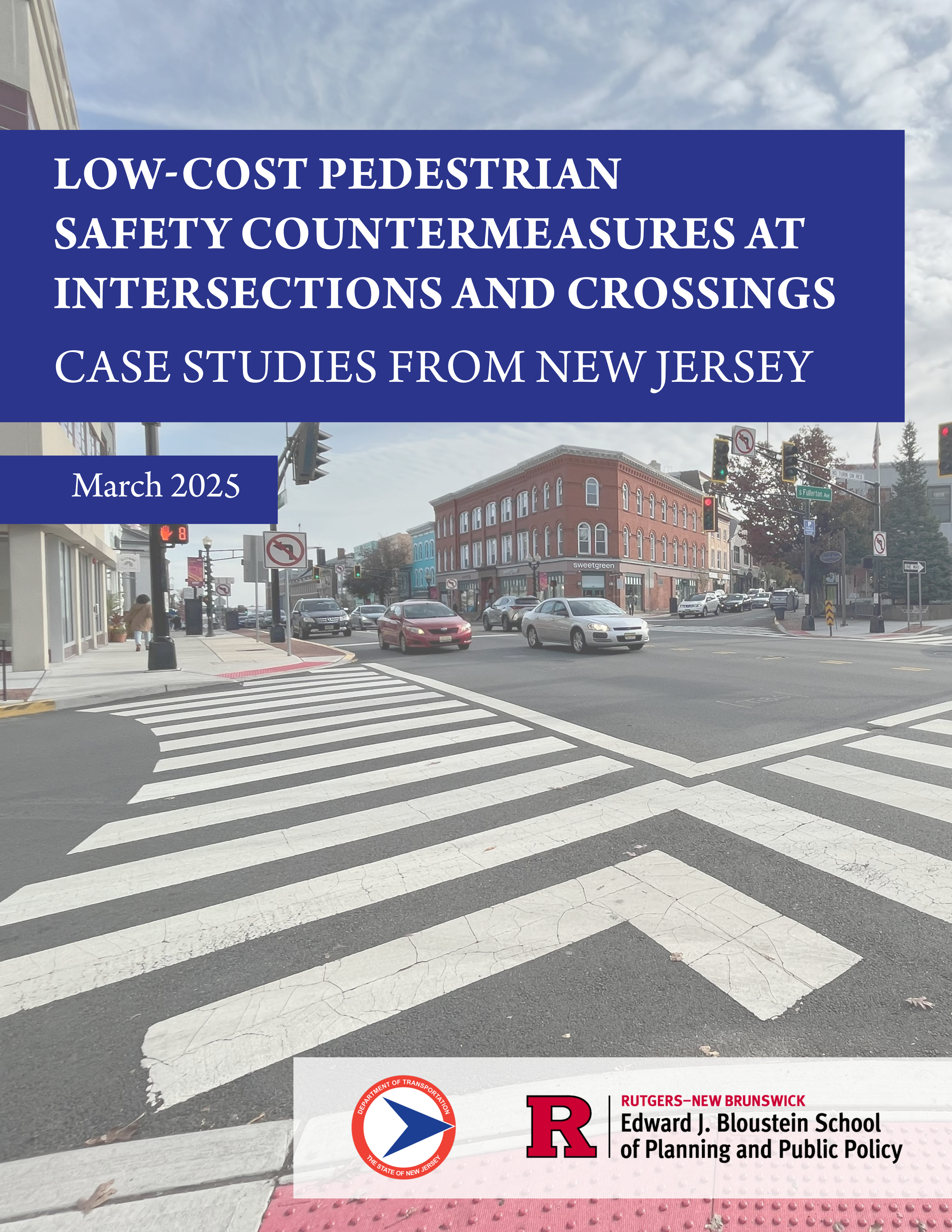
LOW-COST PEDESTRIAN SAFETY COUNTERMEASURES AT INTERSECTIONS AND CROSSINGS

CASE STUDIES FROM NEW JERSEY

March 2025



DEPARTMENT OF TRANSPORTATION
THE STATE OF NEW JERSEY

RUTGERS–NEW BRUNSWICK
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ACKNOWLEDGMENTS

The New Jersey Department of Transportation (NJDOT) Bicycle and Pedestrian Resource Center (BPRC) assists public officials, transportation and health professionals, and the public in creating a safer and more accessible walking and bicycling environment through primary research, education and dissemination of information about best practices in policy and design. The Center is funded and managed by the New Jersey Department of Transportation through funds provided by the Federal Highway Administration.

Susan G. Blickstein, LLC is a planning, policy, and public engagement firm that specializes in sustainable land use and transportation planning in the State of New York and New Jersey. It provides urban planning and strategic planning services to municipal entities, MPOs, state agencies and the private sector. Susan G. Blickstein, LLC is a certified DBE (Disadvantaged Business Enterprise) in New York and New Jersey.

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The authors also wish to thank the staff at the various levels of government who provided their time, expertise, and information to help with this project, including Michael Manzella and Lyndsey Scofield with Jersey City, Nancy Dargis with Bergen County, and Asif Mahmood with Essex County. We also wish to thank Andy Kaplan and Christine Mittman with the North Jersey Transportation Planning Authority (NJTPA).

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INTRODUCTION

Intersections and crosswalks are locations that present the potential for conflict between motor vehicles, pedestrians, bicyclists, and other roadway users. According to the 2020 New Jersey Strategic Highway Safety Plan, 30% of all serious injuries and fatalities in the State occur at intersections. Acknowledging the risks these locations can pose, the 2020 NJ SHSP includes an Intersections emphasis area with a goal of eliminating all fatalities and serious injuries for all road users at intersections. Among the emphasis area strategies are those aimed specifically at improving safety at both signalized and unsignalized intersections for vulnerable road users including pedestrians and bicyclists.

While a range of safety countermeasures can be deployed to address these concerns, low-cost improvements in particular offer communities the ability to increase safety for vulnerable road users without the need for expensive engineering studies or infrastructure investments. This report focuses on three case study examples of low-cost improvements implemented at intersections in New Jersey: Grand Street and Grove Street in Jersey City, Washington Avenue and Barell Avenue in Carlstadt, and Bloomfield Avenue and Fullerton Avenue in Montclair. By examining each project through the specific countermeasures implemented, observational data, and crash data, this report seeks to provide communities throughout the State with an understanding of how to address safety through cost-effective interventions at intersections and pedestrian crossings.

KEY FINDINGS AND CONSIDERATIONS

Need for Better Data and Analysis Tools:

- There is currently no unified reporting system for pedestrian safety countermeasures in New Jersey. Systematic collection of crash, speed, and volume data before and after installation would provide a fuller understanding of a pedestrian countermeasure's actual impact and could inform the development of state-specific Crash Modification Factors, dovetailing with previous efforts in New Jersey to develop state-specific safety performance functions.
- Conventional Crash Modification Factors are helpful in some ways, but do not capture the full range of benefits from low-cost pedestrian safety countermeasures, such as improved perceived safety and comfort for pedestrians, which can result in increased walking trips. In addition, Crash Modification Factors do not account for the way land use context can impact pedestrian behavior and, as a result, crash risk. State-specific CMFs could be developed to incorporate a broader understanding of pedestrian safety factors, including perceived safety and land use.
- Given the timing of this study, the crash data used was impacted by the COVID-19 pandemic, which may have resulted in some anomalies. This makes drawing conclusions difficult, especially in cases where improvements were installed just prior to or during the pandemic. Future research could provide a better understanding of how these case study countermeasures have influenced pedestrian safety by analyzing additional years of crash data less likely to be impacted by the COVID-19 pandemic.

Successful Local Approaches to Implementation:

- The use of redevelopment designation under the New Jersey Development and Redevelopment Law can be an effective mechanism for requiring Complete Streets improvements that enhance network connectivity and safety.
- Jersey City has been successful with implementing improvements in phases, building public support by starting with lower-cost improvements (such as bollards and paint) and transitioning to higher-cost countermeasures over time.
- Jersey City's Vision Zero planning and implementation efforts emphasize improvements that expand the citywide Complete Streets network. It is important to understand spot improvements at individual intersections within the context of a system-wide approach, since focusing solely on spot improvements, which is not uncommon in New Jersey, may not yield the same level of overall safety benefits.
- Some locations may call for a combination of low-cost improvements, ADA accessibility upgrades, high-visibility crosswalks, and bus shelters. These types of interventions should be coordinated and planned concurrently during the local review process.
- Pedestrian safety improvement projects can create a virtuous cycle by spurring support and funding for additional projects aimed at improving pedestrian safety.

Importance of Context and Human Experience:

- Pedestrian safety improvement projects that make streets and intersections safer and more comfortable in turn expand public spaces where people want to spend time, leading to local economic benefits, especially when these projects are located in mixed-use or downtown districts.
- Public transit is a major pedestrian generator, including in light industrial areas along arterial roadways where warehouses and distribution facilities tend to locate. These locations often need sidewalks, ADA accessibility upgrades, high-visibility crosswalks, and bus shelters to improve safety for warehouse employees commuting to and from work.
- Countermeasure selection and design should consider context and human behavior. For example, ergonomic crosswalks reflect how people actually cross the street and can help address non-standard intersection geometry, especially in areas with high pedestrian traffic.
- Some pedestrian improvements may not necessarily result in increased feelings of safety, even if data might indicate that projects have made locations safer than prior conditions. Washington Avenue in Carlstadt, for example, remains an uncomfortable pedestrian experience even after improvements due to high travel speeds and the long crossing distance across a four-lane roadway. Interventions that do not effectively slow vehicle speeds may not result in increased feelings of safety or comfort for pedestrians.
- The Washington Avenue case study illustrates how land use decisions are sometimes made without full consideration of the needs of non-motorized traffic. This is a particular concern on arterial roadways, which continue to be the most challenging roadway type to retrofit. While Washington Avenue provides an example of how to improve walkability in an industrial area, it is also an example of pedestrian countermeasures being combined with conventional engineering features such as Jersey barriers. The latter may inadvertently increase motorist travel speeds by eliminating the visual effect of opposing traffic. This seems to be at odds with a Safe System Approach and may be concerning, given the high volume of heavy vehicles in this busy, light industrial area.

LITERATURE REVIEW

Overview

Being a pedestrian in the United States is more dangerous now than at any point in the past decade. Nationally, pedestrian fatalities jumped 77% between 2010 and 2021, substantially more than the 25% increase in all other traffic fatalities (Macek, 2023). In New Jersey, 28% of all fatal crashes in 2022 involved pedestrians (New Jersey State Police, 2022). Given these troubling increases in pedestrian crashes and fatalities at the state and national levels, improving pedestrian safety has become an urgent priority.

Research has shown that intersections in particular are hot spots for pedestrian crashes. Intersections are understood to be the most hazardous portions of roadway networks because they entail complex turning movements by various roadway users (Chen et al., 2012; Saha, 2022). In 2020, 15% of pedestrian fatalities and 40% of pedestrian injuries happened at intersections (National Highway Traffic Safety Administration [NHTSA], 2022). As such, improvements to intersections are likely to yield the greatest improvements to pedestrian safety, and thus deserve greater attention from transportation planners and traffic engineers.

Studies have proven the safety benefits that result from infrastructure improvements, with some even arguing that they are essential prerequisites to changing unsafe road user behaviors (Bull, 2021; Fields et al., 2014). Agencies implement these countermeasures – programs, devices, or engineering improvements intended to improve safety – to address specific types of crashes and safety focus areas (Herbel et al., 2010; Pedestrian and Bicycle Information Center, n.d.). Agencies are potentially limited in their ability to make these improvements, however, largely due to relatively limited budgets coupled with high project costs.

It is for this reason that low-cost countermeasures are of particular interest for improving pedestrian safety: They allow for more locations to be treated, even with resource limitations, by providing significant safety impacts at relatively low costs. (Anderson & McCabe, 2020).

Installing countermeasures with the greatest cost-benefit is additionally important, given that funding for pedestrian safety is often reduced compared to funding for motor vehicle crash prevention. This is due to the fewer overall incidences of crashes involving pedestrians, even though on average, crashes involving pedestrians are more severe than crashes involving only motor vehicles (Kumfer et al., 2019). Low-cost countermeasures also play an important role because of the growing focus in New Jersey and the rest of the United States on the implementation of Complete Streets and the adoption of the Safe System Approach.

The price of a "low-cost" countermeasure varies; one report defines low-cost as $10,000 to $15,000 or less, and another report defines it as $1,000 to $50,000 or less (Cottrell and Lim, 2018; Federal Highway Administration [FHWA], 2020). The cost of countermeasures depends on a number of factors, such as road conditions, quantity, materials, the size and location of a state and/or municipality, time of year, design costs, and inflation (Pedestrian and Bicycle Information Center, n.d.). Examples of low-cost countermeasures include but are not limited to signage, pavement markings, signal enhancement, increases to pavement friction, double centerlines, rumble strips, and speed reduction. (FHWA, 2020; Saha, 2022).

Much research has been conducted to show the safety benefits of different types of countermeasures after they have been implemented at intersections (Brown et al., 2020; Chen et al., 2012; FHWA, 2020). While the effectiveness of countermeasures can only be measured after implementation – usually through measuring changes in crash data – there are different approaches and methods for enhancing the effectiveness of low-cost countermeasures at intersections before they are implemented.

The HSIP Process

One such approach comes from the Highway Safety Improvement Program (HSIP), which defines the process of identifying, implementing, and evaluating a countermeasure. The HSIP is a Federal-aid, state-administered program that aims to reduce fatalities and serious injuries on public roads by implementing projects to improve roadway safety. While the HSIP process is designed for HSIPs and state agencies that administer HSIP funds, it is applicable to other public agencies, as well as to other infrastructure and safety programs (Chestnutt et al., 2021).

The HSIP process requires three components: planning, implementation, and evaluation. The planning component involves collecting data to identify high-risk locations and contributing crash factors, as well as selecting appropriate countermeasures and prioritizing certain projects (Herbel et al., 2010). The planning stage results in a list of projects, which then move onward to the implementation stage. Implementation starts with the identification of funding sources. Once funding is identified, projects are incorporated into the Statewide Transportation Improvement Program (Chestnutt et al., 2021). HSIP projects are then scheduled, designed, and constructed. Lastly, the evaluation stage estimates the effectiveness of highway safety improvements in HSIP projects. The results from the evaluation go on to inform the various components of the HSIP in order to improve the future planning and implementation of safety improvements (Herbel et al., 2010).

To ensure that the implementation of countermeasures and the selection of projects align with statewide safety goals, the HSIP requires a Strategic Highway Safety Plan (SHSP). The SHSP provides a comprehensive framework that identifies a state's safety needs and sets a vision as well as goals, objectives, emphasis areas, and strategies to manage the state's roadway safety (Herbel et al., 2010). Emphasis areas address common crash types or contributing crash factors, and strategies under the emphasis areas include countermeasures to address safety concerns (Chestnutt et al., 2021). The SHSP informs decisions made during the entire HSIP process, and in turn, the results of implementing and evaluating the HSIP inform future SHSP and HSIP planning efforts (Abel et al., 2020). Understanding the HSIP process can help to identify other strategies to further improve the effectiveness of countermeasures during the planning, implementation, and evaluation stages for both HSIP and non-HSIP projects.

Approaches to Identify Countermeasure Type and Location

The type and location of countermeasures implemented in a given project play a huge role in the performance of that project. Various approaches are used to identify and select projects. These approaches adopt different frameworks for improving safety, with the shared goal of reducing crashes and fatalities. The most common ones include the site-specific approach, the systemic approach, and the systematic approach.

The site-specific approach involves identifying high-crash locations and selecting appropriate countermeasures for those locations (Herbel et al., 2010). This approach is suitable if there are specific locations that have an especially high crash rate and have a high potential for safety improvement (Chestnutt et al., 2021).

The systemic approach, on the other hand, addresses particular crash types and characteristics over an area, not just specific high-crash locations (Cottrell and Lim, 2018). This approach proactively identifies sites that may not have experienced crashes, but nonetheless share the same design and operational attributes as existing crash hotspots (Amos et al., 2017). It also considers various types of data to help understand systemic risk factors and better define crash risk. The types of data considered include social/demographic factors, land use, pedestrian exposure/activity, presence of other modes of transportation, roadway geometrics, and operational measures (Kumfer et al., 2019). Countermeasures implemented using the systemic approach are typically low-cost so that they can be applied in a greater number of locations (Cottrel and Lim, 2018; Kumfer et al., 2019).

The systematic approach takes the logic of the systemic approach a step further, focusing on implementing cost-effective countermeasures at most or all eligible high-crash locations within a defined area. The defined area can be a facility type or a whole network (Chestnutt et al., 2021). While it is not site-specific, the approach efficiently reduces crashes and fatalities through its wide implementation of countermeasures. The systematic approach can be applied in standalone projects or incorporated in design policies and standards. Some states identify one countermeasure if it is proven to be cost-effective and appropriate, and implement it wherever feasible (FHWA, 2020).

These three approaches represent different ways that agencies can identify and address safety concerns at intersections. Once the appropriate countermeasures are identified, though, there must also be a process for evaluating their cost-effectiveness.

Cost-Benefit Analysis

The cost-effectiveness of a countermeasure is often evaluated with a benefit-cost ratio (BCR), defined as the ratio of a countermeasure's benefits, expressed in monetary terms, to the costs of implementing the countermeasure for a given time frame (Bernhardt et al., 2022; Herbel et al., 2010). Because benefit is expressed in monetary terms, it requires an estimate of the number of crashes that would be avoided if certain countermeasures were to be implemented, as well as the monetary value of each avoided crash (Herbel et al., 2010).

This expected change in the number crashes is often determined using a Crash Modification Factor (CMF). A CMF is a multiplicative factor that indicates the expected change in crash frequency after implementing a countermeasure (Chestnutt et al., 2021; Crash Modification Factors [CMF] Clearinghouse, n.d.). The safety benefit of the countermeasure is measured by estimating the crash frequency of the site without the countermeasure, then multiplying that estimate by the CMF to understand the countermeasure's effectiveness. CMFs are a helpful tool for estimating the expected safety benefits for various countermeasures, and they are one of the most appropriate and useful economic measures to assess and select which intersections are in greatest need of safety improvements and which countermeasures should be implemented (Chestnutt et al., 2021; Saha, 2022).

Cost-benefit analysis is a crucial process to effectively identify cost-effective countermeasures. It is important to note that BCRs are estimates, and sometimes communities might choose a specific countermeasure if they have evidence of benefits that are not addressed in the BCR (Bernhardt et al., 2022).

Other Strategies

There are other strategies and practices that can also help in the process of identifying and selecting countermeasures.

Addressing Insufficient Crash Data

While there are a variety of database, software, and modeling tools that can aid with the process of selecting countermeasures, using tools to understand crashes can be expensive and data intensive, and crash data is often insufficient and incomplete. Institutional barriers, capacity limitations, and data gaps can all limit the ability of agencies to use new methodologies and tools (Fields et al., 2014). Other tools and data sources are needed to fully understand pedestrian safety concerns. For instance, pedestrian audits can evaluate pedestrian attractors, such as schools, transit stations, and retail, as well as detractors, such as unsafe or uncomfortable roadways, highways, and steep topography (Fields et al., 2014). Pedestrian counts can show the volume and movement of pedestrians in a given space at a given time. Though it is insufficient on its own, conducting a pedestrian count can provide pedestrian exposure data, which can reduce the risk of over-designing or under-designing intersection improvements (Amos et al., 2017). Using a variety of tools, methods, and frameworks is necessary to address insufficient and incomplete crash data, as well as the capacity limitations of agencies.

Risk Factors

Considering other crash risk factors is another way to help evaluate crash events more holistically, especially when crash data is insufficient or incomplete. There are many types of risk factors that can be considered. For instance, one study considers contextual information around crash clusters that include land use and zoning patterns, urban design characteristics, transit access, and neighborhood demographics (Fields et al., 2014). Another study argues that demographic factors, road environment, and land use types disproportionately influence pedestrian crash occurrence and severity in low-income areas (Lin et al., 2019). It may also be important to consider the presence of other roadway users, as sometimes countermeasures that improve pedestrian safety may compromise the safety of motorists (Chen et al., 2012). Land use factors and other contextual information help to calculate pedestrian exposure data and can thereby help to improve overall safety.

State-Specific Crash Modification Factors

Developing a state-specific Crash Modification Factor list, which consists of approved CMFs that can be used for all safety projects in a particular state, can take into consideration the unique needs and contexts of the state (CMF Clearinghouse, n.d.). A state-specific CMF list that is applicable to the entire state promotes reliability and consistency by ensuring that similar projects across the state use the same list (Chestnutt et al., 2021; CMF Clearinghouse, n.d.). It also leverages the knowledge of people who have an understanding of CMFs, assisting those with less experience while serving as a valuable resource when communicating the rationale for using certain countermeasures (CMF Clearinghouse, n.d.). Usually, a state-specific CMF list is developed by a committee of experts who regularly review the lists to identify new CMFs or replace old ones as appropriate (Chestnutt et al., 2021).

As of 2024, twenty-two states have worked on state-specific CMFs. States usually compile state-specific CMF lists so that there is consistency in CMF use in their state (CMF Clearinghouse, n.d.). For instance, Pennsylvania assembled a list of CMFs by reviewing relevant literature and including only high-quality CMFs that are appropriate for use in Pennsylvania

(Donnell & Gaya, 2014). High-quality CMFs are those that have a rating of 3 or higher in the FHWA CMF Clearinghouse's star quality rating system– the rating system assigns a rating on a scale of 1 to 5 for each CMF, with 5 being the highest-quality (Donnell & Gaya, 2014). To facilitate the use of CMFs, Pennsylvania created a CMF Guide that describes the proper implementation procedures for CMFs and a training presentation for engineers at PennDOT on how to implement CMFs and use the Pennsylvania CMF Guide (Donnell & Gaya, 2014).

In New Jersey's context, state-specific Safety Performance Functions (SPFs), models that estimate the average crash frequency given certain base conditions, have been developed to better reflect conditions in New Jersey (Ozbay et al., 2019). Given that Crash Modification Factors can serve to adjust the base conditions established by SPFs, even though no new State-level CMFs were developed, this report nonetheless contributes to the discussion of the topic. Likewise, the 2016 New Jersey Highway Safety Improvement Program Manual mentions the use of CMFs as they relate to the examples laid out in the Highway Safety Manual (New Jersey Department of Transportation, 2016).

Safe System Approach

The Safe System Approach is a comprehensive approach to traffic safety that seeks to eliminate fatalities and serious injuries for all road users through changes to the design of the transportation system that accommodate human error and keep impacts on the human body at tolerable levels. The Safe System Approach is rooted in its principles: death and serious injury are unacceptable, humans make mistakes, humans are vulnerable, responsibility is shared, safety is proactive, and redundancy is crucial. Incorporating these principles in the process of identifying and implementing countermeasures can improve safety performance. FHWA's "Integrating the Safe System Approach with the Highway Safety Improvement Program: An Informational Report" presents opportunities for integrating the Safe System Approach into the state HSIP process. Opportunities include researching, prioritizing, and funding engineering countermeasures that address Safe System elements and principles. This involves prioritizing research for countermeasures focused on bicycle and pedestrian safety, and especially those that address crashes which result in a fatality or serious injury (Abel et al., 2020). Other opportunities include assessing crash severity risk using level of kinetic energy transfer and speed, identifying opportunities to encourage local planning efforts that align with the Safe System Approach, and establishing a Safe System working group along with pilot projects (Abel et al., 2020).

