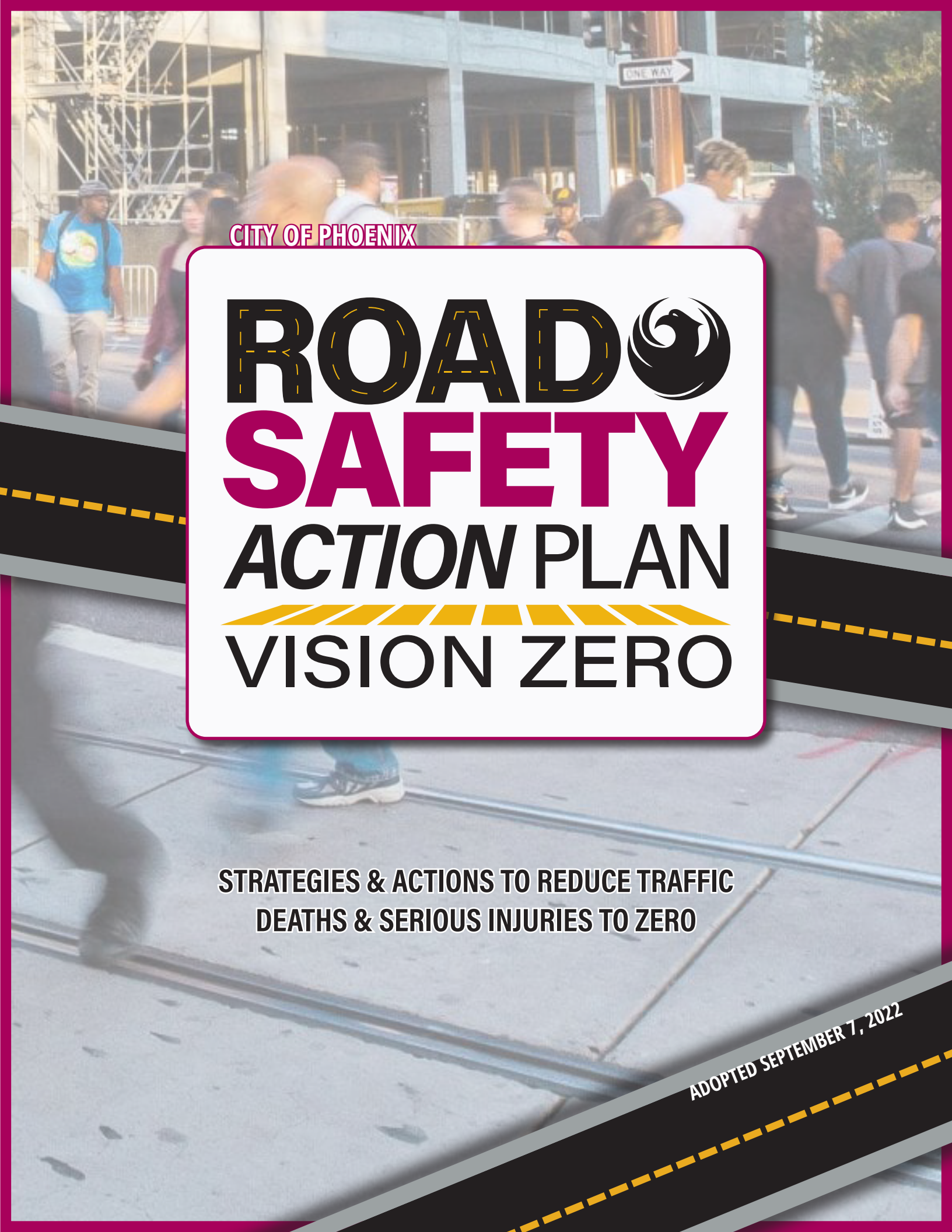

CITY OF PHOENIX

# ROAD SAFETY ACTION PLAN

## VISION ZERO

STRATEGIES & ACTIONS TO REDUCE TRAFFIC DEATHS & SERIOUS INJURIES TO ZERO

ADOPTED SEPTEMBER 7, 2022

# Acknowledgments

The Road Safety Action Plan (RSAP) is more than just a transportation plan — it's a critical step to move to zero deaths and serious injuries by 2050 on Phoenix Streets. The City of Phoenix would like to dedicate this plan to the people who have lost their lives or have been seriously injured through traffic crashes.

## CITY COUNCIL

Mayor: Kate Gallego

District 1: Councilmember Ann O'Brien

District 2: Councilmember Jim Waring

District 3: Councilmember Debra Stark

District 4: Vice Mayor Laura Pastor

District 5: Councilmember Betty Guardado

District 6: Councilmember Sal DiCiccio

District 7: Councilmember Yassamin Ansari

District 8: Councilmember Carlos Garcia

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Briiana Velez, Assistant Director

Bruce Littleton

Carl Langford

Reed Henry

Mailen Pankiewicz

Leticia Vargas

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Vivian Padilla

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Margaret Herrera, Maricopa Assn. of Governments

Richard Nassi, Pima Assn. of Governments

## CITY OF PHOENIX DEPARTMENTS

City Manager's Office

Community & Economic Development Dept.

Fire Dept.

Housing Dept.

Human Services Dept.

Information Technology Services Dept.

Neighborhood Services Dept.

Parks and Recreation Dept.

Planning & Development Dept.

Police Dept.

Public Transit Dept.

Street Transportation Dept.

## CONSULTANTS TEAM

Y2K Engineering

WSP

Lee Engineering

Engineering Mapping Solutions


## PUBLIC PARTICIPANTS

Thank you to thousands of City of Phoenix neighborhood and business association, Block Watch and faith-based groups, schools and community leaders and various community organizations who took the time to provide us with your opinions, thoughts, concerns, and input. **Your voice matters.** It was directly used in creating the RSAP strategies and subsequent implementation plan.

