county overall (69.9%). Correspondingly, a higher proportion of crashes in the City of Elizabeth occurred under low-light conditions, making up 35.2% of total crashes, compared to 30.1% countywide.

The largest component of low-light crashes in the City of Elizabeth occurred under continuous street lighting, which accounted for 27.2% of all crashes in the city, noticeably higher than the county average of 19.4%. Other low-light scenarios such as dusk, dawn,

spotlighting, and areas with no street lighting occur at similar or slightly lower rates than the county average. For crashes involving pedalcyclists and pedestrians, a significant trend was the higher share of crashes occurring under low-light conditions, which was 44.4% compared to 39.9% in Union County overall. Notably, crashes under continuous street lighting at night accounted for 33.2% of all such incidents in the City of Elizabeth, higher than the countywide figure of 26.0%, suggesting that nighttime visibility challenges were more pronounced in denser urban areas.

These findings suggested that the City of Elizabeth experiences relatively more nighttime crashes, particularly in areas with street lighting. This might reflect the city’s higher development density, traffic volumes, and pedestrian activity after dark.

Table 10: Crashes by Lighting Condition in the City of Elizabeth and Union County; 2018–2022

Lighting Condition	City of Elizabeth		Union County	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Daylight	13,670	64.8%	64,586	69.9%
Dark (street lights on, Cont)	5,734	27.2%	17,936	19.4%
Dark (street lights on, Spot)	452	2.1%	2,681	2.9%
Dusk	415	2.0%	2,320	2.5%
Dark (no street lights)	297	1.4%	2,030	2.2%
Dawn	212	1.0%	1,135	1.2%
Unknown	203	1.0%	1,115	1.2%
Dark (street lights off)	106	0.5%	616	0.7%
Total	21,089	100%	92,419	100%

WEATHER CONDITIONS

County trend

Table 11 displays total crashes in Union County categorized by weather conditions. This breakdown helps to understand how different weather factors influence crash occurrence throughout the county.

Weather-related crash patterns in Union County closely mirror statewide trends. Clear conditions were associated with the

highest proportion of crashes, 81.8% in Union County and 80.7% across New Jersey. Rain was the second most frequent weather condition for crashes, contributing to 11.9% in the county and 11.6% statewide. Other weather conditions such as overcast skies (3.7% in Union vs. 4.0% statewide) and snow (1.7% vs. 2.2%) were less frequent, and more severe or rare phenomena like fog, sleet, blowing snow, or strong crosswinds each accounted for less than 1% of crashes.

Table 11: Crashes by Weather Condition in Union County and New Jersey; 2018–2022

Weather Condition	Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Clear	75,573	81.8%	951,605	80.7%
Rain	10,961	11.9%	136,992	11.6%
Overcast	3,407	3.7%	47,743	4.0%
Snow	1,546	1.7%	25,631	2.2%
Unknown	494	0.5%	5,420	0.5%
Freezing Rain	157	0.2%	2,565	0.2%
Fog/Smog/Smoke	117	0.1%	3,010	0.3%
Sleet/Hail	101	0.1%	1,533	0.1%
Blowing Snow	46	~0.0%	811	0.1%
Severe Crosswinds	17	~0.0%	393	~0.0%
Total	92,419	100%	1,179,612	100%

City trend

Table 12 presents the breakdown of crashes by weather conditions in the City of Elizabeth and the County.

In both regions, the majority of crashes occurred during clear weather, accounting for about 83% of crashes in the City of Elizabeth and nearly 82% countywide. Rain was the next most common condition, contributing to roughly 12.6% of crashes in the City of Elizabeth and 11.9% in the county. Other weather conditions

such as overcast, snow, fog, and freezing rain each represented a small share of crashes, collectively making up less than 7% of total incidents. Severe weather events like blowing snow and severe crosswinds were rare contributors to crashes.

Overall, these trends highlighted that while most crashes happen in clear weather due to higher traffic volumes, rain and other adverse weather conditions remained important factors affecting road safety.

Table 12: Crashes by Weather Condition in the City of Elizabeth and Union County; 2018–2022

Weather Condition	City of Elizabeth		Union County	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Clear	17,490	82.9%	75,573	81.8%
Rain	2,657	12.6%	10,961	11.9%
Overcast	497	2.4%	3,407	3.7%
Snow	282	1.3%	1,546	1.7%
Unknown	82	0.4%	494	0.5%
Fog/Smog/Smoke	32	0.2%	117	0.1%
Freezing Rain	24	0.1%	157	0.2%
Sleet/Hail	16	0.1%	101	0.1%
Blowing Snow	7	~0.0%	46	~0.0%
Severe Crosswinds	2	~0.0%	17	~0.0%
Total	21,089	-	92,419	-

SURFACE CONDITIONS

County trend

Table 13 presents crash data in Union County categorized by surface conditions.

Crash patterns by surface condition in Union County were closely aligned with statewide trends. Dry road surfaces were the most common condition, associated with 80.1% of crashes in Union County and 79.9% across New Jersey. Wet surfaces followed as

the second most frequent condition, contributing to 16.8% of crashes in the county and 16.5% statewide.

Less common surface conditions like snow (1.4% in Union vs. 1.9% statewide), ice (0.6% vs. 0.8%), and slush (0.3% in both) accounted for a small fraction of crashes. Surfaces with standing or moving water, oil, or sand were extremely rare, each representing less than 0.1% of incidents.