Conclusion

In the current context of pedestrian fatalities at intersections, agencies at every level of government must consider implementing countermeasures. Low-cost countermeasures prove to be an invaluable resource due to their ability to be deployed quickly and thoroughly. In analyzing the various types of countermeasures and their contexts, we can attempt to maximize benefits and minimize costs, and in doing so, enhance pedestrian safety. By exploring case studies of different New Jersey intersections where low-cost pedestrian safety improvements have been implemented, this research seeks to pilot an approach to understanding the cost-benefit relationship of low-cost pedestrian safety countermeasures at intersections throughout the State.

METHODOLOGY

The selection of the three case studies in Jersey City, Carlstadt, and Montclair is the result of a months-long process which began by compiling a list of various pedestrian safety improvement projects throughout New Jersey. This initial list looked at geographic contexts, types of low-cost countermeasures, road jurisdictions, implementation dates, and any other relevant details about specific projects.

Potential safety projects were identified through outreach to NJDOT consultants, New Jersey's three Metropolitan Planning Organizations (NJTPA, SJTPO, and DVRPC), and planning staff in the municipalities of Princeton, Hoboken, and Jersey City. The research team also reviewed project information available from Sustainable Jersey and New Jersey's three Metropolitan Planning Organizations. In addition, the research team also used the New Jersey Bicycle and Pedestrian Advisory Council (BPAC) as a source of information. The research team distributed a short Qualtrics survey to BPAC members, and attended the May 15, 2023 BPAC Safety Subcommittee Meeting to solicit additional input.

This approach yielded a shortlist of 41 potential projects, which were then narrowed down to 13 locations (see Appendix) based on the following criteria:

- Relatively low-cost
- Pedestrian-focused
- In place since at least mid-2022 (ideally 2021)
- Variation in land use context and road configuration

These criteria were selected to focus on the impact of relatively low-cost pedestrian countermeasures on safety. Due to the range of criteria considered, locations that were part of more extensive roadway redesign projects were included in the initial list. The timing of project completion in the selection process (at least since 2022) was considered to ensure some before and after crash data. Because of the study's focus on pedestrian countermeasures, safety projects which featured bicycle- or vehicle-related countermeasures more heavily were deprioritized. Furthermore, a concerted effort was made to select case studies from a variety of contexts in New Jersey. For this reason, from the list of 13 locations, one project was selected from Hudson County (since six of the 13 projects were located there), with the remaining two projects selected from elsewhere in New Jersey.

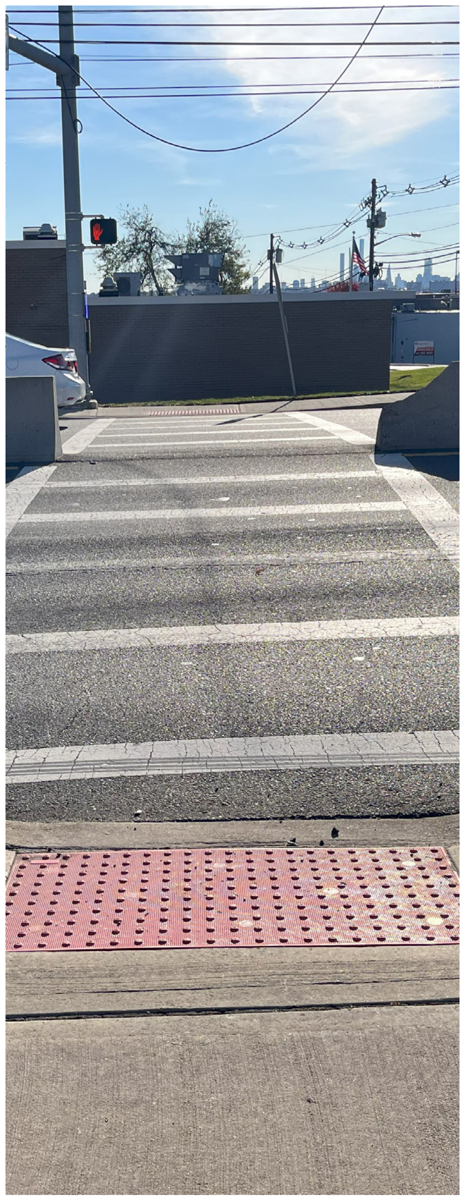
The research team conducted preliminary investigations of each location in the list of 13 projects and presented findings to NJDOT, who ultimately selected the following locations:

- Grand Street and Grove Street in Jersey City, Hudson County
- Washington Avenue and Barell Avenue in Carlstadt, Bergen County
- Bloomfield Avenue and Fullerton Avenue in Montclair, Essex County

The Jersey City example was selected in part because usable speed data was available, which was not the case for the other Hudson County intersections under consideration. The project also featured several low-cost safety interventions, such as daylighting (removing parking spots closest to the crosswalk to improve visibility of pedestrians), painted curb extensions, and plastic soft-hit posts. The incorporation of these countermeasures in the context of streets with bicycle lanes offered an additional dimension that could be analyzed.

The Carlstadt example was selected because the four-lane cross-section and surrounding land use represented a difficult road configuration type that municipalities often seek guidance on, as warehouse and distribution centers flourish in locations that previously generated little pedestrian traffic. Further inquiry into this type of roadway would potentially garner more insight regarding safety solutions for high-speed, four-lane roads. In contrast with the other two examples, the intersection was located in an industrial setting, distinct from the mixed-use contexts of downtown Jersey City and downtown Montclair.

The Montclair example was selected primarily because it offered a good example of an ergonomic crosswalk design on a county roadway in a mixed-use, walkable downtown. More information on this relatively unique countermeasure for New Jersey was deemed to be valuable by NJDOT and the research team.



Grand and Grove Streets, Jersey City

Case Study Location & Surrounding Context

The intersection of Grand Street and Grove Street is located in Jersey City, Hudson County (see Figure 1). It is situated near the downtown and the waterfront. Grand Street runs through many neighborhoods and connects to major routes and highways, making this a well-traveled intersection in Jersey City. Given Bright Street's proximity to the principal intersection of Grand Street and Grove Street (located approximately 200 feet to the west), it has been included as part of the intersection for the purposes of this analysis.

Figure 1 Image of the Grand Street and Grove Street Intersection. Source: SGB, LLC

The intersection is surrounded by a mix of residential and commercial areas (see land use map and Figure 2). At the intersection, there are new apartment buildings and restaurants. There are also a few community facilities nearby, such as the Spanish Church of the Nazarene, the Renaissance Institute, Frank R Conwell Middle School, and the Jersey City Medical Center. The Liberty School and the Hudson Montessori School are also located two to three blocks away. There are a few parks and athletic fields nearby, such as Morris Square Park, Van Vorst Park, and the James F. Keenan, S.J. Field at Saint Peter's Prep. Liberty State Park is also located to the south. The Fire Station of New Jersey is located two blocks away.

Figure 2 Aerial of the land use within .25-miles of the intersection, shown with a red circle. Source: Google

Pedestrian traffic volumes reflect the mixed-use nature of the area. Bicyclists were observed making deliveries, commuting to and from work, and riding recreationally. People of all ages were seen walking, whether it was parents with their children, students leaving school on their own, or adults making deliveries. Some pedestrians were seen entering and leaving restaurants, while others walked their dogs.

Several NJ TRANSIT bus stops are close to the intersection, as is the Jersey Avenue Hudson-Bergen Light Rail station, 0.3 miles to the south, and the Grove Street PATH train station, 0.3 miles to the north.

Figure 3 Screenshot of the Jersey City Zoning Map. The black circle indicates the location of Grand Street & Grove Street.

The intersection is also located near several redevelopment areas (shown on the zoning map in blue, see Figure 3). The area north of the intersection consists of a historic district (brown) along with a few redevelopment areas, and south of the intersection is mostly zoned for redevelopment. Grove Street was extended south of Grand Street, as a part of redevelopment efforts, for example.

Local Complete Streets/Vision Zero Policy

Jersey City has made significant progress with implementing Complete Streets and Vision Zero efforts. The improvements on Grand Street and Grove Street were both efforts to advance the goals of the City's Vision Zero initiative as well as the Citywide Bike Master Plan. Jersey City has a Complete Streets Resolution that was approved in 2011. The City established a Vision Zero Task Force in 2018 and adopted a Vision Zero Action Plan in 2019. As of 2022, 50 out of 77 actions outlined in the Vision Zero Action Plan have been advanced. Because of the City's successful efforts in implementing proven safety countermeasures at high crash-risk locations and achieving zero deaths on local roads in 2022, Jersey City also received a Complete Streets Excellence Award from NJDOT at the 2023 New Jersey Complete Streets Summit.

Figure 4 Aerial of Grand and Grove intersection in December 2022, after countermeasure implementation. Source: Google

Roadway & Intersection Characteristics

Grand Street and Grove Street are both local roads. The posted speed limit for Grand and Grove Streets is 25 mph.

Gove Street runs north-south. North of Grand Street, Grove Street has two lanes with on-street parking on both sides. South of Grand Street, Grove Street does not have marked vehicle lanes but is two-way.

Grand Street runs east-west. West of Grove Street, Grand Street has two travel lanes, with one left turn lane toward Grove Street and a painted median. There is no on-street parking on Grand Street close to the intersection. East of Grove Street, Grand Street also has two lanes with one left turn lane (see Figure 4).

Pedestrian and Bicycle Accommodations

Both Grand Street and Grove Street have sidewalks on both sides near this intersection. Both streets also have different types of bicycle infrastructure. Grove Street north of Grand Street has a two-way protected bicycle lane on one side. Grove Street south of Grand Street has a conventional bicycle lane on one side. Grand Street west of Grove Street has protected bike lanes on both sides. Grand Street east of Grove Street has one buffered bike lane for bicyclists going west, and shared-lane markings for bicyclists going east.

Figure 5 Aerial of Grand and Grove Streets intersection in June 2017, before countermeasure implementation. Source: Google

Project Details & Countermeasure Implementation

Jersey City's Vision Zero Action Plan identified Grand Street as a critical thoroughfare and an opportunity to demonstrate how the City can create a safe system for all residents and visitors. The Action Plan also identified portions of Grand Street and Grove Street in the High Injury Network (HIN), the city's mapped network of streets where high numbers of traffic deaths and serious injuries occur. The HIN helps to prioritize the City's investments and guide the Action Plan's actions and strategies in designing safer streets. The HIN is the starting place for systemwide changes to roadway design and operations in Jersey City.

To design safer streets, the Action Plan identifies key strategies such as prioritizing major safety engineering projects at locations along the HIN, implementing low-cost, high-impact safety improvements throughout the city based on safety engineering studies, and increasing visibility of crossing pedestrians at intersections and mid-block crosswalks with strategies such as painted curbs, flex posts, and bike corrals. The improvements made on Grand and Grove Streets demonstrate the strategies outlined in the Vision Zero Action Plan.

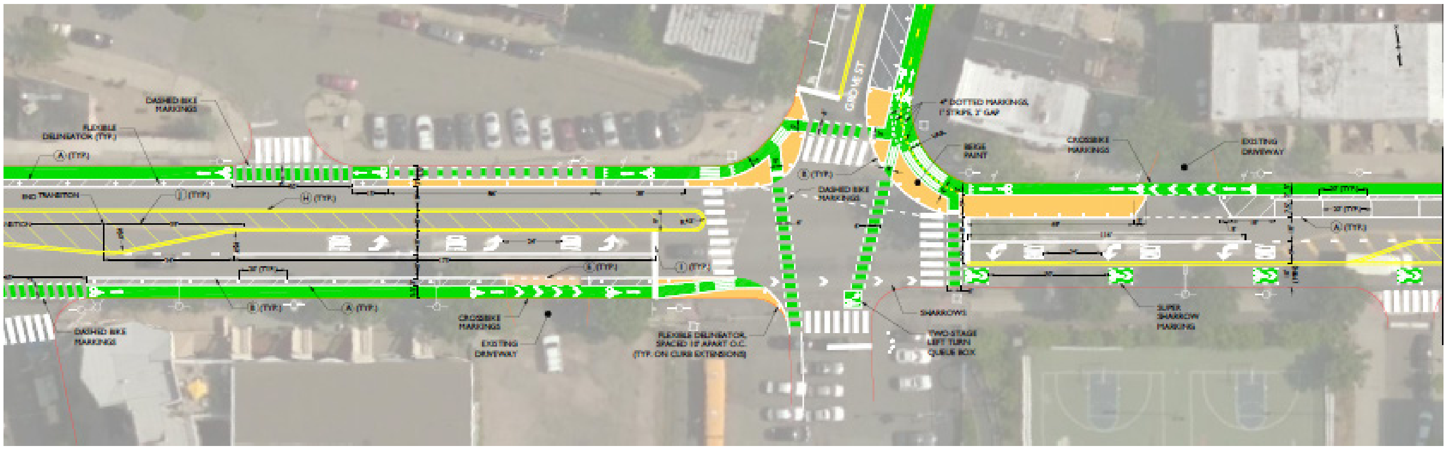


Figure 6 Redesign Plans for the Grand Street and Grove Street intersection. Source: Jersey City Division of Transportation Planning

Grand Street

The improvements at Grand Street resulted from the recommendations of the Grand Street Concept Development Study. Improvements at Grand Street were completed in phases. The sections of Grand Street improvements that pertain to the intersection include Grand Street from Monmouth Street and Grove Street. Protected intersections were installed at Grand and Grove Streets to facilitate the transitions between different bicycle treatments. There are also floating parking lanes at portions of the protected bike lanes for additional protection.

The project was funded through Jersey City's capital budget and used on-call contractors for the design, paving, and striping, for a total cost of $121,770 (striping, paint, and delineators only). The Grand Street improvements were also championed by a local advocacy group, Bike JC, which initiated a petition in 2016 to gather support for creating Jersey City's first protected bike lane on Grand Street. The aerial below shows the Grand and Grove Streets intersection in 2017, before any of the improvements were implemented (Figure 5).

Jersey City held various workshops in 2017-2018 to gather public feedback on alternatives for Grand Street. One out of four possible concepts was chosen, and the City advanced the design of the preferred alternative. Concept development and analysis were completed in 2018, the design was finalized in 2020, and installation began in April 2020 and was completed in July 2020. Figure 6 shows the redesign of Grand Street.

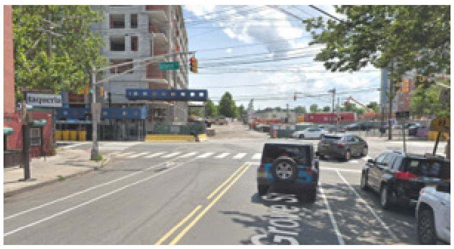
Grove Street

The improvements for Grove Street (north of Grand Street) were implemented in stages (see Figure 6). In July 2019, the conventional bicycle lane on the west side of Grove Street was removed and replaced with a two-way protected bike lane from Columbus Drive to Grand Street on the east side of the street. The bike lane was protected by on-street parking. In 2020, painted curb extensions and plastic soft-hit posts were added at the same time as the Grand Street improvements.

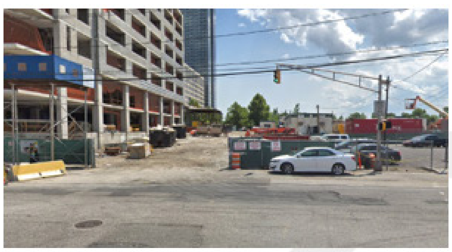
An extension of Grove Street south of Grand Street was finished in mid-2019. Before 2019, Grove Street terminated at Grand Street and did not continue further south (see Figure 7).

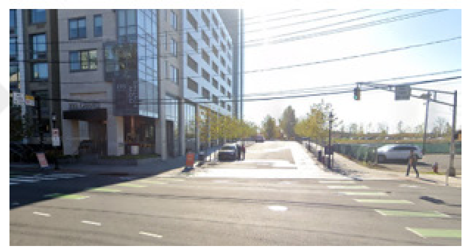
Countermeasures at the Intersection

The main countermeasures that were implemented on Grand and Grove Streets include painted curb extensions with flexible plastic soft-hit posts and bicycle lanes. There are also ADA curb ramps and high-visibility crosswalks at all intersections. South of Grove Street, the crosswalk is solid, rather than striped.



Figures 7-9 Grove Street (north of Grand Street) in July 2018, July 2019, and November 2020 (left to right). Source: Google





Figures 10-12 Grove Street (south of Grand Street) in July 2018, August 2019, and November 2020 (left to right). Source: Google

Countermeasure Details

The graphic below explains the pedestrian countermeasures at the intersection in detail.

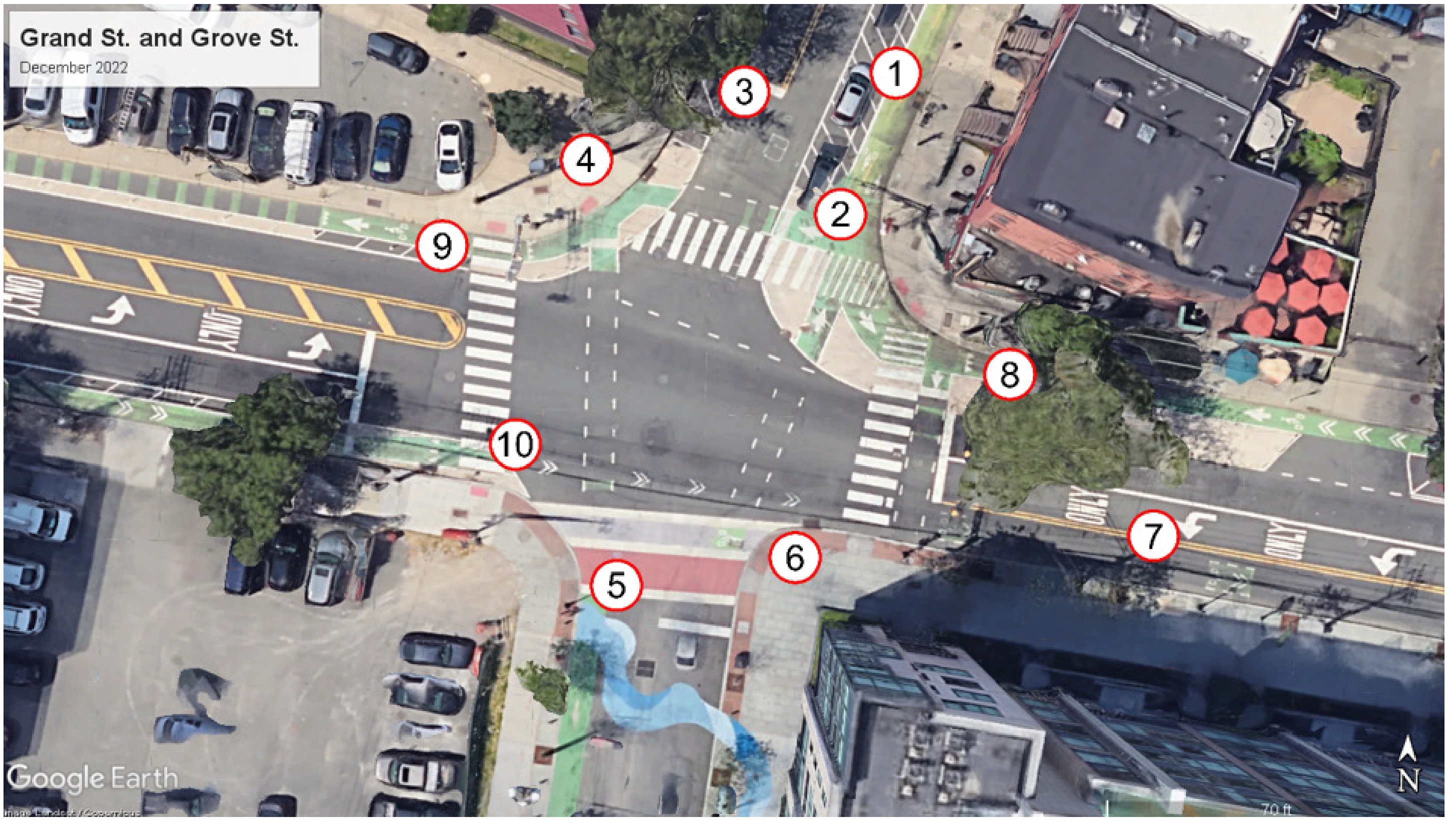
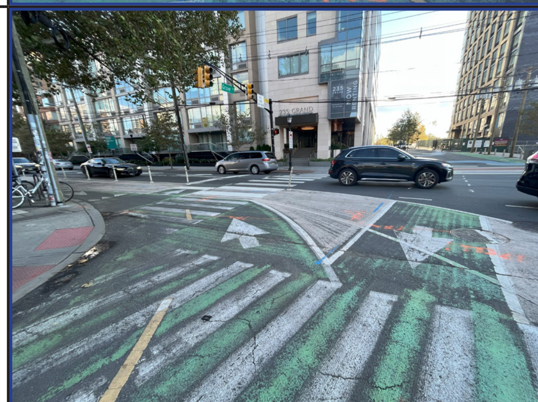
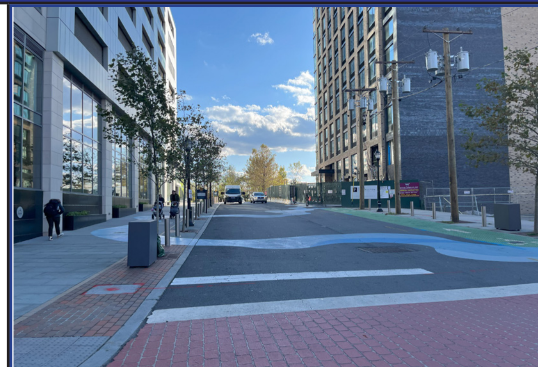


Figure 13 Aerial view of the Grand Street and Grove Street Intersection in December 2022, after countermeasure implementation. Source: Google

	Explanation of Countermeasures from Figure 13	
1	A two-way protected bicycle lane buffered by on-street parking protects bicyclists from drivers veering into the bicycle lane.	
2	Painted curb extensions with soft-hit posts as well as bicycle turning motions drawn in paint guide cyclists and reduce crossing distance for pedestrians.	
3	The intersection was daylighted, removing parking spaces next to intersection with striped paint (car is illegally parked in daylighted area). This increases the visibility of pedestrians to drivers at the crosswalk.	
4	Painted curb extensions and the bicycle lane with soft-hit flex posts force drivers to take slower turns, while also reducing crossing distances for pedestrians.	

	Explanation of Countermeasures from Figure 13	
5	South of Grand Street, Grove Street has a conventional painted bicycle lane on the west side of the street, with a brick crosswalk and street mural representing the site of a former canal.	
6	The tightened turning radius with a brick curb forces drivers to slow down when making turns.	
7	There are painted shared-lane markers on Grand Street going east.	
8	On the northeast corner of the intersection, there is a protected one-way west-bound bicycle lane buffered by on-street parking, daylighting at intersection with painted curb extensions, and soft-hit posts (facing east).	

	Explanation of Countermeasures from Figure 13	
9	On the northwest corner of the intersection, there is a buffered bicycle lane protected by soft-hit posts with small painted curb extensions (facing west).	
10	On the southwest corner of the intersection, there is a buffered bicycle lane protected by soft-hit posts (facing west).	

Figures 14-23 Images of countermeasures at intersection of Grand Street and Grove Street.

Traffic Volume & Observed Activity

Traffic Counts

Jersey City has installed a traffic camera at the intersection of Grand and Grove Streets that logs continuous counts, tracking the number of pedestrians, bicyclists, and cars, as well as the percentage of vehicles that are trucks, AM and PM peak traffic volumes, and specific turning motions. The traffic counts show that this is a well-trafficked intersection with a high number of pedestrians, bicyclists, and vehicles traveling through it on a daily basis. This matches the study team's observations, which showed that the intersection was well-used by all groups. Included below are snapshots from Jersey City's traffic data dashboard from the month of April 2022, for the morning and evening peaks (see Figures 24 and 25). Peak AM traffic from 8:00 a.m. to 9:00 a.m. was 1,196, and peak PM traffic from 5:30 p.m. to 6:30 p.m. was 1,550. The median volume for daily vehicle traffic was 20,188. There were 3,873 total pedestrians, and 534 total bicycles (see Figure 26).

