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LOCAL ROAD SAFETY PLAN | 2023

Davis
CALIFORNIA

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RESOLUTION NO. 23-051, SERIES 2023

RESOLUTION ESTABLISHING A VISION ZERO POLICY AND GOALS TO WORK TOWARDS ZERO TRAFFIC DEATHS AND SEVERE INJURIES AND ADOPTING THE 2023 LOCAL ROAD SAFETY PLAN

WHEREAS, Vision Zero is an international movement to put an end to all severe and fatal traffic injuries using a data-driven approach to improve the engineering of roadways and by conducting targeted education and enforcement; and

WHEREAS, embracing Vision Zero through a comprehensive, multidisciplinary approach will lead to a safer community, benefitting all road users. These calmer, safer streets will bring with them a stronger sense of community; and

WHEREAS, no fatal or serious injury is acceptable on our streets because collisions are preventable incidents that can be addressed through engineering, enforcement and education; and

WHEREAS, the City's Vision Zero Policy, which is included in the Local Roadway Safety Plan, includes the following goals:

1. Make traffic safety a priority for our transportation system and allow people of all ages and abilities to safely use any mode; and
2. Ensure road safety is implemented fairly for all people; and
3. Eliminate traffic deaths and serious injuries by 2035; and
4. Reduce motor vehicle speeds and decrease collisions between people driving, riding bikes, scooting, and walking; and
5. Implement effective countermeasures and strategies; and
6. Improve the use, collection and organization of data to allow for evaluation and reporting that fosters transparency and creates trust with all stakeholders and residents.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Davis does hereby resolve as follows:

1. The City of Davis adopts a Vision Zero Policy to use a data-driven approach and implement countermeasures to eliminate traffic fatalities and serious injuries by 2035; and
2. The City of Davis adopts the 2023 Local Road Safety Plan and supports implementing the projects and programs in the plan.

PASSED AND ADOPTED by the City Council of the City of Davis on this 16th day of May, 2023, by the following vote:

AYES: Chapman, Partida, Vaitla, Arnold

NOES: None

Will Arnold
Mayor

ATTEST:

Zoe S. Mirabile, CMC
City Clerk

INTRODUCTION

The City of Davis is pleased to present its first Local Road Safety Plan (LRSP). The LRSP defines a path towards achieving the City's Vision Zero goal to eliminate traffic deaths and serious injuries by 2035. The City of Davis commits to making its roads safer through engineering, enforcement, and education. The Plan emphasizes making changes based on data evaluation to create an environment where human mistakes on our roadways do not cause death or severe injury, and protects our most vulnerable road users.

This Plan evaluates 11 years of injury collision data between 2009 and 2019 to better understand who is getting in collisions, when collisions are occurring, what types of collisions are occurring, and where collisions are occurring. This plan also includes a brief overview of 2020 collision data. Due to the COVID-19 pandemic impacts, including stay-at-home orders, the total number of collisions in Davis was 55% lower in 2020 compared to 2009 to 2019. As a result, the 2020 collision dataset was not included in the overall analysis of this report, because it would affect data trends.

This report compares the Davis population with those involved in collisions to observe trends and determine if the number of collisions is overrepresented by age group or gender. This report also compares total collisions and collisions where the pedestrian, bicyclists or driver was identified as at-fault in the police report. The purpose of evaluating at-fault cases is not to point blame, but instead an opportunity for the City to develop countermeasures focused on reducing and eliminating severe and fatal collisions and improving safety within the City. Collisions are also evaluated by type, violation, and location to identify key factors and tailor recommendations to addressing these aspects.

Countermeasures to reduce and eliminate severe and fatal collisions fall within the "7 E's": engineering, education, encouragement, enforcement, evaluation, enjoyment, and equity. Both infrastructure and non-infrastructure countermeasures are important tools to reduce and eliminate severe and fatal collisions.

VISION ZERO POLICY

Vision Zero is an international movement to put an end to all severe and fatal traffic injuries using a data-driven approach to improve the engineering of roadways and by conducting targeted education and enforcement.

Vision Zero through a comprehensive, multidisciplinary approach will lead to a safer community, benefitting all road users. These calmer, safer streets will bring with them stronger senses of community.

The City of Davis recognizes that the safety of human life is our highest priority and that traffic deaths and serious injuries are preventable, a public health issue and must be addressed.

The City's Vision Zero Policy includes the following goals:

1. Make traffic safety a priority for our transportation system and allow people of all ages and abilities to safely use any mode;

2. Ensure road safety is implemented fairly for all people;

3. Eliminate traffic deaths and serious injuries by 2035;

4. Reduce motor vehicle speeds and decrease collisions between people driving, riding bikes, scooting and walking;

5. Implement effective countermeasures and strategies;

6. Improve the use, collection and organization of data to allow for evaluation and reporting that fosters transparency and creates trust with all stakeholders and residents

READING THE PLAN

Reading this plan from start to finish will give the fullest understanding of existing conditions and our approach. In addition to the full report, there is a graphic Executive Summary, which includes key takeaways and highlights from this report. The Executive Summary can be found at the City of Davis website and in **Appendix A – Executive Summary.**

SAFETY ANALYSIS

The report includes an analysis of existing conditions and historical trends that provide a baseline level of collisions involving fatalities and serious injuries. This report includes the location of the collisions and the severity of the collisions, as well as contributing factors and collision types by pedestrians, bicyclists, and drivers. The report also includes an analysis of high-risk locations.

TERMS

Some terms used in this report may be unfamiliar and definitions can be found in Appendix B. The terms "KSI" and "Not KSI" are used throughout this report and refer to the severity of the collision. "KSI" means killed or severely injured and "Not KSI" is defined as complaint of pain or visible injury (see **Appendix B – Definitions** for definitions of terms). The data is broken out by severity of injury to better understand trends of who is involved, when, what type, and where severe and fatal collisions occur and develop engineering, enforcement and education countermeasures to make progress toward the Vision Zero goal and eliminate these types of collisions. Throughout the report figures, Not KSI or total collisions are identified in dark blue, while KSI collisions are identified in orange.

Figure 1: Covell Boulevard near J Street (image courtesy of the City of Davis).

ACCIDENT VS. COLLISION

The best practice is to **not** use the word **accident** when describing a **crash or collision**. Accident implies that no one is at-fault and the events are outside human influence or control. Instead, staff will commit to using the words incident, crash, or collision. This decision is in line with the National Highway Traffic Safety Administration in declaring that the word "accident" will no longer be used in materials it publishes, in speeches or other statements or in communications with the media and others.

ENGAGEMENT AND COLLABORATION

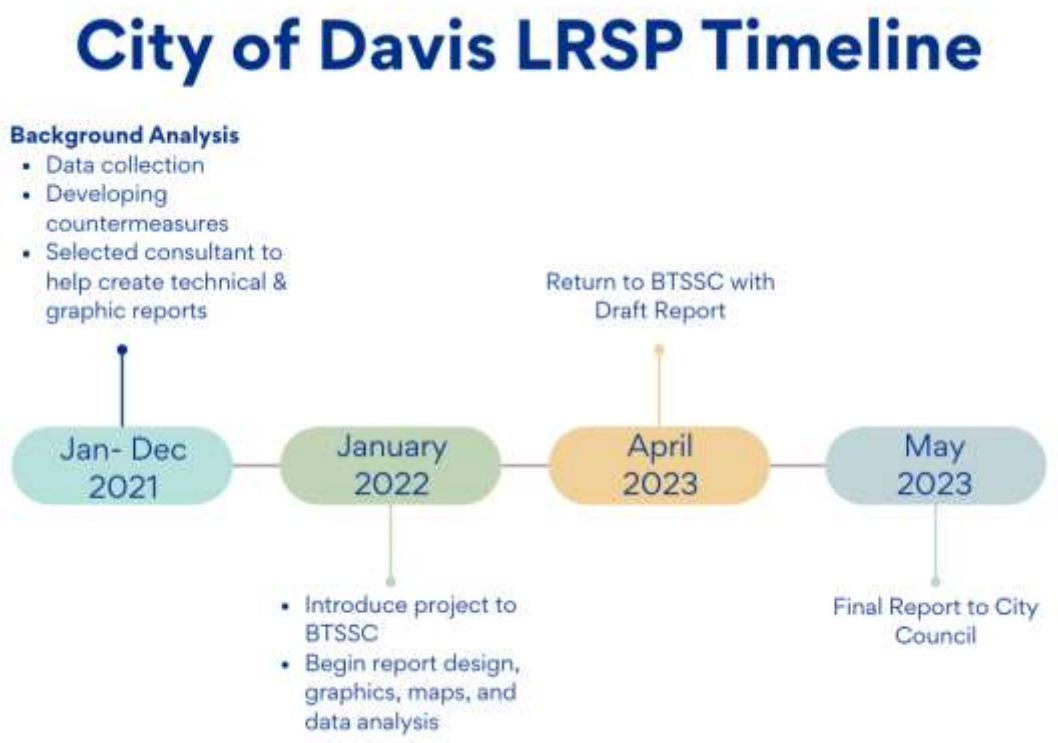


Figure 2: City of Davis LRSP Timeline.

In January 2022, Public Works Engineering and Transportation Staff presented the planning process for this plan to the Bicycling, Transportation, and Street Safety Commission (BTSSC). Staff shared the project timeline (see **Figure 2**) and the plan for future engagement. Staff will return to the BTSSC in spring 2023 with a draft LRSP, which will include data for review and feedback. The plan will be brought to City Council for approval and implementation in 2023.

POLICY AND PROCESS CHANGES

This report includes an assessment of current policies, plans, and guidelines that identify opportunities to improve how processes prioritize transportation safety. The plan discusses implementation through the adoption of revised policies to achieve the City's Vision Zero goal.

STRATEGY AND PROJECT SELECTION

This report identifies a comprehensive set of projects and strategies, shaped by data. These strategies and countermeasures focus on a Safe Systems Approach, effective interventions and consider multidisciplinary activities. To the extent it was practical, data limitations are identified and mitigated. The list of projects and strategies (see Recommendations) is prioritized to provide time ranges for when the strategies and countermeasures will be deployed (short-term, mid-term, and long-term timeframes).

PROGRESS AND TRANSPARENCY

The City reports all fatal and serious injuries annually and posts collisions online on the Traffic Data Map. This map can be found by searching for the Traffic Data Map on the City website. The City plans to update the full report at least every five years.

WHAT IS A LOCAL ROAD SAFETY PLAN?

A Local Road Safety Plan (LRSP) is an analysis of collision patterns and the associated factors that these collisions had in common for all collisions on local roads in the City of Davis over the last 10 years. Understanding these factors will help prioritize programs and projects with the goal of reducing or eliminating traffic collisions while increasing safe, healthy, and equitable mobility for all. This plan, first and foremost, is an engineering report that recommends transportation infrastructure improvements to eliminate all severe and fatal traffic injuries. These engineering efforts are supported by public awareness, education, and traffic enforcement.

The LRSP is a fundamentally different way to approach traffic safety, representing a shift from traditional roadway safety principles. For example, traditional roadway safety attempted to eliminate all collisions by modifying human behavior. The new Safe Systems Approach refocuses roadway design and operations on anticipating human mistakes and lessening impact forces to reduce collision severity and save lives.

WHY THIS LRSP IS IMPORTANT

The City has developed the LRSP as a tool for City planners, engineers, the BTSSC, City Council and the community to understand collision patterns in the community and determine which transportation projects to prioritize and construct in order to address them. The LRSP reveals locations where collision trends occur. These high collision intersections and road segments are consolidated, organized, and prioritized in this Plan to provide project information for a variety of users. This information may be used to acquire funding, prepare additional documents, or spur Capital Improvement Projects.

In addition, several state and federal grant programs now require local jurisdictions to have an LRSP for grant funding eligibility. This LRSP will allow the City to apply for Safe Streets for All (SS4A) funding, Highway Safety Improvement Program (HSIP) funding, Caltrans Active Transportation funding and other funding sources. This data-driven plan also provides much needed information about collisions to strengthen grant applications for road safety improvements.

HOW THE LRSP ALIGNS WITH OTHER CITY PLANS AND POLICIES

The LRSP focuses on how streets are designed and used and rethinks design to provide room for human behavior. With the responsibility of road safety shifting from the roadway user to the designer, it is important to understand who is designing Davis streets, what the approval process consists of and what City plans and policies inform these decisions. Examining the process of how streets are designed and the current policies in place can help City officials determine what changes can be implemented to eliminate severe and fatal collisions.

ROADWAY IMPROVEMENTS IDENTIFIED IN PLANNING DOCUMENTS

Existing infrastructure may be adjusted through several processes including redesign and reconstruction. In no specific order, they are:

2014 SAFE ROUTES TO SCHOOL WALK BIKE AUDIT REPORT (WBAR) AND 2014 BICYCLE ACTION PLAN (BAP)

The City has several planning documents that identify improvements to existing infrastructure. The **2014 Safe Routes to School Walk Bike Audit Report** (WBAR) and **2014 Bicycle Action Plan** (BAP) both identify potential infrastructure projects as well as education and encouragement programs that could improve safety. The WBAR evaluated 11 school sites and worked with community partners to understand existing conditions and recommendations for improvements, including over 100 infrastructure improvement recommendations. The Bicycle Action Plan also includes a map with many proposed infrastructure improvements.

CORRIDOR STUDIES

Proposed land-use projects that significantly impact existing transportation corridors require developers to evaluate impacts and prepare a corridor study. Corridor studies include proposed improvements to intersections and the overall corridor. During the planning phase, the City and developer determine what improvements from the plan will be funded by the developer and will be completed by the City. These plans tend to be conceptual at first, then are refined by a transportation engineering consultant before eventually being approved by the City.

In addition to corridor studies initiated by development projects, some corridor studies are the result of the City prioritizing a corridor for improvement. For example,

Mace Boulevard, Covell Boulevard, Anderson Road, and Russell Boulevard are examples of City-led corridor planning efforts.

WHAT WE ARE DOING NOW

The development of a LRSP and Vision Zero policy is not the only endeavor currently undertaken by the City to improve traffic safety. The efforts listed below are occurring in tandem and reflect the cohesive support and broad approach to the City of Davis Local Road Safety Plan.

MAJOR TRAFFIC SAFETY PROJECTS

The City is already working to improve safety of many corridors. Street Safety Capital Improvement Projects are in various stages of planning and construction on Anderson Road, Fourteenth Street/Villanova Drive, Russell Boulevard, and Fifth Street. More information can be found at https://www.cityofdavis.org/city-hall/improvement-projects.

ACTIVE TRANSPORTATION AND SAFE ROUTES TO SCHOOL PROGRAMS

The City provides bike education to all residents through a free, online bicycle education program, Cycling Savvy. To learn more about the free bike education class or to sign-up, go to www.cityofdavis.org/bikes and select "Cycling Savvy Free Bike Education Class." The Active Transportation Program also promotes bicycle safety by distributing bike lights at events to encourage people to be more visible on roadways.

The City also provides Safe Routes to School bicycle education events and assemblies at all Davis Joint Unified School District schools. Currently, the City and the school district are making improvements to the Safe Routes to School bicycle education program by developing a plan to shift bike education from after-school bike events to in-class bike education training. In addition, the City and school district are working together to expand the Safe Routes to School Program beyond the current elementary schools to focus on all elementary, junior high and high schools.

POLICY FOR INSTALLING CROSSWALKS

The City is in the process of drafting a crosswalk policy that will benefit all road users. The policy will provide a method for evaluating the operation at a new or existing crosswalk and recommending additional enhancements such as removal of parking,

or the placement of a rapid rectangular flashing beacon (RRFB). The crosswalk policy will also include criteria for evaluating crossing guard locations.

RESIDENTAL TRAFFIC CALMING

One of the most common concerns expressed to the City is speeding in residential neighborhoods. The City's Traffic Calming Program works with residents to help reduce traffic speeds through a combination of infrastructure treatments, education, and enforcement. Annually, the City budgets $100,000 to fund traffic calming improvements in neighborhoods. In 2022, the City installed speed humps along several streets including L Street, Radcliffe Drive, Oak Avenue, and Arroyo Avenue. The City recently adopted a Traffic Calming policy that identifies the process and prioritization of future speed hump locations.

WHERE IS THE DATA FROM?

Safety data for this report was compiled at both national and local levels for comparison. National data was gathered from the National Highway Traffic Safety Administration and the Governors Highway Safety Association, while City of Davis data was collected from the Statewide Integrated Traffic Records System (SWITRS) and established roadway data owned by the City.

NATIONAL DATA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)

According to the National Highway Traffic Safety Administration (NHTSA), the number of pedestrian and bicyclist fatalities in the U.S. has steadily increased since 2009[1]. Between 2009 and 2018 nationally, pedestrian fatalities increased by 53%and bicycle fatalities increased by 37%. Comparatively, total traffic fatalities saw an 8% increase during the same period. Together, people on bikes and pedestrians accounted for 20% of all fatalities in 2018, up from 14% in 2009.

NHTSA report findings state that between 2009 and 2018, pedestrian fatalities increased by 69% in urban areas and increased by 0.1% in rural areas. During this same period, bicyclist fatalities increased by 48% in urban areas and decreased by 8.9% in rural areas. Overall, nearly 50% of pedestrians and about 38% of bicyclists are killed in urban areas at non-intersection locations across the U.S.

The NHTSA report found that while intersections are common locations for pedestrian collisions, more pedestrian and bicyclist fatal and injury collisions were observed at non-intersection locations (along segments) in both rural and urban areas.

Data from the NHTSA report reveals that the number one type of collision leading to fatalities and injuries for bicyclists involves motorists overtaking bicyclists from behind. As reported nationally, this type of collisions led to 28% of all U.S. bicyclist fatalities. As with all collision types, there may be variation in observed trends by agency. Other common collisions in urban areas occur at signalized and other intersections that lack traffic controls, such as crossing the uncontrolled leg of a two-way stop-controlled intersection. In addition, frequent

[1] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/14046-pedestrian_bicyclist_safety_resources_030519_v2_tag.pdf

collision types involve motorists turning left or right across the paths of bicyclists who are on a parallel path or involve bicyclists riding out from stop-controlled side streets where the motorist faces no traffic control.

For pedestrians, the number one type of collision involves pedestrians crossing the street and a through-traveling vehicle colliding at both intersection and non-intersection locations. NHTSA states that this collision type resulted in 22% of fatalities or serious injuries. In 80% of those collisions, there is no traffic control present (i.e., no stop sign or signal) for the motorist.

NHTSA states that the above types of collision patterns and conditions are especially prevalent at night or at other times and locations where pedestrians and bicyclists are difficult for motorists to see. Around half of all bicyclist fatalities and more than three-fourths of pedestrian fatalities occur at night, dawn, or dusk. Data from Fatality Analysis Reporting System (FARS) show that the percentage of pedestrians who were killed in nighttime collisions has increased steadily over the past 10 years.

GOVERNORS HIGHWAY SAFETY ASSOCIATION

The Governors Highway Safety Association's, *2018 Pedestrian Traffic Fatalities by State Report* stated that in 2018 more than half of all pedestrian fatalities (59%) occurred on non-freeway arterials, which are the main roads that carry local and regional traffic through communities. The second largest category was collectors and local streets (22%), which typically serve residential areas and downtown traffic. The Report also found that alcohol impairment by either the driver and/or pedestrian accounted for about half of traffic collisions in 2018 resulting in pedestrian fatalities. One-third of fatally injured pedestrians ages 16 and older with known test results had a blood alcohol concentration (BAC) of 0.08 grams per deciliter (g/dL) or higher. A total of 2,015 pedestrians killed in traffic collisions in 2018 had BACs of 0.08 or higher. An estimated 16% of drivers involved in fatal pedestrian collisions with known test results had a BAC of 0.08 or higher.

Although speeding is a problem among all driver age groups, research finds that young drivers are much more likely to cause collisions and commit speeding violations than drivers of other ages. Findings show that younger drivers, particularly

younger men, are at a higher risk of committing a speeding offense and of being repeat speeding offenders, and males are generally overrepresented in speeding-related fatality statistics.[2] A study conducted by the California Department of Motor Vehicles found that the rate of speeding violations per mile traveled was at least three times as high for drivers 16-19 years old as it was for drivers 30 years and older. In a 2011 national telephone survey, the percentage of drivers who reported having at least one speeding-related collisions during the past five years was higher for the youngest drivers, those 16-20 years old, than for any other age group, even though the youngest drivers may not have been driving for all of the past five years. This survey also found that drivers who reported consistently exceeding speed limits by 15 mph on highways or by 10 mph on residential streets tended to be younger than non-speeders.[3]

[2]https://research.qut.edu.au/carrsq/wp-content/uploads/sites/45/2017/07/Speeding-screen.pdf
[3]https://www.nhtsa.gov/sites/nhtsa.gov/files/2011_n_survey_of_speeding_attitudes_and_behaviors_811865.pdf

DAVIS DATA

COLLISION DATA

The data used in this plan is from the Statewide Integrated Traffic Records System (SWITRS). SWITRS was established in 1972 to develop a uniform collection, reporting, and retrieval of traffic collision data. Vehicle Code Section 20008 requires that all law enforcement agencies forward a copy of every traffic collision report involving injury or death to the California Highway Patrol. **The SWITRS data used in this report only includes collisions where people were injured or killed.** Collisions with property damage only are not included in the data set. SWITRS data was accessed through the Transportation Injury Mapping System (TIMS) developed in 2003 by SafeTREC at UC Berkeley.[4]

There are several limitations to the collision data reported in this Plan. SWITRS data only includes police-reported collisions and may not reflect those involving someone who is uncomfortable reporting their collision or did not have the time or motivation to make the report. In addition, the collision data does not capture situations where there are "near miss" collisions where a collision did not occur, but these types of situations can make someone feel unsafe or uncomfortable traveling on the roadway.

The FHWA *Pedestrian and Bicycle Roadway Safety Audit Guide*[5] states that collision data for bicyclists and pedestrians can aid in identifying locations or situations where safety is a concern. The infrequency of bicyclist and pedestrian collisions compared to vehicle-to-vehicle collisions necessitates multiple years of

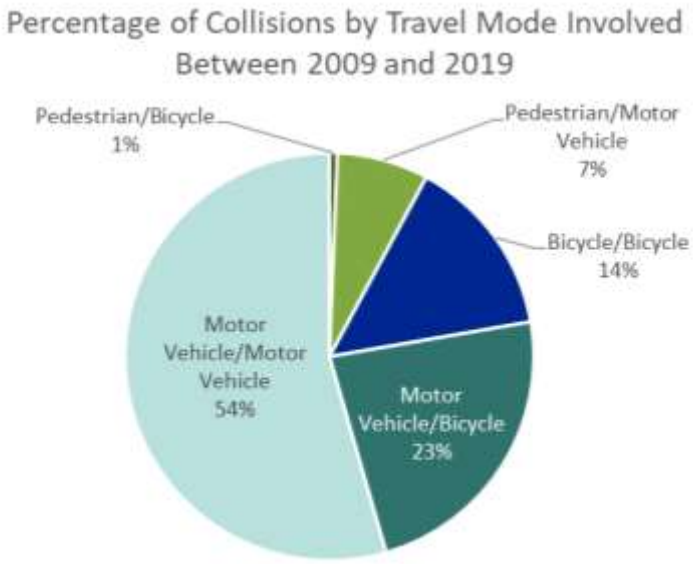


Figure 3. Percentage of collisions by travel mode involved between 2009 and 2019.

[4] https://tims.berkeley.edu/
[5] https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa20042.pdf

data for trends to arise; a minimum of three years of collision data is recommended, but five to 10 years is ideal.

This plan reviewed collision and party SWITRS data between 2009 and 2020.[6] Between 2009 and 2019, there were 1,397 collisions with 2,536 people involved in collisions (see **Figure 3**). These collisions involved drivers, passengers, bicyclists, and pedestrians. Collisions on streets not maintained by the City of Davis, including Interstate 80, Highway 113, and UC Davis, were not included in the dataset. The dataset does not include collisions on the shared-use paths.

ROADWAY DATA

The City has information about the roadway geometry, posted speeds, lane configuration, parking utilization, bicycle and pedestrian facilities, lane/shoulder widths, signalized intersection operation (e.g., signal phasing, turn restrictions) and history of improvement projects. The City has limited and outdated vehicle, bicycle, and pedestrian volume data.

DAVIS EXISTING STREET NETWORK

There are 169 centerline miles of roadway in Davis. Of these, 29 centerline miles are principal and minor arterial roadways and 22 centerline miles are collector streets. There are 140 miles on roads with a speed limit of 25 mph or less, 21 miles of roadway with a speed limit between 25-35 mph and eight miles of roadway with a speed limit over 35 mph. Davis roadway classifications and speed limits are shown in **Figure 4** and **Figure 5**.

Street Types

A **principal arterial** is a street that serves large traffic volumes.

A **minor arterial** is a street that provides a direct route between, but not through, separate neighborhoods.

A **collector** street connects residential streets to arterials.

A **residential** street is in a residential development that connects to homes.

[6] 2020 data was not included in the overall analysis. See highlight on 2020 Collision Data.

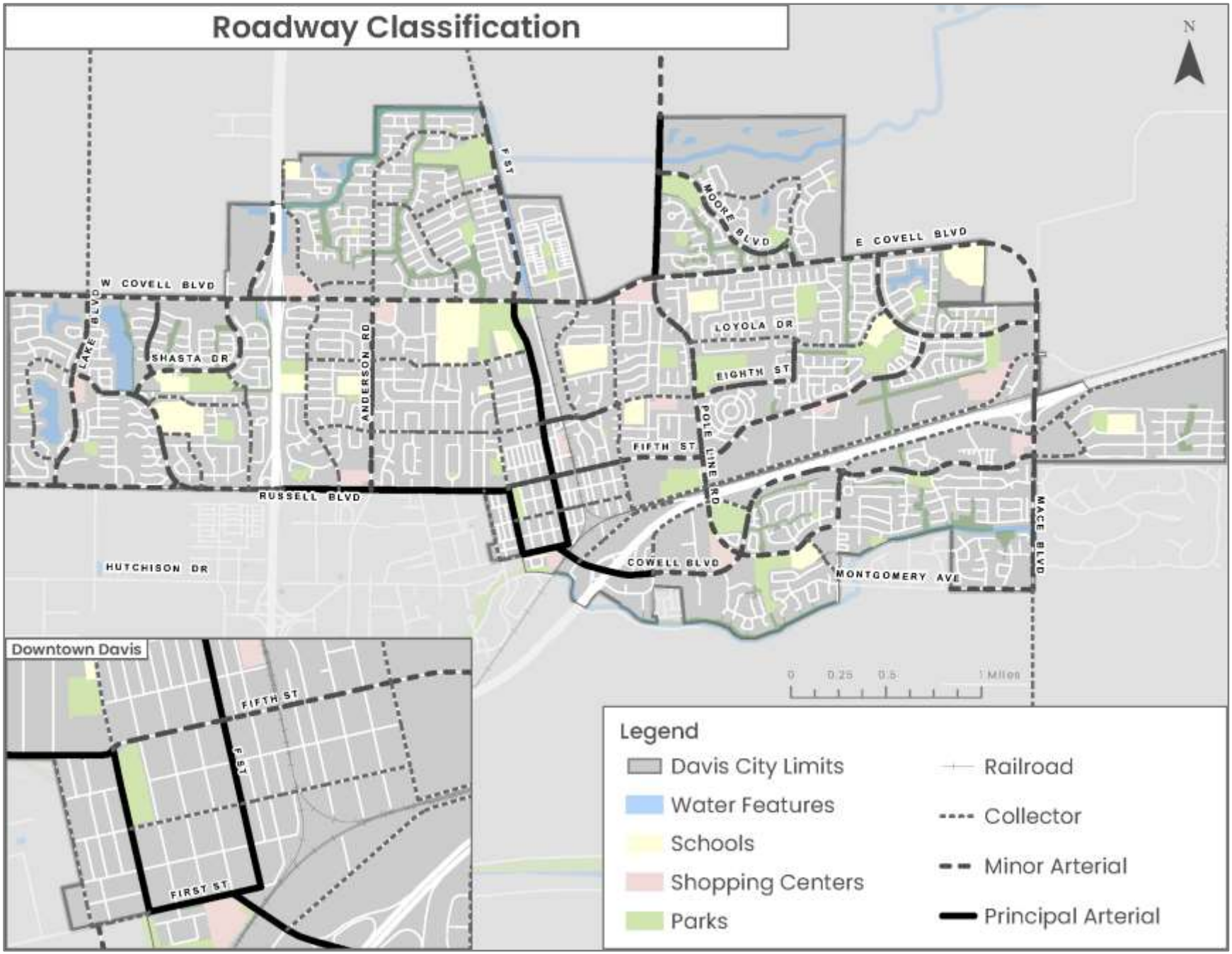


Figure 4. City of Davis streets by roadway classification.

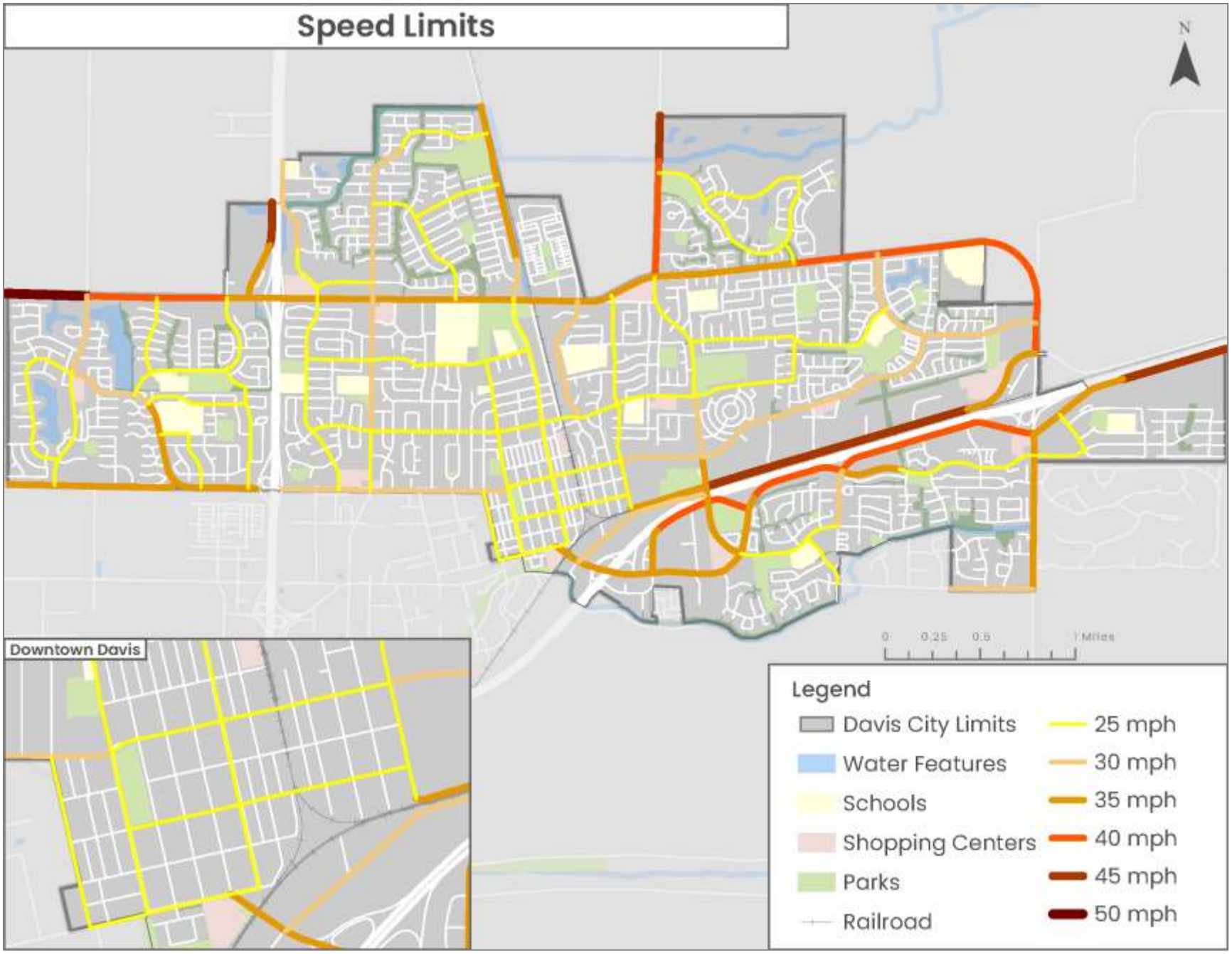


Figure 5. City of Davis speed limit map.

BICYCLE NETWORK

The City of Davis is designated by the League of American Bicyclists as one of five communities in the nation to be a Platinum Bicycle Friendly community. The League of American Bicyclists' Bicycle Friendly America program sets the standard for how communities build and benchmark progress toward making biking better. The League of American Bicyclists' evaluates communities based on five criteria: (1) education; (2) engineering; (3) ridership, crashes, fatalities; (4) evaluation; and (5) encouragement. See the City's bicycle friendly report card at https://bikeleague.org/sites/default/files/bfareportcards/BFC_Fall_2020_ReportCard_Davis_CA.pdf.

Figure 6. City of Davis bicycle counter at 3rd Street and University Avenue.

Davis has 63 miles of off-street bike and pedestrian paths and 118 miles of bike lanes. The network of bicycle facilities can be seen in **Figure 7**. It is important to note that the collision data in this report does not include class 1 bikeways, which are those that provide a completely separated right of way for bicyclists, pedestrians, and other non-motorized travel.

In central Davis, the bicycle network is primarily bike lanes, where bicyclists travel on roadways adjacent to motor vehicles. The City is improving the bicycle facilities in central Davis by adding buffered bike lanes and cycle tracks to separate motor vehicles and bicycles. The Downtown Davis Plan will create priority corridors for various modes of travel and improve safety and mobility for bicyclists, pedestrians and, drivers.

Outside of central Davis there is an extensive pathway network, which was developed as Davis grew in the 1990s and 2000s. This pathway network, which serves both pedestrians and bicyclists, connects to Davis schools, shopping and parks.

As part of the whole pathway network, the City has installed bicycle and pedestrian wayfinding signs in south Davis and east Davis with a plan to install wayfinding signage throughout Davis in the next year.

In addition to the City of Davis Bike Map, the City also provides suggested safe routes to school. **Figure 8** below shows the suggested safe routes to school.

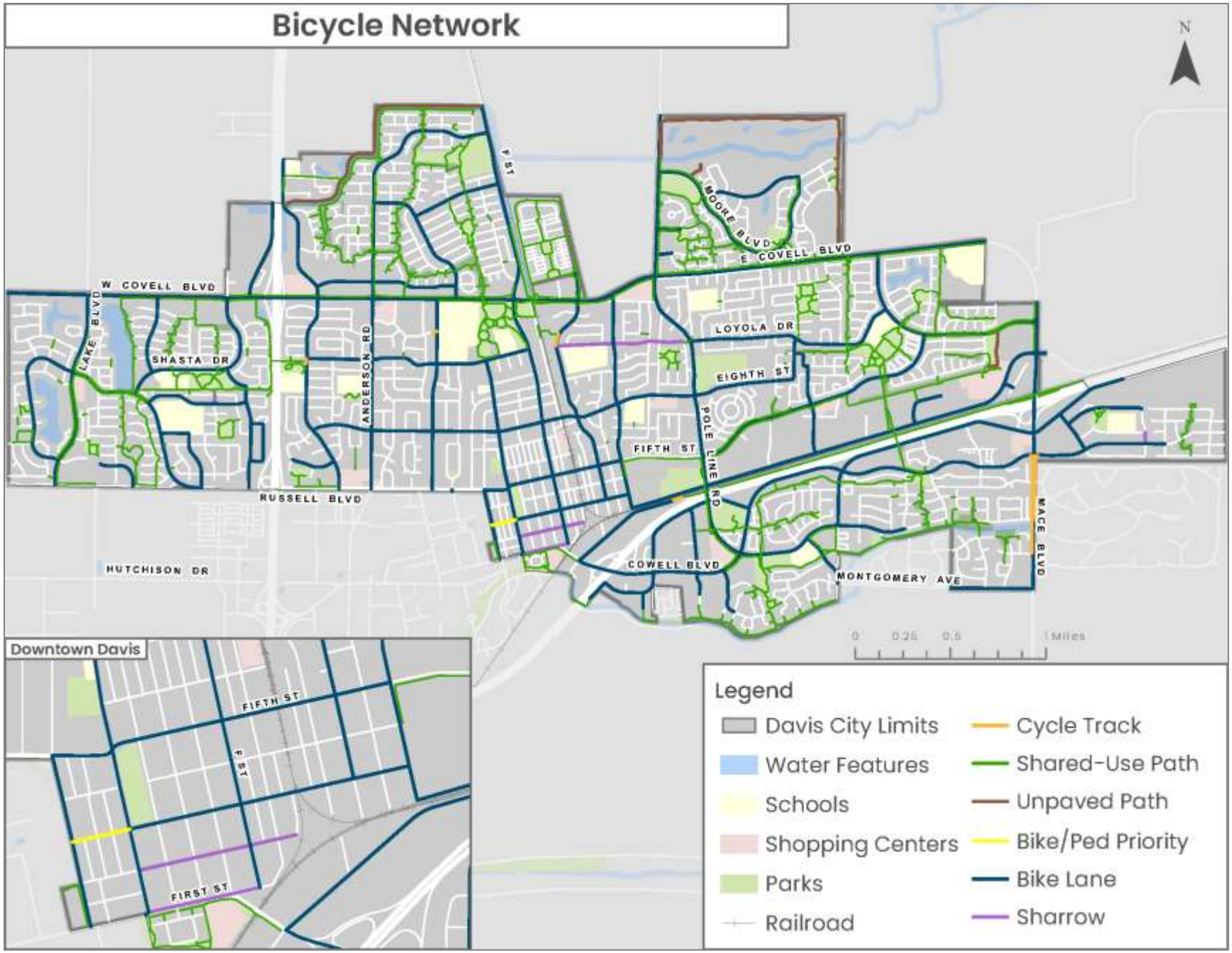


Figure 7. City of Davis bicycle network.

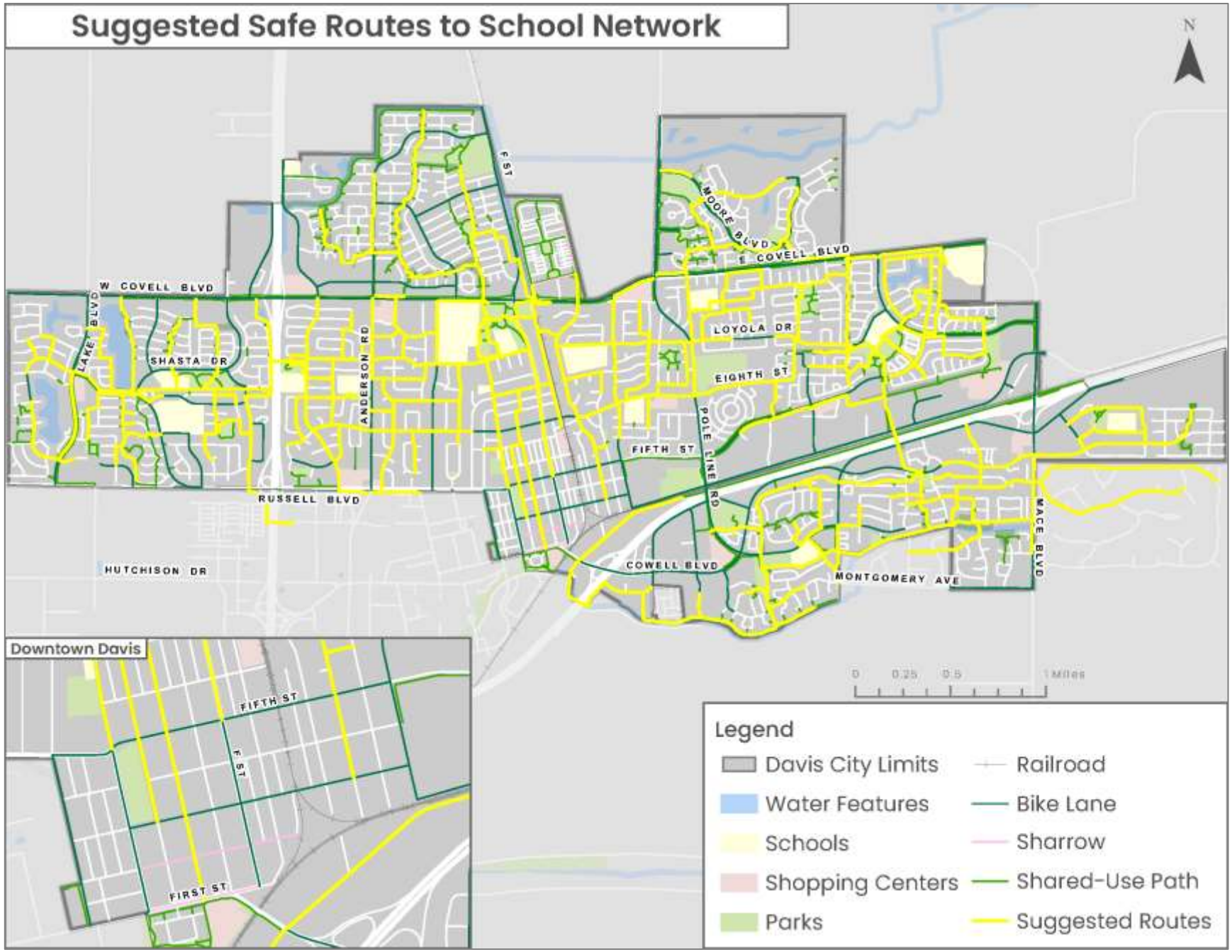


Figure 8. Safe routes to school suggested routes network.

EQUITY CONSIDERATIONS

Advancing equity - the consistent and systematic fair, just, and impartial treatment of all individuals - is becoming a cornerstone belief for all cities. Equity is also about making sure that all voices in a community are incorporated as part of inclusive decision-making. Equity has been considered throughout the development of the report and is addressed in the development of the countermeasures.

The purpose of understanding where concentrations of underserved communities live is to determine if there are a disproportionate number of traffic collisions in these communities. This report used data from the U.S. Census to identify where communities of color, concentrations of seniors, concentrations of people with disabilities and concentrations of non-English monolingual speakers are living in Davis. The traffic collision data was included in these maps to show if there are clusters of collisions in relation to these underserved communities.

As part of this analysis of equity, we want to acknowledge that since the City is home to UC Davis, college students living within the city skew the Davis poverty rate (28.8%) to be almost 10% higher than the County's poverty rate of 19.9%. [7] Using U.S. Census Bureau methodology to calculate non-student poverty, the City's rate equates to 10.32%. Overall, Davis is an affluent community where the median household income is $81,231, the value of an owner-occupied home is $697,900, and a median gross rent is $1,801 a month[8].

Figure 9 shows the 2022 U.S. Census data and concentrations of people of color and traffic collisions in Davis. The Davis population is made up of 61% white, 2.3% black, 0.8% American Indian and 13.8% Hispanic. South Davis and east Davis show the highest concentrations of people of color. When comparing neighborhoods of color and traffic collisions, there does not seem to be a correlation between traffic collisions and areas with a high percentage of people of color.

Figure 10 shows concentrations of non-English, monolingual speakers and traffic collisions in Davis. Non-English, monolingual speakers and people with limited English proficiency may have difficulty speaking, understanding, reading, or writing English. In Davis, the largest concentrations of people speaking languages other than English at home live in south Davis and central Davis. Overall, when evaluating the U.S.

[7] https://www.cityofdavis.org/residents/social-services/social-services-data
[8] https://www.census.gov/quickfacts/daviscitycalifornia

Census data, there does not seem to be concentrations of traffic collisions in areas with non-English, monolingual speakers.

Almost 13% of the Davis population is 65 years and older. **Figure 11** shows the concentrations of people ages 65 years and over and traffic collisions. There are concentrations of older Davis residents in west Davis, north Davis, and south Davis. Understanding where the aging community lives is helpful when determining and evaluating countermeasure improvements. For example, staff might opt for larger signs for easier readability or extend pedestrian crossing timing to accommodate low vision and slower moving people. Based on the U.S. Census data and traffic collisions, there does not seem to be a disproportionate number of collisions occurring in older communities.

According to the U.S. Census 5.2% of Davis residents have a disability. **Figure 12** shows the concentrations of people with disabilities and traffic collisions. The largest concentration of people with disabilities live in central Davis east of downtown. There does not seem to be a concentration of collisions occurring in areas with higher concentrations of disabled people.

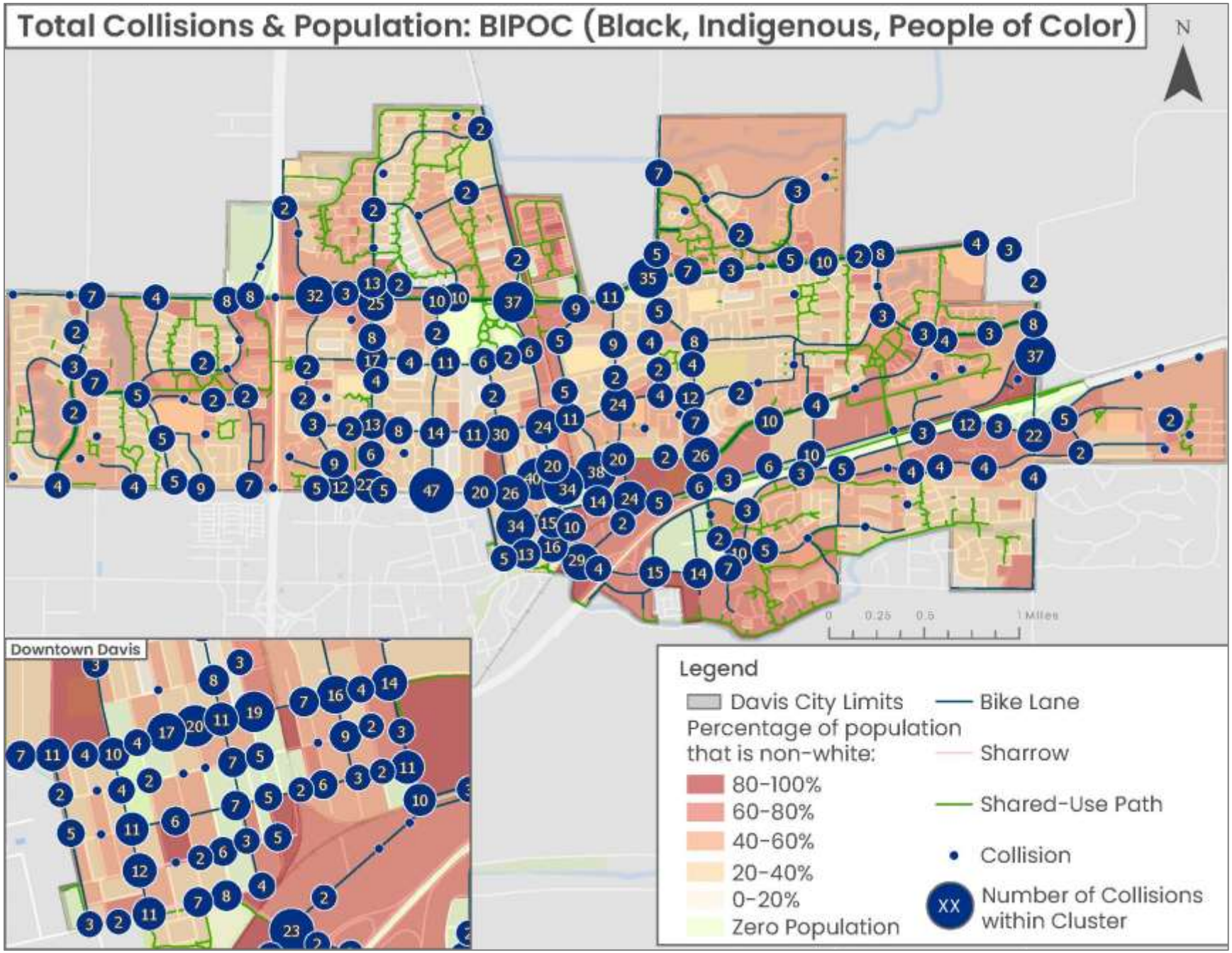


Figure 9. Map of total collisions and population: BIPOC (Black, Indigenous, People of Color).

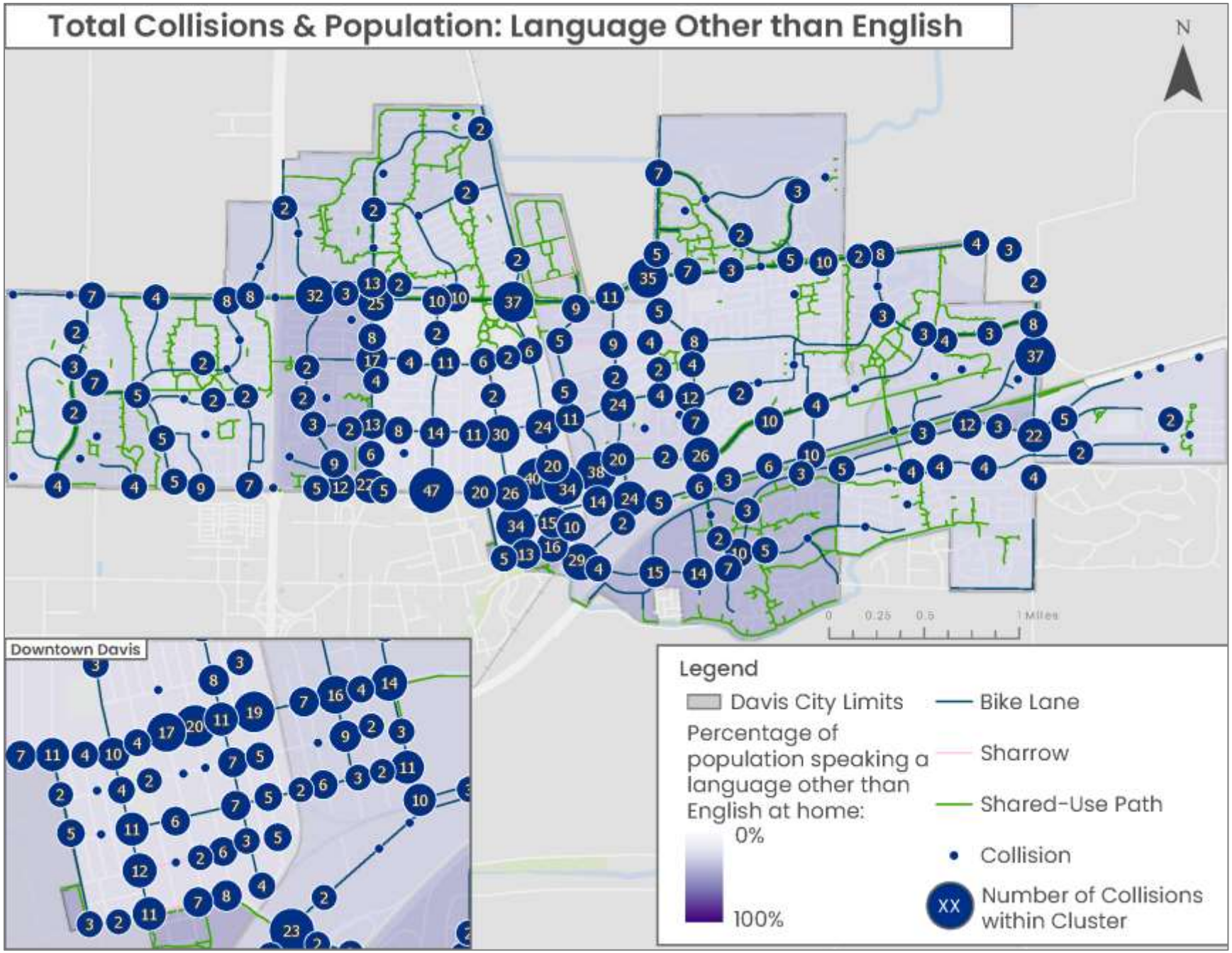


Figure 10. Map of total collisions and population: language other than English.