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# A Message From Mayor Kate Gallego

When it comes to population growth, economic development and innovation, the city of Phoenix has always ranked at the top. Unfortunately, Phoenix has also ranked in the top three cities in our nation for roadway fatalities, behind only Houston and Los Angeles.

Data from 2021 show fatalities on our city roadways are consistently on the rise. In comparing 2021 data with the previous year's, fatalities related to motor vehicle crashes, as well as fatalities involving pedestrians and cyclists, saw a dramatic increase of 25 percent. The numbers are alarming and very tragic.

It was clear that immediate steps needed to be taken to protect anyone and everyone using our roadways.

Since becoming Mayor of the 5th largest city in the U.S. in 2019, I have supported the installation of 34 HAWKs (**H**igh-intensity **A**ctivated cross**W**al**K**s) by our Street Transportation Department, bringing the total number to 77 HAWKs installed across the city. We also have added 120 miles of bike lanes throughout our roadways to encourage the use of active transportation as an alternative and more environmentally friendly mode to travel. Most importantly, Phoenix was at the forefront of cities to establish the Office of Pedestrian Safety as a resource hub that educates residents on a variety of traffic safety issues through community engagement, and promotes increased driver, pedestrian, and bicyclist awareness, especially around school zones and residential neighborhoods.

As Phoenix continues to be one of the fastest growing cities in population and economy in the nation, my commitment to providing safe roadways for everyone is stronger than ever. In March 2021, my colleagues in the City Council and I supported the development of the Road Safety Action Plan (RSAP), a roadmap that includes attainable goals and strategies that fit the unique characteristics of Phoenix's roadways and roadway users. This is the roadmap Phoenix needs to systematically provide guidance and direction on continuously lowering traffic-related fatalities. Spearheaded by the Phoenix Street Transportation Department, this RSAP is the result of the great collaboration among city departments, state agencies, engineering consultants, and more importantly, the many Phoenix residents and stakeholders who provided their input every step of the way.

In January 2022, members of the City Council and I took it a step further by taking action for Phoenix to be a part of the Vision Zero Network. Incorporating the Vision Zero strategy to the RSAP allows for a more multi-disciplinary approach to achieve zero traffic fatalities and injuries, and encourages policy makers, urban planners, health professionals and engineers to work together towards that goal.

On February 2022, the City Council and I made it official. We adopted a resolution to integrate Vision Zero strategies and principles into the RSAP.

Now, the Vision Zero Road Safety Action Plan is a more holistic approach to achieving zero traffic-related fatalities, using the "Five Es of Traffic Safety"—Evaluation, Engineering, Enforcement, Education, and Equity—as its foundation. Working with our partners, my commitment is to continue to invest in safer roadway designs and redesigns, advanced traffic technologies, and engagement programming. That is what our residents want, and that is what they deserve.

This Plan is the culmination of over two years of collaborative dedication and passion for roadway safety from our outstanding Street Transportation engineers and other city staff, policy makers, municipality and state agency partners, public safety personnel, safety technology experts across the nation, and of course, Phoenix residents, who deserve the best quality of life our city has to offer.

# A Message From Councilwoman Debra Stark,

## Transportation, Infrastructure & Planning Chair

Road safety is everyone's business.

A traffic-related fatality or serious-injury crash not only impacts the family of the victim, but also affects the lives and well-being of 911 operators, first responders, medical personnel, and indirectly, the lives of residents and bystanders within the crash area. While most crashes are preventable, there are several factors that may have also contributed to the tragedy.

From 2015 to 2019, about 46% of all traffic-related crashes in Phoenix streets have caused the deaths or severe injuries of pedestrians, motorcyclists or bicyclists (Data Source: ADOT ALISS), citing red-light running, speeding, distracted driving, poor visibility and crossing mid-block as just some of the reasons. As we heard more and more of these tragic stories in the news each day, the need to keep our streets safer for all users became dire. We needed a well-thought-out plan.

Phoenix's Vision Zero Road Safety Action Plan (RSAP) is the outcome of concerted efforts from city department staff, experts in traffic design and technology, and multiple external partners, who listened, discussed, and considered our community members' needs, wants, and feedback to compile a methodical list of attainable goals and strategies for safer streets. The Plan not only calls for safer and more reliable infrastructure and updated technology; it also incorporates effective enforcement, data analysis for prioritization, and ongoing education of the public to deliver a well-rounded approach to achieving road safety. As Phoenix's landscape and demographics continue to change, the Vision Zero RSAP is designed to adapt and accommodate the ebb and flow of our city.

Now, the ball is in our court to create a culture of road safety by having a mindset that fatal and serious injury crashes on our streets are preventable if we remain mindful of our actions and our decisions when sharing the road. After all, zero fatalities and severe injuries on our roads can only be achieved when everyone works together as a system.

As the Chairperson of the Transportation, Infrastructure and Planning (TIP) Subcommittee, I would like to thank everyone who worked on the development of the Plan, especially to our Street Transportation Department that led the efforts. The Vision Zero RSAP reaffirms the Mayor's, my fellow City Councilmembers' and my commitment to preventing traffic-related deaths and reducing road injuries in Phoenix so that we can all confidently drive a vehicle, ride a bike, cross the street, and take public transit knowing that we will all get home safe.

# A Message From Kini L.E Knudson, PE

## City of Phoenix Street Transportation Director

Developing and implementing a comprehensive Road Safety Action Plan (RSAP) is the top priority for the City of Phoenix Street Transportation Department.

Traffic fatalities in Phoenix have increased over several years. In 2021, the city saw 231 roadway fatalities – its highest ever. That was a 25 percent increase from 185 fatalities in 2020. These numbers and that trend are alarming and is the reason that a consistent strategy is needed to ensure appropriate resources are focused on making city roadways safer for all users – drivers, bikers and pedestrians.

I'm grateful for the support and leadership of Mayor Kate Gallego and the Phoenix City Council, who in March 2021 unanimously approved funding for city staff to develop this plan. In February 2022, City Council approved a resolution for that plan to incorporate the goals of Vision Zero – a core philosophy that traffic-related deaths and serious injuries are preventable.