As part of the development of the improved intersection at Grand Street and Grove Street, traffic counts were conducted in May 2017 for the weekday AM and PM peak hours, as well as the weekend midday peak hours. These are shown below (see Figure 27).

The April 2022 traffic counts show that the median number of pedestrians during the AM peak was 280, whereas the median number of pedestrians during the PM peak was 396. This trend of higher traffic volumes during the PM held for the number of cyclists (22 in the morning versus 59 in the afternoon) as well as for motor vehicle traffic.

Peak AM traffic volumes decreased from 2,000 in 2017 to 1,196 in 2022. Peak PM traffic volumes also decreased during this timeframe, from 2,011 in 2017 to 1,550 in 2022. Notably, this decrease in traffic volume occurred despite the construction of Grove Street south of the intersection between 2017 and 2022.

Figure 24 Traffic Count at Grand and Grove Streets Showing AM Peak. Source: Jersey City Division of Transportation Planning

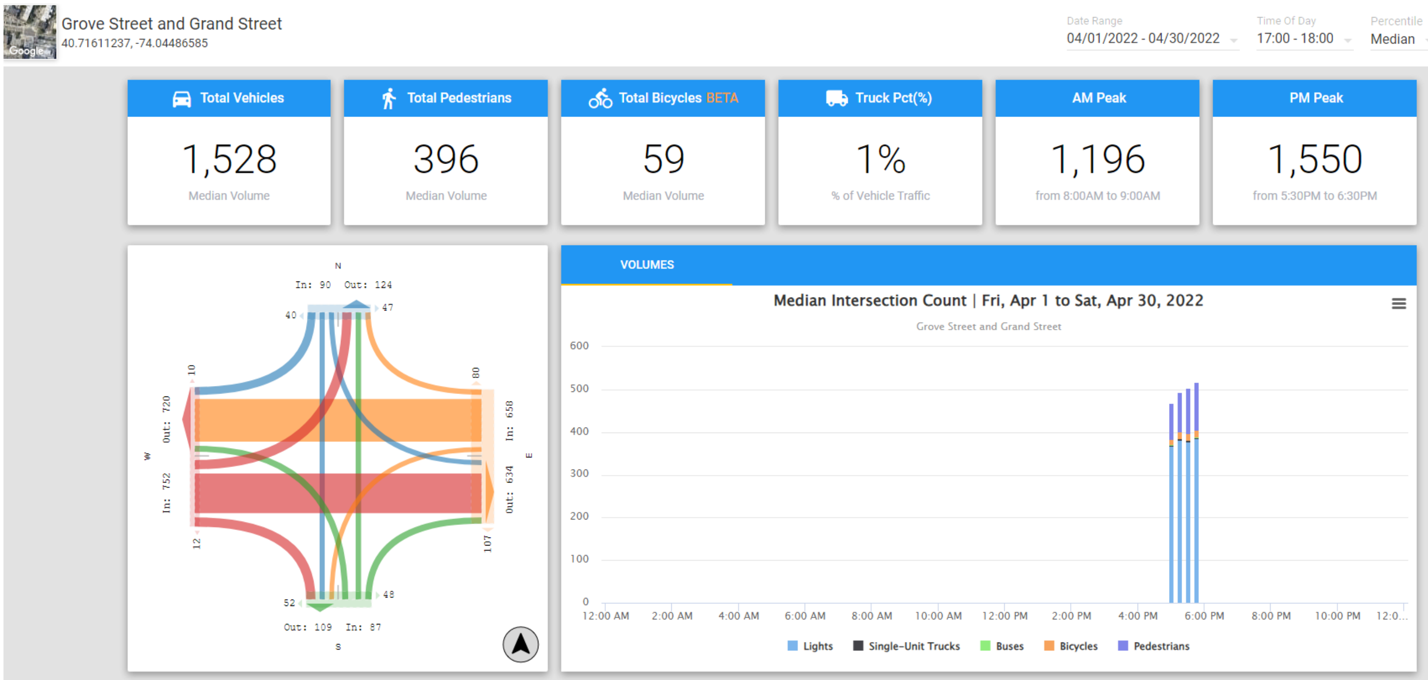


Figure 25 Traffic Count at Grand and Grove Streets Showing PM Peak. Source: Jersey City Division of Transportation Planning

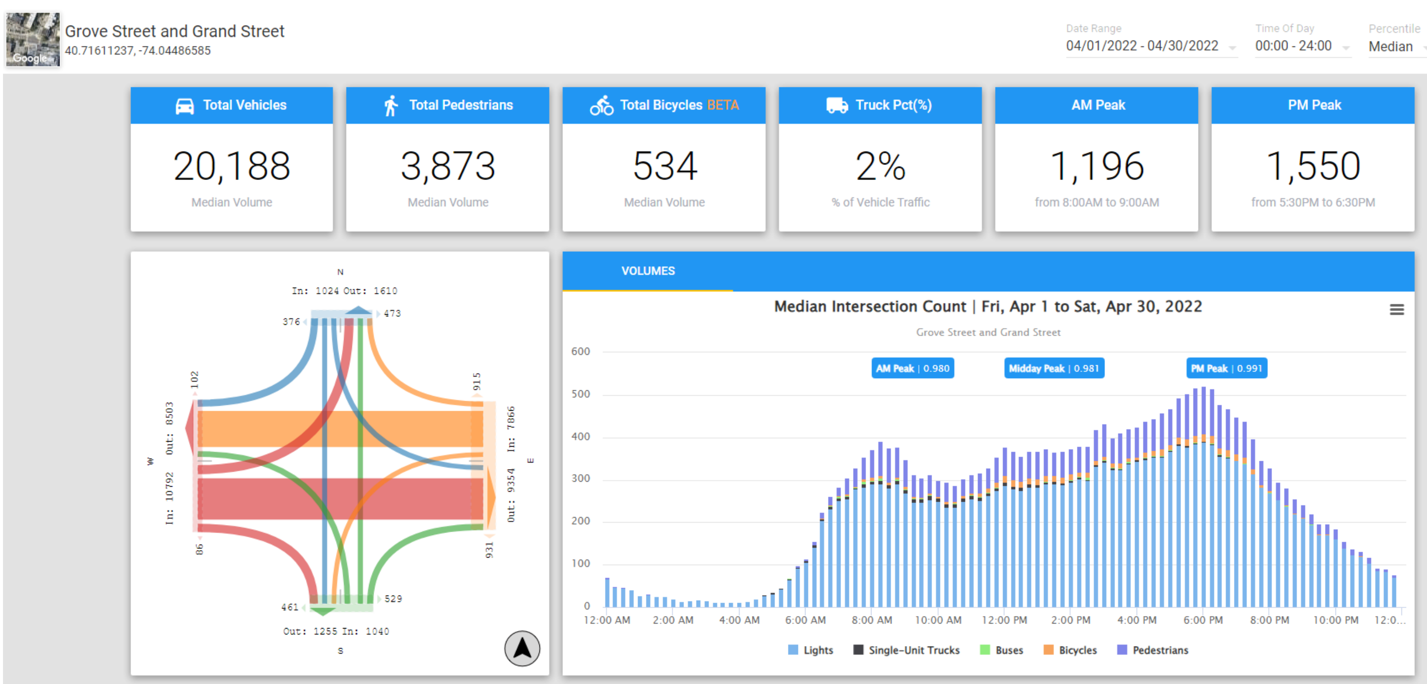


Figure 26 Traffic Count at Grand and Grove Streets Showing Total Daily Traffic Volume. Source: Jersey City Division of Transportation Planning

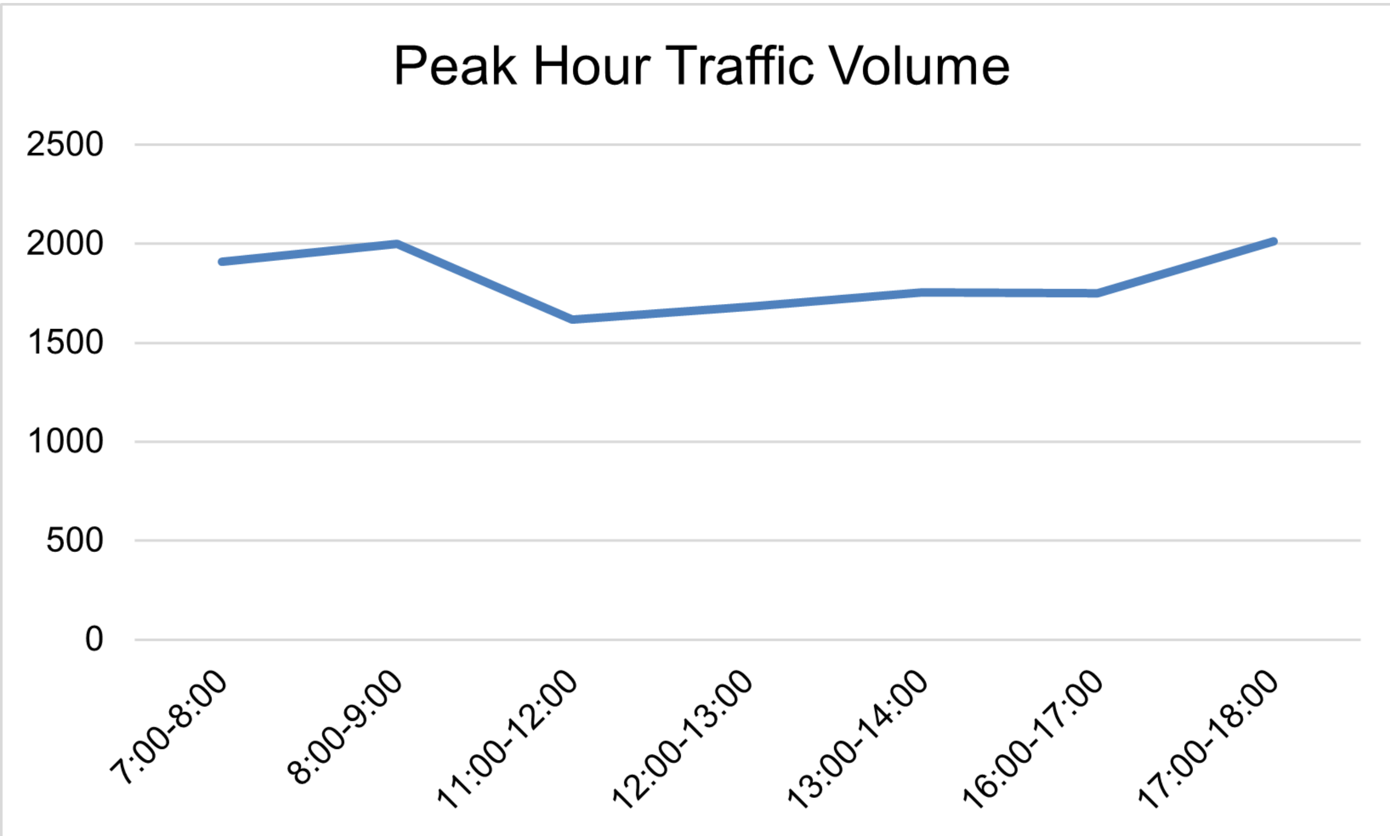


Figure 27 Peak Hour Traffic Counts on Grand Street in May 2017. Source: Imperial Traffic and Data Collection

Crash Analysis

This crash analysis for the intersection of Grand Street and Grove Street is based on data obtained from NJDOT Safety Voyager, from 2013 to 2022. The analysis compares total crashes and pedestrian crashes, as well as temporal trends. For Figures 29 to 31, the dashed green line divides the years before and after the implementation of countermeasures, which were phased over time but began in 2019.

Crash Map

Reported crashes around the intersection of Grand Street and Grove Street were concentrated at the intersections of Grand Street and Grove Street (19), and Grand Street and Bright Street (5). Each intersection saw one pedestrian crash, whereas there were no pedestrian crashes reported in between intersections (see Figure 28).

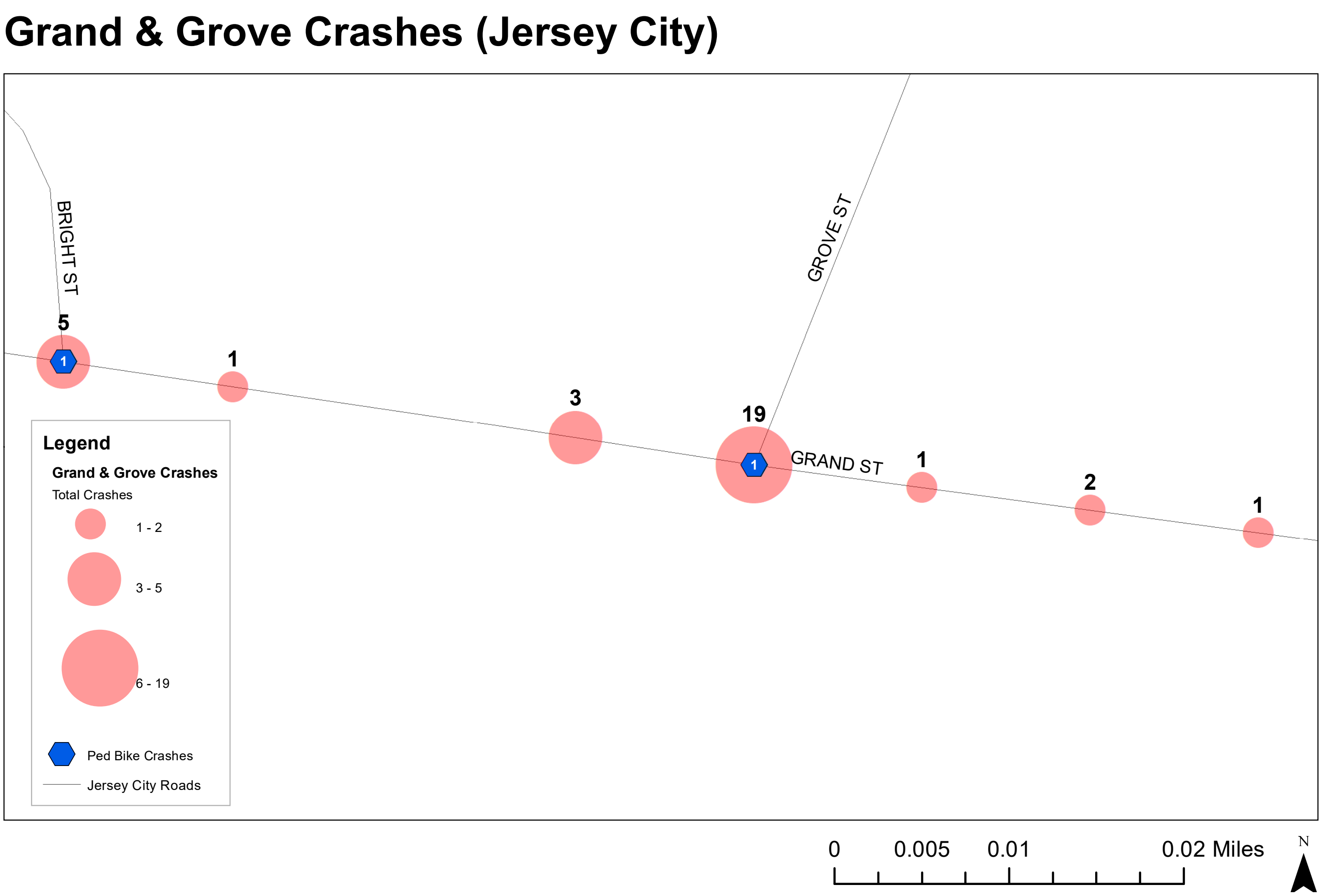


Figure 28 Map of Reported Crashes at Intersection of Grand and Grove Streets. Source: Safety Voyager

Trends Over Time

From 2013 to 2022, there were 32 reported crashes at the intersection, two of which involved pedestrians and four of which resulted in minor injuries with pain complaints. From 2013-2018, there were 26 crashes. From 2019-2022, there were six crashes. There were no collisions reported involving bicyclists. There were no crashes in the years 2014, 2020, or 2022, and most crashes and injuries occurred before 2019. There was a significant spike in crashes in 2018, the year in which both pedestrian crashes took place. Crashes causing only property damage were a much more common occurrence than crashes involving pedestrians, accounting for 28 of the 32 crashes (87.5%).