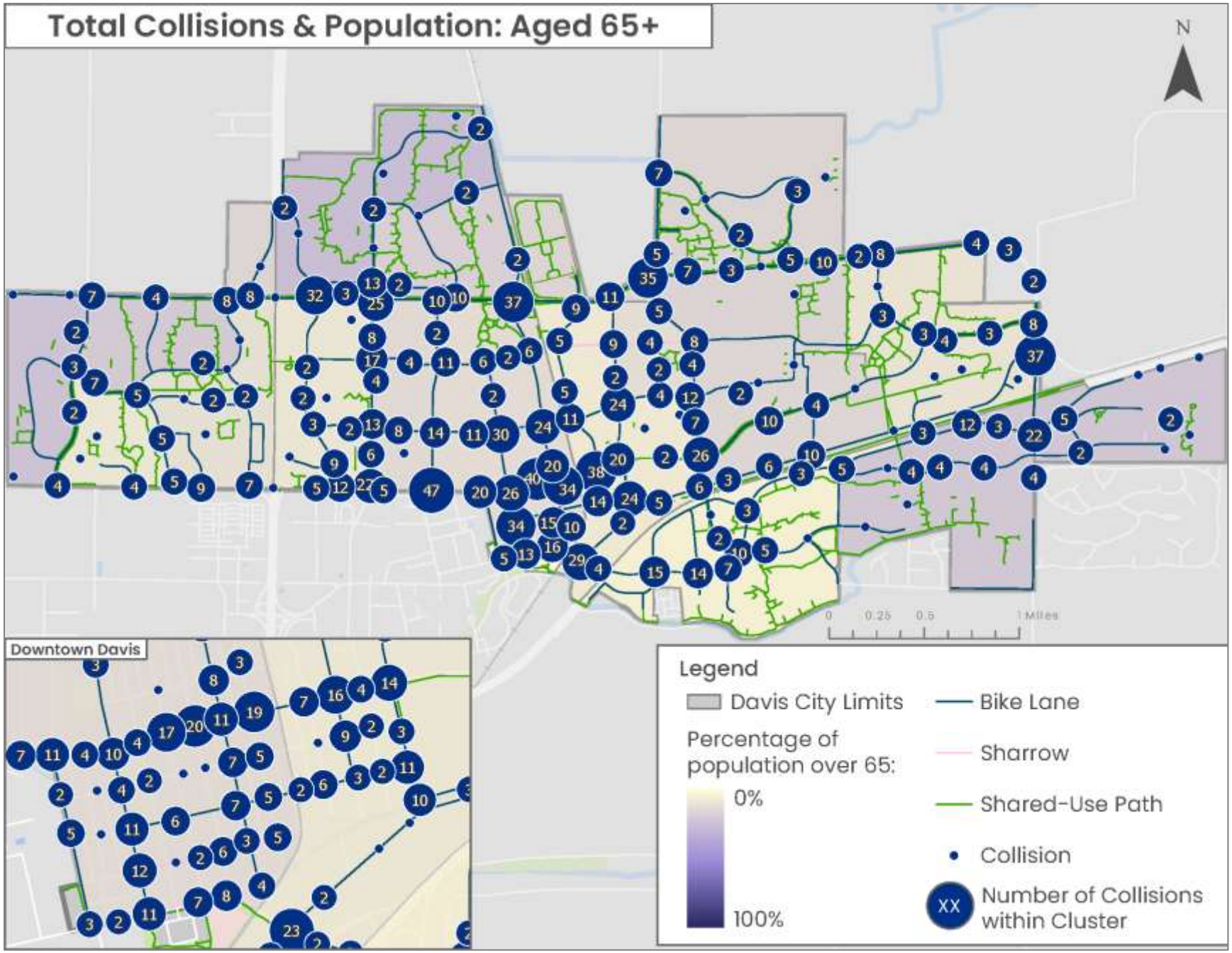


Figure 11. Map of total collisions and population: aged 65+.

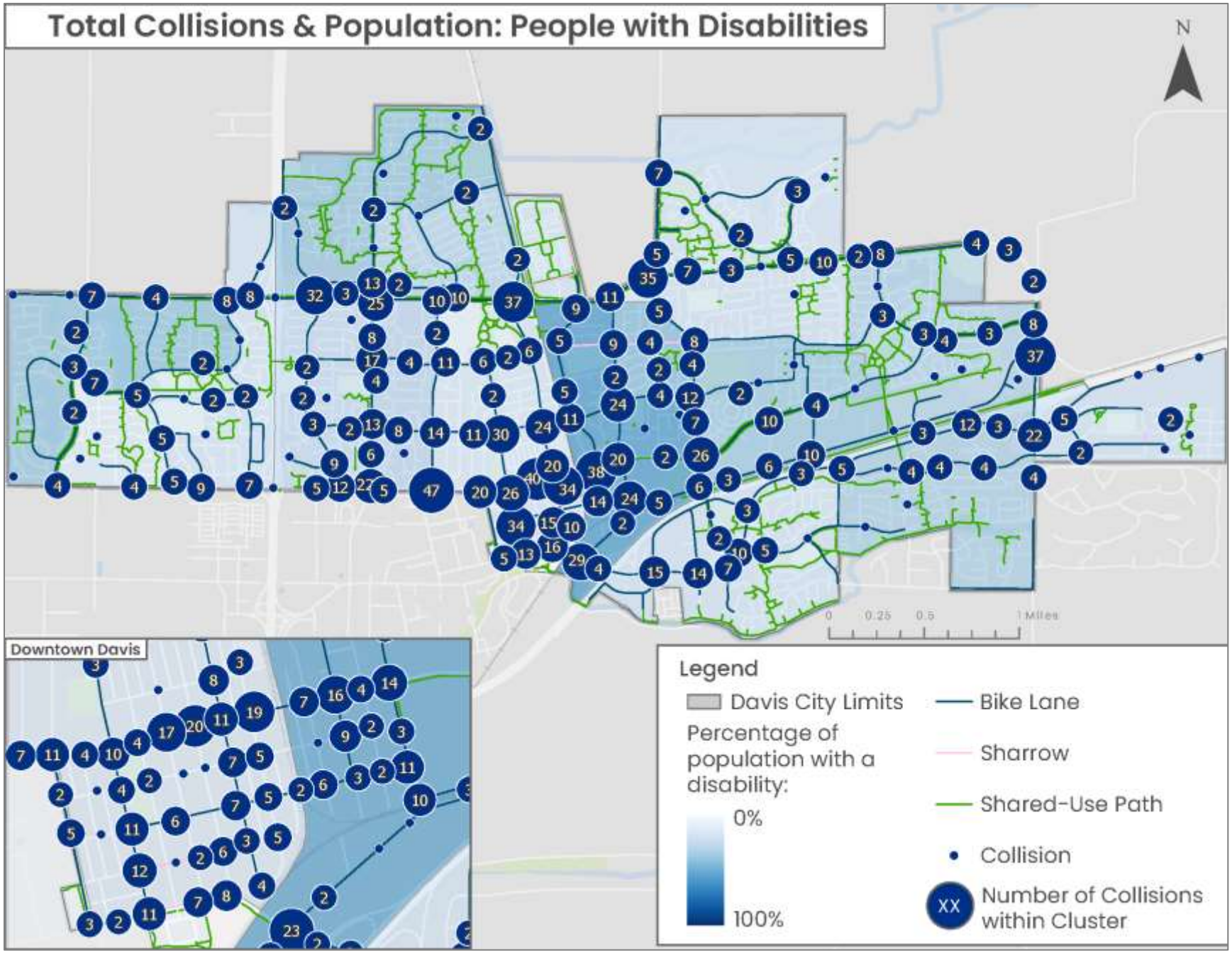


Figure 12. Map of total collisions and population: people with disabilities.

DATA ANALYSIS

The Data Analysis component of this report is broken down into five analysis areas. The intent of this section is to identify and evaluate the data, then determine best practices and future steps to eliminate severe and fatal collisions.

1. **Overview of Collisions in Davis**
   This section includes an overview of total collisions by type and year and the percentage of severe and fatal collisions by mode. This section also includes a highlight of 2020 collision data.
2. **Who is Involved in Collisions**
   This section defines the Davis population and examines trends between national data and Davis. This section also analyzes collision by mode and identifies fatalities.
3. **When are Collisions Occurring**
   This section evaluates day of week, time of day and weather trends.
4. **What Types of Collisions are Occurring**
   This section identifies the types of collisions and the top violation types, as well as trends over time.
5. **Where are Collisions Occurring**
   This section shows where collisions occurred and breaks down collisions by a variety of factors to examine locational trends. This section also identifies countermeasure treatments to eliminate collision types and violation types resulting in severe and fatal collisions.

OVERVIEW OF COLLISIONS

A time period of 2009 to 2019 was used for collision analysis in this report. The 2020 collision data was excluded due to the COVID-19 stay-at-home order, described below.

2020 COLLISION DATA

In March 2020, Yolo County and the State of California issued a stay-at-home order to reduce the spread of COVID-19. Residences were ordered to stay at home from 10 p.m. to 5 a.m. except to conduct activities associated with the operations, maintenance, or usage of critical infrastructure. In addition, residents were to stay at home except for essential tasks or for work in essential businesses. Non-essential workers began working remotely and were no longer commuting to their offices. Both Davis Joint Unified School District and UC Davis eliminated in-person classes and shifted to remote learning. The effects of the stay-at-home order resulted in a 72% decrease of people biking past the bike counter at the intersection of 3rd Street and University Avenue compared to the year before (see **Figure 13**). Anecdotally, there were fewer people on the roads in Davis as people stayed home or relocated outside of the city.

Figure 13. Comparison of 2019 and 2020 annual bicycle counts at 3rd Street and University Avenue in Davis, CA.

Including the 2020 data into this report would have affected the overall averages and potentially impacted data trends (see **Figure 14**). In 2020, there were a total of 78 collisions, which is 55% lower compared to the previous 11 years. Bicycle collisions decreased by 68% and pedestrian collisions decreased by 50% compared to the average bike and pedestrian collisions per year between 2009 and 2019.

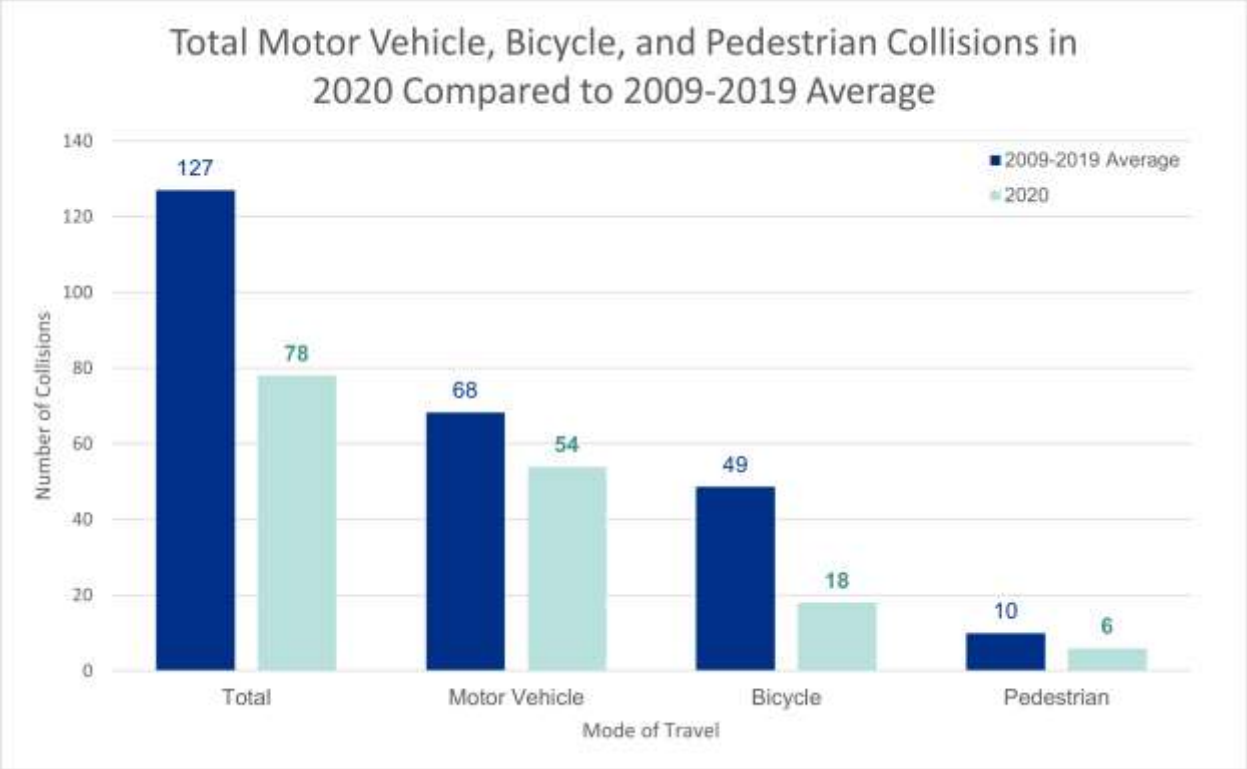


Figure 14. Total, motor vehicle, bicycle, and pedestrian collisions in 2020 compared to 2009-2019 average.

2009-2019 COLLISION DATA

Between 2009 and 2019 in Davis, there were 1,397 collisions with 2,536 people involved. There were a total of 90 KSI collisions, representing 6% of the total collisions. Comparatively, severe and fatal injuries resulted in almost 20% of pedestrian collisions, 7% of bicycle collisions, and 4% of motor vehicle collisions. On average each year, there are 3.5 KSI bicycle collisions, two KSI pedestrian collisions, and almost three KSI motor vehicle collisions.

Figure 15. Total collisions and average collisions in Davis between 2009 and 2019 for driving, walking, and bicycling.

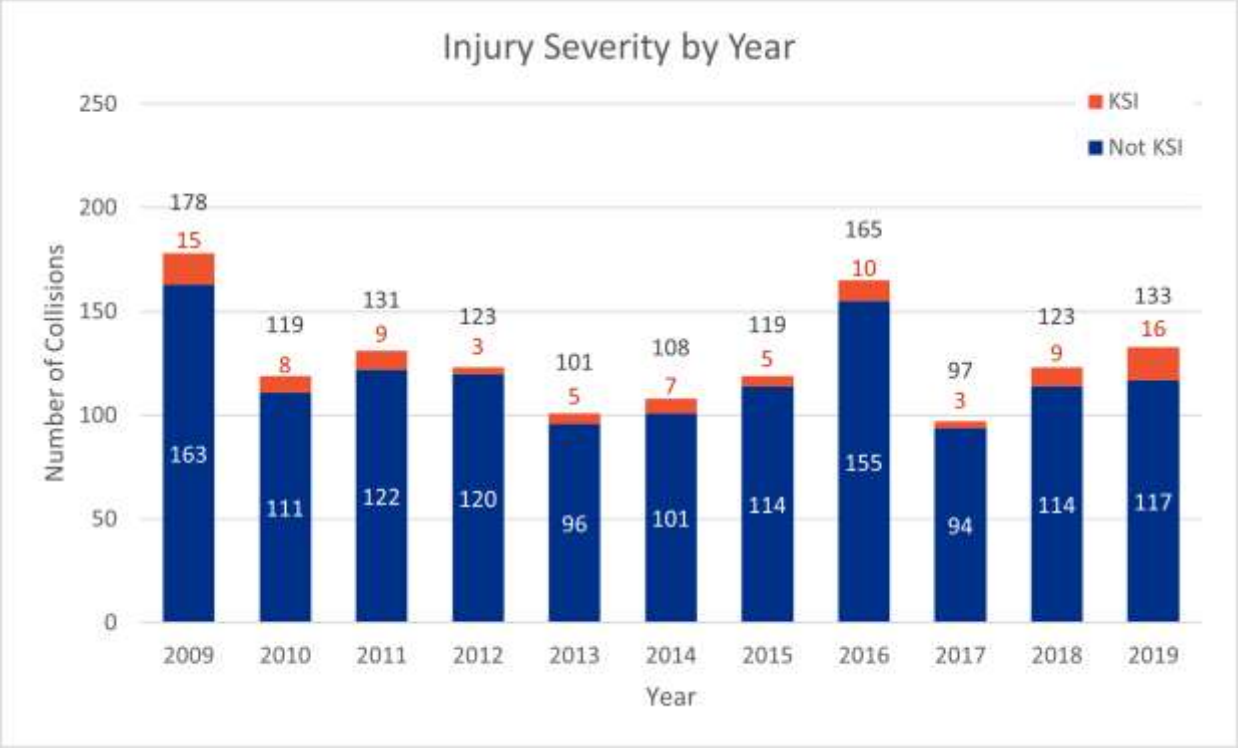


Figure 16: Injury severity by year.

Figure 16 above shows the total number of collisions between 2009 and 2019 and the number of KSI and Not KSI collisions. KSI collisions account for 6% of all total collisions 94% are not KSI. 2009 and 2019 had the most KSI collisions.

Figure 17 shows the total collisions by year and collisions by travel mode. This figure reveals that 2009 resulted in the most collisions with 178 collisions and 2017 had the fewest with 97 collisions. Overall, collisions did not increase between 2009 and 2019. The number of driver, bicycle, and pedestrian collisions vary slightly each year.

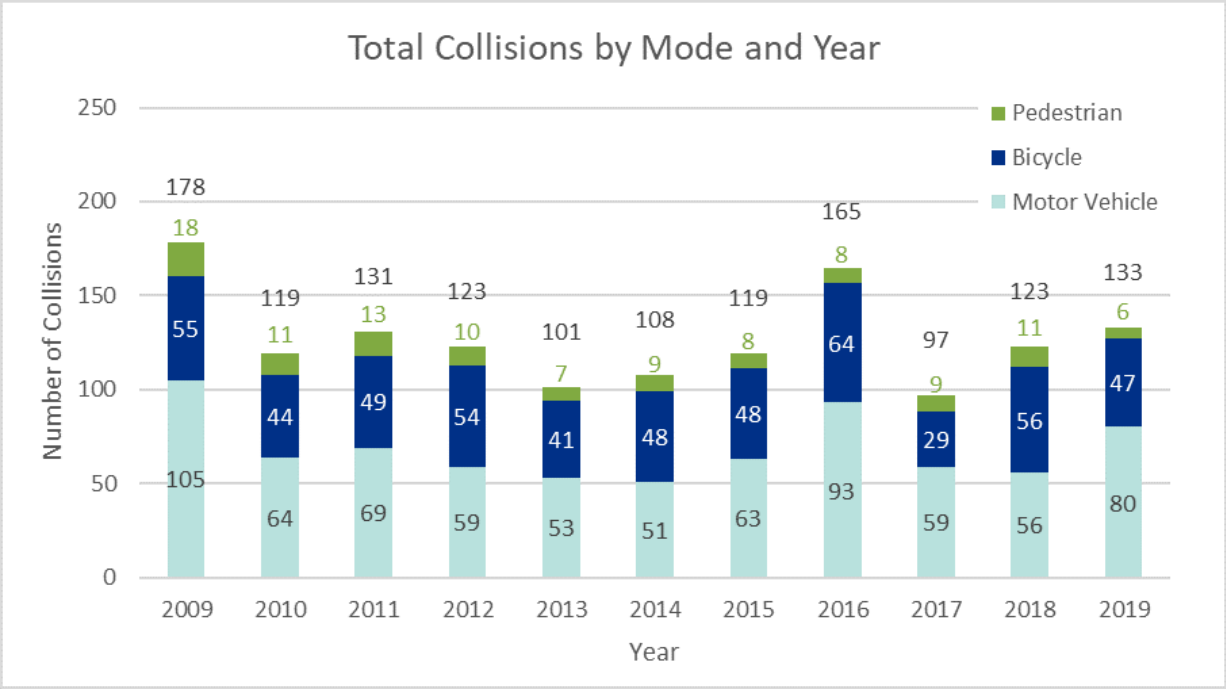


Figure 17: Total collisions by mode and year.

COMPARISON OF DAVIS COLLISION DATA WITH SIMILAR CITIES

To understand how Davis collisions compare with collisions rates in other cities, collisions were evaluated in Boulder, Colorado, and Long Beach, California, both designated by the League of American Bicyclists as Platinum and Silver Bicycle-Friendly Communities, respectively. The comparison included all vehicle, bicycle, and pedestrian collisions resulting in injuries. The source of the Boulder data was from the Vision Zero Boulder Safe Streets Report, 4th Edition, 2022.[9] The Long Beach data was retrieved using the UC Berkeley TIMS collision database.[10]

Figure 18 shows the comparison of collisions by mode for each city. Compared to Boulder and Long Beach, the city of Davis had significantly fewer vehicle collisions and double the bicycle collisions. The city of Davis had slightly more pedestrian collisions compared to Boulder, and Long Beach had over twice as many as Davis.

[9] https://bouldercolorado.gov/media/7841/download?inline
[10] https://tims.berkeley.edu/tools/gismap/

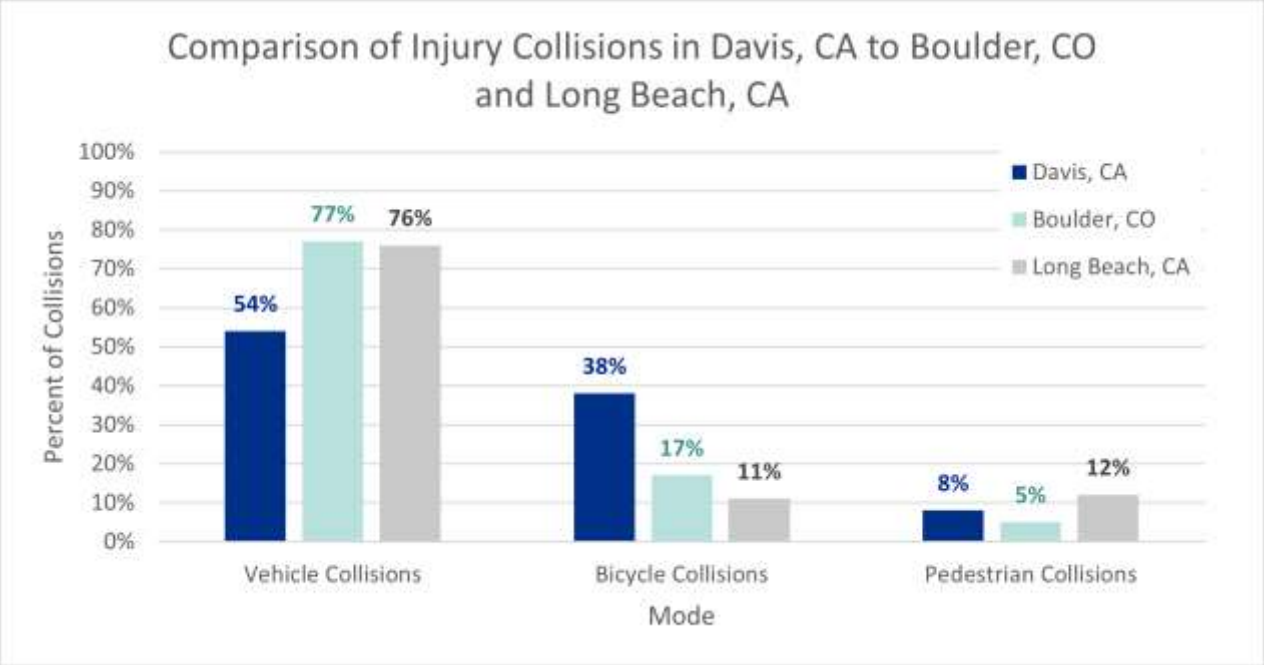


Figure 18. Comparison of Injury Collisions in Davis, CA to Boulder, CO and Long Beach, CA.

WHO IS INVOLVED IN COLLISIONS?

This section defines the Davis population and investigates trends between national data and Davis, analyzing collisions by mode and severity.

DAVIS POPULATION

The Davis city population is approximately 68,000 people: 53,000 adults and 15,000 children. Of the 53,000 adults, about 10,500 are seniors.[11] In addition to Davis residents, UC Davis students, faculty, and staff are also members of the Davis community. UC Davis reports that there are approximately 37,500 UC Davis students enrolled at the university, 11,000 of whom live on campus.[12] There are an additional 16,000 UC Davis staff and faculty who live in and outside of Davis.[13] As a result, the Davis community population, including UC Davis on-campus students, is approximately 79,000 people. **Figure 19** shows the percentage breakdown of the population by age group. Residents aged 20 to 24 years old make up 37% of the Davis population. The second largest age group is those aged 15 to 19 years old, followed by those aged 25 to 29 years old. This population count does not include people commuting to Davis for work or other activities.

The Davis community population is approximately

79,000

[11] https://data.census.gov/cedsci/table?q=davis,%20ca&tid=ACSST5Y2019.S0101
[12] 11,000 was added to the 20 to 24 year old agegroup to account for students living on campus.
[13] https://escholarship.org/uc/item/44z3060c#main

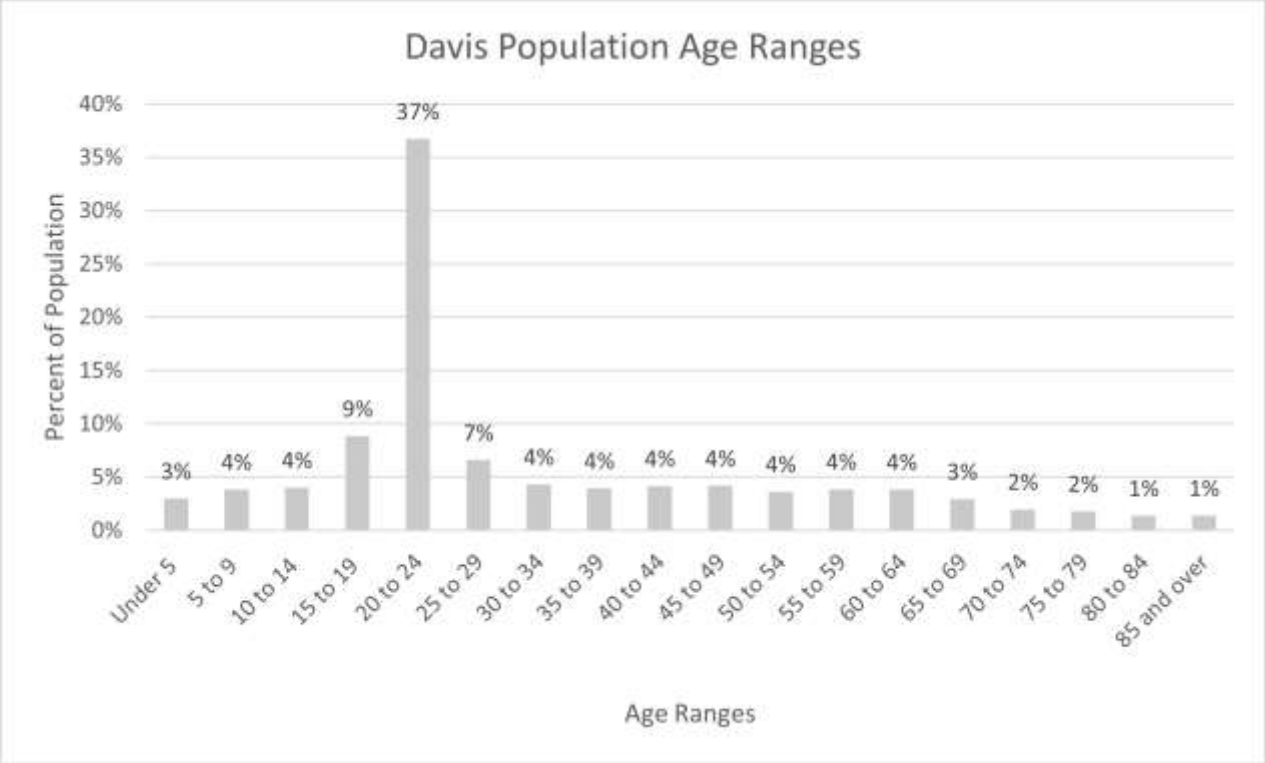


Figure 19: Davis population age ranges.

AGE OF DRIVERS

Figure 20 shows the Davis population compared to the age of drivers involved in collisions.[14] People between 25 and 60 years old are involved in more vehicle collisions relative to their percentage of the population.

41% of the Davis population is between the ages of 20 and 24, but only 26% of total vehicular collisions involve this age group.

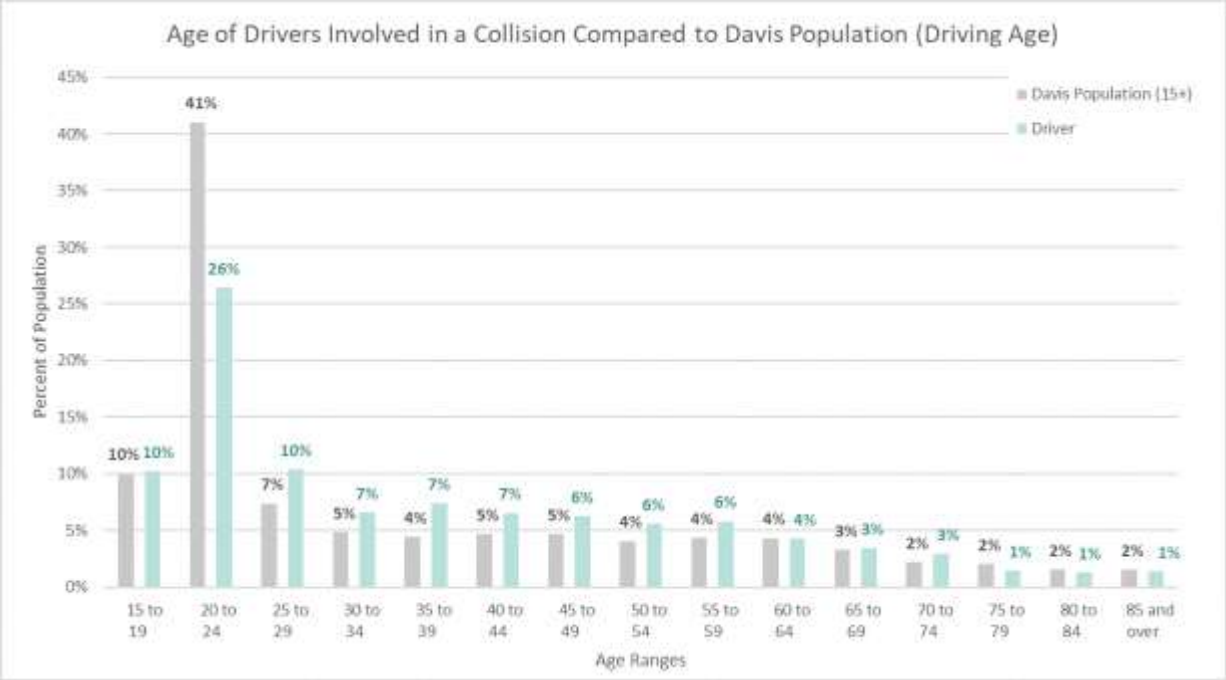


Figure 20: Age of drivers involved in a collision compared to Davis population (driving age).

[14] Davis driver population only includes people 15 and over. As a result, the Davis population percentages changed slightly when non-drivers were removed from the dataset.

Figure 21 below shows ages of at-fault drivers involved in collisions compared to the Davis population. Within this report, "at-fault" means the person's actions caused the collision. A driver was at-fault in 866 of the 1,397 collisions, or 62% of collisions in Davis. All age groups except for people aged 20 to 24 years old had a greater or equal percentage of collisions compared to their percentage of population.

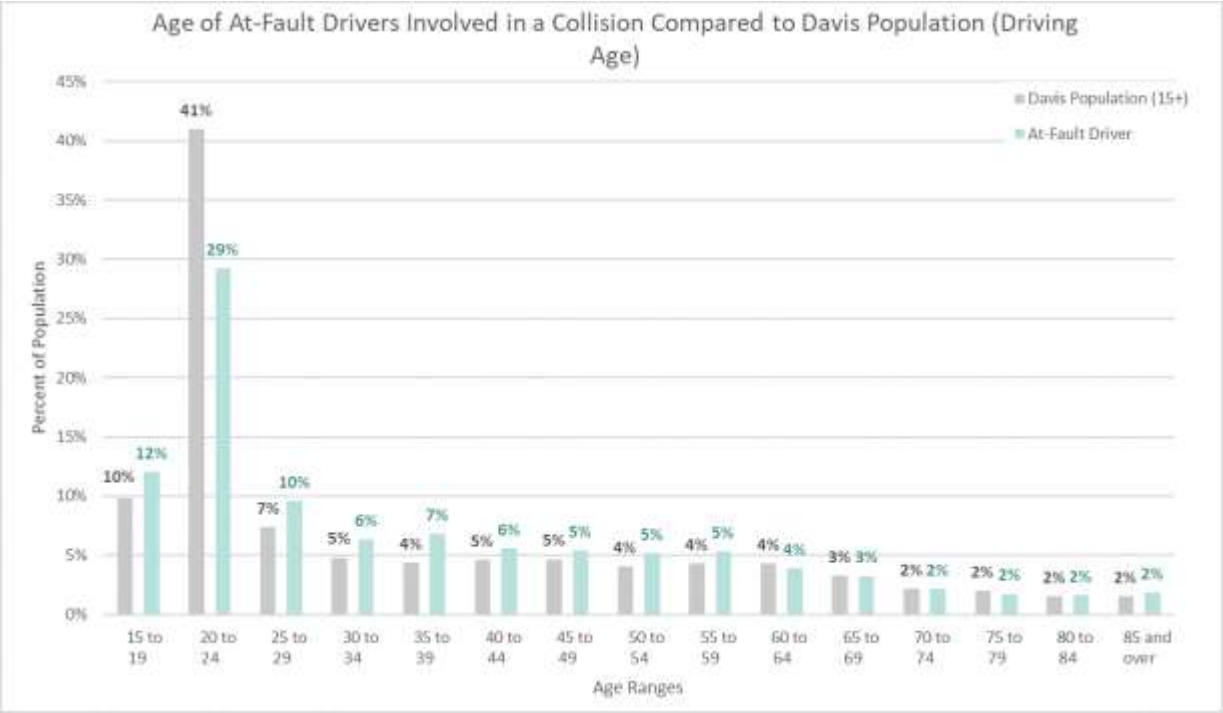


Figure 21: Age of at-fault drivers involved in a collision compared to Davis population (driving age).

BICYCLE AND PEDESTRIAN

Figure 22 and **Figure 23** compare the Davis population with the age of pedestrians and bicyclists involved in collisions. **Figure 22** shows all pedestrian and bicycle collisions and **Figure 23** compares Davis population and those at-fault. In **Figure 22**, the age groups 10 to 14 years old, 15 to 19 years old and 20 to 24 years old comprise 49% of the population, yet they account for 61% of all bicycle collisions. For the age group 25 to 29 years old, there are also more bicycle collisions (13%) compared to the Davis population (7%).

The data indicates that pedestrians ages 30 to 34 years old, 40 to 44 years old, 50 to 54 years old, 65 to 74 years old and 85 years old and over are involved in more collisions compared to their percentage of the Davis population. Comparatively, besides the 30 to 34 age group, these same age groups have very few bicycle collisions.

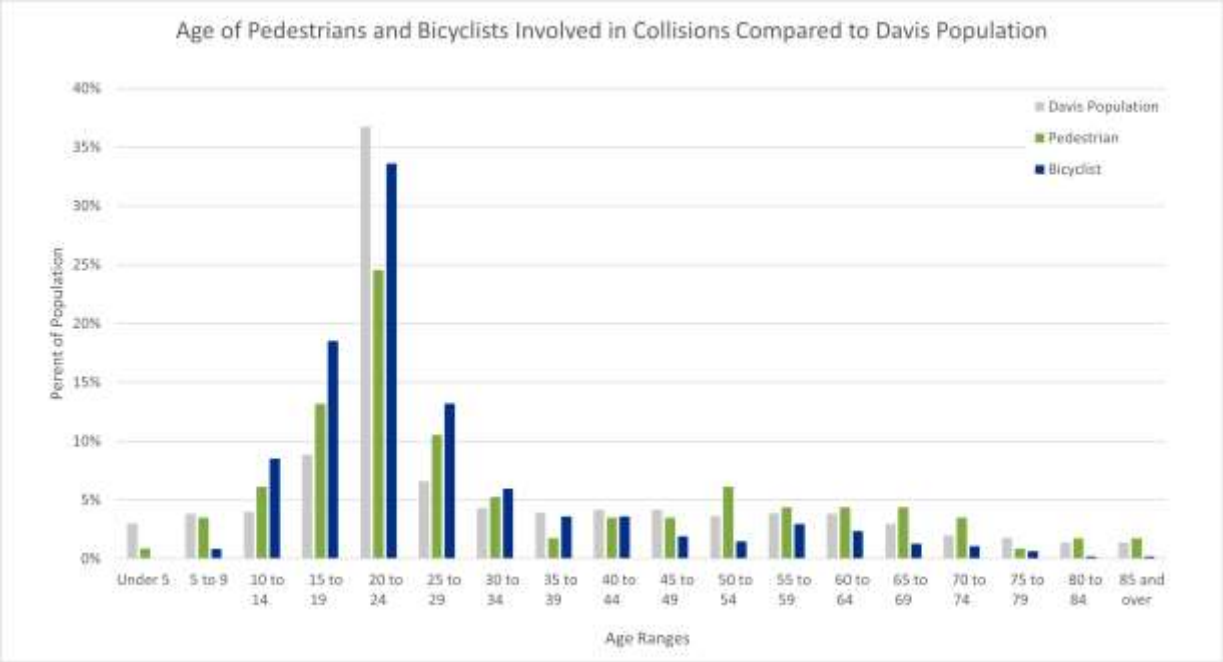


Figure 22: Age of pedestrians and bicyclists involved in collisions compared to Davis population.

Figure 23 below shows at-fault pedestrian and bicycle collisions. For age groups 10 to 14 years old, 15 to 19 years old, 25 to 29 years old, and 40 to 44 years old there are more at-fault bicycle collisions compared to the Davis population. Age groups 25 to 29 years old, 45 to 49 years old, 60 to 64 years old, 65 to 69 years old, 75 to 79 years old and people 80 years old and over are at-fault in more pedestrian collisions compared to the Davis population.

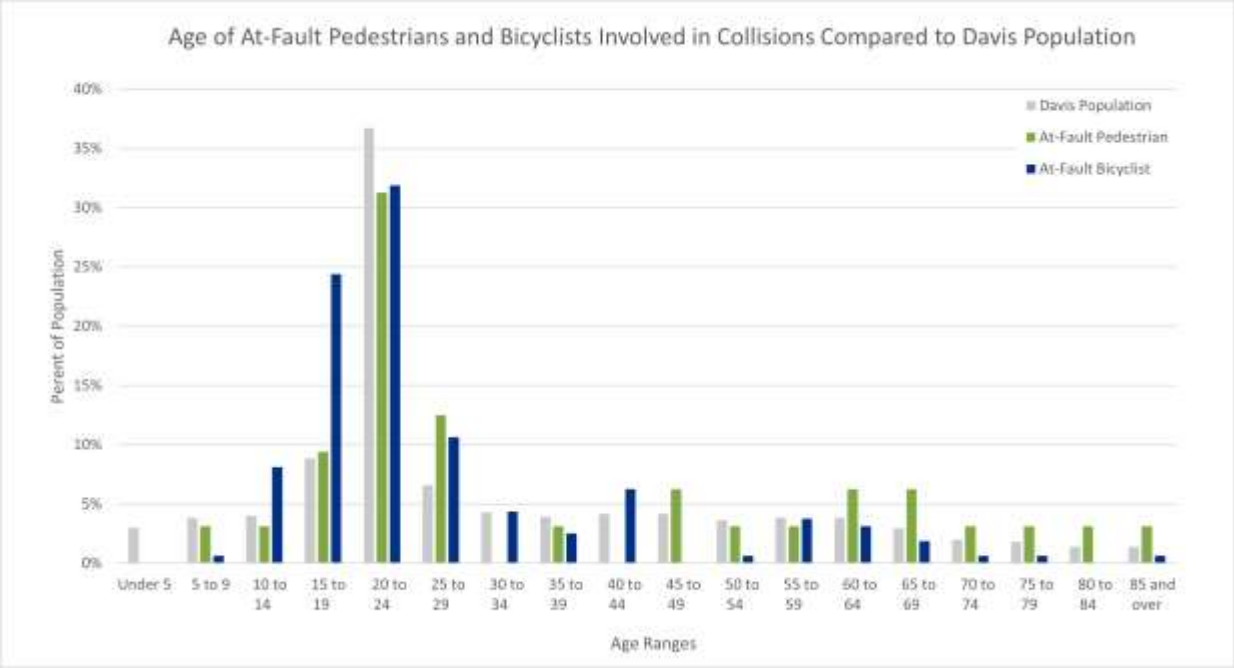


Figure 23: Age of at-fault pedestrian and bicyclists involved in collisions compared to Davis population.

Given the high proportion of bicycle collisions involving young people in Davis, the locations of collisions are displayed below in **Figure 24**, **Figure 25, Figure 26,** and **Figure 27** in conjunction with routes identified as Safe Routes to School for walking and bicycling by the City of Davis Street Smarts program. The collisions involving people 18 and under are displayed on top of the identified routes and are broken into two groups: ages 5-13 and ages 14-18.

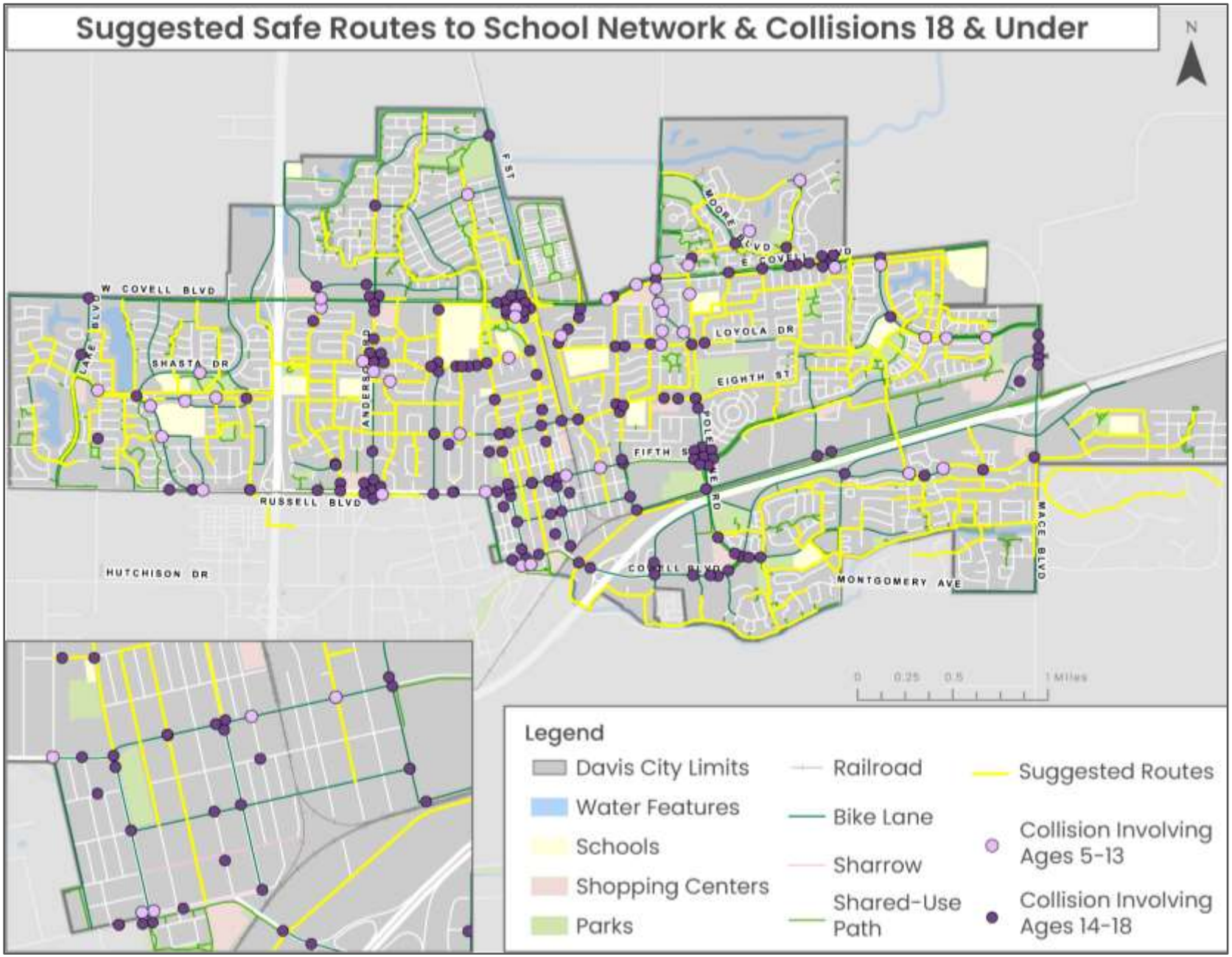


Figure 24. Suggested Safe Routes to School network & collisions 18 & under.

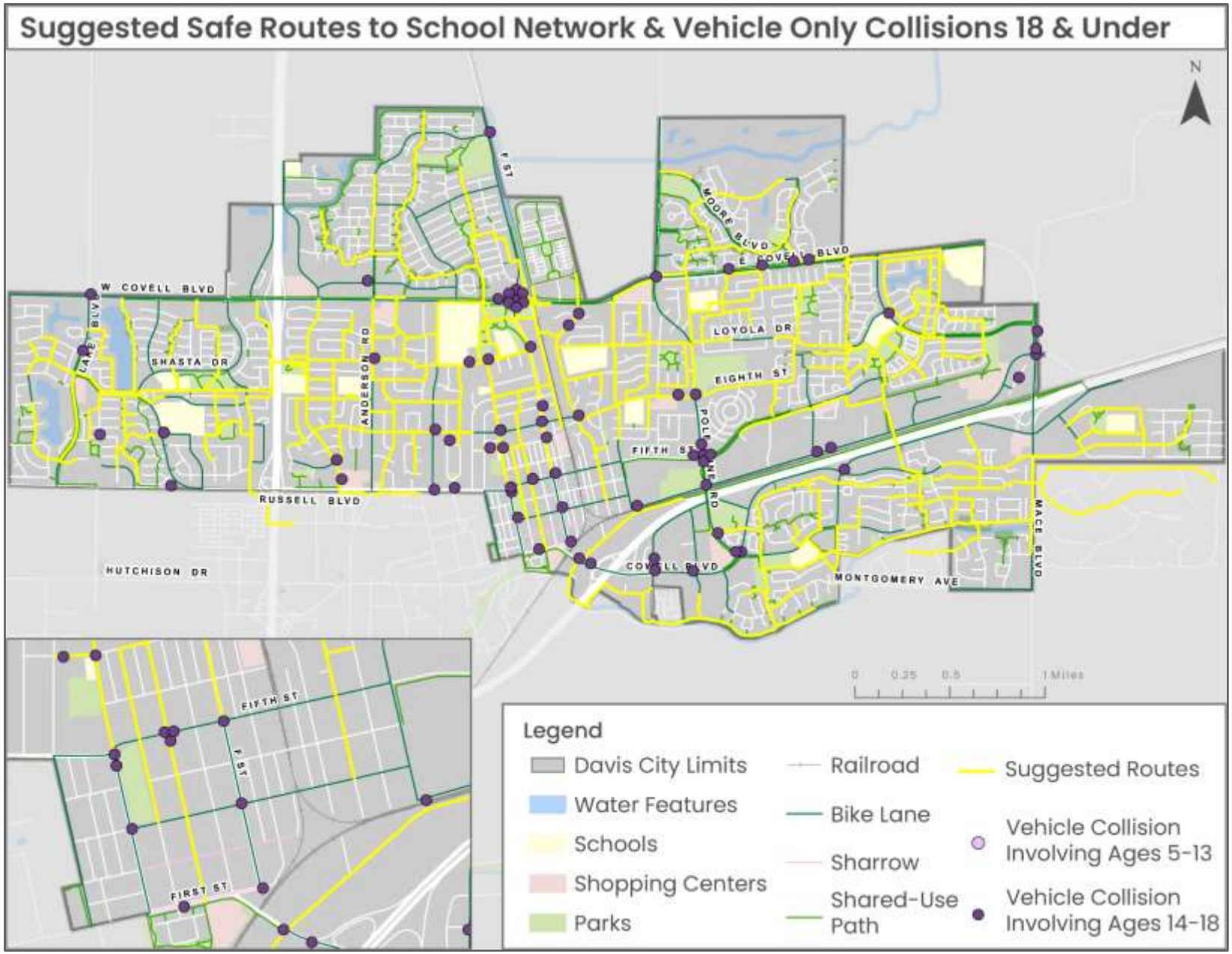


Figure 25. Suggested Safe Routes to School network & vehicle only collisions 18 & under.

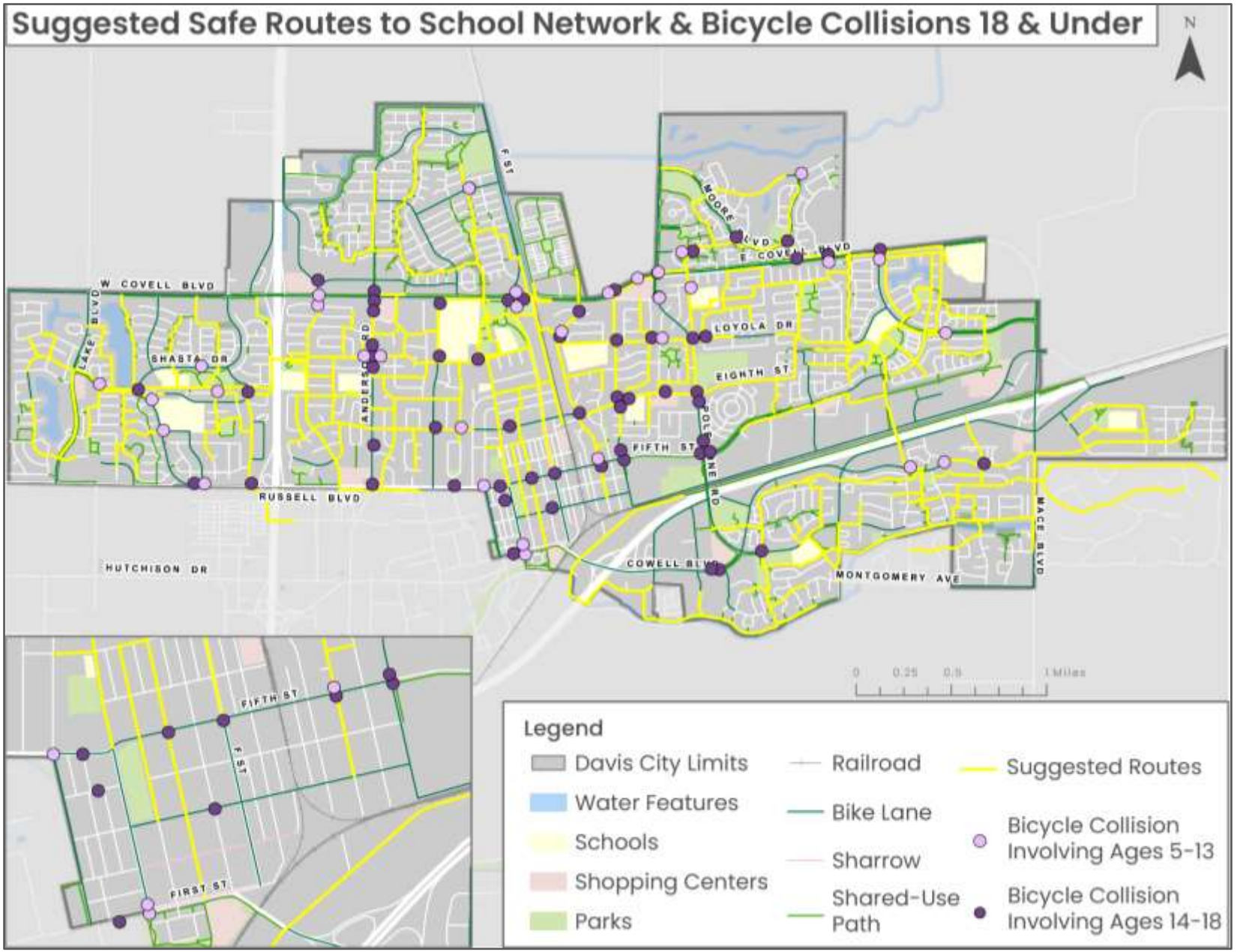


Figure 26. Suggested Safe Routes to School network & bicycle collisions 18 & under.

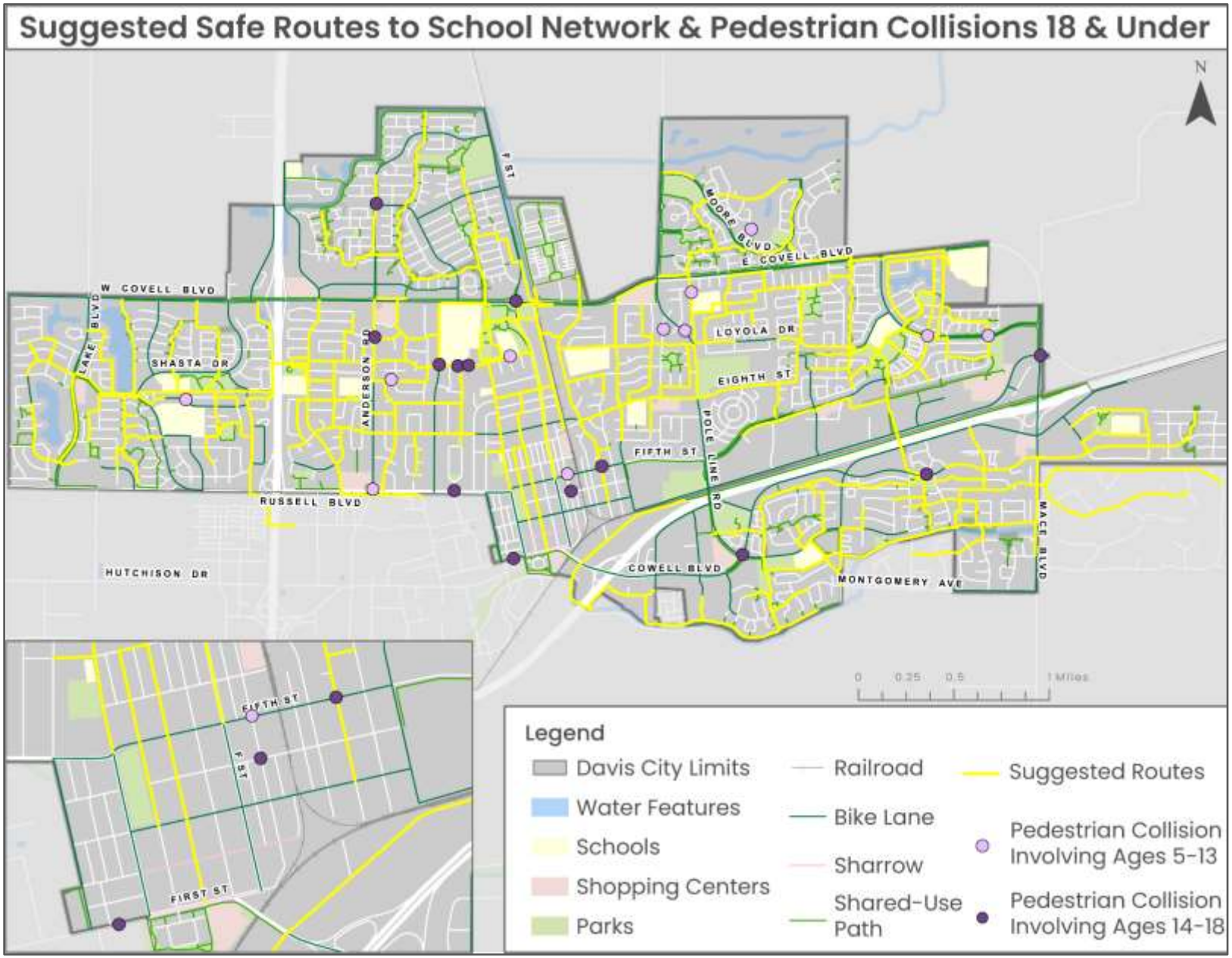


Figure 27. Suggested Safe Routes to School network & pedestrian collisions 18 & under.