Table 13: Crashes by Surface Condition in Union County and New Jersey; 2018–2022

Surface Condition	Union County		New Jersey	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Dry	74,069	80.1%	939,754	79.9%
Wet	15,563	16.8%	194,068	16.5%
Snowy	1,255	1.4%	22,125	1.9%
Unknown	697	0.8%	5,570	0.5%
Icy	566	0.6%	8,933	0.8%
Slush	234	0.3%	3,855	0.3%
Water (Standing/Moving)	31	~0.0%	631	0.1%
Oil	3	~0.0%	116	~0.0%
Sand	1	~0.0%	86	~0.0%
Total	92,419	100%	1,179,612	100%

City trend

Table 14 focuses on the City of Elizabeth and its comparison with the County.

The table compares crash occurrences by surface condition between the City of Elizabeth and Union County. The majority of crashes occurred on dry surfaces, around 80.7%. Wet conditions accounted for the next largest share, approximately 17%, indicating

that rain and wet roads remained a significant factor in crashes. Snowy, icy, and slushy surfaces contributed to a small portion of crashes in the City of Elizabeth, each representing less than 2% combined. Other surface conditions such as water, oil, and sand were rare causes of crashes.

Overall, the distribution of crashes by surface condition in the City of Elizabeth closely mirrors that of Union County.

Table 14: Crashes by Surface Condition in City of Elizabeth and Union County; 2018–2022

Surface Condition	City of Elizabeth		Union County	
	Total Crashes	% Total Crashes	Total Crashes	% Total Crashes
Dry	17,028	80.7%	74,069	80.1%
Wet	3,578	17.0%	15,563	16.8%
Snowy	228	1.1%	1,255	1.4%
Unknown	123	0.6%	697	0.8%
Icy	69	0.3%	566	0.6%
Slush	55	0.3%	234	0.3%
Water (Standing/Moving)	6	~0.0%	31	~0.0%
Oil	1	~0.0%	3	~0.0%
Sand	1	~0.0%	1	~0.0%
Total	21,089	100.0%	92,419	100.0%
Water (Standing/Moving)	6	~0.0%	31	~0.0%
Oil	1	~0.0%	3	~0.0%
Sand	1	~0.0%	1	~0.0%
Total	21,089	100%	92,419	100%

KSI Crashes

This section focuses exclusively on crashes resulting in KSI to better understand the factors contributing to the most serious crashes. It not only summarizes the proportion of KSI crashes associated with various conditions and factors but also compares these figures against the overall distribution of total crashes. By analyzing both the share of total crashes and their corresponding KSI percentages, the chapter aims to identify which factors are associated with disproportionately higher or lower severity.

YEARLY TREND

County trend

The analysis begins by examining yearly trends, including each year's share of total KSI crashes as well as the KSI rate for that year, as shown in Table 15.

Between 2018 and 2022, Union County experienced a total of 925 KSI crashes. **It is important to note that in 2018, New Jersey updated its police reporting manual and revised the definition for injury classification, contributing to the noticeable increase in reported KSI crashes between 2018 and 2019.** Therefore, the comparison offered in this section should be paid special attention to when comparing the 2018 serious injury data.

The annual number of KSI crashes increased from 193 in 2019 to a peak of 246 in 2021, with 2020 being an outlier due to COVID 19

lockdowns, before slightly declining to 204 in 2022. If looking at the number of fatalities, Union County has seen a consistent number across the five-year period; when factoring in the total number of crashes, the percentage of fatalities is higher during post-pandemic years.

Correspondingly, the KSI crash rate (KSI crashes as a percentage of total crashes) rose from 1.02% in 2019 to a high of 1.37% in 2021, indicating an overall increase in crash severity over the period. The year 2021 also accounted for the largest share of total KSI crashes, representing 26.6% of the five-year total.

The KSI crash rate is the proportion of all crashes that result in either being killed or severely injured of each year. It serves as an important measure of crash severity. Comparing the KSI crash rates between Union County and the state, the county consistently exhibited slightly lower severity rates. For example, in 2021, Union County's KSI rate reached 1.37%, compared to the statewide rate of 1.64%. This suggests that crashes in Union County tended to result in severe injuries or fatalities less frequently than the state average.

Table 15: KSI Crashes in Union County and New Jersey; 2018–2022

Year	Union County							New Jersey	
	Total Crashes	Percentage	Killed	Serious Injury	Total KSI Crashes	KSI Rate (KSI/Total Crashes)	KSI Percentage	KSI (KSI/Total Crashes)	KSI Percentage
2022	18,009	19.5%	30	174	204	1.13%	22.1%	1.59%	20.3%
2021	18,002	19.5%	32	214	246	1.37%	26.6%	1.64%	25.4%
2020	14,192	15.4%	28	125	153	1.08%	16.5%	1.57%	20.9%
2019	21,545	23.3%	26	193	219	1.02%	23.7%	1.14%	21.9%
2018	20,671	22.4%	28	75	103	0.50%	11.1%	0.59%	11.5%
Total	92,419	100%	144	781	925	1.00%	100%	1.24%	100%

City trend

Between 2018 and 2022, The city experienced 293 KSI crashes, with an overall KSI rate of 1.39%, which was higher than the countywide rate of 1.00%.

The KSI rate in the City of Elizabeth increased steadily from 1.14% in 2019 to a peak of 1.89% in 2021, before declining to 1.40% in 2022. The year 2021 also saw the highest proportion of KSI crashes, making up 32.4% of all crashes that year.

This trend reflected an overall rise in crash severity in the City of Elizabeth, with the city consistently showing a higher share of severe crashes relative to total crashes compared to the county

average. This indicated a greater risk of serious injury or fatality in crashes within the City of Elizabeth, underscoring the need for focused safety interventions in the city.

