

DRAFT

Sonoma County Vision Zero Action Plan

1.7.22

This report is provided for informational purposes only, and all results, recommendations, and commentary contained herein are based on limited data available at the time of preparation. Further analysis and design are necessary prior to implementing any of the recommendations contained herein. Toole Design makes no representations or warranties regarding the accuracy of the underlying source data. Motor vehicle crashes are complex occurrences that often result from multiple contributing factors. The success of this Vision Zero plan depends on multiple factors outside of Toole Design Group's control.

Dedication

This Action Plan is dedicated to the many people who have lost their lives or sustained life-altering injuries in Sonoma County. Many thanks to those working together to create safer roadways and prevent future tragedies.

DRAFT

Message from the Sonoma County Vision Zero Advisory Committee

Whether venturing out to the coast, biking to work, or going for a neighborhood stroll, every resident and visitor deserves to be safe moving around our County. Sonoma County has seen more fatal and serious injury crashes per capita than other counties in the Bay Area. Even one death on our streets is one too many, but between 2016 and 2020, there were 176 traffic fatalities and 924 crashes that resulted in severe injury.¹

Traffic crashes are not distributed equally along Sonoma County's 2,670 miles of roadway, or among road users. Rural areas and Equity Priority Communities are disproportionately burdened by deadly crashes. Throughout the county, 4% of commuters walk or bike, but pedestrians and bicyclists make up nearly 18% of deaths.² We can and must do more to ensure that streets are safe for everyone, no matter where they live or how they get around.

In October 2019, Sonoma County Transportation Authority launched a Vision Zero planning process in partnership with the Department of Health Services. This planning process was funded by a Caltrans Sustainable Communities Planning Grant. The Vision Zero Advisory Committee is comprised of members from all ten jurisdictions within the County, as well as non-profit organizations, community members, public health and safety agencies, and school leadership. *We are committed to achieving zero traffic deaths and severe injuries on county roadways by 2030.*

We know that we cannot achieve this goal alone. While all jurisdictions are committed to contributing to a unified Vision Zero Action Plan, we also rely on the State legislature for transportation funding and policy. Most importantly, we embark upon this effort in partnership with our community members, who will help us build a culture of street safety. Together, we can prevent deaths and severe injuries caused by traffic crashes.

¹ Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec.

² Sources: U.S. Census, American Community Survey 2019 5-year estimates; UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec.

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Acronyms

- **DHS** – Sonoma County Department of Health Services
- **EPC** – Equity Priority Communities
- **FDs** – local fire departments
- **HII** – High Injury Intersections
- **HIN** – High Injury Network
- **KSI** – Killed or severely injured
- **MTC** – San Francisco Bay Area Metropolitan Transportation Commission
- **PDs** – local police departments
- **SCFD** – Sonoma County Fire Department
- **SCSO** – Sonoma County Sheriff's Office
- **SCTA** – Sonoma County Transportation Authority
- **TPWs** – Transportation and Public Works departments (Sonoma County and local jurisdictions)
- **VMT** – Vehicle Miles Traveled
- **VZAC** – Vision Zero Advisory Committee

Key Terms

- **Crash** (or collision) – Preventable intersecting movements of roadway users that may result in injury or loss of life, trauma, and property damage
- **Equity Priority Communities (EPCs)** – Census tracts that have likely been disadvantaged and faced historic underinvestment based on a concentration of low-income households, households with zero vehicles, people of color, people with disabilities, and people with limited English proficiency (see page 30 for more information)
- **High Injury Intersections** – Intersections with an elevated risk of crashes resulting in an injury or fatality, identified through an analysis of the frequency, severity, and mode of past crashes
- **High Injury Network** – Road segments with an elevated risk of crashes resulting in an injury or fatality, identified through an analysis of the frequency, severity, and mode of past crashes
- **Severe Injury** – A severe (or life-altering) injury involves broken or fractured bones; dislocated limbs; severe lacerations; skull, spinal, or abdominal injuries; unconsciousness; or severe burns
- **Systemic Safety** – A systemic approach to safety involves widely implemented improvements based on high-risk roadway features correlated with specific severe crash types. The approach helps agencies broaden their traffic safety efforts at little extra cost (Federal Hwy. Administration)
- **Traffic Violence** – A term used to describe the epidemic of deaths and severe injuries resulting from vehicular crashes
- **Transportation Equity** – A recognition that transportation-related externalities, such as traffic deaths and injuries, and environmental impacts caused by transportation systems, are disproportionately experienced by some community groups and transportation network users
- **Vision Zero** – A road safety philosophy which states that no loss of life due to traffic crash is acceptable

Executive Summary

Every year, people in Sonoma County lose family, friends, neighbors, and colleagues to preventable traffic crashes on our roads. The *Sonoma County Vision Zero Action Plan* outlines the practical, evidence-based steps we can take together to build a future where our roads are free of fatal and life-altering crashes. Vision Zero is a traffic safety philosophy that lays out a new set of principles for engineering roads, educating travelers, and creating a sense of collective responsibility for ourselves and our fellow travelers. Its central belief is simple: no one should be killed or severely injured by traffic crashes.

What we know about traffic safety in Sonoma County

Crash data (generated through police reports) provides information about the people involved in crashes, where they occurred, and the factors that contributed to the crash.³ Analysis of Sonoma County crash data from 2015 to 2020 shows that:

- After steadily climbing over the last decade, crashes declined between 2018 and 2020, though we don't know to what extent this decline resulted from pandemic related travel trends.
- The highest volumes of crashes occur in late summer and early fall, between Friday and Sunday, and in the afternoon and evenings. Crashes that occur at night are the most likely to result in deaths or severe injuries.
- Eight percent of trips are made on foot or on bicycle, but these modes account for 19% of traffic deaths.
- Impaired driving, unsafe turns, speeding or failure to follow right-of-way rules are the primary causes in 71% of traffic deaths and severe injuries.

Community input gathered through listening sessions and surveys found that many community members described feeling unsafe while walking, bicycling, or using mobility devices.⁴ Enhanced safety features like protected bike lanes and streets designed to slow traffic were popular with most respondents.

Equity requires attention to socioeconomic disparities in how traffic violence and traffic enforcement affect different communities. People of color, people who lack housing, people with lower income, people without access to vehicles, rural residents, and other groups can all experience increased barriers to transportation that contribute to elevated traffic safety risks. Sonoma County has committed to choosing actions that prioritize the needs of those groups and avoiding those that would result in additional burdens or dangers for Equity Priority Communities.

³ Sonoma County crash data is available to the public via the [Vision Zero Data Dashboard](#), which draws on the UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec. See page 12 for more information.

⁴ Listening sessions were convened in 2019 as part of the Sonoma County Comprehensive Transportation Plan. The Vision Zero survey was conducted in Fall 2021 and the focus groups and workshop were held in early 2022.

What we will do to eliminate traffic deaths and severe injuries

The Sonoma County Transportation Authority (SCTA) and Sonoma County Department of Health Services (DHS) have convened the Vision Zero Advisory Committee (VZAC) and set a target goal of zero traffic deaths and severe injuries on county roadways by 2030. Many jurisdictions have completed or are developing Local Road Safety Plans (LRSPs), focused on addressing safety issues on their local roadways. Many other agencies and organizations also do work that aligns with Vision Zero, from Safe Routes to School programs to targeted traffic enforcement. This plan builds on these efforts and identifies the additional strategies and resources required to meet Sonoma County's Vision Zero goal. It represents a commitment to specific Vision Zero actions that are organized into six high-level goals:

1. Create Safer Speeds
2. Eliminate Impaired Driving
3. Create a Culture of Safety
4. Build Safe Streets for All
5. Make Vehicles Safer
6. Improve Data for Effective Decision Making

For each action, the plan includes key implementers, timeline, progress metrics, and implementation notes. Meeting Vision Zero goals will require a multi-faceted approach where Sonoma County, public agency partners, community organizations, and community members come together to increase the safety of our streets.

How we will track our progress

The [Sonoma County Vision Zero Data Dashboard](#) provides an interactive tool to explore safety data and trends. Local jurisdictions will also track their progress towards key actions using a standardized tracking template. SCTA will aggregate data on the countywide level with their existing data on transportation projects to provide a picture of countywide progress, which will be reported on the [Vision Zero page](#).

1. Why Vision Zero?

Every year, people in Sonoma County lose family, friends, neighbors, and colleagues to preventable crashes on our roads. From 2016 to 2020, traffic crashes killed 176 people in Sonoma County and left 924 more with life-changing injuries.⁵ These losses fall hardest on those who have reduced access to transportation, live in places with fewer transportation facilities, or who travel without using private vehicles. People who live in rural areas or in low-income households are disproportionately more likely to die in traffic crashes, as are people traveling on foot, by bike, or using mobility devices like walkers and wheelchairs.

People travel Sonoma County's 2,670 miles of roadway⁶ for many reasons: to go to work or school, to visit businesses and cultural centers, to explore the coastline or mountains, and to see the people we love. We walk, bike, and roll; drive and carpool; and take the bus or the train. No matter how or where we travel, everyone who makes a trip in Sonoma County should arrive home safely at the end of their day.

The *Sonoma County Vision Zero Action Plan* outlines the practical, evidence-based steps we can take together to build a future where our roads are free of fatal and life-altering crashes. This plan contains:

- An introduction to Vision Zero and its core principles
- Analysis of where, when, and why severe and fatal crashes happen today, and which communities are most impacted
- How transportation safety relates to the County's efforts to achieve racial equity and social justice
- A new Vision Zero framework for Sonoma County, including goals, actions, and a process for measuring our progress
- Appendices with additional information on transportation context and existing road safety related plans and efforts

[In memoriam graphics: This plan will include periodic callouts commemorating people who lost their lives to traffic crashes in Sonoma County. We will invite community members to submit photos of family members lost to traffic violence along with their name, age at death, home community, 1-2 sentence biography, and a 1 sentence description of the crash that ended their life. This is an example graphic from another plan.]

⁵ Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec.

⁶ Sonoma County Transportation Authority, *Moving Forward 2050: Sonoma County Comprehensive Transportation Plan*, Table 3-1, 2021.

2. What is Vision Zero?

The design and management of our roads and streets reflects our beliefs about safety, and about our rights and responsibilities as travelers. During the 20th century, we built our transportation systems based on the belief that crashes are *accidents* – events no one can fully prevent or predict. Vision Zero is a traffic safety philosophy that lays out a new set of principles for engineering roads, educating travelers, and creating a sense of collective responsibility for ourselves and our fellow travelers. Its central belief is simple: **no one should be killed or severely injured by traffic crashes.** Thirty years of safety research and practice have proven that, with the right commitments and actions, communities can come together to prevent fatal and life-altering crashes. Vision Zero unites us in a new belief – crashes are not inevitable or acceptable.

Sweden pioneered the Vision Zero approach in the 1990s, and the changes they made based on its principles reduced their national traffic fatalities by half, transforming the country into one of the world's safest places to travel. This success launched a Vision Zero movement that spread across Europe and then to other parts of the world. More than 50 cities and counties across the United States – including over a dozen in California – have adopted Vision Zero as the core of their approach to traffic safety.

Core Principles of Vision Zero:

1. **Saving Lives:** Human life and health should be the highest priority within all aspects of transportation systems
2. **Prevention:** Traffic deaths and severe injuries are preventable
3. **Safe Streets:** Human error is inevitable, and transportation systems should be designed to anticipate error, so the consequence is not severe injury or death
4. **Equity:** All people have the right to travel safely through our community and we must work to eliminate disparities in transportation safety based on income, race, ability, age, language spoken, and vehicle access

Sonoma County recognizes preventable traffic deaths and severe injuries as a major public health issue. That is why the Sonoma County Transportation Authority (SCTA) and the Department of Health Services (DHS) are working together to advance Vision Zero in the county. Just like any public health effort, Vision Zero focuses on rigorous data collection and analysis to identify and evaluate effective treatments. It also acknowledges and seeks to address the social determinants that lead to inequitable health outcomes. By collaborating between the fields of transportation and public health, Sonoma County's Vision Zero effort will leverage the data and resources necessary to address the root causes of traffic deaths and injuries.

Figure 1: Traditional approach to traffic safety compared to Vision Zero Approach

TRADITIONAL APPROACH	VIZION ZERO
Traffic deaths are INEVITABLE	Traffic deaths are PREVENTABLE
GEOGRAPHIC EQUALITY in resource allocation	EQUITABLE investment to address disparities
PERFECT human behavior	Integrate HUMAN ERROR into approach
Prevent COLLISIONS	Focus on FATAL AND SEVERE INJURY CRASHES
INDIVIDUAL responsibility, enforced through TRAFFIC STOPS	COLLECTIVE RESPONSIBILITY based on SAFE SYSTEMS approach

3. Traffic Safety in Sonoma County

Transportation Context

Efforts to improve traffic safety must begin with an understanding of the infrastructure and services that comprise the County's existing transportation system, and how people use it today. Travelers navigate a physical network of facilities (such as roads, bridges, and trails) to reach their destination, and the types of transportation services available to them (such as public transit, school buses, or employer shuttles) influence how they may choose to travel. The relative location of different land uses in the community (such as housing, jobs, shopping, or schools) influences the journey travelers must make. Time of day restrictions (such as work shift hours, school hours, or business hours) influence when they need to reach their destination. Safety problems can arise when the system and services fail to meet their needs, due to design issues, gaps, deficiencies, overcrowding, or other factors.

Sonoma County contains a vibrant mix of developed communities, working lands, and natural resources. It houses nine incorporated cities and towns, with more than half of its approximately 500,000 residents centrally located along the Highway 101 corridor. More than 80 percent of the County's total land area is comprised of agricultural and open spaces. Its natural landscape includes the Sonoma and Mayacama Mountains to the east, the Russian River basin and the Santa Rosa Plain in the center, and the Coast Range and Pacific coastline to the west, with San Pablo Bay at the County's southern edge.

The road network in Sonoma County is comprised of 2,670 miles of public streets, roads, and highways.⁷ County-owned roads in rural and unincorporated areas make up the majority of the

⁷ Source: Sonoma County Transportation Authority, *Moving Forward 2050: Sonoma County Comprehensive Transportation Plan*, Table 3-1, 2021.

roadway system, followed by city-owned roads and streets. State highways represent less than one-tenth of all public roadway miles within the County but carry over half of its daily vehicle miles traveled (VMT) due to their key role in providing intercity and regional connections. Multiple public transit agencies provide bus, rail, and paratransit services throughout the County. Significant shares of transit riders have lower incomes, lack access to vehicles, are students, or have disabilities, making transit an essential mobility option.

Table 1: Road centerline miles and daily VMT by jurisdiction

<i>Jurisdiction</i>	<i>Public Road Centerline Miles</i>	<i>Daily Vehicle Miles Travelled (VMT)</i>
<i>Sonoma County</i>	52%	23%
<i>Santa Rosa</i>	19%	13%
<i>Petaluma</i>	7%	4%
<i>Other Cities</i>	13%	8%
<i>State Highways</i>	9%	52%
<i>State Parks</i>	<0.1%	<0.1%
<i>Federal Agencies</i>	<0.1%	<0.1%
<i>Total</i>	2,670 total miles	12,547,230 total VMT

Source: California Department of Transportation, Highway Performance Monitoring Program, 2018 data via Sonoma County Comprehensive Transportation Plan). Note: miles and percentages are rounded.

Per state law, all of Sonoma County's jurisdictions have adopted "Complete Streets" policies, which require that they design transportation projects for the safety and convenience of people walking, bicycling, and taking transit as well as driving. However, existing walkway and bikeway networks still have many gaps and deficiencies that affect the directness, safety, and comfort of trips made on foot or by bike (including trips to reach transit stops and stations).

People who live outside the County account for a significant share of travel activity on the County's transportation network. An analysis of mobile device data shows that 18 to 24 percent of all County trips are made by people who live elsewhere, with higher levels occurring on the weekends.

Unsurprisingly, they typically travel longer distances than County residents, with average trip lengths of 20 to 30 miles.⁸

Appendix A provides additional detail on public transportation, pedestrian and bicycle infrastructure, and travel patterns in Sonoma County.

Crash Data

Vision Zero takes a data-driven approach to understanding the systemic factors behind traffic deaths and injuries. Analyzing crash data is one of the best ways to understand how and where people are severely injured or killed while traveling on Sonoma County Streets. When a crash occurs and the

⁸ Source: Sonoma County Transportation Authority, *Sonoma County Travel Behavior Study*, 2020.

police are called, a crash report is generated to capture the details of the crash. These details include the location, contributing factors, and demographic information such as the gender and age of those involved. Crash data for this Action Plan was accessed through the [Vision Zero Data Dashboard](#), which draws on the Statewide Integrated Traffic Records System (SWITRS).

[SIDEBAR: The Sonoma County Transportation Authority developed the Vision Zero Data Dashboard in 2021 to show patterns in crash data from around the county and overlay them with other relevant data layers. The Data Dashboard makes it easy for anyone in Sonoma County to explore crash data in their community by year, severity, day of week, travel mode, and top crash factors, such as unsafe speed, following too closely, or improper passing. You can also filter crashes by contextual factors such as traffic volume, weather, and lighting. The Data Dashboard will provide a straightforward tool to track Sonoma County's progress toward our Vision Zero goal and evaluate the effectiveness of various measures over time.]

Crash data helps us understand the causes and outcomes of crashes and provides a foundation for the goals and actions that will reduce crashes and their consequences in the future, but the data also has its limitations. A NHTSA survey estimated that 30 percent of crashes across the United States go unreported.⁹ Crash data is also ultimately collected by humans and information on the exact location or contributing factors is often determined by an officer's discretion at the scene of the crash. Because this plan only includes police-reported crashes, it may not reflect crashes involving someone who is uncomfortable reporting to or interacting with police. In addition, analysis only includes crashes where an injury was recorded at the time of reporting. As a result, analysis in the following sections does not offer insight into non-injury crashes occurring in Sonoma County, which is consistent with this plan's focus on Vision Zero goals.