GENDER

This section evaluates gender by collision type, fault, and age. **Figure 28** below compares the genders of the person involved in the collision type to the Davis population. Of the Davis population, 46% identify as male and 54% identify as female.[15] In Davis, there are more females (1,176) involved in collisions than males (1,116). There were 244 collisions that did not include gender information. Even though there are more women involved in collisions, men are disproportionately represented in pedestrian and bicycle collisions compared to women. The percentage of males and females involved in motor vehicle collisions is similar proportionally to the Davis population.

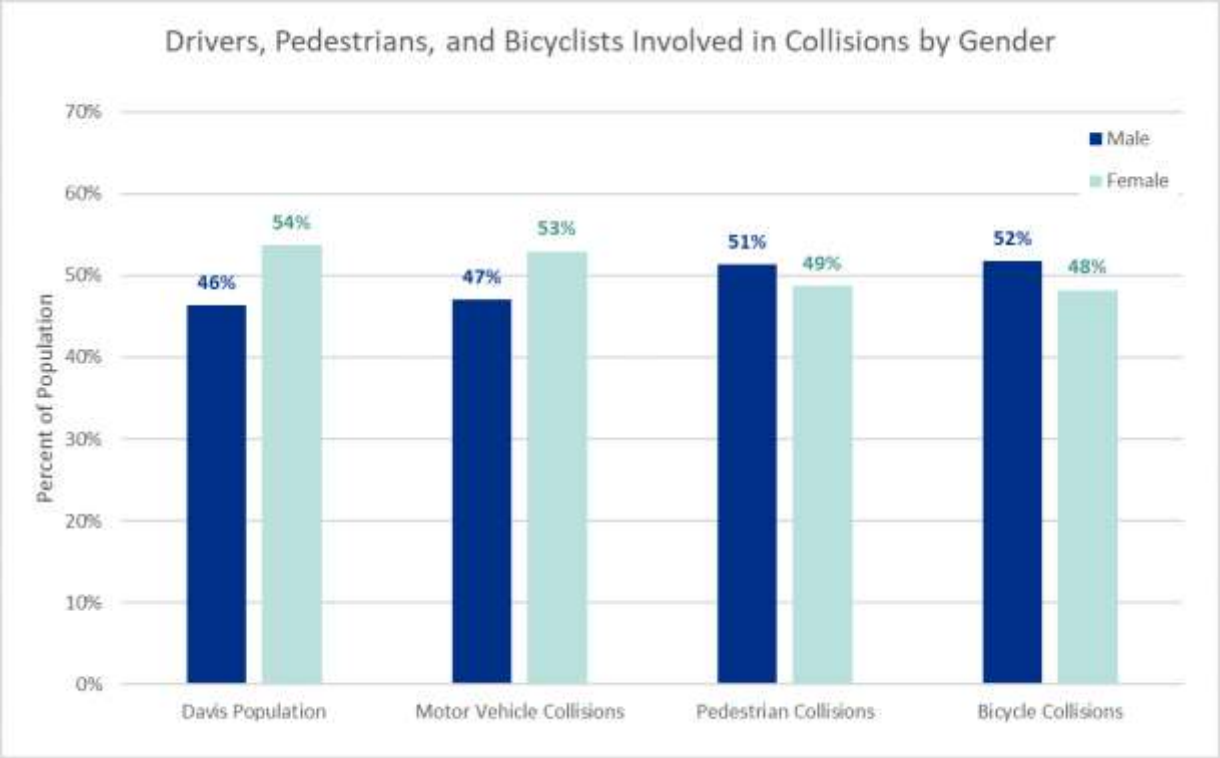


Figure 28: Drivers, pedestrians, and bicyclists involved in collisions by gender.

[15] https://www.ucdavis.edu/sites/default/files/upload/files/uc-davis-student-profile.pdf

Figure 29 below shows at-fault drivers, pedestrians and bicyclists by gender type. Overall, males, who make up 46% of the Davis population, are more at-fault compared to females. The greatest disparity is male and female at-fault bicycle collisions. Males are at-fault in 56% of bicycle collisions and 44% of collisions are caused by females.

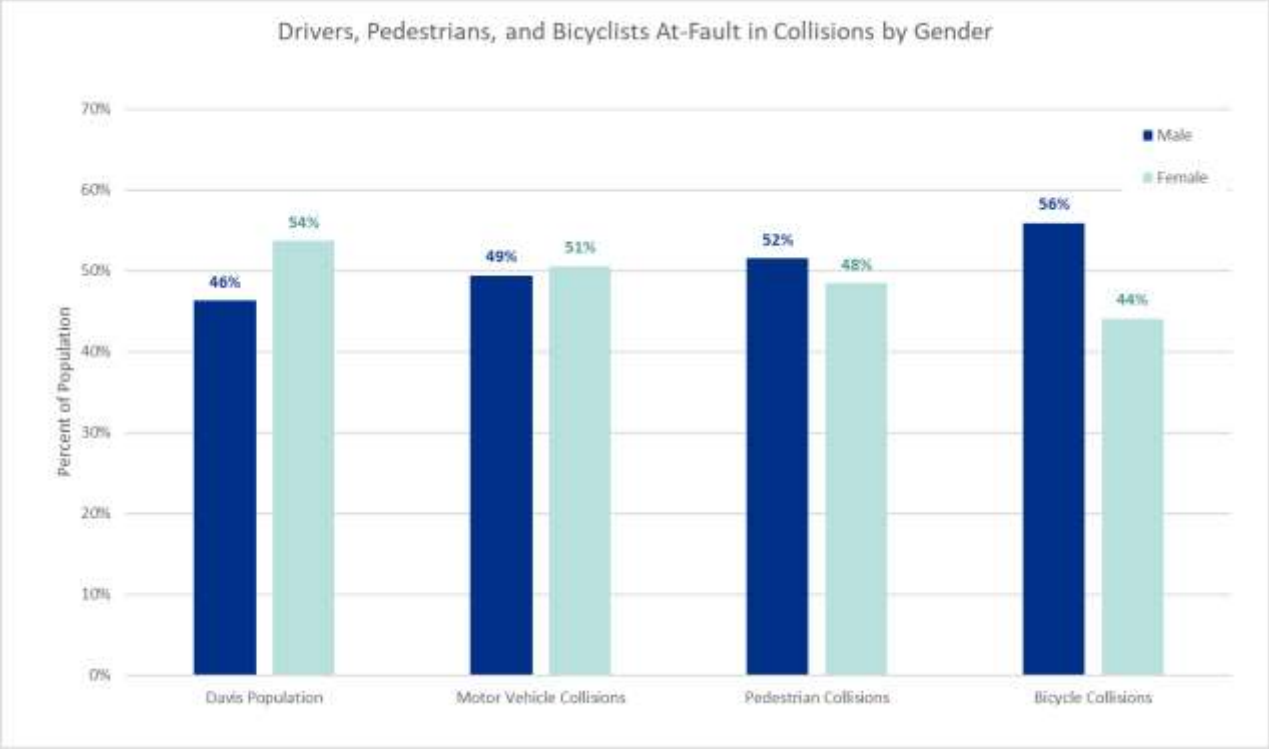


Figure 29: Drivers, pedestrians, and bicyclists at-fault in collisions by gender.

Figure 30 through

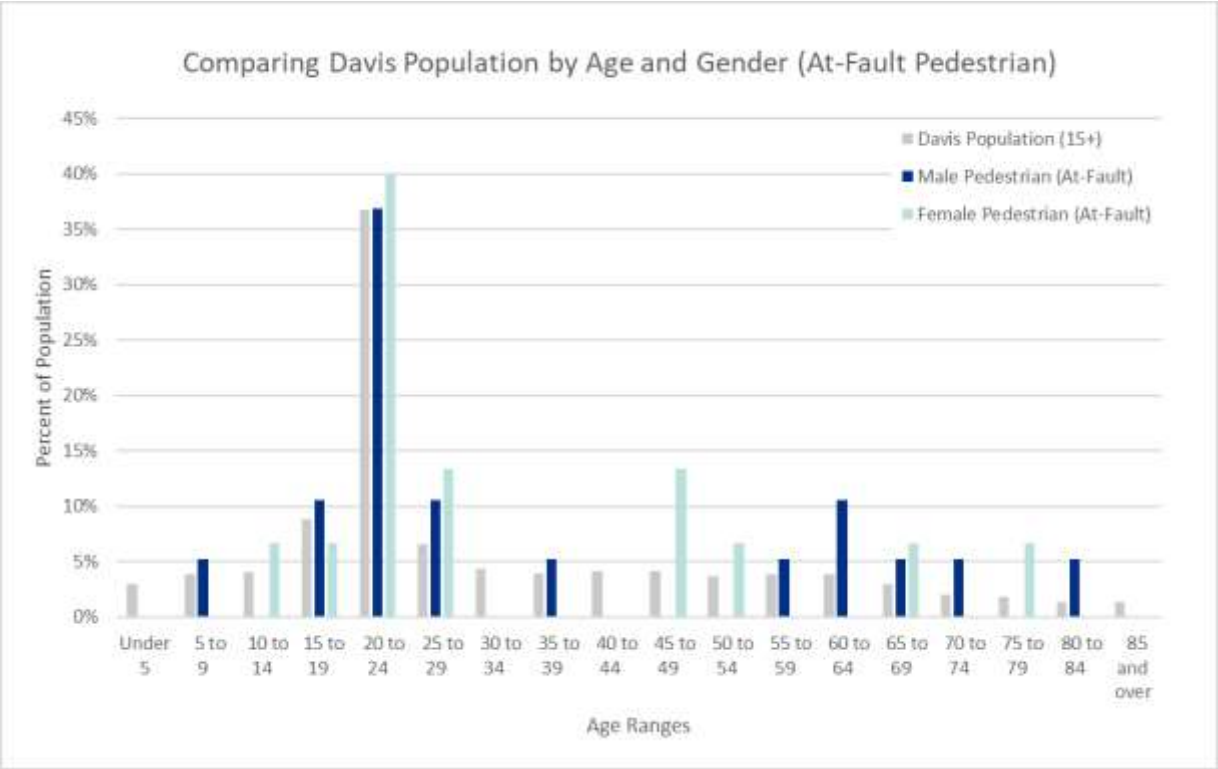


Figure 35 compare gender and age for drivers, bicyclists and pedestrians as well as all collisions and at-fault collisions.

Figure 30 reveals that female drivers between 20 and 29 years old are involved in more collisions than male drivers. The data indicates that both male and female drivers between 25 and 59 years old are involved in more collisions proportionally compared to the Davis population.

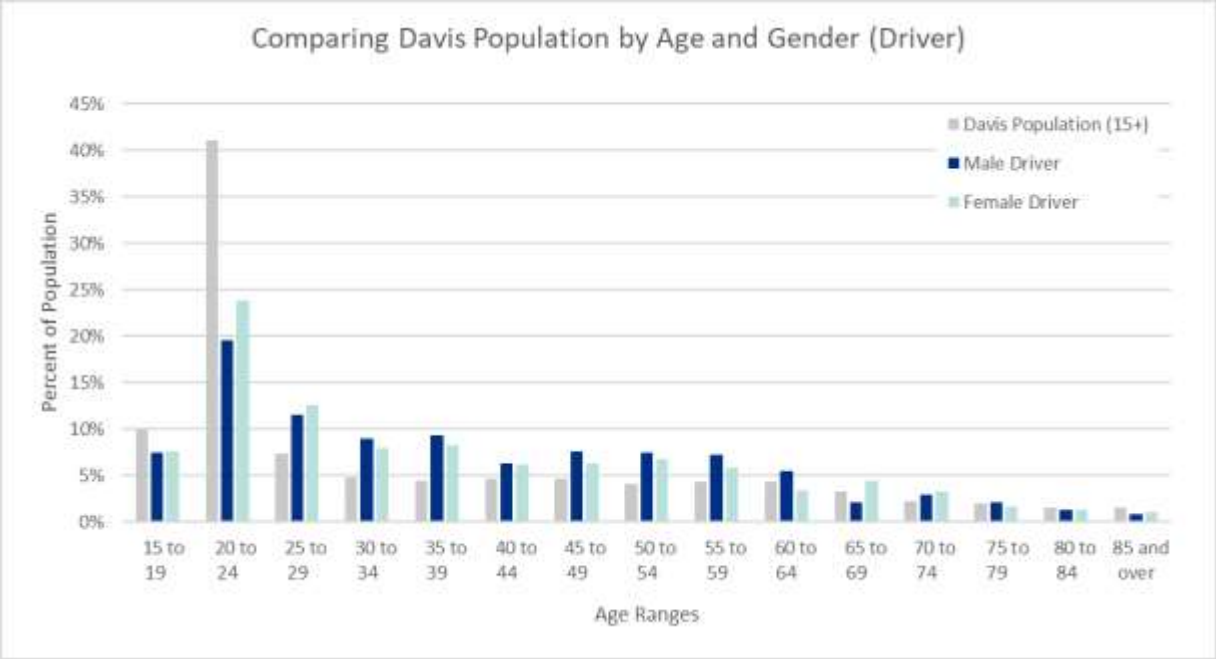


Figure 30: Comparing Davis population to age and gender.

Figure 31 compares age and gender of at-fault drivers.

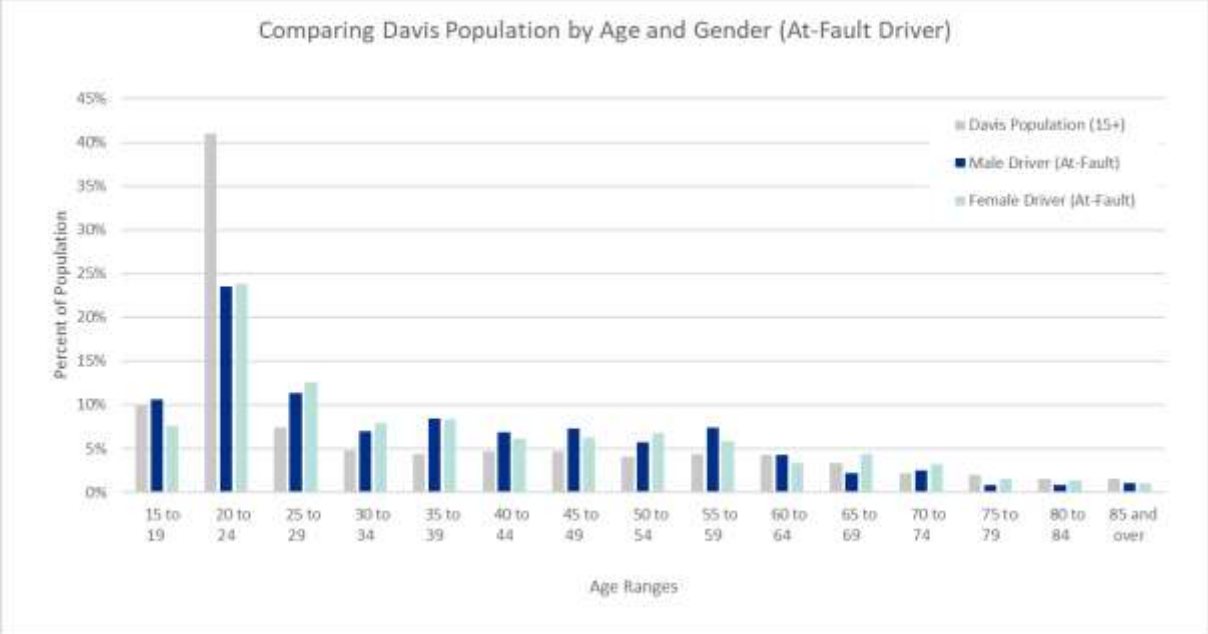
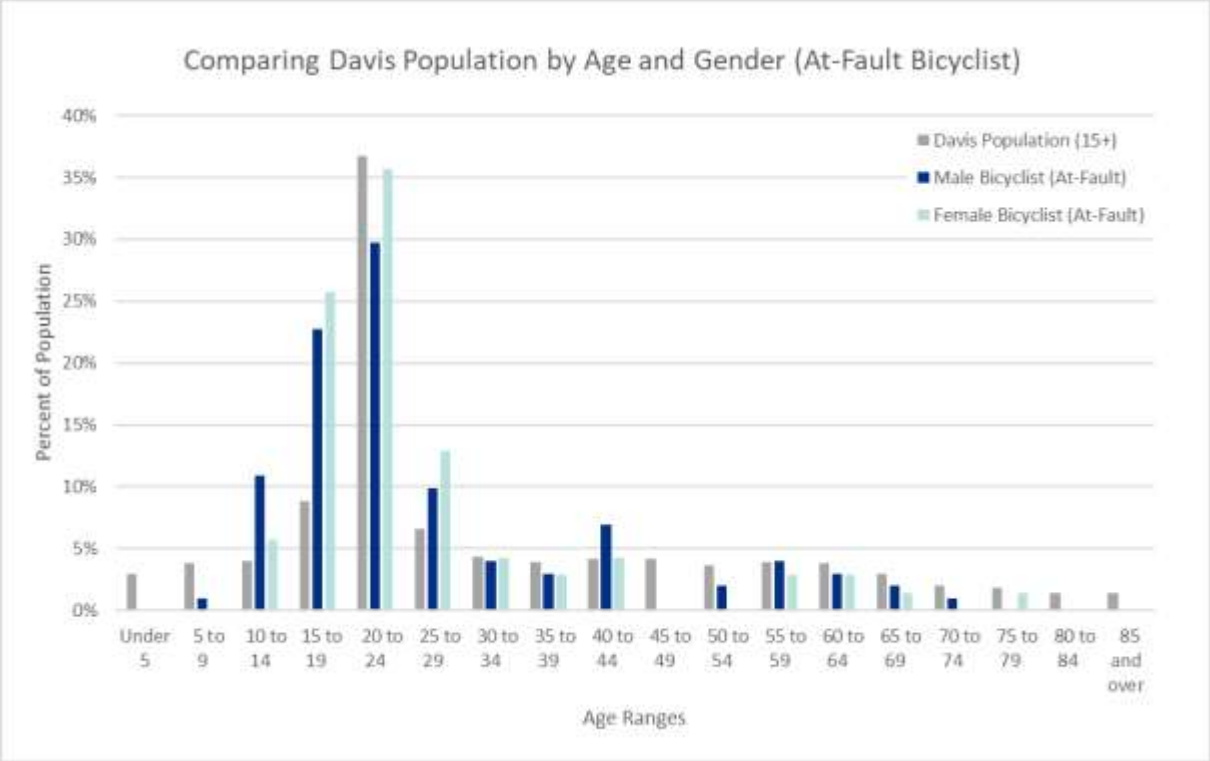


Figure 31: Comparing Davis population to age and gender (at-fault drivers).

Below Figure 32 and Figure 33 compare the Davis population to males and females involved in all bicycle collisions and at-fault bicycle collisions.



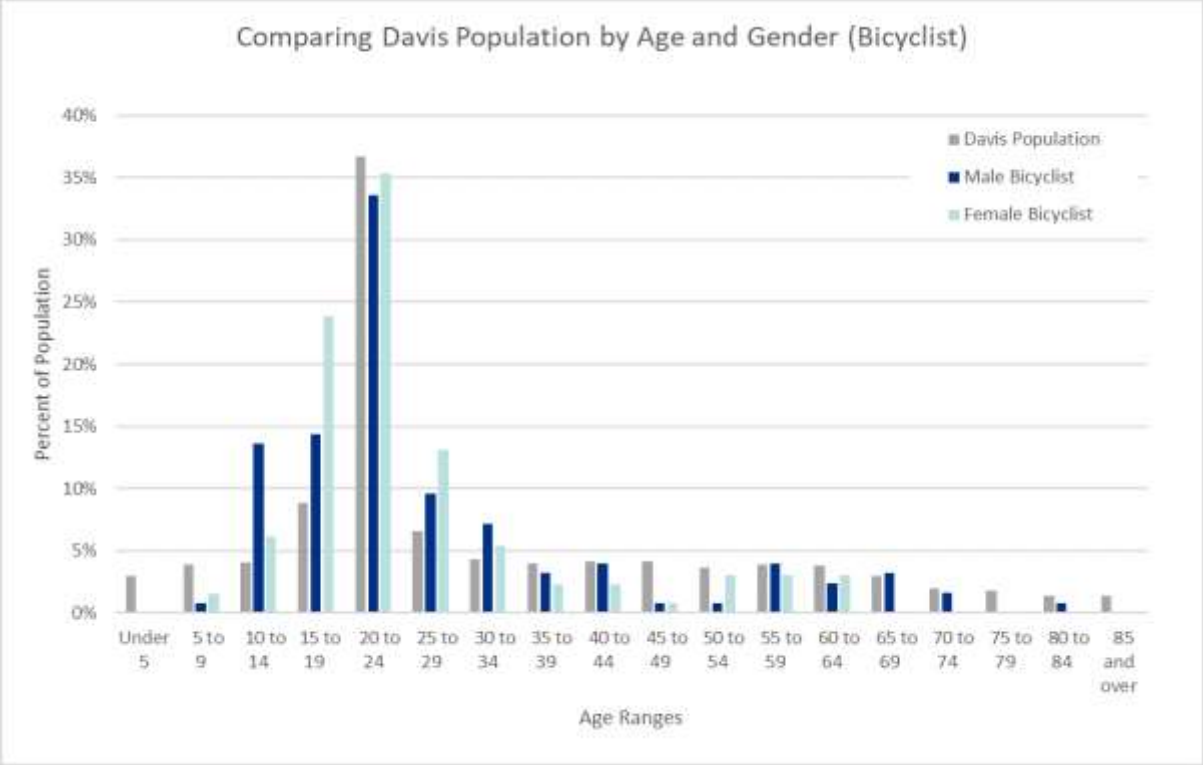
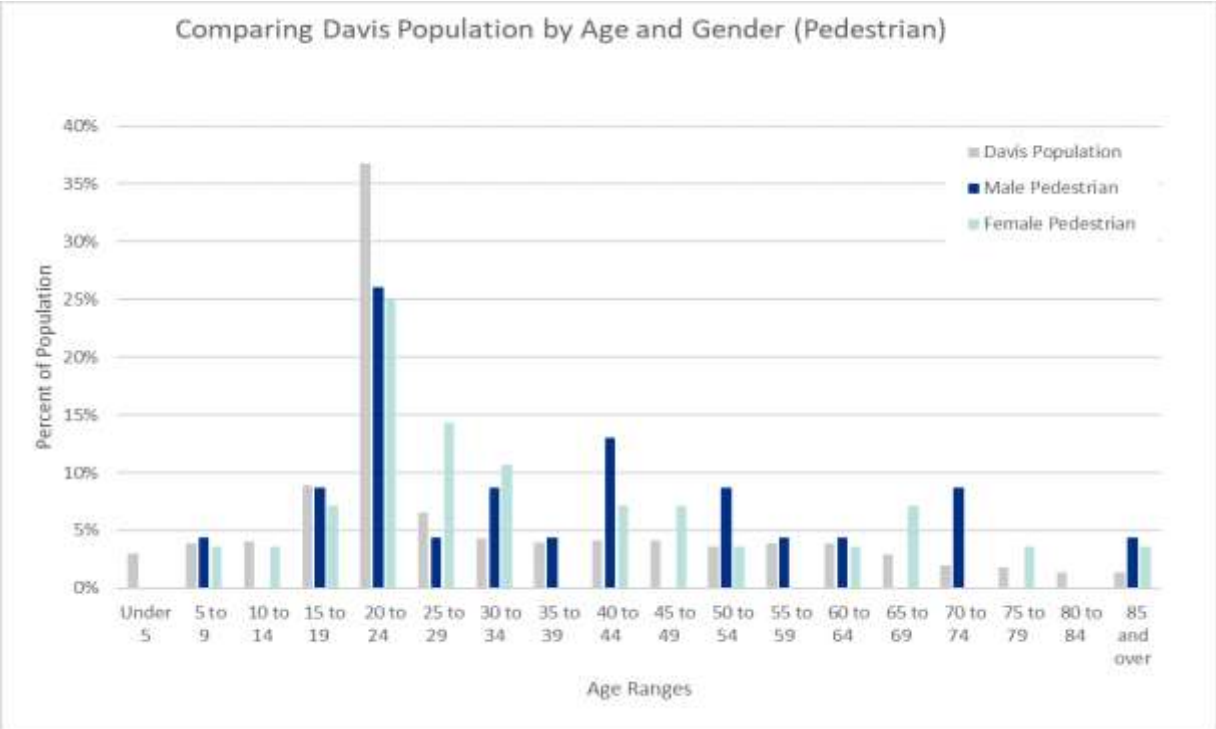


Figure 32. Comparing Davis population by age and gender (bicyclist).

Figure 33: Comparing Davis population by age and gender (at-fault bicyclists).

Below **Figure 34** and



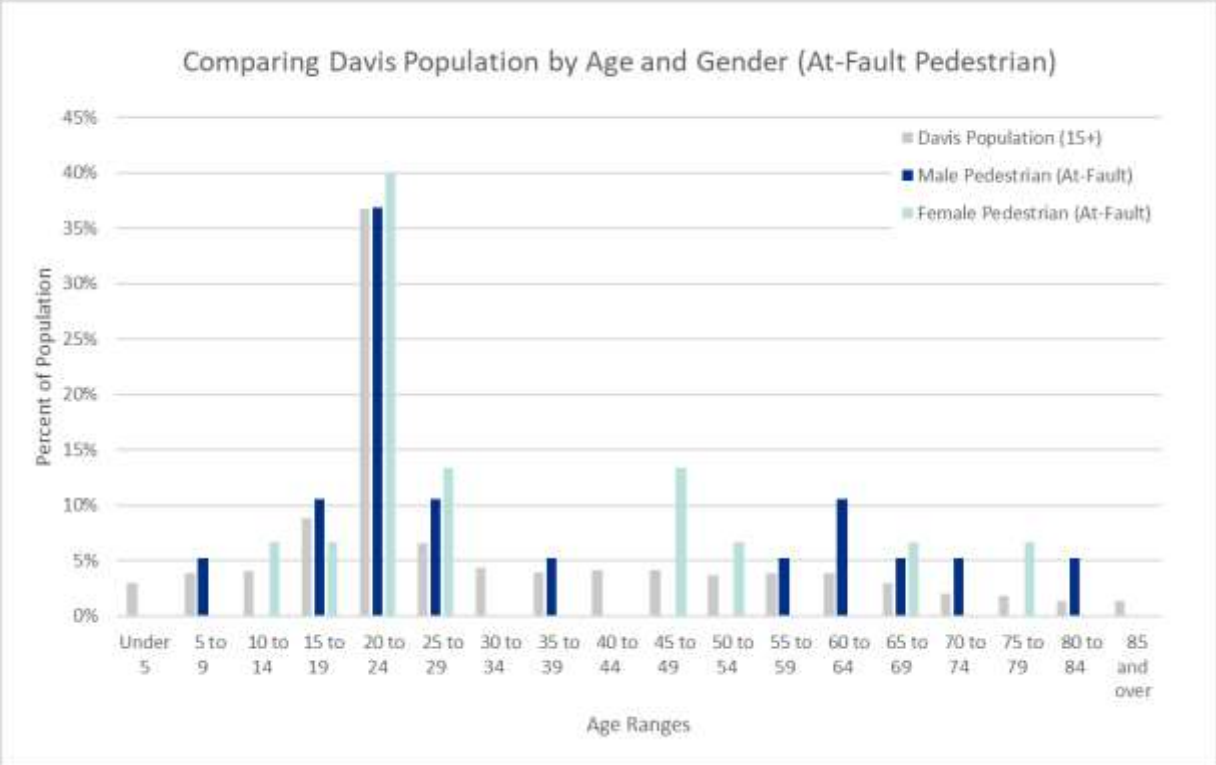


Figure 35 compare the Davis population by age and gender for all pedestrian collisions and at-fault pedestrian collisions.

Figure 34: Comparing Davis population by age and gender (pedestrian).

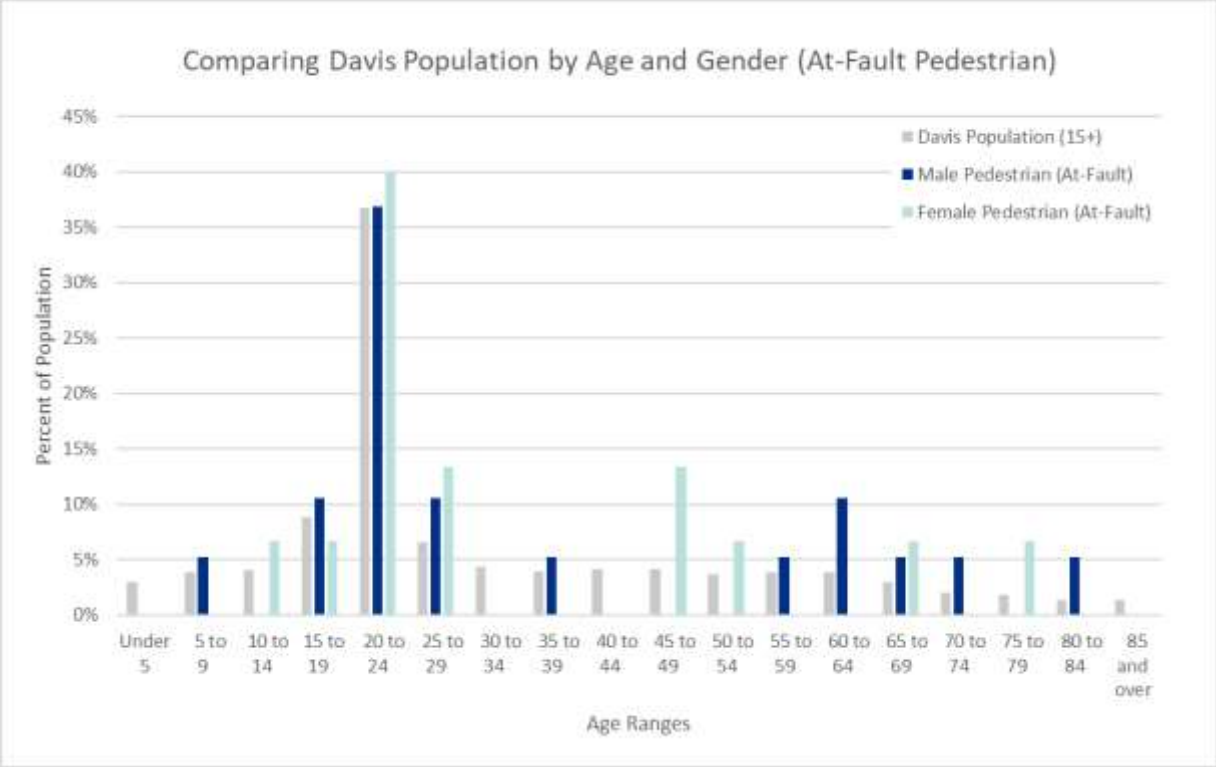


Figure 35: Comparing Davis population by age and gender (at-fault pedestrian).

ALCOHOL USE

This next section evaluates alcohol-involved collisions and collisions resulting in alcohol violations. Alcohol-involved collisions are defined as collisions involving a driver, bicyclist or pedestrian that had been drinking. Not all alcohol-involved collisions result in an alcohol violation or citation for driving under the influence of alcohol or drugs.

Between 2009 and 2019, there were 133 alcohol-involved collisions. **Figure 36** shows all alcohol-involved collisions by year and breaks down the data by KSI and Not KSI collisions. Nineteen collisions were KSI and the remaining 114 were Not KSI.

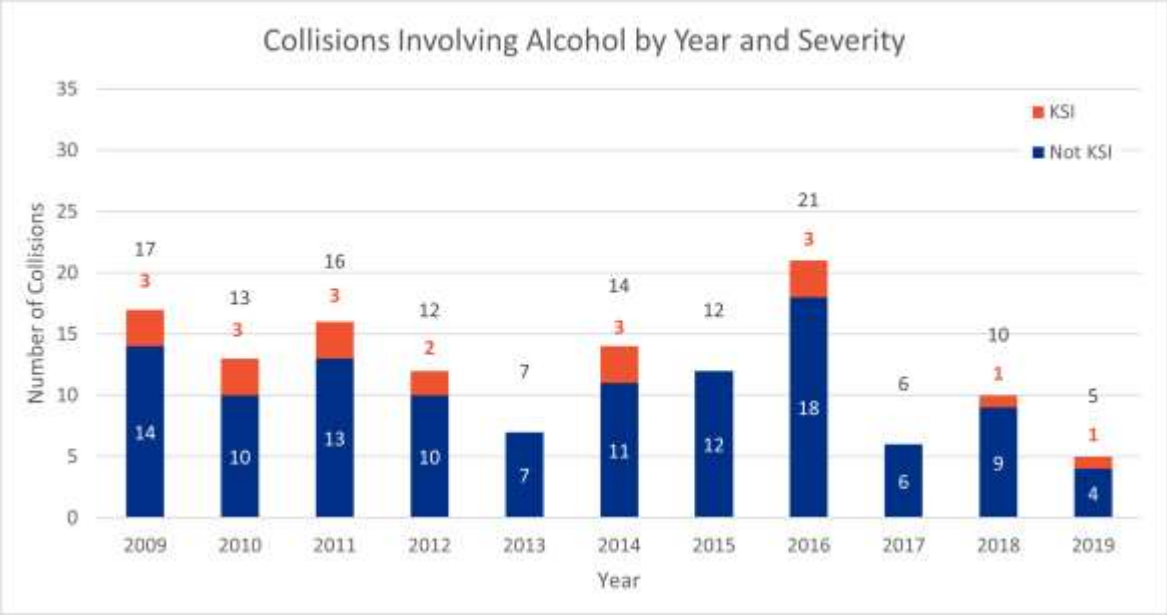


Figure 36: Collisions involving alcohol by year and severity.

In Davis, 10% of all collisions involve alcohol and 21% of all KSI collisions involve alcohol. In addition, 33% of all fatal collisions involve alcohol. Of the alcohol-involved collisions, 56% of drivers were cited with an alcohol-related violation.

Figure 37. Davis fatalities caused by alcohol.

CELL PHONES AND COLLISIONS

In 2001, the collision reports began to include cellphone use as part of the recorded data. Even though cellphone information is now part of collision reports, there is very little data available about cellphone use related to collisions. Out of the 1,397 collisions between 2009 and 2019, only eight collisions included information about hands free cellphone use and only 24 collisions included information about handheld cellphone use. Therefore, no conclusions or trends can be found regarding cellphones and collisions based on this dataset.

FATALITIES

There were six fatalities in on local roads in Davis between 2009 and 2019. **Figure 38** shows the locations of these fatalities and the associated table includes the date and time of the collision, the location and the description of the fatal incident. All fatalities involved motor vehicles. Two of the fatal collisions involved drugs or alcohol; two were a result of unsafe speed, and two were due to a pedestrian violation. Two pedestrians were killed between 2009 and 2019.

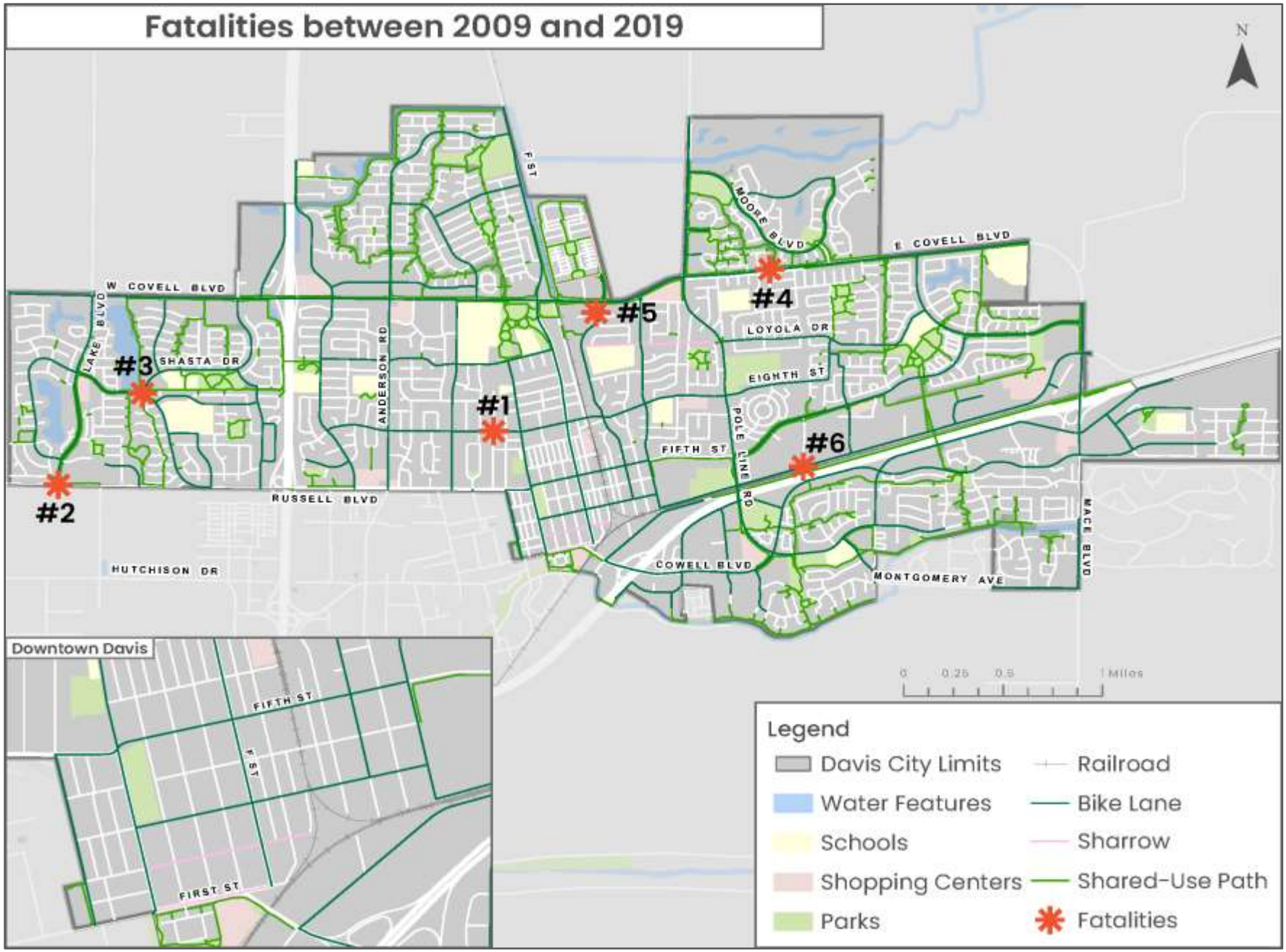


Figure 38. Map of fatalities from 2009-2019.

Table 1: Fatalities in Davis between 2009 and 2019.

Fatalities in Davis Between 2009 and 2019				
ID	Date, Time	Location	Description of Fatal Incident	Deceased
1	1/9/2011, Sunday at 4:19 a.m.	8th Street near Miller Drive	21-year-old female was driving under the influence of alcohol and ran off the road.[16]	Driver
2	12/21/2011, Wednesday at 6:39 a.m.	Russell Boulevard and Lake Boulevard	A 61-year-old male not under the influence of alcohol or drugs was driving at unsafe speeds on Russell Blvd. He sideswiped and killed a 25-year-old female walking in a crosswalk.[17]	Pedestrian
3	2/4/2012, Saturday at 11:01 p.m.	Arlington Boulevard and Shasta Drive	A 62-year-old female not under the influence of alcohol or drugs was driving on Arlington Blvd. She sideswiped and killed a 19-year-old pedestrian crossing the street outside of the crosswalk. The pedestrian was under the influence of alcohol.[18]	Pedestrian
4	02/01/2014, Saturday at 2:02 p.m.	Covell Boulevard near Baywood Lane	A 39-year-old male not under the influence of alcohol or drugs was driving at unsafe speeds on Covell Blvd. The 39-year-old rear-ended and killed an 85-year-old female driver.[19]	Driver
5	7/11/2014, Friday at 10:09 p.m.	Cranbrook Court and J Street	A 19-year-old female was driving at unsafe speeds. No one involved was under the influence of alcohol and drugs.[20]	Person standing on trunk of vehicle.
6	2/24/2016, Wednesday at 5:16 p.m.	2nd Street and Cantrill Drive	A 32-year-old male with six other people in his vehicle was driving at unsafe speeds on 2nd Street. The driver was under the influence of drugs. A 71-year-old in another vehicle was struck and killed.[21]	Driver

FATALITIES IN 2020 AND 2021

During the creation of this report, there was one pedestrian fatality on January 3, 2021, at 6 p.m. on Olive Drive near Hickory Lane.[22] The driver was cited with driving under the influence of alcohol and drugs and vehicular manslaughter.

[16] https://www.davisenterprise.com/Archived-Stories-0/speed-alcohol-blamed-in-crash/
[17] https://www.davisenterprise.com/news/local/crime-fire-courts/ucd-law-student-dies-of-injuries-from-collision/
[18] https://www.davisenterprise.com/news/local/crime-fire-courts/ucd-student-critically-injured-in-west-davis-collision/
[19] https://www.davisenterprise.com/news/local/crime-fire-courts/trial-confirmed-for-fatal-crash-suspect/
[20] https://www.davisenterprise.com/news/local/crime-fire-courts/davis-teen-succumbs-to-head-injuries/
[21] https://www.davisenterprise.com/news/local/crime-fire-courts/charges-upheld-for-driver-in-fatal-second-street-crash/
[22] https://www.davisenterprise.com/news/local/man-killed-in-olive-drive-hit-and-run/

WHEN ARE COLLISIONS OCCURRING?

This section describes day of week, time of day and weather trends related to collision data.

DAY OF THE WEEK AND TIME OF DAY TRENDS

The National Safety Council reports that fatal car collisions are more frequent on weekends, peaking on Saturday. The number of nonfatal collisions tends to be higher on weekdays, peaking on Friday.[23] The report also highlights that during the spring and summer months fatal collisions tend to peak between 8 p.m. and 11:59 p.m. In the summer, the nonfatal collision peak is earlier, from 12 p.m. to 3:59 p.m. During October through March, the peak for both fatal and nonfatal collisions is from 4 p.m. to 7:59 p.m. **Figure 39** from the National Safety Council shows the collision trends by time of day and day of the week.

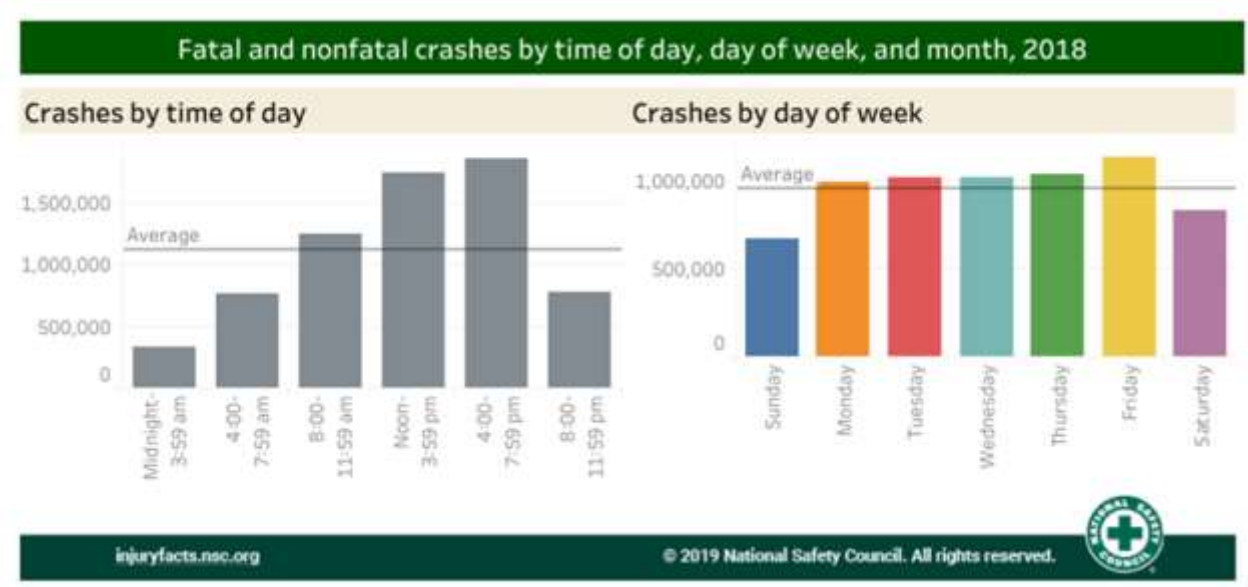


Figure 39: National Safety Council fatal and nonfatal crashes by time of day and day of week, 2018.

[23] https://injuryfacts.nsc.org/motor-vehicle/overview/crashes-by-time-of-day-and-day-of-week/

Figure 40 and **Figure 41** below display the collisions in Davis by time of day and day of the week. Similar to the national data, there are more collisions on Fridays compared to other days of the week. Also similar to national data, most collisions in Davis occur between 4 p.m. and 7:59 p.m.

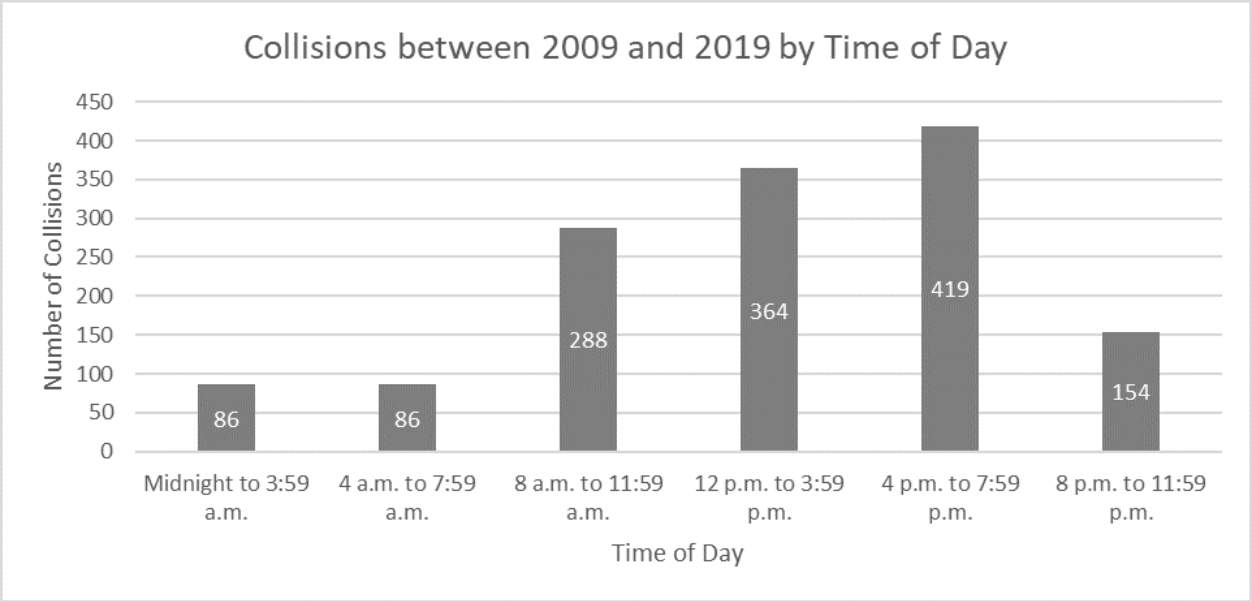


Figure 40: Collisions between 2009 and 2019 by time of day.

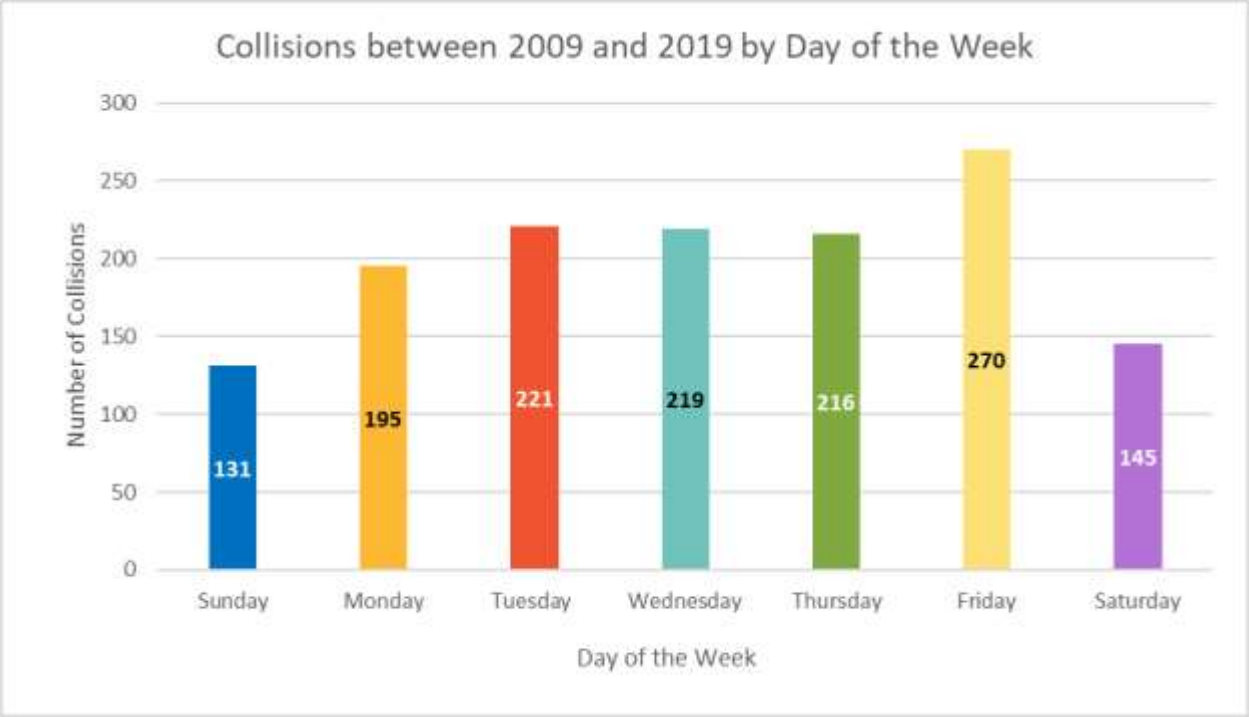


Figure 41. Collisions between 2009 and 2019 by day of the week.

According to the National Traffic Safety Administration's report *Passenger Vehicle Occupant Fatalities by Day and Night – A Contrast in May 2007*, the rate of fatalities is three times higher at nighttime than daytime. The report states that approximately 50% of nationwide collisions happen at nighttime with 25% of travel occurring in the dark hours. The report also noted that there are significantly more alcohol-related and speeding collisions in the nighttime versus the daytime. **Figure 42** reveals that most collisions in Davis occur in the daylight.

Only 2% of collisions occurred on streets without streetlights.