Table 16: KSI Crashes in City of Elizabeth and Union County; 2018–2022

Year	City of Elizabeth							Union County	
	Total Crashes	Percentage	Fatal	Serious Injury	Total KSI Crashes	KSI Rate (KSI/Total Crashes)	KSI Percentage	KSI Rate (KSI/Total Crashes)	KSI Percentage
2022	5,013	23.8%	8	62	70	1.40%	23.9%	1.13%	22.1%
2021	5,020	23.8%	9	86	95	1.89%	32.4%	1.37%	26.6%
2020	3,603	17.1%	10	45	55	1.53%	18.8%	1.08%	16.5%
2019	4,139	19.6%	3	44	47	1.14%	16.0%	1.02%	23.7%
2018	3,314	15.7%	4	22	26	0.78%	8.9%	0.50%	11.1%
Total	21,089	100%	34	259	293	1.39%	100%	1.00%	100%

TYPE

In Union County, crashes involving vulnerable road users were the most disproportionately severe. The vast majority of crashes, 97.5%, involved only motor vehicles, with just 1.7% involving pedestrians and 0.8% involving pedalcyclists. However, when focusing on crashes that resulted in KSI, these proportions shifted dramatically. Pedestrian-involved crashes accounted for 24.8% of all KSI incidents, and pedalcyclist crashes made up 4.6%.

Right-angle crashes were the second-largest contributor to severe injuries in the county, responsible for 18.6% of KSI crashes despite being 15.0% of all crashes. Fixed-object crashes also showed elevated severity, making up 14.9% of KSI crashes from just 8.9% of total crashes.

Conversely, rear-end crashes, though the most common crash type (28.5%), accounted for only 11.7% of KSIs, reflecting generally lower severity. Sideswipe crashes were similarly frequent (19.3% of

crashes) but contributed only 6.5% of KSIs, indicating they were less likely to cause serious injuries.

In the City of Elizabeth, the urban environment amplified certain risks. Pedestrian crashes accounted for 26.6% of KSIs while representing only 2.9% of total crashes, an even higher disparity than countywide. Right-angle crashes were also more severe in the city, contributing 23.9% of KSIs compared to 18.6% countywide.

Fixed-object crashes in the City of Elizabeth contributed a smaller share of KSIs (8.9%) than in the county overall (14.9%), possibly because of lower urban speeds. Rear-end and sideswipe crashes remained frequent but less severe, with rear-end crashes making up 21.0% of the City of Elizabeth’s total crashes but just 10.9% of KSIs. Sideswipes accounted for 24.2% of total crashes but only 6.5% of KSIs.

Pedalcyclist crashes accounted for 2.7% of KSIs in the City of Elizabeth, lower than the county average, though still a concern due to urban cycling hazards. Overturned crashes, while rare, made up

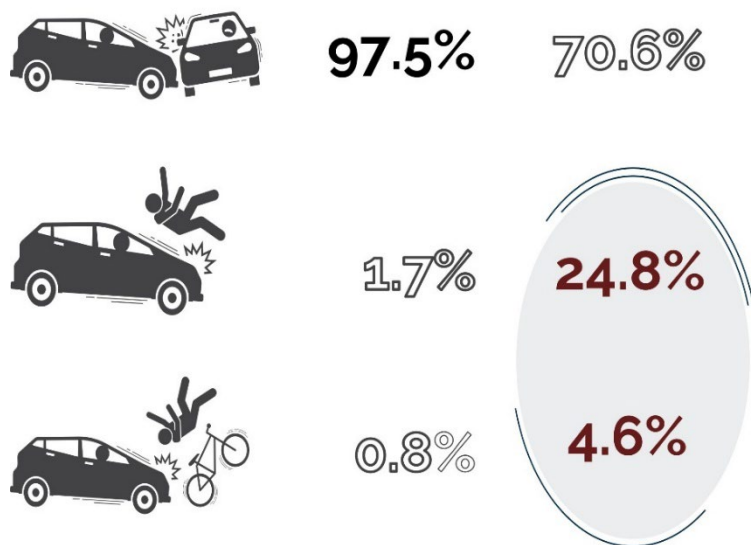
3.1% of KSIs in the City of Elizabeth, higher than the county's 1.6%, reflecting the serious injuries rollovers can cause.

Overall, right-angle and pedestrian crashes emerged as the primary drivers of KSI in the City of Elizabeth, underscoring the need for focused safety measures for vulnerable road users in dense urban areas.

KSI Crash Characteristics

Analysis of KSI crash characteristics across Union County and the City of Elizabeth reveals clear differences in crash frequency and severity among roadway types. State highways in Union County showed the highest severity, with a KSI crash rate of 4.4 per mile, even though they accounted for only about 24% of total crashes.

Figure 1: Vulnerable Users & Crash Severity in Union County; 2018-2022



Over 27% of KSI crashes on these roads involved pedalcyclists or pedestrians. This suggests greater risks for vulnerable road users along higher-speed routes. County roads had a lower KSI rate per mile than state highways but still accounted for a significant share of severe crashes. They also showed the highest proportion of vulnerable road users involved in KSI crashes (36%), an increased exposure for pedestrians and pedalcyclists.

Interstates and the Garden State Parkway maintained moderate KSI rates per mile, 3.0 and 3.3 respectively, consistent with their high-speed nature, though vulnerable road user crashes on these facilities remained relatively uncommon. In contrast, local roads had the largest number of total crashes but the lowest KSI rate per mile (0.2). However, nearly 31% of KSI crashes on local roads involved pedestrians or pedalcyclists, reflecting the urban and residential settings where people travel outside of vehicles.