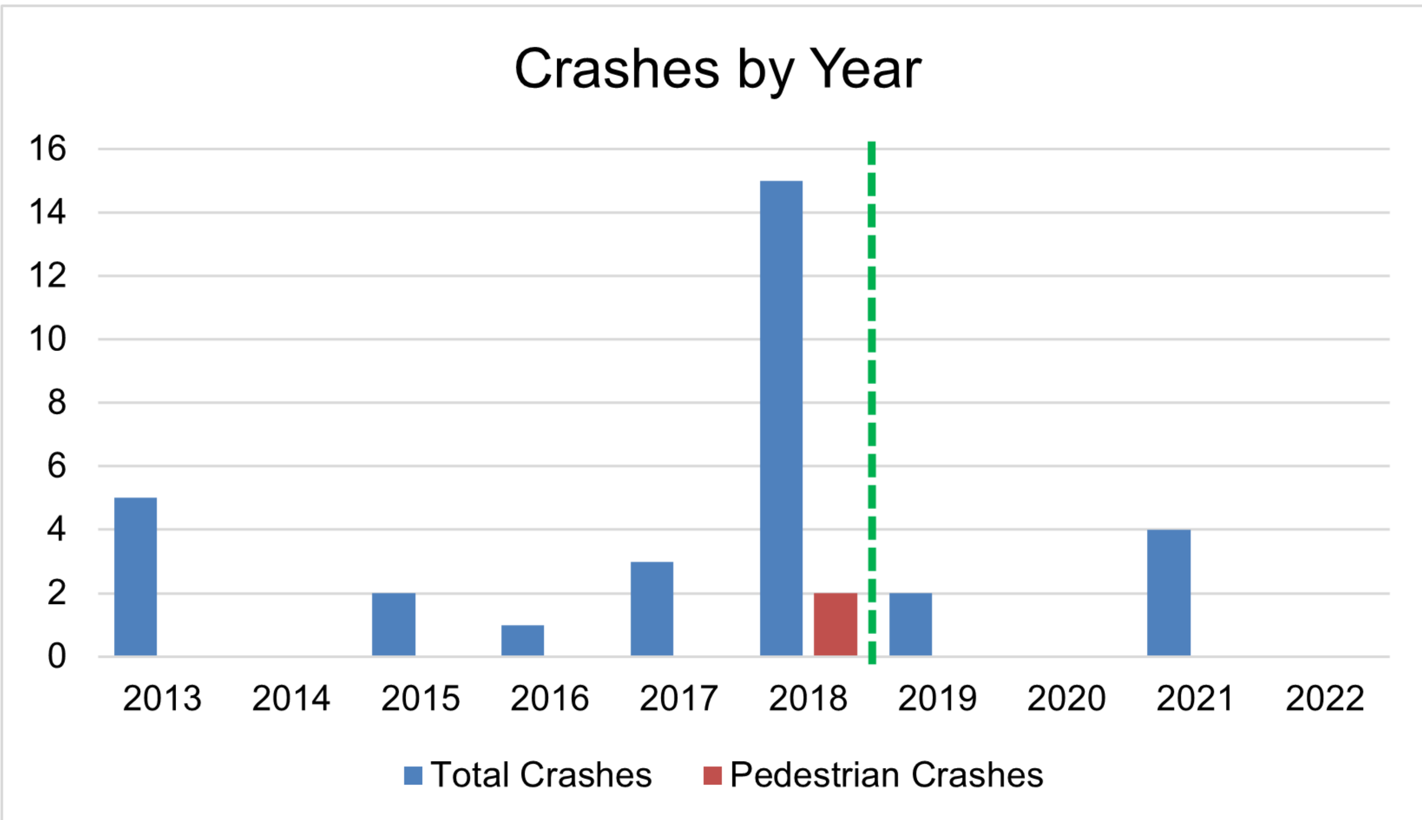


Figure 29 Graph Showing Reported Crashes by Year

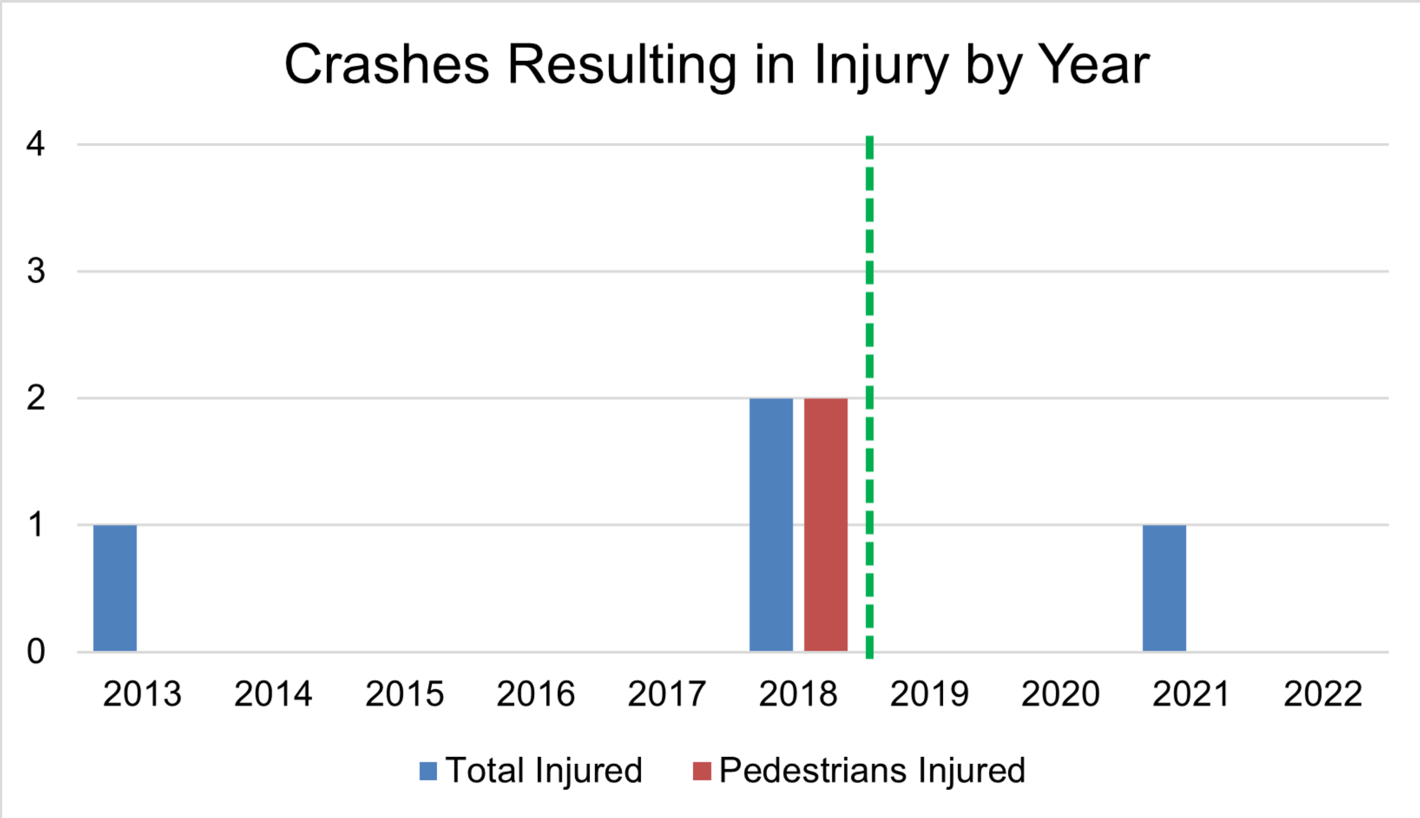


Figure 30 Graph Showing Reported Crashes Resulting in Injury by Year

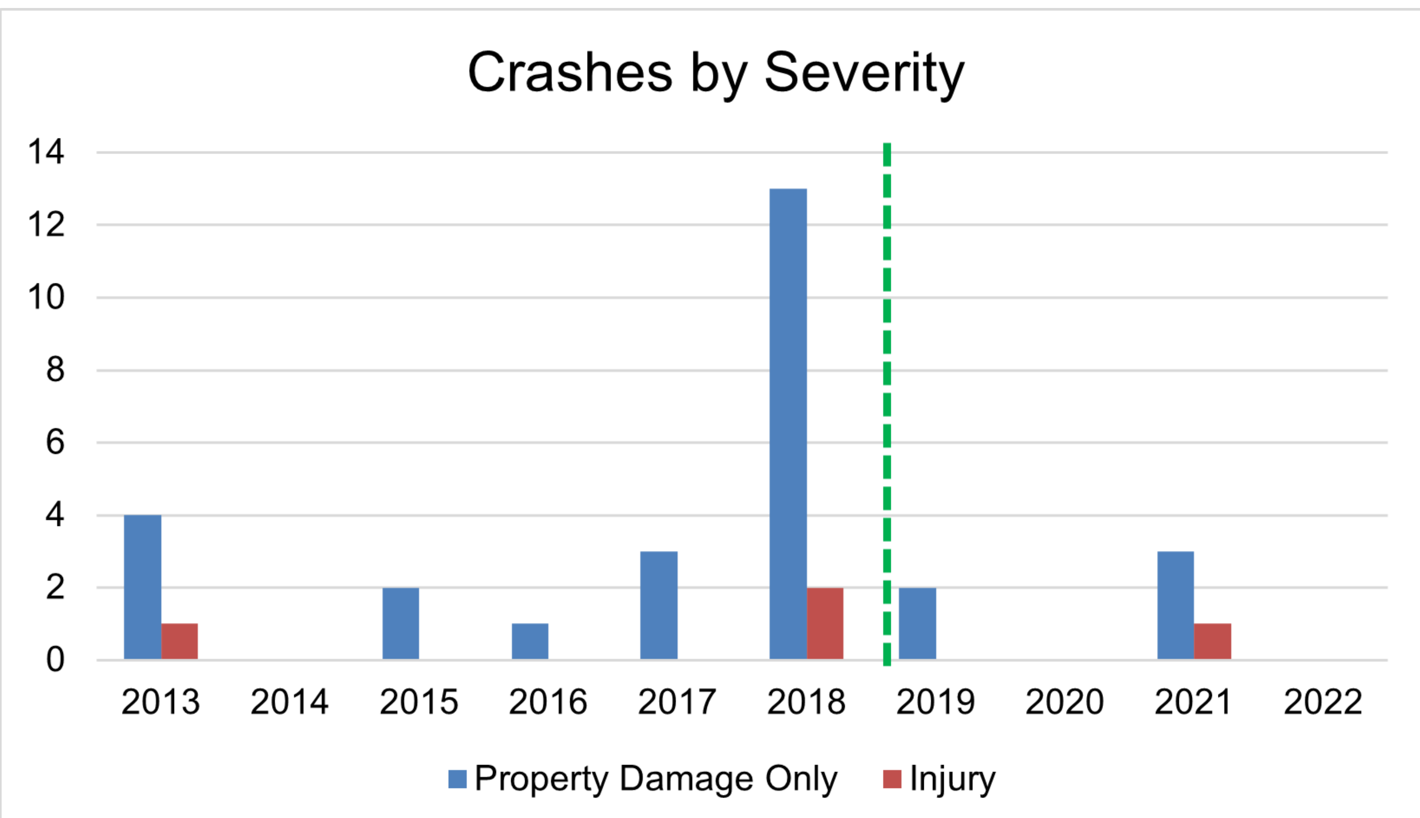


Figure 31 Graph Showing Crash Severity by Year

Crash Type

The majority of crash types between 2013 and 2022 were same direction crashes (19 crashes, 59%), rear end (11 crashes, 34%) or sideswipe (8 crashes, 25%). Six percent of crashes involved pedestrians. While there were fewer reported crashes in all categories of collisions since 2019 (and the same number of crashes for backing), the relative proportion of crashes due to backing or striking a parked vehicle increased during this period. Incidents of rear ending were proportionally similar in both periods, while since 2019, there has been a decrease in the proportion of all other types of crashes.

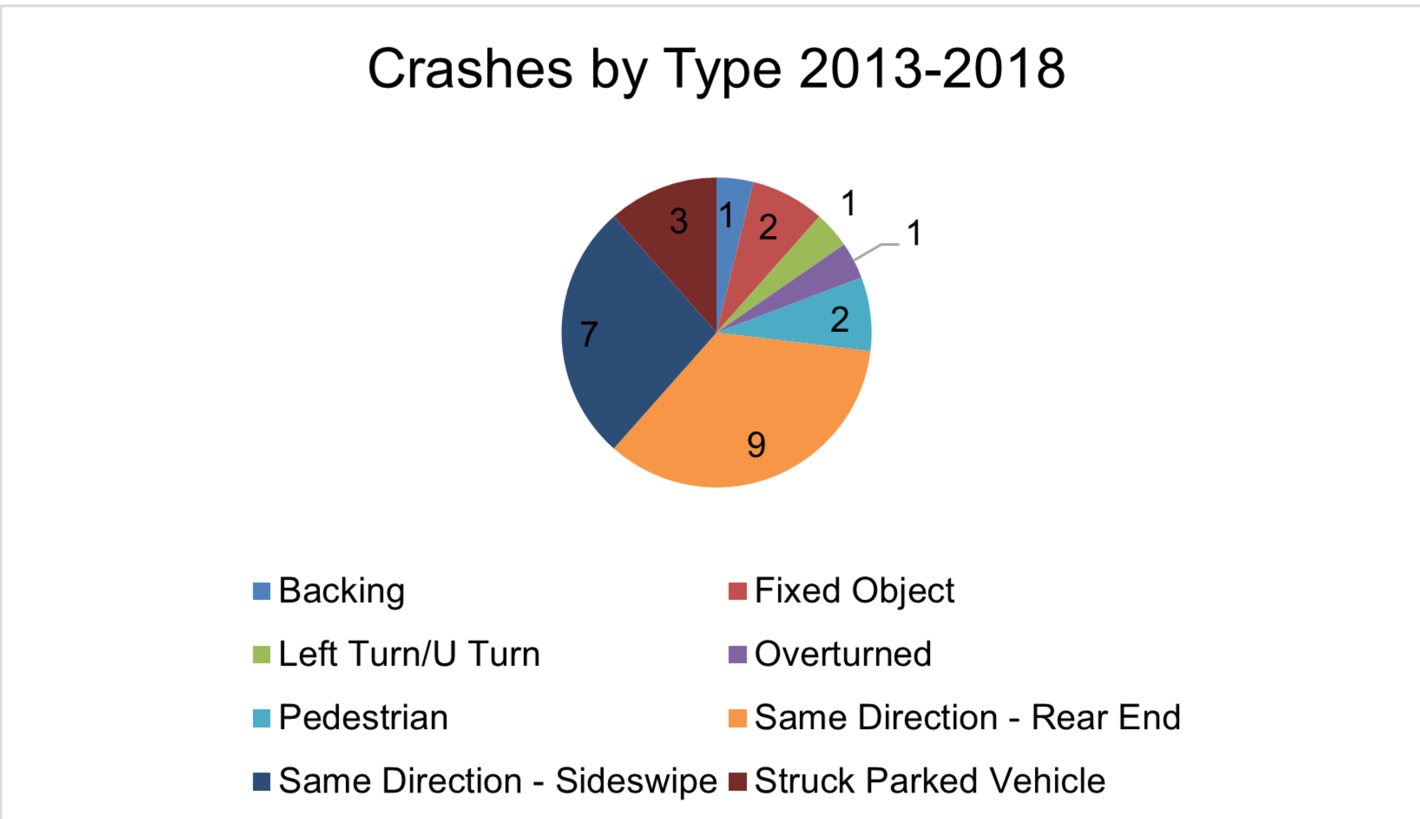


Figure 32 Graph Showing Percentage of Crashes by Type 2013-2018

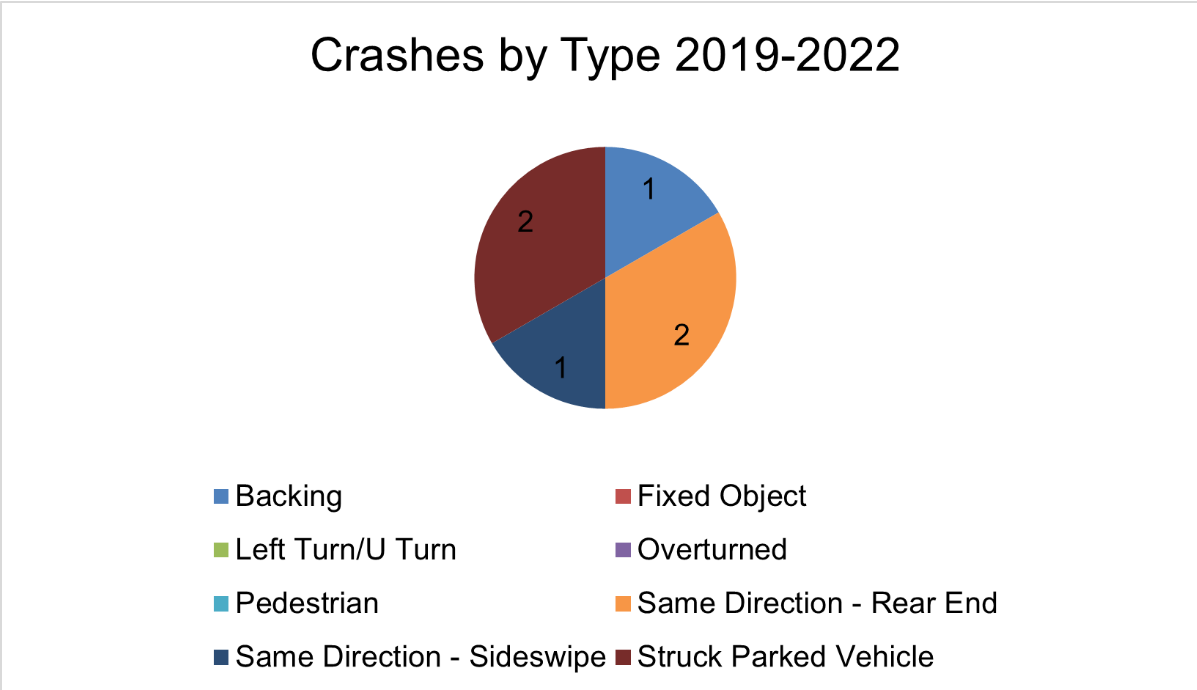


Figure 33 Graph Showing Percentage of Crashes by Type 2019-2022

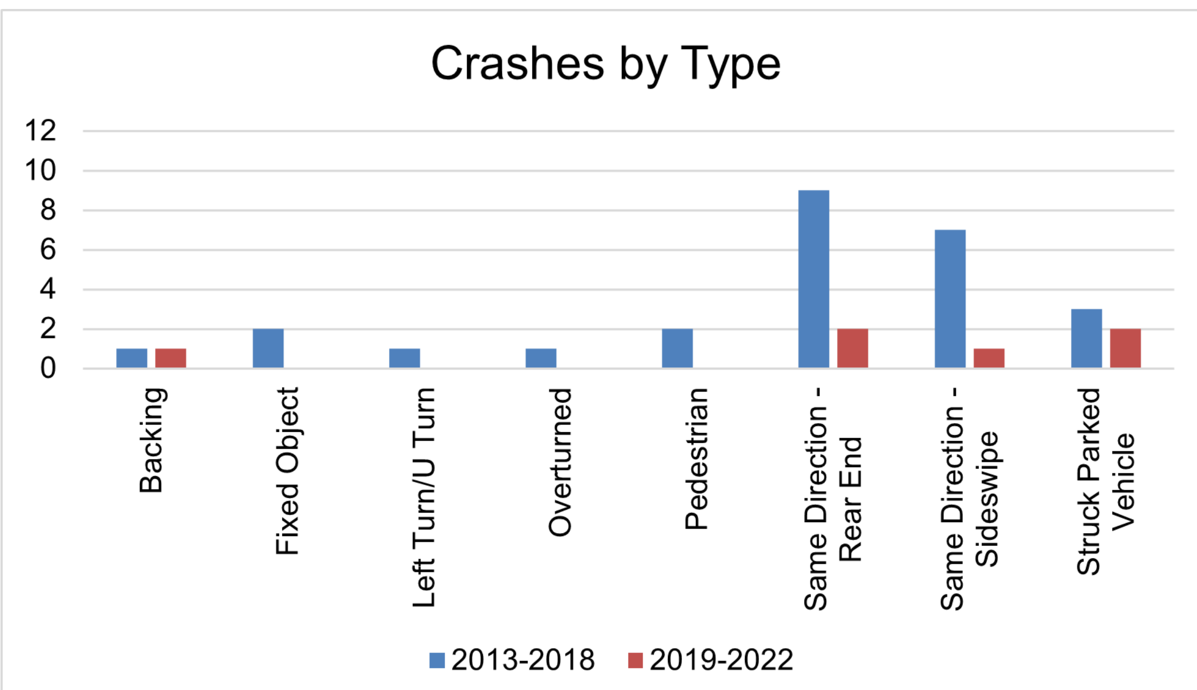


Figure 34 Graph Showing Number of Reported Crashes by Type Before and After 2019

Roadway and Light Conditions

25 (78%) reported crashes occurred when road conditions were dry. One of the two pedestrian crashes took place when it was dry, while the surface conditions are not recorded for the other pedestrian crash. 22 (69%) crashes occurred during the day, while eight (25%) crashes occurred at night. Both pedestrian injuries occurred under lower-light conditions, once when it was dark and once at dawn.

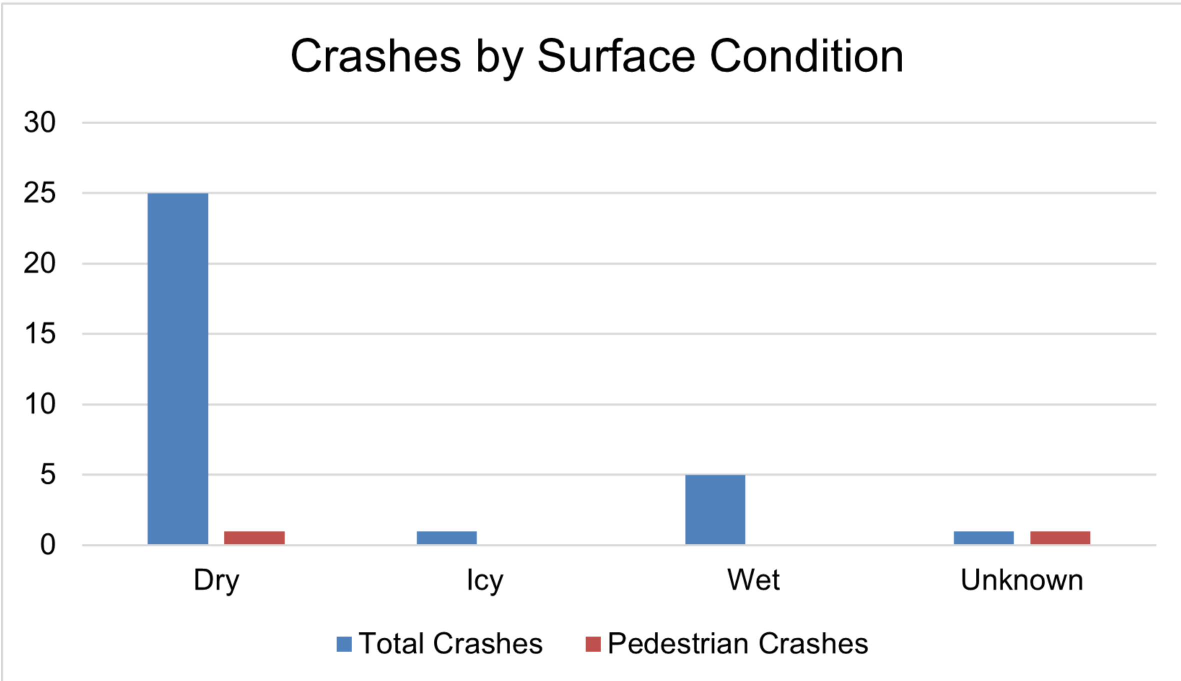


Figure 35 Graph Showing Reported Crashes by Surface Condition

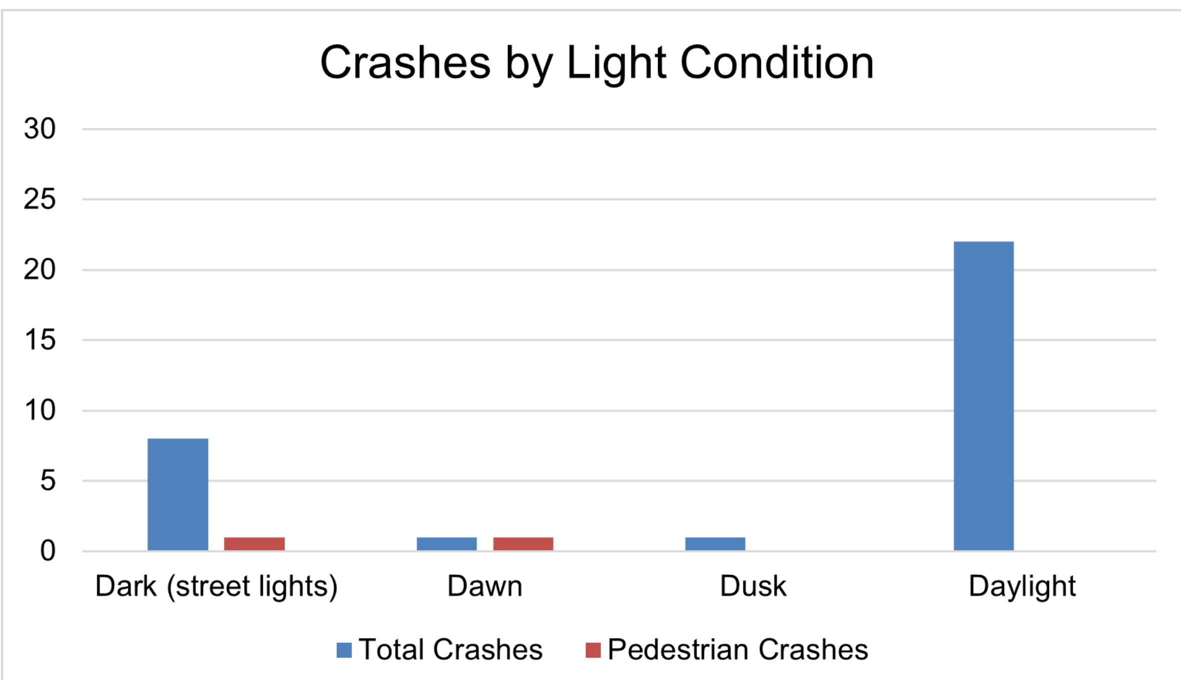


Figure 36 Graph Showing Reported Crashes by Light Condition

Washington and Barell Avenues, Borough of Carlstadt

Case Study Location & Surrounding Context

The intersection of Washington Avenue (CR 503) and Barell Avenue is located in the Borough of Carlstadt, Bergen County. It is a stop-controlled T-intersection with a High-Intensity Activated Crosswalk (HAWK) signal to assist pedestrians with crossing Washington Avenue, a four-lane, divided roadway. The intersection is 1.5 miles from the NJ Turnpike (I-95) via Paterson Plank Road and around one mile away from the Meadowlands Sports Complex. The intersection is located in a light industrial area (shown in Figure 38) with several gas stations as well as numerous wholesale and warehouse uses, including an Amazon hub just west of the intersection.

Pedestrian traffic appeared to be mostly employees of these industrial facilities completing their work commutes on foot. Many were seen getting off the bus and immediately crossing Washington Avenue, using the HAWK signal to get to their destination.

There is NJ TRANSIT bus service (Routes 161 and 703) and a stop with a bus shelter (Washington Avenue at Barell Avenue) at the intersection. The project team observed that there was fairly frequent bus service in the morning rush period, running around every five to 15 minutes. The HAWK signal, installed in late 2018, provides access to both sides of the street, principally the Amazon Hub, for bus riders.

Local Complete Streets/Vision Zero Policy

The Borough of Carlstadt does not have a Complete Streets Policy or Vision Zero plan, but NJTPA/CAIT studied this intersection as part of a 2013 Roadway Safety Audit (see Section III).

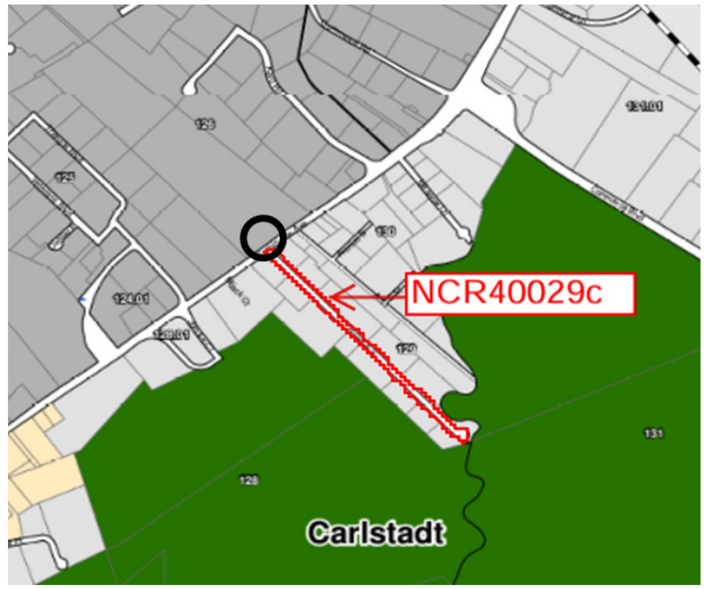


Figure 37 Screenshot of the Borough of Carlstadt Zoning Map. The intersection is indicated with the black circle.

Figure 38 Aerial showing the industrial land use in the .33-mile radius surrounding the intersection. The intersection is indicated with the red circle. Source: Google

Roadway & Intersection Characteristics

Washington Avenue is a four-lane, bidirectional road, divided by a Jersey barrier, with a speed limit of 40 miles per hour. Pedestrian crossing signs are located approximately 400 feet in advance of the intersection in either direction. Barell Avenue is a local road, with a right turn lane at the intersection with Washington Avenue. Left turns from Barell Avenue to travel south down Washington Avenue are not possible because of the Jersey barrier. Barell Avenue terminates at Washington Avenue and does not intersect with any other streets. Barell Avenue forms a long, single block around 2,000 feet long, without sidewalks. Washington Avenue has sidewalks on both sides of the roadway north of Barell Avenue. On the east side of Washington Avenue, there is no sidewalk south of Barell Avenue. On the west side of Washington Avenue, the sidewalk continues south of Barell Avenue for approximately 150 feet.