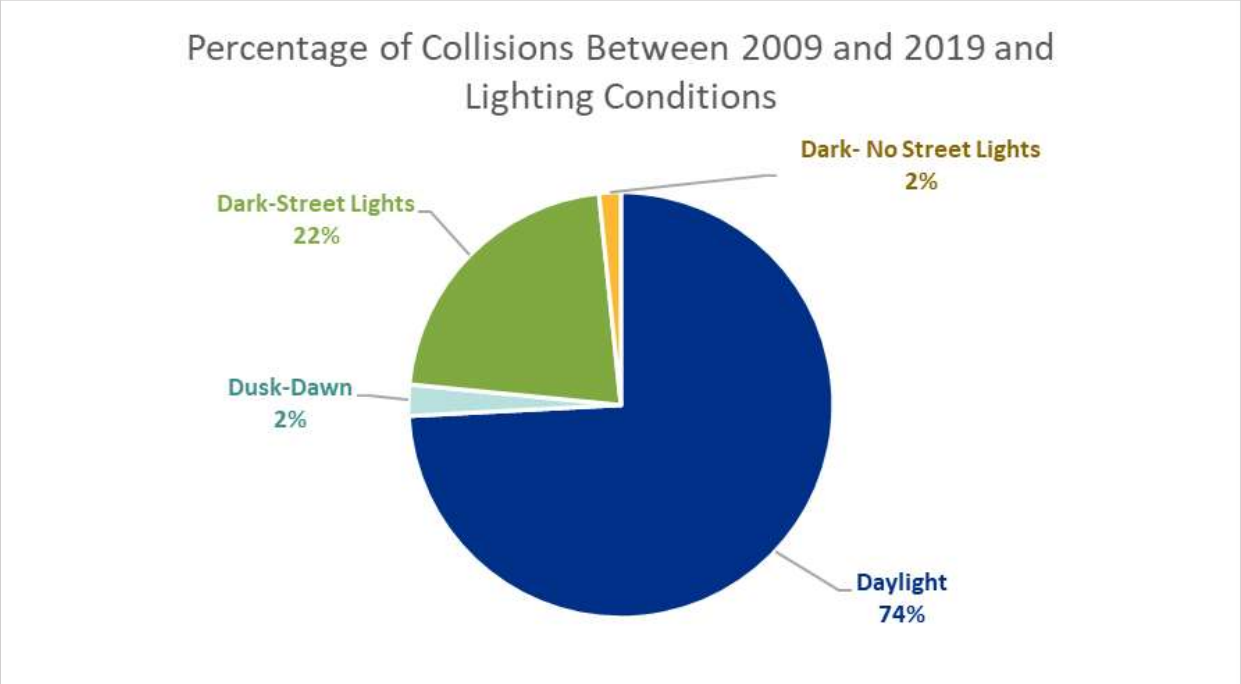


Figure 42: Percentage of collisions between 2009 and 2019 and lighting conditions.

WEATHER-RELATED COLLISIONS

The Federal Highway Administration states that 21% of collisions nationwide are weather-related.[24] The vast majority of weather-related collisions occur as a result of wet pavement and rain. On average in Davis, there are 267 sunny days and 66 rainy days a year.[25] As a result, most collisions happen on days with clear skies.

In late fall through early spring, after the first significant rainfall, a thick, ground fog known as Tule fog settles in the Sacramento Valley area. Tule fog is the leading cause of weather-related collisions in California.[26] Fog was noted as the weather condition for four collisions in Davis between 2009 and 2019. Investigators hypothesize that fog played a role in the fatal collision on January 11, 2011, between a driver and pedestrian. The other three collisions during fog in Davis involved motor vehicle drivers crashing into other motor vehicles. **Figure 43** shows the weather conditions reported at the time of Davis collisions.

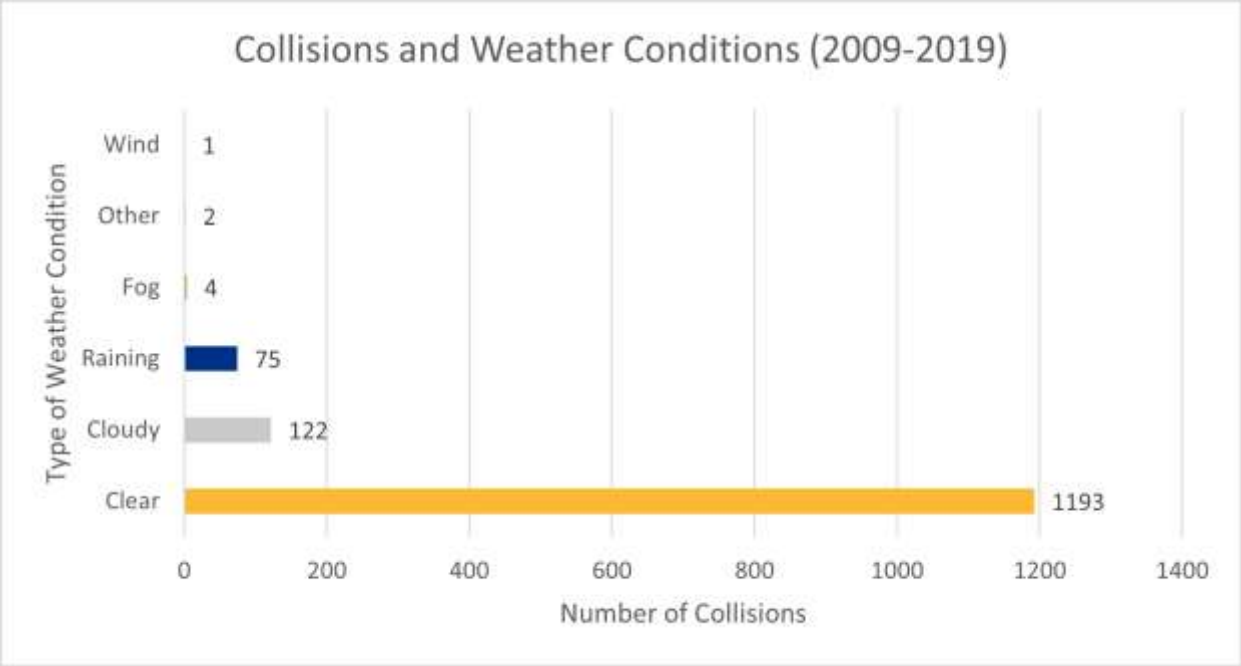


Figure 43. Collisions and weather conditions (2009-2019).

[24]https://ops.fhwa.dot.gov/weather/q1_roadimpact.htm#:~:text=Weather%20Impacts%20on%20Safety,1%2C235%2C000%20%2D%20are%20weather%2Drelated.
[25] https://www.weather-us.com/en/california-usa/davis-climate#:~:text=Throughout%20the%20year%2C%20in%20Davis,309mm)%20of%20precipitation%20is%20accumulated.
[26]https://en.wikipedia.org/wiki/Tule_fog

COLLISIONS WHERE GLARE WAS A FACTOR

In addition to weather, glare from headlights and the sun plays a role in collisions. Research shows there is a trend in collisions caused by glare. In general, older drivers are more likely to be involved in collisions if glare obstructs their vision.[27] Between 2009 and 2019, there were 56 collisions in Davis where vision obscurity was a factor. Adults aged 35 to 44 years old, who account for 9% of the Davis population, were involved in 18% of vision obscurity collisions.

People ages 35 to 39, 70 to 74, and 80 to 84 had the most collisions where glare was a factor compared to the Davis population.

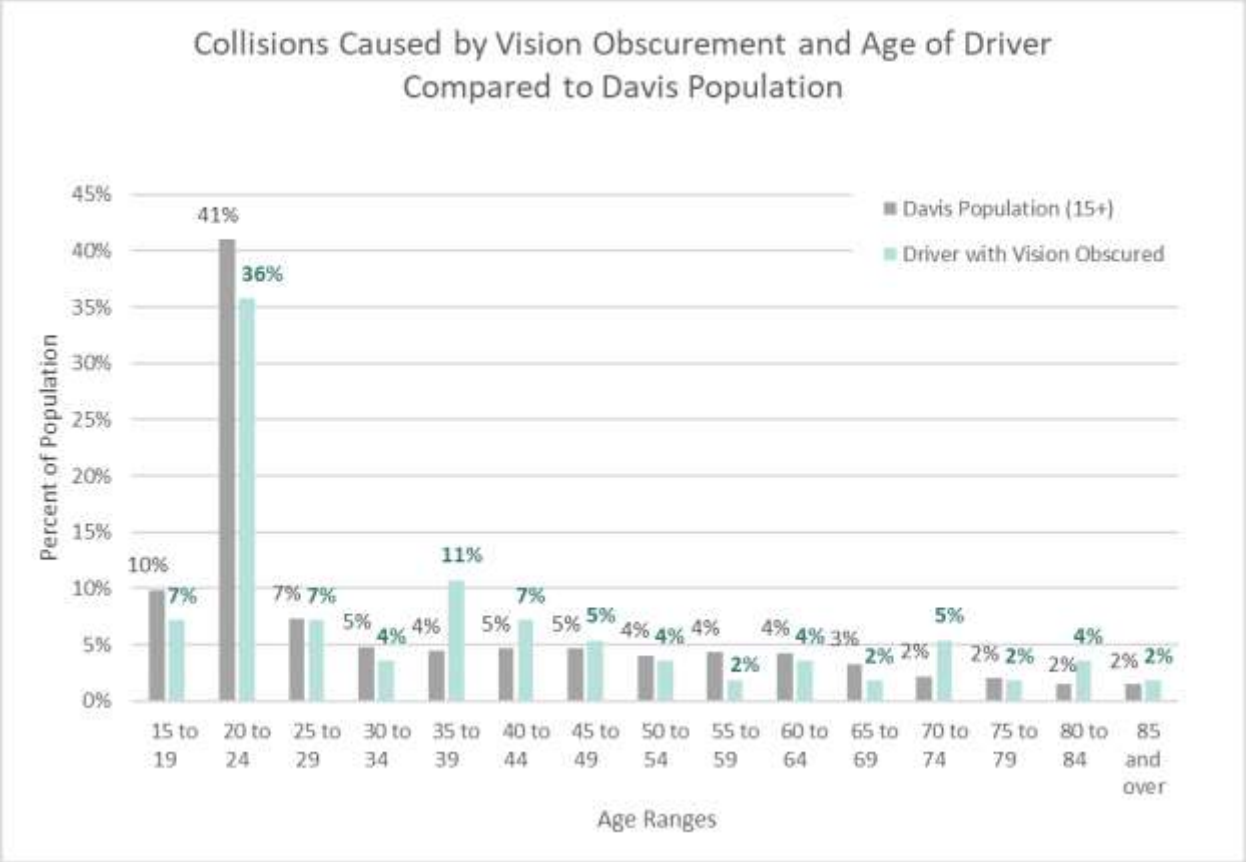


Figure 44. Collisions caused by vision obscurity and age of driver compared to Davis population.

[27] https://nces.ed.gov/FCSM/pdf/2005FCSM_Choi_Singh_IVA.pdf

WHAT TYPE OF COLLISIONS ARE OCCURRING IN DAVIS?

This section analyzes what types of collision are occurring for drivers, pedestrians, and bicyclists.

KILLED OR SEVERELY INJURED (KSI) AND VISIBLE INJURIES AND COMPLAINT OF PAIN (NOT KSI) COLLISIONS

Of the 1,397 total collisions between 2009 and 2019, 6% (90 collisions) resulted in someone being killed or severely injured. **Figure 45** below shows the percentage of collisions by mode that resulted in KSI and Not KSI. Motor vehicle collisions had the smallest percentage of KSI, while pedestrian collisions had the largest percentage. Pedestrians are the most vulnerable road users and as a result, when they are involved in collisions are more likely to be killed or severely injured compared to people in motor vehicles and bicyclists.

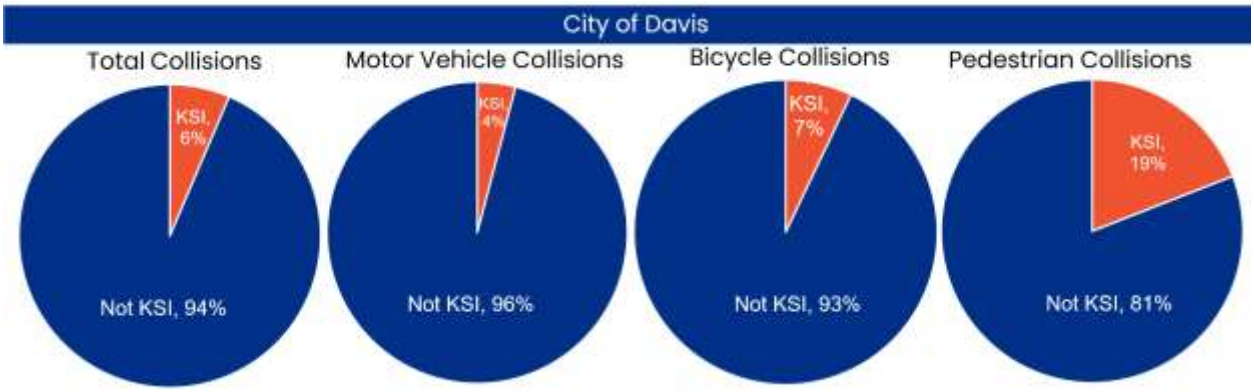


Figure 45. City of Davis KSI and Not KSI compared by mode.

COMPARING DAVIS KSI AND NOT KSI TO OTHER CITIES

To better understand KSI percentages, 10 years of KSI and not KSI data was analyzed for the City of Woodland and the City of Santa Cruz. Both the city of Woodland and the City of Santa Cruz are comparable to Davis. The City of Woodland is directly north of Davis with a population of 61,398 people[28]. The City of Santa Cruz, also home to a University of California campus, has a population of 61,950[29].

Overall, there are slightly more total collision in Woodland and Santa Cruz. In all cities, there are more pedestrian KSI collisions compared to other modes. In all cities, less than 10% of motor vehicle collisions and bicycle collisions resulted in KSI.

[28] https://www.census.gov/quickfacts/fact/table/woodlandcitycalifornia/PST045221
[29]https://www.census.gov/quickfacts/santacruzcitycalifornia

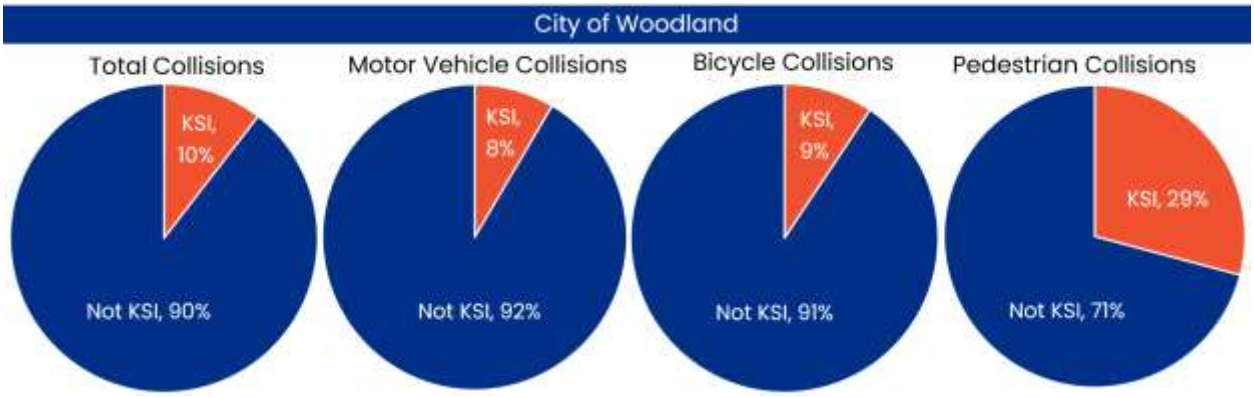


Figure 46. City of Woodland KSI and Not KSI compared by mode.

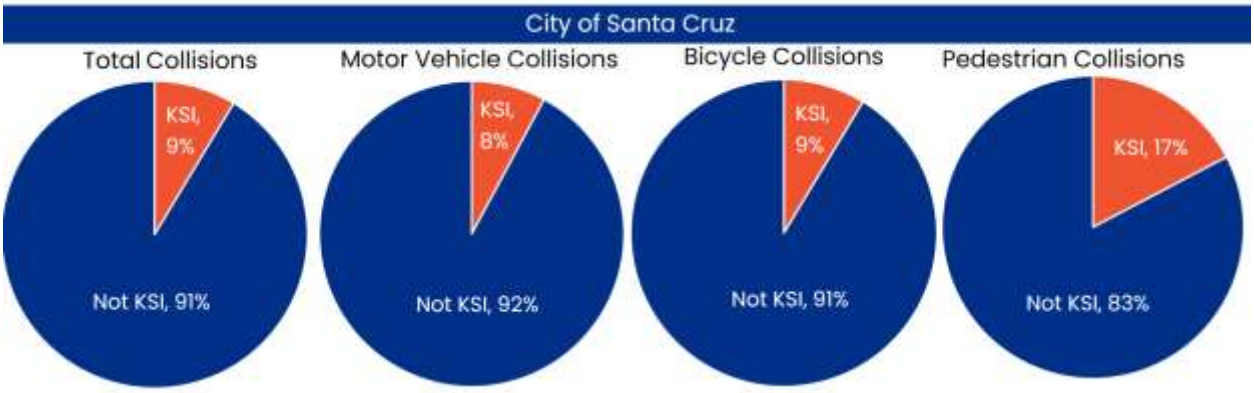


Figure 47. City of Santa Cruz KSI and Not KSI compared by mode.

TYPES OF COLLISIONS

Collisions with a bicycle, broadside collisions and rear-end collisions resulted in the total most collisions. Together, these collision types represented 73% (1,021 collisions) of all collisions in Davis from 2009 through 2019. **Figure 48** shows the collision types and breaks down collision types by severity of injury.

"Single Vehicle" collisions are those that involve single vehicles with (1) a train or animal; (2) an automobile fire; (3) passengers falling or jumping from a vehicle; or (4) a vehicle backing.

**Note: 422 bicycle collisions were counted as 'Collisions with a Bicycle'. An additional 113 bicycle collisions were counted as a broadside, rear-end, hit-object, head-on, sideswipe or overturned collision. There were six collisions that were unclassified and not included in these categories.*

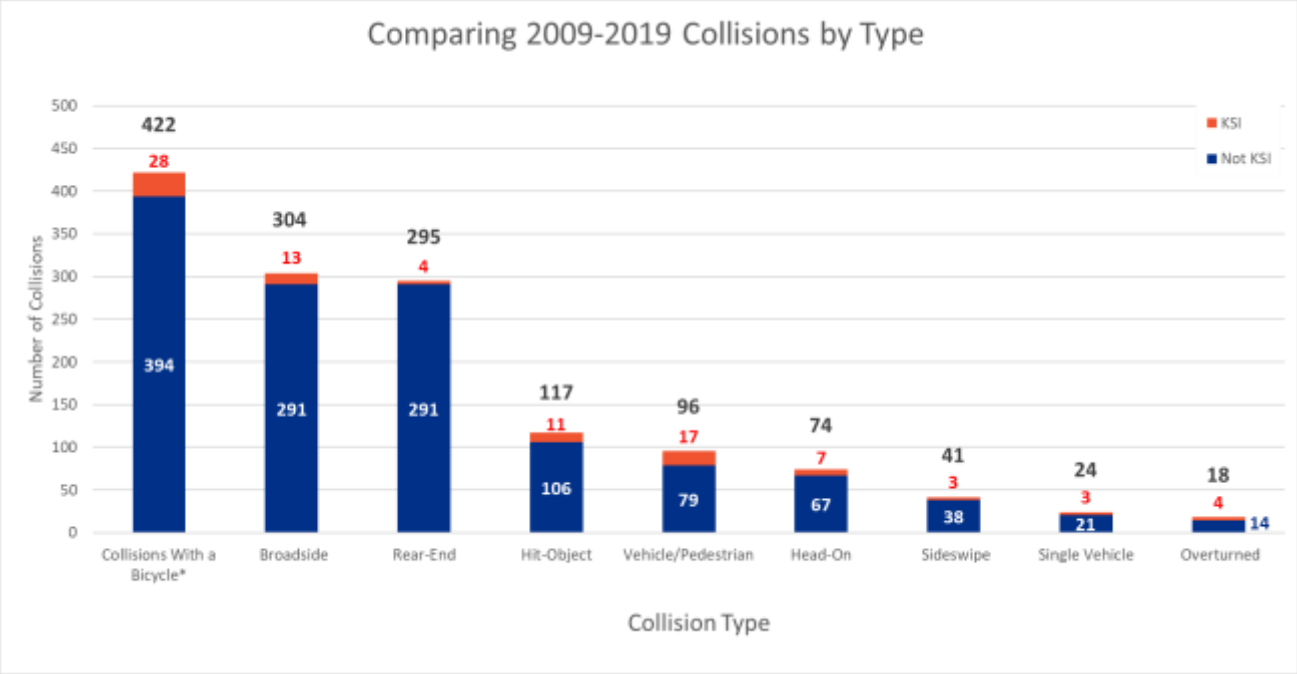


Figure 48: Comparing 2009-2019 collisions by type.

Figure 49 below shows the top five collision types in Davis with the highest proportion of collisions resulting in people killed or severely injured.

Overturned vehicle collisions comprised the fewest number of total collisions. However, overturned vehicles had the largest proportion of KSI collisions with 22%. Eighteen percent of vehicle/pedestrian collisions were KSI. Single vehicle (12%), head-on collisions (9%), and hit-object collisions (9%) rounded off the top five.

Broadside collisions are the second largest collision type, but did not make the top five KSI collision types with only 4% KSI. Rear-end collisions also did not make the top five KSI collisions with only 1% KSI. Even though these types of collisions make up a large portion of the collisions, people are less likely to be killed or severely injured than other types.

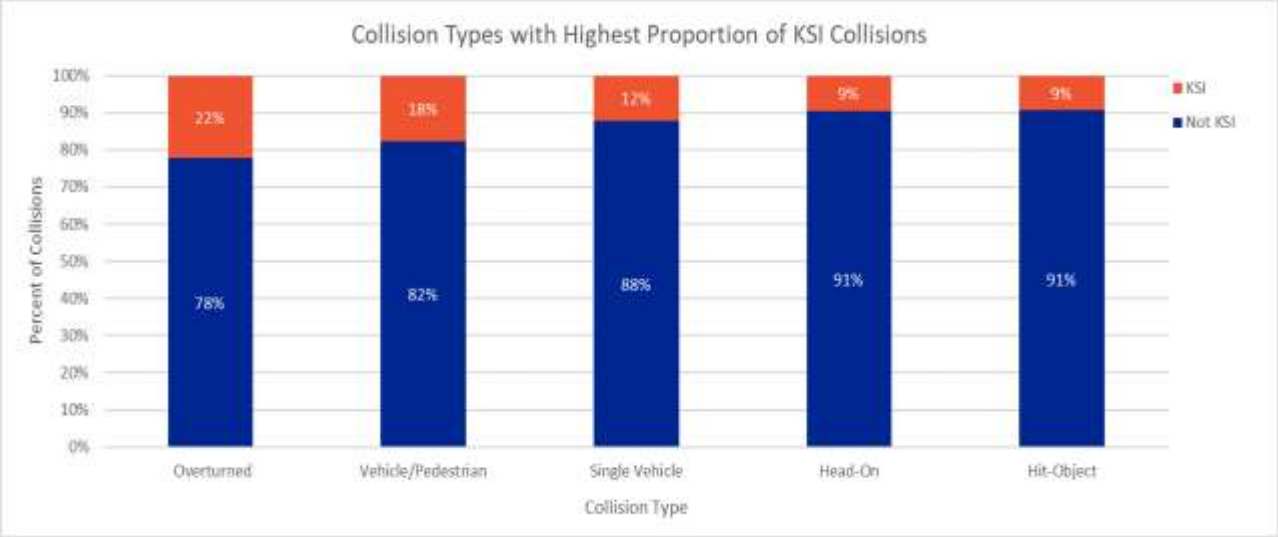


Figure 49: Collision types with highest proportion of KSI collisions.

COLLISION TYPE COMPARING KSI AND NOT KSI BY YEAR

Figure 50 through Figure 58 show the annual collisions by collision type. Looking at the collisions by type over time allows us to identify data trends.

COLLISIONS INVOLVING A BICYCLE

Between 2009 and 2019, there were a total of 422 collisions categorized as a collision type involving bicycles. **Figure 50** below shows the number of collisions per year and breaks down the collisions by KSI and Not KSI. There is an average of 38 total collisions each year and an average of three KSI collisions per year. The number of KSI collisions is slightly increasing since 2015, however, this is not considered a trend due to the small numbers involved.

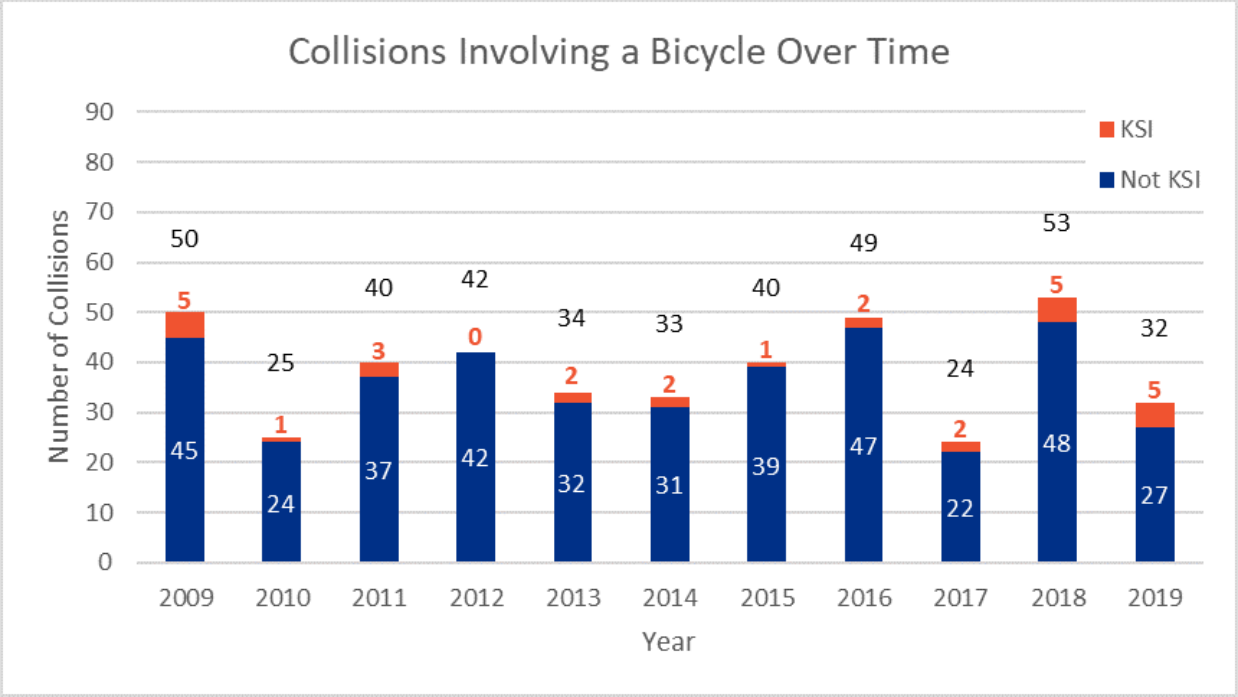


Figure 50: Collisions involving a bicycle over time.

REAR-END COLLISIONS

Figure 51 below shows rear-end collisions over time for KSI and Not KSI. Over the study period, there were a total of four KSI rear-end collisions. 2009 had the most rear-end collisions and 2014 had the fewest. On average, there are a total of 29 rear-end collisions each year and 0.3 KSI collisions per year.

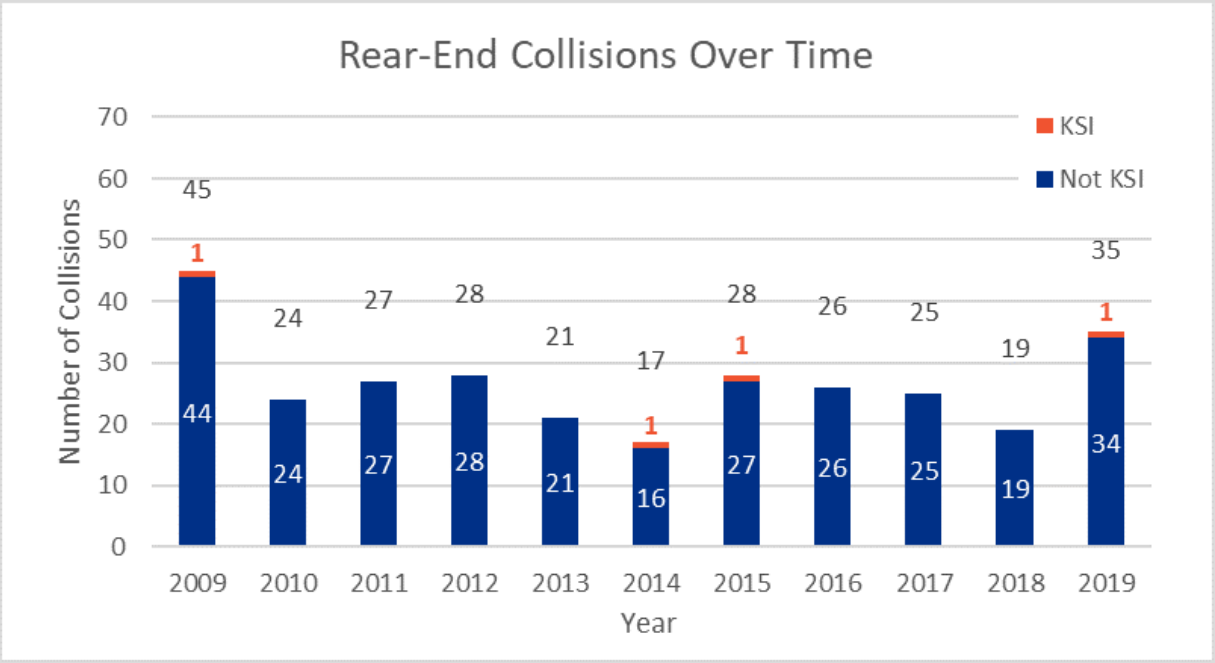


Figure 51: Rear-end collisions over time.

HEAD-ON COLLISIONS

Figure 52 shows that between 2009 and 2019 there were 74 head-on collisions, totaling seven KSI and 67 not KSI. On average, there are a total of seven head-on collisions each year and 0.6 KSI head-on collisions each year.

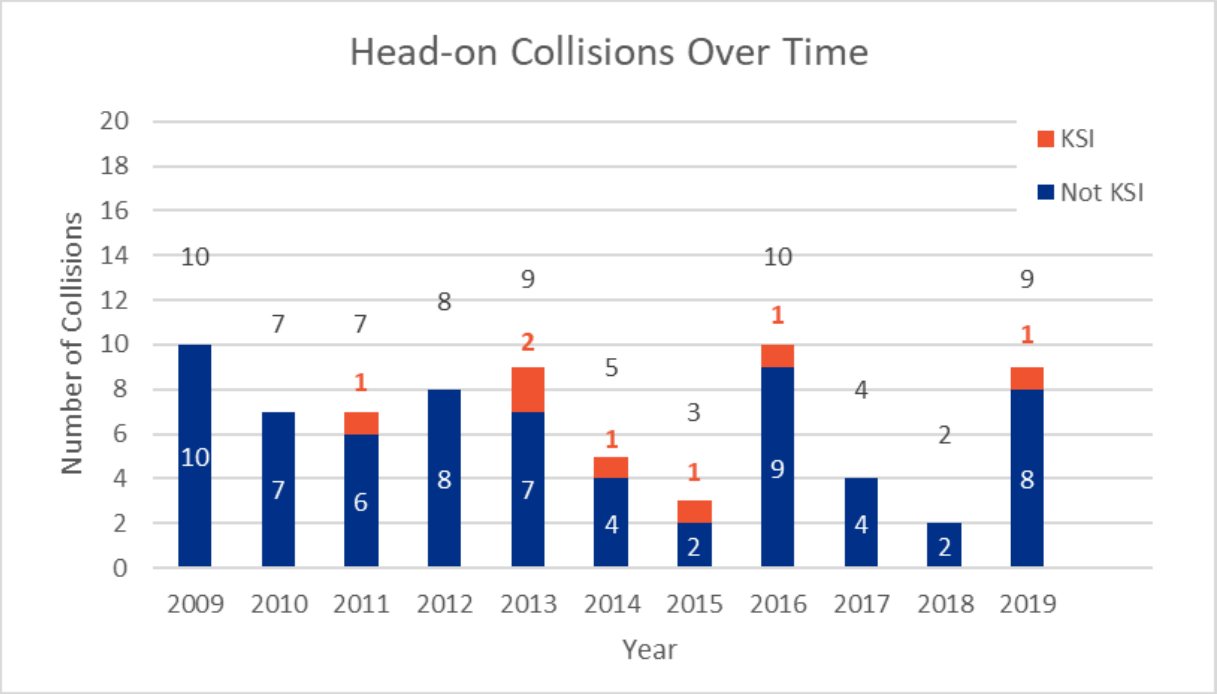


Figure 52: Head-on collisions over time.

SIDESWIPE COLLISIONS

Between 2009 and 2019, there were 41 sideswipe collisions with three KSI. On average, there are a total of four sideswipe collisions each year and 0.3 KSI collisions. **Figure 53** indicates that since 2018 the number of sideswipes each year has increased, however more data is needed to see if this is a trend.

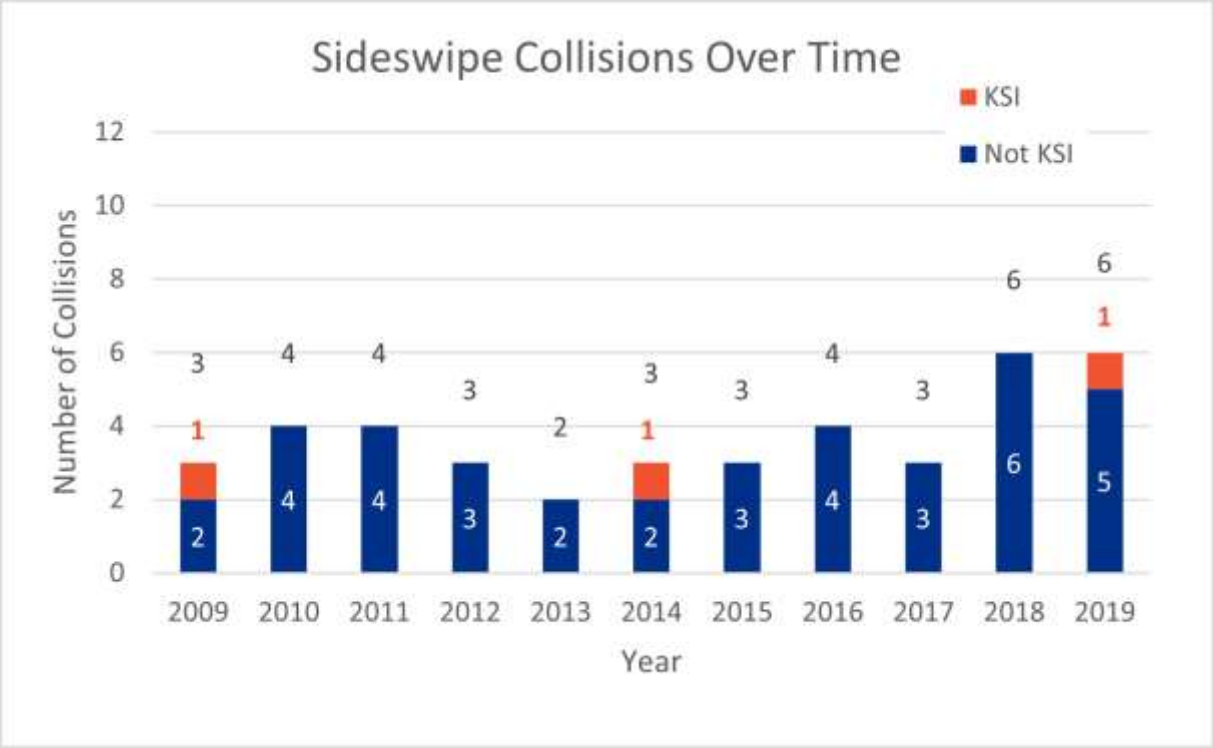


Figure 53. Sideswipe collisions over time.

BROADSIDE COLLISIONS

Between 2009 and 2019, there were 304 broadside collisions, of which 13 were KSI. On average, there are total of 28 broadside collisions each year and one KSI broadside collision a year. **Figure 54** shows that 2016 and 2019 had the most broadside collisions, but more data is needed to determine if broadside collisions are increasing.

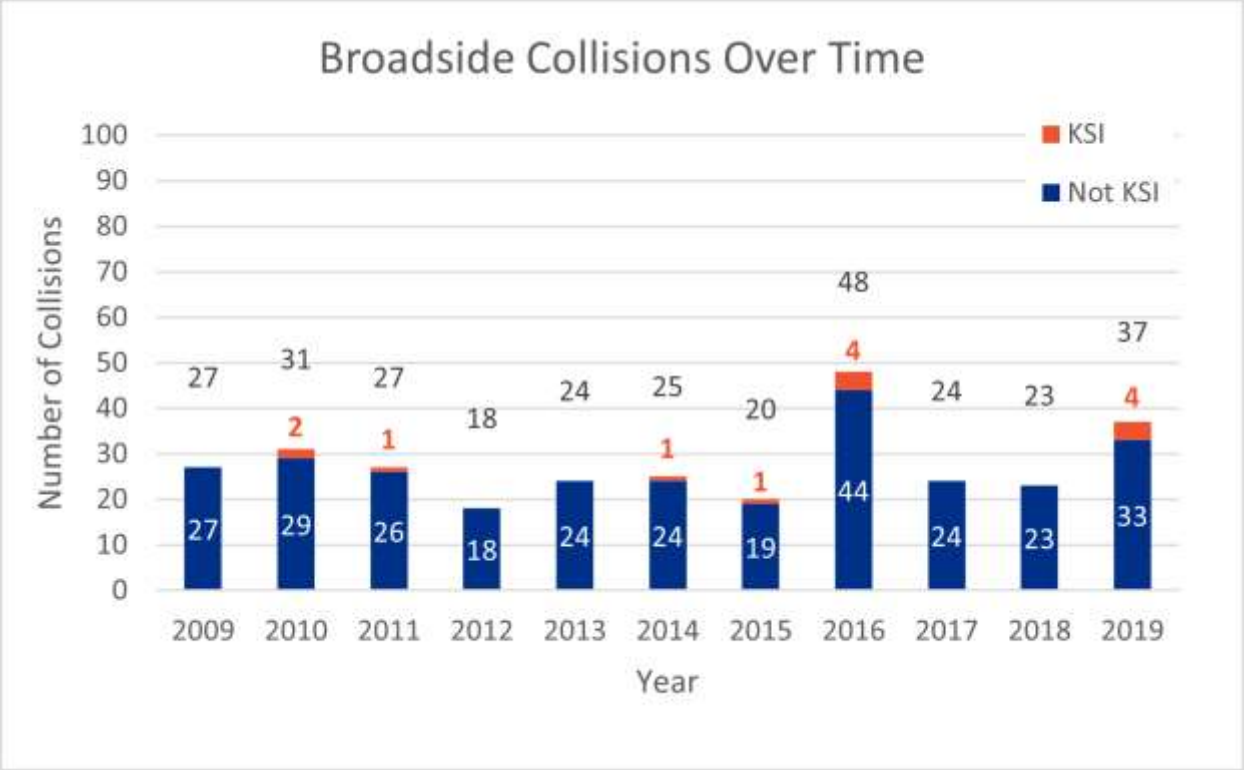


Figure 54: Broadside collisions over time.

HIT-OBJECT COLLISIONS

There were 117 hit-object collisions between 2009 and 2019 with 11 KSI. On average, there are a total of 12 hit-object collisions each year and one KSI collision per year. **Figure 55** shows that 2015 and 2016 had the most hit-object collisions. Between 2017 and 2019, the number of hit-object collisions per year is about the same.

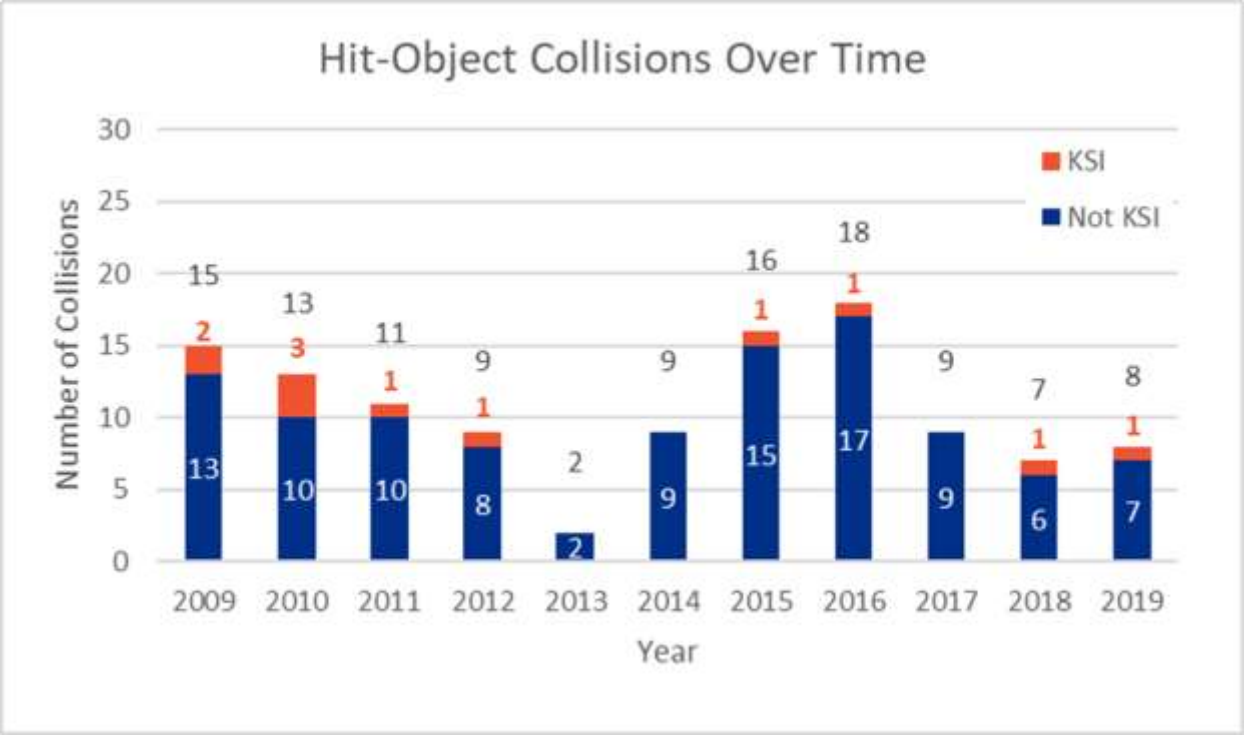


Figure 55: Hit-object collisions over time.

OVERTURNED COLLISIONS

The fewest number of collisions between 2009 and 2019 were overturned collisions with a total of 18 collisions including four KSI. **Figure 56** below shows the breakdown of collisions by year. On average, there are a total of 1.6 overturn collisions in a year and 0.6 KSI collisions per year; however, no overturned collisions have occurred in Davis since 2016.

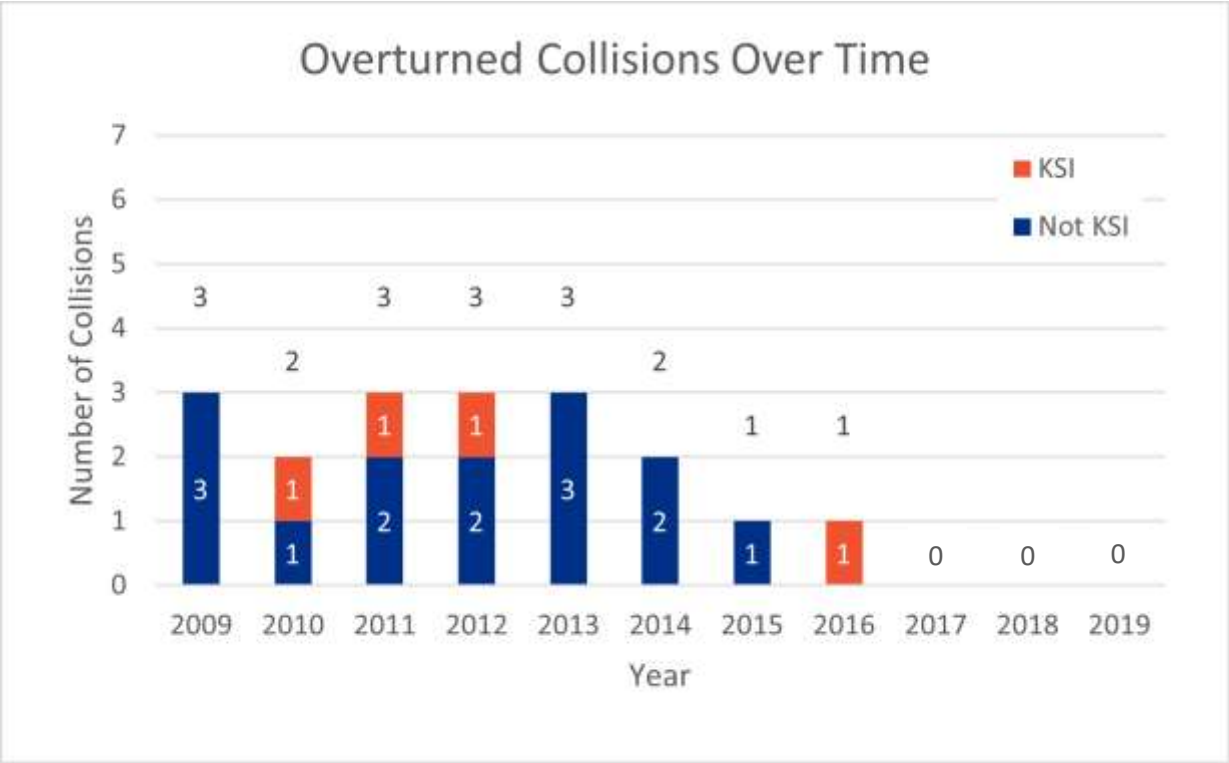


Figure 56: Overturned collisions over time.

VEHICLE/PEDESTRIAN COLLISIONS

Between 2009 and 2019, there were 96 vehicle/pedestrian collisions with 17 KSI. On average, there are a total of nine vehicle/pedestrian collisions per year and 1.5 KSI collisions per year. **Figure 57** shows that in 2018 and 2019, there were three KSI per year, resulting in an increase in the number of KSI collisions per year. More data is needed to determine if this is a trend.

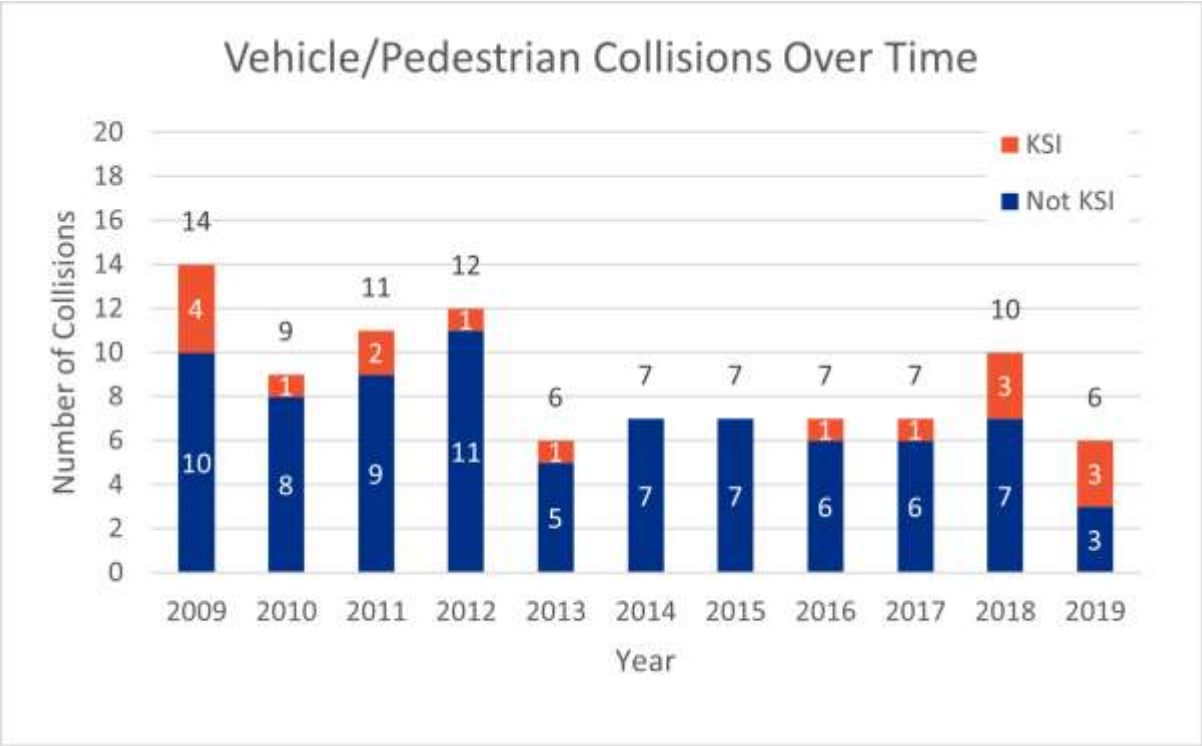


Figure 57: Vehicle/pedestrian collisions over time.

SINGLE VEHICLE COLLISIONS

Between 2009 and 2019 there were 24 single vehicle collisions (involving one vehicle with (1) a train or animal; (2) an automobile fire; (3) Passengers falling or jumping from a vehicle; or (4) a vehicle backing). Three of these collisions were KSI collisions. Many of the single vehicle collisions occurred in 2009 and in 2014. There is an average of two single vehicle collisions and 0.3 KSI single vehicle collisions per year. **Figure 58** shows the distribution of single vehicle collisions throughout the study period.

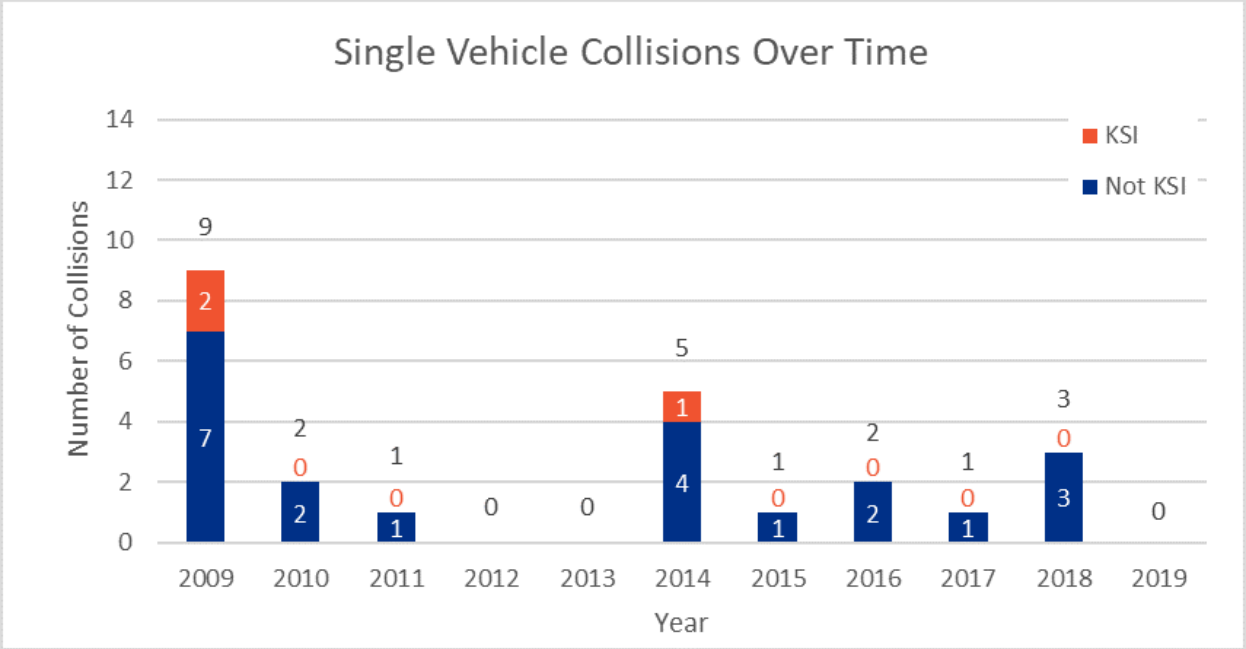


Figure 58. Single vehicle collisions over time.

TOP FIVE VIOLATIONS

Figure 59 shows the top five violation types by total collisions and includes the total number of KSI and Not KSI collisions between 2009 and 2019. The top violation by number of collisions was unsafe speed with 389 violations followed closely by failure-to-yield with a total of 345 violations.