Within the City of Elizabeth, the patterns were similar. Local streets experienced the most KSI crashes due to their sheer mileage and urban density, but state roads in the city exhibited a much higher KSI crash rate of 10.3 per mile, considerably exceeding interstates and other road types. **In the City of Elizabeth, about 30% of all KSI crashes involved pedestrians or pedalcyclists, with state and county roads showing particularly high vulnerable user involvement.**

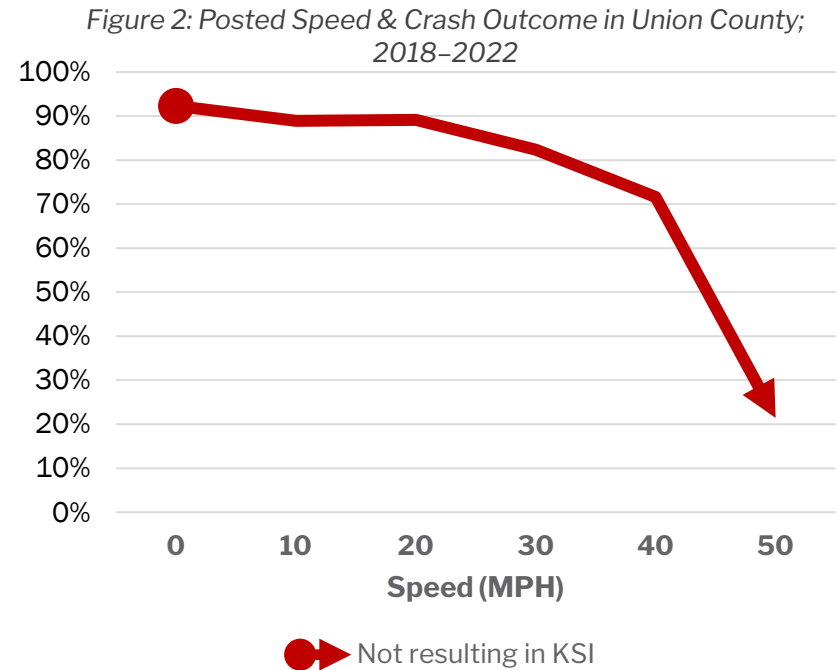
Overall, these patterns highlight how crash severity and vulnerable user involvement varied significantly by roadway classification.

POSTED SPEED

Figure 2 illustrates the relationship between posted speed limits and crash outcomes in Union County. It shows a clear trend, where the percentage of crashes not resulting in KSI decreased sharply as the posted speed limit increased. In summary, higher posted speed limits are associated with a greater likelihood of fatal or severe injury crashes. This pattern reinforces the well-established link between vehicle speed and crash severity.

Contributing Factors

Across Union County, driver inattention was the most common factor, contributing to about 25.5% of all crashes and 23.4% of KSI crashes. Unsafe speed, though involved in just 1.9% of total crashes, contributed to 6.9% of KSI crashes, showing how speeding greatly increased the likelihood of severe outcomes. Failure to yield right of way appears in 3.7% of all crashes but accounted for 6.6% of KSI crashes, highlighting risks at intersections and crossings. Following too closely was frequent in total crashes (6.3%) but dropped to only 1.6% of KSI crashes, suggesting it's less often tied to severe injuries. Traffic signal violations, though represent 1.1% of the total crashes, were involved in 3.2% of KSI crashes, underlining their potential for serious consequences.



In the City of Elizabeth, the same issues appeared but with some urban-specific differences. Driver inattention accounted for 21.8% of all crashes and 17.4% of KSI crashes, slightly lower than countywide in severe cases. Speeding represented 2.2% of all crashes but 6.8% of KSI crashes. Signal violations stood out more in the City of Elizabeth, making up 5.1% of KSI crashes, higher than the county's 3.2%. Following too closely was less of a factor in the city's severe crashes (2.0%) than countywide.

For crashes involving pedalcyclists and pedestrians, driver inattention again led in Union County, linked to 16.2% of all such crashes and 17.1% of KSI crashes. Failure to yield was involved in 8.3% of all vulnerable user crashes and 7.3% of KSI cases. Crossing where prohibited rose from 2.9% of all crashes to 4.0% of KSI

crashes and running or darting into traffic showed a similar increase.

In the City of Elizabeth, driver inattention had an even bigger role in vulnerable road user crashes, contributing to 33.7% of these crashes and 23.5% of KSI crashes, both higher than county averages. Failure to yield appeared in 15.4% of all bike and pedestrian crashes and 7.4% of KSI crashes. Illegal crossings, though relatively rare overall (1.0%), made up 2.9% of KSI crashes in the city, exceeding the county's share. Inattentive behavior among pedestrians or pedalcyclists was more common in the City of Elizabeth's severe crashes, at 5.1% compared to 1.3% countywide.

Overall, while Union County and the City of Elizabeth shared similar risk factors, the City of Elizabeth's urban setting contributed to more severe outcomes for speeding, signal violations, and conflicts with pedestrians and pedalcyclists.

Environmental Factors

Across Union County, daylight conditions saw the most crashes overall, but severe injuries were disproportionately higher in darkness. While about 70% of all crashes happened during daylight, only about 50% of KSI crashes occurred then. In contrast, crashes under continuous street lighting accounted for 19.4% of all crashes but rose to 35.2% of KSI crashes, showing that even well-lit night conditions carry heightened risk. Completely dark roads without lighting, though a small share of crashes overall, also saw higher severity.