Figure 39 Bus stop located on the east side of Washington Avenue, north of Barell Avenue. Source: SGB, LLC

Figure 40 Bus stop located on the west side of Washington Avenue, south of Barell Avenue. Source: SGB, LLC

Washington Avenue carries a high volume of vehicle and truck traffic, including construction vehicles. During the team field visit, there was constant car and truck traffic, though it dissipated slightly after 9 am. While the posted speed limit is 40 mph, drivers were seen exceeding this speed. During the two-hour field visit, several vehicles proceeded through the intersection after the light turned red. Many drivers also continued through the intersection without stopping at the red HAWK signal once pedestrians had crossed. Many drivers exhibited frustration, honking immediately once the lights turned green. While the HAWK signal provides a measure of safety for pedestrians, Washington Avenue's four lane cross-section with fast-moving heavy vehicles is not a pedestrian-friendly environment.

Project Details & Countermeasure Implementation

The Rutgers' Transportation Safety Resource Center (TSRC) at the Rutgers' Center for Advanced Infrastructure and Transportation (CAIT) and the North Jersey Transportation Planning Authority (NJTPA) have partnered to perform Road Safety Audits (RSA) at locations that sub-regions identified to have safety concerns. NJTPA and TSRC have ranked roadway segments based on crash data to help sub-regions identify high-crash locations.

Bergen County submitted an application to the FY 2013 NJTPA Local Safety Program to install improvements along Washington Avenue. While NJTPA did not select the proposed project for the FY 2013 funding cycle, it was supportive of improvements along Washington Avenue.

NJTPA decided to conduct a Road Safety Audit (RSA) to understand if the improvements proposed by Bergen County would be appropriate for the types of crashes that were occurring. The RSA focused on the section of Washington Avenue between Moonachie Boulevard/Empire Avenue and its southern terminus at NJ 120. The Washington Avenue and Barell Avenue intersection is one of six intersections that were examined in the RSA. The final road safety audit was completed in October 2013.

Construction began in May 2018 and was completed in May 2019. The project was funded with a 2014 Federal Local Safety Grant. The NJTPA chose the designer and administered their contract, while the County bid the project and administered the construction and inspection contracts.

The total construction cost for the Washington Avenue improvements from Paterson Plank Road to Empire Boulevard was $3,120,013.27; total inspection cost was an additional $581,410.83.

Figure 41 An aerial screenshot of the intersection from May 2018. Source: Google

Figure 42 An aerial screenshot of the intersection from November 2022. Source: Google

Countermeasures at Intersection

The main countermeasures at the intersection are the HAWK signal, pedestrian push buttons, and a striped, high-visibility crosswalk. Other improvements include sidewalks, ADA curb ramps, and the addition of the Jersey barrier.

Countermeasure Details

An aerial photograph from May 2018 shows the intersection before improvements. There were no sidewalks, crosswalks, or any other pedestrian/bicycle infrastructure at the site. The aerial from November 2022 shows the various pedestrian improvements that were installed. They are identified on Figure 6 and explained in the table below.

	Explanation of Countermeasures from Figure 42	
1	Sidewalks were added on both sides of Washington Avenue north of Barell Avenue. On the west side of Washington Avenue, there is now a planted strip between the sidewalk and the travel lanes, which makes walking more comfortable by creating distance between the pedestrian and vehicular traffic.	
2	Barell Avenue does not have any pedestrian facilities or striping. There is an ADA ramp that allows pedestrians to cross. Sidewalks continue north from this point.	
3	A crosswalk with ADA curb ramps was also added, improving accessibility for those with mobility difficulties (shown facing east).	

	Explanation of Countermeasures from Figure 42	
4	The intersection uses a HAWK signal with push buttons. This push-activated signal introduces signal control, allowing pedestrians to cross high-speed roads safely while also minimizing vehicle delay. After pressing the button, a voice recording states "Wait to cross Washington," followed by beeping. The study team timed the duration of the pedestrian signal at 21 seconds; the countdown timer ran for 15 seconds	
5	On the west side of Washington Avenue, the sidewalk continues for approximately 150 feet until it reaches the edge of the Amazon warehouse parking lot.	

Figures 43-47 Images of countermeasures at intersection of Washington and Barell Avenues. Source: SGB, LLC

Traffic Volume

The most recent traffic count on Washington Avenue was done on Tuesday, November 14, 2023 at the intersection of Washington and Moonachie Avenues, the northernmost end of the Washington Avenue corridor project, located about 3,700 feet from the intersection with Barell Avenue. This traffic count shows that the intersection is well-trafficked, with an Average Annual Daily Traffic (AADT) of 28,374.

Figure 48 shows the vehicle totals for the peak AM (8:15-9:15) and PM (4:30-5:30) hours, where traffic volumes were 2,189 and 2,193, respectively. A total of 7,659 vehicles continued southbound toward Barell Avenue and 6,811 vehicles continued northbound coming from the direction of Barell Avenue.

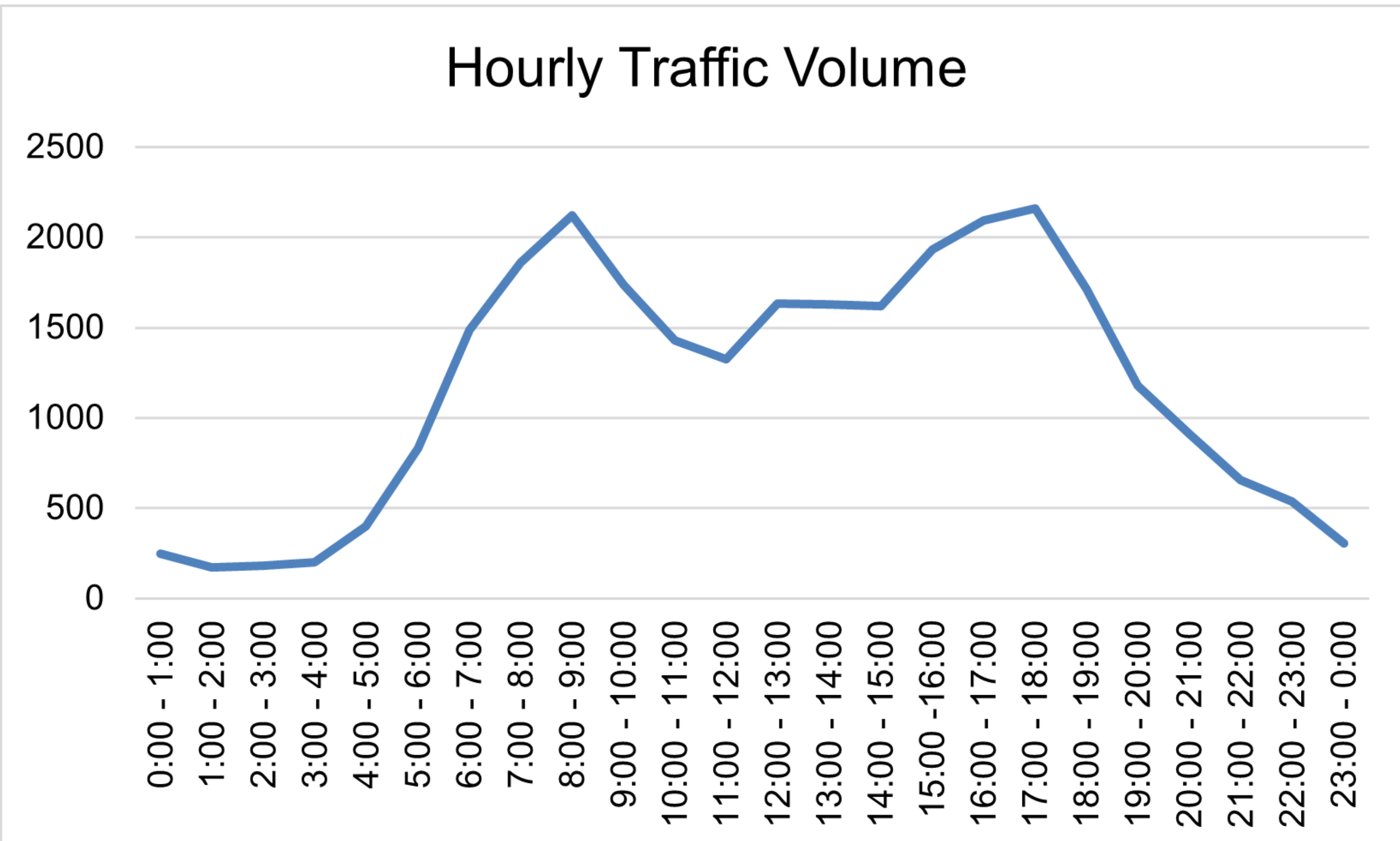


Figure 48 Traffic counts from 11/14/23 at the Washington Avenue and Moonachie Avenue intersection. Source: Bergen County

Crash Analysis

The following crash analysis for the intersection of Washington Avenue and Barell Avenue is based on data obtained from NJDOT Safety Voyager for the period of 2013 to 2022. The analysis compares total crashes and pedestrian crashes, as well as temporal trends. For Figures 50 to 52, the dashed green line divides the years before and after the implementation of countermeasures, which were phased in over time beginning in 2018.

Crash Map

Reported crashes around the intersection of Washington and Barell Avenues were mainly concentrated at the intersection (20), and to the north of the intersection (22). North of the intersection saw the only pedestrian crash recorded. All but one crash took place on Washington Avenue, with a single crash occurring on Barell Avenue, away from the intersection.

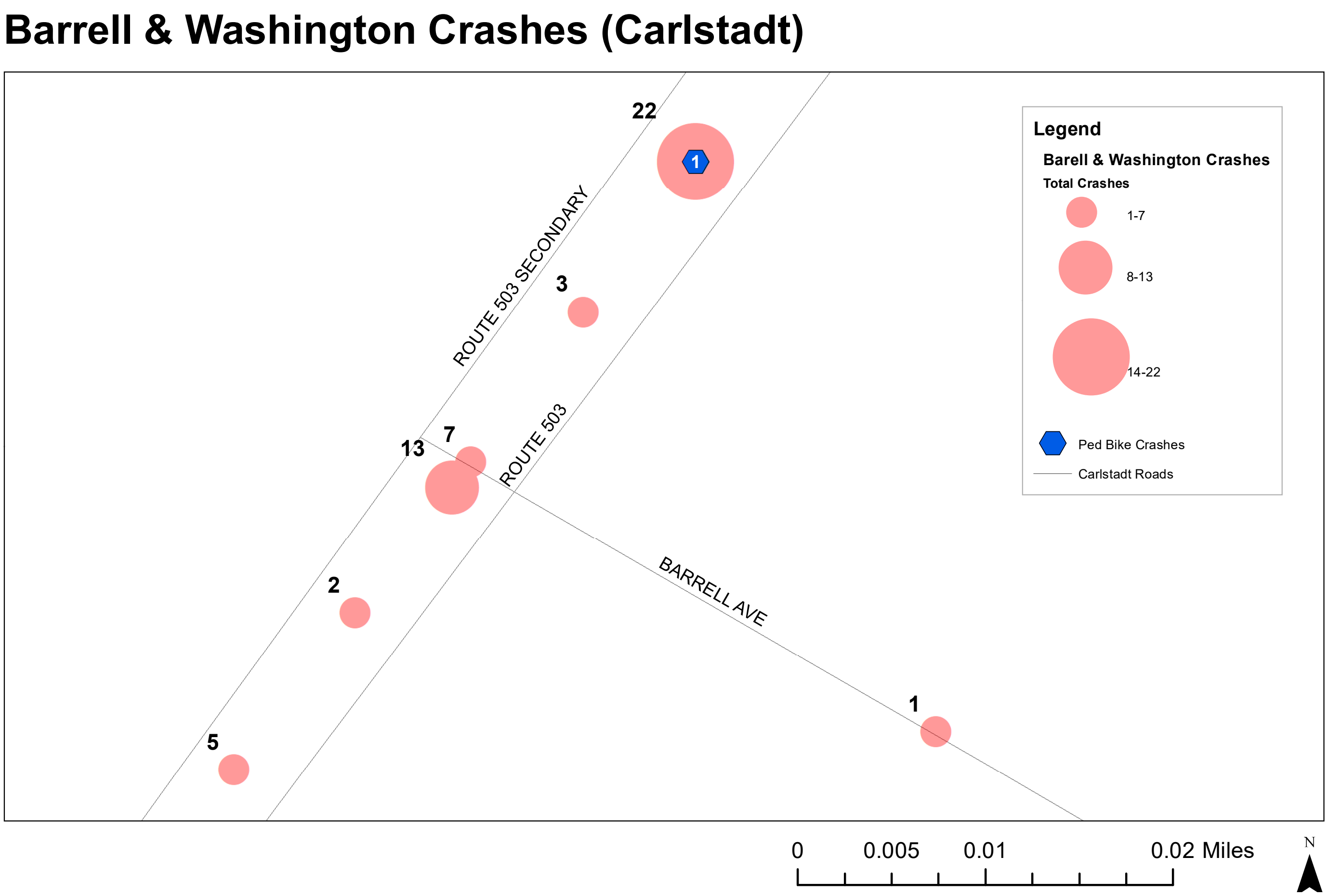


Figure 49 Map of reported crashes at the intersection of Washington and Barell Avenues. Source: Safety Voyager

Trends Over Time

From 2013 to 2022, there were 53 reported crashes around the intersection, one of which involved pedestrians and resulted in a pain complaint. From 2013 until 2018 (the year road redesign work began), there were 44 crashes, including one that involved a pedestrian. From 2019-2022, there were nine reported crashes. Following the roadway redesign, crashes decreased from over seven per year to over two per year. There were 14 injuries (including one pedestrian injury) from 2013-2018, while there were five injuries between 2019 and 2022 (without any pedestrian injuries). For the years 2013 to 2018, crashes involving property damage only were more common than those involving injury, accounting for 39 of the 53 crashes (73.5%). From 2019-2022, crashes resulting in an injury were as frequent as crashes resulting in property damage. Given that the pandemic began in the middle of the post-installation period, additional data in the coming years will be helpful in efforts to understand longer-term shifts in crash trends.

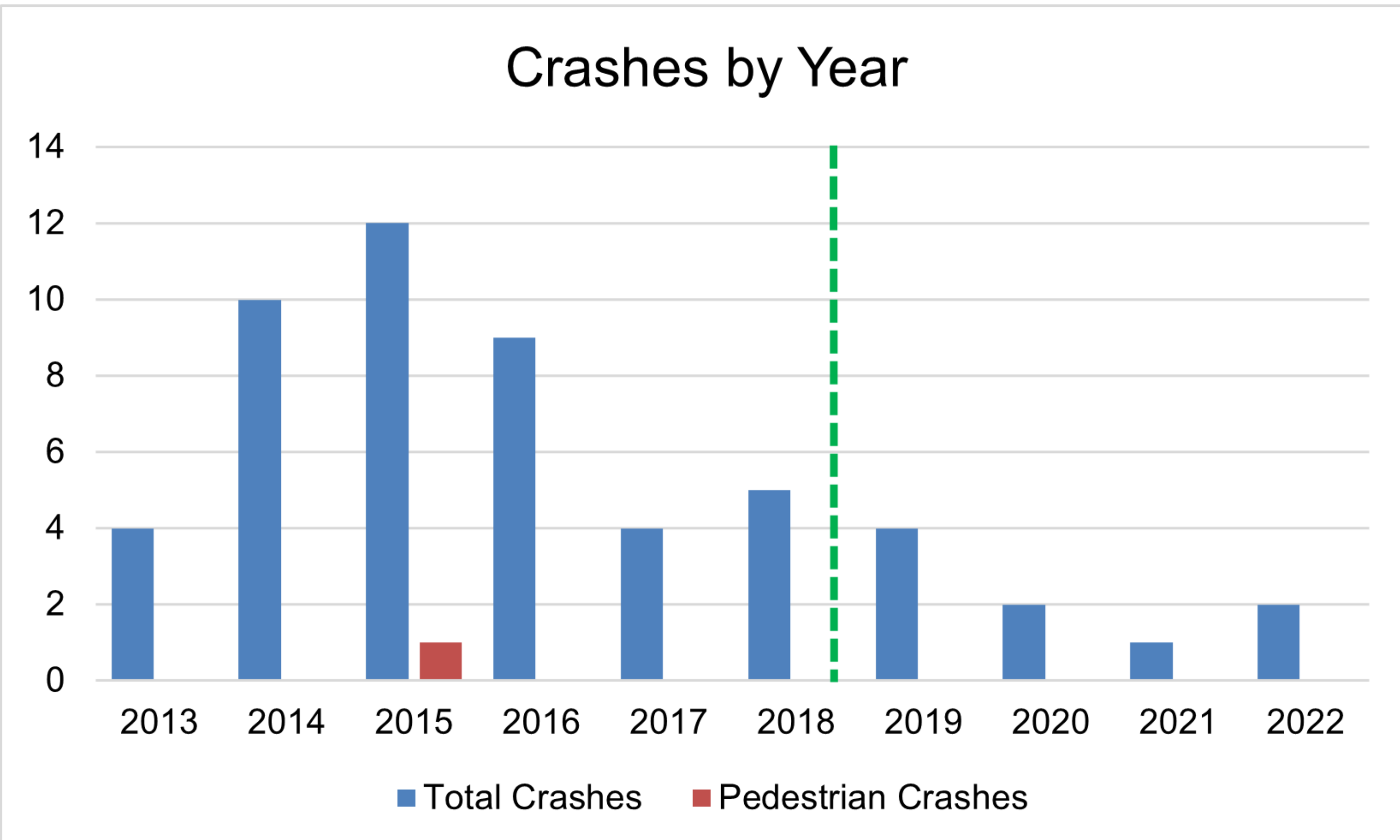


Figure 50 Graph Showing Reported Crashes by Year

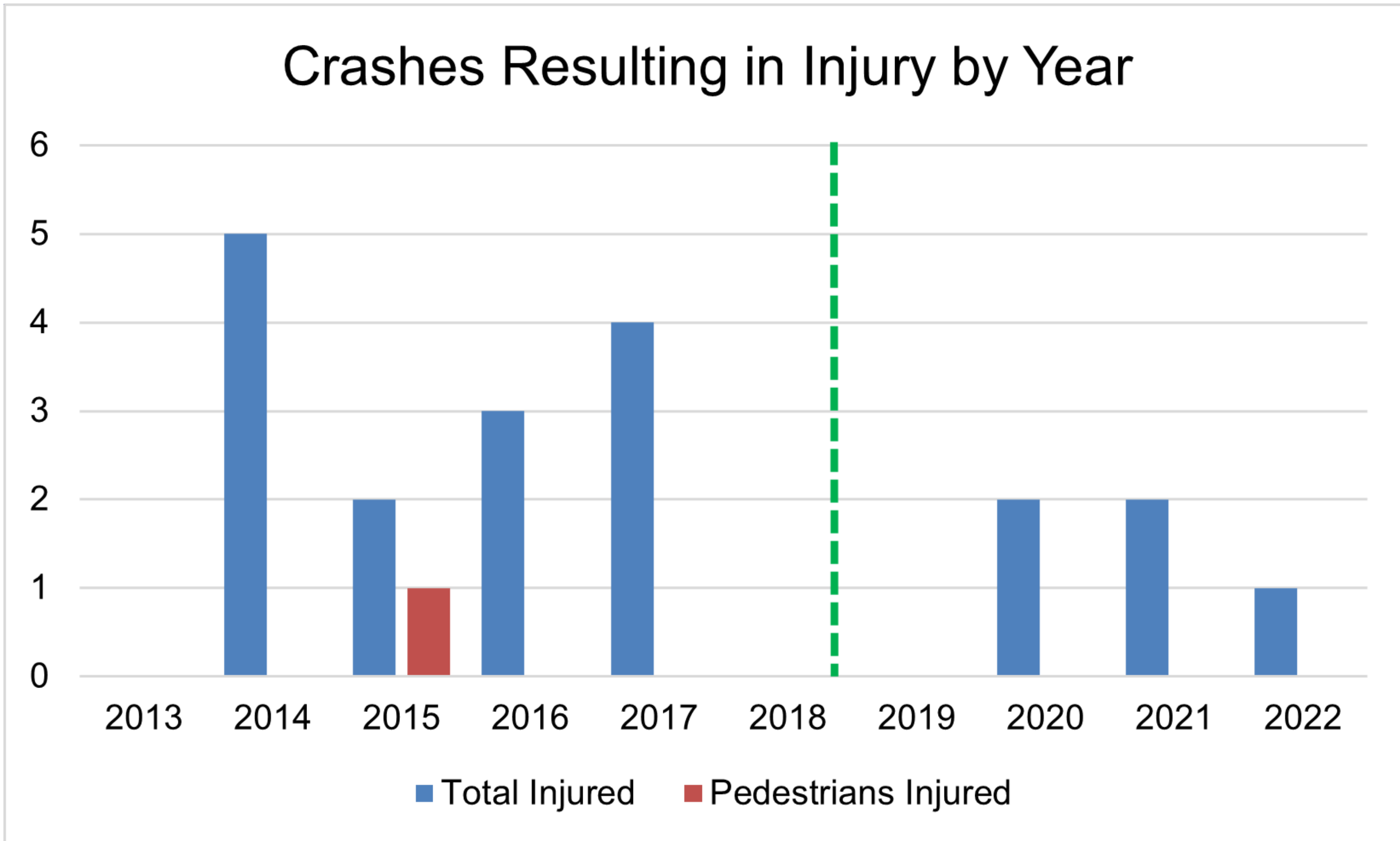


Figure 51 Graph Showing Reported Crashes Resulting in Injury by Year

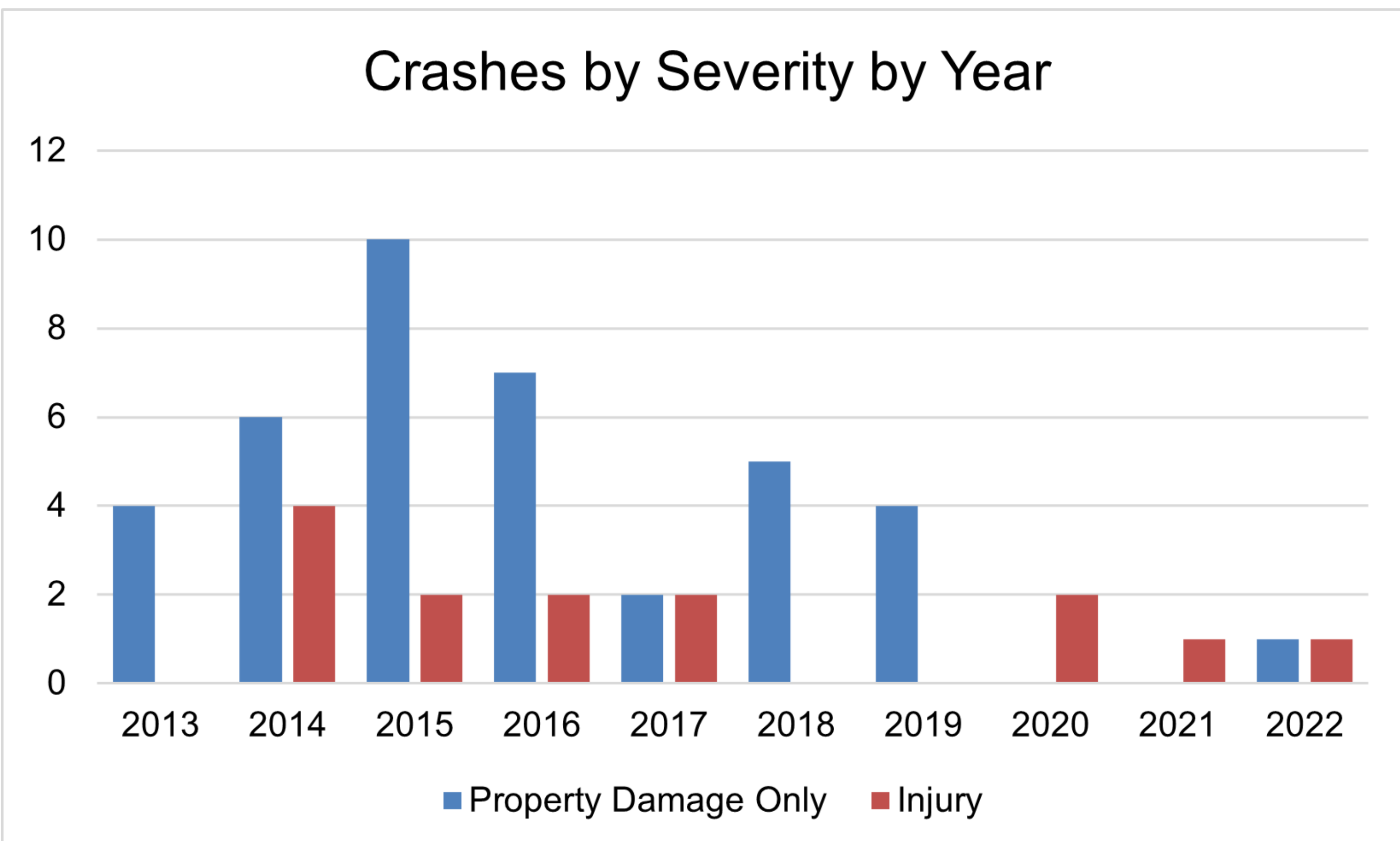


Figure 52 Graph Showing Reported Crash Severity by Year

Crash Type

The most common types of crashes between 2013 and 2022 were fixed object, right-angle, and rear-end crashes, which all occurred 10 times. There were nine collisions due to backing and eight due to sideswipes. The relative proportion of same direction crashes increased from 22% from 2013-2018, to two-thirds from 2019-2022. This trend is not surprising, given that the installation of Jersey barriers was part of the project. Backing, fixed object, and right-angle crashes occurred once each from 2019-2022, decreasing in proportion in this period. Notably, there were no reported crashes involving a pedestrian after 2018.