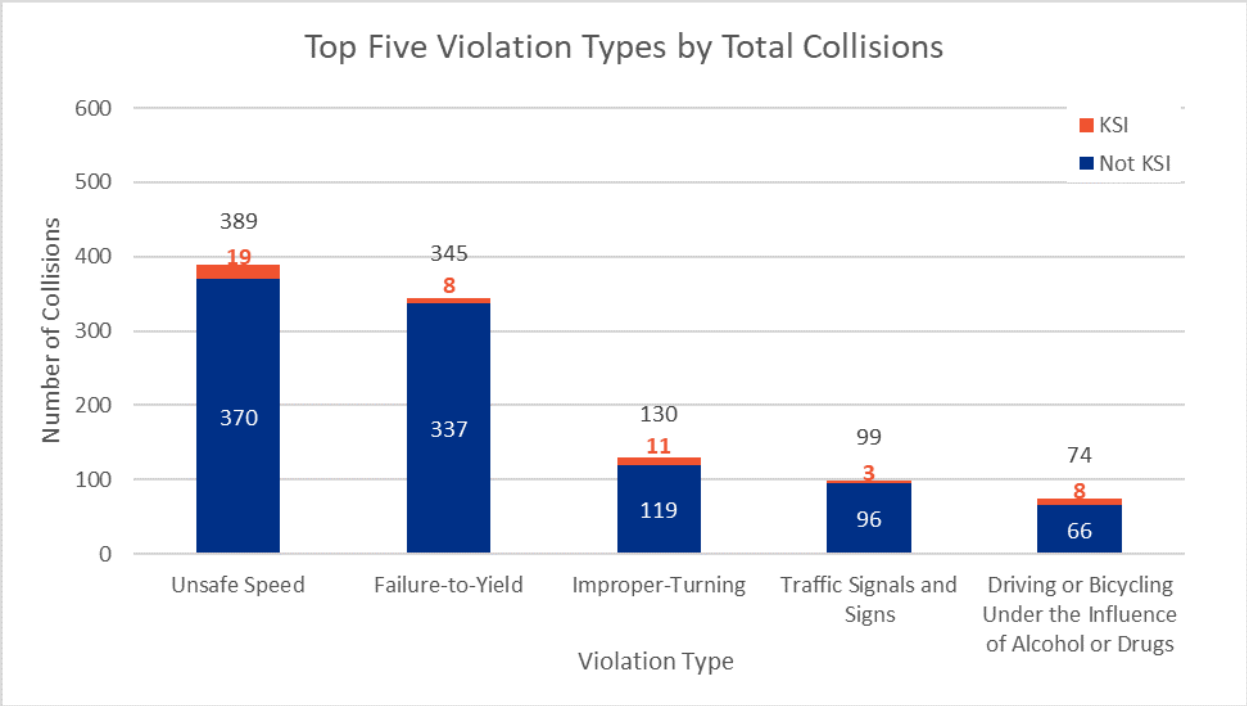


Figure 59: Top five violation types by total collisions.

Figure 60 shows the top five violations by number of KSI collisions. Although total number of pedestrian violations and driving or biking under the influence of drugs or alcohol is small compared to other violation types, these violation types resulted in the highest percentage of KSI collisions. Thirty-three percent of pedestrian violations and 11% of driving or biking under the influence of drugs or alcohol violations resulted in someone being killed or severely injured. Comparatively, only 5% of unsafe speed violations and 2% of failure-to-yield violations resulted in KSI collisions.

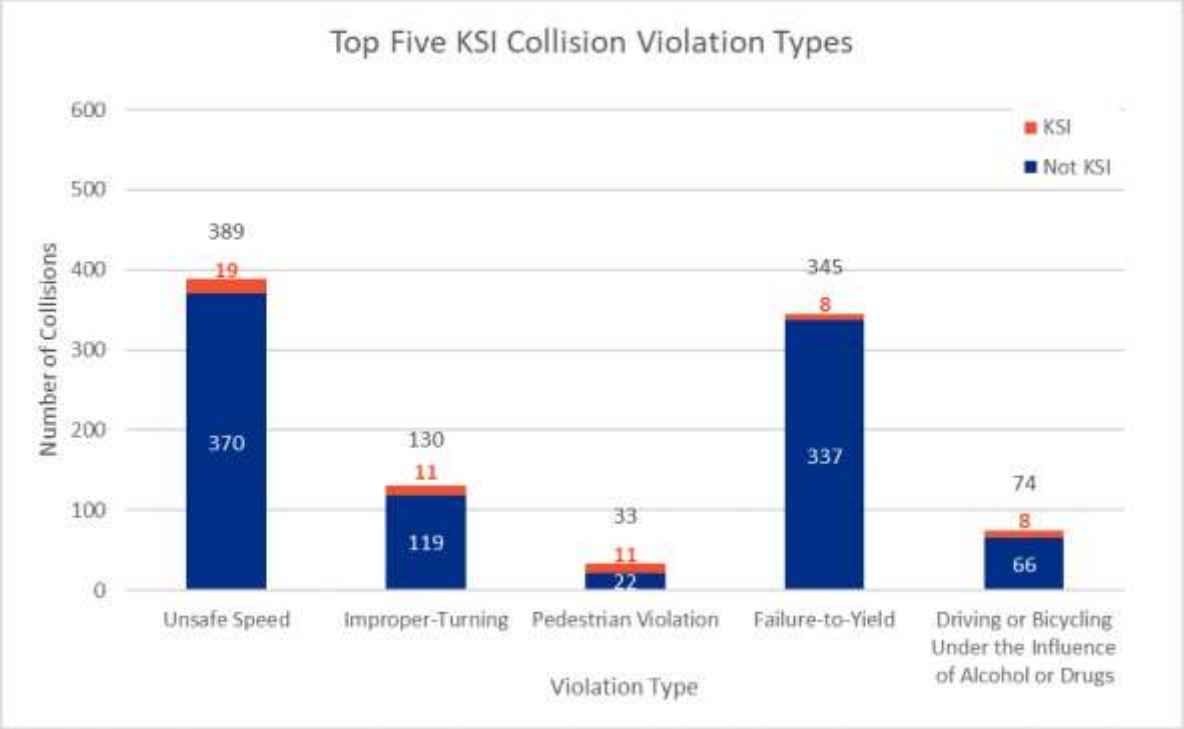


Figure 60: Top five KSI collision violation types.

The next section provides more detailed information about the top five violations by total collisions and top five violations by number of KSI collisions. Four of the five top violations by total collisions are also the top five violations by most KSI collisions.

Table 2: Top total and KSI collision violation types.

Top Total & KSI Collision Violation Types		
Violation Type	Top 5 in Total Collisions	Top 5 in KSI Collisions
Unsafe Speeds	X	X
Failure-to-Yield	X	X
Improper-Turning	X	X
Driving/Bicycling Under the Influence of Alcohol or Drugs	X	X
Traffic Signals & Signs	X	
Pedestrian Violations		X

UNSAFE SPEED VIOLATIONS

Unsafe speed had the most total collisions (389) and total most KSI collisions (19). **Figure 61** below shows that 2009 resulted in the most unsafe speed violation collisions for both KSI and Not KSI collisions. On average, there are 35 total collisions and 1.7 KSI collisions each year where someone is cited for unsafe speed.

Figure 61: Unsafe speed violations over time.

FAILURE-TO-YIELD VIOLATIONS

Failure-to-yield was the second most frequent violation in total collisions and the fourth most frequent in KSI collisions. Of failure-to-yield collisions, 337 (98%) are Not KSI. On average, there are a total of 31 collisions and 0.7 KSI collisions each year where someone is cited with failure-to-yield. **Figure 62** shows that 2019 had three KSI failure-to-yield collisions, which is the highest incidence of that type- in one year. Overall, 2016 had the total most failure-to-yield collisions (50 collisions), and 2015 had the fewest with 21 collisions.

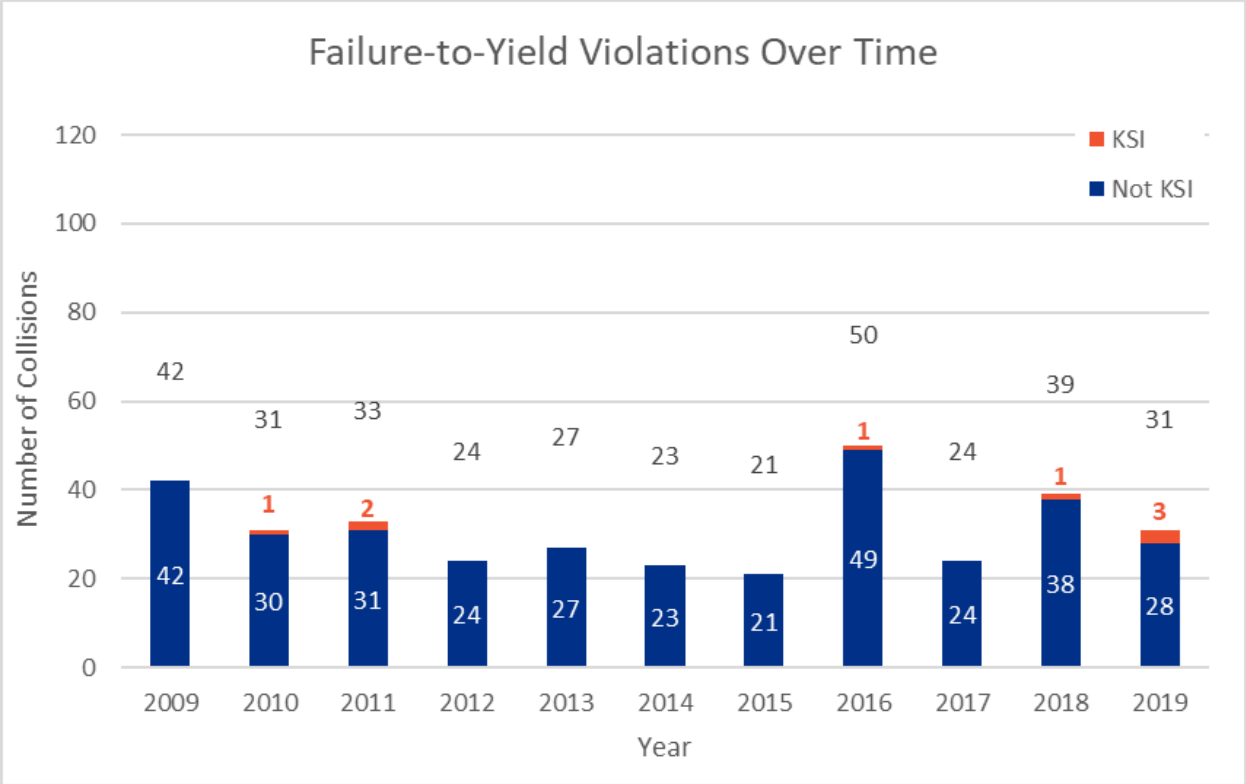


Figure 62: Failure-to-yield violations over time.

IMPROPER-TURNING VIOLATIONS

Improper-turning was the third most frequent violation type in total collisions and the second most frequent type in KSI collisions. Between 2009 and 2019, there were 130 collisions where someone received an Improper-turning violation. Of those, 11 were KSI collisions. On average, there are 12 total collisions and one KSI collision each year where someone is cited for improper-turning. **Figure 63** shows the number of improper-turning violation collisions over time. 2016 had the most collisions and 2013 had the fewest of that type. Only 2010 and 2012 did not have KSI collisions from that type.

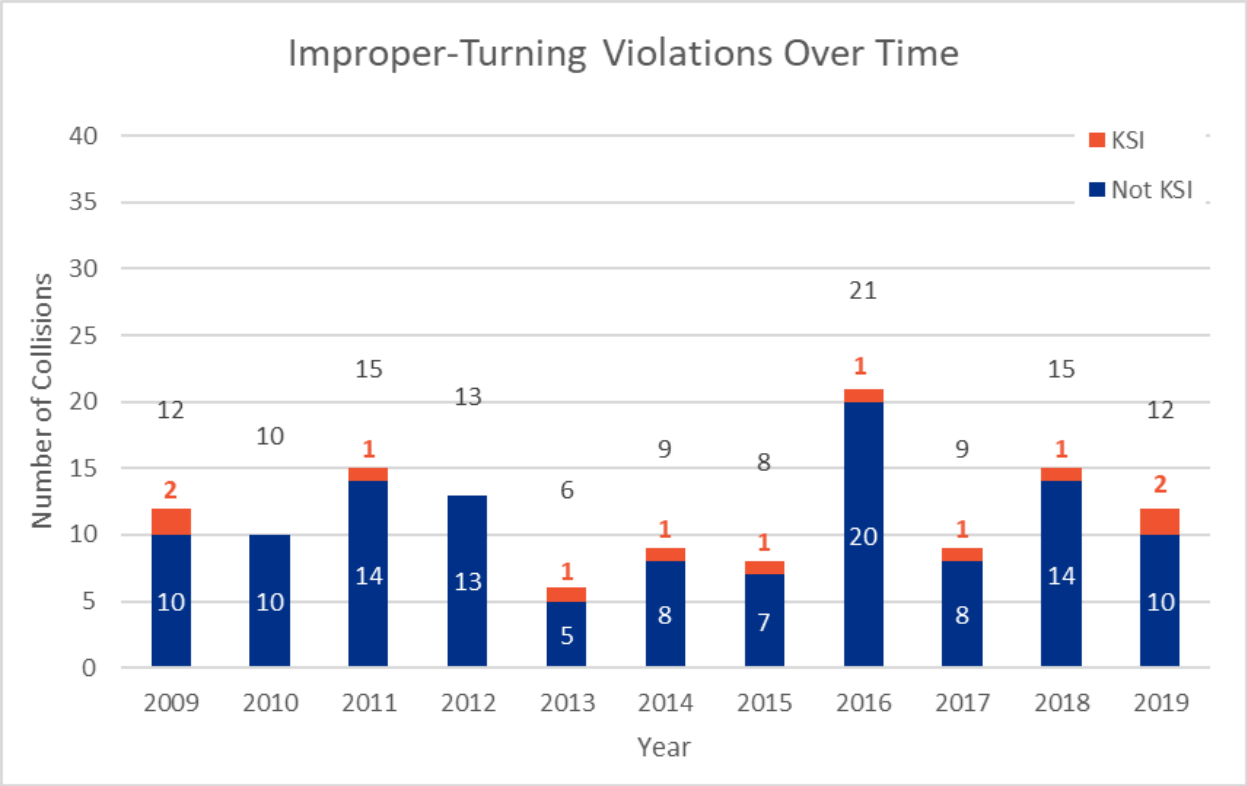


Figure 63: Improper-turning violations over time.

DRIVING OR BICYCLING UNDER THE INFLUENCE OF ALCOHOL OR DRUGS

Driving or bicycling under the influence of alcohol or drugs was the fifth most frequent violation for both total number of collisions and KSI collisions. Between 2009 and 2019, there were 74 alcohol/drug violations, of which eight were KSI collisions. On average, there are 6.7 collisions each year where someone receives an alcohol/drug violation and 0.7 KSI alcohol/drug collision violations. Overall, the number of KSI and Not KSI alcohol/drug violation collisions fluctuates each year and the number of collisions of this type since 2016 is decreasing.

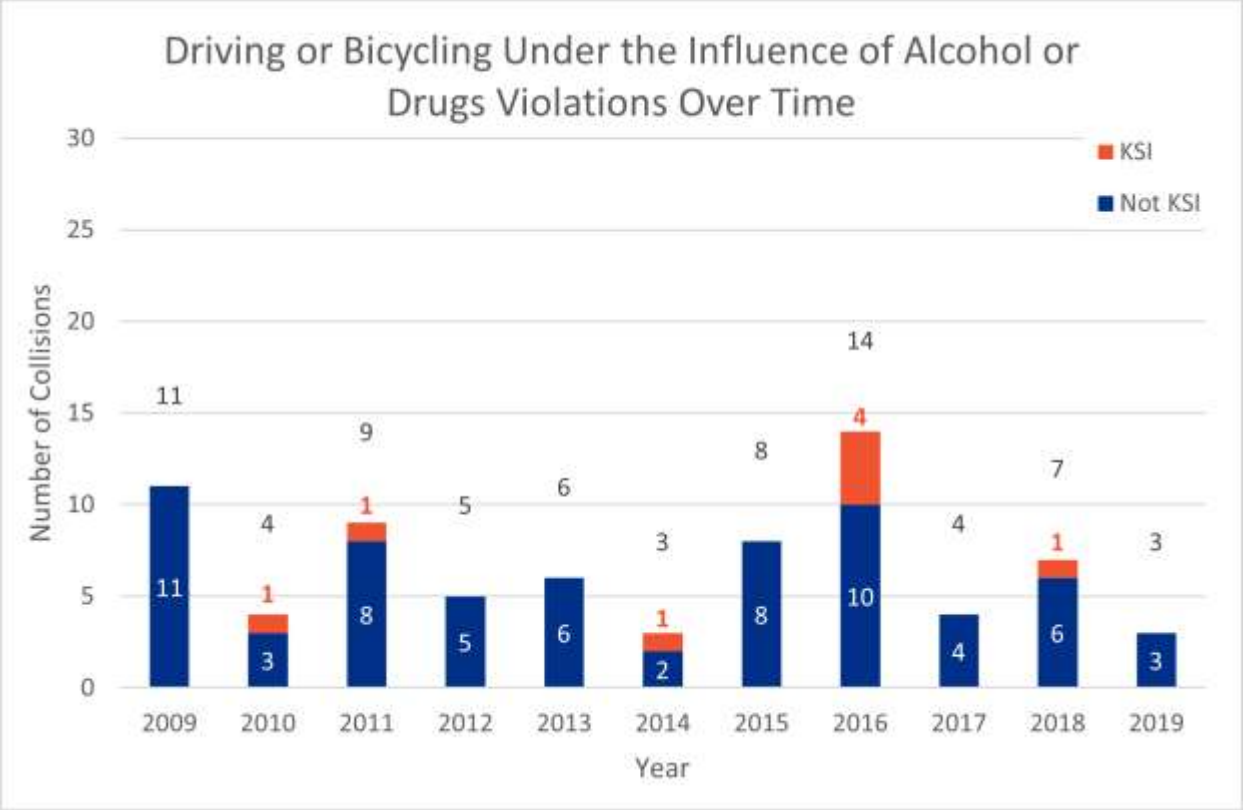


Figure 64: Driving or bicycling under the influence of alcohol or drugs violations over time.

TRAFFIC SIGNALS AND SIGNS

Traffic signals and signs violation is the fourth most frequent violation in total violations, but is not one of the top five violations for KSI collisions, with only three collisions in 11 years. Between 2009 and 2019, there were 99 collisions where someone was cited for traffic signals and signs violation. **Figure 65** shows that 2019 had the most collisions where someone received a citation for traffic signals and signs. This was three times more collisions than occurred in 2017 or in 2018. More data is needed to see if the number of traffic signals and signs violation collisions is increasing.

Figure 65: Traffic signals and sign violations over time.

PEDESTRIAN VIOLATION

Pedestrian violation is third on the top five violations by most KSI collisions (11), but is 11th in total overall number of collisions with 33 total collisions. Thirty-three percent of the pedestrian violation collisions were KSI collisions, which proportionally is the most KSI collisions compared to the total number of collisions. Only 2013 and 2015 did not have a KSI due to pedestrian violation. On average, there are three total pedestrian violation collisions and one KSI collision each year.

Figure 66: Pedestrian violations over time.

INTERSECTIONS VS ROAD SEGMENTS

The section below compares collisions in intersections versus along road segments. Between 2009 and 2019, 53% of all collisions occurred in intersections and 47% along road segments. **Figure 67** below shows the percentage of intersection and road segment collisions by mode. Motor vehicle collisions are slightly more likely to occur along road segments, while pedestrian and bicycle collisions are more likely to occur at intersections.

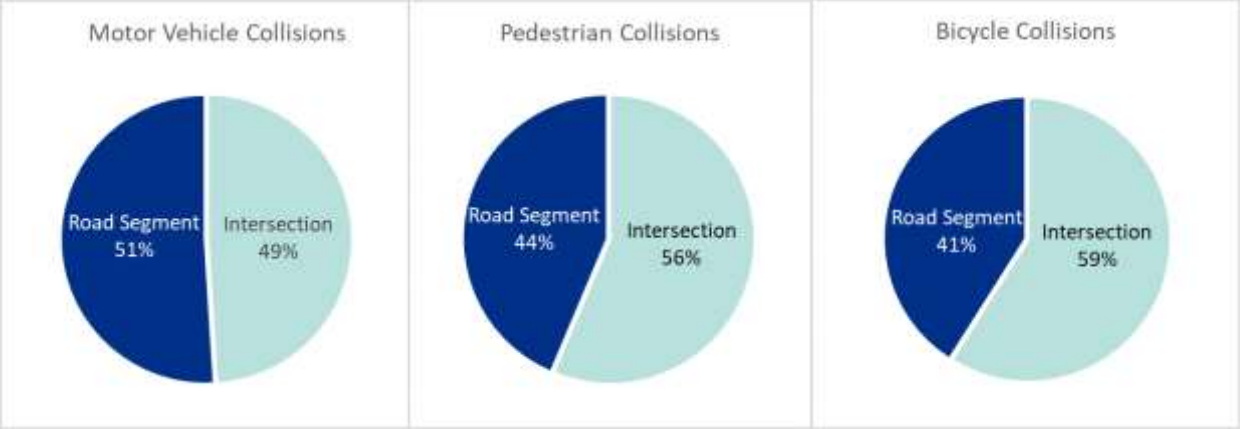


Figure 67: Percentage of intersection and road segment collisions 2009-2019 by mode.

Below **Figure 68** and **Figure 69** show the percent of collisions in intersections and road segments by collision severity. Four percent of motor vehicle collisions in intersections resulted in KSI collisions and 5% in road segments. There was a smaller proportion of KSI bicycle collisions in intersections than in road segments, with 6% and 8% respectively. A quarter of pedestrian collisions in road segments were KSI collisions and 15% of pedestrian intersection collisions were KSI collisions, dramatically higher than both motor vehicles and bicycles in both intersections and road segments.

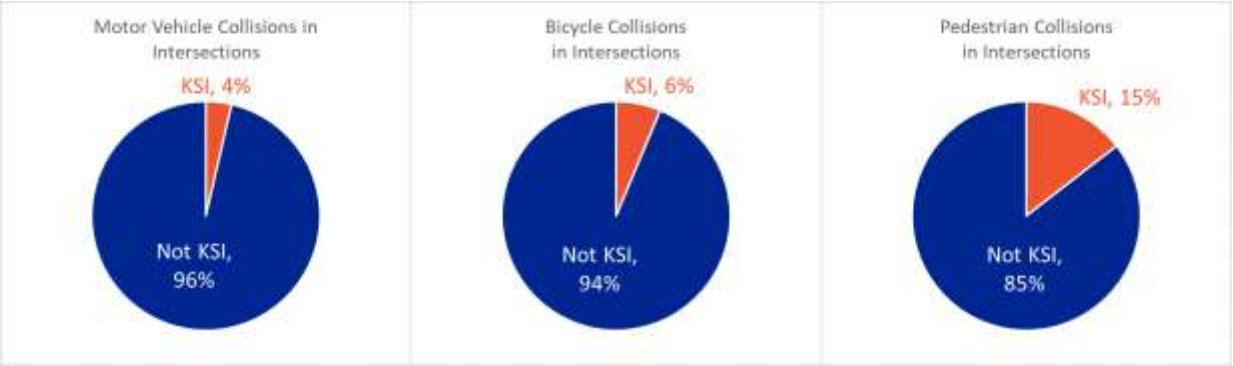


Figure 68: Collisions in intersections 2009-2019 by mode.

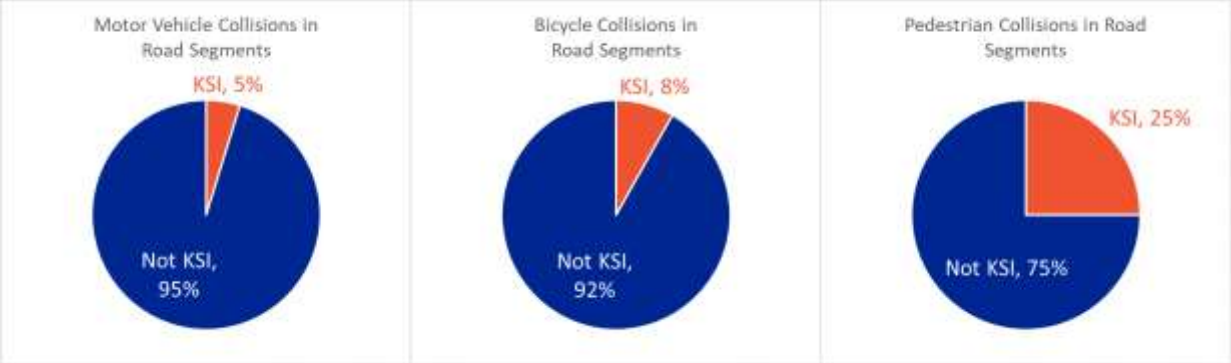


Figure 69: Collisions in road segments 2009-2019 by mode.

PEDESTRIAN COLLISIONS

PedBikeSafe.org shares that pedestrians are more likely to be injured in collisions occurring at intersections, but are more likely to be killed at non-intersections. This is consistent with the data in Davis. Between 2009 and 2019 in Davis, 110 pedestrians were involved in collisions and 19 were severely injured, and two were killed on the roadway.

Figure 70 below shows where pedestrians were located on the street when the collision occurred. Almost half (45%) of the pedestrian collisions in Davis occurred when the pedestrian was crossing in the crosswalk at an intersection. Pedestrians in the road (including the shoulder) accounted for about 20%of pedestrian collisions. Sixteen percent of pedestrian collisions occurred when pedestrians were crossing not in crosswalks.

Crossing in a crosswalk not at an intersection accounts for 8% of pedestrian collisions. However, one third of total collisions with pedestrians crossing in a crosswalk not at an intersection were KSI. Nine percent of pedestrian collisions occurred, "not in road" and 30% of these collisions were KSI.

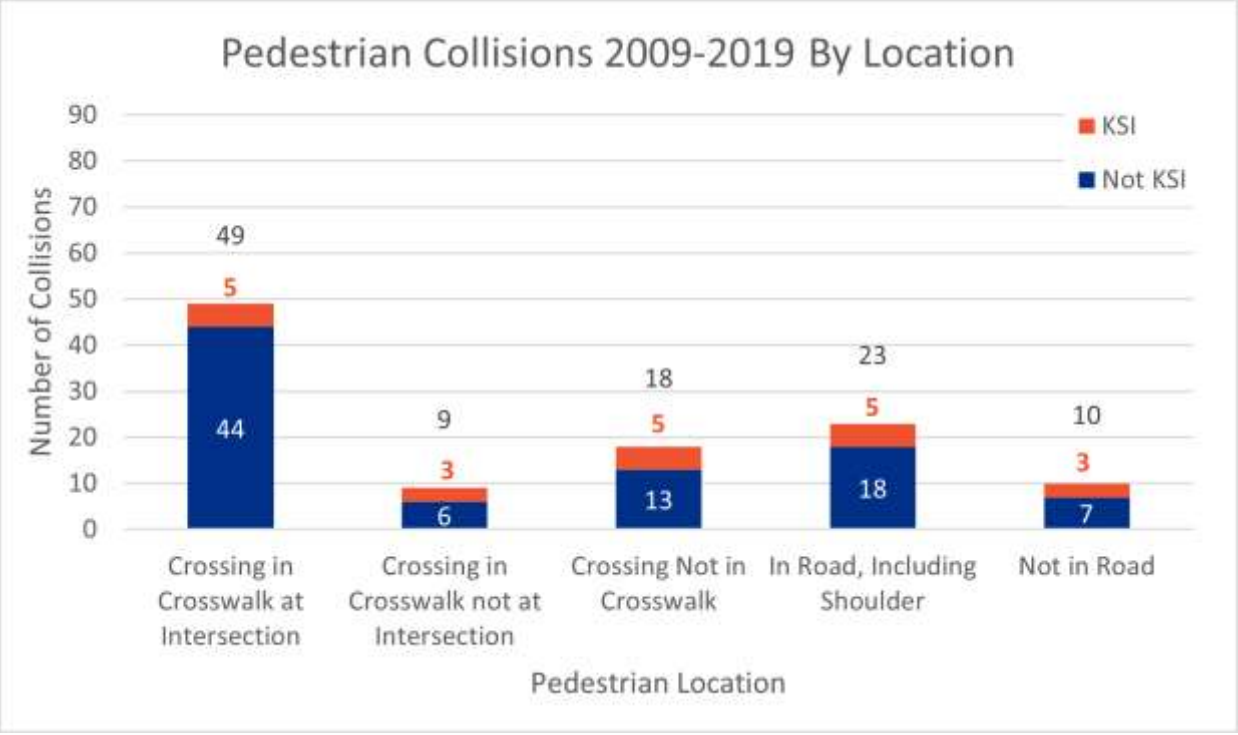


Figure 70: Pedestrian collisions 2009-2019 by location.

Below **Figure 71** shows the number of pedestrian collisions over time. Between 2009 and 2019, there were 110 pedestrian collisions, of which 89 collisions were Not KSI and 21 were KSI. On average, there are a total of 10 pedestrian collisions each year and two KSI pedestrian collisions. 2009 had the most overall pedestrian collisions and most KSI pedestrian collisions. There has been at least one KSI pedestrian collision a year between 2009 and 2019. Between 2012 and 2017, there was one KSI per year, however in 2018 and 2019, there were three KSI collisions each year. More data is needed to determine if there is a trend of KSI pedestrian collisions increasing.

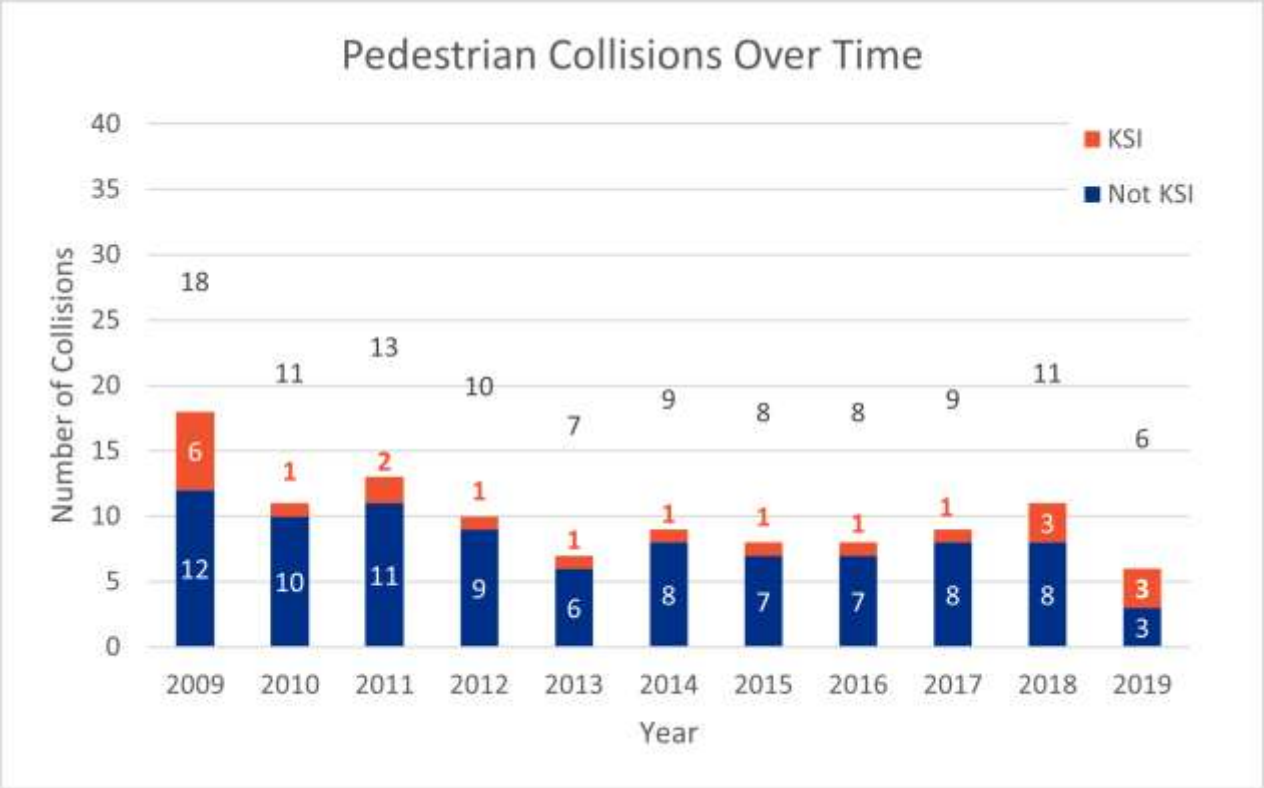


Figure 71: Pedestrian collisions over time.

Figure 72 and **Figure 73** below show pedestrian collisions in intersections and in road segments. Between 2009 and 2019, there were nine KSI collisions in intersections and 12 KSI collisions in road segments. Since 2009, the number of KSI collisions in intersections has decreased per year. In addition, five of the years in this range show no pedestrian KSI collisions at intersections. In comparison, only three years during the study period resulted in no pedestrian KSI collisions at non-intersection locations.

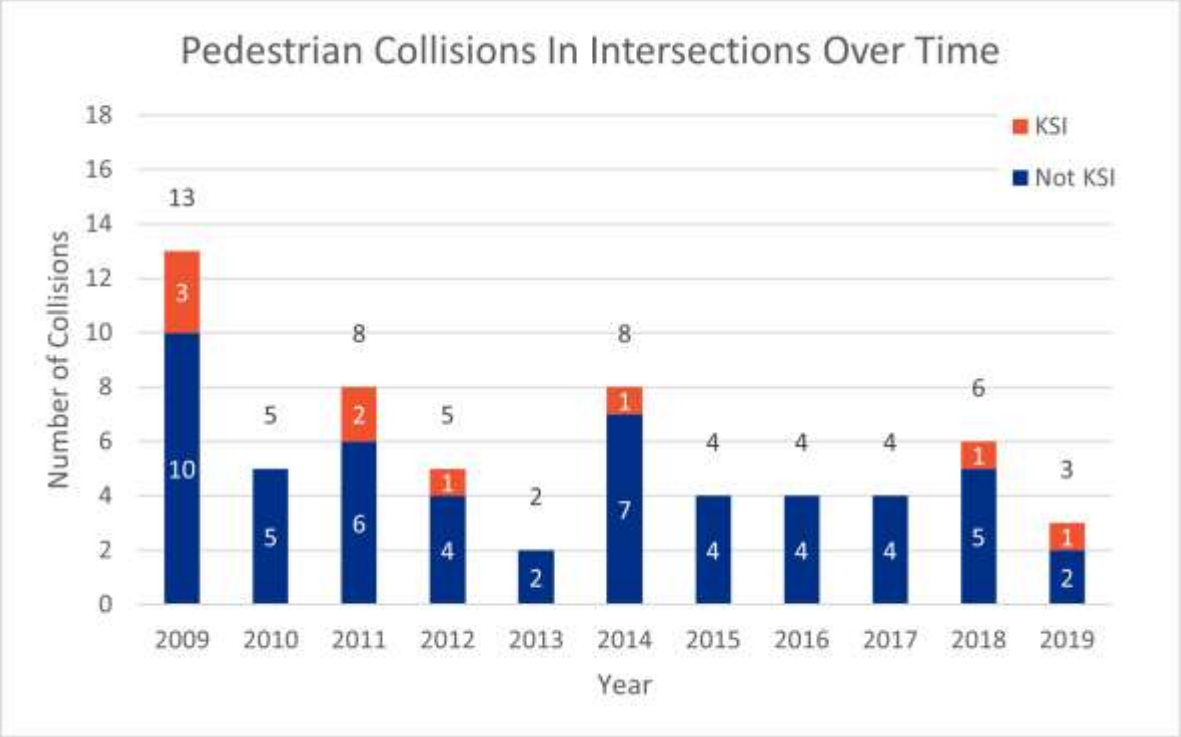


Figure 72: Pedestrian collisions at intersections over time.

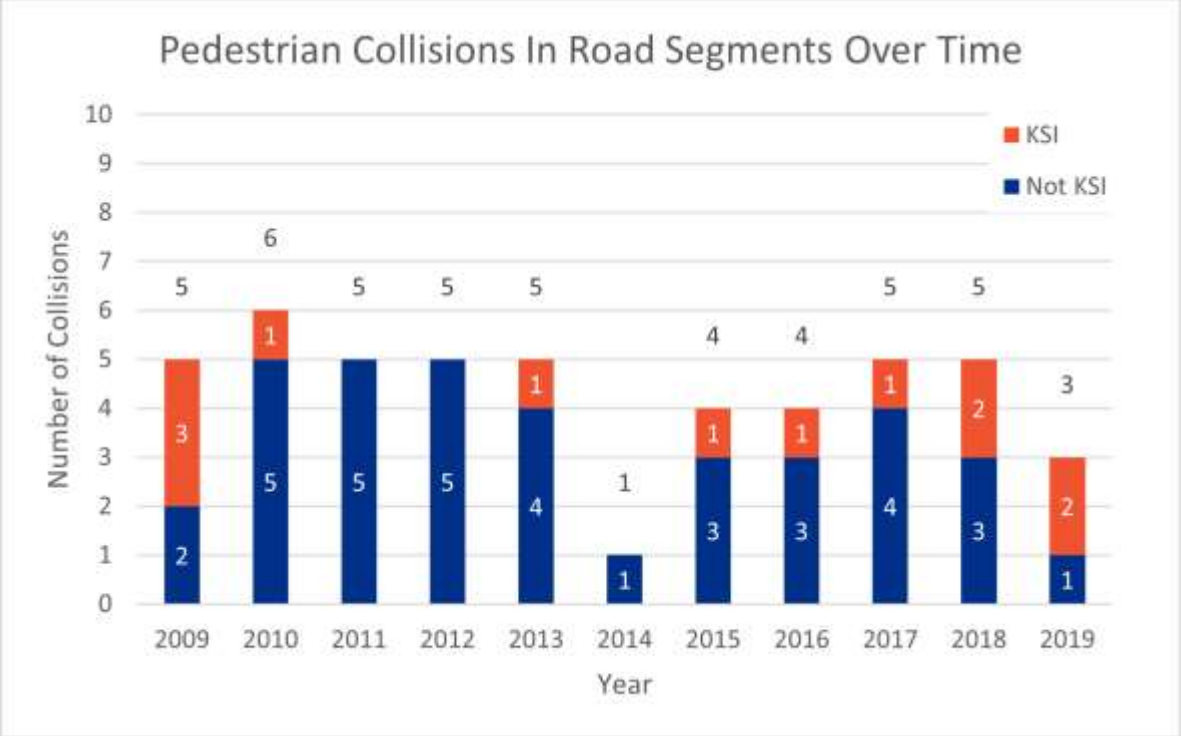


Figure 73: Pedestrian collisions in road segments over time.

BICYCLE COLLISIONS

Between 2009 and 2019, there were a total of 535 bicycle collisions. Of those, 497 collisions were Not KSI and 38 were KSI bicycle collisions. On average, there are 49 bicycle collisions a year and 3.5 KSI bicycle collisions.

Figure 74: Bicycle collisions over time.

Figure 75 and **Figure 76** show the number of collisions in intersections and road segments and distribution of KSI and not-KSI bicycle collisions. Between 2009 and 2019, there were 316 bicycle collisions in intersections and 219 collisions in road segments. On average, there are 29 bicycle collisions at intersections and 19 bicycle collisions along road segments per year. Even though almost 20% more collisions are occurring in intersections compared to road segments, the total number of KSI collisions is almost the same. There were 20 KSI collisions in intersections and 18 KSI collisions in road segments. **Figure 75** reveals that 10 out of the 11 years there was at least one intersection bicycle collision KSI a year. Comparatively, there were two years in the dataset with no KSI bicycle collisions along road segments.

Figure 75: Bicycle collisions in intersections over time

Figure 76: Bicycle collisions in road segments over time.

WHERE ARE COLLISIONS OCCURRING?

HOW TO READ COLLISION MAPS

In this section, collision data is mapped to find where collisions occur. Locations with one collision are marked by a small circle (●). Locations with more than one total collision are "collision clusters," which are displayed as proportionally large circles with the number of collisions located near each other. The cluster labels identify the total number of collisions in the cluster. Killed or Severely Injured (KSI) collisions are shown as an orange point (●) within or at the edge of the cluster. **Figure 77** provides an example and identifies how to interpret these collision locations.

Figure 77. Interpreting collision maps.

TOTAL COLLISIONS

Between 2009 and 2019, there were a total of 1,397 injury collisions in Davis. Of these, 667 collisions resulted in a complaint of pain, 640 in a visible injury, 84 in a severe injury and six in a fatality. The map **Figure 78** below shows the locations of all collisions with areas of high collision volumes identified as clusters. The largest collision clusters are along Russell Boulevard and 5th Street north and east of downtown Davis, on Covell Boulevard, and at the intersection of Mace Boulevard and 2nd Street. The intersections of Russell Boulevard and Oak Avenue, Covell Boulevard and F Street, and Covell Boulevard and Pole Line Road stand out as well with high volumes of collisions. In general, collisions trend along the principal and minor arterials as well as the primary east-west collectors north of downtown Davis within the center of the city.

KSI COLLISIONS

Between 2009 and 2019, there were 90 KSI collisions, displayed in **Figure 79**. The majority of KSI collisions are occurring along and near Anderson Road, particularly at Russell Boulevard. There are also clusters of KSI collisions east of the downtown and east of Holmes Jr. High on Drexel Drive. Smaller clusters of collisions are next to the shopping centers in south Davis.

HIGH-INJURY NETWORK

Figure 80 displays a High-Injury Network created by analyzing roadways with high concentrations of collisions. The network displays both roadways with high total collision rates and roadways with high KSI collision rates. This network identifies high-risk locations throughout Davis and can be used to identify priority locations for future safety projects.

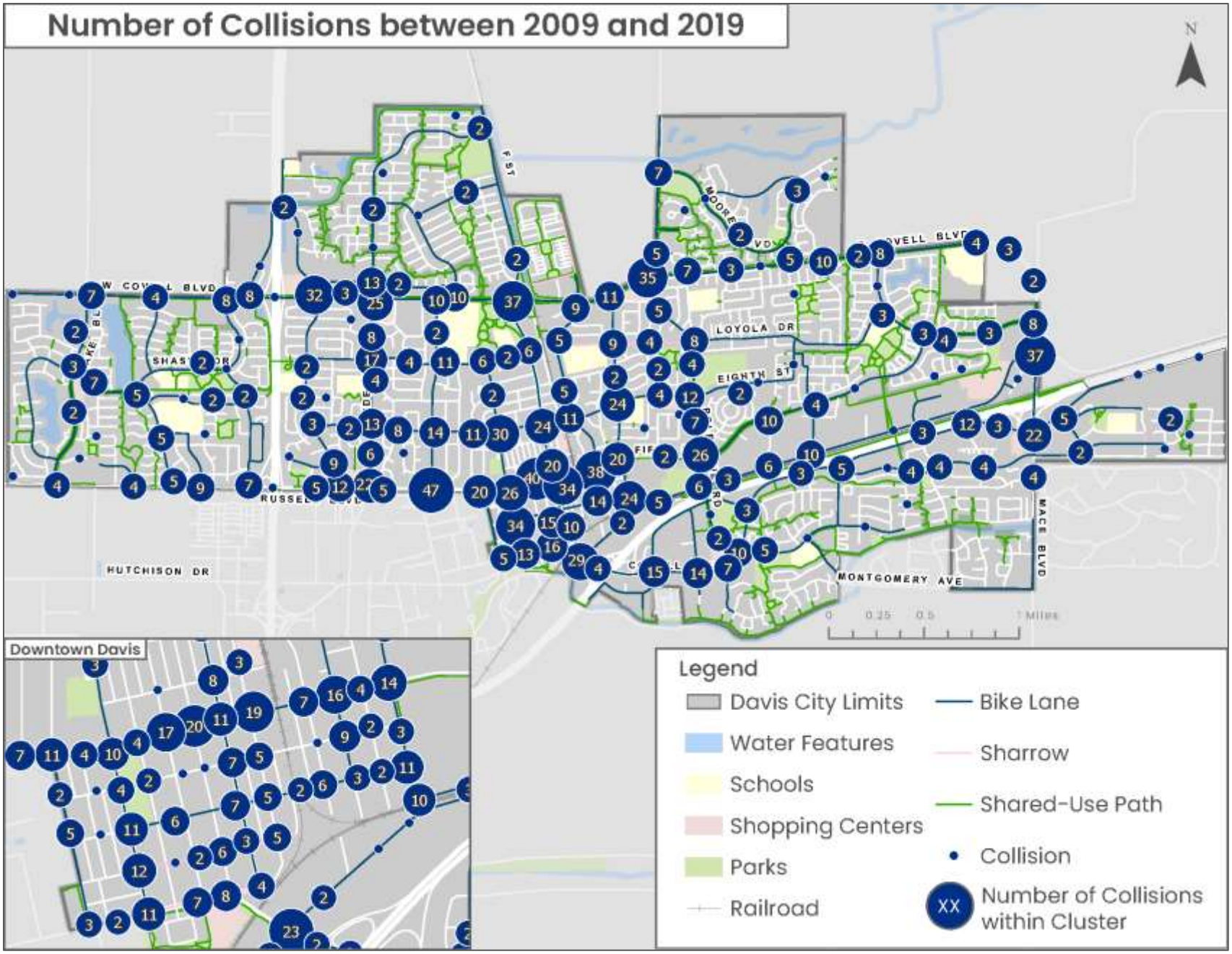


Figure 78. Map of collisions 2009-2019

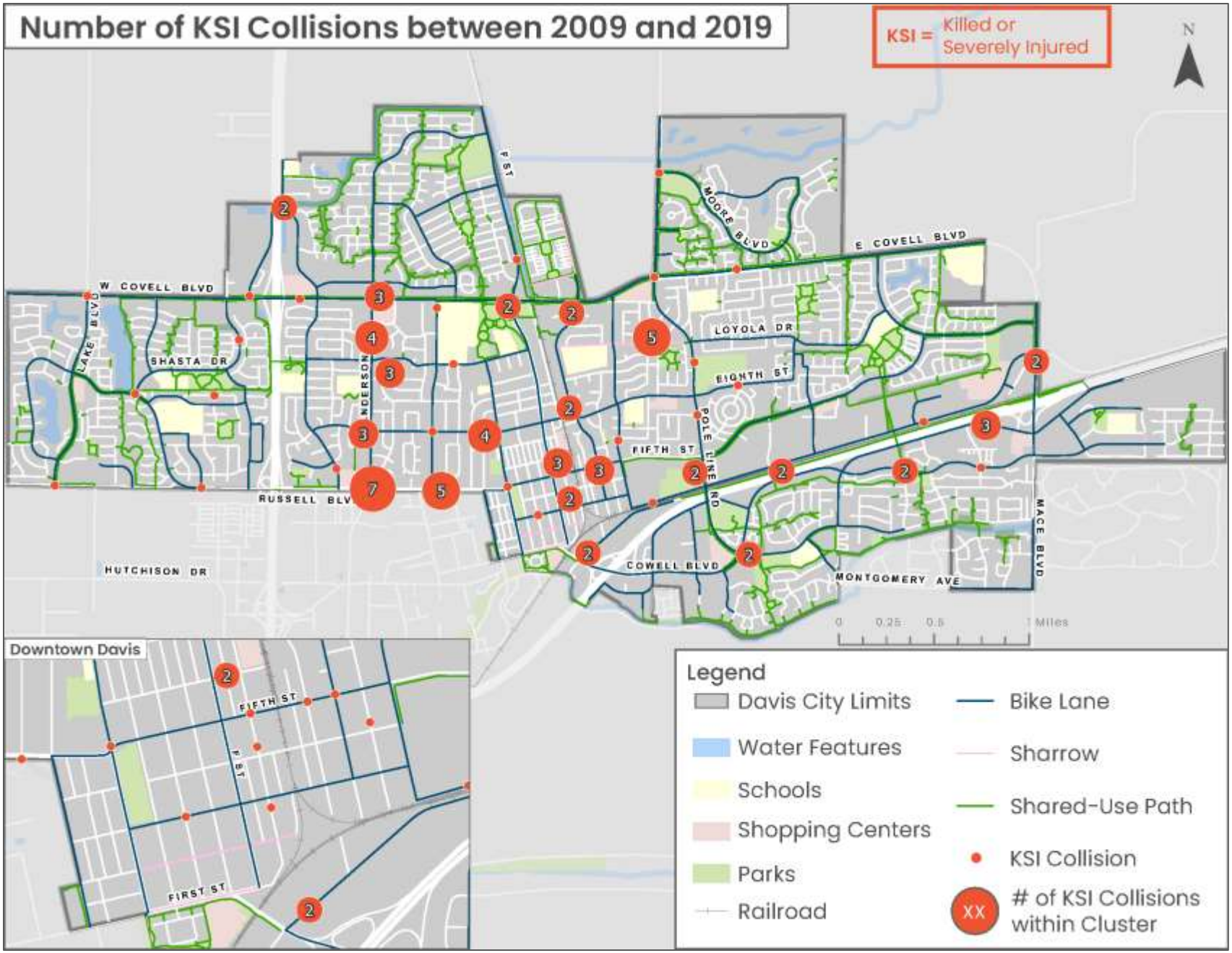


Figure 79. Map of KSI collisions 2009-2019

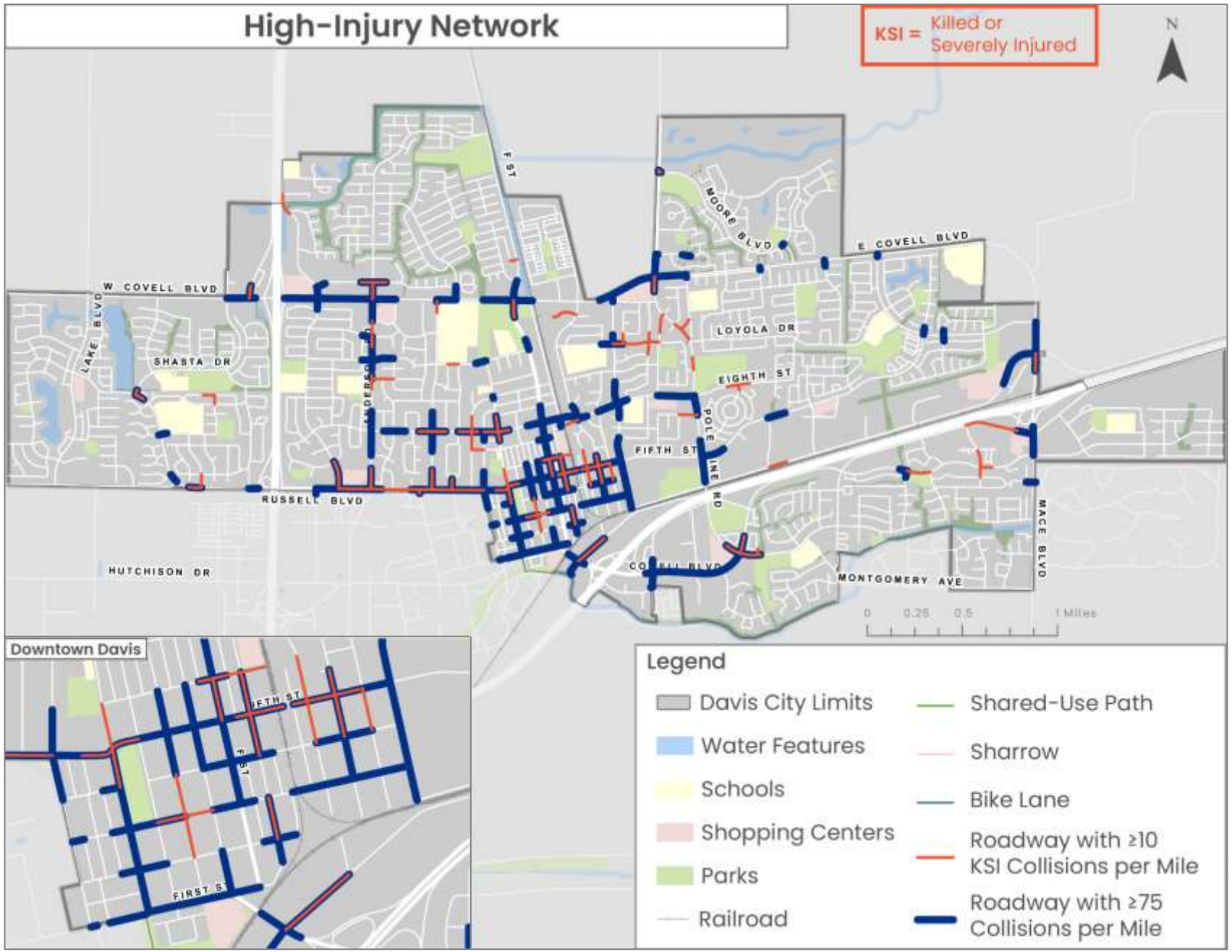


Figure 80. Map of Davis high-Injury network.

VEHICLE ONLY COLLISIONS

Between 2009 and 2019, there were 756 collisions that involved only vehicles (no bicycles or pedestrians). Of these, 34 were KSI collisions. The locations of these collisions can be seen in **Figure 81** and follow the trend of total collisions, with clusters along the principal and minor arterials as well as the primary east-west collectors north of downtown Davis within the center of the city. The largest collision cluster occurs at Mace Boulevard and 2nd Street, though there are no KSI vehicle only collisions at that location. Other large collisions clusters are at the intersection of Covell Boulevard and Pole Line Road, and along 5th Street in downtown Davis.