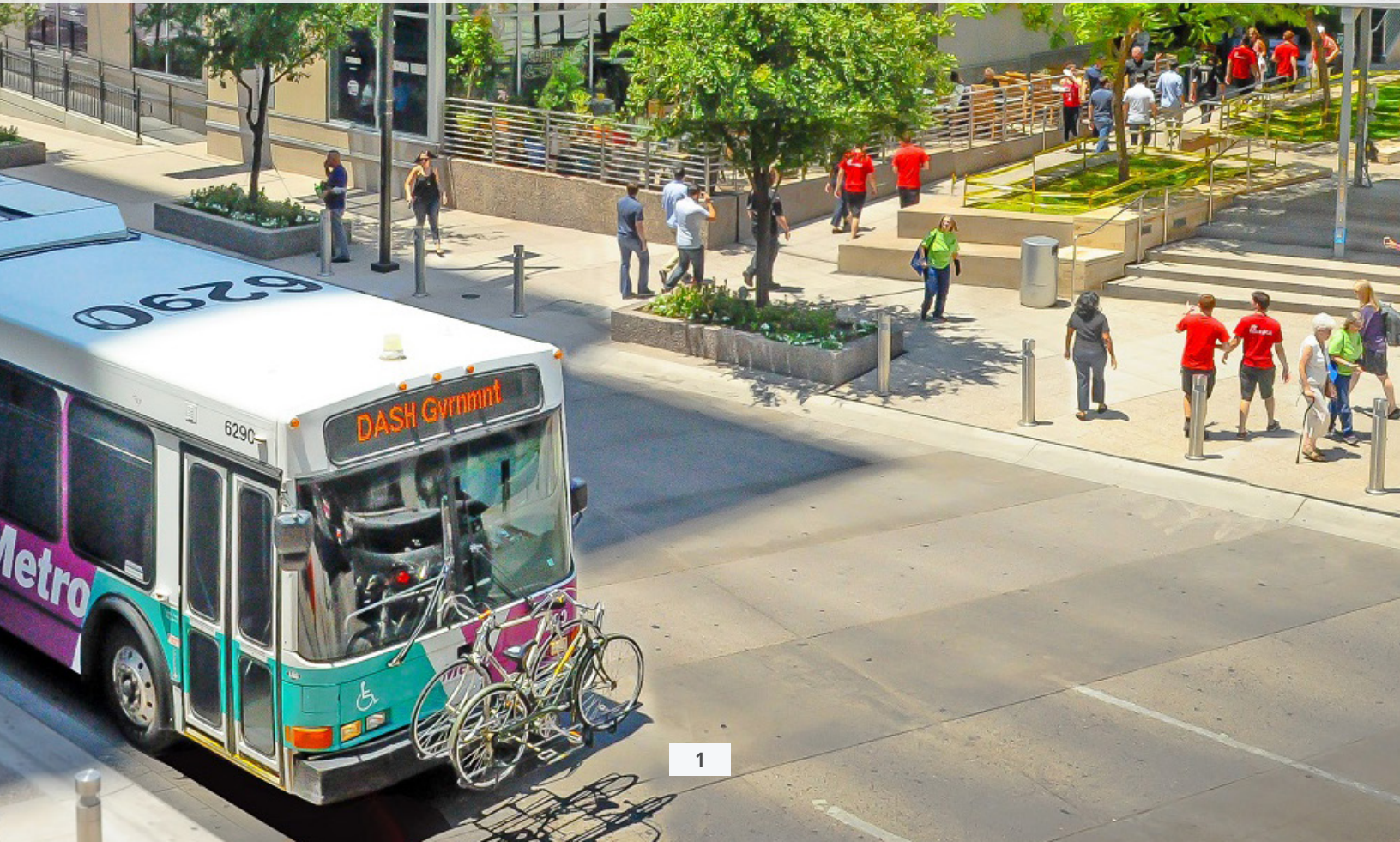
In addition to embracing the Vision Zero approach, the RSAP also provides a roadmap for how to coordinate the implementation of the five E's of transportation safety – Evaluation, Engineering, Enforcement, Education and Equity. All five carry equal weight, and each are vital to helping Phoenix achieve its roadway safety goals.

Creation of this plan also would not have been possible without the input received from thousands of Valley residents, who took time to communicate with us through interactive online surveys, at public meetings and special events, and through social media and email. Public engagement was crucial, and the feedback received helped city staff create and revise a plan that matches the priorities of the community.

Improving roadway safety is a community effort and the Street Transportation Department has dedicated itself to the task of reversing recent trends and improving roadway safety for all.

CHAPTER 1

# INTRODUCTION



On Average*, In the City of Phoenix...