[SIDEBAR: Across the United States, fatalities and severe injuries resulting from crashes first started to rise in the early 1900s as automobile use became more widespread. Per capita fatalities peaked around 1970 before improvements such as seatbelts and airbags began to improve safety for automobile occupants. However, data from the National Highway Traffic Safety Administration (NHTSA) suggests that fatalities may be rising again over the last decade, largely driven by an increase in the number of people stuck and killed by drivers while walking. In particular, 2020 brought the largest single-year spike in the U.S. traffic crash fatality rate in nearly a century. Many attributed the spike to an increase in speeding and reckless driving, partially enabled by reduced traffic congestion.¹⁰]

Crashes Over Recent Years

This plan analyzed crashes occurring in Sonoma County between 2016 and 2020. During this time period, fatal and severe crashes in Sonoma County peaked in 2018 and have decreased over the last two years. Crashes as a whole also decreased in 2019 and 2020 across all jurisdictions, with

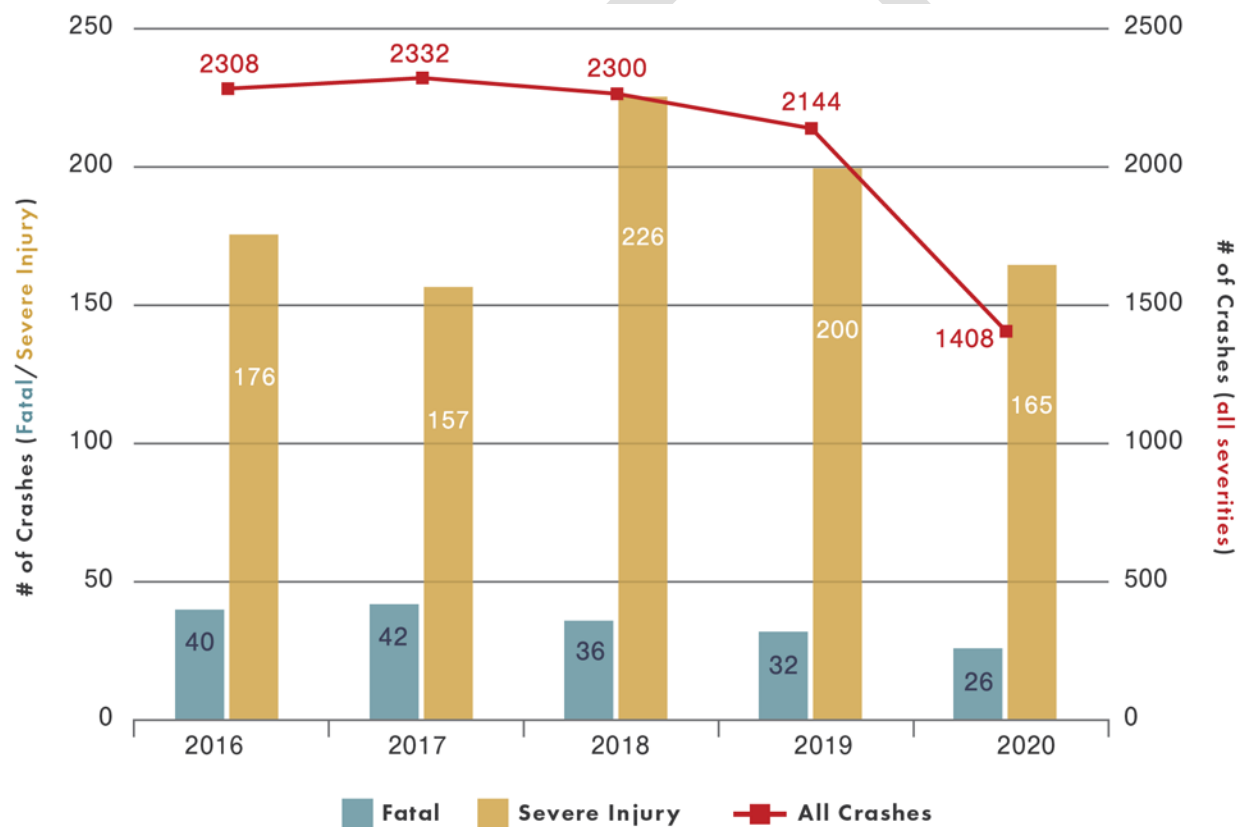
⁹ Source: National Highway Traffic Safety Administration (NHTSA), *National Telephone Survey of Reported and Unreported Motor Crashes*, 2015.

¹⁰ Source: National Highway Traffic Safety Administration, "Update to Special Reports on Traffic Safety During the COVID-19 Public Health Emergency: Fourth Quarter Data [Traffic Safety Facts]", June 2021.

the most pronounced trends in Santa Rosa, Petaluma, and unincorporated areas of the county. By comparison, fatal and severe injury crashes across the state increased substantially in 2018 and 2019 before declining somewhat in 2020.

It remains unclear how much of this the recent drop in severe injury crashes resulted from changes to travel patterns around the 2020 COVID-19 pandemic, which generally correlated with an increase in traffic fatalities and injuries in other parts of the country. While crashes as a whole decreased in the last two years, pedestrian and bicycle crashes have remained relatively steady. Furthermore, fluctuations should be contextualized in terms of longer-term trends. The numbers of fatal and severe injury crashes in Sonoma County, the Bay Area, and California as a whole have all trended upward over the last decade. Even accounting for the decrease in 2020, California saw a 42% increase in severe injury crashes between 2011 and 2020, representing nearly 5,000 additional fatal and severe injury crashes.

Figure 2: Sonoma County crashes over time by severity



Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec)

Crashes by Month

Fatal and severe injury crashes in Sonoma County are highest in the late summer and early fall. Controlling for seasonal variation in travel, June and August remain the deadliest months of the year both in absolute numbers and in rate of fatal and severe injury crashes per vehicle miles traveled (VMT). This is consistent with national data, though Sonoma County's summer fluctuations are a bit

more pronounced.¹¹ Bicycle crashes increase from April to October and drop off dramatically between January and March, likely reflecting seasonal variations in bicycle travel. Pedestrian crashes are relatively constant throughout the year with peaks across summer, fall, and winter months.

Figure 3: Sonoma County fatal and severe injury crashes by month, 2016-2020



Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec

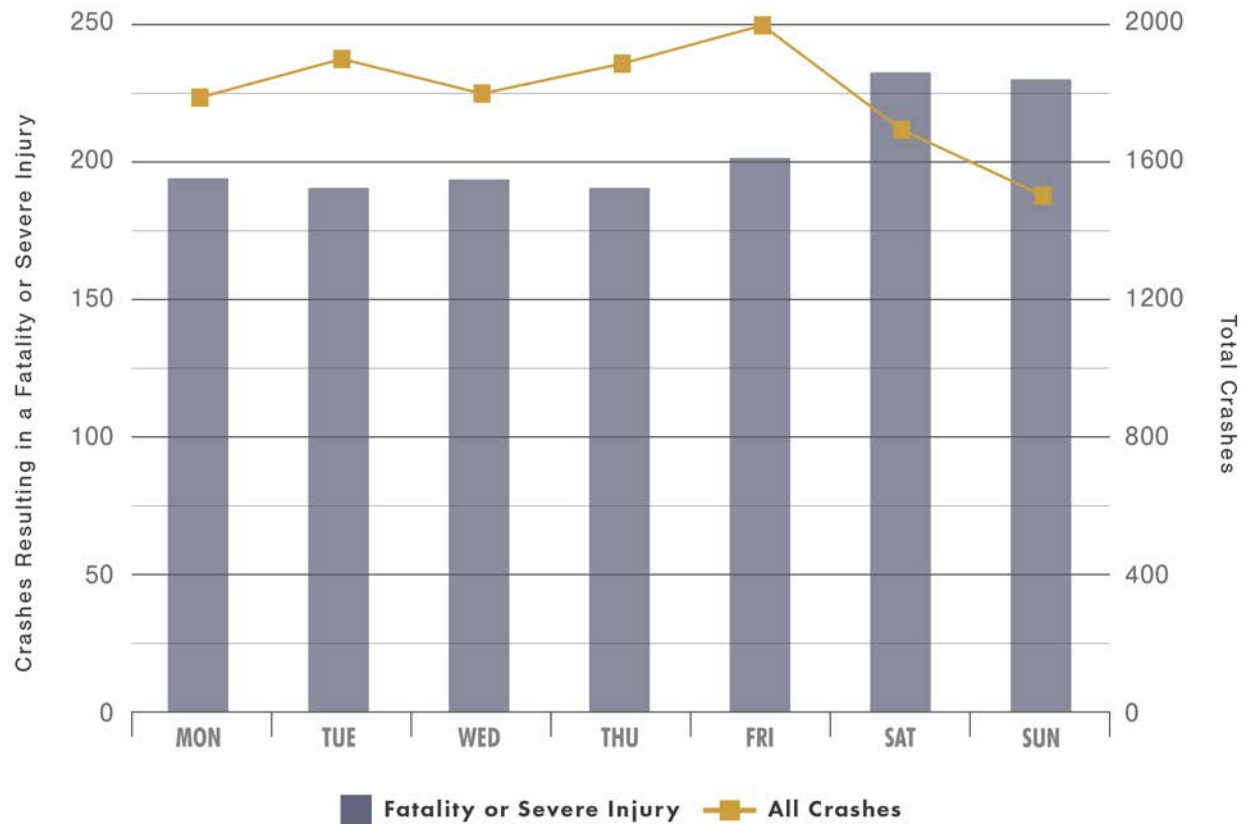
Crashes by Day of Week and Time of Day

Crashes also vary by day of the week. With all modes combined, fatal and severe injury crashes are most frequent on Fridays, Saturdays, and Sundays. This trend suggests a link between these crashes and the prevalence of recreational travel, including evening entertainment. Unsurprisingly, impaired driving is the primary crash factor for a higher share of crashes on these days compared to the rest of the week. By mode, fatal and severe injury crashes for bicyclists are substantially higher on

¹¹ National Safety Council analysis of NHTSA FARS data, [Crashes by Month](#).

Saturdays while those for pedestrians and automobiles are more evenly spread throughout the week.

Figure 4: Sonoma County Crashes by day of week, 2016-2020



Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec

The afternoon and evening hours account the greatest total number of fatal and severe injury crashes, likely due to higher overall travelers on the road. However, crashes that occur at night are more likely to result in deaths and severe injuries.

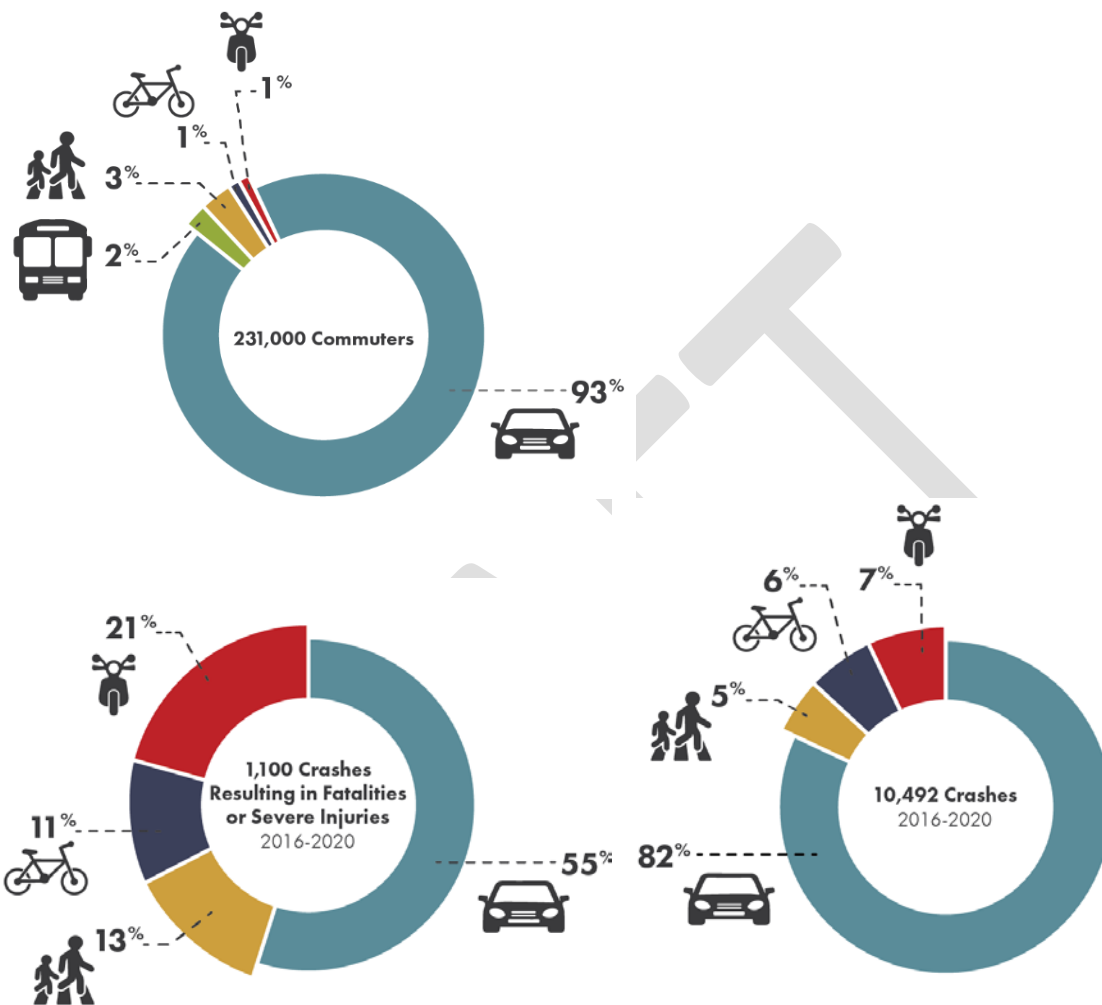


Crashes by Travel Mode

When collisions occur, people who are not enclosed by a vehicle are at greater risk of suffering severe or fatal injuries. While most trips in the County are made in vehicles, travelers using other modes are at disproportionate risk of traffic violence. Four percent of commute trips, and eight percent of all trips, are made on foot or on bicycle, but these modes account for 24% of crashes resulting in a fatality or severe injury.¹² Motorcycles only account for 1% of commutes but 13% of fatality and severe injury crashes.

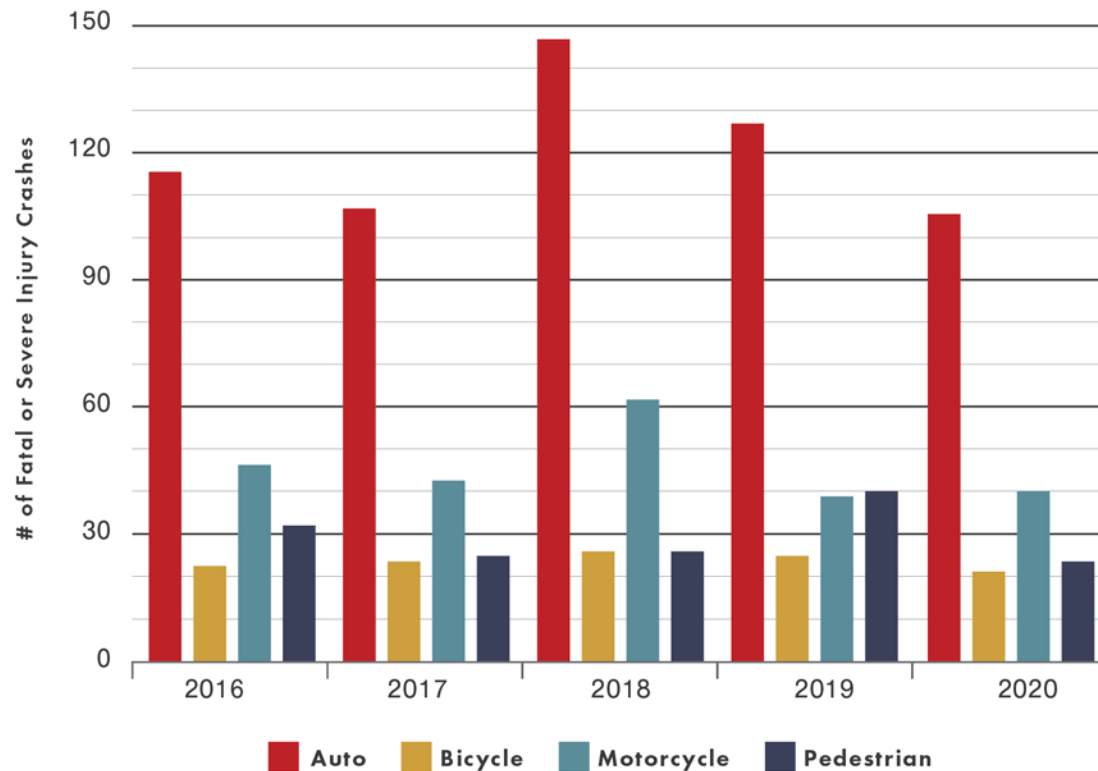
¹² The graph shown uses United States Census data because it breaks out trips into the same categories as our crash analysis. However, commute trips account for a fraction of overall travel. The 2015 Sonoma County Travel model found that driving, including driving alone and sharing a ride, accounted for 91.4% of all trips, followed by 8.2% walking and bicycling and 0.4% made by public transportation.

Figure 5: Travel mode share in Sonoma County for commute trips (top left), for all crashes (top right), and for fatal or severe injury crashes (bottom left).



Sources: U.S. Census, American Community Survey 2019 5-year estimates; Crash data from the UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec.

Figure 6: Sonoma County crashes over time, by mode



Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec

Main crash factors

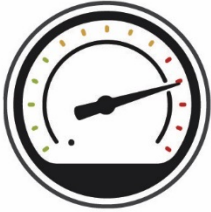
Fatal and Severe Injury Crash Factors

While there are many factors that contribute to crashes, the primary factors in fatal and severe injury crashes in Sonoma County are impaired driving, unsafe turns, unsafe speeds, and right-of-way violations¹³. Between 2016 and 2020 these four factors alone accounted for 70% of all traffic related deaths and severe injuries in the county. Specifically, driving under the influence is the leading cause of traffic fatalities and is responsible for more deaths and severe injuries than any other factor. Since 2008, impaired driving has caused 140 deaths and more than 300 series injuries.