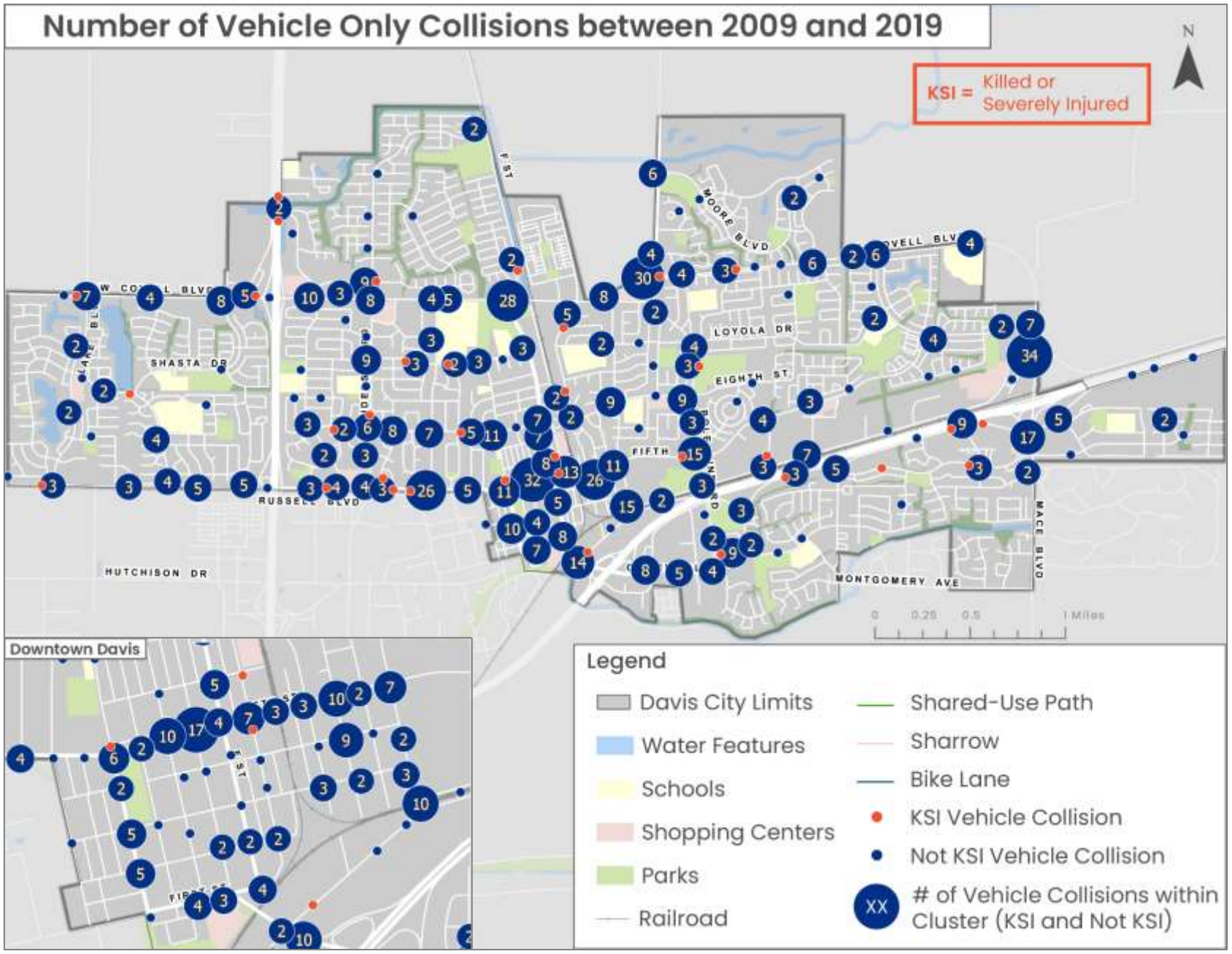


Figure 81. Map of vehicle only collisions 2009-2019.

BICYCLE COLLISIONS

There were 535 collisions involving bicycles between 2009 and 2019 with 38 bicyclists severely injured. **Figure 82** displays the locations of all collisions involving bicycles with KSI collisions layered on top. Most severe bicycle collisions are occurring along Anderson Road and Russell Boulevard. The map also shows KSI bicycle collisions in downtown Davis. There are clusters of higher total collision volumes along Russell Boulevard, Anderson Boulevard, 5th Street, 8th Street and Pole Line Road.

Figure 83 shows the location of bicycle collisions at intersections, and **Figure 84** along road segments. The largest clusters of intersection bicycle collisions are at Russell Boulevard at Anderson Road, Oak Avenue, and A Street, along 8th Street at F Street and L Street and at 1st Street and B Street. The largest clusters of road segment bicycle collisions are along Anderson Road, 3rd Street, 5th Street and Olive Drive.

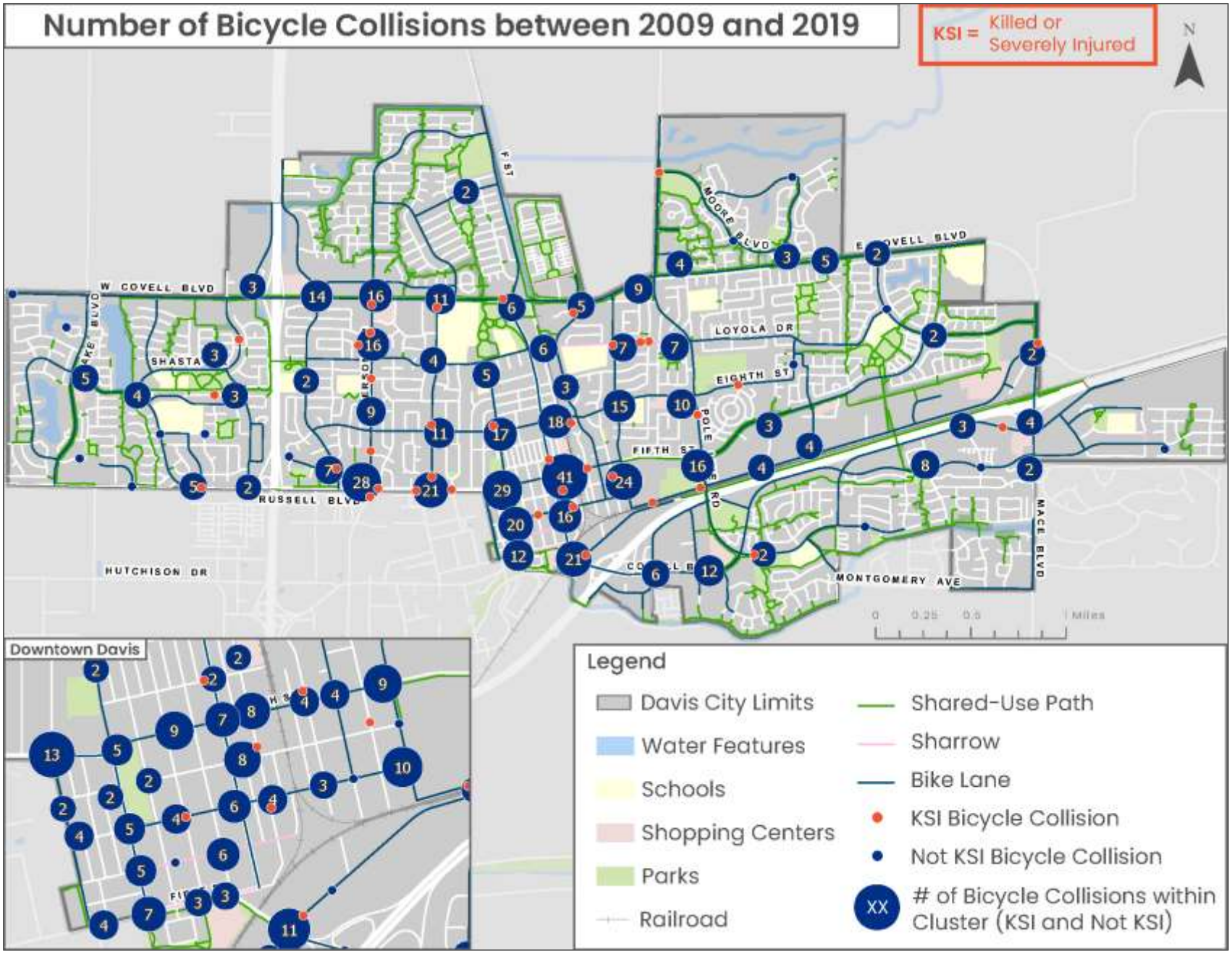


Figure 82. Map of bicycle collisions 2009 – 2019.

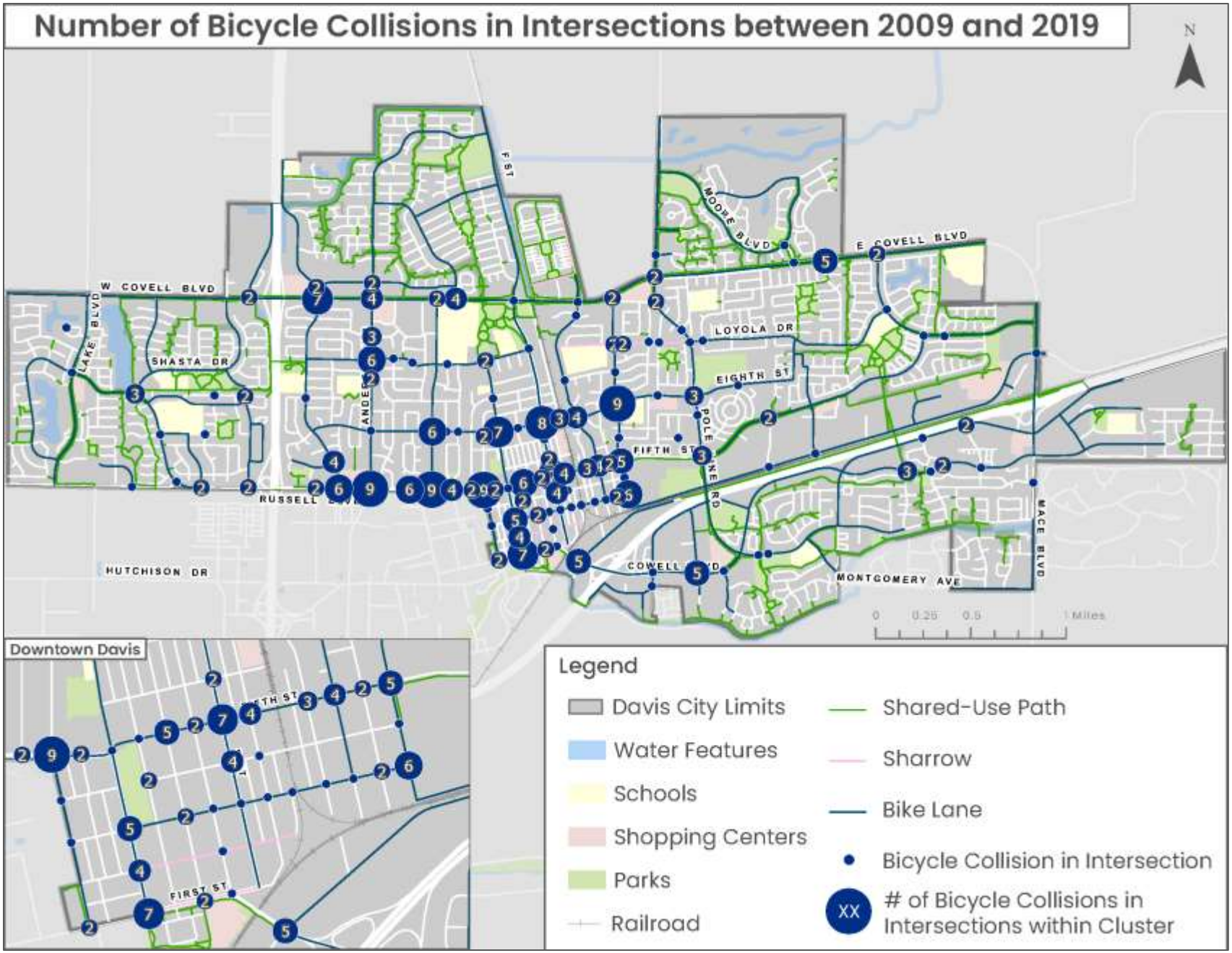


Figure 83. Map of bicycle collisions in intersections 2009-2019.

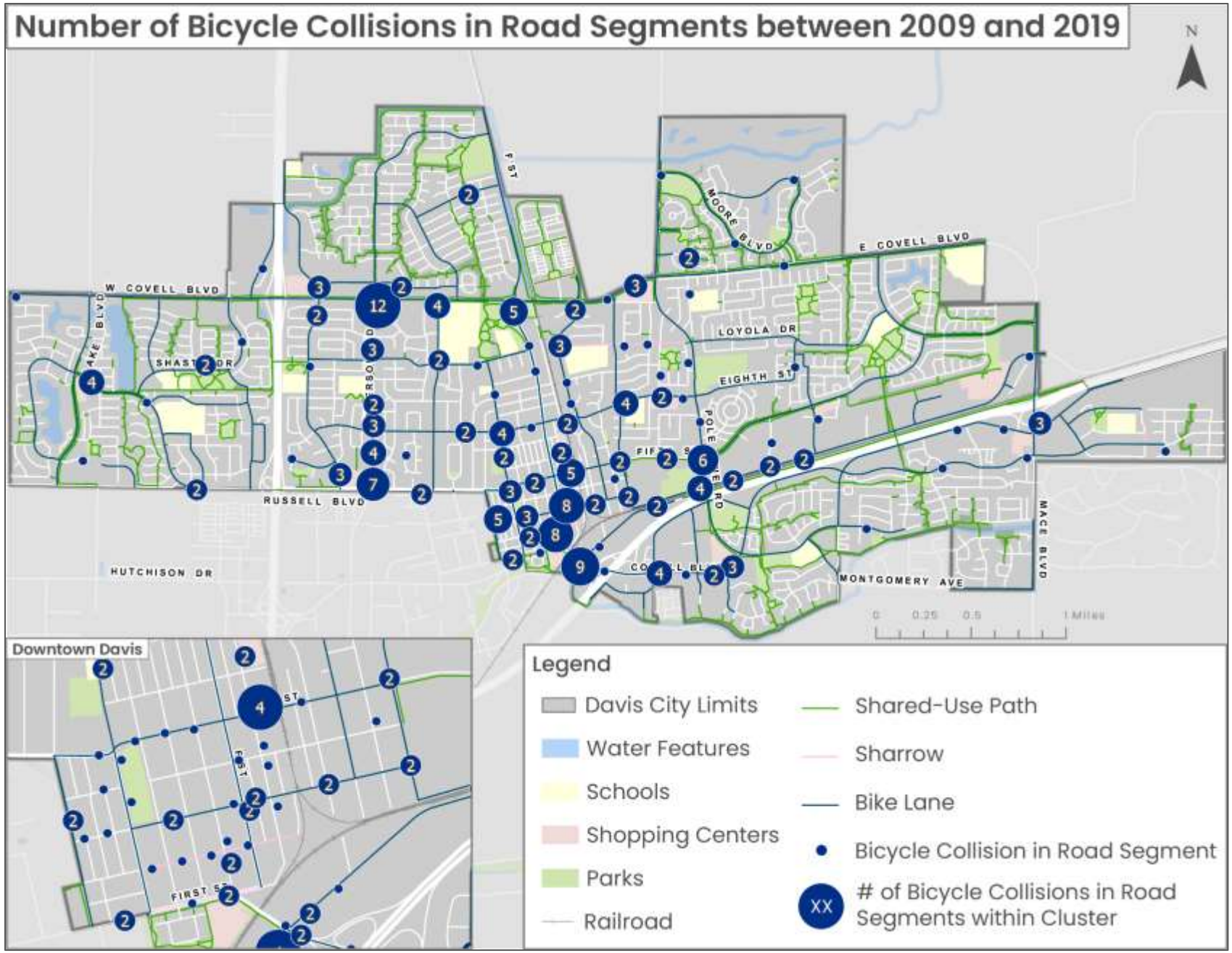


Figure 84. Map of bicycle collisions in road segments 2009-2019.

PEDESTRIAN COLLISIONS

Between 2009 and 2019, there were 110 collisions involving pedestrians with 19 pedestrians severely injured and two pedestrian fatalities. The locations of these collisions are displayed in **Figure 85**. The two pedestrian fatalities occurred in west Davis. Both the Anderson Road corridor and Russell Boulevard corridor adjacent to UC Davis are roadways where pedestrians have been severely injured. The largest clusters of total pedestrian collisions are on Sycamore Lane, 8th Street, 5th Street and in downtown Davis.

Figure 86 displays the locations of pedestrian collisions that occurred in intersections, many of which are in downtown Davis along 1st Street, 2nd Street, and 5th Street. The locations of pedestrian collisions occurring in road segments are shown in **Figure 87**. These collisions are scattered throughout the city with the only clusters along Sycamore Lane north of W Covell Boulevard and along Chiles Road in East Davis. The majority of standalone pedestrian road segment collisions are found near Downtown Davis.

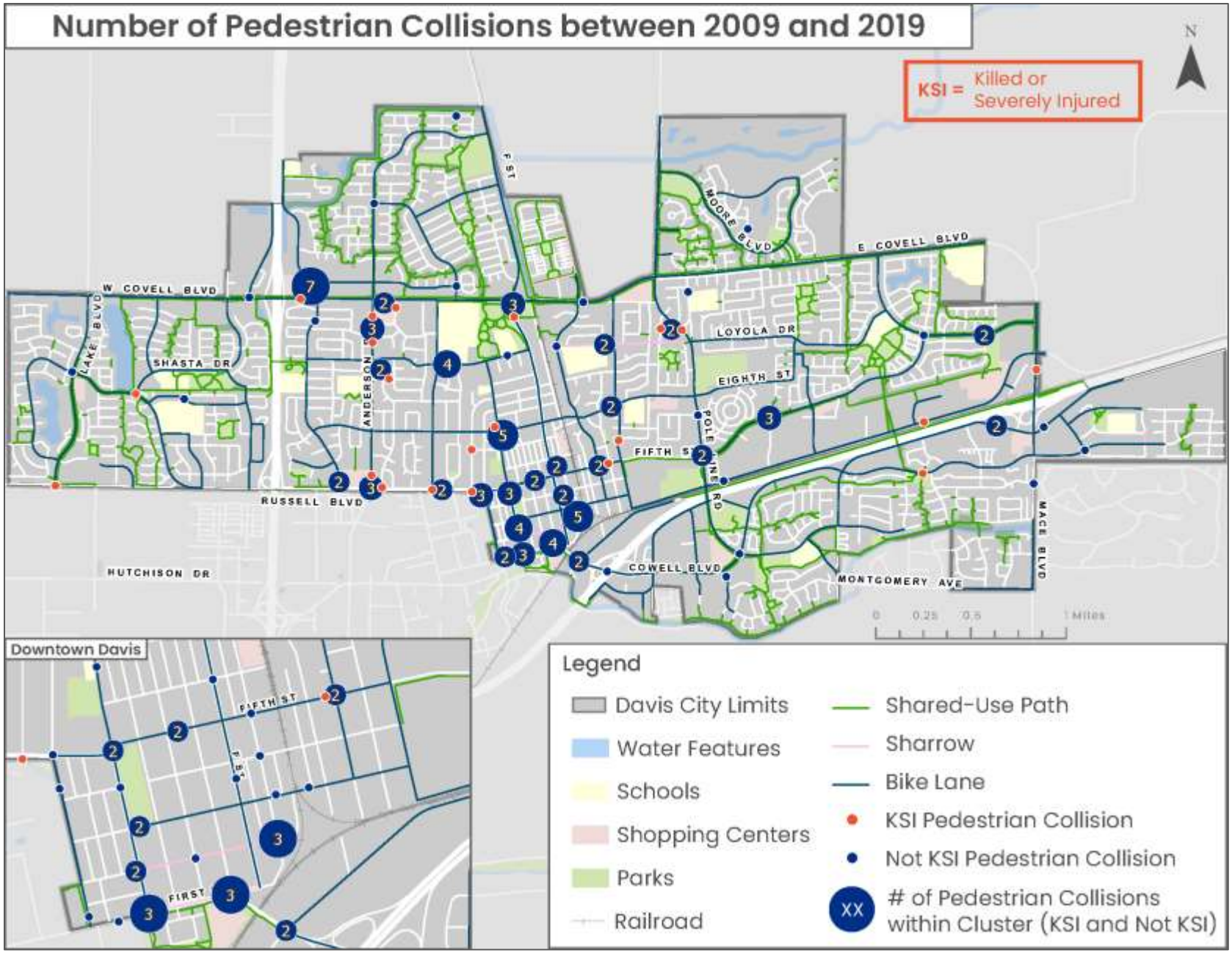


Figure 85. Map of pedestrian collisions 2009-2019.

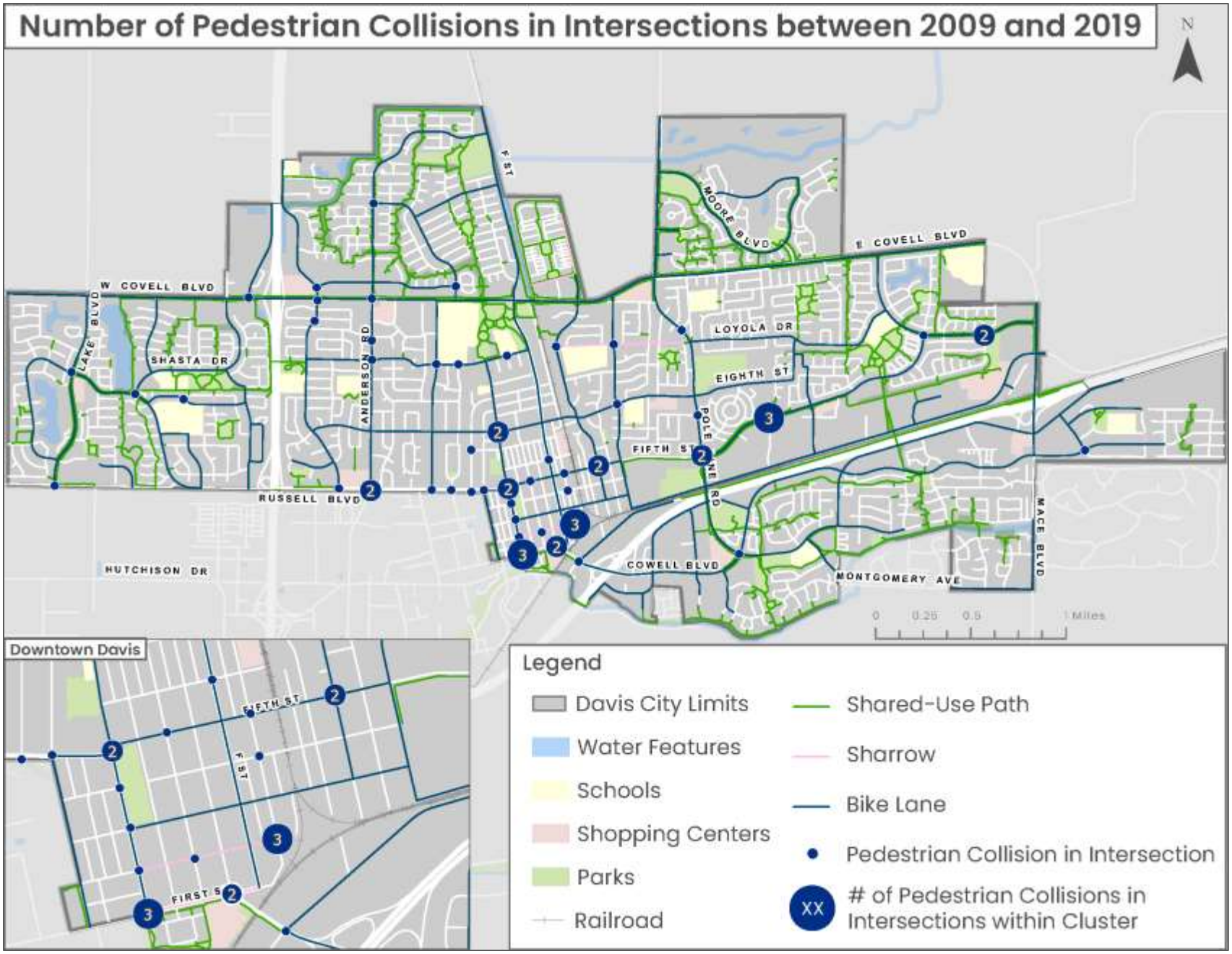


Figure 86. Map of pedestrian collisions in intersections 2009-2019.

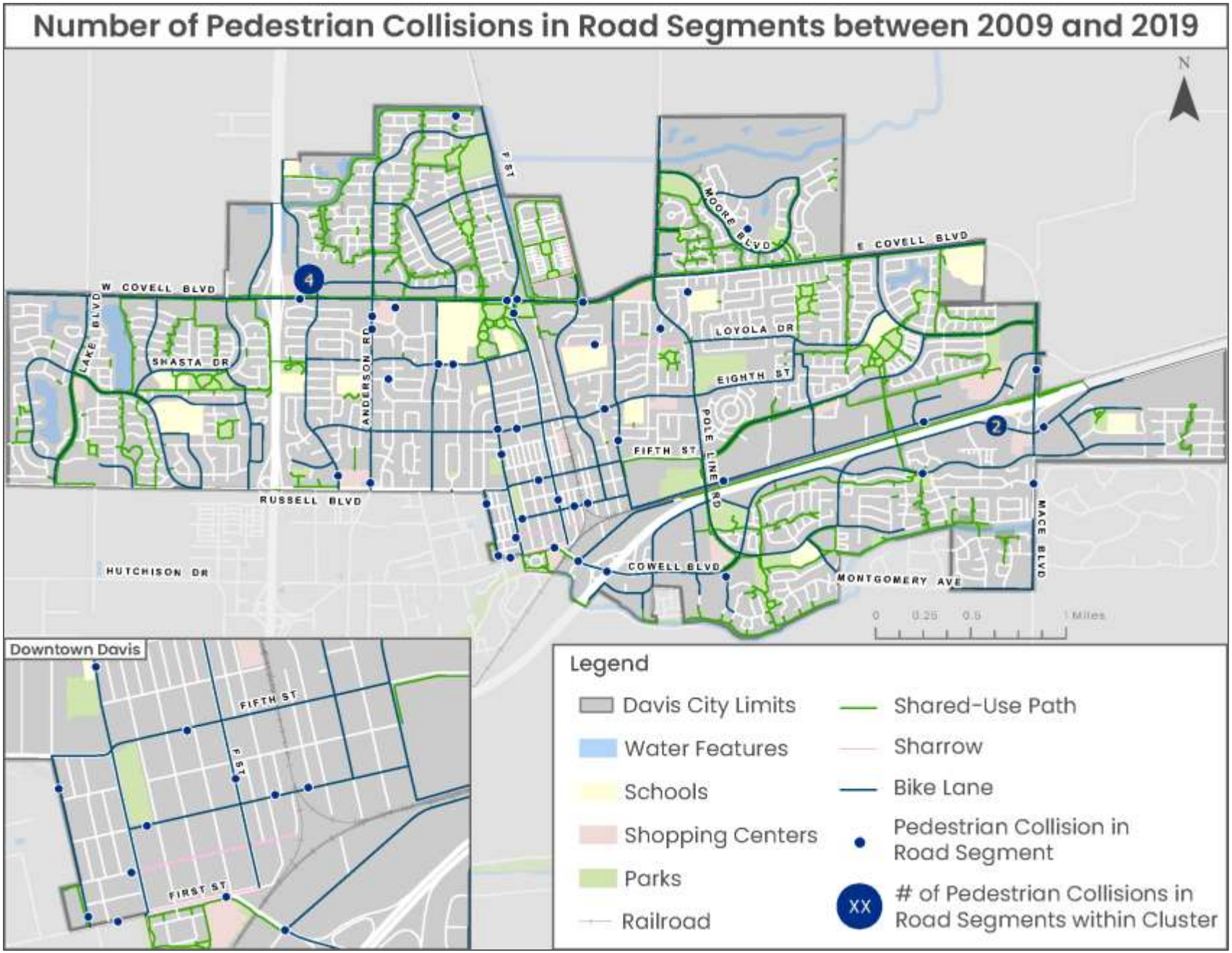


Figure 87. Map of pedestrian collisions in road segments 2009-2019.

LOCATION OF COLLISIONS BY COLLISION TYPE

There are eight collision types used to describe a collision in the SWITRS data. This report focuses on seven collision types including head-on, sideswipe, rear-end, broadside, hit-object, overturned and vehicle/pedestrian. The "other" type of collision was excluded from the analysis.

HEAD-ON COLLISIONS

Between 2009 and 2019 in Davis, there were 74 head-on collisions and of those, seven resulted in severe injuries. There were no fatal head-on collisions. **Figure 88** shows the locations of all head-on collisions, highlighting clusters of multiple collisions as well as KSI collisions. The largest clusters are at the curve of 2nd Street and J Street and along 8th Street, particularly at the intersection with B Street. **Figure 89** displays the violation types associated with each of the head-on KSI collisions. The severe collisions on F and G Streets involved motorcycles. The B Street severe collision involved a bicycle and motor vehicle. The remainder of the severe collisions were between motor vehicles.

COUNTERMEASURES FOR HEAD-ON COLLISIONS

- Improve striping for crosswalks, bike lanes and travel lanes
- Corridor access management: add center islands
- Centerline rumble strip
- Protected left turn signal

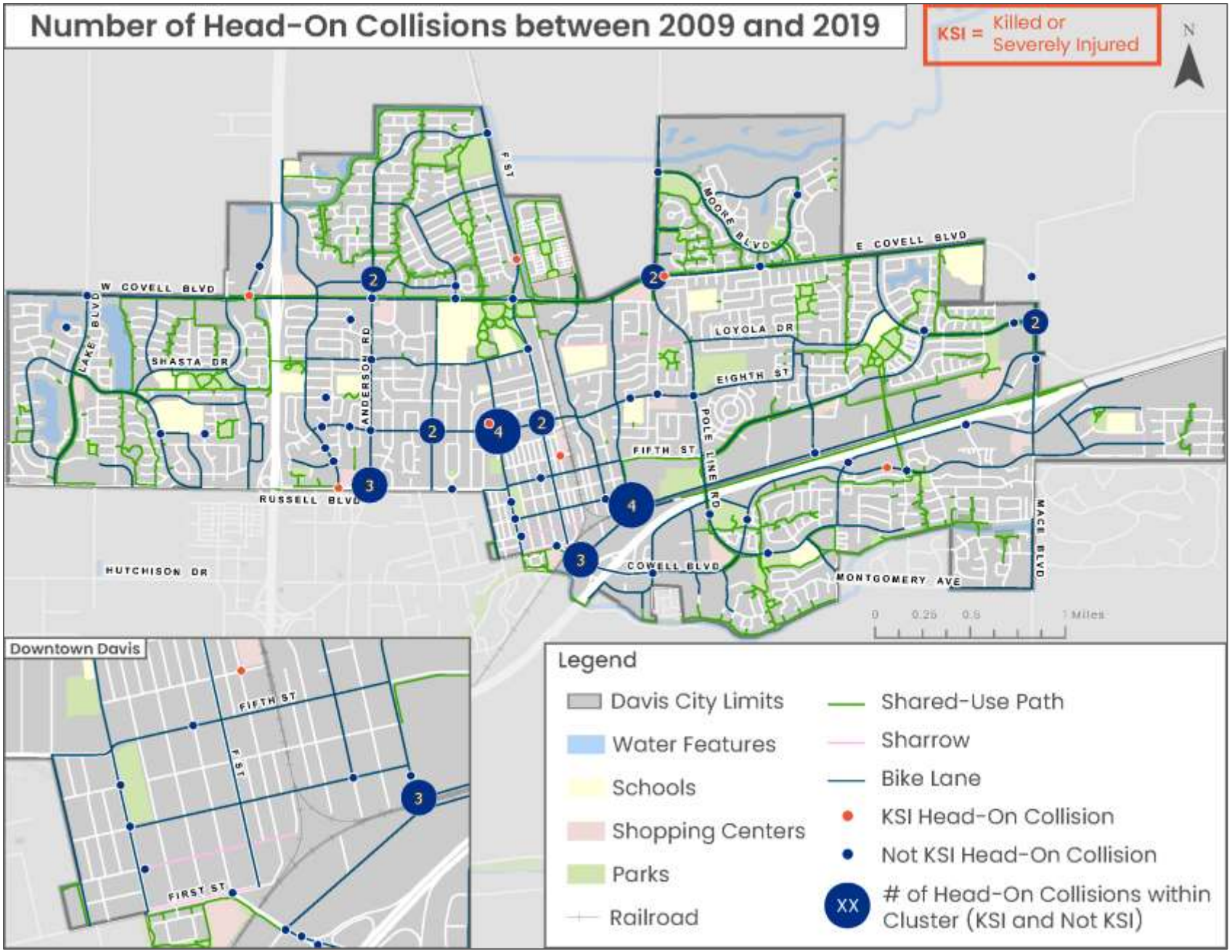


Figure 88. Map of head-on collisions 2009-2019.

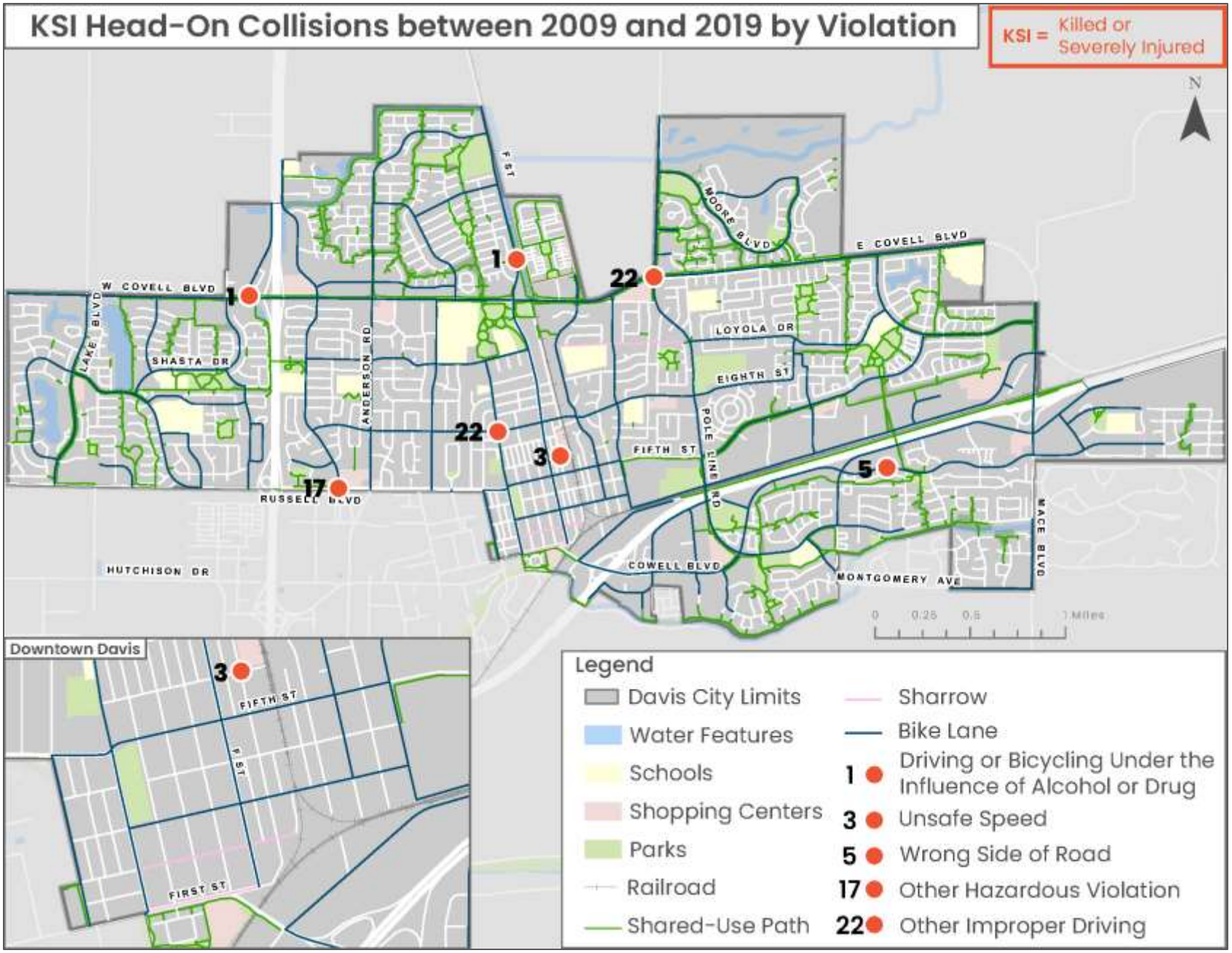


Figure 89. Map of KSI head-on collisions 2009-2019 by violation.

SIDESWIPE COLLISIONS

Between 2009 and 2019, there were 41 sideswipe collisions, and two of those collisions resulted in severe injuries. **Figure 90** shows the locations of all the sideswipe collisions and **Figure 91** specifies the violation type corresponding to each KSI collision. The largest cluster of sideswipe collisions were on 5th Street near F Street. The severe collisions on Russell Boulevard and G Street involved motor vehicles, and the Anderson Road collision involved a motor vehicle and bicycle. Improper-turning was the violation type for two of the three severe collisions.

COUNTERMEASURES FOR SIDESWIPE COLLISIONS

- Improve striping for crosswalks, bike lanes, and travel lanes
- Road diet to reduce the number of travel lanes
- Channelized turn lanes

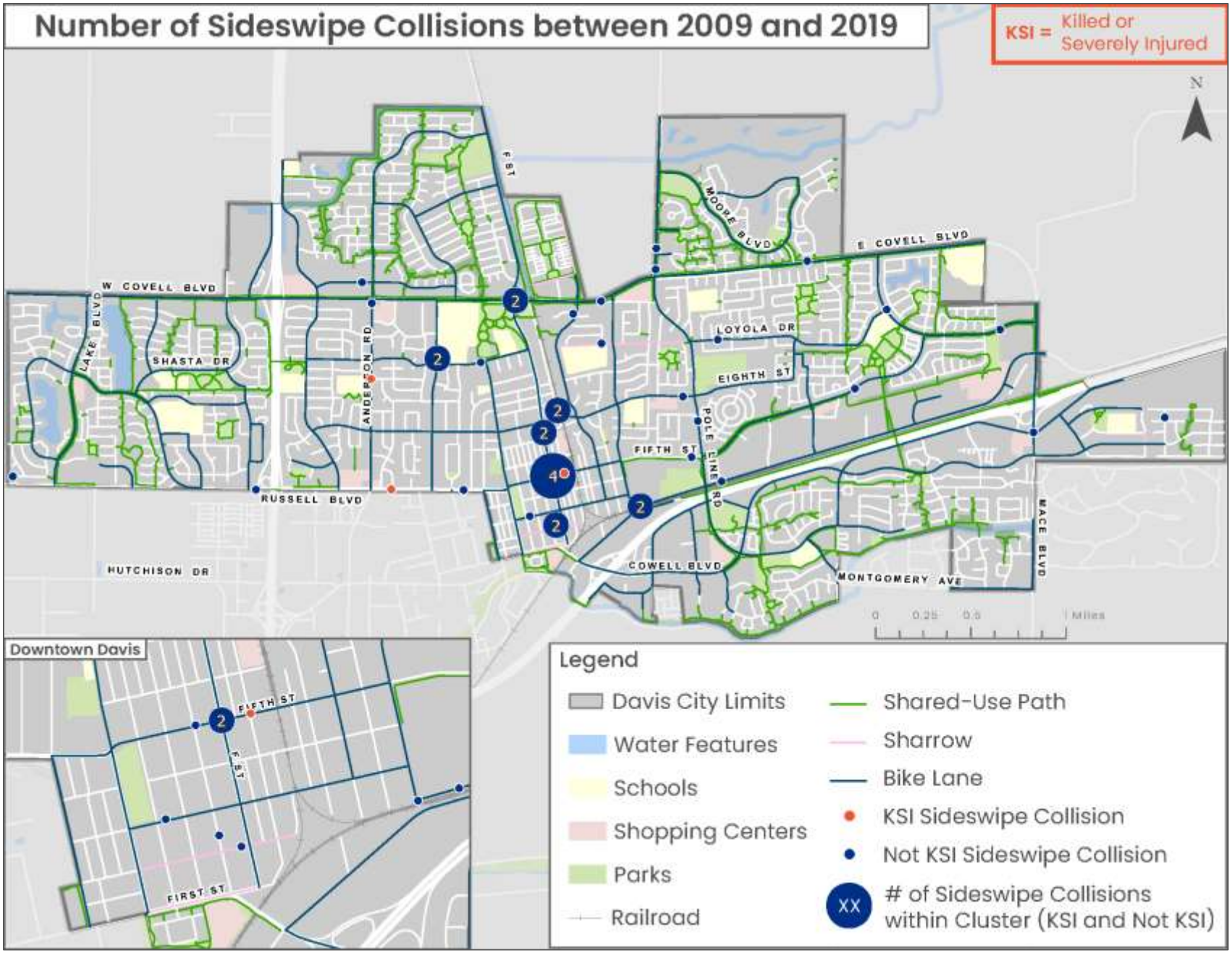


Figure 90. Map of sideswipe collisions 2009-2019.

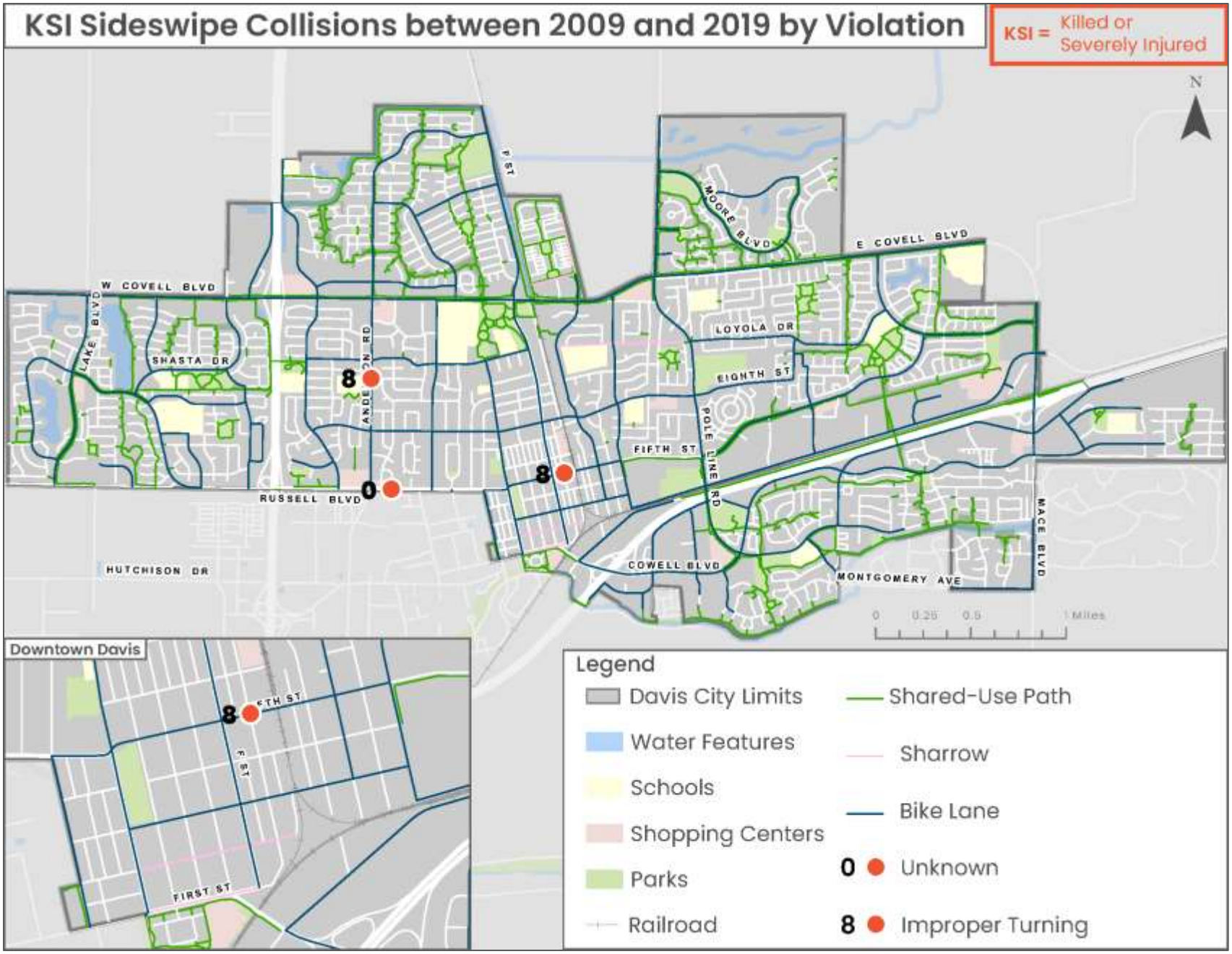


Figure 91. Map of KSI sideswipe collisions 2009-2019 by violation.

REAR-END COLLISIONS

As displayed in **Figure 92**, there were 295 rear-end collisions between 2009 and 2019, including three severe injuries and one fatality. The largest clusters of rear-end collisions occurred along Mace Boulevard near 2nd Street and along W. Covell Boulevard, particularly at the intersection with F Street. There are also rear-end collision clusters along Russell Boulevard and 5th Street. The rear-end fatality occurred at Covell Boulevard and Baywood Lane and involved motor vehicles. The violations associated with the four KSI collisions can be observed in **Figure 93**. Three of the four KSI collisions were a result of unsafe speed, including the fatality.

COUNTERMEASURES FOR REAR-END COLLISIONS

- Advanced warning signs
- Additional signal heads
- Retroreflective backplates
- Dilemma zone detection

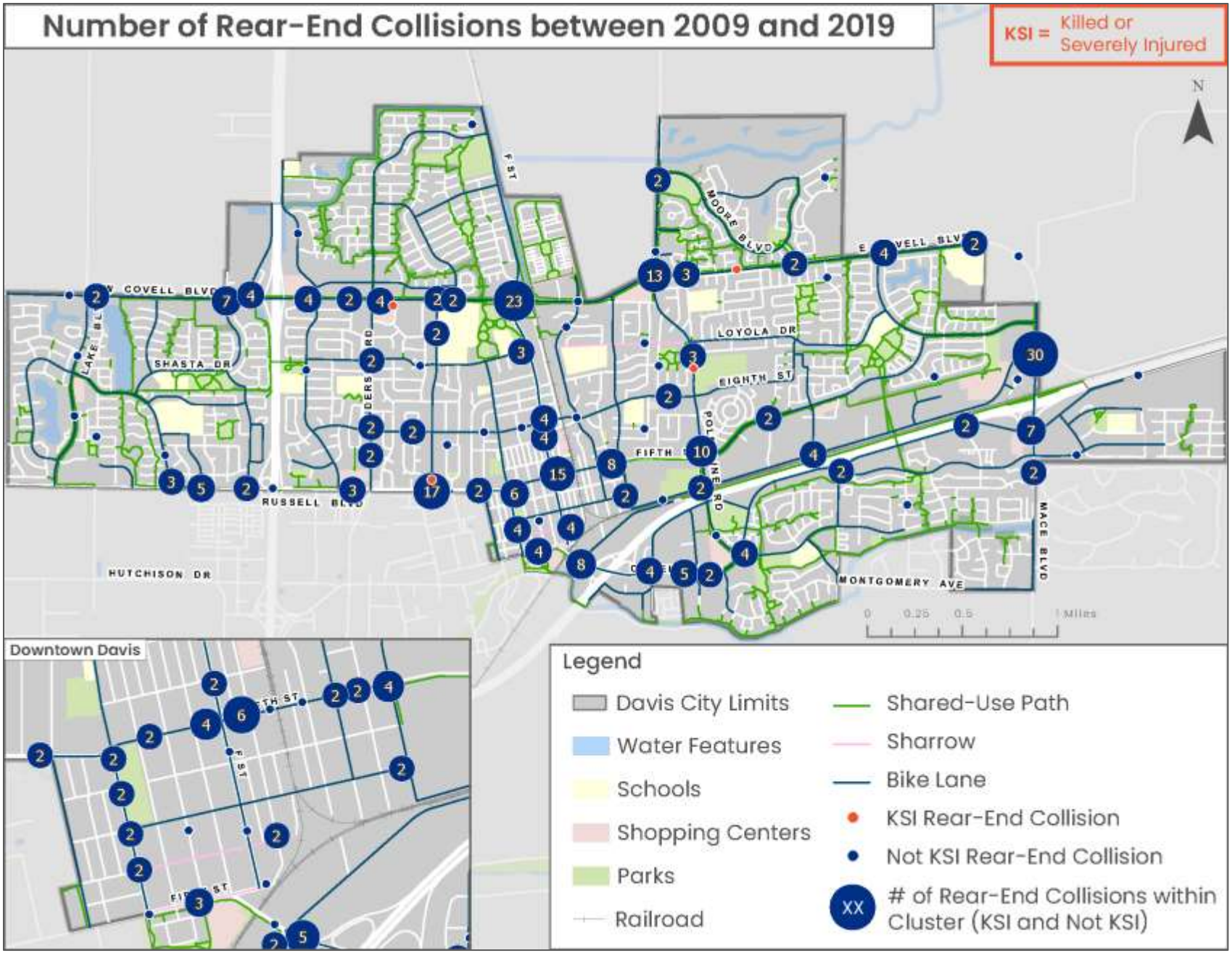


Figure 92. Map of rear-end collisions 2009-2019.

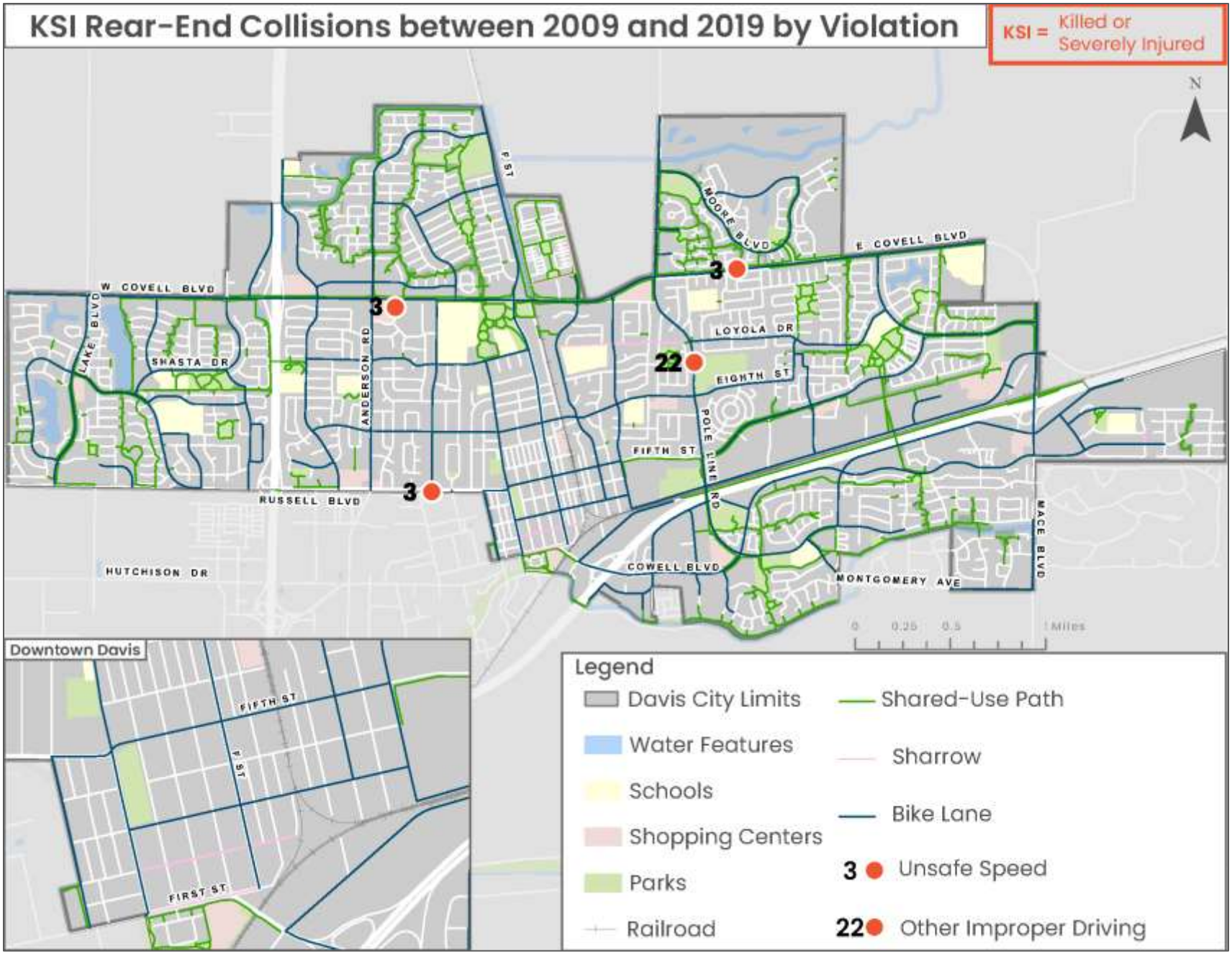


Figure 93. Map of KSI rear-end collisions 2009-2019 by violation.

BROADSIDE COLLISIONS

Between 2009 and 2019, there were 304 broadside collisions with 12 collisions resulting in severe injuries and one resulting in a fatality. The locations of these collisions are displayed in **Figure 94**, with the KSI collision violation types in **Figure 95**. 5th Street between D Street and E Street had the largest cluster of broadside collisions. There were also high volumes of broadside collisions along Anderson Road, Russell Boulevard, and Covell Boulevard. Four of the KSI broadside collisions were the result of a failure-to-yield violation, and six of them involved bicycles or motorcycles. The fatality along 2nd Street occurred between motor vehicles and was the result of a driving under the influence of alcohol or drug violation.