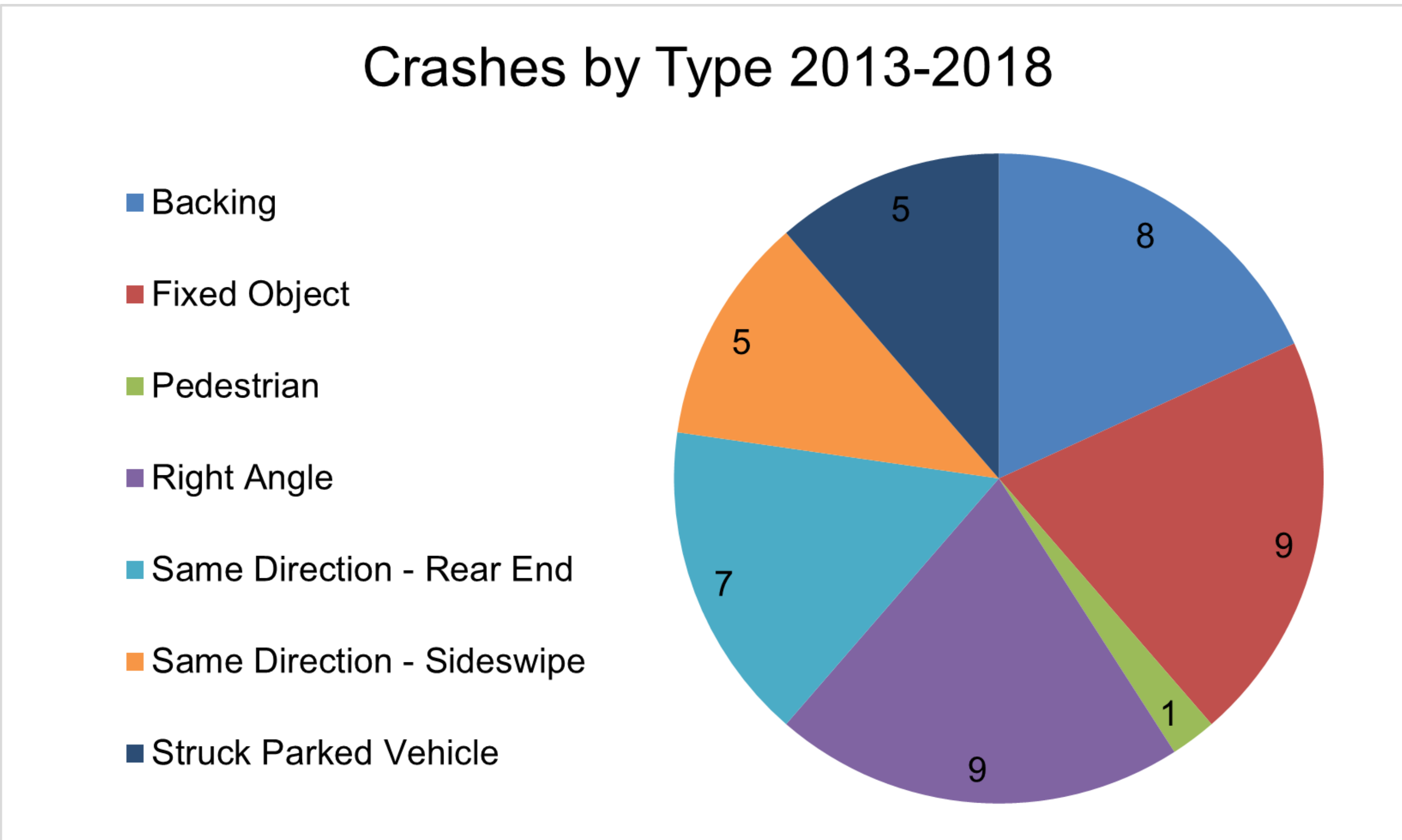


Figure 53 Graph Showing Percentage of Reported Crashes by Type 2013-2018

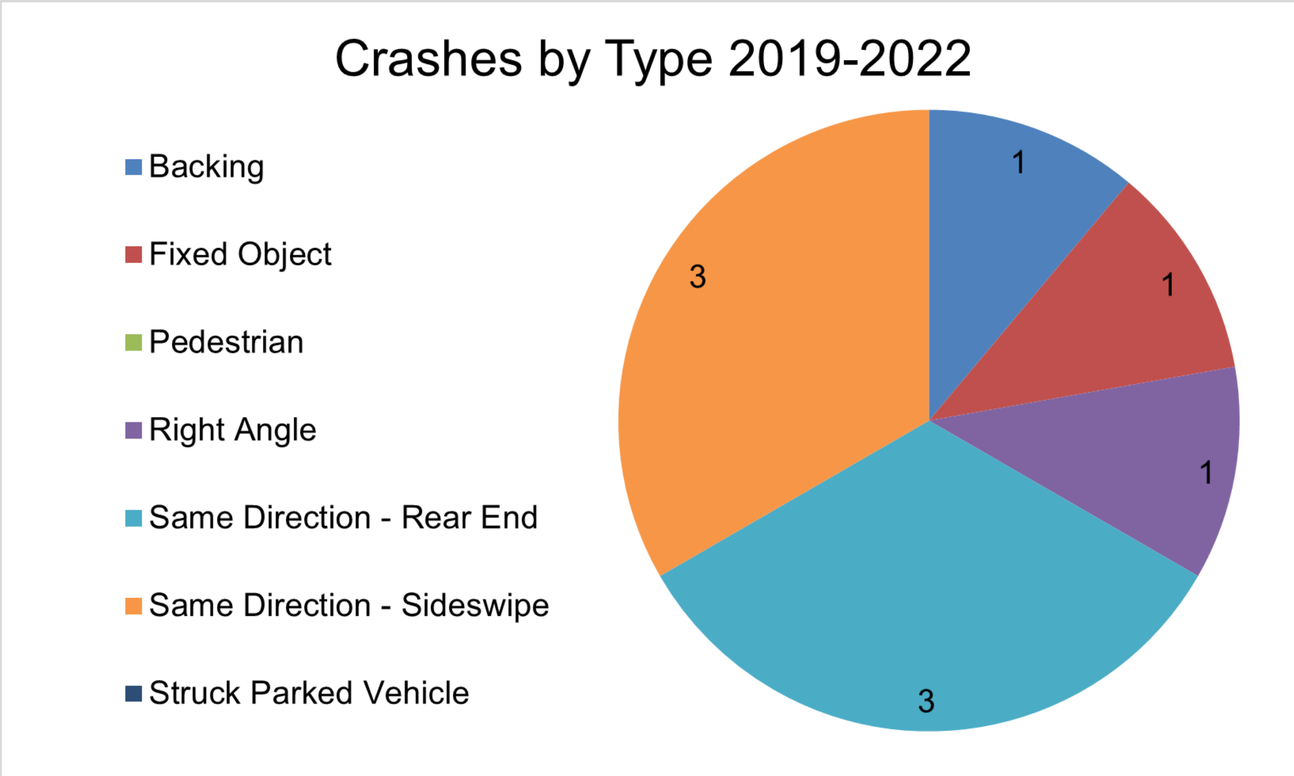


Figure 54 Graph Showing Percentage of Reported Crashes by Type 2019-2022

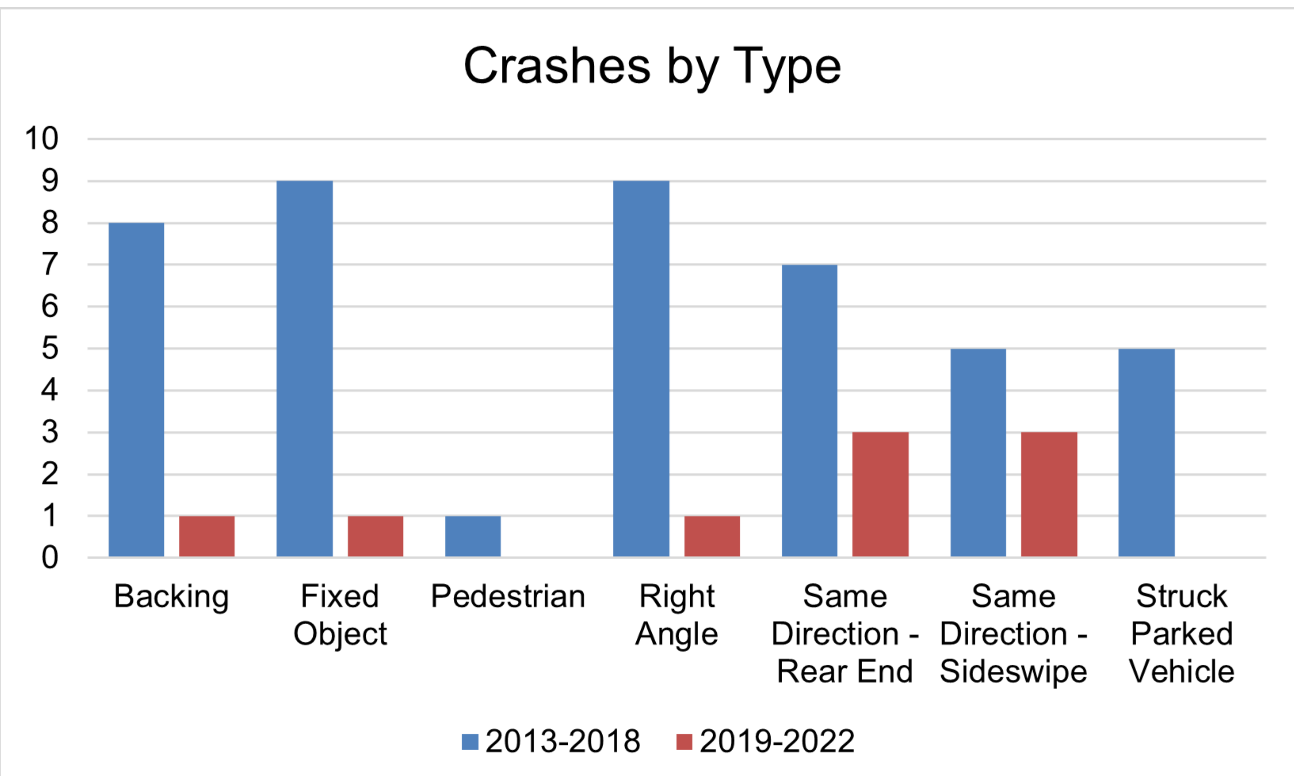


Figure 55 Graph Showing Number of Reported Crashes by Type Before and After 2019

Roadway and Light Conditions

The vast majority of crashes, 46 (86.6%), took place when road conditions were dry and during daylight (81.1%). The only reported pedestrian crash also took place during dry, daylight conditions.

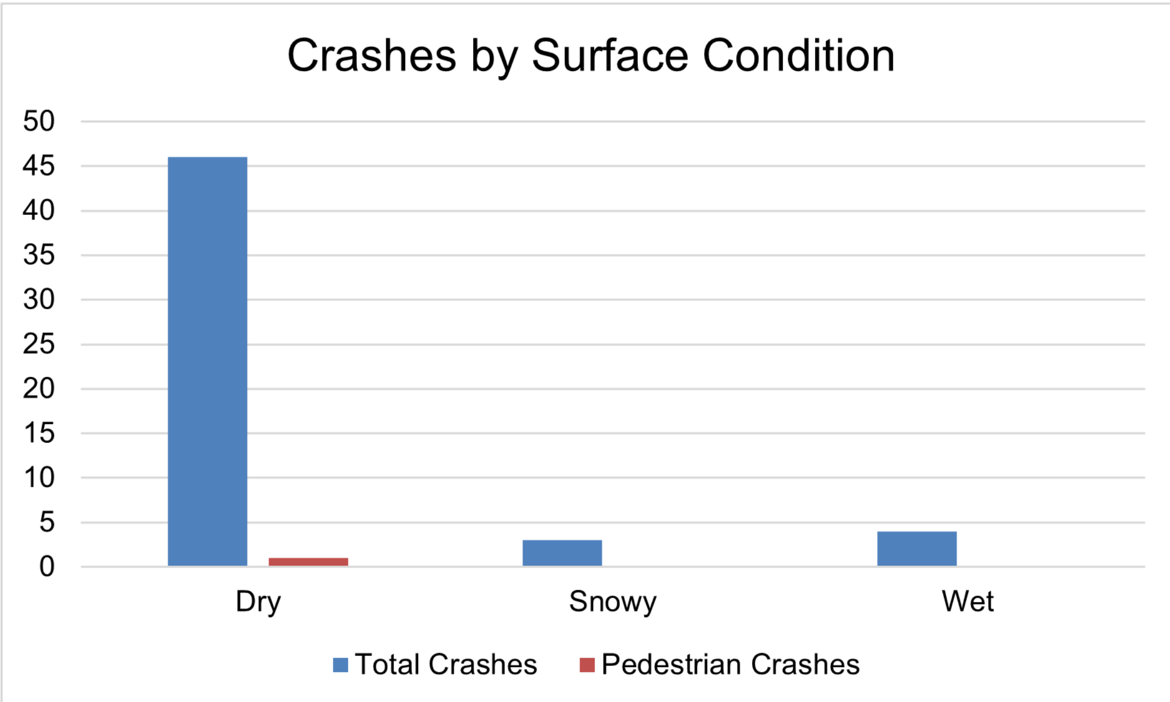


Figure 56 Graph Showing Reported Crashes by Surface Condition

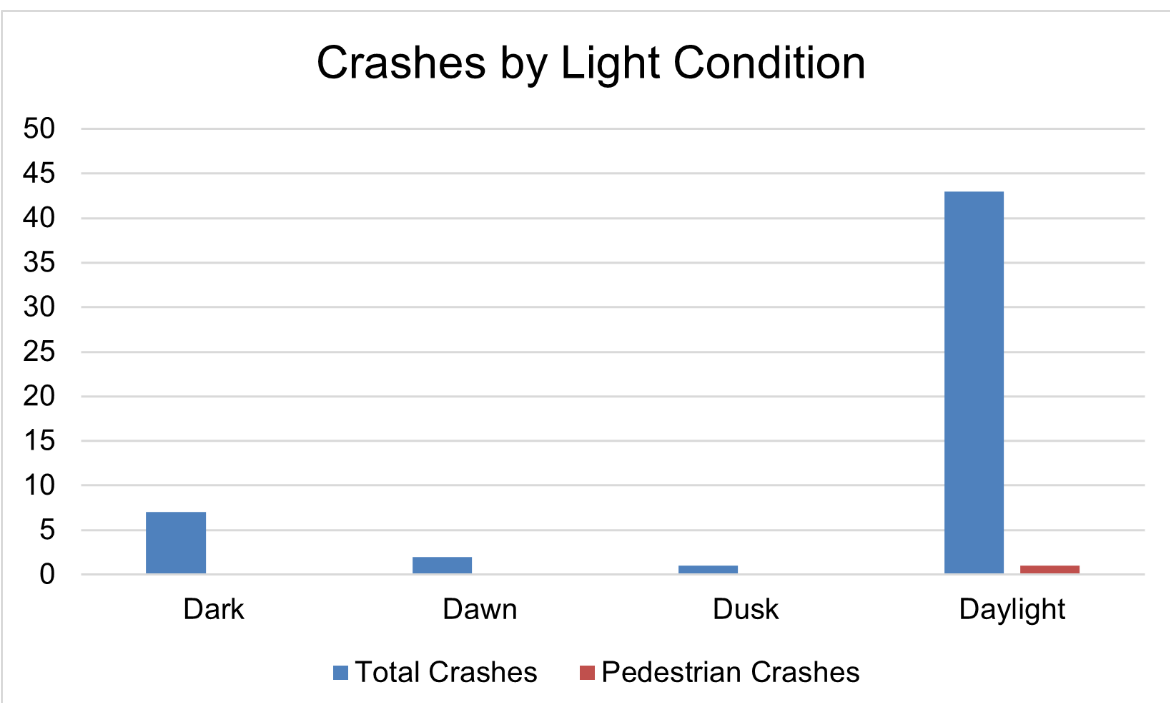


Figure 57 Graph Showing Reported Crashes by Light Condition

Bloomfield Avenue, Montclair

Case Study Location & Surrounding Context

Bloomfield Avenue (CR506) is an important commercial corridor with heavy pedestrian traffic in Montclair, Essex County. The focus of this case study is the "Five Corners intersection" – where South Fullerton Avenue, North Fullerton Avenue, Church Street, Glenridge Avenue, and Bloomfield Avenue all converge. For the purposes of analysis, these streets are all considered to be a part of the Bloomfield Avenue and Fullerton Avenue intersection.

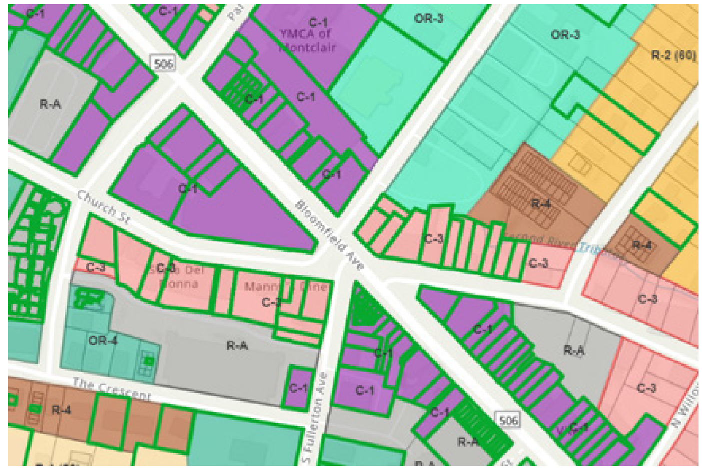


Figure 58 Montclair's Zoning Map

The area is zoned for a mix of commercial, mixed-use, and redevelopment designations. The built environment consists of primarily two- and three-story mixed-use buildings.

Bloomfield Avenue has several restaurants and shops near the intersection, including Anthropologie (women's clothing store), Sweetgreen (fast casual restaurant chain), and The Clairidge (movie theater). Glenridge Avenue, approaching Bloomfield Avenue, is zoned as commercial, being home to a series of small shops, such as nail salons, bookstores, and massage parlors. Both South Fullerton Avenue and Church Street have various shops and restaurants with some outdoor seating. North Fullerton Avenue approaching Bloomfield Avenue is zoned as OR-3 (Garden Apartment and Office Building Zone) and C-3 (Central Business Zone). Compared to the other streets surrounding the intersection, North Fullerton Avenue is more residential with offices, churches, health centers, and banks.

Figure 59 Image of the intersection of Church Street and Bloomfield Avenue (Facing west). Source: SGB, LLC

The intersection is used as both a place to pass through, whether via walking, bicycling, private motor vehicle or bus and also as a destination. The intersection is also a community gathering space. Students are heavy users of the intersection. Observations took place around the time that schools let out.

There are two bus stops at the intersection. One is the Bloomfield Avenue at North Fullerton Avenue stop (#18131) of NJ TRANSIT Route 28. The other one is the Bloomfield Avenue at Church Street stop (#18122) of NJ TRANSIT Route 34. The Church Street bus stop has a bus shelter, while the one at North Fullerton Avenue does not. In addition, the NJ TRANSIT Walnut Street Station and Bay Street Station are both located about 0.6 miles from the intersection.

Figure 60 Photo of the Bloomfield Avenue at Church Street Bus Stop, which has a bus shelter. Source: SGB, LLC

Local Complete Streets/Vision Zero Policy

The Township of Montclair adopted a Complete Streets Policy on October 6, 2009. In June 2017, the Montclair SAFE (Streets Are For Everyone) Complete Streets Implementation Plan was finalized, and in 2022, it was adopted into the Master Plan. The SAFE Plan is a policy and planning guide to help implement the Township's Complete Streets policy and build on the goals and objectives of the Townships' Circulation Plan. The purpose of the SAFE Plan is to support and advance Complete Streets efforts so that streets are designed to encourage safe driving, bicycling, and walking.

A resolution to create a Vision Zero Task Force was adopted by the Montclair Township Council during the May 16, 2023 Council Meeting, and took effect on June 13, 2023 upon the appointment of the Task Force's members. The Task Force will update Montclair's Complete Streets Plan and develop recommendations around high-crash corridors and intersections. The goal is to have a new Complete Streets Plan, an official Vision Zero Task Force report, and to eliminate all crashes by the end of 2028 .

Figure 61 Aerial of the land use within .25-miles of the intersection, shown with a red circle. Source: Google

Roadway & Intersection Characteristics

Bloomfield Avenue is also known as County Route 506, and has a speed limit of 25 miles per hour. It is part of the "Five Corners intersection." This intersection's irregular geometry and complexity, was the main impetus for the roadway improvements in 2022. Figure 62 shows the intersection before improvements, while Figure 63 and the following table explain the roadway characteristics after improvements were made in detail.

Figure 62 An aerial screenshot of the intersection from March 2021. Source: Google

Figure 63 An aerial screenshot of the intersection in April 2022, after improvements were made. Source: Google

	Explanation of Roadway and Intersection Characteristics for Figure 63	
1	North and South Fullerton Avenue both have one lane in each direction, with a dedicated right turn lane. On-street parking is provided beyond the intersection.	
2	Bloomfield Avenue is striped with two travel lanes in each direction. Left turns are not permitted, which simplifies and limits a potentially hazardous turning motion.	
3	West of N/S Fullerton Avenue, Bloomfield Avenue has on-street parking on the north side, which can act as protection from vehicle collisions for pedestrians on the sidewalk.	