¹³ A single crash may be caused by a combination of multiple contributing factors. However, this report focuses on the *primary crash factor* which is determined in a crash report to be the *most* influential cause of the crash.

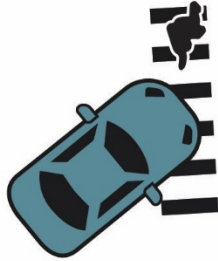
Top Crash Factors for all Crashes (2016-2020)

1. Unsafe Speed



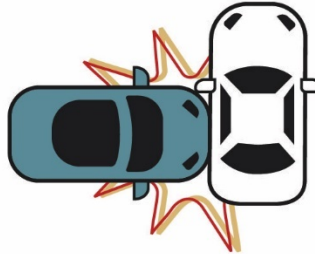
31%
of Crashes

2. Unsafe Turns



16%
of Crashes

3. Right of Way



15%
of Crashes

4. Impaired Driving



11%
of Crashes

Top Crash Factors Resulting in a Fatality or Severe Injury (2016-2020)

1. Impaired Driving



24%
of Crashes

2. Unsafe Turns



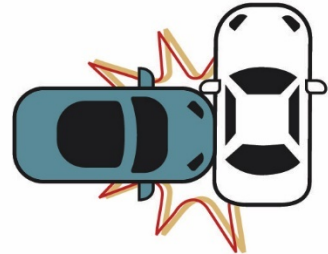
20%
of Crashes

3. Unsafe Speed



17%
of Crashes

4. Right of Way



10%
of Crashes

Source: UC Berkeley Transportation Injury Mapping System (TIMS), provided by SWITRS and processed by SafeTrec

Impaired Driving

Of the 1,318 fatal and severe injury crashes in Sonoma County between 2016 and 2020, nearly a quarter (24%) were caused by someone operating a vehicle under influence of drugs or alcohol. Impaired driving led to 66 fatalities and 245 severe injuries as well as 1,200 other crashes. In the US, alcohol impairment is legally defined as a blood alcohol content (BAC) of 0.08 percent or higher, but even small amounts of alcohol can lead to reduced focus and alertness. The effect of other drugs, such as cannabis, on driving behavior is not as well documented. Epidemiological studies

have been largely inconclusive about whether cannabis use results in an increased risk of crashes.¹⁴ The drug's effects are highly dependent on dose and individual tolerance. Additionally, one study found that half of drivers under the influence of cannabis were also under the influence of alcohol, further complicating efforts to study the drug's effects.¹⁵ However, we know that cannabis negatively affects a number of skills needed for safe driving and thus the safest option is to avoid operating a vehicle while under the influence of any substance.¹⁶ Addressing drug and alcohol abuse, providing transportation options, and keeping impaired drivers from getting behind the wheel are critical steps toward meeting Vision Zero goals.

Unsafe Turns

Unsafe, or "improper" turns, occur when drivers make unpredictable movements, often without reasonable warning. Examples include ignoring a "No Turn on Red" sign or turning at a red light without making a complete stop. Over the past five years, 20 percent of fatal and severe injury crashes were caused by vehicles making unsafe turns. Between 2016 and 2020, 40 people were killed, and 228 people were severely injured in Sonoma County because of drivers making unsafe turns. Improved intersection and signal design can help reduce the incidence of crashes from unsafe turns.

Unsafe Speeds

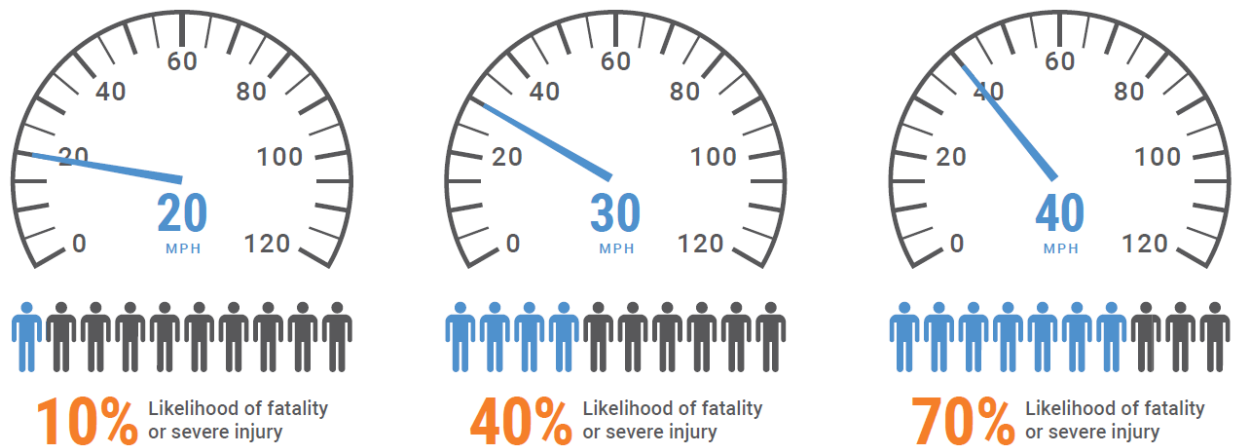
Higher speeds increase both the risk of a crash and the likelihood that a crash will result in severe injury or death. At higher speeds, a driver's field of vision is narrowed, and they have less time to react, making collision avoidance particularly challenging. In addition, the faster a vehicle is moving, the longer the stopping distance and the greater the force of impact will be. In Sonoma County over the past five years, speeding drivers caused 4,000 crashes leading to over 200 severe injuries and 29 deaths. It is important to note that roads with higher speed limits are a risk factor regardless of whether drivers are exceeding those limits. Travel speeds of 40-45 mph see a notably higher rate of fatal and severe injury crashes relative to lower speed roads. Reducing vehicle speeds is essential to meeting Sonoma County's Vision Zero goal.

¹⁴ Compton, R. P., & Berning, A., "Drug and alcohol crash risk." In *Traffic Safety Facts Research Note*. Washington, DC: National Highway Traffic Safety Administration, 2015; Sewell, R. A., Poling, J., & Sofuoglu, M., "The effect of cannabis compared with alcohol on driving." *American Journal on Addictions*, 18(3), 185–193, 2009. <https://doi.org/10.1080/10550490902786934>.

¹⁵ Martin, J. L., Gadegbeku, B., Wu, D., Viallon, V., & Laumon, B., "Cannabis, alcohol and fatal road accidents." *PLoS ONE*, 12(11), 1–16, 2017. <https://doi.org/10.1371/journal.pone.0187320>; Sewel et. al., 2009.

¹⁶ Center for Disease Control and Prevention (CDC), *What You Need to Know About Marijuana Use and Driving*, 2017.

Figure 7: Likelihood of Death and Severe Injury Due to Speed



Source: Tefft, Brian C. Impact speed and a pedestrian's risk of severe injury or death, *Accident Analysis & Prevention*, 50, 2013

Right-of-Way Violations

Right-of-way violation crashes occur when a driver or other road user breaks the rules of the road that determine who goes first and who yields. These crashes typically occur when drivers fail to properly yield at a stop sign, making a U-turn, or merging on or off of a highway. Many right-of-way crashes may also include a vehicle making an unsafe turn, however the *primary collision factor* for these crashes is a right-of-way violation. Between 2016 and 2020 right-of-way crashes caused 110 severe injuries and 14 fatalities. Driver education, signage, and roadway design can all help reduce right-of-way violations and the resulting crashes.

Hot Spots

To help understand where people are being killed and injured on Sonoma County roads, SCTA conducted a high injury network (HIN) and a high injury intersection (HII) analysis using crash data provided by the Transportation Injury Mapping System (TIMS), from the University of California – Berkeley.¹⁷

High Injury Network

A High Injury Network (HIN) analysis is a systematic process for identifying segments of a road network where users are at higher risk. This is achieved by examining the location, frequency, severity, and mode of crashes along the road network. This processed crash data is then spatially aggregated along the network using a ‘moving window’ analysis to develop relative collision scores, from which a subset of ‘high injury’ segments are classified as the high injury network. Many public agencies use this approach to identify areas to prioritize safety investments.

¹⁷ See Appendix C for more information on the methodology behind the HIN and HII analysis.

Sonoma County's high injury network includes 209 miles of road segments in all parts of the County. While there are concentrations of HIN segments in more urban and suburban areas, including Santa Rosa, Sebastopol, Rohnert Park, and Petaluma, there are also segments in rural areas.

[\[Option for table or graph showing top 20 most dangerous corridors from HIN\]](#)

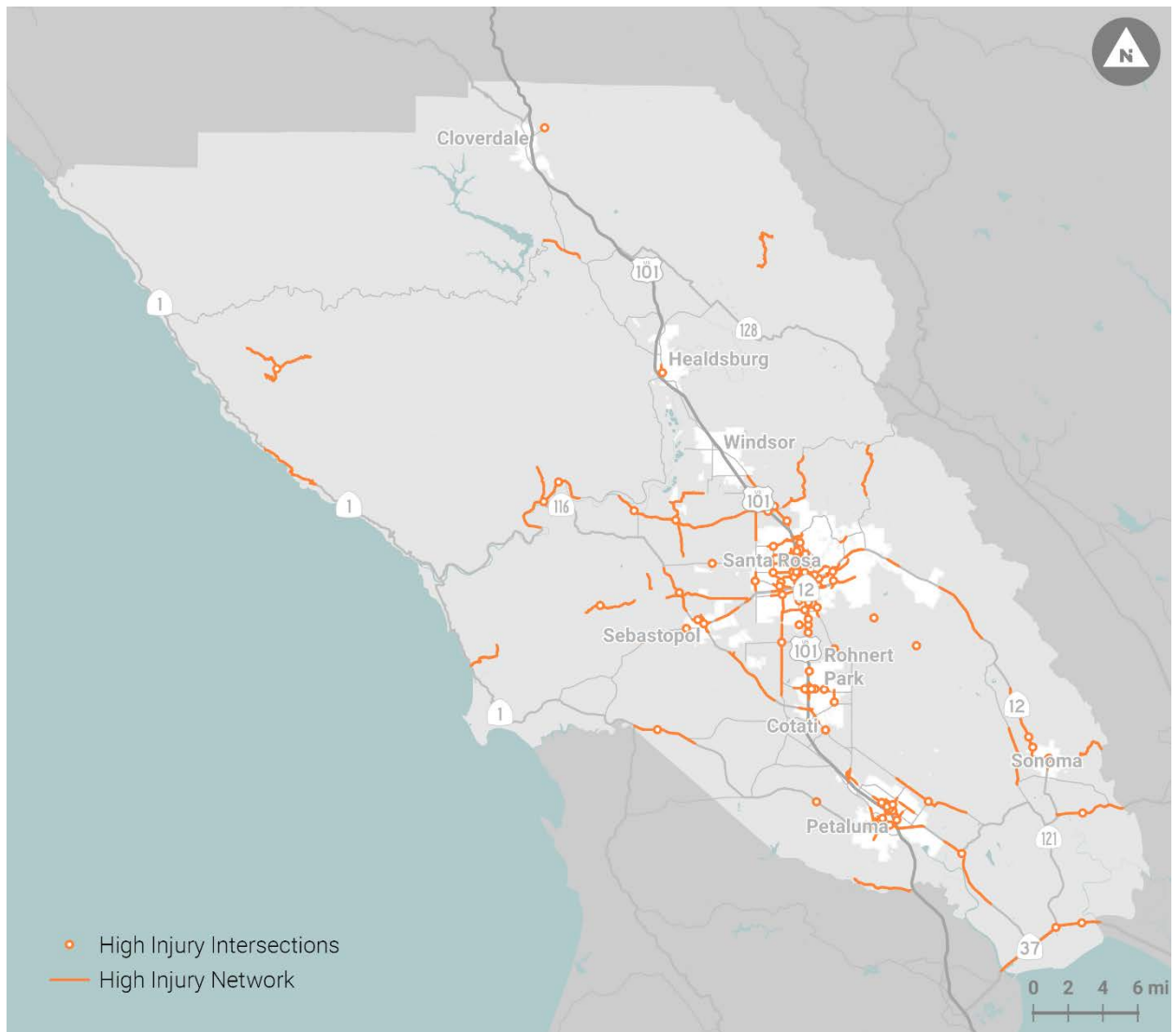
High Injury Intersections

The HIN analysis accounts for intersection crashes but does not explicitly call them out, instead implying that intersections along the identified segments would also be of higher risk. The High Injury Intersections (HII) analysis uses the same data as the HIN but focuses specifically on crashes that occurred within 250 feet of an intersection. The HIIs represent intersections where a substantial number of crashes resulting in an injury or fatality occurred for at least one mode.

Sonoma County's 98 High Injury Intersections are also spread throughout the County with concentrations in Santa Rosa, Petaluma, and Sebastopol. HIIs are particularly concentrated in these areas when we look specifically at crashes involving people walking and bicycling. Those involving only drivers and motorcyclists are more evenly spread throughout the eastern half of the County.

[\[Option for table or graph showing top 20 most dangerous HIIs\]](#)

Figure 8: Sonoma County High Injury Intersections (HII) and High Injury Network (HIN)



Community Perceptions of Safety and Problem Areas

While crash data analysis is critical to understanding where Vision Zero investments are needed, it does not give a complete picture of safety issues in the County. In order to better understand the daily experience of using Sonoma County roads, this plan also draws on the collective knowledge of local communities.

[SIDEBAR: Engagement Process]

The initiatives presented in this plan were informed by extensive public engagement on traffic safety issues, including:

- 12 listening sessions
- [XX stakeholder interviews]
- Three focus groups
- A virtual countywide public workshop
- A survey that received nearly 2,500 responses]

Comprehensive Transportation Plan Listening Sessions

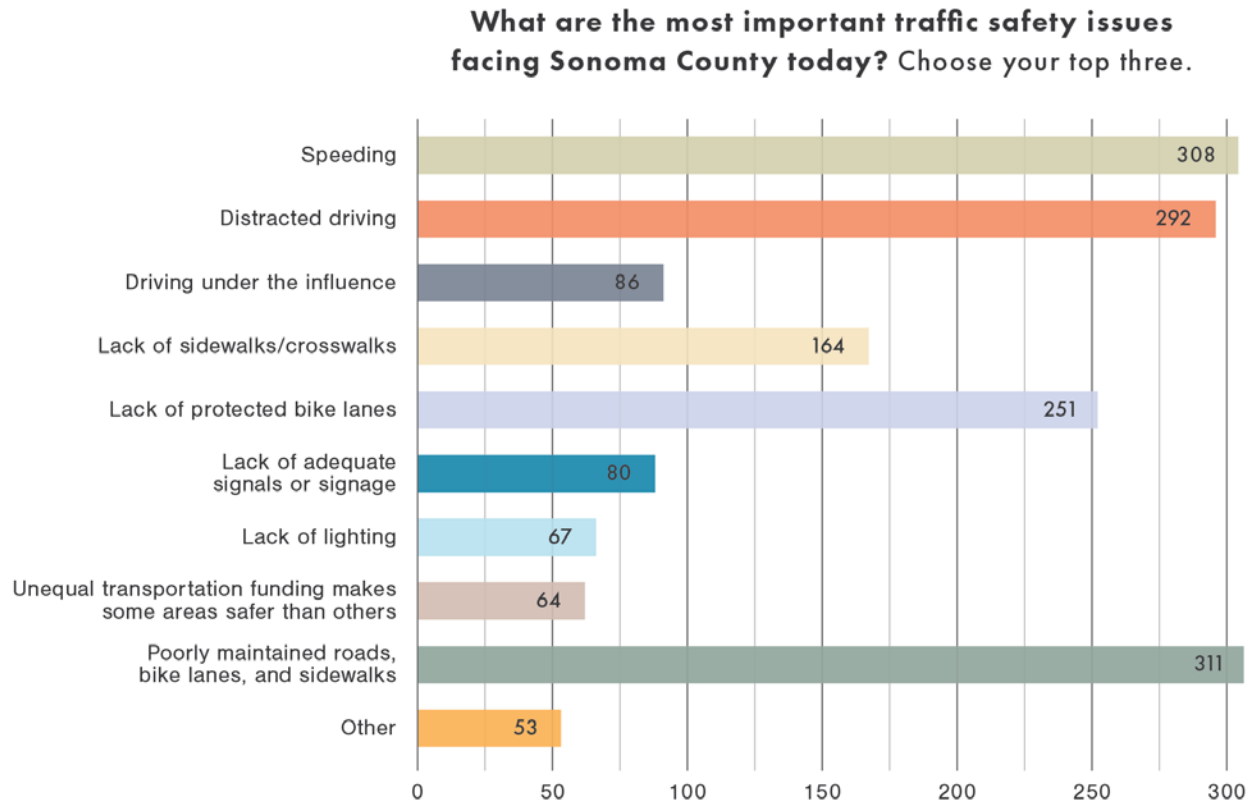
Traffic safety emerged repeatedly as an issue during SCTA's listening sessions for the 2021 Comprehensive Transportation Plan (CTP).¹⁸ Many participants expressed concerns about personal safety, and frustration with narrow and missing sidewalks, particularly at bus stops, where transit riders sometimes must wait on the side of the road, and conflicts between bicyclists and drivers sharing narrow roadways. Many requested more bike paths and protected bike lanes. Participants also complained that people park too close to intersections, resulting in limited sightlines for crossing pedestrians and vehicles. They requested more crosswalks and flashing beacons at pedestrian crossings.

Survey

Between September and November 2021, Sonoma County collected feedback from nearly 2,500 community members about traffic safety. Respondents mapped their daily travel patterns and identified "danger zones," or areas where they did not feel safe walking, biking, or driving. They also shared perceptions of traffic safety more broadly in the County. When asked about the most important traffic safety issues facing Sonoma County, the top three responses were poorly maintained roads, bike lanes, and sidewalks (311), speeding (308), and distracted driving (292).