The City of Elizabeth showed similar trends but with a more pronounced urban effect. Dark conditions with streetlights on accounted for 27.2% of total crashes but 43.3% of the city's KSI crashes, suggesting nighttime could increase the severity of the

crash outcomes. Overall, more than half of the City of Elizabeth's severe crashes happened in low-light conditions.

For crashes involving pedalcyclists and pedestrians, daylight remained the most common condition in both Union County and the City of Elizabeth. However, the City of Elizabeth saw a greater share of crashes involving vulnerable users at night under continuous street lighting compared to the county.

Weather-wise, most crashes happened during clear conditions, about 82% in Union County and 83% in the City of Elizabeth, and these also accounted for most KSI crashes. Poor weather conditions like rain, snow, or fog were involved in fewer crashes overall and contributed to a smaller share of severe crashes.

Surface conditions followed a similar pattern. About 81% of all crashes and 86% of KSI crashes in Union County occurred on dry roads, indicating that good conditions might encourage faster or less cautious driving. The City of Elizabeth mirrored these trends closely, with dry surfaces again being the setting for most severe crashes.

Overall, reduced visibility, especially at night, and dry, clear conditions were key environmental factors associated with the severity of crashes across Union County and the City of Elizabeth.

Spatial Distribution

After examining crash trends from a statistical perspective across Union County and the City of Elizabeth, this section focuses on the spatial distribution of crashes. Mapping crash locations reveals areas of concentration, highlighting clusters with elevated crash frequency or severity. In some cases, proximity to key points of interest appears to increase exposure to KSI crashes. These geographic patterns offer valuable insights into how crashes are distributed and help inform targeted safety interventions.

HOTSPOTS

To identify crash hotspots, a kernel density analysis was conducted to estimate the concentration of crashes over the study area. This methodology calculates the density of crash incidents, with closer crashes contributing more to the density than those farther away. The resulting map highlights clusters where crashes occur more frequently.

Figure 3 includes all KSI crashes, and it reveals that the majority of serious crashes were concentrated in the City of Elizabeth, with additional notable high-intensity clusters found in Kenilworth, Hillside, Plainfield, and Rahway. Other municipalities display KSI hotspots as well, but these tended to be more scattered and less intense. In the City of Elizabeth, the densest clusters occurred along key state roadways such as US Route 1 and NJ Route 27. Kenilworth's most significant hotspots were centered around Kenilworth Boulevard and Michigan Avenue. Hillside showed concentrated clusters near US Route 22, while Rahway exhibited similar high-intensity areas along US Route 1 and NJ Route 27,

echoing the pattern seen in the City of Elizabeth. In the City of Plainfield, KSI hotspots were more dispersed but generally focus around the town center and along Front Street. These spatial patterns highlighted critical corridors and areas where safety improvements may be needed.

A similar KSI hotspot analysis, shown in Figure 4, was conducted that focused solely on pedestrian and bicyclist crashes, with results showing the highest concentrations found in the City of Elizabeth. Key intersections along NJ Route 28, NJ Route 27, and US Route 1 stood out as prominent locations for these serious pedestrian and bike crashes. In Kenilworth, the segment of Kenilworth Boulevard west of Michigan Avenue emerged as a notable hotspot for pedestrian and bicycle KSI incidents. Plainfield also exhibited significant clusters, particularly along Front Street. Beyond these areas, additional smaller clusters of pedestrian and bike KSI crashes were scattered throughout the county, indicating multiple locations where pedestrian and pedalcyclist safety improvements may be needed.