ROAD SAFETY ACTION PLAN
VISION ZERO

# EVERY DAY,

**There are 83 automobile crashes.**

# EVERY OTHER DAY,

**There is at least one fatal car crash.**

# IN A SINGLE YEAR,

**There are 190 people killed,
enough to fill a commercial airliner.**

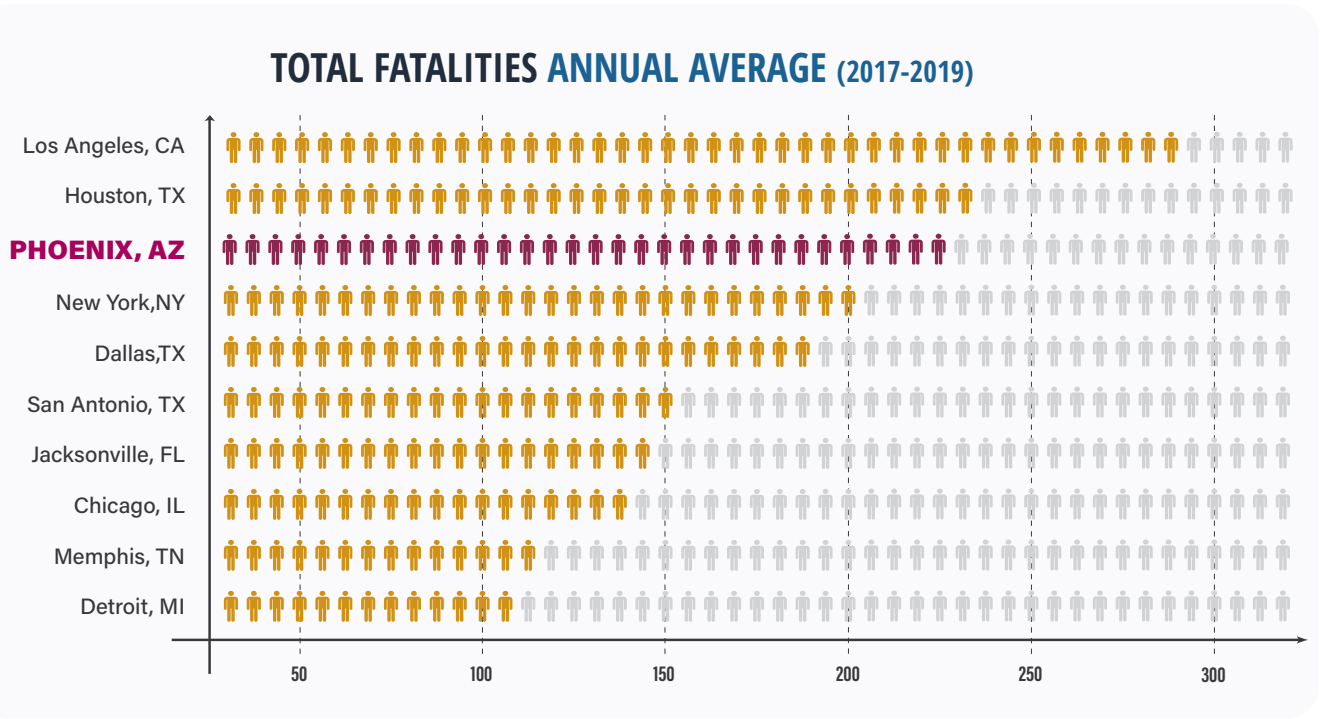
**If one fully loaded commercial airliner were to crash with no surviving passengers each year, imagine for a moment what the response would be.**

**Lives lost through motor vehicle crashes deserve the same attention.**

*2015-2019

# AN URGENT NEED

With an average of over **30,000 crashes annually** and an average of 2 crashes resulting in serious injury every single day, the National Highway Traffic Safety Administration (NHTSA) has consistently ranked Phoenix in the top 3 cities in the nation for overall traffic fatalities. In 2021, as the COVID pandemic continued, the amount of people killed on Arizona's transportation system reached a new peak of **1,120** (preliminary number), the highest number of traffic fatalities since 2007 with **231** of those fatalities (21%) within the City of Phoenix - the most amount of lives lost in a single year since 2000. **Any fatalities on our streets are unacceptable, and the City of Phoenix has pledged to take action**.




This City of Phoenix, **Road Safety Action Plan – Moving To Vision Zero** was created to fundamentally shift the way the City of Phoenix addresses and responds to crashes, develop systemic strategies to improve safety, and provide a road-map for the City to hone a "safety-first," proactive stance in reducing and ultimately preventing road fatalities. The purpose of this plan is simple: ultimately reduce the number of traffic fatalities and serious injuries to **zero** by 2050**.**

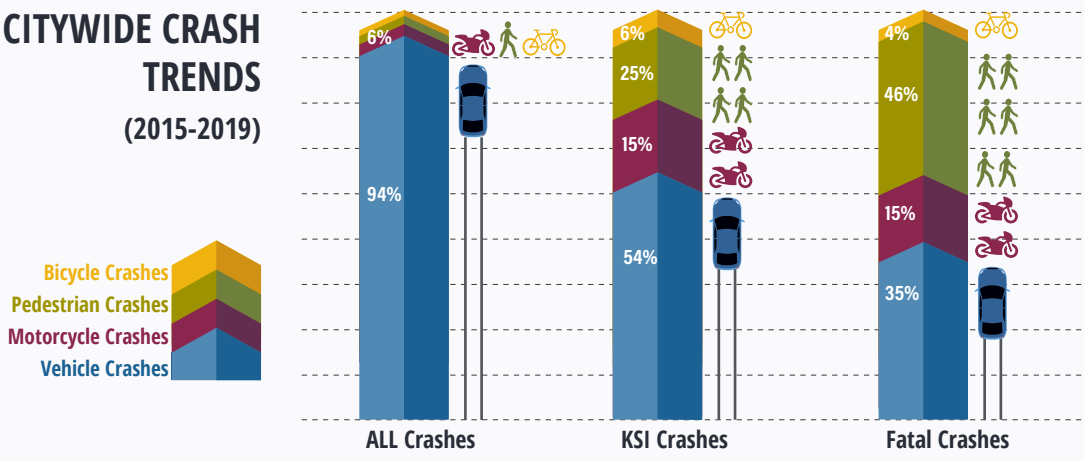
**"We need a change in mentality. We've become accustomed to accepting the unacceptable"**

**-Pete Buttigieg, US Secretary of Transportation**


*The tragedy of lost life on Phoenician streets doesn't just affect the people involved with a crash. For every person directly involved, there are parents, siblings, children, friends, coworkers, neighbors, first responders, bystanders, and others that often bear the brunt of the emotional pain, and consequences of fatal crashes.*

*In addition to the emotional pain of losing life, having a life significantly altered for the future, or even short term consequences of a non fatal impact, the financial impact is significant as well. Using the USDOT FHWA Safety Program Crash Costs for Highway Safety Analysis, adjusted for Arizona, it is estimated that $2.75 billion dollars was lost in the greater Phoenix community by people getting killed or seriously injured between 2016-2020 on the City of Phoenix High Injury Network (HIN). This figure doesn't include the tens of thousands other crashes that occurred on Phoenix streets that were damaging to a lesser degree.*