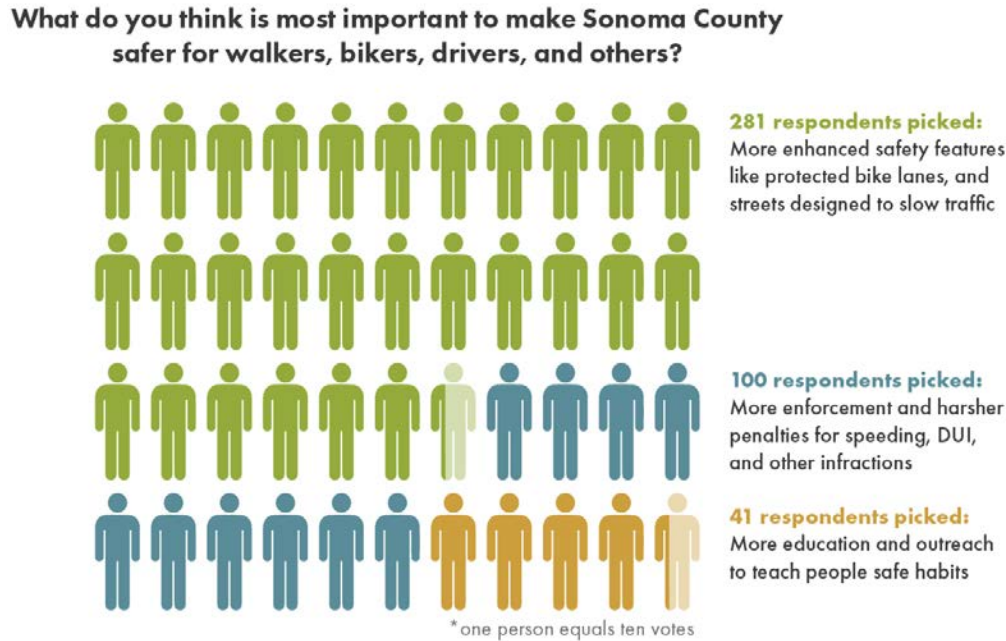
¹⁸ In 2019, SCTA worked with four community-based organizations to gather feedback from community members who are often under-represented, including seniors, youth, Latinos, recent immigrants, and other low income or disadvantaged communities.

Figure 9: Survey responses about the most important traffic safety issues facing the County today



When asked what measures are most important to make Sonoma County safer for all road users, 67% of respondents selected, “More enhanced safety features like protected bike lanes, and streets designed to slow traffic”. In comparison, 24% selected, “More enforcement and harsher penalties for speeding, DUI, and other infractions” and 10% selected, “More education and outreach to teach people safe habits.”

Figure 10: Survey responses about Vision Zero priorities



Most respondents did not feel safe walking, biking, or rolling in Sonoma County, with even lower perceptions of safety among people of color and those living outside of city limits.

Focus Groups, Stakeholder Interviews, and Public Workshop

This plan was developed and refined through input collected through additional focus groups, stakeholder interviews, and a public workshop held in winter of 2021/22. [\[Pending stakeholder interviews and focus groups\]](#)

Vision Zero Priorities

[\[Pending stakeholder interviews and focus groups\]](#)

Locations

As part of the survey, respondents placed pins in “Danger Zones” and “Safe Spots” for traffic safety throughout the county. Over 1,000 respondents placed nearly 7,000 points. [\[Locations TBD pending further analysis\]](#)

[\[Map\(s\) showing location data from survey\]](#)

Centering Equity

At its core, Vision Zero emphasizes that all people have a right to move about their communities safely. However, it is impossible to meet that goal without acknowledging and addressing racial and socioeconomic disparities in the transportation realm.

Transportation Costs and Barriers

Many Sonoma County residents struggle to access transportation options that meet their needs and that they can afford. Households spend an average of 57 percent of their incomes on housing and transportation – far above affordable levels.¹⁹ Most neighborhoods are low-density, with few jobs or destinations in walking distance and limited access to public transportation. As a result, most households must drive to meet their daily needs. The typical County household travels 22,000 miles by vehicle each year, at a cost of more than \$15,000 (24% of the average household income).²⁰ These costs fall particularly heavily on low-income households.

For people who cannot afford a vehicle, cannot drive, or prefer not to, using the County's walking, bicycling, and transit networks presents other challenges. Recent public outreach found that community members perceive the need for safety improvements and maintenance on sidewalks, bikeways, and streets, and that these concerns present barriers to walking and bicycling. As shown in Figure 5, people walking, bicycling, or using mobility devices face a higher risk of death or severe injury when involved in a crash. This exacerbates existing disparities in road safety between high- and low-income households.

Community members have expressed the desire for expanding the locations served by transit, with buses coming more frequently and running more hours of the day. Many of the County's transit routes are concentrated around morning and evening commuting peaks, with limited service for people who work other shifts or students who attend night classes. While off-peak service typically has higher net costs per rider due to lower overall ridership, it may be the only way someone without a vehicle can make a trip. Adding service with flexible routes or on-demand scheduling may help transit agencies to provide mobility options for those living in areas underserved by fixed route services or travelling outside of peak hours.

Disparities in Crash Victims

Equity Priority Communities experience a disproportionate share of traffic-related injuries and fatalities. Throughout the country, Vision Zero's data-driven analysis reveals a concentration of traffic

¹⁹ The Center for Neighborhood Technology has defined affordable neighborhoods as places where the combined cost of housing and transportation make up no more than 45% of a typical household's income. Data in this paragraph comes from the 2017 Update of the Center for Neighborhood Technology's Housing and Transportation (H+T) Affordability Index. Retrieved Dec. 3, 2021 from: <https://htaindex.cnt.org/about/>

²⁰ Center for Neighborhood Technology, H+T Fact Sheet for Sonoma County, Retrieved Dec. 3, 2021 from: <https://htaindex.cnt.org/fact-sheets/?focus=county&gid=455>

safety issues that suggest racialized patterns of disinvestment and neglect. Between 2015 and 2019, the Governor’s Highway Safety Association found that the rate of traffic deaths per 100,000 was 146 for American Indians/Alaskan Natives and 69 for Blacks compared to 58 for the total United States population.²¹ Compared to white children, African American children are twice as likely, and Latino children nearly one-and-a-half times more likely, to be killed while walking.²²

Figure 11: Racial disparities among children killed while walking



Source: Dangerous by Design, 2011

Because they are forced to live in some of the most dangerous locations, most notably along high-speed roadways, people who are unhoused—camping or living in vehicles—also shoulder a disproportionate share of traffic injuries and fatalities.²³ In 2020, around 2,700 people were experiencing homelessness in Sonoma County and 40% of them also have a physical or cognitive disability, putting them at even greater risk of being the victim of a crash.²⁴

These disparities help explain the high degree of correlation between Sonoma County’s high injury network and its social vulnerability scores and Equity Priority Communities (see Figure 12 and Figure 13). The areas of Santa Rosa, Rohnert Park, Sonoma, and Petaluma that rank the highest in terms of poverty, housing burden, and health risk are home to some of the most dangerous corridors and intersections in the County.

Creating a more equitable transportation landscape requires moving past geographic equality in transportation resource allocation and instead prioritizing communities that have been left out of transportation planning efforts and seen chronic under-investment in basic amenities like sidewalks, bike lanes, and pedestrian crossings.

²¹ Governors Highway Safety Association (GHSA), *An Analysis of Traffic Fatalities by Race and Ethnicity*, 2021.

²² National Complete Streets Coalition & Smart Growth America, *Dangerous by Design*, 2011.

²³ Data on homelessness and traffic violence is limited for Sonoma County but an investigation in Austin, TX found that 14% of deaths in the unhoused population involved traffic collisions (“Casualties of the Streets”, *Austin American-Statesman*, 2015). Anecdotal evidence suggests an elevated level of risk for Sonoma County’s unhoused population as well.

²⁴ Sonoma County Community Development Commission, *2020 Sonoma County Homeless Census Comprehensive Report*.

Disparities in Traffic Enforcement

Some Vision Zero efforts have relied heavily on increasing police enforcement and penalties to curb dangerous travel behavior. However, due to racial profiling and the regressive burden of penalties and fines on low-income individuals, these enforcement actions can end up harming the very people that they are intended to help.²⁵ This plan acknowledges the important role of law enforcement agencies to accomplish Vision Zero goals while focusing resources on actions that will not place a disproportionate burden on Equity Priority Communities.

Disparities Between Rural and Urban Areas

Rural communities also face a disproportionate rate of traffic injuries and fatalities. Nationwide, the fatality rate on rural roads is two times greater than on urban roads.²⁶ In Sonoma County, rural disparities in road safety are compounded by relatively high concentrations of poverty in rural and semi-rural areas, such as those along the Russian River or in the Springs area of the Sonoma Valley. While much of Sonoma County's High Injury Network is located in the cities, rural areas face a disproportionate number of fatal and severe injury crashes relative to the population density and traffic volumes. These areas often have disconnected street grids and lack transit services, pedestrian, or bike infrastructure, forcing many people to walk and bike along the shoulders of high traffic, high speed roadways.²⁷

Measuring and Mapping Disparities

Sonoma County has identified the need to improve quantitative and geospatial data on transportation disparities across the County. In the absence of more granular local data, this plan draws on two well established and robust data sources to understand spatial inequality: The Bay Area Metropolitan Transportation Commission's [Equity Priority Communities](#) and the California Office of Environmental Health Hazard Assessment's [CalEnviroScreen](#) tool. These two data sets are also fairly similar to health and equity data presented in the [2014 Portrait of Sonoma County](#), a Department of Health Services report that is currently being updated.

²⁵ For more information on racial profiling and disparities in traffic enforcement, see findings from Stanford Open Policing Project, "A large-scale analysis of racial disparities in police stops across the United States" (*Nature Human Behavior*, 2020), and the *Oregon Statistical Transparency of Policing Report* (2019).

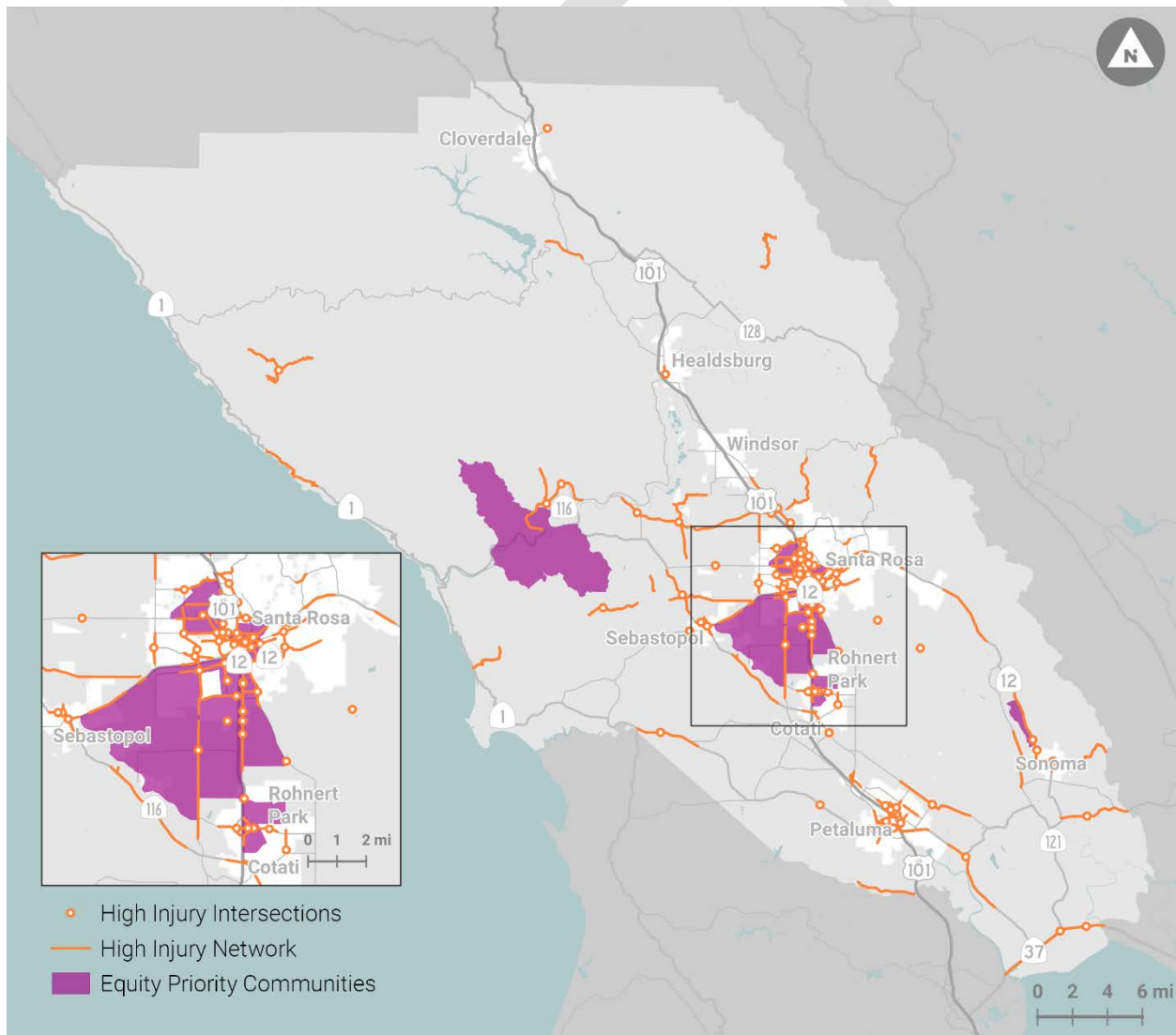
²⁶ United States Bureau of Transportation Statistics, *Rural Transportation Statistics*, November 16, 2021. Retrieved on Dec. 2, 2021 from <https://www.bts.gov/rural#:~:text=While%20only%2019%25%20of%20the,higher%20than%20on%20urban%20roads.>

²⁷ Transit service in rural areas has higher net costs per mile, creating financial challenges for providing frequent bus routes in those areas. Most state, county, and local governments lack sufficient revenue to meet all maintenance needs on their roadway systems (including walkways and bikeways), while facing pressures to modernize and improve them. Because improvements may provide the greatest net benefits in areas where many people travel, rural networks may receive lower funding priority. Because small communities and rural areas develop more slowly than urban areas, they may be less likely to see walkways and bikeways built as part of private development or major road projects.

Equity Priority Communities

The Bay Area Metropolitan Transportation Commission (MTC) uses demographic data from the American Community Survey to identify areas with a concentration of underserved populations, such as low-income households, households with zero vehicles, people of color, people with disabilities, and people with limited English proficiency. This data is updated every four years as part of updates to Plan Bay Area. These areas, referred to as Equity Priority Communities (EPCs), are census tracts that have likely been disadvantaged and faced historic underinvestment. MTC prioritizes these communities for transportation investments and planning efforts. This plan uses EPCs as a geographic tool to prioritize certain Vision Zero investments. Figure 12 shows the high degree of overlap between Sonoma County's High Injury Network and Equity Priority Communities. While only 8.8% of roadway mileage in the county falls within or adjacent to these areas, these roadways accounted for 25.7% of fatal and severe injury crashes between 2015 and 2019.

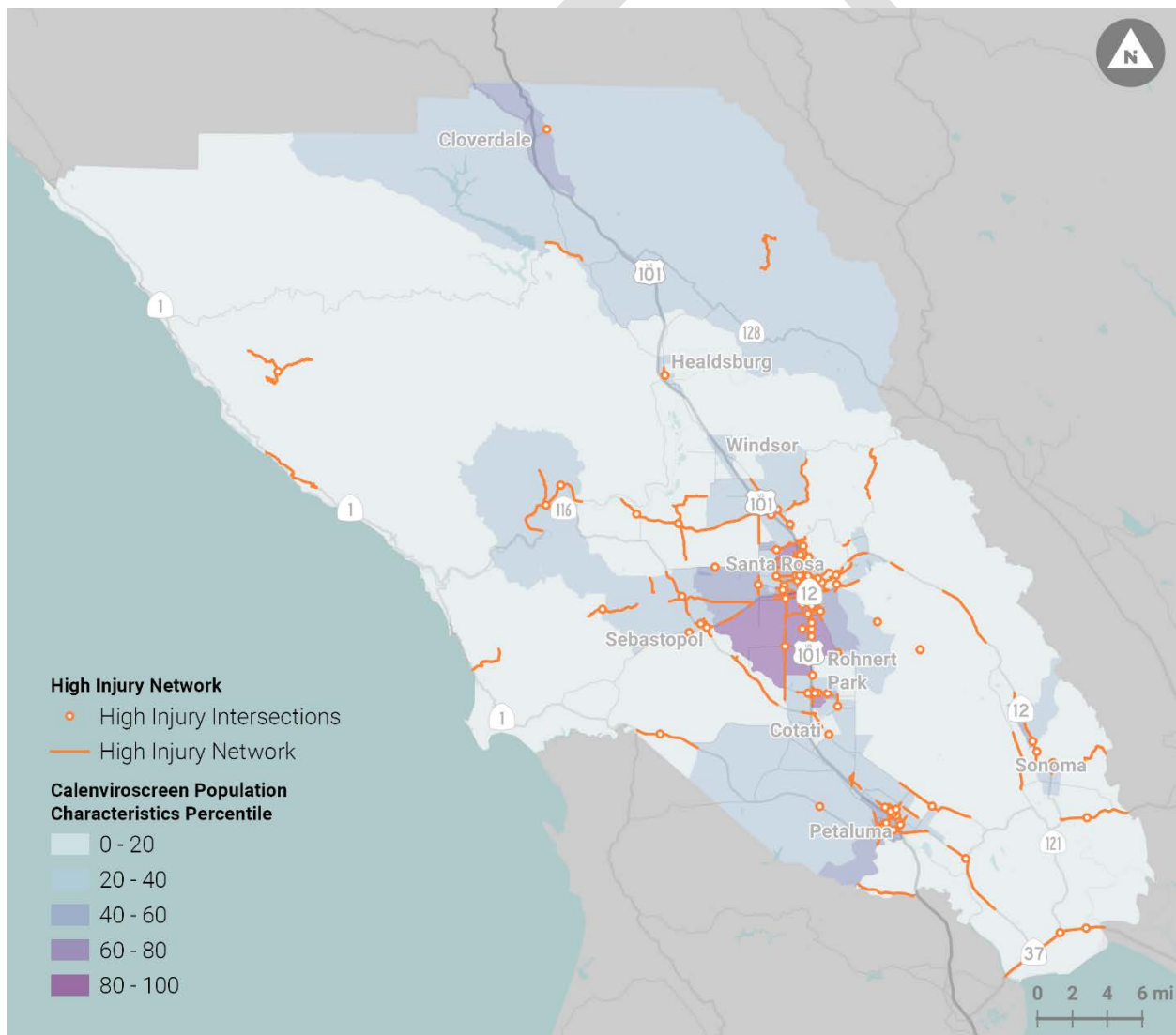
Figure 12: Sonoma County High Injury Network (HIN) and High Injury Intersections (HII) overlaid with Equity Priority Communities



CalEnviroScreen

CalEnviroScreen is a mapping tool from the California Office of Environmental Health Hazard Assessment that helps identify California communities that are most affected by many sources of pollution, and where people are often especially vulnerable to pollution's effects. It includes both pollution burden, which estimates exposure to harmful substances, and population characteristics, including underlying health issues and socioeconomic factors. The population characteristics index provides another tool to help identify areas with populations that may be particularly vulnerable to injuries and fatalities from crashes. This plan uses CalEnviroScreen to supplement analyses around equity and Vision Zero. Figure 13 shows the correlation between Sonoma County's High Injury Network and areas with high degrees of social vulnerability based on the CalEnviroScreen population characteristics. Darker purple areas represent those with a higher proportion of vulnerable people based on age, health, and socioeconomic indicators.