Figure 3: KSI Crashes in Union County; 2018–2022

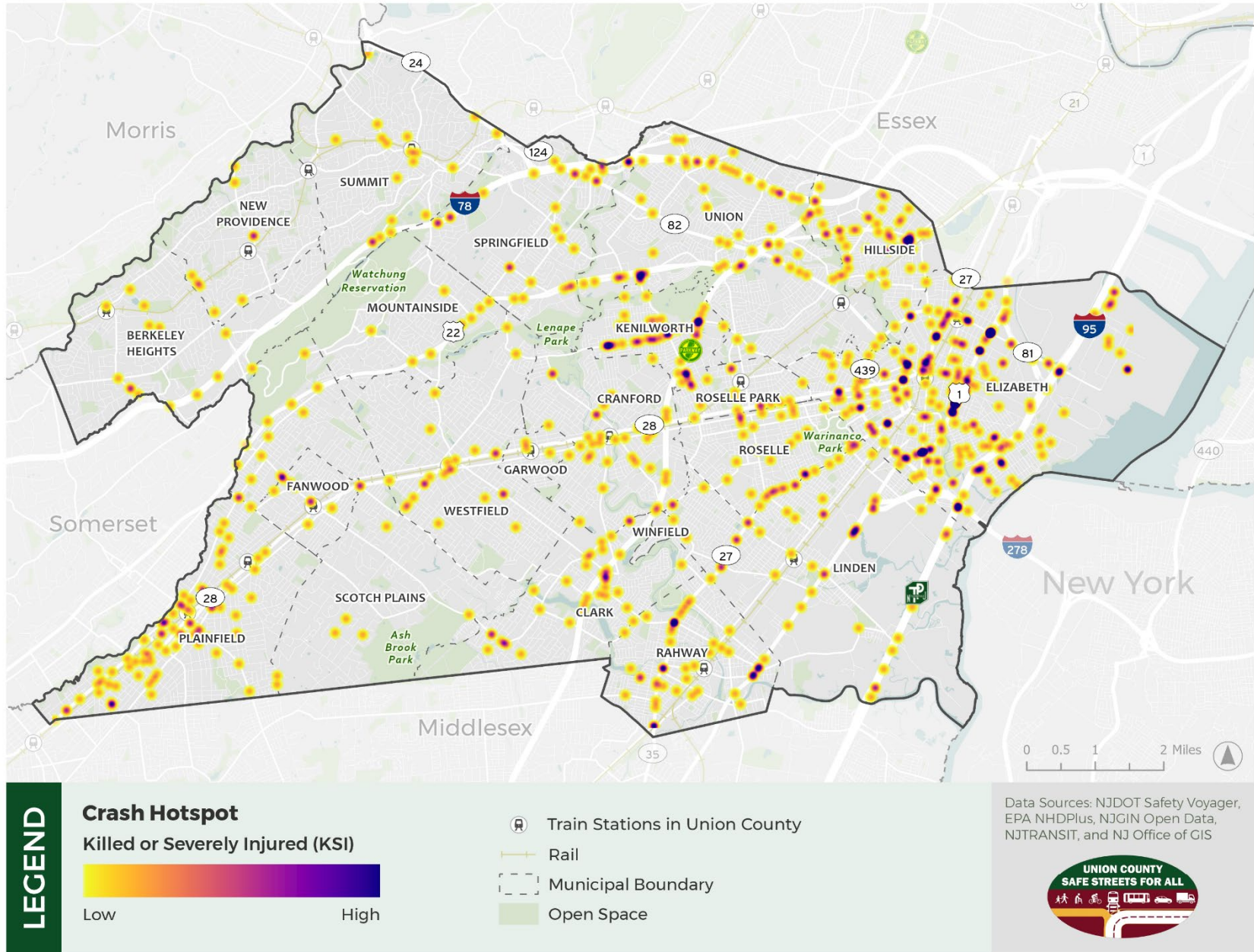
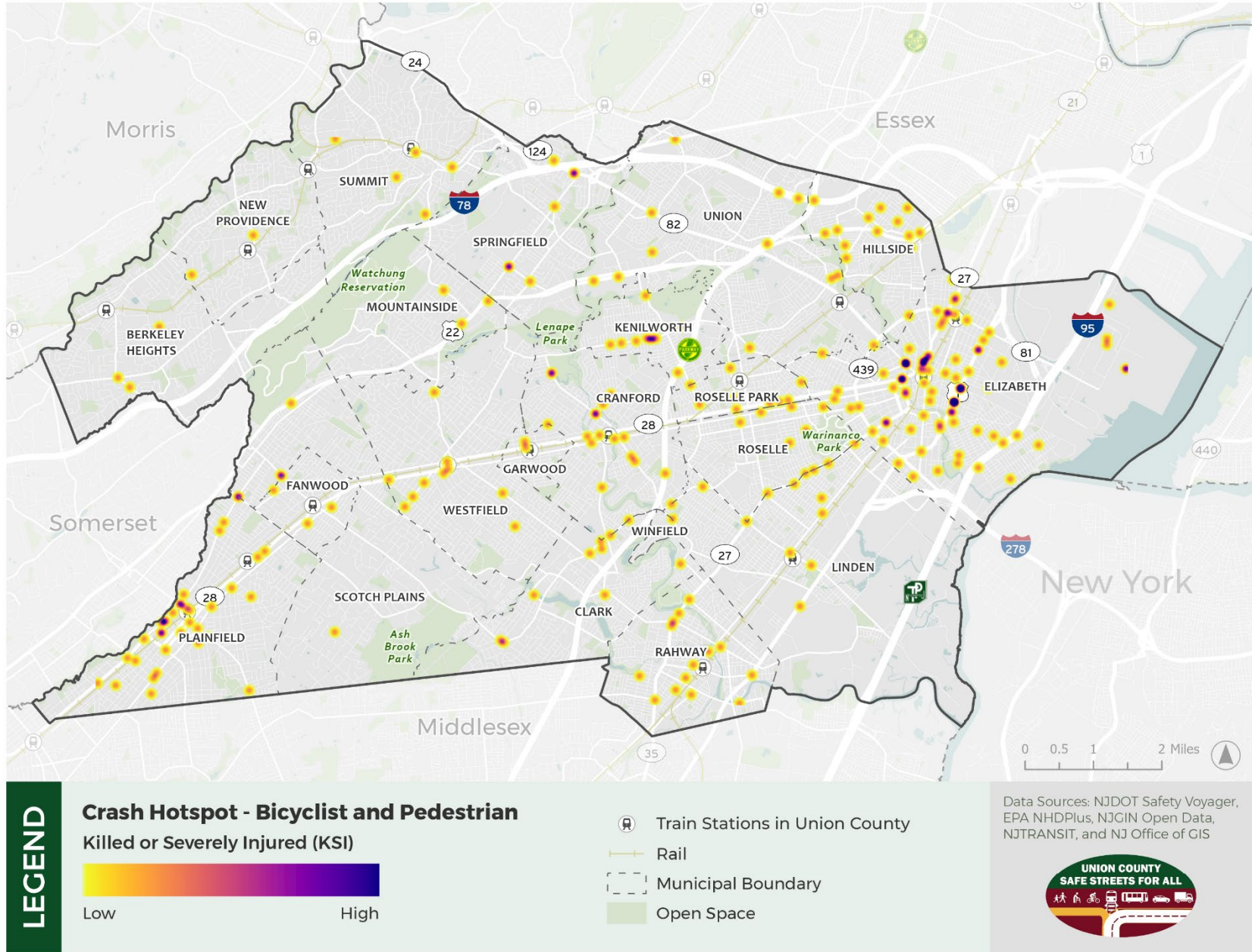


Figure 4: Bicycle & Pedestrian KSI Crashes in Union County; 2018–2022



PROXIMITY TO VULNERABLE ROAD USER GENERATORS

This section analyzes the number of KSI crashes occurring near facilities that attract/generate trips by pedestrians and bicyclists, which are collectively referred to as Vulnerable Road Users (VRUs). Mapping these generators can help identify areas with higher crash concentrations and thereby inform targeted safety strategies. The analysis was conducted at a county-wide level and includes the City of Elizabeth.