When analyzing 5-year crash data (2015-2019), an alarming trend emerges. Although 94% of ALL crash types (minor, serious injury, and fatal) are vehicle to vehicle incidents, when drilling down to *killed and serious injury motor vehicle crashes* (KSI), the vulnerability of those outside of motor vehicles becomes evident with people walking, bicycling, or riding a motorcycle involved in 46% of KSI crashes. Within the same five-year study period, **65% of fatal crashes involved people walking, bicycling, or riding a motorcycle** with a large portion of fatal crashes (46%) involving a pedestrian. As a crash increases in severity, those outside of vehicles are more likely to be the ones sustaining serious injury and death. This plan aims to address safety for **everyone** on the streets of Phoenix no matter how they travel around the city.



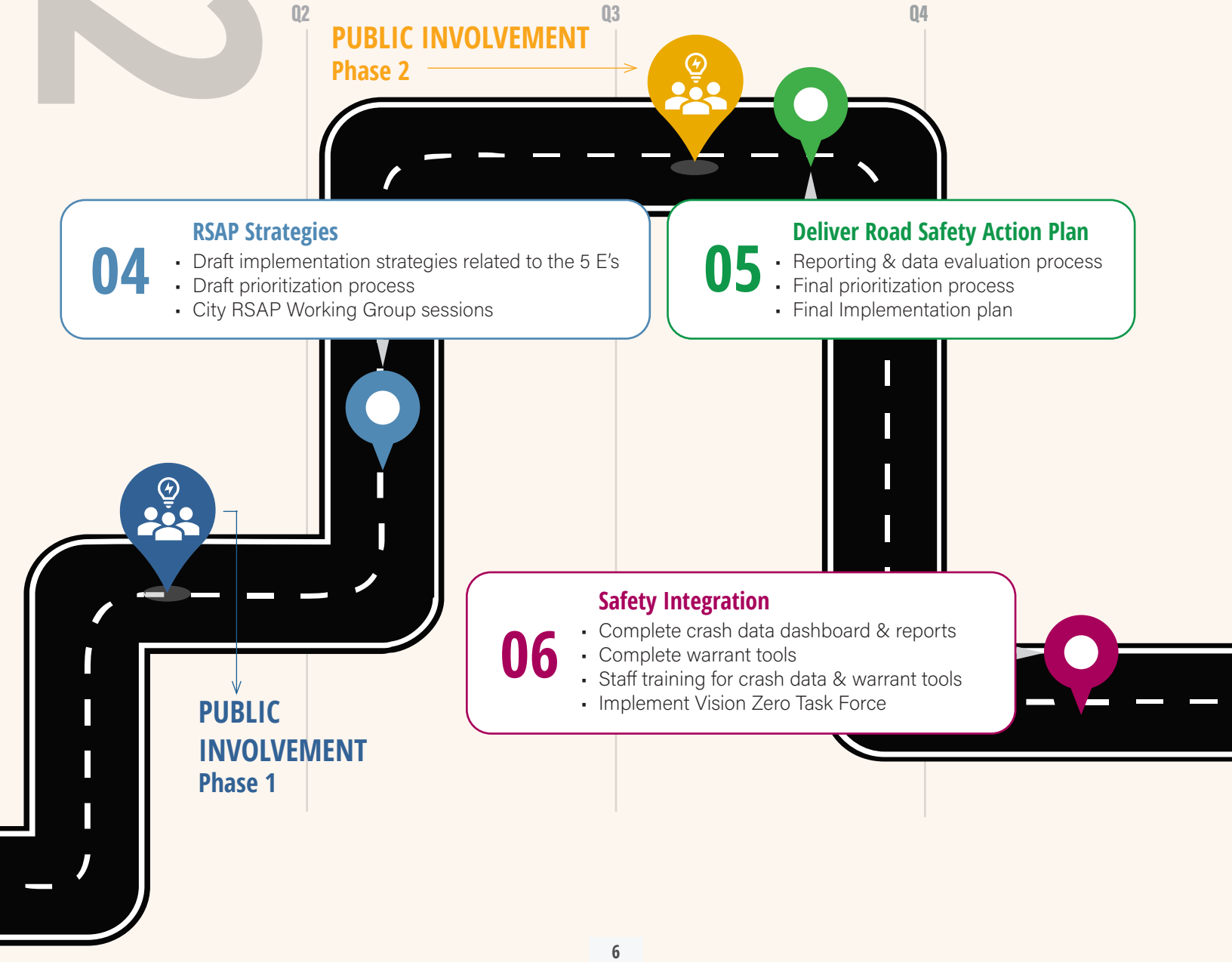
# THE PLANNING PROCESS

2021

Building from decades of previous traffic and safety work, the City of Phoenix initiated the Road Safety Action Plan (RSAP) in the Summer of 2021 to upgrade evaluation tools, engage the public, collaborate with City staff from different departments, and create a transparent safety plan that is comprehensive and implementable. The planning process consisted of **six phases** that included: a discovery phase, goals and visioning effort, safety tools and data improvement, development of RSAP strategies, delivery of the RSAP, and finally the integration of new safety measures and tools.