Figure 13: Sonoma County High Injury Network (HIN) and High Injury Intersections (HII) overlaid with CalEnviroScreen Scores



4. Goals and Actions

Eliminating traffic fatalities and severe injuries requires a sustained and coordinated effort. Based on what we heard from the public and key stakeholders, and what we see in the crash data for Sonoma County, we propose a prioritized set of actions across six major goals:

1. Create Safer Speeds
2. Eliminate Impaired Driving
3. Create a Culture of Safety
4. Build Safe Streets for All
5. Make Vehicles Safer
6. Improve Data for Effective Decision Making

The first two goals—Create Safer Speeds and Eliminate Impaired Driving—directly target two leading crash factors for severe crashes in Sonoma County. Create a Culture of Safety addresses all crash factors by instilling a sense of shared responsibility for the collective safety of all road users. The next two—Build Safe Streets for All and Make Vehicles Safer—focus on the physical conditions of Sonoma County streets and vehicles to reduce conflicts between road users, prevent crashes from occurring, and to reduce their severity when they do happen. For example, Automated Traffic Enforcement (ATE) using red light cameras reduces right of way crashes while installing side guards on trucks reduces the severity of improper turning crashes involving bicycles and pedestrians. The last goal, Improve Data for Effective Decision Making, lays out an overarching vision for improving the data quality and ease of use to inform ongoing efforts across the other five goals and enable decision makers to prioritize resources.

These goals focus on the key factors behind traffic-related deaths and severe injuries in Sonoma County and the systemic changes required to make the County's roads safer for everyone. The actions to meet each of these goals draw on best practices from around the country, tailored to the context of Sonoma County and refined through discussions with the Vision Zero Advisory Committee. They build on existing plans and efforts, providing a roadmap to reach the county's Vision Zero goal.²⁸

An implementation strategy and timeline are provided for each action. These actions are also color coded into one of six implementation buckets, designed to help Vision Zero implementers to understand where they have a leading role to play:

Planning	Operations and Maintenance
Design and Engineering	Policy and Legislation
Education and Outreach	Data and Analysis

²⁸ See Appendix B for descriptions of relevant existing plans and efforts and how they relate to Vision Zero.

Create Safer Speeds

The faster someone drives, the longer it takes to avoid hitting someone entering their path of travel and the more severe the impact of a crash will be. Unsafe speed is the top factor for all crashes in Sonoma County and the third most common crash factor for crashes resulting in a fatality or severe injury. Slowing drivers also makes streets more inviting for people walking and biking. Create safe speeds is primarily about setting appropriate speed limits and then designing streets that encourage motorists to comply with limits, particularly in more developed areas where there are more people walking and biking.

Action 1.1	Review speeds and posted limits on the county's high injury network, set context appropriate speeds, and implement speed mitigation measures based on findings and legislative authority
Key Implementer(s):	TPWs
Timeline:	3-5 years
Progress Metric(s):	Miles of roadways in Sonoma County's high injury network that have received speed mitigation measures
Implementation Notes:	Any reduction to speed limits should be accompanied by mitigation measures to lower design speed. Speed mitigation measures include narrower lane widths (may include adding bicycle lanes), smaller curb radii, raised crosswalks, curb bulb outs, speed feedback signs, speed humps, pinch points, chicanes, roundabouts, and coordinated signal timing. Streets with substantial pedestrian and bike volumes should have a speed limit no greater than 25 mph. California AB 43, which goes into effect in June 2024, will permit cities to lower speed limits beyond the 85 th percentile on streets with high injuries and fatalities and require traffic surveyors to consider the presence of vulnerable groups, including children, seniors, and persons with disabilities, when setting speed limits. ²⁹

²⁹ For more information on the 85th percentile based method for setting speed limits and it's limitations, see NACTO's City Limits article "[Designed to Fail: The Problem with Percentile-Based Speed Limits.](#)"

Action 1.2	Develop and adopt a process to reduce speed limits to 25 mph or below on county and local roads where appropriate, such as areas around schools, parks, senior centers, and transit stations
Key Implementer(s):	TPWs
Timeline:	3-5 years
Progress Metric(s):	Adoption of process
Implementation Notes:	California AB 43, will "establish a prima facie speed limit of 25 miles per hour on state highways located in any business or residence district" and "authorize Caltrans and a local authority to declare a speed limit of 20 or 15 miles per hour, as specified, on these highways". Lower posted speed limits should be accompanied by physical traffic calming measures such as lane narrowing or speed humps.

Eliminate Impaired Driving

Crash data shows that impaired driving contributes to a quarter of traffic fatalities and severe injuries in Sonoma County. Strategies to eliminate impaired driving should provide transportation alternatives for people who are consuming alcohol while also working with law enforcement and community-based organizations to keep people with a pattern of impaired driving from getting behind the wheel and addressing the root causes of alcohol and drug abuse.

Action 2.1	Continue and expand law enforcement engagement with businesses around responsible beverage service
Key Implementer(s):	Sonoma County Sheriff's Department (SCSO), local Police Departments (PDs)
Timeline:	Ongoing
Progress Metric(s):	Number of businesses engaged
Implementation Notes:	Establishments that continue irresponsible beverage service, enabling impaired driving may have licenses revoked. Encourage businesses to coordinate with and promote designated driver services and other safe transportation options. Consider implementing "Place of Last Drink (POLD) Survey" to track where DUI offenders last obtained alcohol before their arrest. ³⁰
Action 2.2	Encourage safe wine, beer, and cannabis tourism by promoting ride share services, designated driver services, and walking wine tours
Key Implementer(s):	Sonoma County Tourism, tourism industry, DHS, SCTA
Timeline:	Ongoing
Progress Metric(s):	Reduction in the number of crashes caused by impaired drivers
Implementation Notes:	Seek grant funding to expand and promote services and information. Create payment options to make rideshare services accessible to riders without access to accepted credit cards.

³⁰ See [National Liquor Law Enforcement Association \(NLLEA\) page](#) for more information on collecting and using Place of Last Drink (POLD) data.

Action 2.3	Support diversion programs like the Driving Under the Influence Program that focus on education over punishment
Key Implementer(s):	DHS, Sonoma County Office of the District Attorney
Timeline:	Ongoing
Progress Metric(s):	Percent of DUI offenders participating in these programs
Implementation Notes:	Seek California Office of Traffic Safety (OTS) grant funding to support and expand these programs.
Action 2.4	Support community-based drug and alcohol problem assessment and treatment programs such as Turning Point
Key Implementer(s):	DHS, Drug Abuse Alternatives Center (DAAC)
Timeline:	Ongoing
Progress Metric(s):	Number of individuals participating in these programs
Implementation Notes:	Seek grant funding to support and expand these programs.
Action 2.5	Expand and promote publicly subsidized transport services to include more night-time hours
Key Implementer(s):	Sonoma County Transit, Santa Rosa CityBus, Sonoma-Marin Area Rail Transit (SMART), Petaluma Transit, Golden Gate Transit
Timeline:	3-5 years
Progress Metric(s):	Number of nighttime service hours
Implementation Notes:	May include on-demand, flexible route, or traditional fixed route service. Adding service hours will require additional funding but will also improve mobility options for low-income individuals who work irregular hours. Additional night-time transit service would also benefit older adults who do not feel safe driving at night. ³¹ Nighttime crashes are the most likely to result in deaths or severe injuries.

³¹ A Sonoma County Area Agency on Aging survey found that 49% of respondents (predominately over age 60), prefer not to drive at night and identified a primary need for additional mobility options during evening hours (Source: *Discovery Report*, 2021). See report summary in Appendix B for more information.

Create a Culture of Safety

Creating a culture of safety involves a variety of measures with a common goal of encouraging safe behavior and instilling a sense of shared responsibility for each other's safety. It is a community-driven goal that requires buy-in and support from diverse stakeholders, elected officials, agency partners, and the media. Many actions focus on youth and young drivers to help develop the next generation of responsible road users. This goal targets dangerous behavior contributing to all four of the top crash factors: impaired driving, unsafe turns, unsafe speed, and right of way violations.

Action 3.1	Develop a network of "civic partners" who pledge to support Vision Zero through the dissemination of safety and educational information to their networks
Key Implementer(s):	Community-based organizations, DHS, VZAC, Sonoma County Safe Streets Coalition, school districts, Office of Education, driver training providers
Timeline:	1-2 years
Progress Metric(s):	Number of civic partners who take the pledge
Implementation Notes:	Includes the creation of a Vision Zero "heart" for the County: a hub of information, resources, and experiences available to partners to draw upon for local efforts.
Action 3.2	Work with media partners to more accurately report traffic crashes to avoid victim-blaming and report crashes in the context of Vision Zero
Key Implementer(s):	DHS, SCTA, SCSO, PDs
Timeline:	Ongoing
Progress Metric(s):	Percent of news articles that connect crashes to systemic and infrastructural issues rather than blaming crash victims
Implementation Notes:	Coverage should focus on systemic issues rather than individual mistakes. ³²

³² For more info on effective media reporting on crashes, see April 4, 2018 article from Columbia Journalism Review: "[When covering car crashes, be careful not to blame the victim](#)".

Action 3.3	Develop comprehensive engagement strategies that prioritize Equity Priority Communities and create personal connections to Vision Zero
Key Implementer(s):	DHS, community-based organizations, Sonoma County Safe Streets Coalition
Timeline:	1-2 years
Progress Metric(s):	Development of strategies
Implementation Notes:	Engagement should highlight the shared responsibility of traffic safety with an emphasis on the harm caused by dangerous driving behavior. Communications can be deployed in high crash areas and at times of the year and times of day when the most severe crashes occur (June and August, Friday to Sunday, 3-5pm for Sonoma County).
Action 3.4	Work with Safe Routes to School (SRTS) program, school districts, and parents to promote safe, active transportation through education, school policies, and pick-up/drop-off procedures
Key Implementer(s):	Sonoma County Office of Education (SCOE), Local School Districts, Sonoma County Bicycle Coalition, Sonoma County Safe Streets Coalition, Sonoma County Safe Routes to School Program
Timeline:	3-5 years
Progress Metric(s):	Number of partner districts and schools involved; Percent of students participating in International Walk and Roll to School Day
Implementation Notes:	Focus on existing SRTS program priorities. Pick-up/drop-off procedures should work to eliminate double parking, stopping on crosswalks, and loading/unloading children at locations across the street from schools. Depending on their age and proximity to school, children should be encouraged to walk, bike, or carpool to school. "Walking School Buses" and "Bike Trains" may be organized to further improve safety and visibility. Funding available through SRTS grants from Caltrans and CMAQ.
Action 3.5	Promote anti-distraction messaging among vehicle fleet operators, including rental car agencies, government agencies, rideshare companies, waste management providers, and shuttle operators
Key Implementer(s):	Sonoma County Transit, Santa Rosa CityBus, Sonoma-Marin Area Rail Transit (SMART), Rental Car Agencies, TPWs, Caltrans
Timeline:	1-2 years
Progress Metric(s):	Number of participating agencies and partners; Number of vehicle fleet operators that have employed anti-distraction messaging; Reduction in crashes associated with distraction of driver
Implementation Notes:	Messaging may be developed as part of larger campaign to create Culture of Safety and overlap with goals in that category. Seek California Office of Traffic Safety (OTS) or National Highway Traffic Safety Administration (NHTSA) grant funding to support and expand these programs.

Action 3.6	Partner with youth organizations to create peer-to-peer anti-distraction messaging campaigns
Key Implementer(s):	Sonoma County Office of Education, Boys and Girls Clubs of Sonoma County, Sonoma County Junior Commission, Sonoma State University, Santa Rosa Junior College
Timeline:	1-2 years
Progress Metric(s):	Development of messaging materials and curriculum; Number of participating organizations/ number of students involved
Implementation Notes:	This action will require significant partnership efforts with local schools and student-led organizations. It should build upon established relationships with student organizations.

[SIDEBAR: Sonoma County's Safe Routes to School (SRTS) program is supported by the SCTA through Measure M and Federal funding and is implemented by the Sonoma County Bicycle Coalition. The mission is to encourage safe walking, bicycling, and alternative transportation use for K-8 students. In the 2019-2020 school year, SRTS provided technical support and programming to 63 schools, including promotional resource kits, art contests, recommended book lists, and events. International Walk and Roll to School Day is an annual event produced by the SRTS Program that takes place in October, which encourages students to safely walk and bike to and from school, and educates parents, school officials, and staff about the benefits of walking and biking to school.

Utilizing the knowledge and skills of the Sonoma County Bicycle Coalition, the SRTS provides Pedestrian and Bicycle Safety training to elementary and middle school students across Sonoma County. At the elementary school level SRTS provides pedestrian safety training to 2nd (or 3rd) graders, bicycle basics training – including an on-bicycle safety skill class called a “Bike Rodeo” to 4th graders, active transportation communication & mapping lessons to 5th graders, and “Drive Your Bicycle” classes and/or Bike Clubs for middle school students. In addition, the Safe Routes to School program provides bicycle safety/skill training to the community at large through Family Bicycle Workshops, Learn to Ride classes, Fun & Educational Family Rides, Community Bicycle Rodeos, and even a Kids Bike Adventure Camp. In a typical school year, close to 20,000 Sonoma County students are reached with SRTS encouragement and/or education programming or events.]

Build Safe Streets for All

Building safe streets in Sonoma County means ensuring that streets are designed to encourage safe behavior and reduce conflicts between users. This goal was identified as the most important step toward Vision Zero by 67% of survey respondents. Depending on the crash profiles of particular locations, infrastructural countermeasures can also address specific crash types—such as left turn conflicts or fixed object crashes—in a systematic and cost-effective way. Street profiles should also respond to the surrounding land uses and activities, making it easier and more attractive for people to walk, roll, bike, and take transit.

Action 4.1	Update street design standards to reflect the latest research and best practices around safety and Complete Streets, with an emphasis on serving diverse road users of all ages and abilities
Key Implementer(s):	TPWs
Timeline:	1-2 years
Progress Metric(s):	Number of Sonoma County jurisdictions that have updated street design and construction standards
Implementation Notes:	Make these standards reflect the goals of the county's Complete Streets Policy. Refer to standards from the National Association of City and Transportation Officials (NACTO). For example, typical cross sections should specify lane widths narrower than 12' in most cases and standard bicycle facility for high volume, high speed roads should be separated or protected. See new Caltrans Complete Streets policy outlined in DP-37, effective 12/7/21, and forthcoming MTC Complete Streets policy.
Action 4.2	Deploy a toolbox of multi-modal safety design elements and countermeasures to systemically address high-risk intersections and corridors³³
Key Implementer(s):	TPWs
Timeline:	3-5 years, ongoing
Progress Metric(s):	Percent of high injury intersections and corridors that have received countermeasures
Implementation Notes:	Examples of proven countermeasures include longitudinal dedicated turn lanes/phases, leading pedestrian intervals (LPIs), pedestrian refuge islands, chevron signs along roadway curves, corridor access management, walkways, and roadway reconfigurations ("road diets"). There are also countermeasures such as rumble strips, roundabouts, and intersection lighting that are particularly effective at reducing crashes on rural roadways. Toolbox can be incorporated into Local Road Safety Plans (see Action 4.8).

³³ See Caltrans Pedestrian Safety Countermeasures Toolbox (June 2019).

Action 4.3	Create a dedicated funding stream for projects designed to meet Vision Zero safety goals and prioritize projects in Equity Priority Communities
Key Implementer(s):	SCTA, TPWs
Timeline:	3-5 years, ongoing
Progress Metric(s):	Dollars invested in Vision Zero infrastructure projects (with x1.5 multiplier for dollars invested in Equity Priority Communities)
Implementation Notes:	Measure M, TDA3, TFCA, OBAG 3, CMAQ, SRTS.
Action 4.4	Identify and implement road safety improvements through routine resurfacing processes
Key Implementer(s):	TPWs
Timeline:	1-2 years, ongoing
Progress Metric(s):	Percent of resurfacing projects that have included safety improvements
Implementation Notes:	Installing safety improvements as part of the resurfacing process is substantially more cost-effective. Improvements can be as simple as installing new markings for high visibility crosswalks, bike lanes, and edge lines or flush medians to narrow lane widths.
Action 4.5	Establish a multidisciplinary rapid response team to evaluate and address fatal and severe injury crashes and crash sites
Key Implementer(s):	TPWs, SCSO, PDs
Timeline:	1-2 years
Progress Metric(s):	Percent of fatal and severe injury crash sites analyzed and percent to receive interventions
Implementation Notes:	The rapid response team should also propose and implement short-term and/or pilot interventions to address the contributing factors behind the crash.