	Explanation of Roadway and Intersection Characteristics for Figure 63	
4	West of N/S Fullerton Avenue, Bloomfield Avenue has a bus stop with a shelter. The stop is identified via pavement markings on the south side of Bloomfield Avenue. To the west of the bus stop, there is on-street parking.	
5	Church Street and Glenridge Avenue are both one-way streets that carry traffic away from the Bloomfield Avenue intersection. Glenridge Avenue was originally one-way towards the intersection, but this was changed as part of an infrastructure project to improve traffic flow. Both Church Street and Glenridge Avenue have on-street parking on one side.	
6	Glenridge Avenue has a buffered two-way cycle track along the right side of the road. The buffer creates distance from the bicyclist and the motorist, improving safety.	

Figures 64-69 Images of pedestrian countermeasures at Bloomfield Avenue intersection. Source: SGB, LLC

Project Details & Countermeasure Implementation

Improvements to this intersection are part of a larger project to improve safety and overall operations at twelve intersections along Bloomfield Avenue and nine intersections along Park Avenue. Essex County received a $9,685,049 grant from NJTPA via the Federal Highway Administration's Local and Rural Road Safety Program.

The total project cost was $7.4 million for 12 intersections along the 1.2-mile corridor, plus $1.5 million for construction inspection. Construction started in July 2021 and was finished in November 2022. The project includes the 1.2-mile section beginning at the intersection of North Mountain and South Mountain Avenues and extending to the intersection of Maple Avenue and Pine Street.

Countermeasures at Intersection

The main countermeasures that were implemented include ergonomic crosswalks and curb extensions to shorten pedestrian crossing distances and times. There are also new signal poles and overhead traffic lights with LED bulbs, as well as new pedestrian signal heads with countdown timers and a pedestrian scramble phase that allows pedestrians to cross simultaneously in all directions. Split phasing, where the traffic signal for a single street is divided into separate signal phases, was implemented on Fullerton Avenue, and backplates were installed on traffic lights for increased signal visibility.

Countermeasure Details

Figure 70 and the following table explain the pedestrian countermeasures at the intersection in detail.

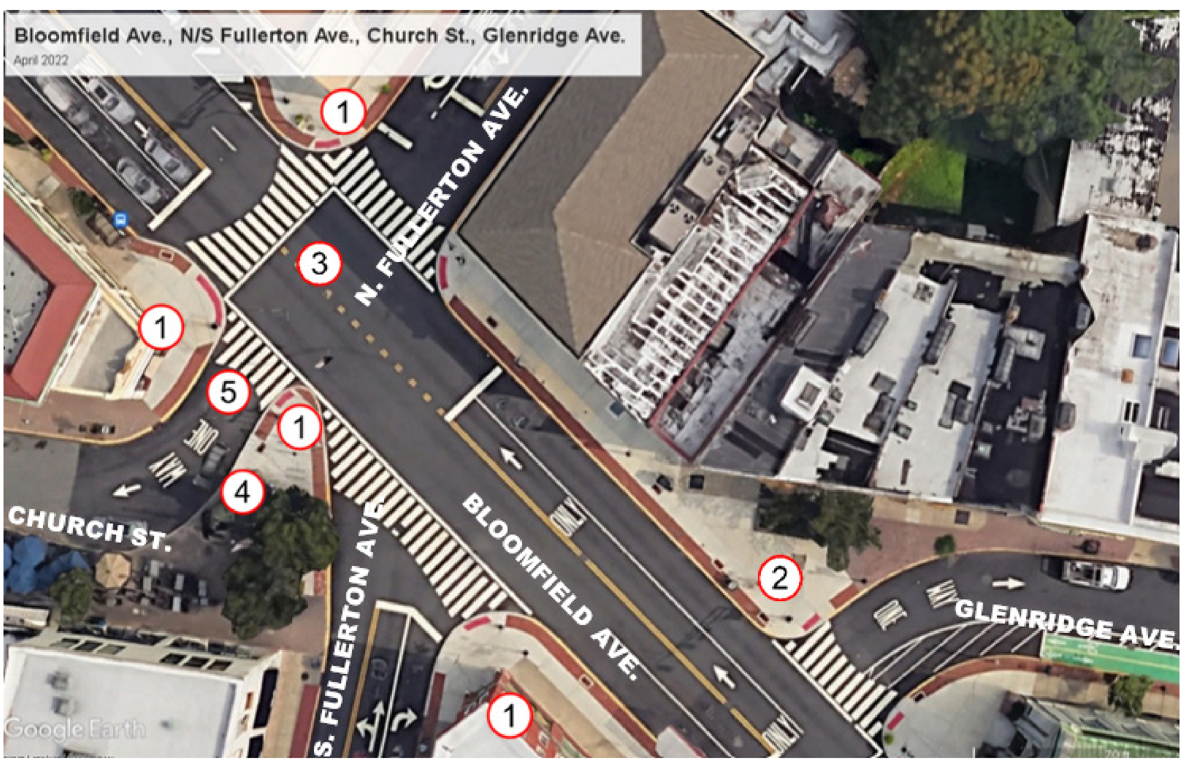
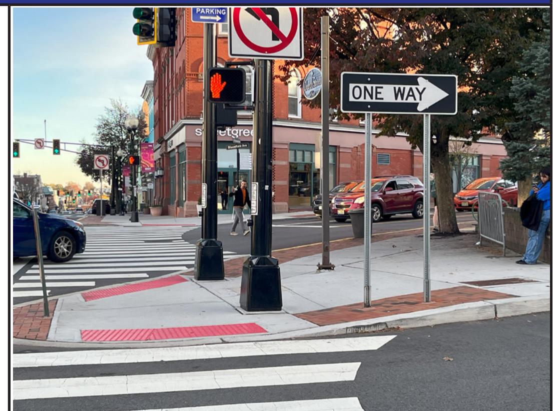


Figure 70 Screenshot of the intersection from April 2022. Source: Google

	Explanation of Countermeasures from Figure 69	
1	Curb extensions were added to shorten crossing distances and times.	
2	Glenridge Avenue has a small protected area with textured pavement and bicycle parking.	
3	Ergonomic crosswalks were added at the intersection. These crosswalks reflect how people actually cross the street and can help address non-standard intersection geometry, especially in areas with high levels of pedestrian traffic.	
4	Pedestrian push buttons change pedestrian signals, which allow pedestrians to cross the street more safely.	

	Explanation of Countermeasures from Figure 69	
5	Pedestrian signal heads with countdown timers notify pedestrians how much time they have to cross the street before the signal changes.	

Figures 71-75 Images of pedestrian countermeasures at Bloomfield Avenue intersection. Source: SGB, LLC

Traffic Volume

Essex County's automatic traffic monitors have the ability to record traffic volumes. While no project-specific traffic metrics have been monitored for the Bloomfield Avenue project, the County has traffic data for Bloomfield Avenue. Traffic counters set up at the intersection monitored vehicular traffic volumes over a period of three days, from December 12 to December 14, 2023. The average daily volume over this three-day span was 23,868. The AM peak was found to maintain lower volumes over a longer duration when compared to the PM peak, which showed a more pronounced increase and decrease in traffic volume. The AM peak hour was between 7:00 and 8:00 a.m., averaging 1,042 vehicles for both directions of travel. The PM peak hour was between 7:00 and 8:00 p.m., averaging 2,007 vehicles for both directions of travel.

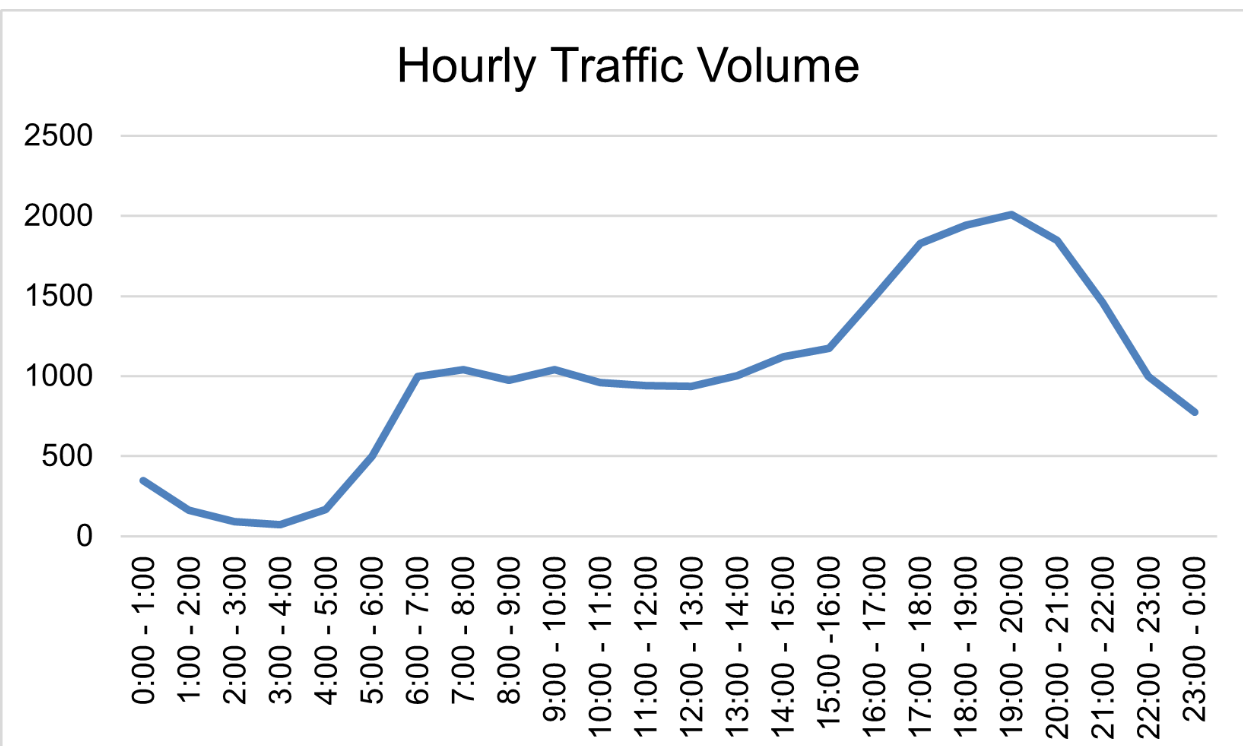


Figure 76 Graph of average hourly vehicular traffic volume from 12/12/23 to 12/14/23 at Bloomfield Avenue intersection. Source: Essex County

Crash Analysis

This crash analysis for the intersection of Bloomfield Avenue and Fullerton Avenue is based on data obtained from NJDOT Safety Voyager, from 2013 to 2022. The analysis compares total reported crashes and pedestrian crashes, as well as temporal trends. Because the improvements along Bloomfield Avenue were completed in 2022, no before and after comparisons can be made at this time. That being said, this intersection saw the most total crashes, as well as the most pedestrians involved in crashes, of the three case studies. This relatively high volume of crashes signals that safety improvements to the intersection were warranted.

Crash Map

Reported crashes were primarily concentrated at the complex intersection where Bloomfield Avenue, Fullerton Avenue, Church Street, and Glenridge Avenue meet. Over two-thirds of crashes, 165 of the 241 (68.4%), were clustered at the intersection, of which 10 involved 12 pedestrians and one involved a bicyclist. The immediate area outside of the intersection along Bloomfield Avenue saw an additional 48 crashes to the west of the intersection (including two pedestrian crashes) and an additional 29 crashes to the east.

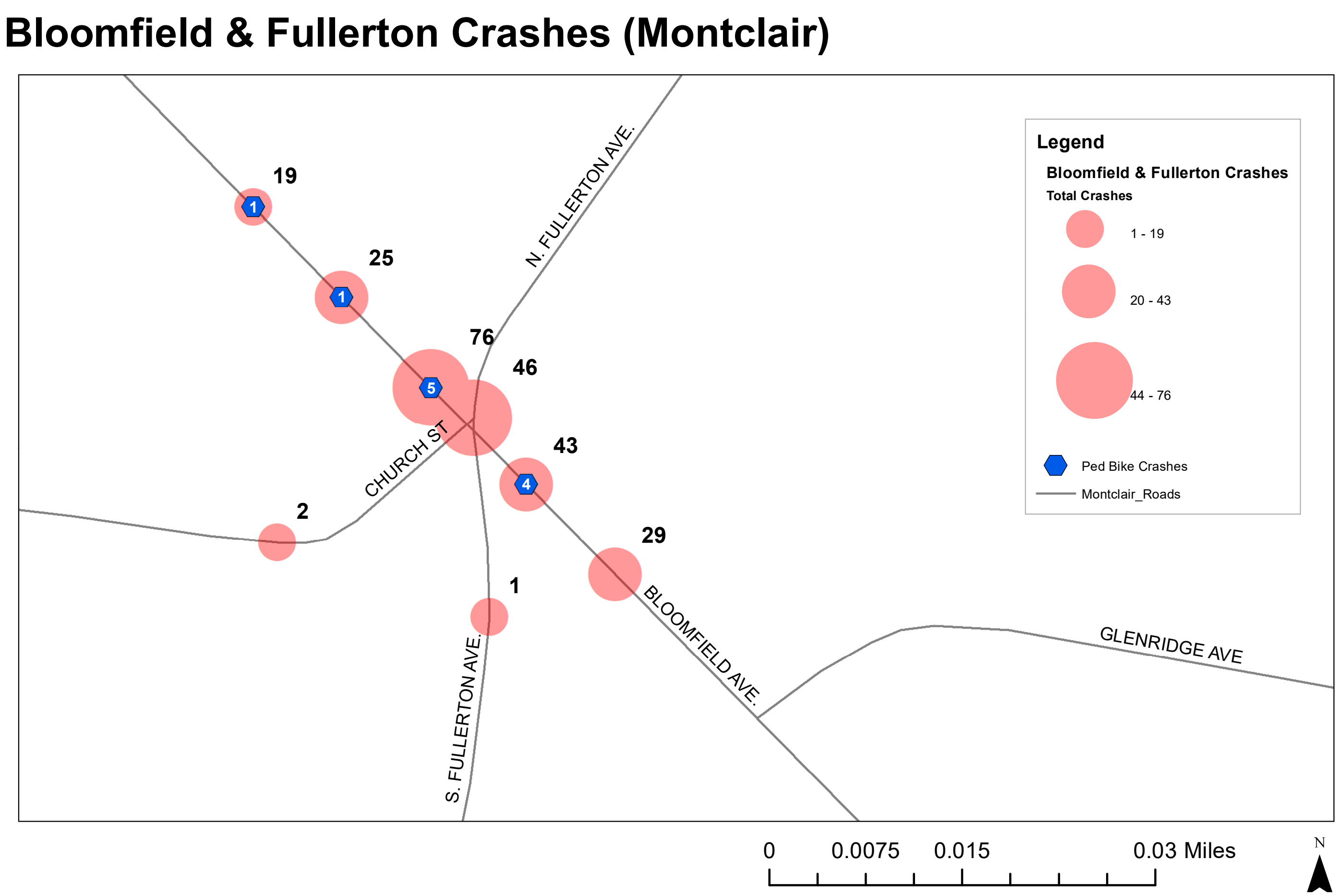


Figure 77 Map of reported crashes at intersection of Bloomfield Avenue intersection. Source: Safety Voyager

Trends Over Time

There were 241 reported crashes at the intersection from 2013 to 2022, 10 of which involved 12 pedestrians, and one of which involved a bicyclist. Total crashes peaked in 2015 at 36 crashes, while the number of pedestrian crashes peaked in 2019 at three, involving a total of five pedestrians. Of the 10 crashes involving 12 pedestrians, two pedestrians were uninjured, five complained of pain, three sustained a moderate injury, and two were incapacitated. One crash involved a bicyclist, who was not injured. Crashes resulting only in property damage made up 87.5% (211) of all crashes.

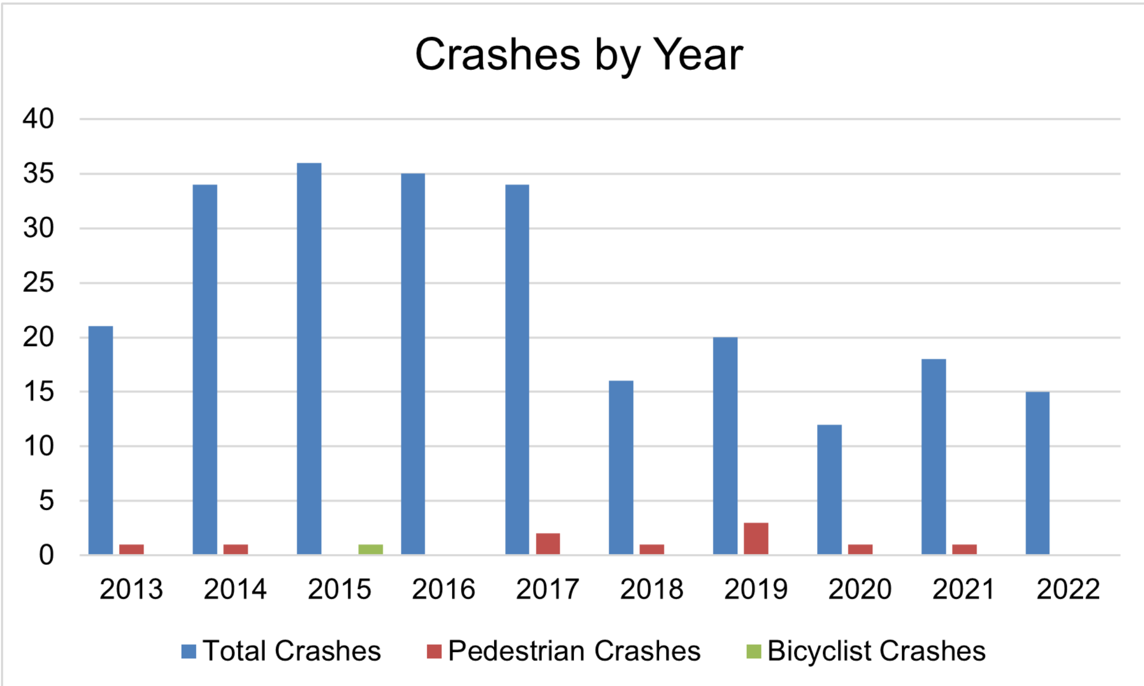


Figure 78 Graph Showing Reported Crashes by Year

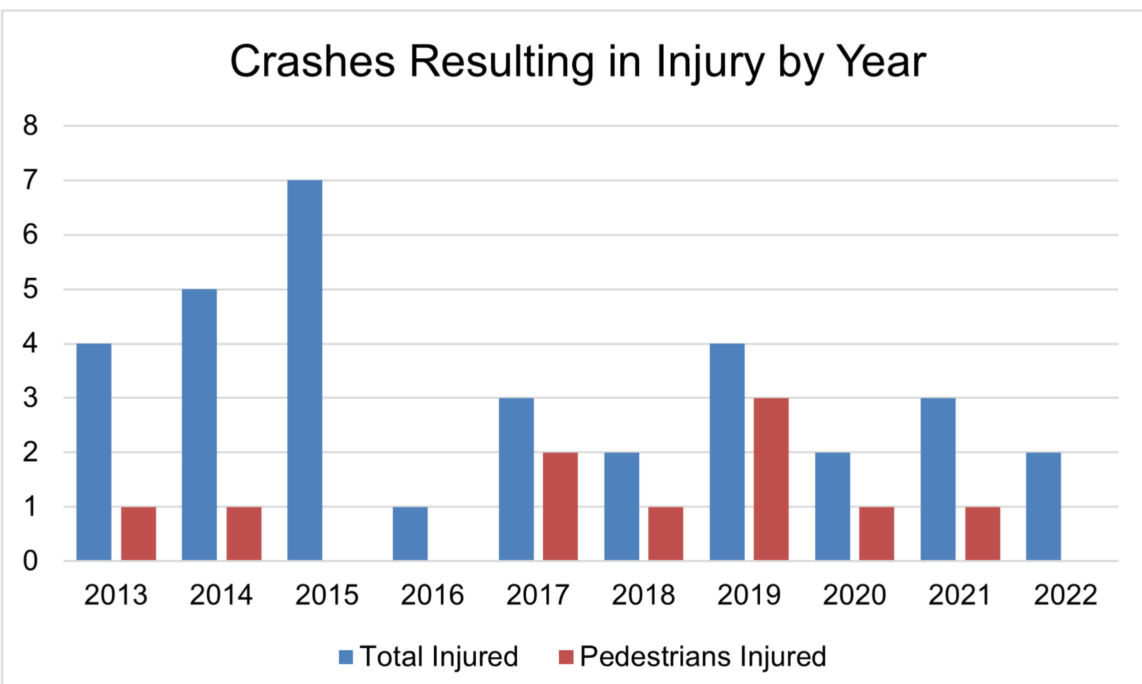


Figure 79 Graph Showing Reported Crashes Resulting in Injury by Year

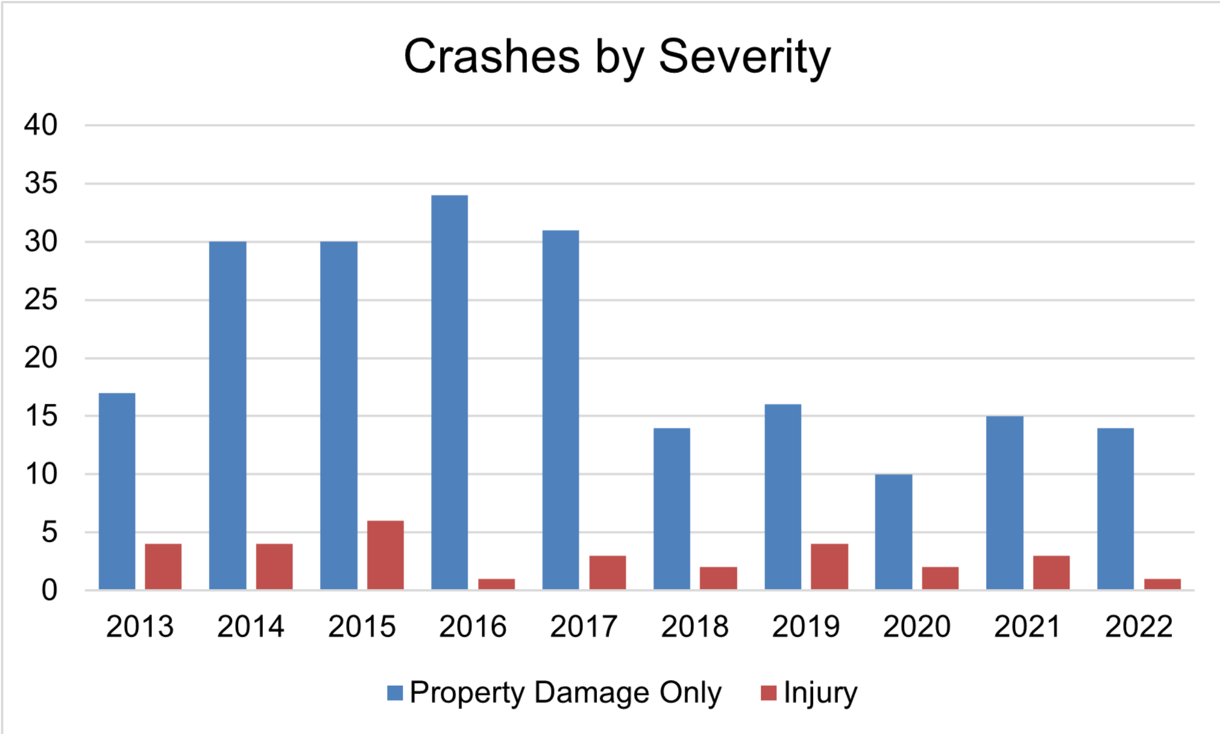


Figure 80 Graph Showing Reported Crash Severity by Year

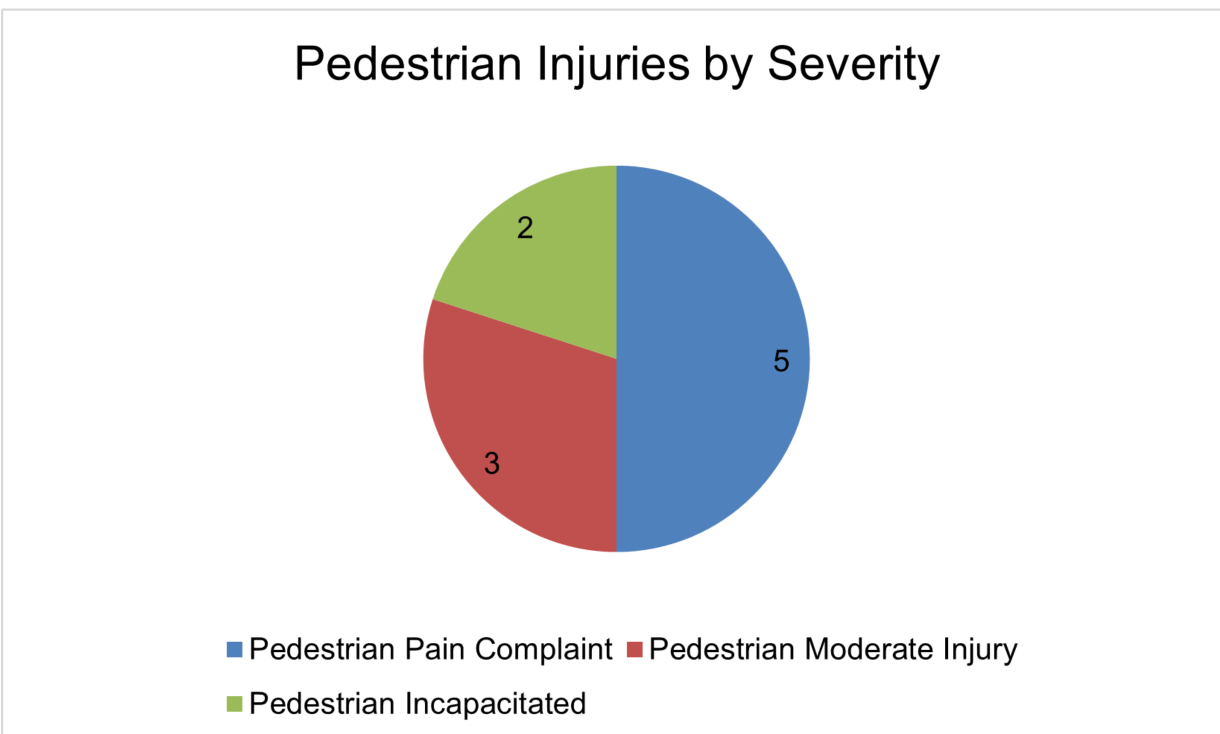


Figure 81 Graph Showing Reported Pedestrian Injuries by Severity

Crash Type

Between 2013 and 2022, there were 241 reported crashes, with sideswipes in the same direction being the most common (69 crashes, 28.6%), followed by rear end crashes in the same direction (55 crashes, 22.8%), and striking a parked vehicle (46 crashes, 19%). Of the 11 bike/ped crashes, 10 involved pedestrians, and one involved a bicyclist.