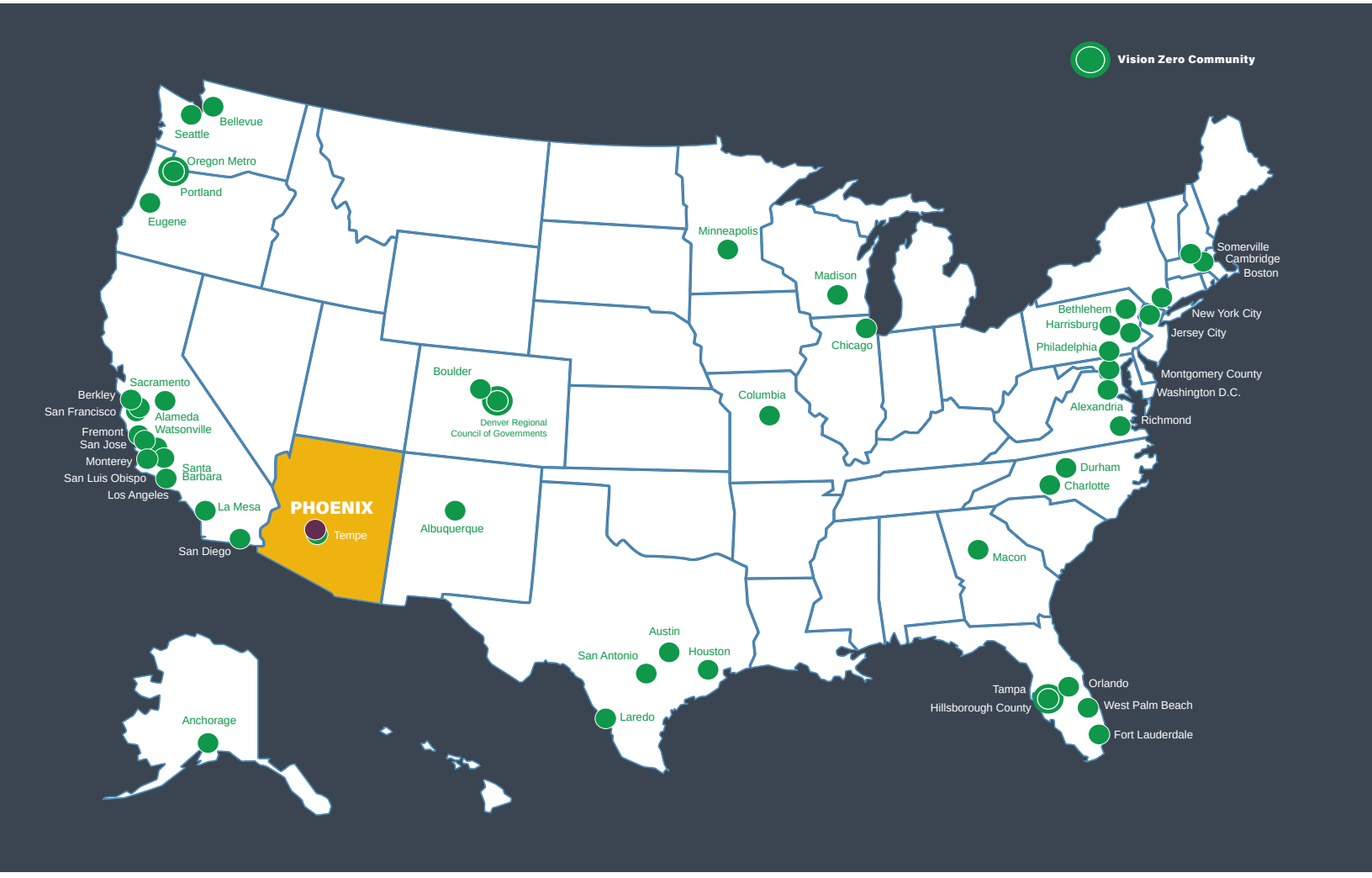
2024

The process also included an internal City RSAP Working Group that established guidance and partnerships at the beginning of the work effort (Discovery Phase), and worked to develop the RSAP objectives and strategies together (RSAP Strategies). This RSAP Working Group included both technical staff and executive leadership to ensure that the strategies, implementation plan, and performance metrics were realistic and highly beneficial to reduce KSI's on Phoenix streets. Essential partners in this RSAP Working Group include: the City Manager's Office, Community & Economic Development, Mayor and City Council Offices, Fire, Housing, Human Services, IT Services, Neighborhood Services, Parks and Rec, Planning and Development, Police, Public Transit, and Street Transportation Departments. This group will transform into the **RSAP Implementation Team** upon approval of the RSAP.



# VISION ZERO COMMITMENT

Vision Zero refers to the ultimate goal of eliminating all fatalities and serious injuries on Phoenix roadways. Beginning with the ethical belief that everyone – people walking, biking, taking transit, and driving - have the right to move safely in their community; no one should be killed or seriously injured in crashes on the transportation network; and that all traffic deaths are preventable. A Vision Zero commitment sets measurable objectives, establishes a clear schedule and time-frame, and puts forth strategies to accomplish the objectives.




On February 16, 2022, the Phoenix City Council voted in favor of a resolution to commit to Vision Zero, understanding that transportation safety is everyone's responsibility, including both the City and road users, and to be proactive in employing programs and strategies to meet City Council's adopted goals and objectives of zero traffic deaths by 2050. The City of Phoenix will join 51 cities and regions (as of August 2021) in becoming a part of the Vision Zero Network, and 1 of 2 cities in Arizona.

**WHEREAS,** Phoenix aspires to reduce the number of fatal and serious injury crashes on its streets to zero;

**WHEREAS,** Vision Zero is a City safety policy that takes an ethical approach toward achieving safety for all road users;

**WHEREAS,** in the past five years more than 900 people have lost their lives and more than 4,000 people were seriously injured on Phoenix streets;

**WHEREAS,** traffic-related deaths and serious injuries are preventable;

**WHEREAS,** the severity of motor vehicle-related crashes can be reduced;

**WHEREAS,** Phoenix wants to be proactive in reducing fatal and serious injury crashes on our streets.

**WHEREAS,** transportation safety is everybody's responsibility, including the City and road users;

**WHEREAS,** multiple City Departments, that include Street Transportation, Planning and Development, and Phoenix Police departments, are actively employing programs to improve safety; and

**WHEREAS,** Vision Zero leverages existing programs and can create new programs and strategies to help meet the Council's adopted performance measure to achieve a reduction in the number of fatal and serious injury crashes to zero.

**NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF PHOENIX AS FOLLOWS:** The Phoenix City Council hereby makes a commitment that the City of Phoenix will adopt the Vision Zero strategy with the goal of eliminating all traffic fatalities for all users on Phoenix roadways.

**PASSED** by the Council of the City of Phoenix this 16th day of February, 2022

MAYOR

ATTEST:

Denise Archibald, City Clerk

APPROVED AS TO FORM:
Cris Meyer, City Attorney

By: _____ RRH
Acting Chief Counsel

REVIEWED BY:

Jeffrey Barton, City Manager

# THE FEDERAL SAFE SYSTEMS APPROACH

When creating this Road Safety Action plan (RSAP), Phoenix strived to develop a plan that went beyond traditional road safety measures by integrating best practices, Vision Zero Network guidance, and Federal guidance recognizing the need to take action now. The Federal Highway Administration (FHWA) Safe Systems Approach focuses on a **human-centric approach** of intelligent transportation system design, proactively identifying and addressing risks, and creating redundancies in safety measures. **People will still make mistakes, and crashes will still occur - but they shouldn't end in life-altering tragedy.**


The Safe Systems Approach brings safety to the forefront of transportation investment and provides a model for the Safety-first approach of this RSAP. It does so through a holistic view of the road system that first anticipates human mistakes and second keeps impact energy on the human body at tolerable levels according to the FHWA.

The Plan also prepares the City for funding opportunities through the Federal Infrastructure Investment and Jobs Act (IIJA) by identifying a High Injury Network (HIN), developing actionable strategies that address fatal and serious crash trends, and creating engineering, evaluation, equitable, educational, and enforcement solutions that are comprehensive. The City of Phoenix will continue to work with their federal, state (Arizona Department of Transportation and the Governor's Office of Highway Safety), regional (Maricopa Association of Governments and Valley Metro/Valley Metro Rail), and local agencies to align safety plans, actions, projects, policies, and funding strategies for implementation.

## HUMAN-CENTRIC APPROACH

1. **Death/serious injury is unacceptable**
2. **Humans make mistakes**
3. **Humans are vulnerable**
4. **Responsibility is shared**
5. **Safety is proactive**
6. **Redundancy is crucial**

# VISION

## Phoenix aspires to reduce the number of fatal and serious injury crashes on its streets to ZERO by 2050

## GOALS

- Create a Road Safety Action Plan that moves to VISION ZERO
- Engage the public through an inclusive engagement process
- Use data to drive decisions
- **Embrace the 5 E's of safety**
  (Evaluation, Engineering, Enforcement, Education, & Equity)
- Establish a culture of safety
- Develop and implement strategies and countermeasures
- Establish performance measures for evaluation


CHAPTER 2

# THE FACTS

Through the creation of this Road Safety Action Plan, the City of Phoenix analyzed 5 years of crash data (2015-2019) to determine trends and understand the facts of road safety in the city. Data was obtained from the Arizona Crash Information System (ACIS) maintained by the Arizona Department of Transportation (ADOT). *Appendix-A contains detailed crash analysis report.*

Following the Federal Highway Administrations (FHWA) Safe Systems approach of honing in on preventing serious and fatal crashes, the Phoenix team needed to determine how often these injuries occur. In the five years analyzed, there were over **150,000 vehicular crashes** that included about **5,000 crashes that resulted in a person getting killed or seriously injured** (KSI) on Phoenix public roads. While the total number of crashes has been increasing in the past years, the number of crashes resulting in a fatality or serious injury has stayed between 2.6% and 3.8%.

# QUICK FACTS:

**46%** of all fatal crashes involved pedestrians

despite only making up 2.5% of all crashes, with most pedestrian crashes occurring at night

**4%** of all traffic fatalities are bicyclists

in a collision with a vehicle, a bicyclist will ALWAYS receive a far greater share of injury

**21%** of all KSI crashes are speed related

with Impaired Driving & Distracted Driving the primary factor in 15.3% & 3.7% of KSI crashes respectively

**15%** of all traffic fatalities are motorcyclists

despite only being involved in 2% of crashes, with 39% of motorcyclists involved in crashes not wearing helmets

**43%** of all KSI crashes occur at signalized intersections

with less than 6% of Phoenix's signalized intersections accounting for 12% of all KSI crashes