Action 4.6	Close gaps in bicycle and pedestrian networks and design facilities for all-ages and all abilities
Key Implementer(s):	SCTA, TPWs
Timeline:	5-10 years
Progress Metric(s):	Miles of new and upgraded bike and pedestrian facilities that connect to existing facilities; Increase in mileage of low stress bicycle facilities, such as separated paths, bicycle boulevards, and separated bikeways
Implementation Notes:	Sonoma County has built 75 miles of bicycle infrastructure in the last 5 years and has nearly 1,000 miles of bicycle and pedestrian infrastructure currently planned. Near-term investments should prioritize closing gaps and addressing high injury intersections/corridors, which are also priorities for MTC funding. SCTA plans to develop a Countywide Active Transportation Plan which will focus on defining a connected network of low stress bicycle facilities for Sonoma County.
Action 4.7	Adopt guidelines for the installation of marked pedestrian and bicycle crossings, including crossing enhancements, based on vehicle speeds and volumes, street characteristics, transit stops, and other factors
Key Implementer(s):	SCTA, TPWs
Timeline:	1-2 years
Progress Metric(s):	Guidelines developed
Implementation Notes:	For uncontrolled pedestrian crossings, see FHWA STEP Guide ³⁴ . Crossing enhancements could include Pedestrian Countdown Signals, high visibility crosswalks, bicycle conflict markings, Leading Pedestrian Intervals, and Rectangular Rapid Flashing Beacon (RRFB) for unsignalized crossings. Criteria could also include crash data though it can give an incomplete picture due to low sample sizes for specific intersections.

³⁴ Federal Highway Administration Office of Safety, *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (FHWA-SA-17-072), 2018.

Action 4.8	Complete Local Road Safety Plans (LRSPs)
Key Implementer(s):	Local jurisdictions
Timeline:	3-5 years
Progress Metric(s):	Number of Sonoma County jurisdictions that have completed LRSPs
Implementation Notes:	The process of preparing an LRSP creates a framework to systematically identify and analyze safety issues and recommend improvements, resulting in a prioritized list of improvements and actions. LRSPs are required to qualify for Highway Safety Improvement Program (HSIP) funds. They may include systemic safety analysis based on roadway and built environment characteristics to proactively target interventions at intersections and corridors the data shows to be high risk for pedestrians, bicyclists, and other vulnerable roadway users.
Action 4.9	Research and consider reinstating and expanding Automated Traffic Enforcement (ATE) as a strategy to reduce red light running
Key Implementer(s):	Sonoma County Office of the District Attorney, SCSD, PDs
Timeline:	3-5 years
Progress Metric(s):	Number of locations in high injury network with ATE
Implementation Notes:	Ticket revenue should be dedicated to particular Vision Zero efforts, such as building safer streets. Be mindful that the locations do not place a disproportionate burden on low-income communities. Consider tiered fines based on ability to pay. May require additional staffing of a sworn officer to review video footage. Pending approval by the state legislature, also explore Automated Speed Enforcement (ASE) at key locations such as schools located on the high injury network. A.B. 550, a 2021 bill that would have created a speed camera pilot program, was not passed by the State Legislature this year.

[Option to add an additional action around maintenance, which came up in the survey as the top traffic safety issue facing Sonoma County today]

[SIDEBAR: What is an LRSP? Federal regulations require each State to have a Strategic Highway Safety Plan (SHSP). An SHSP is a statewide data-driven traffic safety plan that coordinates the efforts of a wide range of organizations to reduce traffic accident fatalities and serious injuries on all public roads. While the SHSP is used as a statewide approach for improving roadway safety, A Local Road Safety Plan (LRSP) can be a means for providing local and rural road owners with an opportunity to address unique highway safety needs in their jurisdictions while contributing to the success of the SHSP. The process of preparing an LRSP creates a framework to systematically identify and analyze safety problems and recommend safety improvements. Preparing an LRSP facilitates the development of local agency partnerships and collaboration, resulting in a prioritized list of improvements and actions that can demonstrate a defined need and contribute to the statewide plan. The LRSP offers a proactive approach to addressing safety needs and demonstrates agency responsiveness to safety challenges.]

Make Vehicles Safer

Motor vehicles are large, heavy, and fast, making them inherently dangerous to other road users. This goal focuses on making sure that the vehicles on Sonoma County roads are designed to reduce the likelihood of driver error resulting in a fatality or severe injury.

Action 5.1	Install side guards on all large County- and city-owned fleet and require entities contracting with Sonoma County or local jurisdictions to have side guards on a certain proportion of their fleet over 10,000 lbs.
Key Implementer(s):	Sonoma County Transit, Santa Rosa CityBus, Sonoma-Marin Area Rail Transit (SMART), TPWs, Caltrans
Timeline:	1-2 years
Progress Metric(s):	Percent of fleet vehicles over 10,000 lbs. with side guards installed; Contracting requirement instated
Implementation Notes:	Side guards, also known as “lateral protective devices”, keep pedestrians, bicyclists, and motorcyclists from being run over by a large truck’s rear wheels in a side-impact collision. ³⁵ Also install crossover mirrors for vehicles for which they would improve visibility. There are currently no Federal regulations governing the use of sideguards but could look to recent municipal policies in Boston, Portland, DC, and Cambridge, Mass.
Action 5.2	Adopt guidelines for incorporating safety features in specifications for new fleet vehicles purchases
Key Implementer(s):	Sonoma County Transit, Santa Rosa CityBus, Sonoma-Marin Area Rail Transit (SMART), TPWs, Caltrans
Timeline:	1-2 years
Progress Metric(s):	Establishment of guidelines
Implementation Notes:	Safety features may include forward collision warning and mitigation systems, electronic stability control, driver alert systems, adaptive cruise control, rear-view cameras, and GPS based monitoring of driving behavior.

³⁵ See the Volpe Center’s [lateral protection devices webpage](#) for more information on side guards, research on their efficacy, and resources for implementers.

Action 5.3	Advocate for an automated mobility policy framework that advances Vision Zero safety goals
Key Implementer(s):	Local elected officials
Timeline:	3-5 years
Progress Metric(s):	Adoption of automated mobility policy frameworks at county and state levels
Implementation Notes:	Maximum autonomous vehicle (AV) operating speeds must be set at legal limits. AV vehicles must share data, including crash and near miss reports, with local jurisdictions. See NACTO's Blueprint for Autonomous Urbanism ³⁶ and Seattle New Mobility Playbook ³⁷ .

³⁶ National Association of City Transportation Officials (NACTO), Blueprint for Autonomous Urbanism, Second Edition, 2019.

³⁷ See Appendix C: Preliminary Automated Mobility Policy Framework. Seattle Department of Transportation, New Mobility Playbook, 2017.

Improve Data for Effective Decision Making

Improving the scope and quality of crash data helps planners, engineers, and policy makers to make better decisions about resource allocation and facility design.

Action 6.1	Maintain and update the Sonoma County Vision Zero Data Dashboard for all crash and safety data on the Vision Zero website
Key Implementer(s):	SCTA
Timeline:	Ongoing, 0-2 years
Progress Metric(s):	Completion of yearly update and periodic
Implementation Notes:	Improvements may include an expanded data portal and clearinghouse
Action 6.2	Provide annual citation data for infractions that potentially lead to severe injuries and deaths, such as impaired driving, speeding, and failure to yield
Key Implementer(s):	SCSO, PDs
Timeline:	1-2 years, ongoing
Progress Metric(s):	Provision of data
Implementation Notes:	This data can be used to analyze the effectiveness of Vision Zero education, outreach, and other investments that target these behaviors. Data could be summarized in a new section in the VZ story map.
Action 6.3	Analyze annual citation data to determine if particular groups are being disproportionately targeted
Key Implementer(s):	SCSO, PDs
Timeline:	1-2 years, ongoing
Progress Metric(s):	Percentage of annual citations for people of color compared to County-wide statistics
Implementation Notes:	Extensive quantitative analysis has revealed racial disparities in traffic enforcement. ³⁸

³⁸ See Stanford Open Policing Project data and findings: <https://openpolicing.stanford.edu/>.

Action 6.4	Use Portrait of Sonoma County, hospital trauma, and health center data in identifying underlying elements related to safety and mobility
Key Implementer(s):	DHS, Sonoma County Hospitals and Trauma Centers
Timeline:	3-5 years
Progress Metric(s):	Identification of elements related to safety and mobility
Implementation Notes:	Continue to investigate and incorporate health service provider data into the data dashboard as these data resources are developed and integrated with other crash and safety data resources. Can also help to understand the degree of underreporting of crashes.
Action 6.5	Deliver a training module for Sonoma Sheriff's Office and local Law Enforcement personnel responsible for crash reporting that addresses the unique attributes required to accurately report circumstances of crashes involving bicyclists, pedestrians, and other vulnerable road users
Key Implementer(s):	SCSO, PDs
Timeline:	3-5 years
Progress Metric(s):	Training module is developed and delivered; Number of annual participants attending the training
Implementation Notes:	Training should focus on accurately reporting crashes involving vulnerable users. ³⁹ See Model Minimum Uniform Crash Criteria (MMUCC) for guidance on collecting quality crash data. As more PDs move toward electronic reporting, there may be opportunities to supplement Form 555 with fields for accurately identifying unmarked crosswalks, assigning right-of-way violations properly, bicycle and pedestrian location (relative to infrastructure that is present), pre-crash actions, and other aspects of these crashes that are critical in safety analysis.

³⁹ Example training modules include NHTSA's "[Pedestrian Safety Training for Law Enforcement](#)" and the State of Massachusetts's online "[Crash Reporting Training](#)".

Action 6.6	Use regional data sources such as the Metropolitan Transportation Commission's Regional High Injury Network and Regional Safety Data System, and Caltrans District 4 location-based needs identified by their active transportation planning efforts to inform safety project development and funding decisions
Key Implementer(s):	SCTA, TPWs
Timeline:	3-5 years
Progress Metric(s):	Integration of regional data sources into Sonoma County planning and prioritization frameworks
Implementation Notes:	There will be potential funding opportunities attached to MTC's Regional High Injury Network.

5. What's Next?

Holding Ourselves Accountable

This Vision Zero Action Plan represents a commitment to an initial set of actions addressing Sonoma County's highest priority traffic safety issues. Implementing these actions will require collaboration between all the Key Implementers listed above as well as other supporting organizations and government agencies. It will also require the support of people who live, work, and visit Sonoma County.

Evaluating Our Efforts and Progress Towards Vision Zero

Tracking and evaluating our progress towards Vision Zero will occur at both the local and the countywide level. At the local level, each jurisdiction, including the County of Sonoma, will track their progress across key actions, such as updating standards, implementing safety improvements and speed mitigation measures, and retrofitting fleet vehicles. This will be done through a standardized Vision Zero tracking tool.

At the countywide level, SCTA will aggregate this data with their existing data on transportation projects to provide a picture of countywide progress towards these engineering and infrastructure-oriented goals. SCTA will also continue to update the Vision Zero [Data Dashboard](#) and report out key findings through the associated [Story Map](#). This crash data will provide the key indicator of Sonoma County's progress toward Vision Zero: fatal and severe injury crashes per year. We will also use the Data Dashboard to monitor particular subsets of crashes to evaluate our progress in particular areas, including:

- Crashes involving bicycle and pedestrians
- Crashes resulting from impaired driving
- Crashes resulting from unsafe speeds
- Crashes in rural versus urbanized areas
- Crashes occurring on roadways in Equity Priority Communities

SCTA will add also additional sections to the Story Map to spotlight local projects and track other key countywide actions, including:

- Expansion and promotion of programs to combat impaired driving (Actions 2.1, 2.2, 2.3, 2.4)
- Implementation of countywide Vision Zero outreach and education programs that encourage safe behavior and create personal connections to Vision Zero (Actions 3.1, 3.3, 3.5, 3.6)
- Establishment of a dedicated funding stream for Vision Zero infrastructure projects (Action 4.3)
- Advocating for an automated mobility framework that advances Vision Zero safety goals (Action 5.3)
- Integration of new data sources to analyze safety and equity issues (Actions 6.2, 6.3, 6.4)

Future Trends and Uncertainties

Sonoma County anticipates changes in the next few decades that have significant implications for transportation safety. Over the next 30 years, the County's population is forecast to grow from under 500,000 people to over 600,000, representing an additional 32,000 households. The County workforce will also increase, potentially adding 30,000 new jobs (with jurisdictions' general plans reflecting a desire for up to 100,000). Together, this increase in population and employment will greatly increase travel activity on the County's transportation system. Total VMT is forecast to increase by 20 percent per day, even as local development and increases in nearby jobs may reduce VMT per capita by approximately 10 percent. Increased traffic volumes have the potential to increase the number and rate of crashes, unless paired with efforts to improve safety and invest in improvements to other travel modes. By 2050, the proportion of County residents ages 65 and older is expected to rise from 22 percent to 31 percent.⁴⁰ As people age, cognitive changes can reduce driving ability and safety; availability of other travel modes plays a key role in allowing older adults to age in place while meeting their needs.

While demographic trends and travel models can provide some insight into the direction and degree of change in travel patterns, many factors cannot be easily predicted. The recognized need to prevent severe global warming – and to adapt to climate changes that are already occurring – may bring about policy changes to how California prices, invests in, and incentivizes different ways of traveling. As technologies like intelligent transportation systems (ITS), electric vehicles, autonomous vehicles, micro-transit, and e-bikes are developed, piloted, and deployed, they can alter the safety and efficiency of the transportation system in both planned and unexpected ways. Disruptive events like the COVID-19 pandemic and the Tubbs Fire of 2017—and successive wildfires in Sonoma County—can create rapid changes in population, growth, goods movement, and travel, with long-term effects that are difficult to predict. Creating safe systems will require Sonoma County and its communities to invest in solving the safety problems of the day, while anticipating different future scenarios and preparing to monitor events as they unfold.

Pandemic related travel patterns

The shelter-in-place orders and other public health policies and practices implemented during the Covid-19 pandemic resulted in travel patterns different from those during pre-pandemic times. In 2020 and part of 2021 walking and bicycling activity increased in many communities, and in most places, commute traffic and transit ridership significantly decreased. Some cities created temporary facilities to accommodate the growing demand for space for walking and bicycling. It is possible that many of these temporary facilities will remain permanent. This, coupled with the growing use of electric bicycles, suggests that the increased walking and bicycling activity observed during the pandemic may remain into the future.

In the second half of 2021, as many employees returned to work and students went back to school, travel patterns shifted closer to pre-pandemic trends. In many metropolitan areas, evening rush hour is similar to pre-pandemic volumes, while the morning rush hour is more dispersed than before the

⁴⁰ Source: U.S. Census and California Department of Finance via Sonoma County Transportation Authority (SCTA) Comprehensive Transportation Plan, *Moving Forward 2050*.

pandemic. By 2050, freight traffic is projected to triple worldwide.⁴¹ These patterns suggest that the safety concerns and trends present before the pandemic will likely continue to be important as daily life and travel patterns slowly return to pre-pandemic times. In addition, if freight traffic and walking and bicycling activity continues to increase, providing adequate separation between vehicles and vulnerable road users and encouraging safe travel behaviors will be increasingly important to achieve Vision Zero.

Introduction of autonomous vehicles

In the future, the integration of autonomous vehicles onto Sonoma County's roadways may improve safety for all road users. Autonomous vehicles can use vehicle sensors, advanced mapping technology, and on-board messaging to improve safety and reduce crashes associated with several different contributing factors. For example, autonomous vehicles will likely reduce crashes associated with certain driver behaviors, such as driving while impaired, distracted, or tired; or failure to obey traffic laws (e.g., red-light running and speeding). Law enforcement and other crash investigators may also be able to extract new details about crashes from autonomous vehicles that will improve our understanding of pre-crash events.⁴² Researchers estimate that autonomous vehicles may reduce crash rates by 34 to 90 percent.⁴³ This large range highlights the current uncertainty of the impact of autonomous vehicles on roadway safety overall.

It is also possible that the nature and convenience of autonomous vehicles will result in more cars on the road and an increase in VMT, and thus increased opportunities for crashes. Autonomous vehicles may allow children, the elderly, and disabled, who may not otherwise have traveled alone to have more mobility independence.⁴⁴ Typical drivers may also travel more because they can be more productive with their time in a vehicle. These are all important benefits of autonomous vehicles, but without proper policies and infrastructure improvements, the increased traffic volume could have negative impacts on traffic safety, particularly among people walking and bicycling.

While autonomous vehicles have many benefits, they will not reduce all crashes, and more importantly to this plan, the full benefits of autonomous vehicles will only be realized after the majority, or all vehicles on the road are autonomous. It will be a long time, possibly 20 to 50 years before most vehicles on the road are autonomous.⁴⁵ It will also take a long time for these vehicles to become affordable for most of the population, suggesting that the benefits associated with these vehicles may not be evenly distributed throughout a community. This plan anticipates future developments with autonomous vehicles but primarily responds to current roadway safety trends

⁴¹ Organization for Economic Cooperation and Development (OECD), ITF Transport Outlook 2019, www.oecd-ilibrary.org/sites/transp_outlook-en-2019-en/index.html?itemId=/content/publication/transp_outlook-en-2019-en

⁴² Governor Highway Safety Association. Preparing for Automated Vehicles: Traffic Safety Issues for States." 2018. https://www.ghsa.org/sites/default/files/2018-08/Final_AVs2018.pdf

⁴³ Victoria Transport Policy Institute. Autonomous Vehicles Implementation Predictions. November 5, 2021. <https://www.vtpi.org/avip.pdf>.