COUNTERMEASURES FOR BROADSIDE COLLISIONS

- Leading pedestrian and bicycle intervals
- Protected intersections
- Corridor access management: center islands and refuge islands
- Removal of channelized right turn lanes
- Enhancement of existing bike lanes into buffered bikeway
- Roundabouts
- Reduced left turn conflicts at intersections

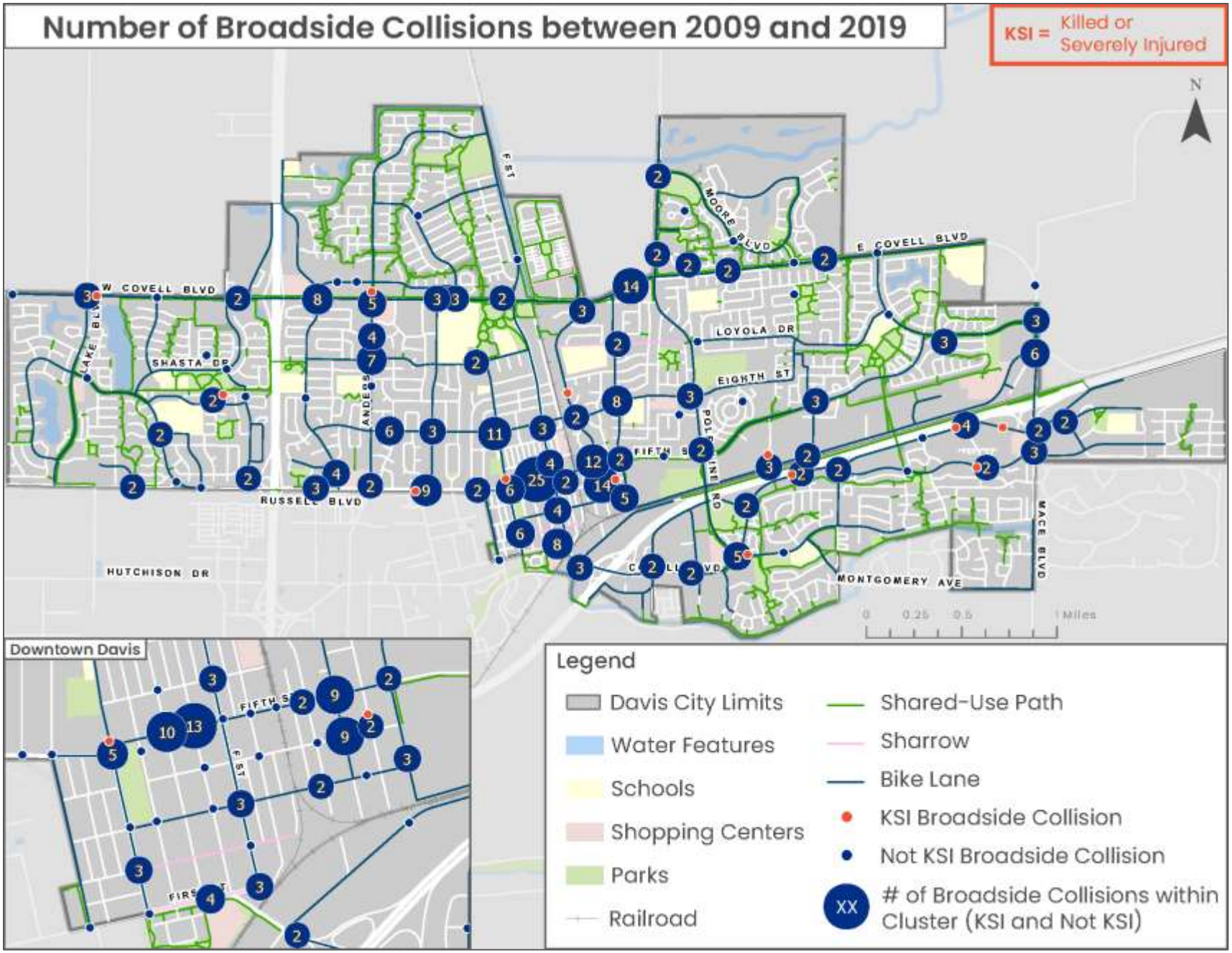


Figure 94. Map of broadside collisions 2009-2019.

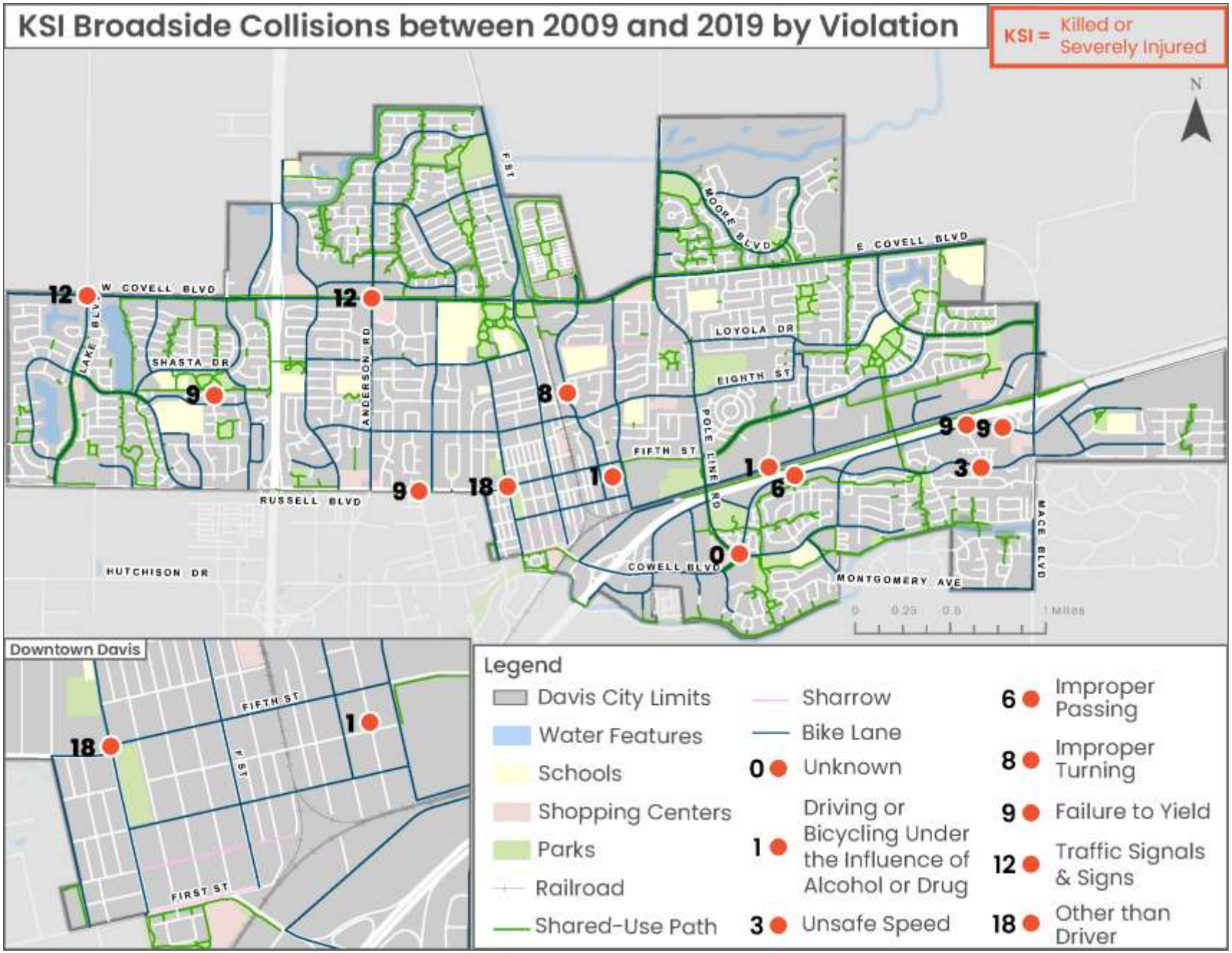


Figure 95. Map of KSI broadside collisions 2009–2019 by violation.

HIT-OBJECT COLLISIONS

Between 2009 and 2019, there have been 117 hit-object collisions. Of these, 10 resulted in severe injuries and one resulted in a fatality. **Figure 96** displays the locations of the hit-object collisions, and **Figure 97** identifies the violation type corresponding to each KSI hit-object collision. Many of the hit-object collisions occurred along Covell Boulevard with the largest clusters at Pole Line Road and Anderson Boulevard. The next largest cluster with four hit-object collisions was on the curve of J Street and 2nd Street. The majority of the KSI hit-object collisions involved unsafe speed violations. The fatality and two of the severe injury collisions were a result of driving under the influence of alcohol and drug violations.

COUNTERMEASURES FOR HIT-OBJECT COLLISIONS

- Improve striping
- Removal of obstructions from the clear recovery zone
- RRFBs
- Buffered bicycle lanes
- Cycle tracks

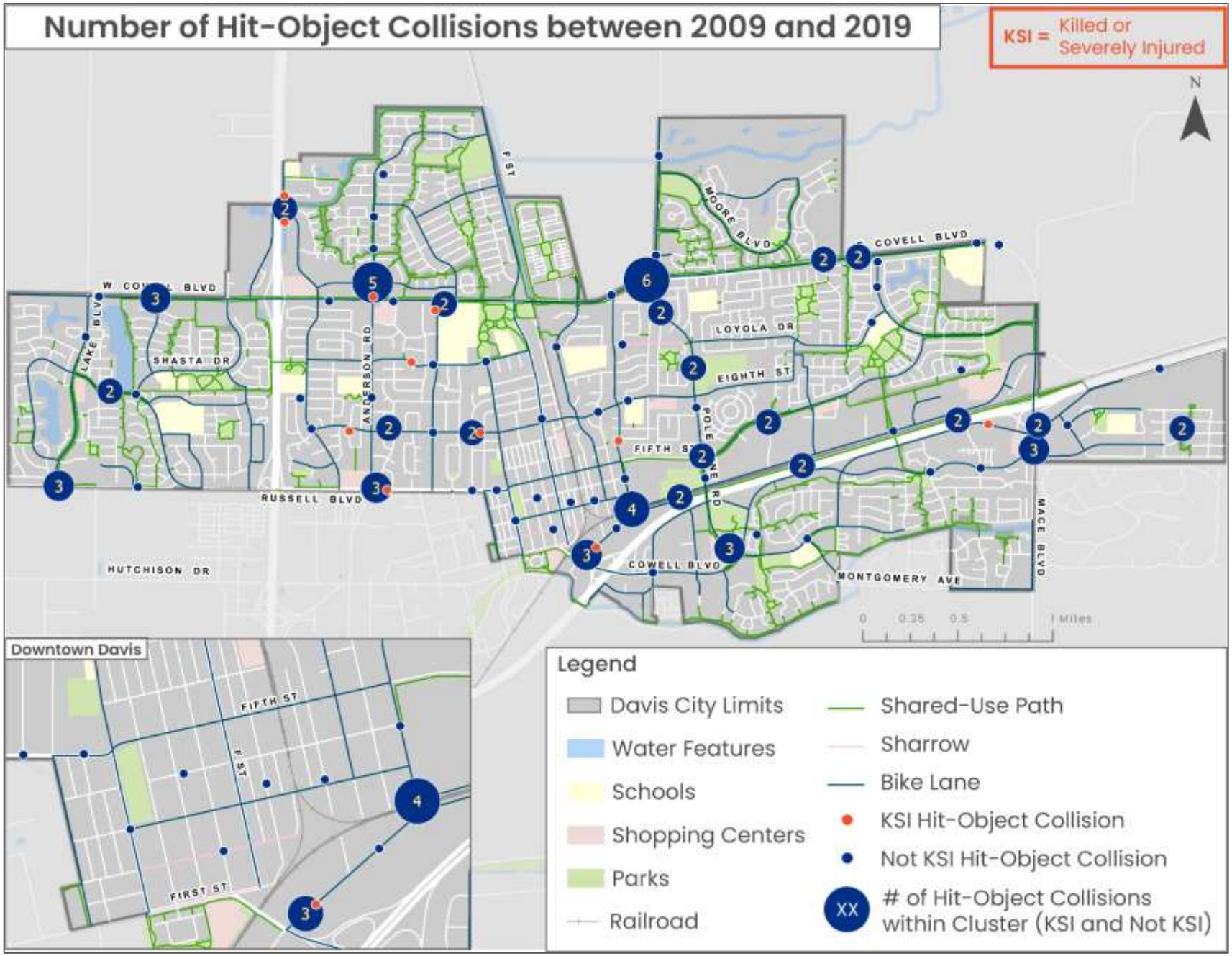


Figure 96. Map of hit-object collisions 2009-2019.

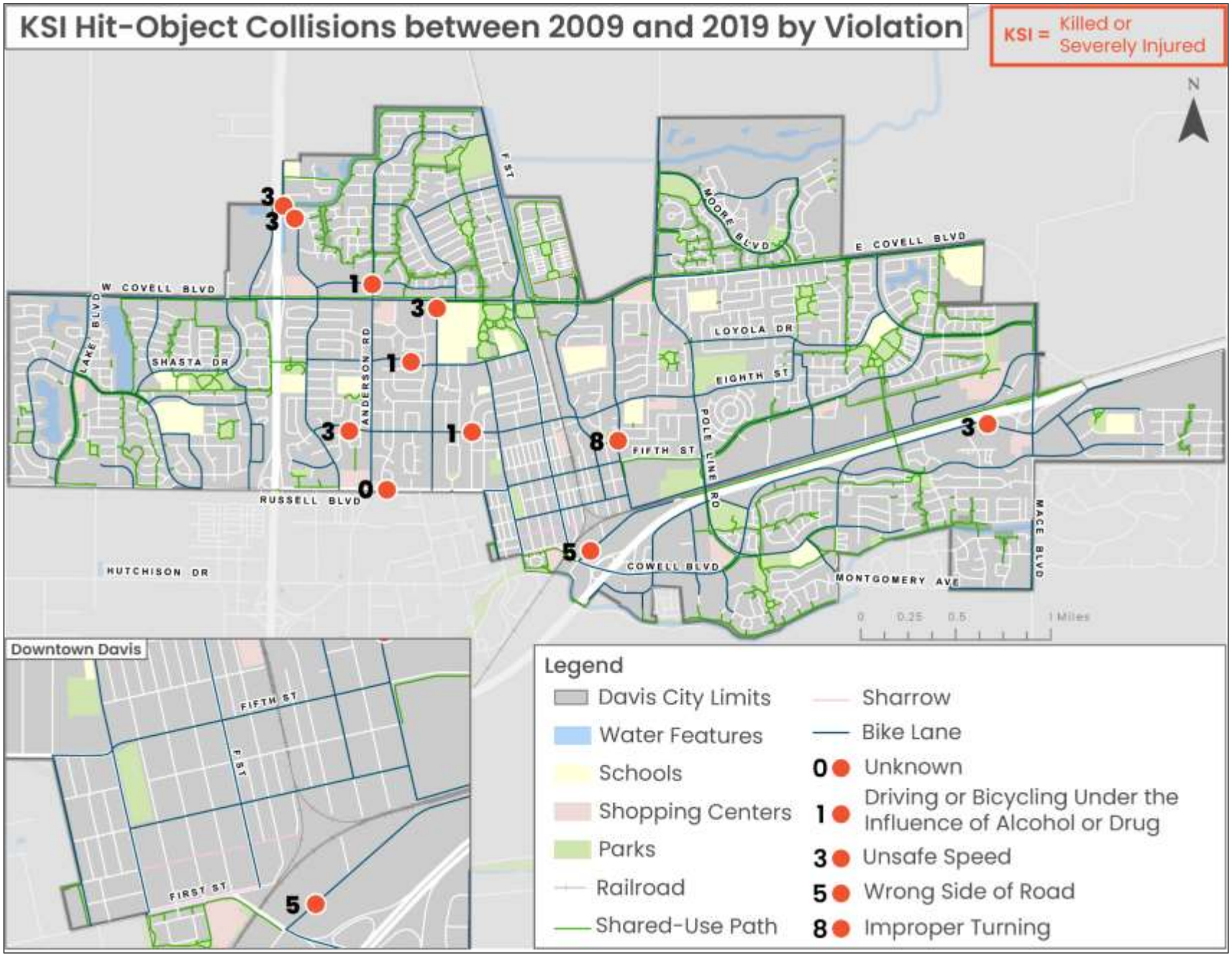


Figure 97. Map of KSI hit-object collisions 2009-2019 by violation.

OVERTURNED COLLISIONS

Between 2009 and 2019, there were 18 overturned collisions, including four severe injuries. The locations of all overturned collisions and the violation types of the four KSI overturned collisions can be seen in **Figure 98** and **Figure 99.** The majority of the overturned collisions occurred along Anderson Boulevard and Russell Boulevard near UC Davis, including the only collision cluster. The KSI overturned collisions nearest to UC Davis on Russell Boulevard and on Sycamore Lane involved bicycles.

COUNTERMEASURES FOR OVERTURNED COLLISIONS

- High Friction Surface Treatment

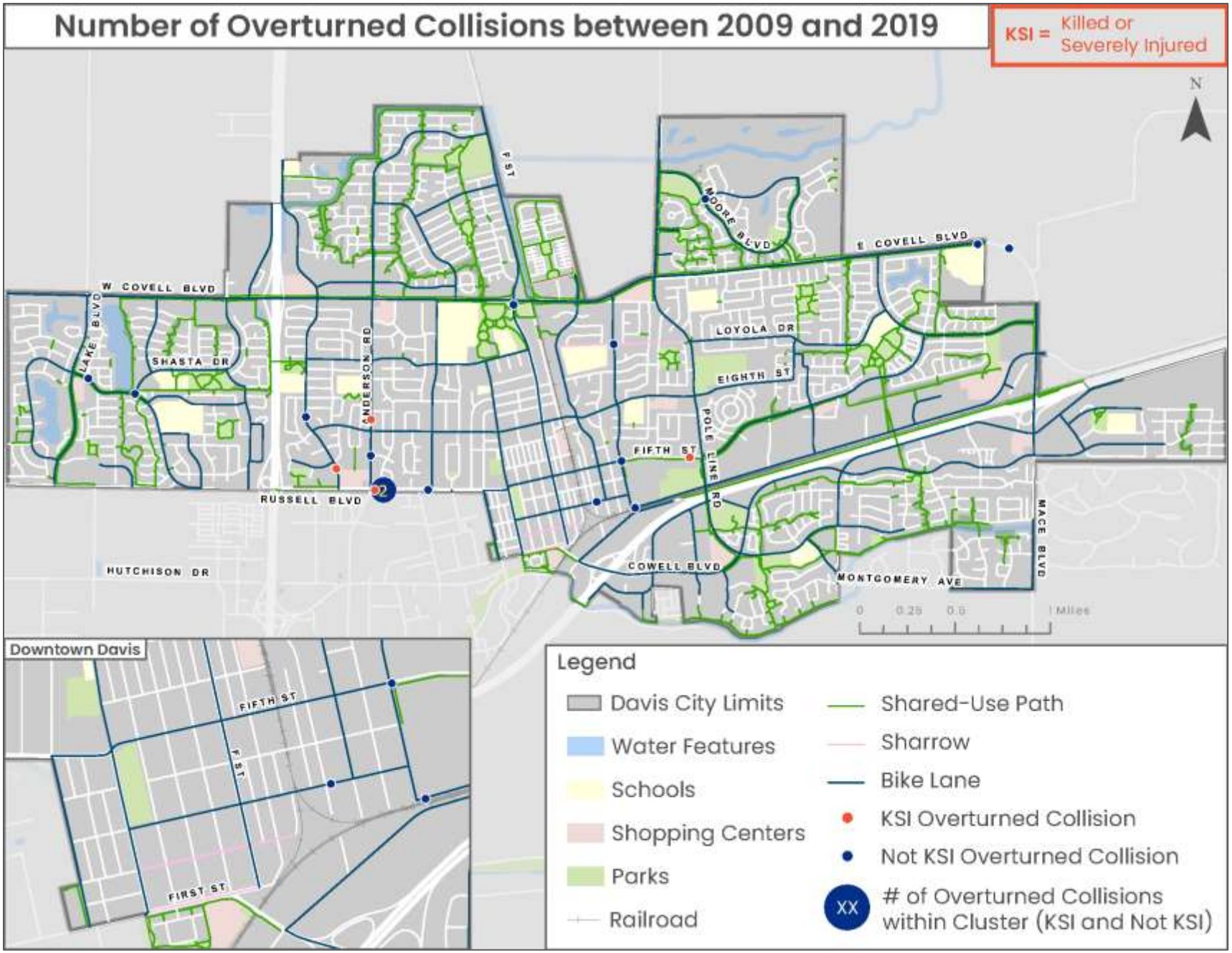


Figure 98. Map of overturned collisions 2009-2019.

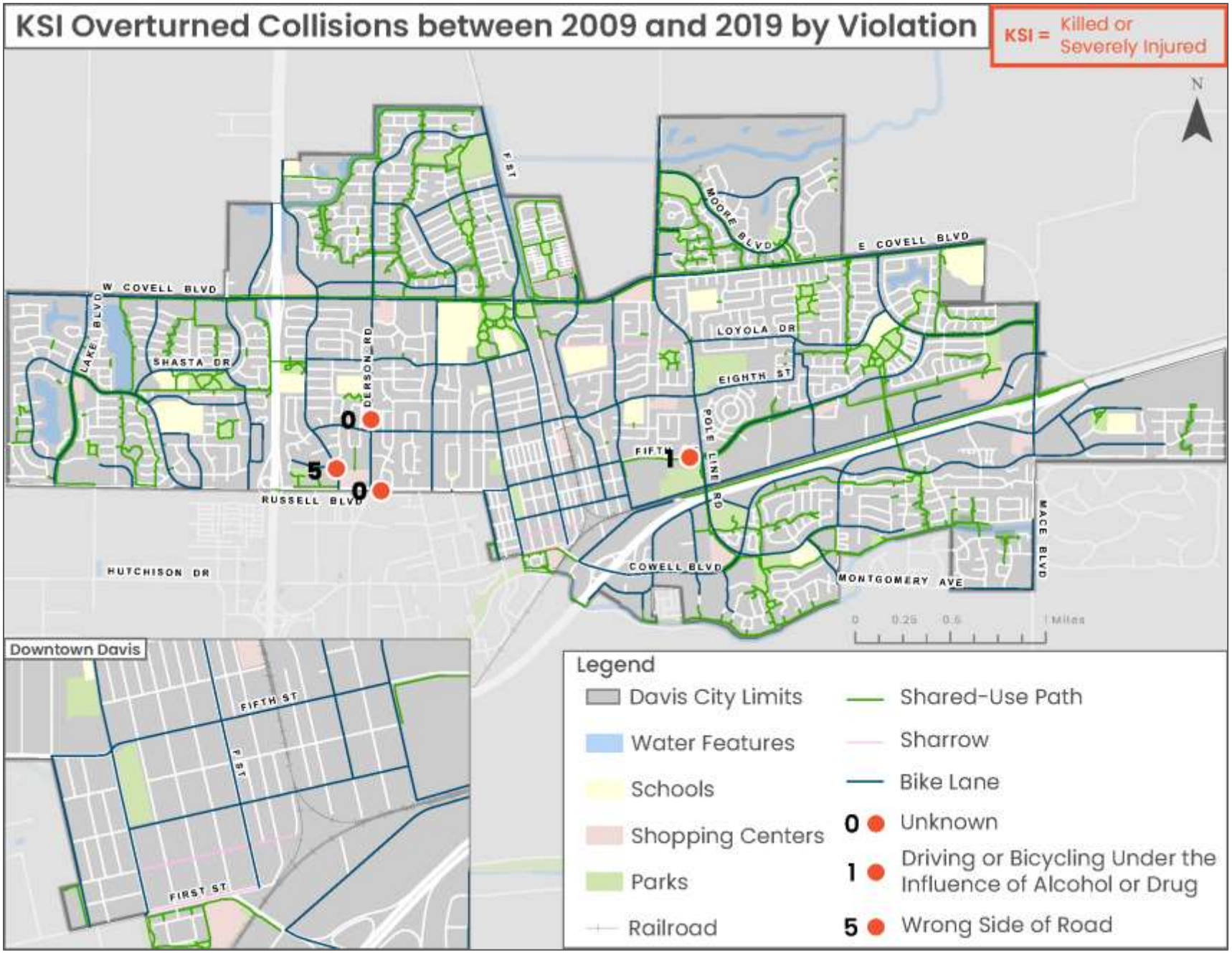


Figure 99. Map of KSI overturned collisions 2009-2019 by violation.

VEHICLE/PEDESTRIAN COLLISIONS

Between 2009 and 2019, there were 96 vehicle/pedestrian collisions with 15 severe injuries and two fatalities. The locations of these collisions are shown in **Figure 100**. The majority of vehicle/pedestrian collisions occurred in downtown Davis, with the exception of a large cluster along Sycamore Lane near the shopping area in North Davis. As displayed in **Figure 101**, 10 of the 17 KSI vehicle/pedestrian collisions were associated with a pedestrian violation, including the two fatalities.

COUNTEREMASURES FOR VEHICLE/PEDESTRIAN COLLISIONS

- Leading Pedestrian Intervals
- RRFBs
- Enhanced crosswalks
- Pedestrian hybrid beacons

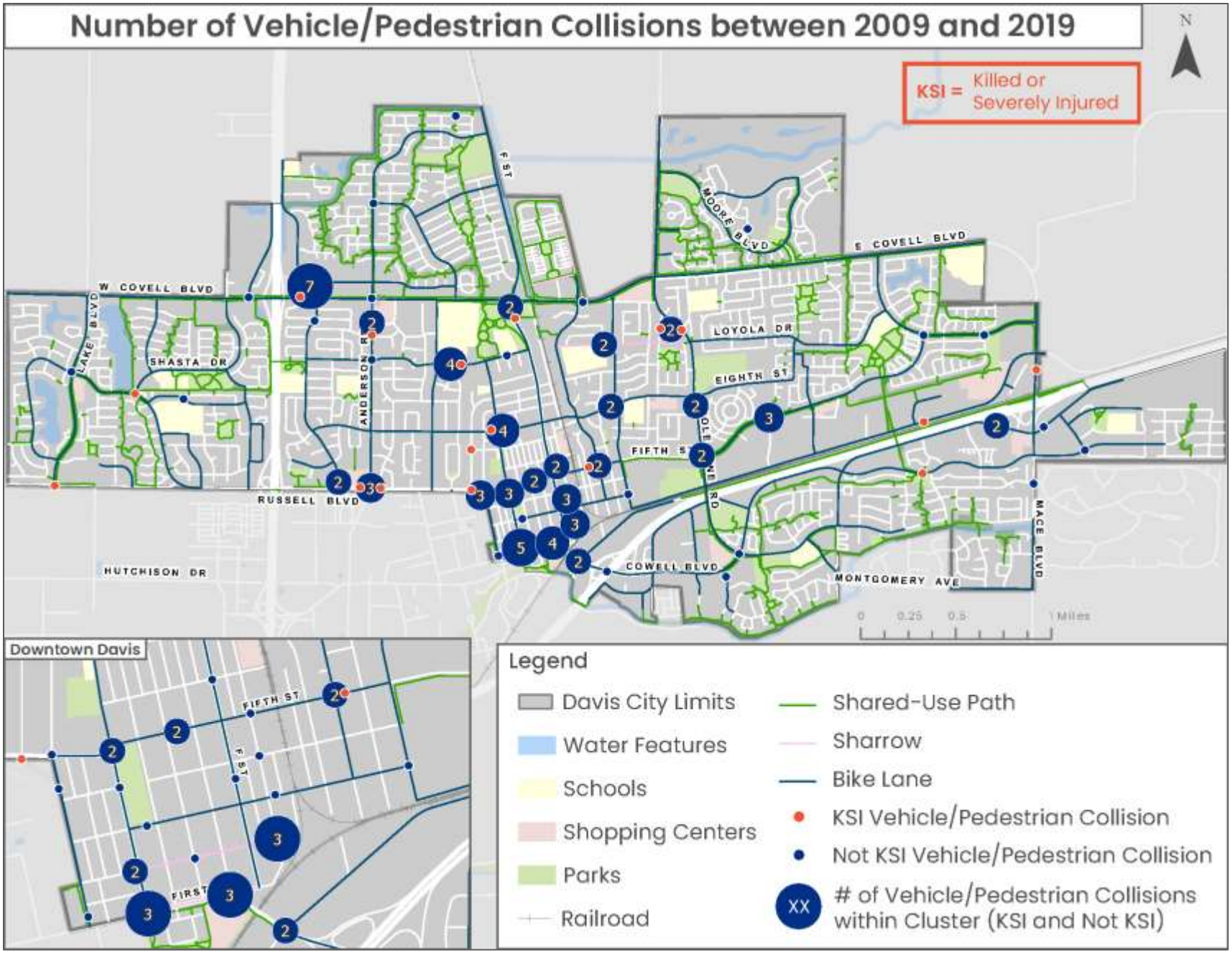


Figure 100. Map of vehicle/pedestrian collisions 2009-2019.

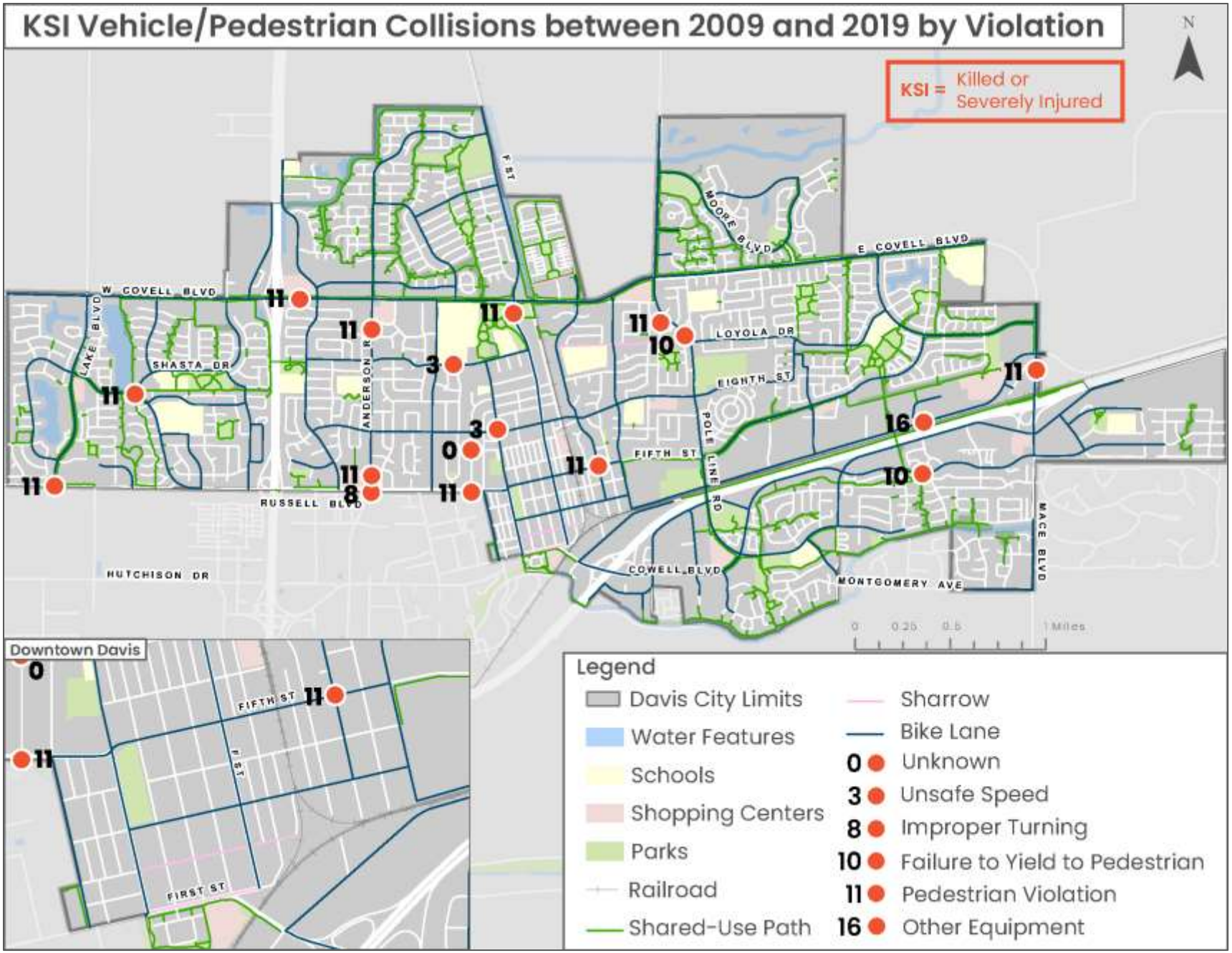


Figure 101. Map of KSI vehicle/pedestrian collisions 2009-2019 by violation.

LOCATION OF COLLISIONS BY VIOLATION TYPE AND SEVERE AND FATAL COLLISIONS

This section details the locations of total and KSI collisions by the top four violation types cited in Davis collisions. The types are unsafe speed, failure-to-yield, improper-turning, and traffic signal/sign violations.

UNSAFE SPEED

Between 2009 and 2019, there were 389 unsafe speed violations, which can be seen in **Figure 102**. There are large clusters of unsafe speed violations along 5th Street, Russell Boulevard, Covell Boulevard, Mace Boulevard, Richards Boulevard and Cowell Boulevard. The largest cluster of unsafe speed violations is at the intersection of Mace Boulevard and 2nd Street, followed by the intersection of Russell Boulevard and Anderson Boulevard.

Of the 389 unsafe speed violations, 17 of the violations resulted in severe injuries and two violations resulted in fatalities. Both unsafe speed fatalities occurred in North Davis, along Covell Boulevard and along J Street. Seven of the unsafe speed violations involved bicycles, and two involved pedestrians.

COUNTERMEASURES OF UNSAFE SPEED

- Narrow vehicular travel lane widths
- Advanced warning signs prior to traffic signals
- Remove free right turn lanes
- Roundabouts
- Enhance bicycle lanes and convert to buffered Class II or Class IV bikeways
- Grade separated bicycle crossings
- Roundabouts

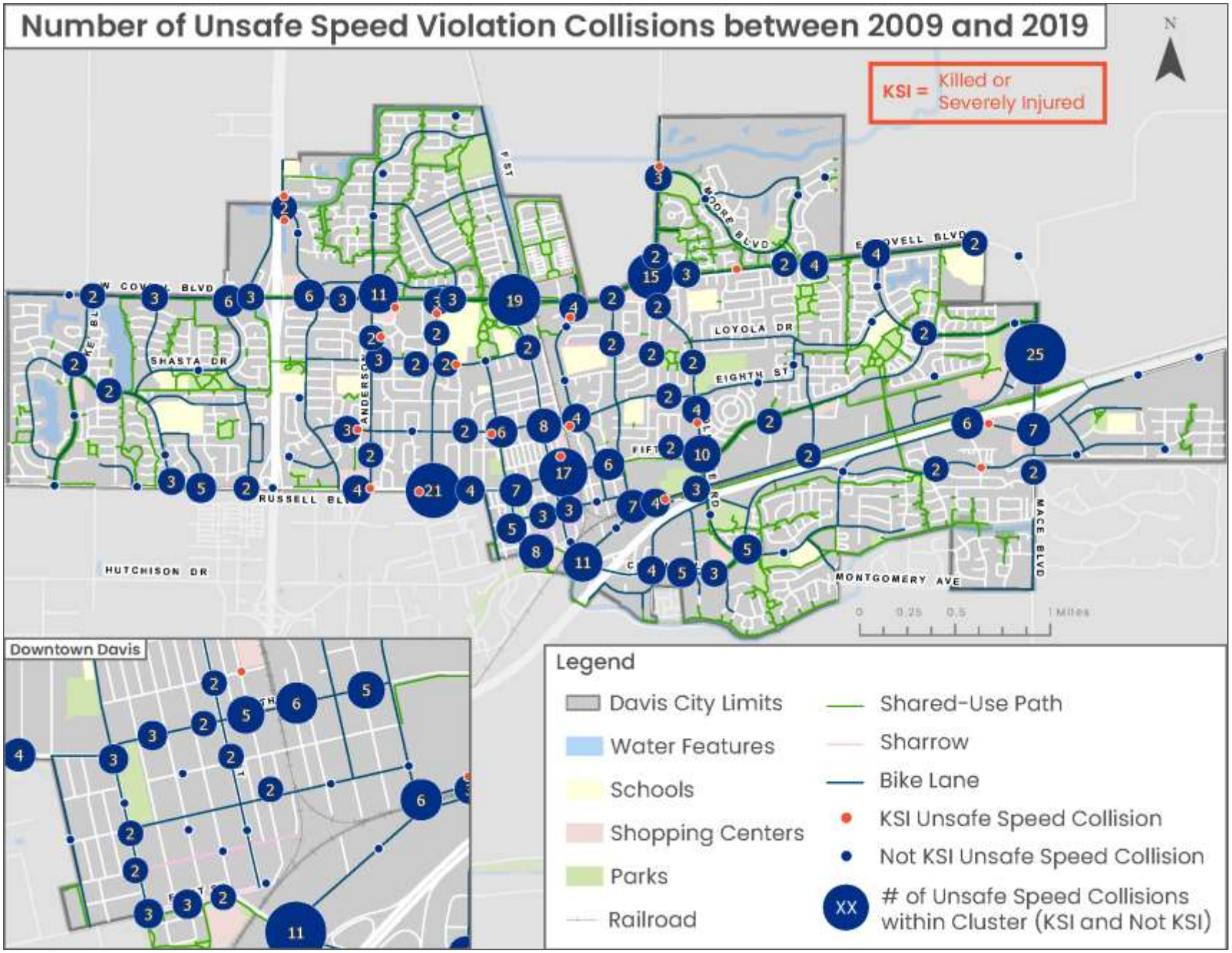


Figure 102. Map of collisions involving unsafe speed violations 2009-2019.

FAILURE-TO-YIELD

Failure-to-yield is the second highest violation type with 345 violations during the study period. The locations of collisions involving this violation are displayed in **Figure 103**. The largest clusters of failure-to-yield collisions occurred in downtown Davis, primarily along 5th Street. There were also large clusters along 8th Street and Covell Boulevard.

Out of the 345 failure-to-yield violations, eight collisions were documented as severe and zero were fatal. Seven of the eight KSI failure-to-yield violations involved bicycles.

COUNTERMEASURES FOR FAILURE-TO-YIELD COLLISIONS

- Leading pedestrian and bicycle intervals
- No right turn on red
- No right turn on red blank out signs.
- Corridor access management- add center islands and channelized turn lanes
- Reduced left turn conflicts at intersections
- Protected bicycle and pedestrian intersections
- Refuge islands

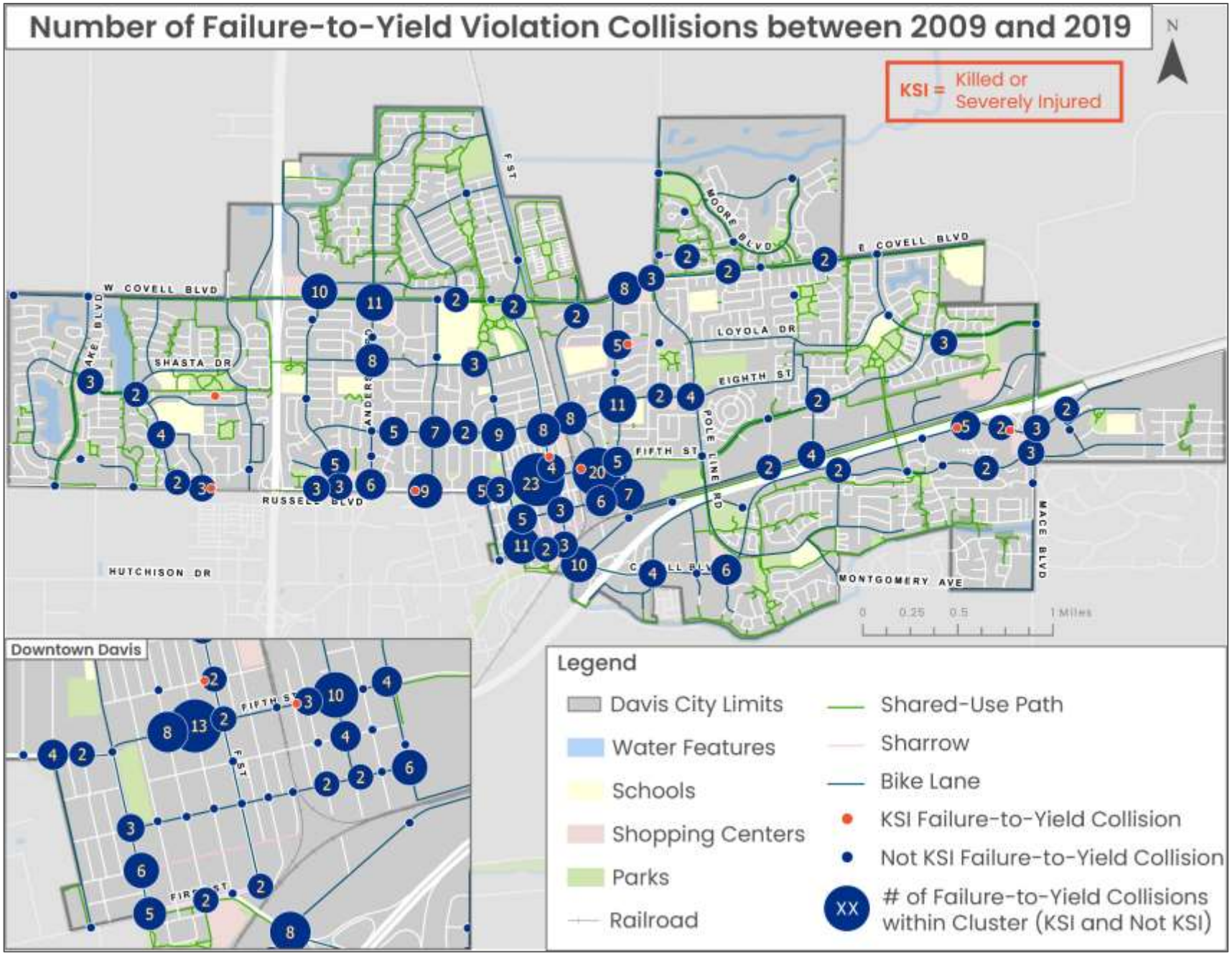


Figure 103. Map of collisions involving failure-to-yield violations 2009-2019.

IMPROPER-TURNING

There were 130 improper-turning violations that resulted in injuries during the study period, 11 of which were severe. **Figure 104** identifies the locations of these collisions, which include large clusters of improper-turning violations on Anderson Road and 5th Street. Of the 11 KSI improper-turning violations, seven involved bicycles and two involved pedestrians.

COUNTERMEASURES FOR IMPROPER-TURNING VIOLATIONS

- Corridor access management - add center islands and channelized turn lanes
- Improve striping for crosswalks, bicycle lanes and travel lanes
- Movement restrictions
- Channelization

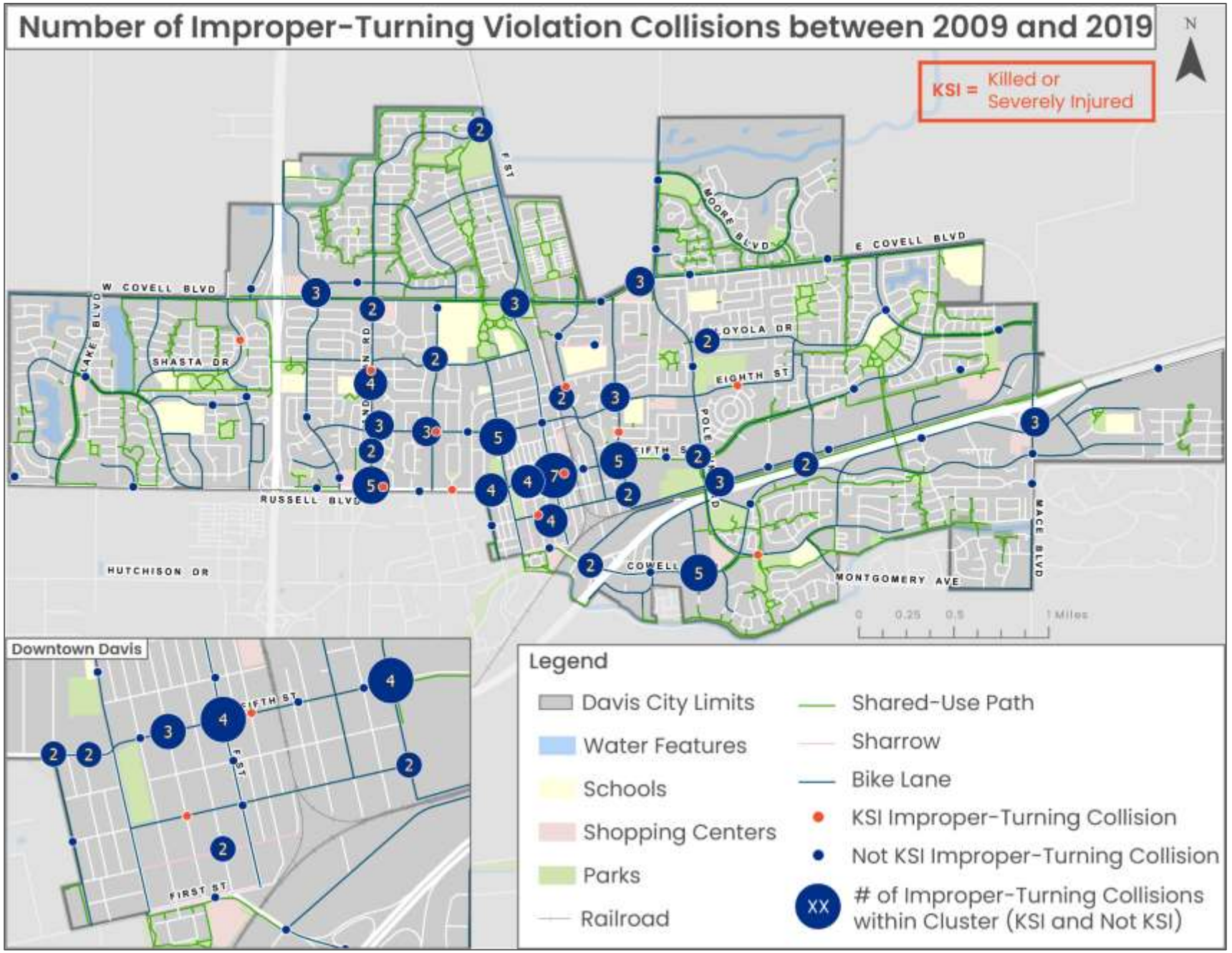


Figure 104. Map of collisions involving Improper-turning violations 2009-2019.

TRAFFIC SIGNAL AND SIGN VIOLATIONS BETWEEN 2009 AND 2019

Traffic signal and sign violations accounted for 99 collisions including three severe injuries between 2009 and 2019. There are several large clusters of violations in downtown Davis, particularly in its southwest corner and along 5th Street. The remaining collision clusters are found along the major and minor arterials, including 8th Street, Covell Boulevard, Russell Boulevard and Mace Boulevard. These collision cluster trends can be seen in **Figure 105**.

COUNTERMEASURES FOR TRAFFIC SIGNALS AND SIGNS

- Advanced warning signs prior to traffic signals
- Retroreflective back plates
- Blank-out signs
- Grade-separated bicycle crossings
- Roundabout

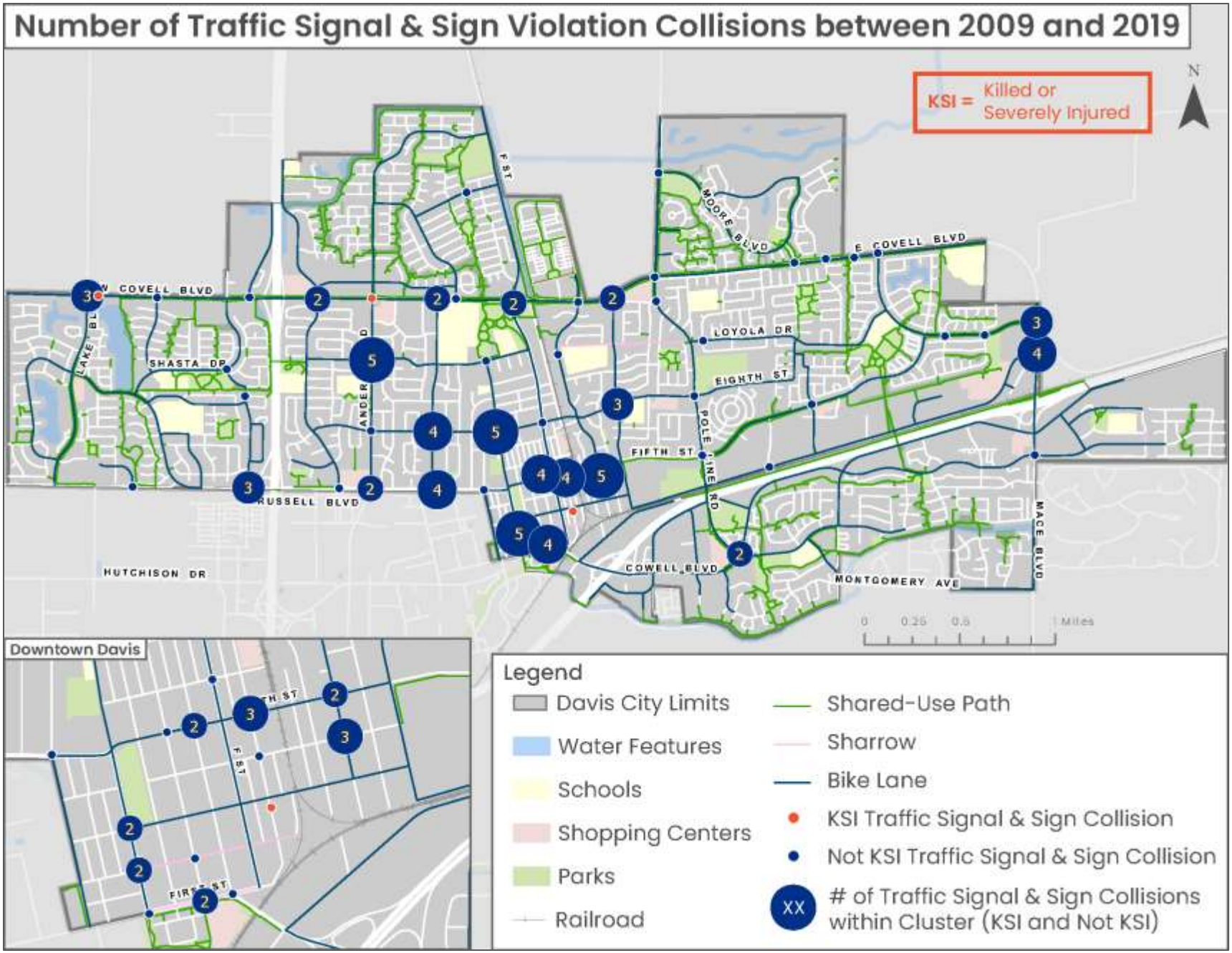


Figure 105. Map of collisions involving traffic signal & sign violations 2009-2019.

PRIORITY INTERSECTIONS

The locations of the highest number of collisions between 2015 and 2019 involving bicyclists, pedestrians, signalized and un-signalized intersections were prioritized for analysis. The top five locations with the highest number of each type are mapped in **Figure 106** and summarized in the tables below including collision trends and proposed recommendations. These recommendations can also be found in the following Recommendations summary.

The intersection of Russell Boulevard and Anderson Boulevard is one of the top locations for bicycle, pedestrian and signalized intersection collisions. The remaining majority of the pedestrian and unsignalized intersection collisions are found in the downtown Davis area, while the signalized intersection and remaining bicycle collision top locations are scattered throughout the city including correlation at the intersections of 8th Street and L Street and of Anderson Boulevard and Villanova Drive.