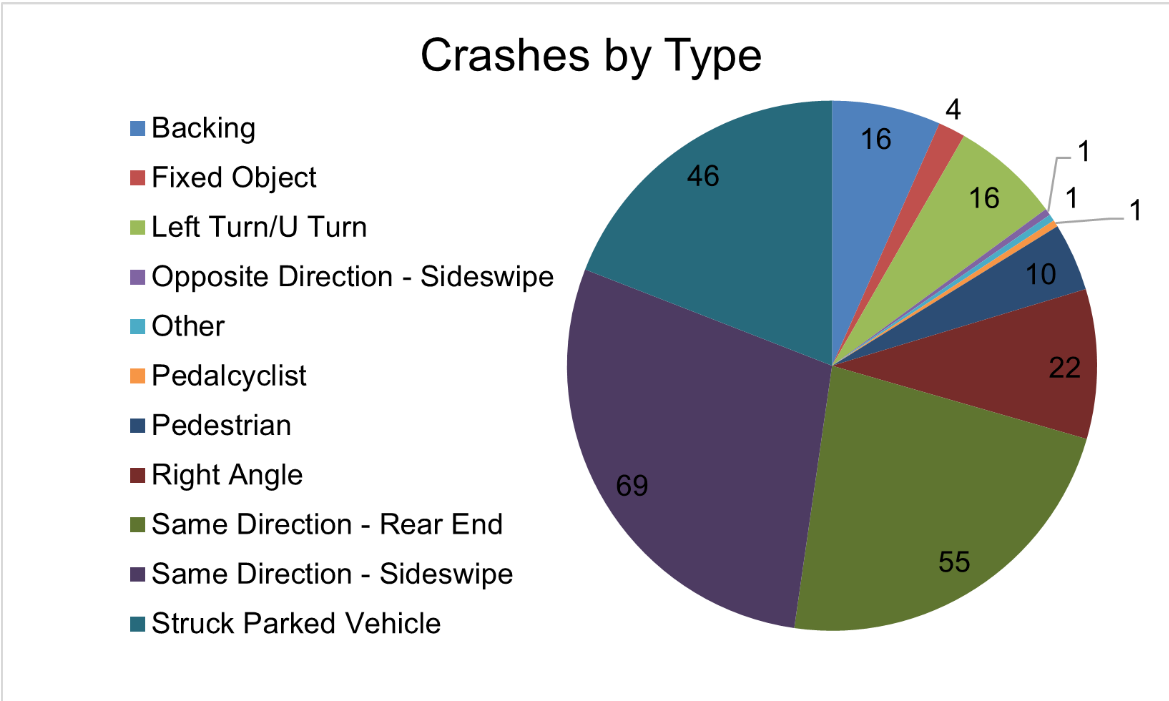


Figure 82 Graph Showing Percentage of Reported Crashes by Type

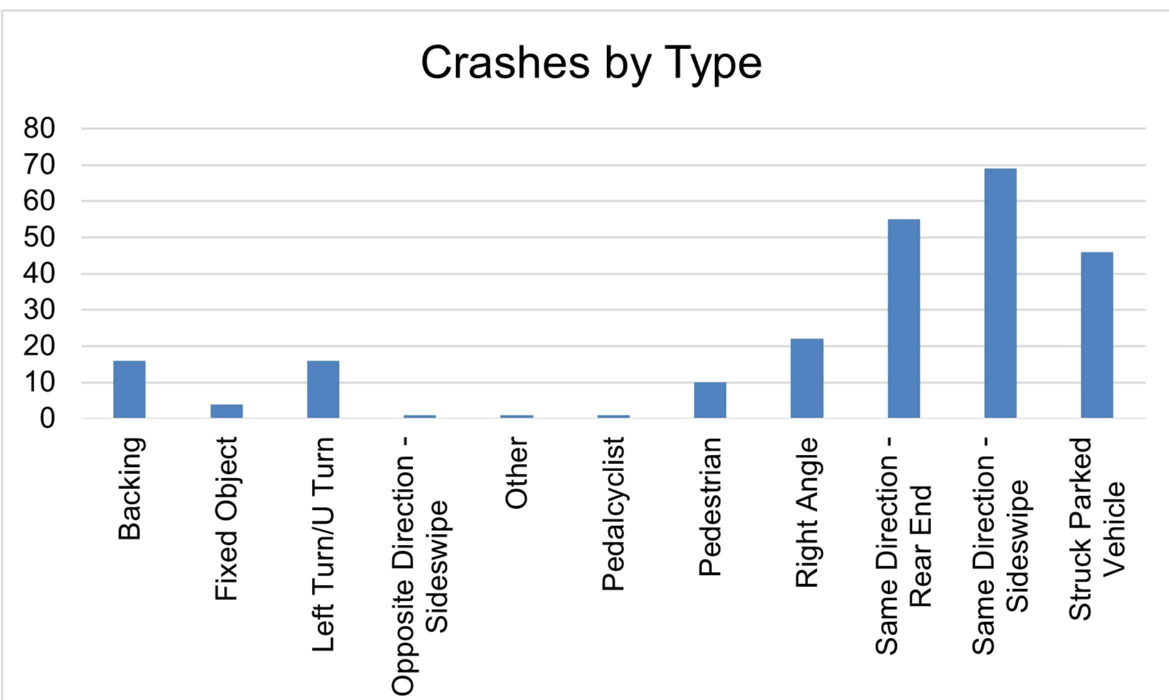


Figure 83 Graph Showing Reported Crashes by Type

Roadway and Light Conditions

The vast majority of reported crashes, 205 (85%), occurred when road conditions were dry. Eight of the pedestrian crashes also took place in dry conditions, while two took place when surface conditions were wet. The single reported bicycle crash took place when conditions were dry. Over two-thirds of all crashes, 169 (70.1%), occurred during the day, while 61 (25.3%) occurred when it was dark. Of the total 10 crashes involving pedestrians, five pedestrian crashes occurred during the day, while five occurred when it was dark. The bicycle crash took place during the day.

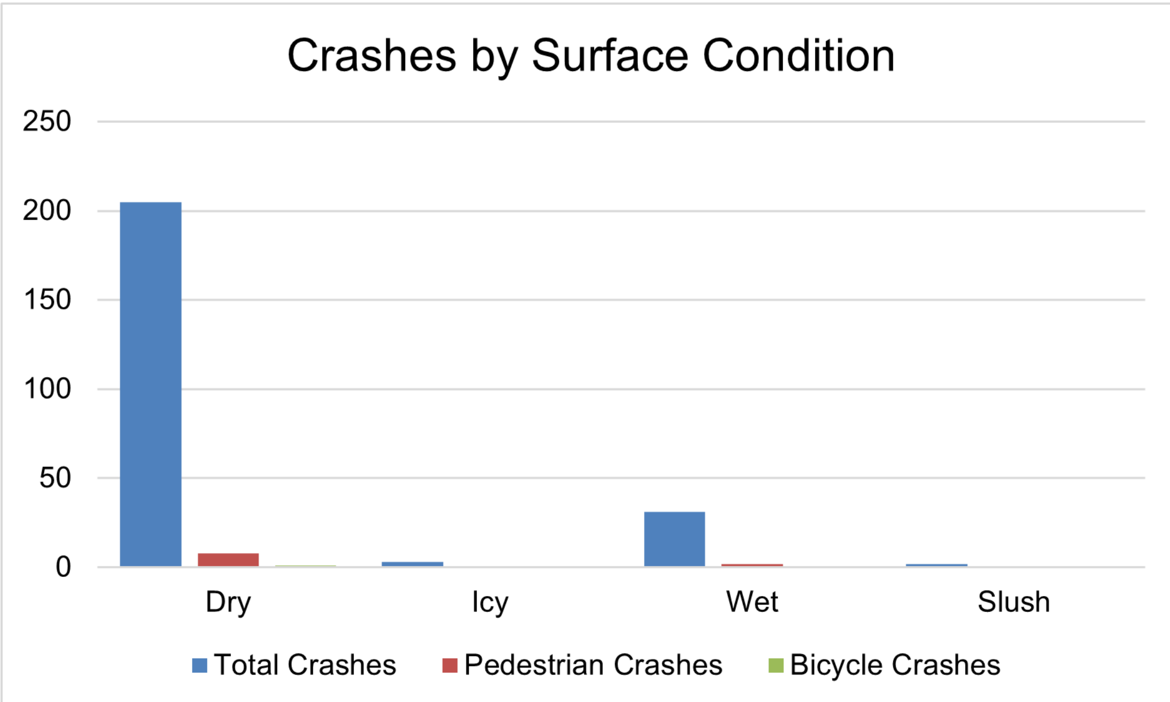


Figure 84 Graph Showing Reported Crashes by Surface Condition

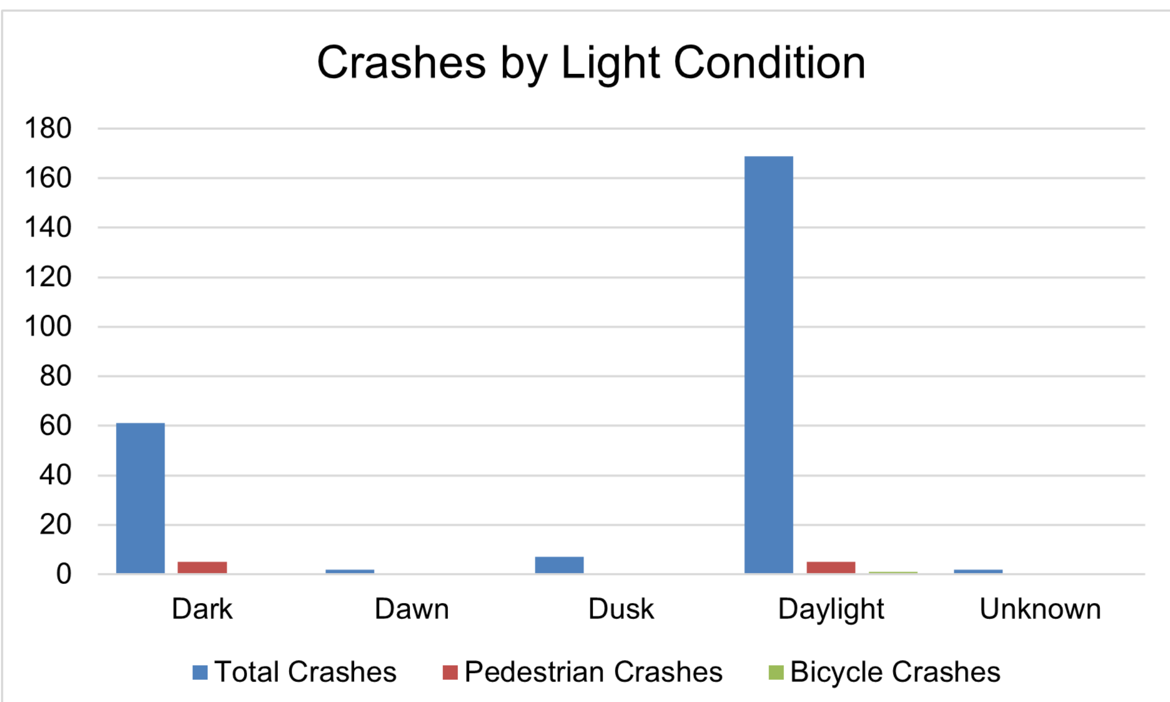


Figure 85 Graph Showing Reported Crashes by Light Condition

ENDNOTES

1. The crash statistics from New Jersey State Police are unofficial and subject to change until the associated case is completed by the NJSP Fatal Accident Investigation Unit (New Jersey State Police, 2022)

2. Bernhardt et al. (2022) explains that a crash is characterized as a pedestrian crash if one or more units involved are a pedestrian, if one or more persons are identified as a pedestrian, if the crash results in a pedestrian injury, and if the "other factor" involves a swerve or deceleration because of a pedestrian (Bernhardt et al., 2022).

3. For more information:
https://www.jerseycitynj.gov/cityhall/infrastructure/transportation_resources/trafficsafety
https://data.jerseycitynj.gov/explore/dataset/engineering-project-grand-street-street-redesign/information

4. Jersey City has since extended improvements to the portion of Grand Street west of Pacific Avenue. This segment was included in the 2018 Study, but funded separately with a 2019 NJDOT Municipal Aid grant in the amount of $2,079,311, which included more durable materials, more substantial traffic signal upgrades, sidewalk improvements, etc. The protected bike lanes now extend to Fairmount Avenue. That project was completed in 2022.

5. Proposed improvements for Washington and Barell Avenues are shown on pg. 53 of RSA. www.njtpa.org/NJTPA/media/Documents/Projects-Programs/Local-Programs/Road%20Safety%20Audits/2013-Bergen-Washington-Ave-Final.pdf

6. The Bloomfield Avenue Complete Corridor Plan, completed in April 2015, contains early conceptual improvements and additional details about the intersection. https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_5276204/File/Government/Departments/Planning%20Community%20Development/Reports_Studies/Transportation/1300703_Bloomfield_Final-Report_150403.pdf

7. More information here: https://www.njtpa.org/NJTPA/media/Documents/Newsroom/NJTPA-News/Press-Releases/FY%202017-%202018%20Safety%20Projects/lsp_essex1.pdf

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Appendix A – Table of Potential Case Study Locations

Intersection	Municipality	County	Countermeasure	Year	Road
Newark Av & 2 St	Jersey City	Hudson	Painted curb extensions w/ soft-hit posts	2017	County
Jersey Av & 6 St	Jersey City	Hudson	Painted curb extensions w/ soft-hit posts	2017/2018	Local
Grand & Grove Sts	Jersey City	Hudson	Painted curb extensions w/ soft-hit posts, bike lanes	2019/2020	Local
Washington Av & Thomas Gangemi Dr	Jersey City	Hudson	Painted curb extension, painted refuge island w/ soft-hit posts	2019/2020	Local
JFK Blvd & Pavonia Av	Jersey City	Hudson	Hi-vis crosswalks, all-pedestrian signal phase	2022	County
Sinatra Dr & 2 St	Hoboken	Hudson	Painted chicane w/ soft-hit posts	Before 2022	Local
Main Av & Madison St	Passiac	Passiac	Pedestrian countdown signals, hi-vis crosswalks, signage, ADA curb ramps	2015	County
Stuyvesant Av	Union	Union	Streetscape improvements, ergonomic crosswalks, curb extensions, mid-block crossing	2017/2018	County
Barell & Washington Avs	Carlstadt	Bergen	HAWK signal, hi-vis crosswalk	2018/2019	County
Shore Rd & Monroe Av	Linwood City	Atlantic	Rectangular Rapid Flashing Beacons (RRFB)	Fall 2021	Local
Chapel & Hanover Avs	Cherry Hill	Camden	RRFB, hi-vis crosswalk, ADA curb ramps, 5ft bike lanes, reduced lane width, parking lane	2021	County

Appendix A – Table of Potential Case Study Locations

Bloomfield & Fullerton Avs	Montclair	Essex	Overhead traffic lights, pedestrian crosswalk signals, ergonomic crosswalks, signage	2022	County
Madison Av	Morris Town	Morris	Leading Pedestrian Interval (LPI)	2022	State

Appendix B – Before & After Google Street View Screenshots of Potential Case Study Locations

Newark Avenue & 2nd Street, Jersey City, Hudson County – September 2007 (top) & July 2022 (bottom)

Jersey Avenue & 6th Street, Jersey City, Hudson County – September 2017 (top) & March 2023 (bottom)

Grand & Grove Streets, Jersey City, Hudson County – July 2018 (top) & July 2022 (bottom)

Washington Avenue & Thomas Gangemi Drive, Jersey City, Hudson County – July 2018 (top) & July 2022 (bottom)

JFK Boulevard & Pavonia Avenue, Jersey City, Hudson County – April 2013 (top) & August 2022 (bottom)

Sinatra Drive & 2nd Street, Hoboken, Hudson County – August 2018 (top) & November 2022 (bottom)

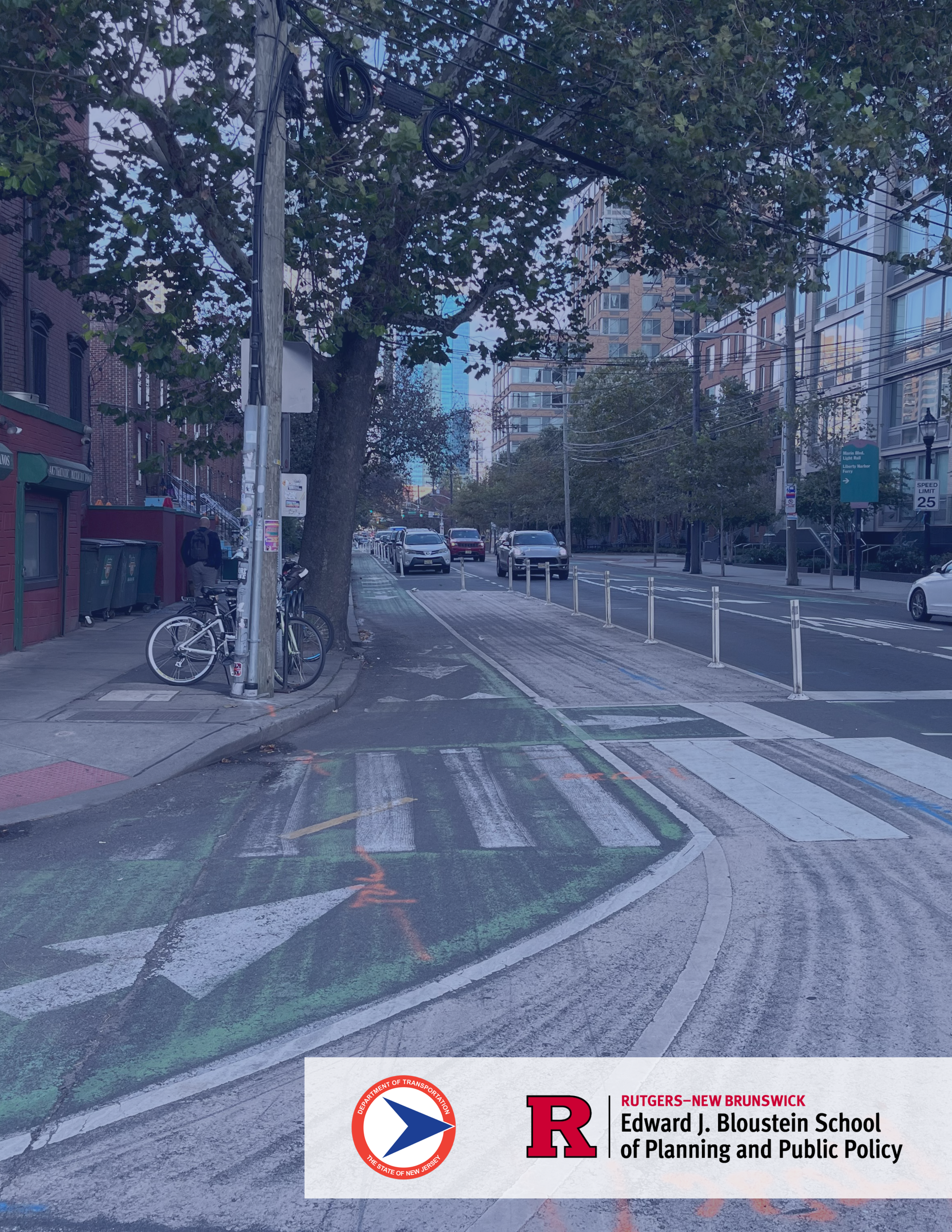
Main Avenue & Madison Street, Passaic, Passaic County – October 2014 (top) & September 2021 (bottom)

Stuyvesant Avenue, Union, Union County – August 2016 (top) & June 2022 (bottom)

Barell & Washington Avenues, Carlstadt, Bergen County – September 2018 (top) & November 2022 (bottom)

Shore Road & Monroe Avenue, Linwood City, Atlantic County – July 2018 (top) & October 2019 (bottom)

Chapel & Hanover Avenues, Cherry Hill, Camden County – August 2019 (top) & April 2023 (bottom)



DEPARTMENT OF TRANSPORTATION
THE STATE OF NEW JERSEY

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