⁴⁴ Governor Highway Safety Association. Preparing for Automated Vehicles: Traffic Safety Issues for States." 2018. https://www.ghsa.org/sites/default/files/2018-08/Final_AVs2018.pdf

⁴⁵ Victoria Transport Policy Institute. Autonomous Vehicles Implementation Predictions. November 5, 2021. <https://www.vtpi.org/avip.pdf>.

and concerns. Future policies should ensure that autonomous vehicles are adopted and used in a way that encourages safe travel and minimizes increases in VMT.

Conclusion and Vision Zero Pledge

While we don't know what exactly the future of transportation will look like for Sonoma County, we do know what we must do now to work towards our goal of eliminating traffic fatalities and severe injuries by 2030. The goals and actions laid out in this plan chart a course toward our Vision Zero goal, but it will also take collective action from all of us. By pledging to make safe decisions and look out for one another, we can help to make Sonoma County roads safer for everyone.

Sonoma County Vision Zero Pledge

- I will drive at safe speeds
- I will not drive or ride a motorcycle, bicycle, or scooter while under the influence of drugs or alcohol
- I will not use my phone or other distracting devices while driving, riding a motorcycle, bicycle, or scooter, or walking
- I will look out for others and be considerate, especially when driving in areas where people are walking or bicycling
- I will follow the rules of the road and yield to slower traffic at crossings and on paths and trails
- I will share this pledge with my family, friends, and neighbors

[Final image idea: photo or story about a family, school district, or community coming together to promote safety in Sonoma County]

6. Acknowledgments

Project Team

Sonoma County Transportation Authority

- Janet Spilman
- Christopher Barney
- Tanya Narath

Sonoma County Department of Health Services

- Kristin Thigpen
- Laurel Chambers
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- Toole Design
- MIG

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7. Appendices

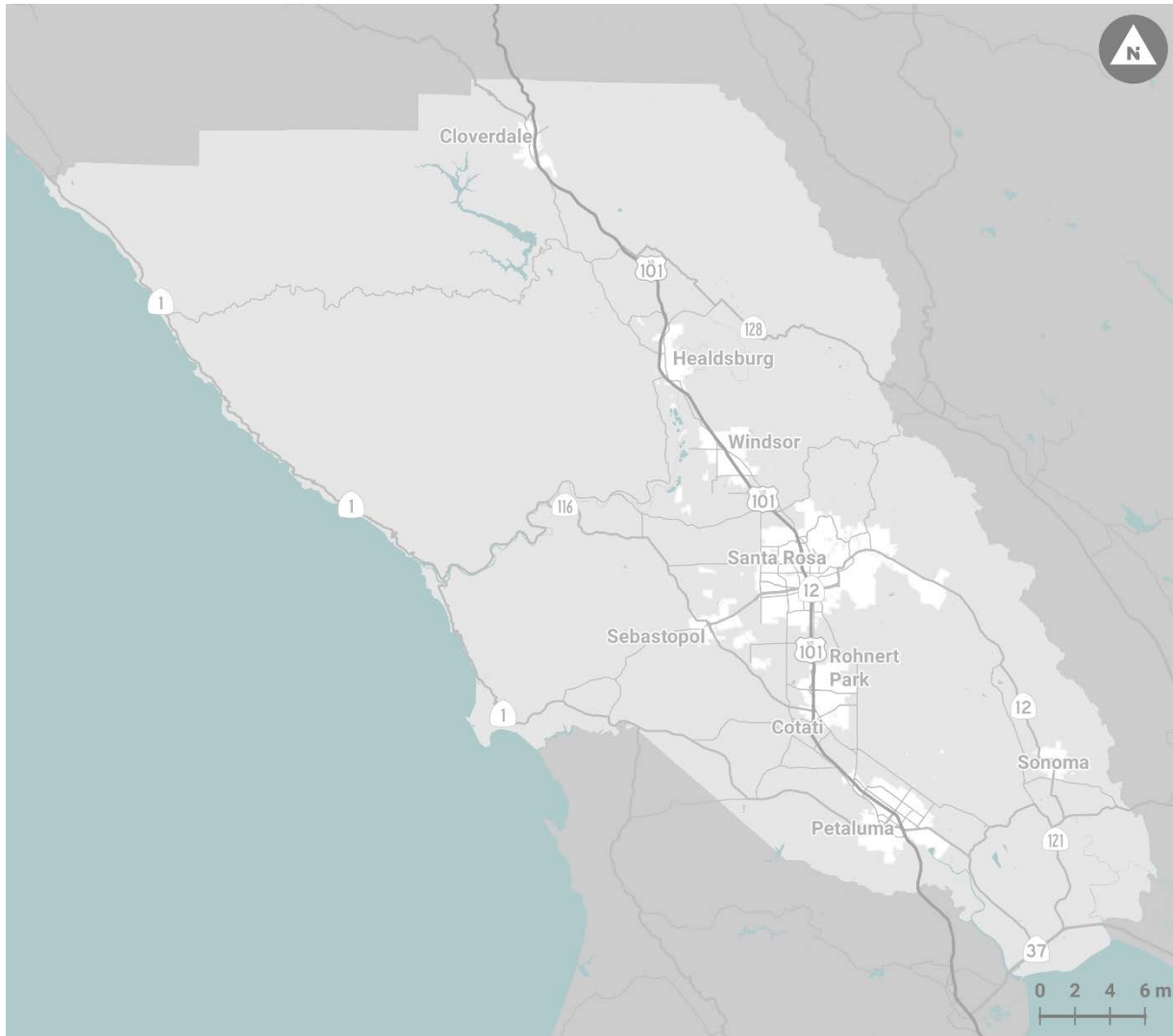
Appendix A: Transportation Context and Travel Patterns in Sonoma County⁴⁶

Roads

Most Sonoma County residents and visitors travel using its 2,670 miles of public streets, roads, and highways. State highways represent less than one-tenth of all public roadway miles within the county but carry over half of its daily vehicle miles traveled (VMT) due to their key role in providing intercity and regional connections. Highway 101 serves as the central north-south corridor, connecting seven of the county's nine cities, while Highway 1 links coastal communities and destinations. State Routes 12, 37, 116, 121, and 128 provide cross-county connections (see Figure 14). County-owned roads in rural and unincorporated areas make up the majority of the roadway system, followed by city-owned roads and streets.

⁴⁶ Data and analysis of Sonoma County's transportation network, trends, and issues draws primarily on the Sonoma County Transportation Authority (SCTA) Comprehensive Transportation Plan, *Moving Forward 2050*. Other sources are noted where used.

Figure 14: Major roads and jurisdictional boundaries in Sonoma County

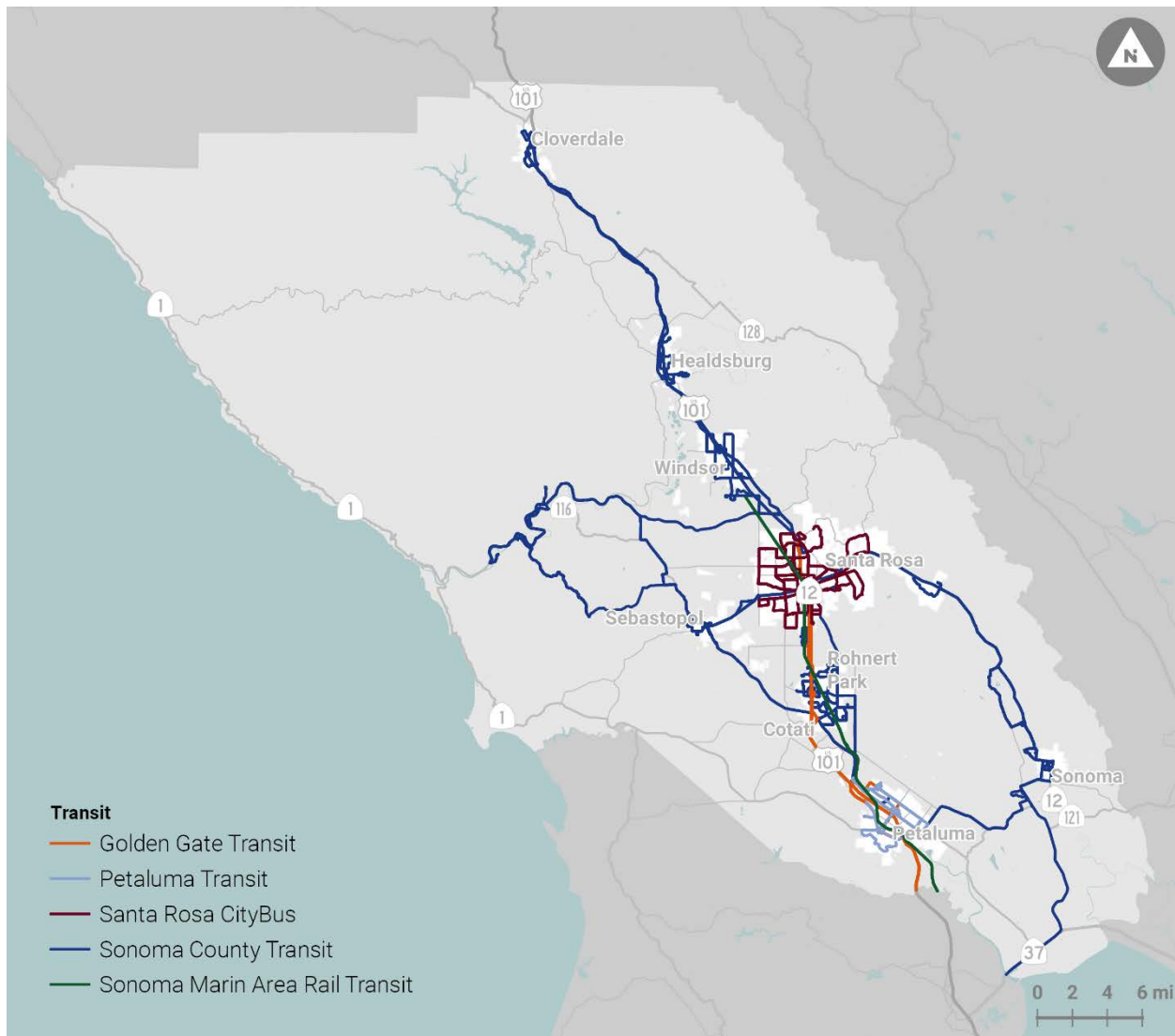


Public Transportation

Multiple transit agencies serve Sonoma County. Local and intercity buses operated by [Sonoma County Transit](#) serve all cities and towns in the County, as well as unincorporated areas between communities. [Santa Rosa CityBus](#) and [Petaluma Transit](#) each provide additional local service within their cities. For intercity commuters, [Sonoma-Marin Area Rail Transit \(SMART\)](#) provides train service to twelve stations connecting the [Sonoma County Airport](#) to the Larkspur Ferry Terminal in Marin County. [Golden Gate Transit](#) operates two commuter bus lines along Highway 101, with connections to East Bay routes. The [Mendocino Transit Authority](#) operates one route that links Santa Rosa to coastal communities in Sonoma and Mendocino counties, and a second linking Santa Rosa directly to central Mendocino County cities via the Highway 101 corridor. Several bus operators also provide paratransit services (curb-to-curb rides for people with disabilities) within a ¾ mile radius of their existing fixed-route services.

In 2019, people made 4.4 million rides on the County’s public transit routes, 84 percent via bus and 16 percent via rail. Surveys conducted on transit routes in 2018 found that approximately three in four bus riders and one in four train riders were very low income, and a significant portion did not have access to vehicles. Many high school and college students rely on transit, as do people with disabilities who cannot drive.

Figure 15: Transit routes in Sonoma County



Walkways and bikeways. All of Sonoma County’s jurisdictions have adopted “Complete Streets” policies, which require that they design transportation projects for the safety and convenience of

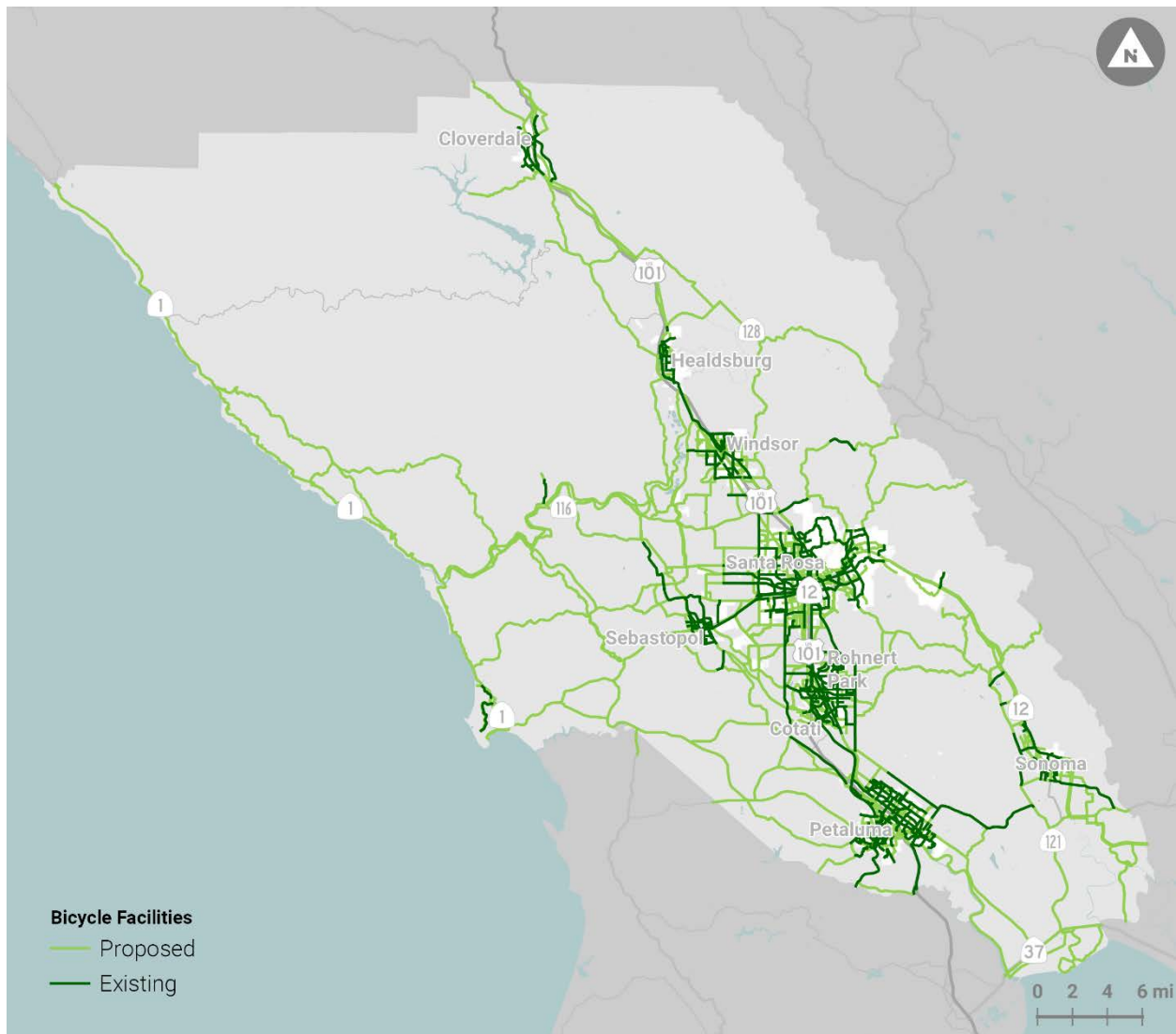
people walking,⁴⁷ bicycling, and taking transit as well as driving. Paired with transportation and land use policies that prioritize walking, bicycling, and access to transit in active mixed-use districts, these efforts have increased opportunities to walk and bike comfortably in the County's communities.

Walkways include a range of infrastructure such as sidewalks, trails, curb ramps, and crossings. When paired with landscaping, trees, lighting, and street furniture, these become comfortable for users of all ages. The Americans with Disabilities Act of 1990 requires jurisdictions to meet accessibility requirements as they build new pedestrian facilities or update old ones. These improvements are essential to providing fair access for people with sensory or mobility disabilities, but they also increase comfort and safety for people of all ages and abilities. With no countywide data set capturing all routes, gaps, and deficiencies in the pedestrian network, it is challenging to know where the current transportation system meets the needs of people walking.

Currently the County's bicycle system includes 208 miles of bikeways of various types, with bike lanes being the most common. Bikeway designs should be chosen to match their context. For example, a design that offers protection and separation increases safety for people bicycling on high-speed roads with higher traffic volumes, while many riders may comfortably use the travel lane on a quiet, slow-speed neighborhood street. Other elements like bicycle-activated signal detection, bicycle parking, traffic calming, and signage support safe and convenient bikeways. More than 1,000 additional miles of bikeways are planned and awaiting funding.

⁴⁷ This action plan defines *walking* and *pedestrian* as including people who use mobility aids such as wheelchairs, scooters, and walkers.

Figure 16: Bicycle facilities in Sonoma County



Current Travel Patterns

Over the course of the typical week, people make 1,648,000 trips on or through Sonoma County. Nine in ten of these trips take place entirely within the County's borders, indicating that residents meet the majority of their daily needs without needing to travel to neighboring counties. Incorporated cities and towns serve as the origin or destination for most trips, and trips contained within the City of Santa Rosa account for 44 percent of all vehicle trips in the County. Most trips are made by vehicle – and most of those by driving alone – while active travel modes such as walking, biking, or taking transit represent less than 10 percent of all trips.

On average, commute trips are twice the length (in both duration and distance) of trips made for other purposes. Over the last 40 years, Sonoma County workers have become increasingly likely to commute by driving alone, and a small but increasing share of workers have eliminated commutes by working from home. Carpool, transit, and walk and bike rates have all dropped for commute trips.

While travel to work and school can often be foremost in people's minds due to its regularity and the need to arrive on time, these trips represent just over 25 percent of all weekly travel in Sonoma County. Most trips are made for other reasons, such as shopping, medical appointments, and social or recreational activities. These trips are typically shorter, less consistent in time and day of the week, and often involve multiple people traveling together in a vehicle.