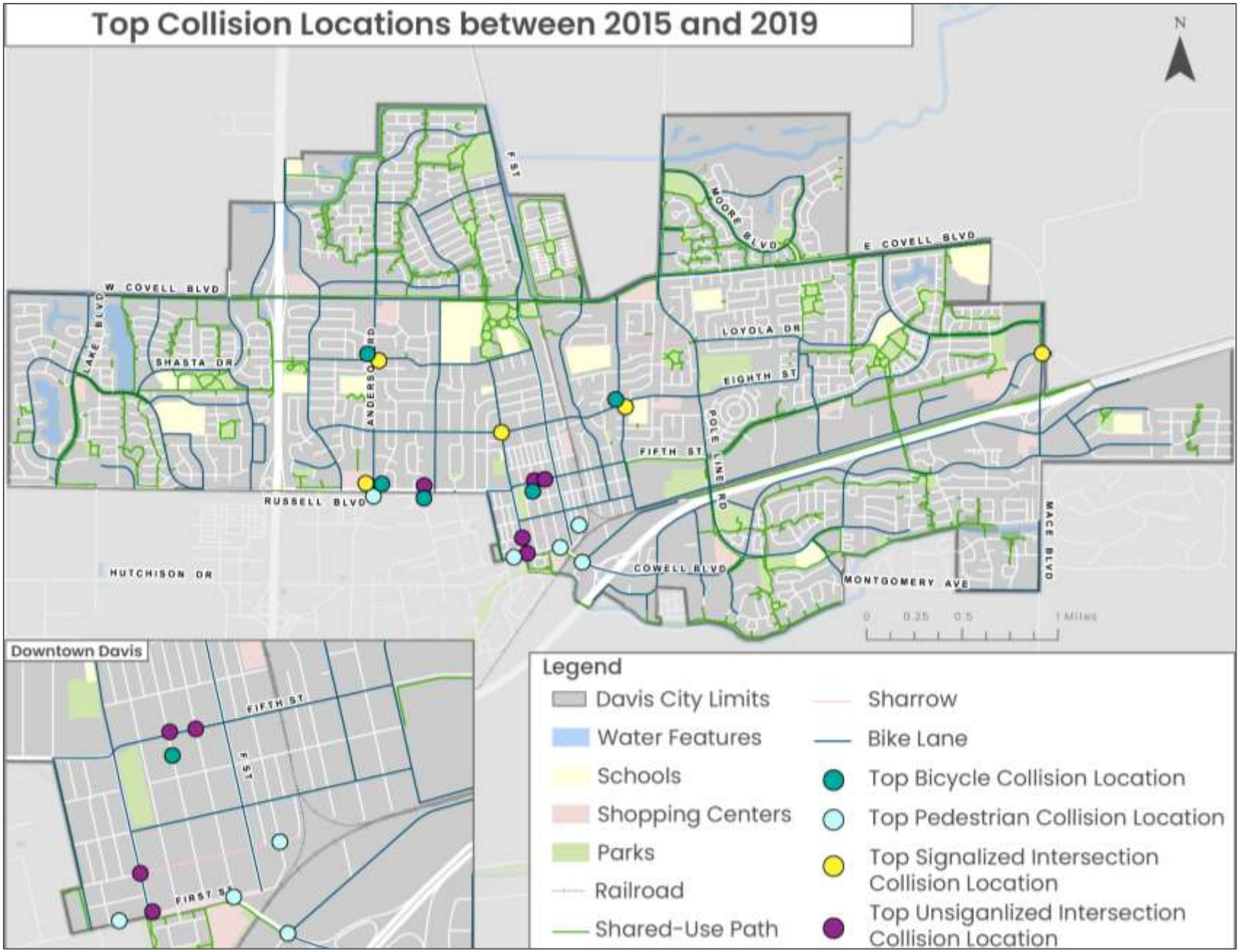


Figure 106. Top collision locations 2015–2019.

Table 3: Top five locations of collisions involving bicycles 2015-2019.

Top Five Locations of Collisions Involving Bicycles 2015-2019			
Rank	Intersection	Control	# of Collisions
1	Russell Boulevard at Anderson Road	Signal	6
2	8th Street at L Street	Signal	5
3	5th Street at D Street	Stop	4
3	Russell Boulevard at California Avenue	Stop	4
3	Anderson Road at Villanova Drive	Signal	4

Table 4: Top five locations of collisions involving pedestrians 2015-2019.

Top Five Locations of Collisions Involving Pedestrians 2015-2019			
Rank	Intersection	Control	# of Collisions
1	1st Street at B Street	AWS	3
2	1st Street at E Street	Signal	2
2	2nd Street at G Street	AWS	2
2	Russell Boulevard at Anderson Road	Signal	2
2	Richards Boulevard at Olive Drive	Signal	2

Table 5: Top five locations of collisions at signalized intersections 2015-2019.

Top Five Locations of Collisions at Signalized Intersections 2015-2019		
Rank	Intersection	# of Collisions
1	Mace Boulevard at 2nd Street	10
2	Russell Boulevard at Anderson Road	9
2	Anderson Road at Villanova Drive	9
3	8th Street at B Street	8
3	8th Street at L Street	8

Table 6: Top five locations of collisions at unsignalized intersections 2015-2019.

Top Five Locations of Collisions at Unsignalized Intersections 2015-2019			
Rank	Intersection	Control	# of Collisions
1	5th Street at D Street	Stop	8
2	B Street at 1st Street	AWS	6
2	B Street at 2nd Street	Stop	6
2	5th Street at E Street	Stop	6
2	Russell Boulevard at California Avenue	Stop	6

RECOMMENDATIONS

Table 7: Prioritized recommendations.

Location	Recommendation	Short-Term	Mid-Term	Long-Term
Citywide	Conduct additional analysis of bicycle & pedestrian collisions of people ages 10-17.		X	
Citywide	Conduct further analysis and community engagement with equity communities to better understand and address safety concerns.		X	
Citywide	Obtain ADT data for roadways.		X	
Citywide (systemic)	Evaluate existing uncontrolled pedestrian crossings for enhanced signage.			X
Citywide (systemic)	Evaluate existing uncontrolled pedestrian crossings for installation of Rectangular Rapid Flashing Beacons (RRFBs).			X
Citywide (systemic)	Evaluate existing signalized intersections for improvements to traffic signal head visibility by installing retroreflective back-plates, replacing 8-inch heads with 12-inch heads, and adding additional signal heads.			X
Citywide (systemic)	Evaluate existing signalized intersections to identify locations for installation of pedestrian countdown signal heads at traffic signals.			X
Citywide (systemic)	Evaluate existing signalized intersections to identify locations for installation of Leading Pedestrian Intervals (LPI).			X
Citywide (systemic)	Develop a plan for installation locations of separated bike lanes.			X

Table 8: Prioritized recommendations for education, enforcement, encouragement, and equity.

Programs and Policies	Recommendation	Short-Term	Mid-Term	On-Going
Training	Provide safety related training and support for staff responsible for street design and enforcement activities.	X		
Reduce and eliminate impaired driving	Post education and outreach at alcohol-serving establishments. Encourage rideshare and other services as alternatives to impaired driving.	X		
Improve data	Improve data collection and reports on cell phone use and distractions. Collect traffic volume data for motor vehicles, bicycles, and pedestrians.	X		
Improve data	Conduct further analysis of collision data. Create a policy for the collection and retention of collision data.	X		
Street Standards	Update street standards to design for safer streets.		X	
Speed feedback signs	Increase use of speed feedback signs.		X	
Enforcement officers	Increase the number of enforcement officers to number recommended by best practices.			X
JHS and HS education	Develop education programs for JHS and HS about safe driving, biking, and walking.			X
UC Davis partnerships	Partner with UC Davis on transportation education and outreach campaigns.			X
Improvements in aging communities	Increase pedestrian crossing times, improve lighting, and install signs with larger font.			X
Improvements in non-English-speaking communities	Install universal signs. Create materials in languages people can read.			X
Improvements in disabled communities	Install universal signs. Increase pedestrian crossing times, improve lighting, and install signs with larger font. Improve ADA access and crossings.			X

APPENDIX A – EXECUTIVE SUMMARY

APPENDIX B – DEFINITIONS

ACCIDENT VS. COLLISION

The best practice is to **not** use the word **accident** when describing a **crash or collision**. Accident implies that no one is at-fault and the events are outside human influence or control. Instead, staff will commit to using the words incident, crash, or collision. This decision is in line with the National Highway Traffic Safety Administration in declaring that the word "accident" will no longer be used in materials it publishes, in speeches or other statements or in communications with the media and others.

BICYCLE

A bicycle, as defined in California Vehicle Code (CVC) Section 231, is a device upon which any person may ride, propelled exclusively by human power through a belt, chain, or gears and having one or more wheels. Persons riding bicycles are subject to the provisions specified in CVC Sections 21200 and 21200.5. The operator of a unicycle or tricycle that is involved in a collision will be considered a bicyclist only if the cycle meets the definition of a bicycle.

BRAKES

The service brakes of every motor vehicle or combination of vehicles shall be adequate to control the movement of and to stop and hold the vehicle or combination of vehicles under all conditions of loading.

BROADSIDE COLLISION

A collision that occurs when the front of one vehicle slams into the side of another vehicle or device.

COMPLAINT OF PAIN

"Complaint of Pain" includes: (1) persons who seem dazed, confused, or incoherent (unless such behavior can be attributed to intoxication, extreme age, illness or mental infirmities); (2) persons who are limping or complaining of pain or nausea, but do not have visible injuries; (3) any person who may have been unconscious, as a result of the collision, although it appears he/she has recovered; (4) persons who say they want to be listed as injured but do not appear to be so.

DRIVING OR BICYCLING UNDER THE INFLUENCE OF ALCOHOL OR DRUGS

It is unlawful for a person who is under the influence of any alcoholic beverage to drive a vehicle. It is unlawful for a person who has 0.08% or more, by weight, of alcohol in his or her blood to drive a vehicle. It is unlawful for a person who is under the influence of any drug to drive a vehicle. It is unlawful for a person who is under the combined influence of any alcoholic beverage and drug to drive a vehicle.

FAILURE-TO-YIELD

Requires drivers approaching an intersection to yield to motorists who have already entered the intersection. The driver of a vehicle approaching an intersection shall yield the right-of-way to any vehicle that has entered the intersection from a different highway.

FOLLOWING TOO CLOSELY

The driver of a motor vehicle shall not follow another vehicle more closely than is reasonable and prudent, having due regard for the speed of such vehicle and the traffic upon, and the condition of, the roadway.

HAZARDOUS PARKING

A person shall not stop, park or leave standing any vehicle whether attended or unattended, except when necessary to avoid conflict with other traffic or in compliance with the directions of a peace officer or official traffic control device, in any of the following places: (a) within an intersection, (b) on a crosswalk, (c) between a safety zone and the adjacent right-hand curb [and] (d) within 15 feet of the driveway entrance to a fire station.

IMPEDING TRAFFIC (OTHER SPEED LAWS)

No person shall drive upon a highway at such a slow speed as to impede or block the normal and reasonable movement of traffic unless the reduced speed is necessary for safe operation, because of a grade or in compliance with law.

IMPROPER-TURNING

No person shall turn a vehicle from a direct course or move right or left upon a roadway until such movement can be made with reasonable safety and then only after the giving of an appropriate signal in the event any other vehicle may be affected by the movement.

KILLED OR SERIOUSLY INJURED

Killed or Seriously Injured (KSI) is a standard metric for safety policy used in transportation and road safety. Seriously injured means the person injured had broken bones, dislocated or distorted limbs, severe lacerations, severe burns, skull, spinal, chest and abdominal injuries or they were unconscious at or when taken from the collision scene. A fatal injury is classified as death as a result of injuries sustained in a collision, or an injury resulting in death within 30 days of the collision.

LIGHTING

All lighting equipment of a required type installed on a vehicle shall at all times be maintained in good working order. Lamps shall be equipped with bulbs of the correct voltage rating corresponding to the nominal voltage at the lamp socket.

MOTOR VEHICLE

A motor vehicle is any motorized vehicle not operated on rails. For purposes of classification, a trailer, coaster, sled or wagon or other equipment being towed or pushed by a motor vehicle is considered part of the motor vehicle, including such equipment when detached while in motion. For collision reporting purposes, a motorized bicycle, moped or motorized scooter, shall be considered a motor vehicle, whether the motor is operating or not. Motor vehicle does not include a self-propelled wheelchair, motorized tricycle, or quadricycle, if operated by a person who, by reason of physical disability, is otherwise unable to move about as a pedestrian.

OTHER EQUIPMENT

Other equipment includes horns, sirens, amplification devices, exhaust systems, noise limits, safety belts, headsets and earplugs, tires or fenders. Please see Chapter 5 California Vehicle Code for an exhaustive list of other equipment.[30]

OTHER HAZARDOUS VIOLATION

Other Hazardous Violation is defined in the Highway Patrol Manual as a collision of a vehicle involved with (1) a bicycle, train, or animal; (2) an automobile fire; (3) Passengers falling or jumping from a vehicle; (4) a vehicle backing; and (5) a bicycle involved with a pedestrian or another bicycle.

[30] https://law.justia.com/codes/california/2011/veh/division-12/

OTHER THAN DRIVER (OR PEDESTRIAN)

Other than driver (or pedestrian) is a collision where the primary cause was beyond the control of the driver, such as when a large animal (deer, horse, cow, etc.) runs in front of a vehicle, the driver suffers a medically induced difficulty, such as heart attack or diabetic coma, a driver operating a vehicle properly and safely for visible conditions strikes “black ice” and runs off the road, mechanical failure occurs that was unknown or not foreseeable through normal and reasonable maintenance or when a vehicle tire throws up a rock which strikes another vehicle’s windshield.

OTHER VISIBLE INJURIES

An injury, other than a fatal or severe injury, which is evident to observers at the scene of the collision. Other visible injuries include: (1) Bruises, discoloration or swelling; (2) Minor lacerations or abrasions; and (3) minor burns.

PARTIES

Parties are the major players in traffic collision - drivers, pedestrians, bicyclists, and parked vehicles.

PASSENGER

Passenger includes non-operator on bicycle or any victim on/in parked vehicle or multiple victims on/in non-motor vehicle.

PEDESTRIANS

A pedestrian is any person who is afoot or using a means of conveyance propelled by human power other than a bicycle. A pedestrian includes: (1) any person riding a device propelled by human power other than a bicycle or the rider of a unicycle or tricycle that does not meet the definition of a bicycle; (2) any person operating a pedestrian conveyance such as a skateboard, roller skates, sled, skis, scooter, baby carriage or wheeled toys; (3) any person who is operating a self-propelled wheelchair, motorized tricycle or quadricycle, if operated by a person who, by reason of physical disability, is otherwise unable to move about as a pedestrian; and (4) any person operating an electric personal assistive mobility device.

PEDESTRIAN RIGHT OF WAY

The driver of a vehicle shall yield the right-of-way to a pedestrian crossing the roadway within any marked crosswalk or within any unmarked crosswalk at an intersection.

PEDESTRIAN VIOLATION

Every pedestrian upon a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway so near as to constitute an immediate hazard.

(b) The provisions of this section shall not relieve the driver of a vehicle from the duty to exercise due care for the safety of any pedestrian upon a roadway.

RELATIONSHIP BETWEEN SPEED AND RISK OF FATAL INJURY

One of the most widely studied variables in a road safety is the relationship between speed and fatality risk. The AAA Foundation for Traffic Safety shows that the likelihood of fatality is 10% for a pedestrian struck by a vehicle traveling at 23 miles per hour, but the likelihood increases to 50% at 42 miles per hour and to 90% at 58 miles per hour.

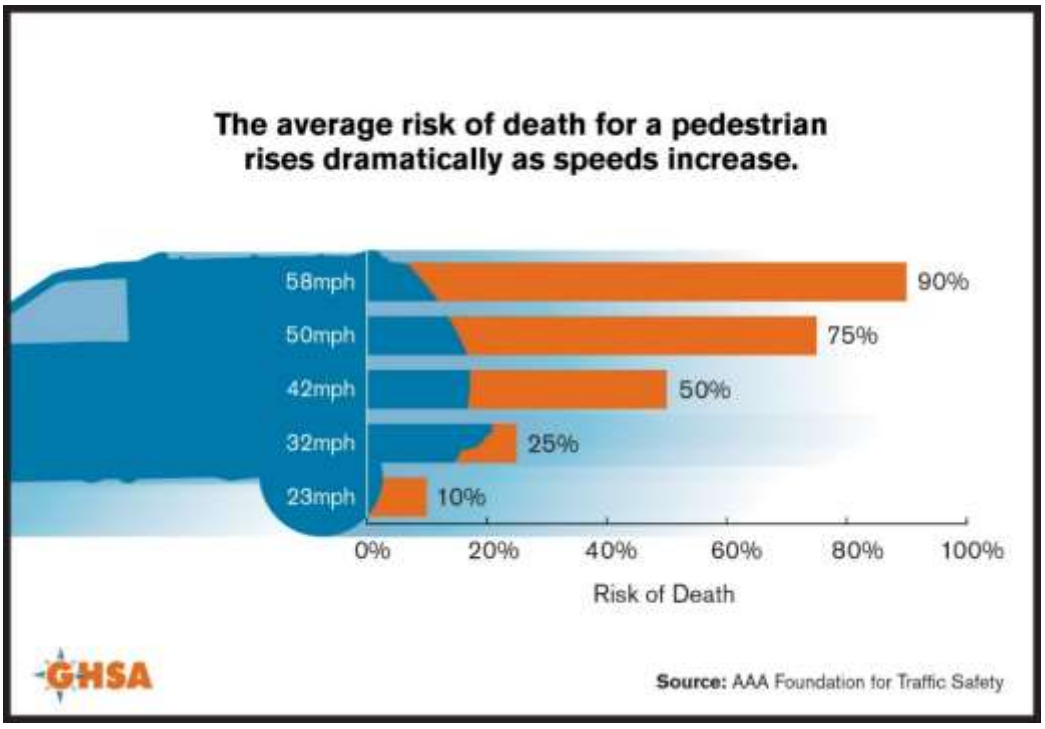


Figure 107. The average risk of death and speed (Governor's Highway Safety Association).

SIDESWIPE COLLISION

Sideswipe collision is a collision between two vehicles or bicycles that are traveling in the same direction where the right side of one vehicle or bicycle impacts with the left side of the other.

TRAFFIC SIGNALS AND SIGNS

Vehicle Code 38300 CVC is the California statute that makes it an offense for a driver to disobey any traffic sign, signal or traffic control device that is lawfully placed by federal, state, or local authorities. Some examples of "signs, signals, and devices" are stop signs, speed limits and "do not enter" signs.

UNSAFE SPEED

No person shall drive a vehicle upon a highway at a speed greater than is reasonable or prudent having due regard for weather, visibility or the traffic on, and the surface and width of, the highway and in no event at a speed which endangers the safety of persons or property.

UNSAFE STARTING OR BACKING

No person shall start a vehicle stopped, standing, or parked on a highway, nor shall any person back a vehicle on a highway until such movement can be made with reasonable safety.

WRONG SIDE OF THE ROAD

Driving or bicycling on the wrong side of the road.

APPENDIX C – MITIGATION TOOLKIT

Proven countermeasures from the Federal Highway Administration's (FHWA) Office of Safety, the Highway Safety Improvement Plan (HSIP), and the National Association of City Transportation Officials (NACTO) were used in this report. The FHWA developed a list of proven countermeasures based on proven effectiveness and benefits. FHWA also provides countermeasure guidance in the Speed Management Plan.[31] Many of the countermeasures in this report are drawn from the FHWA findings. Countermeasures from the Highway Safety Improvement Plan (HSIP) Analyzer Manual are also proven to be effective. These countermeasures are important as the HSIP is a funding source the City uses to fund road safety projects. In addition, the NACTO design guides include countermeasures for transportation issues. Both the FHWA report and HSIP report evaluated the crash reduction factor/ safety benefit of each countermeasure. These safety evaluations are used in this report.

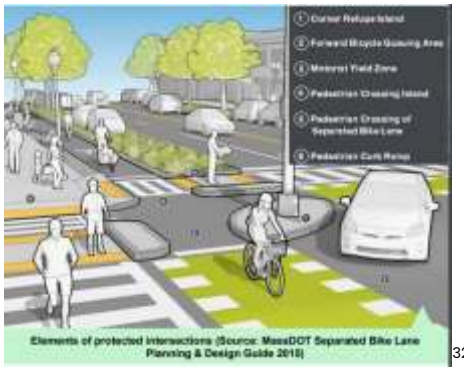
Each countermeasure was evaluated by three criteria: cost, complexity, and safety benefit. **Table 9** below includes the criteria and evaluation scale. Countermeasures were not weighted or prioritized. The Countermeasure Toolbox (**Table 10** through **Table 13**) identifies the countermeasure, benefits, and then evaluates the countermeasure. The countermeasures are divided by intersection treatments and road segment treatments. In addition, the countermeasures are broken down by bicycle and pedestrian safety countermeasures and driver safety countermeasures.

Table 9: Countermeasure evaluation criteria tool table.

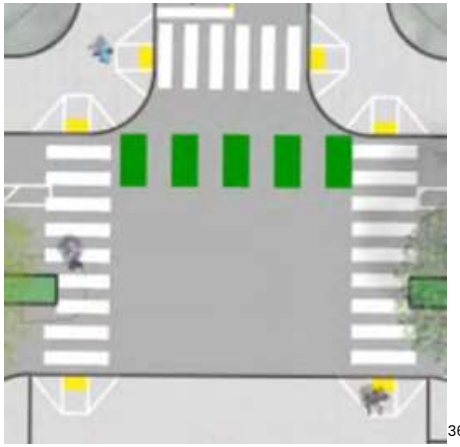
Cost	**$$$$**	**$$$**	**$$**	**$**
	$1,000,000+	$100,000+	$10,000+	$1,000+
Complexity				
	Very High Complexity- Lots of time	High Complexity	Medium Complexity	Low Complexity- Little time
Safety Benefit				
	Very High Safety Benefit	High Safety Benefit	Medium Safety Benefit	Low Safety Benefit

[31] https://safety.fhwa.dot.gov/local_rural/training/fhwasa010413spmgmt/speedmanagementguide.pdf

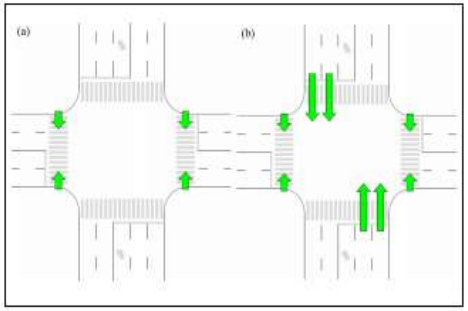
Table 10: Intersections and uncontrolled crossings countermeasures for bicyclists and pedestrians.

	Countermeasure	Benefits of Design	Cost	Complexity	Safety Benefit
Intersection Crossing Countermeasures	**Enhanced Pedestrian and Bicycle Crossings**				
	 Elements of protected intersections (Source: MassDOT Separated Bike Lane Planning & Design Guide 2015)[32]	This design can reduce the likelihood of high-speed vehicle turns, improve sightlines, and dramatically reduce the distance and time during which people on bikes are exposed to conflicts. Protected intersections create shorter, simpler crossings, more predictable movements and better visibility between people on bikes and people driving. As a result, the intersection is more comfortable and safer for people using the bikeway and the crosswalk.[33]	**$$-$$$**	◑	◕
	Medians and Pedestrian Crossing Islands				
	 Median and pedestrian crossing islands near a roundabout. Source: www.pedbikeimages.org / Dan Burden	Medians or pedestrian crossing islands should be considered along multi-lane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic and intermediate or high travel speeds. Some example locations that may benefit from raised medians or pedestrian crossing islands include mid-block areas, approaches to multi-lane intersections and areas near transit stops or other pedestrian-focused sites.[34]	**$$-$$$**	◑	◕

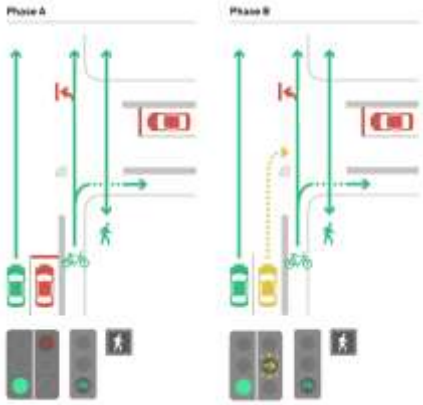
[32] http://nyc.gov/html/dot//downloads/pdf/cycling-at-a-crossroads-2018.pdf
[33] https://nacto.org/publication/dont-give-up-at-the-intersection/protected-intersections/
[34] https://safety.fhwa.dot.gov/provencountermeasures/ped_medians/

	Raised Crosswalk				
		Raised crosswalks function as an extension of the sidewalk and allow a pedestrian to cross the street at a constant grade. A raised crosswalk is typically a candidate treatment on two-lane or three-lane roads with speed limits of 30 mph or less and AADTs below 9,000. Raised crossings are generally avoided on truck routes, emergency routes, and arterial streets.[35]	**$**		
	Visible Crosswalks				
	 [36]	Marked crosswalks guide pedestrians and alert drivers to a crossing location, so it is important that both drivers and pedestrians clearly see the crossings.[37]	**$**		

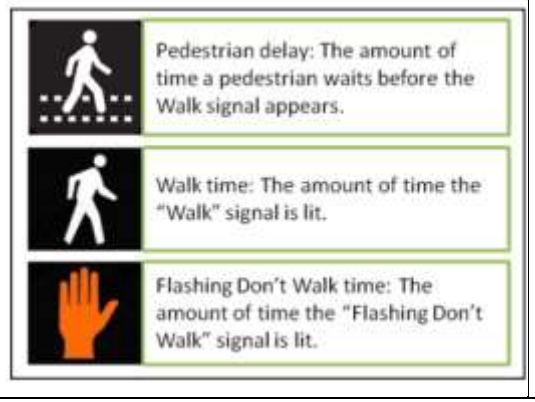
[35] https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf
[36] https://www.cityofdavis.org/home/showpublisheddocument?id=9073
[37] http://guide.saferoutesinfo.org/engineering/marked_crosswalks.cfm

Signal Countermeasures	**Leading Through Interval**				
	 **Figure 2.** Movements allowed during the leading interval: (*a*) LPI and (*b*) LTI. 38	A Leading Through Interval (LTI) is a signalization technique that provides a partially protected crossing. During a leading interval, only turning traffic is held; through traffic is allowed to run. This lessens the negative effect on capacity of Leading Pedestrian Interval, and consequently allows LTI to have a longer leading interval, thus affording pedestrians and cyclists greater protection.[39]	**$**		
	Leading Pedestrian Interval				
		Leading pedestrian interval (LPI) gives pedestrians and people on bikes the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication. LPIs provide the following benefits: • Increased visibility of crossing pedestrians. • Reduced conflicts between pedestrians and vehicles. • Increased likelihood of motorists yielding to pedestrians. Enhanced safety for pedestrians who may be slower to start into the intersection.[40]	$$		

[38] http://www.northeastern.edu/peter.furth/wp-content/uploads/2020/09/2019-LTI-vs-LPI-Furth-and-Saeidi.pdf
[39] http://www.northeastern.edu/peter.furth/wp-content/uploads/2020/09/2019-LTI-vs-LPI-Furth-and-Saeidi.pdf
[40] https://safety.fhwa.dot.gov/provencountermeasures/lead_ped_int/

Protected-Permissive Turn Phase					
	Protected-permissive signal phasing can reduce the number of conflicts per turning motor vehicle, even compared with full signal protection. Protected-permissive bicycle signal operations allow riders to decide for themselves whether it is safe to go during the motor vehicle phase, or whether to wait for a fresh protected bike phase. Protected-permissive bicycle signals are most applicable on streets where turn volumes are moderate to high and vehicle storage is needed, but prevailing motor vehicle speeds are relatively low, preferably 25 mph or below.[41]	$		
No Right On Red					
	Prohibiting right turns on red is a simple, low-cost measure. Together with a leading pedestrian interval, the signal changes can benefit pedestrians and bicyclists with minimal impacts on traffic. This countermeasure should be used in locations with substantial pedestrian and bicycle volumes and places where children cross.	$		

[41] https://nacto.org/publication/dont-give-up-at-the-intersection/signal-phasing-strategy/protected-permissive-bike-signal/

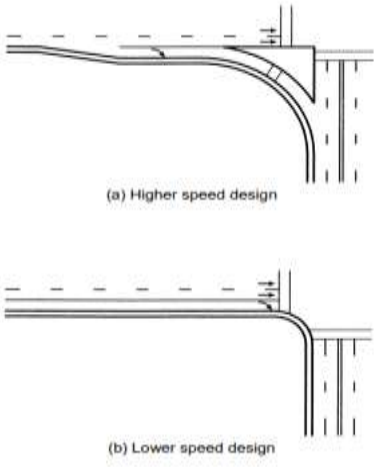
	Reduce Pedestrian and Bicycle Delay at Intersections				
		Reducing the waiting time for pedestrians and bicyclists at intersections will increase compliance with signal indications. Signal cycle timing should be kept short (90 seconds maximum).[42]	**$**		

[42] http://pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=45

Table 11: Intersections and uncontrolled crossings countermeasures for drivers.

	Countermeasures	Benefits of Design	Cost	Complexity	Safety Benefit
Intersection Crossing Countermeasures	**Roundabout**				
		Roundabouts can be implemented in urban under a wide range of traffic conditions. They can replace signals, two-way stop controls, and all-way stop controls. Roundabouts are an effective option for managing speed and transitioning traffic from high-speed to low-speed environments, such as along high-speed roads. Roundabouts provide substantial safety and operational benefits compared to other intersection types, most notably a reduction in severe crashes.[43]	**$$$-$$$$**	◑	●
	Reduced Left-Turn Conflicts at Intersections				
		Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur in order to simplify decisions and minimize the potential for related crashes. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn (RCUT) and the median U-turn (MUT).[44]	**$$-$$$**	◑	●

[43] https://safety.fhwa.dot.gov/provencountermeasures/roundabouts/
[44] https://safety.fhwa.dot.gov/provencountermeasures/reduced_left/

Dedicated Left and Right Turns at Intersections					
	Auxiliary turn lanes—either for left turns or right turns—provide physical separation between turning traffic that is slowing or stopped and adjacent through traffic at approaches to intersections. Turn lanes can be designed to provide for deceleration prior to a turn, as well as for storage of vehicles that are stopped and waiting for the opportunity to complete a turn.[45]	**$$**	◑	●
Remove channelized right turn lanes					
 [46]	Effective intersection design promotes desirable speeds to optimize intersection safety. The appropriate speed will vary based on the use, type, and location of the intersection. On high-speed roadways with no pedestrians, practitioners may want to promote higher speeds for turning vehicles to remove turning vehicles from the through traffic stream as quickly and safely as possible. This can be accomplished with longer, smooth tapers and larger corner radii. On low-speed roadways or in areas with pedestrians, practitioners may want to promote lower turning speeds. This can be accomplished with smaller turning radii, narrower lanes, and/or channelization features.[47]	**$$-$$$$**	◑	◕

[45] https://safety.fhwa.dot.gov/provencountermeasures/left_right_turn_lanes/
[46] https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf
[47] https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf

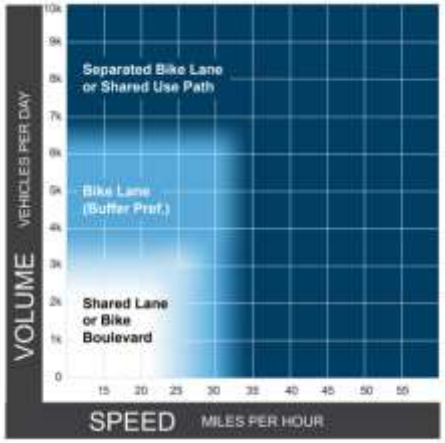
Signal Countermeasures	**Signalization**				
		Traffic signals play a prominent role in achieving safer performance at intersections. Research has shown that the proper installation and operation of traffic signals can reduce the severity of crashes.[48]	**$$$**		
	Advanced Warning Signs				
		The use of warning signs shall be based on an engineering study or on engineering judgment. The use of warning signs should be kept to a minimum as the unnecessary use of warning signs tends to breed disrespect for all signs.[49]	**$**		

[48] https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf
[49] https://mutcd.fhwa.dot.gov/pdfs/2003/Ch2C.pdf

	Protected turns				
	 [50]	"Protected-only" phasing consists of providing a separate phase for left-turning traffic and allowing left turns to be made only on a green left arrow signal indication, with no pedestrian movement or vehicular traffic conflicting with the left turn. As a result, left-turn movements with "protected-only" phasing have a higher capacity than those with "permissive-only" phasing due to fewer conflicts.[51]	$		
Striping Countermeasures	**Improve Striping**				
		Improving striping for crosswalks, bike lanes and travel lanes defines areas and let road users know to expect to see people walking, biking, and driving in these spaces.	$		

[50] http://pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=51
[51] https://www.fhwa.dot.gov/publications/research/safety/04091/04.cfm#chp422

Table 12: Road segment countermeasures for bicycle and pedestrian safety.

	Countermeasure	Benefits of Design	Cost	Complexity	Safety Benefit
Road Segment Countermeasures	**Walkways and pathways**				
	 Source: pedbikeimages.org / Burden	Well-designed pedestrian walkways, shared-use paths, and sidewalks improve the safety and mobility of pedestrians.[52]	**$$$**		
	Convert Existing Bike Lane into Class IV bikeway				
		Class IV Bikeway is a bikeway for the exclusive use of bicycles and includes a separation required between the bikeway and vehicular lane.[53] Class IV bikeways eliminate the risk and fear of collisions where vehicles over-take people on bikes.[54]	**$$$-$$$$**		

[52] https://safety.fhwa.dot.gov/provencountermeasures/walkways/
[53] https://dot.ca.gov/-/media/dot-media/programs/design/documents/dib-89-01_kf-a11y.pdf
[54] https://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks/one-way-protected-cycle-tracks/

	Grade Separated Crossing				
	 Source: https://storymaps.arcgis.com/stories/89bcbe95ee24415d8544b9f6ac114125	Overpasses and underpasses allow for the uninterrupted flow of pedestrian movement separate from vehicle traffic. Overpasses work best when the topography allows for a structure without ramps, such as an overpass over a sunken highway. Underpasses work best when designed to feel open and accessible. Grade separation is most feasible and appropriate in extreme cases where pedestrians must cross roadways such as freeways and high-speed, high-volume arterials.	**$$$**		
Road Segment Signal Countermeasures	**Pedestrian and Bicycle Hybrid Beacon**				
	 Photo Credit: Mike Cynecki	The pedestrian hybrid beacon (PHB) is a traffic control device designed to help pedestrians safely cross busy or higher-speed roadways at midblock crossings and uncontrolled intersections.[55]	**$$**		

[55] https://safety.fhwa.dot.gov/provencountermeasures/ped_hybrid_beacon/

	Rapid Reflective Flashing Beacon (RRFB)				
		An RRFB is a pedestrian-actuated conspicuity enhancement used in combination with a pedestrian, crossing warning sign to improve safety at uncontrolled, marked crosswalks. Research indicates RRFBs can result in motorist yielding rates as high as 98% at marked crosswalks. However, yielding rates as low as 19% have also been noted. Compliance rates varied most per the city location, posted speed limit, crossing distance, and whether the road was one or two-way. RRFBs are particularly effective at multilane crossings with speed limits less than 40 mph.[56]	**$$**		

[56] https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf

Table 13: Road Segment countermeasures for drivers.

	Countermeasure	Benefits of Design	Cost	Complexity	Safety Benefit
Travel Lane Countermeasures	**Narrow Vehicular Travel Lanes**				
		Narrower streets help promote slower driving speeds which, in turn, reduce the severity of crashes.	**$**		
	Road Diet				
		A Road Diet typically involves converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane (TWLTL). Benefits of Road Diet installations may include: • An overall crash reduction of 19% to 47%. • Reduction of rear-end and left-turn crashes due to the dedicated left-turn lane. • Reduced right-angle crashes as side street motorists cross three versus four travel lanes. • Fewer lanes for pedestrians to cross. • Opportunity to install pedestrian refuge islands, bicycle lanes, on-street parking, or transit stops.	**$$-$$$**		

Access Countermeasures	**Corridor Access Management**				
		Access management refers to the design, application, and control of entry and exit points along a roadway. This includes intersections with other roads and driveways that serve adjacent properties. Thoughtful access management along a corridor can simultaneously enhance safety for all modes, facilitate walking and biking, and reduce trip delay and congestion. The following access management strategies can be used individually or in combination with one another: • Driveway closure, consolidation, or relocation. • Limited-movement designs for driveways (such as right-in/right-out only). • Raised medians that preclude across-roadway movements. • Turn lanes (i.e., left-only, right-only or interior two-way left).	**$-$$$**		

APPENDIX D – COLLISIONS INVOLVING BICYCLISTS 2015 – 2019

K = Fatality S = Severe Injury V = Visible Injury C = Complaint of Pain

Table 14: Collisions involving bicyclists by severity 2015-2019.

Collisions Involving Bicyclists by Severity 2015-2019																					
Primary Street	Secondary Street	2015				2016				2017				2018				2019				Total
		K	S	V	C	K	S	V	C	K	S	V	C	K	S	V	C	K	S	V	C	
RUSSELL BLVD	ANDERSON RD											1				1	1		1		2	6
E 8TH ST	L ST				1			1								2				1		5
5th ST	D ST							2	1			1										4
CALIFORNIA AVE	RUSSELL BL			1				1								1			1			4
VILLANOVA DR	ANDERSON RD			2					1											1		4
1st ST	B ST								2											1		3
3RD ST	B ST			2	1																	3
3rd ST	G ST															2			1			3
ALVARADO AVE	ANDERSON RD			1				1								1						3
OLIVE DR	RICHARDS BL			1	1												1					3
RUSSELL BL	SYCAMORE LN				1								1							1		3
1st ST	E ST			1				1														2
2ND ST	B ST								1							1						2
2ND ST	CANTRILL DR				1												1					2
3rd ST	D ST		1									1										2
3rd ST	L ST							1												1		2
5th ST	F ST								1											1		2
5th ST	J ST																			2		2
5th ST	L ST			1												1						2
5th ST	POLE LINE RD			1												1						2
8TH ST	ANDERSON RD			1	1																	2
8TH ST	J ST				1				1													2
CHESTNUT LN	E 8TH ST				1															1		2
CHILES RD	ENSENADA DR				1											1						2
COVELL BL	OAK AVE				1		1															2
COWELL BL	DREW AVE															1					1	2
COWELL BL	LA VIDA WY												1							1		2
E 8TH ST	A ST								1											1		2

E 8TH ST	F ST			1															1		2
J ST	ALICE ST							1								1					2
RUSSELL BL	A ST							1											1		2
RUSSELL BL	UNIVERSITY AVE								1				1								2
SYCAMORE LN	ALVARADO AVE							1					1								2
WEST COVELL BL	JOHN JONES RD							1	1												2
WEST COVELL BL	SYCAMORE LN			1					1												2
14TH ST	B ST			1																	1
1st ST	1ST ST 227												1								1
1st ST	A ST								1												1
1st ST	RICE LN																		1		1
2ND ST	PENA DR															1					1
2ND ST	POLE LINE RD										1										1
3RD ST	A ST								1												1
3rd ST	C ST											1									1
3rd ST	F ST								1												1
3rd ST	H ST															1					1
3rd ST	J ST							1													1
3rd ST	K ST															1					1
4TH ST	C ST											1									1
5TH ST	C ST											1									1
5TH ST	CANTRILL DR							1													1
5th ST	E ST			1																	1
5th ST	G ST															1					1
5th ST	I ST						1														1
6TH ST	F ST														1						1
7TH ST	F ST															1					1
8TH ST	B ST			1																	1
8TH ST	H ST															1					1
8TH ST	L ST			1																	1
8TH ST	OAK AVE				1																1
ANDERSON RD	AMHERST ST			1																	1
CALAVERAS AVE	ARLINGTON BL											1									1
CANNERY LOOP	SPARKS LN																		1		1
CATALINA DR	WEST COVELL BL											1									1
CHESTNUT LN	DREXEL DR															1					1

CLAREMONT DR	L ST							1													1
CLAREMONT DR	POLE LINE RD			1																	1
COLBY DR	SYCAMORE LN																		1		1
COLLEGE PARK DR	RUSSELL BL										1										1
COVELL BL	ALHAMBRA DR								1												1
COVELL BL	ANDERSON RD			1																	1
COVELL BL	F ST														1						1
COVELL BL	MONARCH LN																			1	1
COVELL BL	POLE LINE RD															1					1
COVELL BL	WRIGHT BL							1													1
COWELL BL	ENSENADA DR							1													1
COWELL BL	MACE BL			1																	1
COWELL BL	OHLONE ST																		1		1
COWELL BL	WASHOE DR											1									1
CYPRESS LN	DREXEL DR																	1			1
E 8TH ST	B ST												1								1
E 8TH ST	D ST							1													1
EAST COVELL BL	J ST																		1		1
EAST COVELL BL	MONARCH LN														1						1
EISENHOWER ST	RUSSELL BL								1												1
EL CAPITAN ST	SHASTA DR														1						1
EUREKA AVE	W 8TH ST								1												1
HAWTHORNE LN	SYCAMORE LN																		1		1
HOPKINS RD	HUTCHISON DR																			1	1
HUMBOLDT AVE	ARLINGTON BL								1												1
HUTCHINSON DR	LARUE RD				1																1
HUTCHINSON DR	OLD DAVIS RD				1																1
IMPERIAL AVE	BARKLEY ST																	1			1
J ST	DREXEL DR			1																	1
J ST	KENNEDY PL																		1		1
L ST	L ST 525																		1		1
LARUE RD	ORCHARD RD												1								1
LILLARD DR	FARRAGUT CIR													1							1
MACE BL	RD 32A													1							1
MILLER DR	RUSSELL BL								1												1

MONARCH LN	BRYANT PL			1																		1
MOORE BL	POLE LINE RD														1							1
MOORE BL	ROCKWELL DR															1						1
OAK	RUSSELL BL																			1		1
OAK AVE	RUSSELL BL								1													1
PACIFIC DR	DREXEL DR											1										1
POLE LINE RD	BIRCH LN															1						1
POLE LINE RD	LOWER BL																			1		1
POLE LINE RD	PICASSO AVE			1																		1
RESEARCH PARK	RICHARDS BL			1																		1
RUSSELL BL	ARTHUR ST								1													1
SEINE AVE	ARLINGTON BL															1						1
SHASTA DR	ARTHUR ST																			1		1
TULIP LN	JAVIER PL			1																		1
VILLANOVA DR	REED DR			1																		1
W 8TH ST	ANDERSON RD			1																		1
W 8TH ST	DOUGLAS AVE															1						1
WAKEFOREST LN	SYCAMORE LN																			1		1
WEST SHORE ST	OAK AVE											1										1
WRIGHT BL	MOORE BL							1														1
Total		0	1	28	13	0	2	18	21	0	2	11	7	0	4	27	4	0	5	25	5	173

APPENDIX E – COLLISIONS INVOLVING PEDESTRIANS 2015-2019

K = Fatality S = Severe Injury V = Visible Injury C = Complaint of Pain

Table 15: Collisions involving pedestrians by severity 2015-2019

Collisions Involving Pedestrians by Severity 2015-2019																							
Primary Street	Secondary Street	2015				2016				2017				2018				2019				Total
		K	S	V	C	K	A	B	K	S	V	C	K	K	A	K	S	V	C	K	C	
1ST ST	B ST				1				1											1		3
1ST ST	E ST				1			1														2
2ND ST	G ST											1				1						2
ANDERSON RD	RUSSELL BL																		2			2
RICHARDS BL	OLIVE DR			1												1						2
1ST ST	1ST ST 227												1									1
1ST ST	A ST											1										1
2ND ST	B ST											1										1
2ND ST	CANTRILL DR								1													1
2ND ST	D ST																			1		1
2ND ST	MACE BL														1							1
3RD ST	H ST															1						1
5TH ST	D ST											1										1
5TH ST	E ST			1																		1
6TH	F ST							1														1
7TH ST	B ST											1										1
8TH	B ST														1							1
ALVARADO AVE	CATALINA DR								1													1
ANDERSON RD	CATALINA DR												1									1
B ST	W 8TH ST							1														1
BIRCH LN	POLE LINE RD														1							1
CHILES RD	ENSENADA DR																				1	1
CHILES RD	MACE BL			1																		1
COVELL BL	COVELL BL 1451																			1		1
COVELL BL	F ST						1															1
COVELL BL	SYCAMORE LN										1											1
COWELL BL	EL CEMONTE AVE																1					1
COWELL BL	VALDORA ST															1						1
CROCKER LN	LA RUE RD															1						1
DREXEL DR	L ST							1														1
E 8TH ST	L ST																1					1

EAST COVELL BL	J ST											1										1
HANOVER DR	WEST COVELL BL		1																			1
HUMBOLDT AVE	IMPERIAL AVE				1																	1
L ST	DUKE DR																		1			1
POLE LINE RD	LEHIGH DR			1																		1
RODIN PL	HARTLEY ST															1						1
SATANDER CT	HUTCHISON DR																1					1
WEST COVELL BL	JOHN JONES RD															1						1
Total		0	1	4	3	0	1	4	3	0	1	6	2	0	3	7	3	0	3	3	1	45

APPENDIX F – COLLISIONS AT SIGNALIZED INTERSECTIONS 2015-2019

K = Fatality S = Severe Injury V = Visible Injury C = Complaint of Pain

Table 16: Collisions at signalized intersections by severity 2015-2019.

Collisions at Signalized Intersections 2015-2019																							
Primary Street	Secondary Street	2015				2016				2017				2018				2019				Total
		K	S	V	C	K	A	B	K	S	V	C	K	K	A	K	S	V	C	K	C	
MACE BL	2ND ST				2				4				1							3		10
ANDERSON RD	VILLANOVA DR			1					2				2			1				3		9
RUSSELL BL	ANDERSON RD											1	1			2	1		2		2	9
B ST	8TH ST			1	1			1	1				2				1			1		8
L ST	8TH ST				1			1	1				1			2	1			1		8
OAK AVE	8TH ST				2				2							1						5
OLIVE DR	RICHARDS BL			1	1			1								1	1					5
RUSSELL BL	OAK AVE							1	1			1								1		4
RICHARDS BL	RT 80			2	1														1			4
SYCAMORE LN	RUSSELL BL				1								1						1	1		4
ANDERSON RD	COVELL BL			1								2										3
B ST	3RD ST			1	1												1					3
F ST	8TH ST			1																2		3
CALAVERAS AVE	ARLINGTON BL				1							1				1						3
L ST	COVELL BL											2								1		3
POLE LINE RD	COVELL BL				1							1									1	3
RT 113	COVELL BL								1			1	1									3
SYCAMORE LN	COVELL BL							1	1											1		3
ALHAMBRA DR	MACE BL												1							1		2
MACE BL	CHILES RD																1			1		2
ANDERSON RD	8TH ST			1																1		2
F ST	5TH ST								1											1		2
G ST	5TH ST				1											1						2
L ST	5TH ST			1	1																	2
RUSSELL BL	A ST							1												1		2
RUSSELL BL	ARTHUR ST								1												1	2
ALHAMBRA DR	COVELL BL								1											1		2
OAK AV	COVELL BL			1	1																	2
COWELL BL	DREW AVE															1					1	2
1ST ST	E ST			1	1																	2

B ST	5TH ST								1													1
POLE LINE RD	5TH ST			1																		1
F ST	COVELL BL																1					1
WRIGHT BL	COVELL BL							1														1
LILLARD DR	COWELL BL								1													1
COWELL BL	POLE LINE RD		1																			1
COWELL BL	RESEARCH PARK DR																			1		1
ARLINGTON BL	RUSSELL BL								1													1
Total		0	1	13	16	0	0	7	19	0	0	9	10	0	0	10	7	0	4	21	5	122

APPENDIX G – COLLISIONS AT UNSIGNALIZED INTERSECTIONS 2015-2019

K = Fatality S = Severe Injury V = Visible Injury C = Complaint of Pain

Table 17: Collisions at unsignalized intersections by severity 2015-2019.

Collisions at Unsignalized Intersections 2015-2019																							
Primary Street	Secondary Street	2015				2016				2017				2018				2019				Total
		K	S	V	C	K	A	B	K	S	V	C	K	K	A	K	S	V	C	K	C	
5TH ST	D ST							2	3			2				1						8
B ST	1ST ST				1				3											2		6
B ST	2ND ST								3			1				2						6
5TH ST	E ST							1				2				1				1	1	6
RUSSELL BL	CALIFORNIA AVE			1				2	1							1			1			6
J ST	5TH ST							1								1				3		5
CHILES RD	ENSENADA DR				1			1	2							1						5
J ST	4TH ST								2											2		4
8TH ST	J ST				1				2			1										4
8TH ST	OESTE DR			1	1			1								1						4
CANTRILL DR	2ND ST				1	1										1						3
F ST	6TH ST				1			1							1							3
F ST	7TH ST															2					1	3
ALVARADO AVE	ANDERSON RD			1				1								1						3
RUSSELL BL	CALIFORNIA AVE			1					1										1			3
COVELL BL	DELANI DR							1	2													3
2ND ST	L ST							1	1				1									3
RUSSELL BL	MILLER DR								2												1	3
2ND ST	PENA DR															2	1					3
LA RUE RD	RUSSELL BL											1	1								1	3
COVELL BL	SHASTA DR								1				1							1		3
L ST	3RD ST							1												1		2
SYCAMORE LN	ALVARADO AVE							1					1									2
14TH ST	B ST			1																1		2
KLEIBER HALL DR	BIKE PATH											1					1					2
POLE LINE RD	BIRCH LN														1	1						2
3RD ST	D ST		1									1										2
RUSSELL BL	EISENHOWER ST								1											1		2
COWELL BL	ENSENADA DR						1														1	2
5TH ST	I ST						1														1	2

3RD ST	J ST							1	1												2
CLAREMONT DR	L ST				1			1													2
HUTCHISON DR	LA RUE RD				1															1	2
COWELL BL	LA VIDA WY											1						1			2
COVELL BL	LAKE BL			1				1													2
RT 80	MACE BL											1						1			2
POLE LINE RD	PICASSO AVE			1								1									2
DAIRY RD	TERCERO BIKE PATH			1											1						2
RUSSELL BL	UNIVERSITY AVE								1			1									2
MOORE BL	WRIGHT BL							1												1	2
4TH ST	1ST ST			1																	1
A ST	1ST ST								1												1
G ST	2ND ST										1										1
A ST	3RD ST								1												1
B ST	3RD ST																	1			1
B ST	7TH ST			1																	1
H ST	9TH ST								1												1
8TH ST	A ST								1												1
LEHIGH DR	ADELINE PL							1													1
ARTHUR ST	ALAMEDA AVE														1						1
J ST	ALICE ST							1													1
CATALINA DR	ALVARADO AVE								1												1
F ST	AMAPOLA DR						1														1
CATALINA DR	ANDERSON RD											1									1
F ST	ANDERSON RD							1													1
COVELL BL	BAYWOOD LN				1																1
TULIP LN	BLACKBURN DR								1												1
MONARCH LN	BRYANT PL			1																	1
5TH ST	C ST										1										1
RUSSELL BL	CALIFORNIA ST							1													1
5TH ST	CANTRILL DR							1													1
COVELL BL	CATALINA DR										1										1
8TH ST	CHESTNUT LN				1																1
COWELL BL	CHILES RD								1												1
POLE LINE RD	CLAREMONT DR			1																	1
LOYOLA DR	CONQUISTADOR WY																	1			1
F ST	COVELL BL																	1			1
J ST	COVELL BL																	1			1
SYCAMORE LN	COVELL BL			1																	1

CR-32B	CR-105D											1									1
2ND ST	D ST																		1		1
8TH ST	D ST							1													1
LILLARD DR	DANBURY ST											1									1
8TH ST	DOUGLAS AVE															1					1
CHESTNUT LN	DREXEL DR															1					1
CYPRESS LN	DREXEL DR																	1			1
COWELL BL	EL CEMONTE AVE																1				1
CHILES RD	EL CEMONTE RD															1					1
8TH ST	ELMWOOD DR												1								1
8TH ST	EUREKA AVE								1												1
ARLINGTON RD	EVENSTAR LN															1					1
1ST ST	F ST																1				1
2ND ST	F ST															1					1
I ST	F ST											1									1
LILLARD DR	FARRAGUT CIR														1						1
BIDWELL ST	FREMONT CT							1													1
3RD ST	G ST															1					1
EL CEMONTE AVE	GLIDE DR				1																1
3RD ST	H ST															1					1
8TH ST	H ST															1					1
SHASTA DR	HAMPTON DR															1					1
SYCAMORE LN	HAWTHORNE LN																		1		1
HUTCHISON DR	HOPKINS RD																			1	1
OLD DAVIS RD	HUTCHISON DR				1																1
RT 113	HUTCHISON DR																			1	1
DAIRY RD	HUTCHISON DR																1				1
SATANDER CT	HUTCHISON DR																1				1
HUTCHISON DR	HUTCHISON PL				1																1
HUMBOLDT AVE	IMPERIAL AV				1																1
COVELL BL	JOHN JONES RD							1													1
3RD ST	K ST															1					1
J ST	KENNEDY PL																		1		1
APPLE LN	KENT DR							1													1
DREXEL DR	L ST												1								1
L ST	L ST 525																		1		1
RUSSELL BL	LAKE BL							1													1
POLE LINE RD	LEHIGH DR			1																	1
COVELL BL	MANZANITA LN																			1	1
8TH ST	MILLER DR												1								1
COVELL BL	MONARCH LN															1					1

POLE LINE RD	MOORE BL				1																1
WEST SHORE ST	OAK AVE											1									1
RUSSELL BL	ORCHARD PARK DR							1													1
LARUE RD	ORCHARD RD												1								1
LOT #25	ORCHARD RD																1				1
DREXEL DR	PACIFIC DR											1									1
RUSSELL BL	PORTAGE BAY EAST																		1		1
ANDERSON RD	RADCLIFFE DR											1									1
MACE BL	RD 32A														1						1
VILLANOVA DR	REED DR			1																	1
RICHARDS BL	RESEARCH PARK			1																	1
OLD DAVIS RD	RT 80																			1	1
RUSSELL BL	RUSSELL BL 655																		1		1
MALLORCA LN	SANTIAGO ST								1												1
ARLINGTON BL	SEINE AVE								1												1
CANNERY LOOP	SPARKS LN																		1		1
ANDERSON RD	SUNSET CT																			1	1
SYCAMORE LN	WAKEFOREST LN																		1		1
COWELL BL	WASHOE DR											1									1
Totals:		0	1	16	15	1	3	29	36	0	0	19	13	0	4	26	9	0	3	26	13	214