Schools

Approximately 56% of KSI crashes within Union County occurred within a quarter mile of a school, a significant concentration given the potential for a high number of students walking in these areas. Figure 8 shows schools in Union County (public, private, and charter) with a 0.25-mile buffer around each school. School data was obtained from the NJ Office of GIS, using information from the NJ Department of Education updated in 2023.

Bus Stops

Around 35% of all KSI crashes occurred within 150 feet of a bus stop, posing a heightened risk for people accessing transit where pedestrian activity is typically concentrated. Figure 9 shows NJ Transit bus stops with a 150 ft buffer around each stop.

Train Stations

Approximately 31% of all KSI crashes occurred within 0.5 miles of a train station. Although there are relatively fewer train stations in the county than other VRU generators, these locations tend to generate much higher concentrations of VRU activity, as trains carry larger volumes of passengers. Figure 10 shows train stations in Union County with a 0.5 mile buffer around each station.

Figure 5: KSI Crashes within ¼ Mile of a School, Union County, 2018-2022

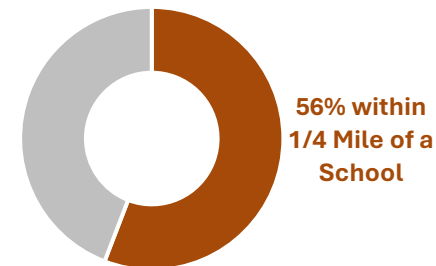


Figure 6: KSI Crashes within 150 ft. of a Bus Stop, Union County, 2018-2022

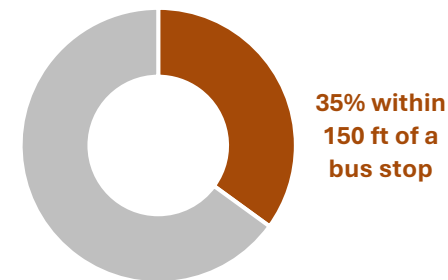


Figure 7: KSI Crashes within ½ Mile of a Train Station, Union County, 2018-2022

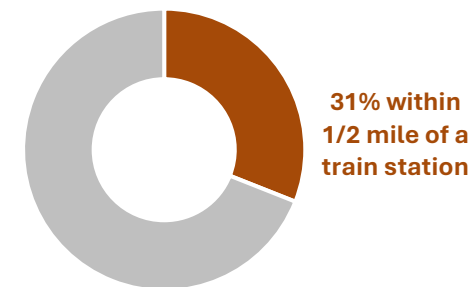


Figure 8: School Locations w/ 1/4 Mile Buffer, Union County

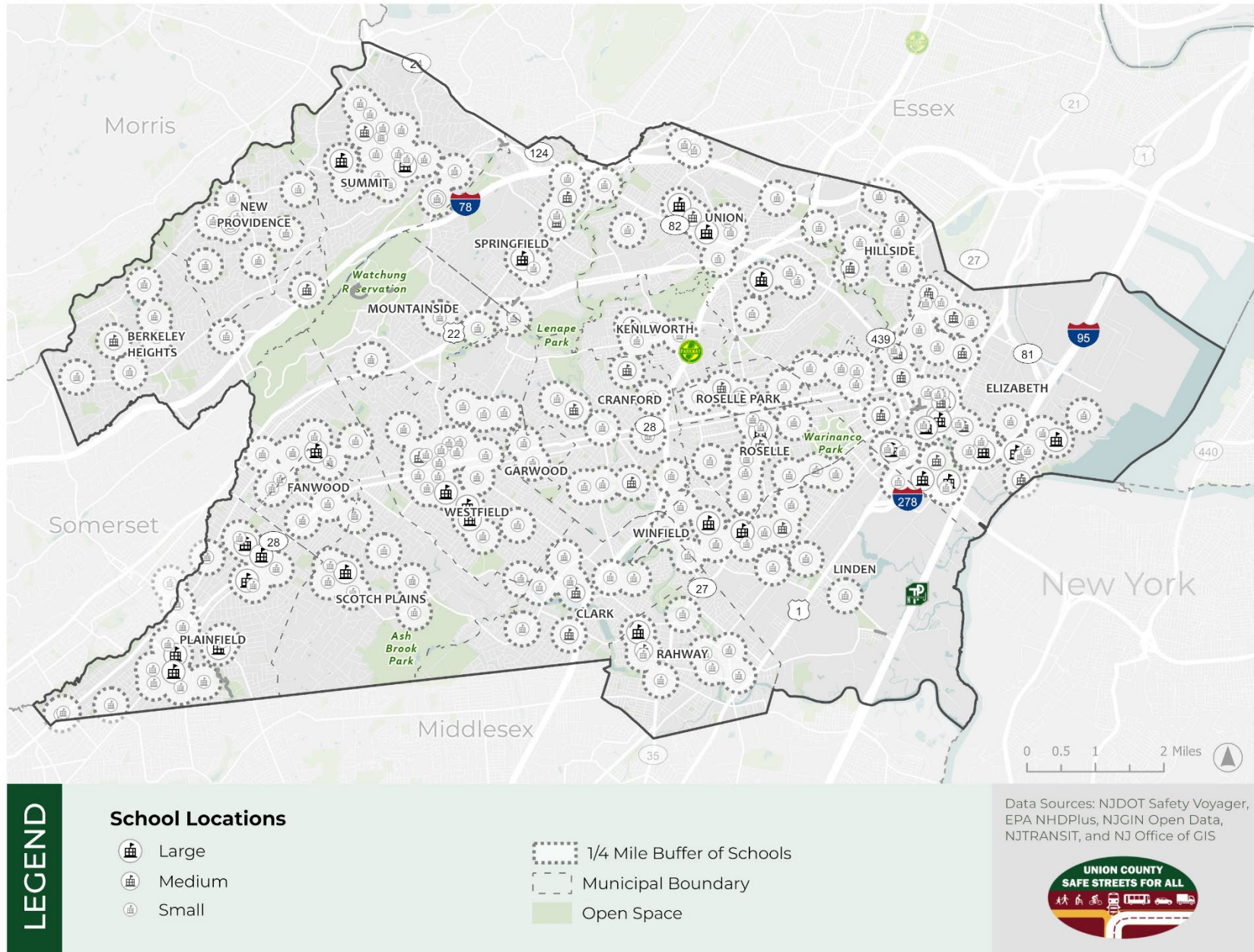


Figure 9: Bus Stop Locations w/ 150 ft. Buffer, Union County

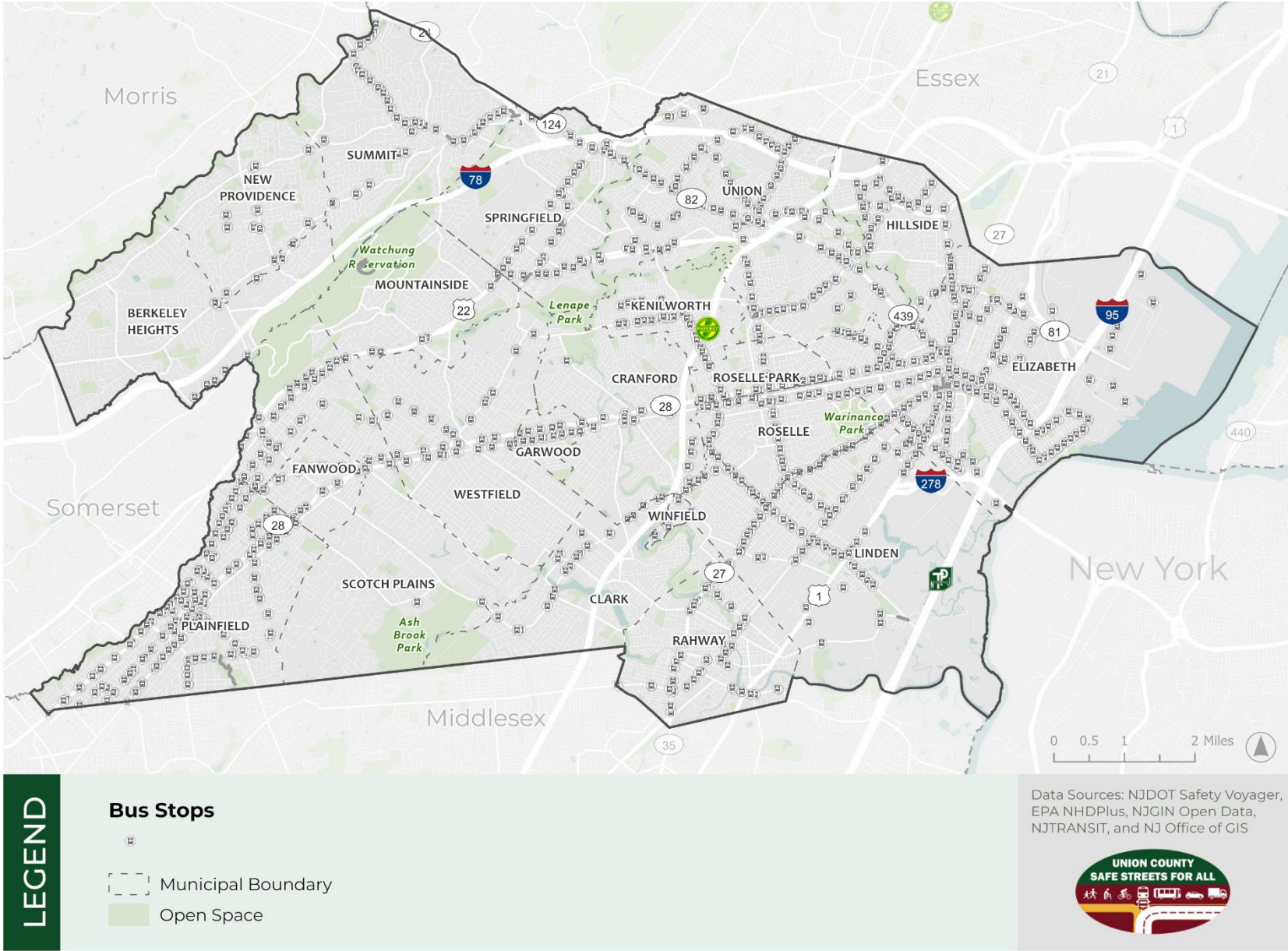


Figure 10: Train Station Locations w/ 1/2 Mile Buffer, Union County