People who live outside the County account for a significant share of travel activity on the County's transportation network. Mobile device shows that 18 to 24 percent of all County trips are made by people who live elsewhere, with higher levels occurring on the weekends. Unsurprisingly, they typically travel longer distances than County residents, with average trip lengths of 20 to 30 miles.⁴⁸

⁴⁸ Sources: Sonoma County Transportation Authority (SCTA) Comprehensive Transportation Plan, *Moving Forward 2050* and Sonoma County Transportation Authority, *Sonoma County Travel Behavior Study*, 2020.

Appendix B: Related Road Safety Plans and Efforts

Moving Forward 2050 (Sonoma County Comprehensive Transportation Plan)

The 2021 Comprehensive Transportation Plan (CTP) establishes a vision of connecting people and places as Sonoma County transitions to a zero-emissions future. Key actions in the plan include implementing a Vision Zero policy and setting clear strategies to achieve the goal of zero fatalities and severe injuries.

Local Road Safety Plans

Many jurisdictions in Sonoma County are working on Local Road Safety Plans (LRSP). These plans are developed with the collaboration of various city departments, local agencies, and organizations. They identify, analyze, and prioritize roadway safety improvements within a particular jurisdiction. They reveal systemic crash patterns and crash locations throughout the city and propose a toolbox of countermeasures to address these patterns. Prepared in compliance with State and Federal guidelines, the LRSPs provide the necessary data to support current and future applications for Highway Safety Improvement Program funding (HSIP) to build the proposed safety improvements.

The Cities of [Cotati](#), [Healdsburg](#), [Petaluma](#), [Rohnert Park](#), and the Town of [Windsor](#) have all developed or are developing LRSPs at this time.

Sonoma County Bicycle and Pedestrian Plan

This 2014 plan includes projects, programs, and policies that work together to provide safe and efficient transportation opportunities for bicyclists and pedestrians in Sonoma County. Recommendations included over 1,000 miles of new bicycle and pedestrian facilities across all jurisdictions.

Local Bicycle and Pedestrian Plans

Following the SCTA's 2014 Countywide Bicycle and Pedestrian Master Plan many jurisdictions in Sonoma County also developed bike plans which could be added to the countywide plan and serve as standalone documents for their community. Since 2008 [Healdsburg](#), [Windsor](#), and [Cotati](#) have developed bicycle and pedestrian plans to guide and implement local projects and programs. Key objectives across all plans include creating countywide pedestrian and bicycle networks that are safe and secure, reducing automobile crashes with pedestrians and bicyclists, and developing public outreach materials to promote bicycle and pedestrian safety and the benefits of active transportation.

Santa Rosa Bicycle and Pedestrian Master Plan

This 2018 plan sets a long-range vision for improving walking and bicycling in the city of Santa Rosa. Key goals include increasing access and comfort, maintaining and expanding the network, and supporting a culture of walking and biking. The plan also lays out specific recommendations to develop a comprehensive Vision Zero strategy and identify a HIN as a foundation for a future countywide Vision Zero Action Plan.

Sonoma County Area Agency on Aging Discovery Report

As part of the Sonoma County Connected Communities Transportation Study, this 2021 report provides a comprehensive needs assessment and action plan to identify strategies to deliver transportation services to older adults and people with disabilities, with a focus on low-income and geographically isolated individuals. The Sonoma County Area Agency on Aging (AAA) conducted five focus groups, a dozen key informant interviews, and a survey with over 500 responses. The respondents were predominately older adults with a large majority (93%) over 60 years old. The study identified several primary mobility needs that relate to Vision Zero, including a need for better connections to the fixed-route transit network, improved transit during evening hours and other medical discharge times, and inconsistent and unaffordable transit fares.

MTC Vision Zero Effort for San Francisco Bay Area

The Bay Area Metropolitan Transportation Commission established a Regional Safety/Vision Zero Policy in 2020 and has been working on the Regional High Injury Network and Regional Safety Data System, which aims to enhance local jurisdiction's access to reliable and consistent data, help communities use this data to develop regional policies, and ultimately support jurisdictions by providing technical assistance with safety planning.

Caltrans District 4 Bike and Pedestrian Plans

These plans build on the California State Bicycle and Pedestrian Plan with the vision of people in California of all ages, abilities, and incomes being able to safely, conveniently, and comfortably walk and bicycle for their everyday transportation needs. Key emphasis areas in both plans include designing safer and more intuitive highway crossings and interchanges, and engaging with low-income, minority, rural, and tribal communities during planning and project development to address issues affecting those communities. The Pedestrian Plan also specifically encourages partner jurisdictions to develop Vision Zero Action Plans and highlights the Caltrans Toward Zero Deaths goal as the agency's expression of the Vision Zero approach.

California Highway Safety Improvement Program (HSIP)

The Highway Safety Improvement Program (HSIP) is a core federal-aid program under the 2015 Fixing America's Surface Transportation (FAST) Act. The purpose of the HSIP is to achieve a significant reduction in traffic fatalities and severe injuries on all public roads.

California Strategic Highway Safety Plan (SHSP)

A key component of the HSIP is a Strategic Highway Safety Plan which identifies California's key safety needs and guides investment decisions towards strategies and countermeasures with the most potential to save lives and prevent injuries. The 2020-2024 CA HSIP includes recommendations to establish a preferred methodology for developing a HIN for bicyclists and pedestrians and developing a community-stakeholder education toolkit to increase awareness for the role motor-vehicle speed plays in severe and fatal crashes.

Appendix C: High Injury Network and Intersection Methodology

In an effort to help the Sonoma County Transportation Authority (SCTA) understand and visualize high injury location within the County, Toole Design conducted both a high injury network (HIN) and a high injury intersection (HII) analysis. This memorandum describes the methodology for these analyses.

High Injury Network (HIN)

At the broadest level, a HIN analysis is a systematic process for identifying segments of a road network where users are at higher risk. This is achieved by examining the location, frequency, severity, and mode of collisions along the road network. This processed collision information is then spatially aggregated along the network using a 'moving window' analysis to develop relative collision scores, from which a subset of 'high injury' segments are classed as the high injury network. While there are several different methodologies used to identify high risk locations, moving windows analyses are often used because they allow us to generalize the locations of crashes, reflecting the stochasticity in where crashes occur, while still respecting the fact that locations along corridors tend to share characteristics. Many public agencies use this approach to identify areas to prioritize safety investments.

The following sections outlines how the data is used, and the approach used to develop the HIN.

Preparation of the Collision Data

The first step of the HIN analysis is to prepare the collision data. For this HIN analysis, the same collisions that were used for the rest of the Sonoma County Vision Zero Data Dashboard were used. Those were collisions from a 5-year period (2015-2019) within the county, for all injury and fatality collisions (all collisions except property damage only), as provided by the [Transportation Injury Mapping System](#) (TIMS) from the University of California – Berkeley.

Mode Assignment

The collision data collected from TIMS has the location, severity, and mode assigned to each collision. For the purposes of this safety analysis, the mode assignment that was coded to the collision data was re-classified in order to assign the collision to the most vulnerable mode following the order of pedestrian, bicyclist, motorcyclist, and automobile driver. For example, a collision involving a pedestrian and a motorist would be classified as a pedestrian collision because the pedestrian is the more vulnerable mode involved in the collision.

Weighting by Severity of Injury

Collisions were then assigned a weight according to the severity of the injury. This weight was used during the HIN and HII analyses as the value that is aggregated to each corridor and intersection, rather than simply counting the number of crashes. The purpose of this weight is to place emphasis of collisions that have more severe outcomes over collisions that resulted in minor injury or no injury. This analysis employed a 3:1 weighting ratio, where KSI collisions (fatal and serious injury) received a weight of three, and non-KSI collisions (minor injury and complaint of pain) received a weight of one.

Preparation of the Roadway Network Data

In preparation for the moving windows analysis (described below), the countywide road network was dissolved into continuous segments. All contiguous roads with the same name were dissolved. Controlled access highways were removed from the network as those were not within the scope of SCTA's Vision Zero project. The reason for this dissolving of the road network is that often times there are similar conditions along a stretch of the network, and the fact that a collision occurred in one location rather than 100 ft further up or down the road can be down to chance. If conditions are similar in nearby segments of the same road, then it would stand to reason that they have a similar likelihood of a future collision.

Moving Window Analysis Methodology

In the simplest terms, a moving windows analysis identifies the HIN by examining collisions along the roadway network in overlapping spatial segments or “virtual” windows that “step” along each corridor.

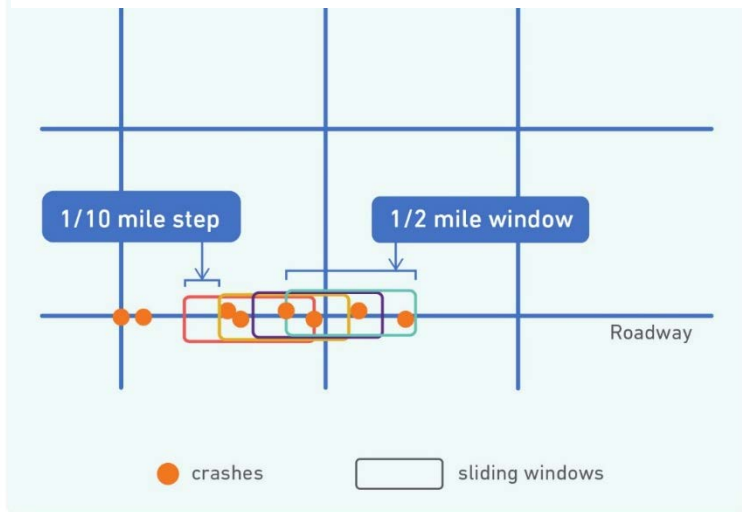
Following the processing of the collision and road network data, the collisions were spatially aggregated onto the network and then weighted. The weights for each collision were aggregated by mode to all to the windows that were within a distance of 50 feet. For example, if a window is near two non-KSI motor vehicle collisions, one non-KSI pedestrian collision, and one KSI pedestrian collision, it would be assigned a motor vehicle score of two (2 non KSI x 1 weight), and a pedestrian score of four (1 KSI x 3 weight + 1 non-KSI x 1 weight). Collisions that occurred within 50 feet of a junction of two or more roads would be counted for each corridor window, meaning intersection collisions are assigned to each intersecting street. See Figure 18 for a diagram of this approach.

The chosen length of this virtual window and the length that it stepped along the corridor were based on urban and rural land use, as in urban areas there tends to be more diversity in roadway characteristics (number of lanes, roadway uses, traffic volumes, etc.) which change over shorter distances, compared to rural areas where conditions tend to be less diverse and change over longer distances.

- In urban areas of the County, the windows were 0.5 miles long and stepped along each corridor at 0.1 miles increments.
- For rural areas, the windows were 2 miles long and stepped along each corridor at 0.5 miles increments.

The next step in the moving windows analysis was to ‘smoothe’ the sliding window outputs, so that the HIN score would be influenced by collisions both directly underlaying the segment of road itself,

Figure 17: Sample diagram of the moving window analysis



as well as those that occurred a short distance from it. This was done by creating non-overlapping sections of the road network, which were the same length as the step distance of the moving window (0.1 mile for urban, and 0.5 mile for rural). These steps took the maximum score for the moving window segment that they overlapped, which since the moving windows were longer than these step sizes, allowed the non-overlapping steps to capture the impacts of nearby collisions.

Identifying the High Injury Network

To identify the final HIN, scores were assigned to each section of the roadway network. A cut-off score or threshold for each mode (as shown in Table 1 below) was then determined to identify roadway segments that are candidates for the HIN.

The process for determining the thresholds for the HIN was both a qualitative and quantitative exercise. The goal of the HIN development process was to create a list of HIN segments that capture potentially high-risk sections of the road network, and provide a digestible, actionable list that can help inform the end user. There is not a set definition of 'high' risk, nor is there a 'right' score for this. There is also not set number of HIN segments that should be identified by the process. Instead, the process for creating the final HIN is guided by the data, but ultimately decided based on iteration and human guidance.

The HIN development process used for this analysis was conducted by Toole Design, with guidance and input from SCTA, as well as the County's Vision Zero Data Subcommittee. Toole Design received feedback on the raw scores for each mode that members felt should be used as the threshold, as well as general locations that they felt should be in the HIN, for which the relevant scores were determined. Using this feedback and expert judgement, threshold scores were selected for each mode for both urban and rural areas, as shown in

Table 2: Threshold Score by Mode for Roadway Segments that are included in the HIN

. For the final
HIN (including
the multimodal

HIN, and the HINs by mode), see the [HIN/HII webmap](#).

Threshold scores vary by mode because the segment scores are impacted by total collision frequency, so selecting the same score cut-off for different modes would disadvantage modes with lesser overall collision frequencies. For example, a score of 5 may be high for pedestrians, since they make up fewer absolute collisions, whereas a score of 5 for motorists may be low because motor vehicle collisions account for a larger share of collisions. For a detailed breakdown of collisions by mode, view the [Vision Zero Data Dashboard](#).

Table 2: Threshold Score by Mode for Roadway Segments that are included in the HIN

	Urban	Rural
<i>Pedestrian</i>	7	5
<i>Bicycle</i>	6	5
<i>Automobile</i>	19	35
<i>Motorcycle</i>	7	11

HINs were identified separately for each mode (pedestrian, bicycle, automobile, and motorcycle), as well as a all modes combined for a multimodal HIN. Corridors that met or exceeded the threshold for each mode are included in their mode's HIN, as well as the multimodal HIN. It is important to note that the multimodal HIN accounts for areas that are at high risk for any one mode but may not be at high risk for another. For example, a segment that is at high risk for bicyclists may not be high risk for automobiles but will still show up in the final multimodal HIN.

Once identified, the HIN corridors were displayed as a single line on a map, rather than displaying the scores for each mode. This was done to simplify the output dataset and make it easier to communicate to the intended audience, as its easier to understand that a segment of road is potentially higher risk rather than understand the nuances and relative differences in risk between different segments of the road.

Differences between the Countywide and City of Santa Rosa HINs

The City of Santa Rosa developed a HIN (for pedestrian and bicyclists only) as part of their 2018 [Bicycle and Pedestrian Master Plan Update](#). While the Santa Rosa HIN is quite similar to the HIN produced by this process, there are several differences owing both to the data used and general methodology. Toole Design reviewed their methodology and results as well as spoken with City of Santa Rosa staff in order to understand and explain these differences.

High Injury Intersection (HII)

In addition to the development of the HIN, SCTA requested a separate analysis focused on intersections. As described in the HIN methodology, the HIN development process accounts for intersection collisions but does not explicitly call them out, instead implying that intersections along the identified segments would also be of higher risk. This follow-up analysis to identify High Injury Intersections (HII) only focuses on intersection collisions and explicitly creates a list of intersections in a manner analogous to the HIN.

Preparation of the Collision Data

The same collisions that were used in the HIN were used as a starting point for the HII. These were all injury and fatality collisions (all report collisions except for property damaged only) from 2015-2019, with location, severity and mode assigned. The same logic of assigning the most vulnerable mode was also assigned to the collisions.

However, only a subset of all collisions was used to examine intersection collisions for the HII. While the collision data does include information specifying if the collisions occurred at an intersection, this was not used for determining intersection collisions for several reasons. This intersection relationship classification reported in the collision data typically only counts if the collision physically occurred within the intersection, driveway, or alleyway, rather than within the intersection's 'area of influence'. The purpose of this analysis was to focus on collisions that occurred near and within intersection between two streets, not driveways or alleys. In order to capture all collisions that were within the intersection's area of influence, a cut-off distance of 250 feet was used. Collisions within 250 feet of the intersection centroid were classified as 'intersection' collisions, while all other were classified as 'non-intersection' collisions. This 250-foot threshold was selected in accordance with Caltrans' Highway Safety Improvement Program (HSIP) guidelines.

Preparation of the Intersection Data

At the time of this analysis, SCTA did not have an intersection dataset. Instead, a regional intersection dataset was developed by using the SCTA's road network data. As was done for the HIN analysis, controlled access highway segments were excluded from this analysis. Points were created wherever three or more line segments met. Some pseudo intersection points were created where only two line features met; these were removed from this dataset.

Intersection Collision Density Analysis

Collisions flagged as having occurred at an intersection were aggregated by mode. Unlike the HIN where collisions were assigned to all overlapping window segments within a distance, intersection collisions were only assigned to the single intersection closest to the collision data point. This approach was selected because intersections are spatially discrete features, and thus analyzed individually.

During the collision aggregation process, the same frequency and severity methodology used in the HIN development was applied to the HII development process. KSI collisions received a weight of three, while non-KSI received a weight of one. Each intersection then received a score representing the combined severity and frequency of collisions for each mode.

Final High Injury Intersections

Like the HIN, the HII also used a yes/no assessment for identifying if an intersection was part of the HII. This was also determined by selecting a cut-off score for each mode and assigning everything that was that score or higher as in the HII, and those that were lower as not (see Table 3). This was done for the sake of simplicity because it is easier to communicate that an intersection is either 'high risk' or not, rather than explaining the relative risk levels. Also, like the HIN, the HII is made up of modal HIIs which are determined independently of each other. Like segments, intersections which might be high risk for one mode might not be so for another. The multimodal HII is comprised of intersections which are in the HII for at least one mode. Note that the threshold scores were the same for urban and rural contexts for pedestrian and bicycle collisions because these occurred mainly in urban areas, and there was not enough variation in rural areas to receive a different score.

Table 3 Threshold Score by Mode for Roadway Segments that are included in the HII

	Urban	Rural
<i>Pedestrian</i>	4	4
<i>Bicycle</i>	4	4
<i>Automobile</i>	15	10
<i>Motorcycle</i>	5	4

The process for determining the threshold scores or minimum thresholds for the HII was as much an art as science, similar to the HIN development process. Toole Design received feedback on the scores for each mode from SCTA Staff and the Vision Zero Data Subcommittee, which combined with their professional judgment was used create the cut-offs scores which determined the final HII. The final HII (the overall HII, and the HII by mode) can be seen on [HIN/HII webmap](#).

Appendix D: Sample Vision Zero Resolution

[Sample resolution text in progress]

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