**57%** of all KSI crashes occur at roadway segments

with less than 3% of Phoenix's roadways accounting for 12% of all KSI crashes

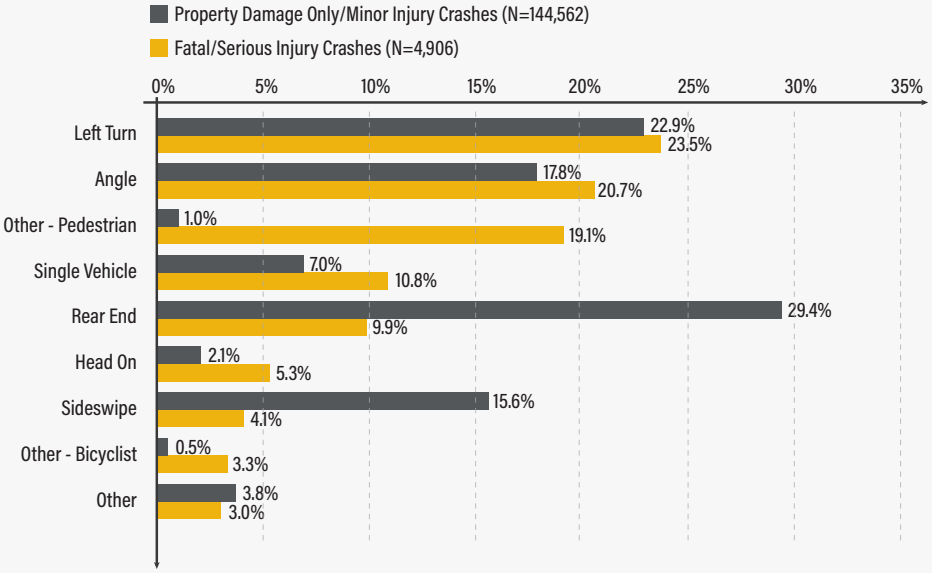
# CRASH FACTORS

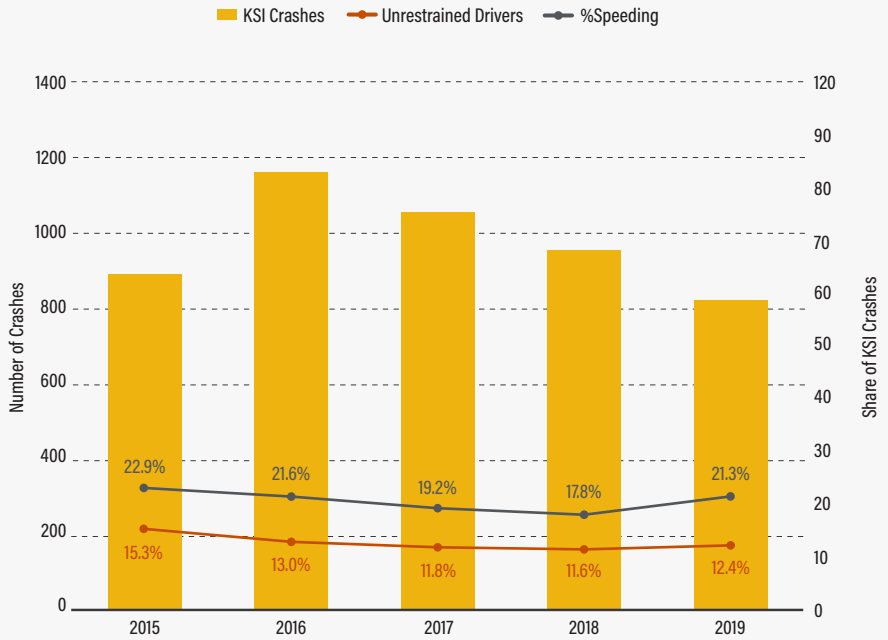
Understanding **how** and **when** crashes occur and **who** is involved are all critical factors in determining how to prevent them in the future.

## HOW

The manner of collision is an important descriptor of how crashes happen, and the physics of a collision is a key factor in resulting injury. Serious and fatal crashes happen in a different way than the other collisions. The most common collision manners of crashes that result in a fatality or serious injury are left-turn, angle, and pedestrian crashes; whereas among the less severe crashes, the most common collision manners are rear-end, left-turn, and angle crashes.

Speed violations and not wearing a seatbelt are two serious factors that contribute to KSI crashes. 20.5% of crashes that killed or seriously injured people, involved speeding and a further 13% of KSI crashes involved an unrestrained driver as the primary factor in a fatality/serious injury.

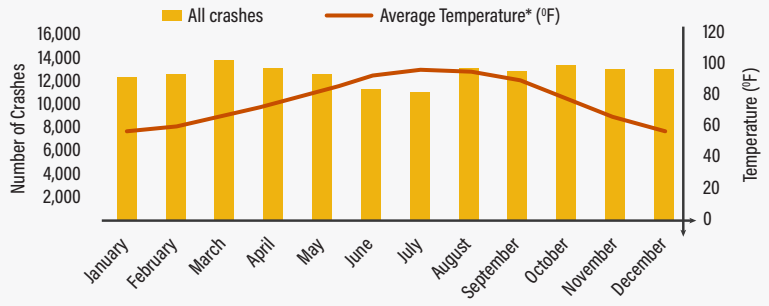


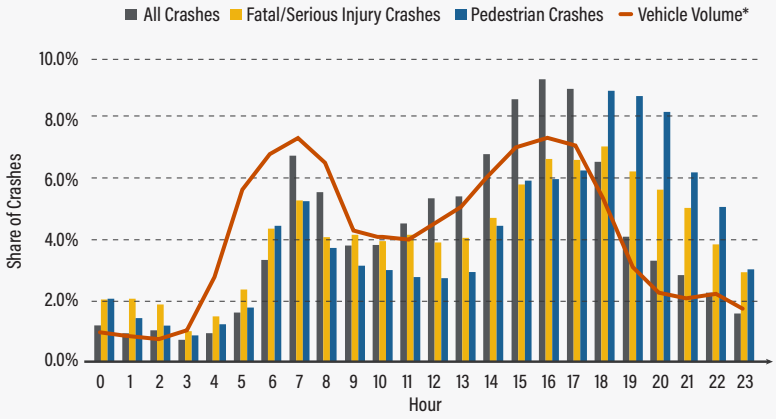



## WHEN

March was the month with the highest number of crashes, averaging 89 per day; July, on the other hand, registered the lowest number of crashes (70 per day). Fridays registered the highest number of crashes, but Sundays registered the highest rate of serious and fatal crashes (4.1% of Sunday crashes resulted in a fatality or serious injury, compared to an average of 3.2% on the other days of the week).

As might be expected, the time of day with the highest number of crashes is the afternoon peak hour (from 3 pm to 6 pm), when 27% of crashes occurred. Crashes involving a pedestrian most commonly happen between 6 pm to 9 pm, when more than 25% of all pedestrian crashes were reported (the same period recorded 14% of all crashes and 19% of serious/fatal crashes).




## WHO

The largest age group representing drivers of the unit that contributed most to the crash are individuals between 15 to 24 years old. The largest age group representing drivers of other units are individuals from 25 to 34 years old. Men are more likely to be involved in pedestrian and bicycle crashes in Phoenix.

Understanding this data can inform how resources can be directed and targeted for educational and awareness campaigns.

*Unit 1 is defined as the driver that contributes to a crash the most

# HIGH INJURY NETWORK (HIN)

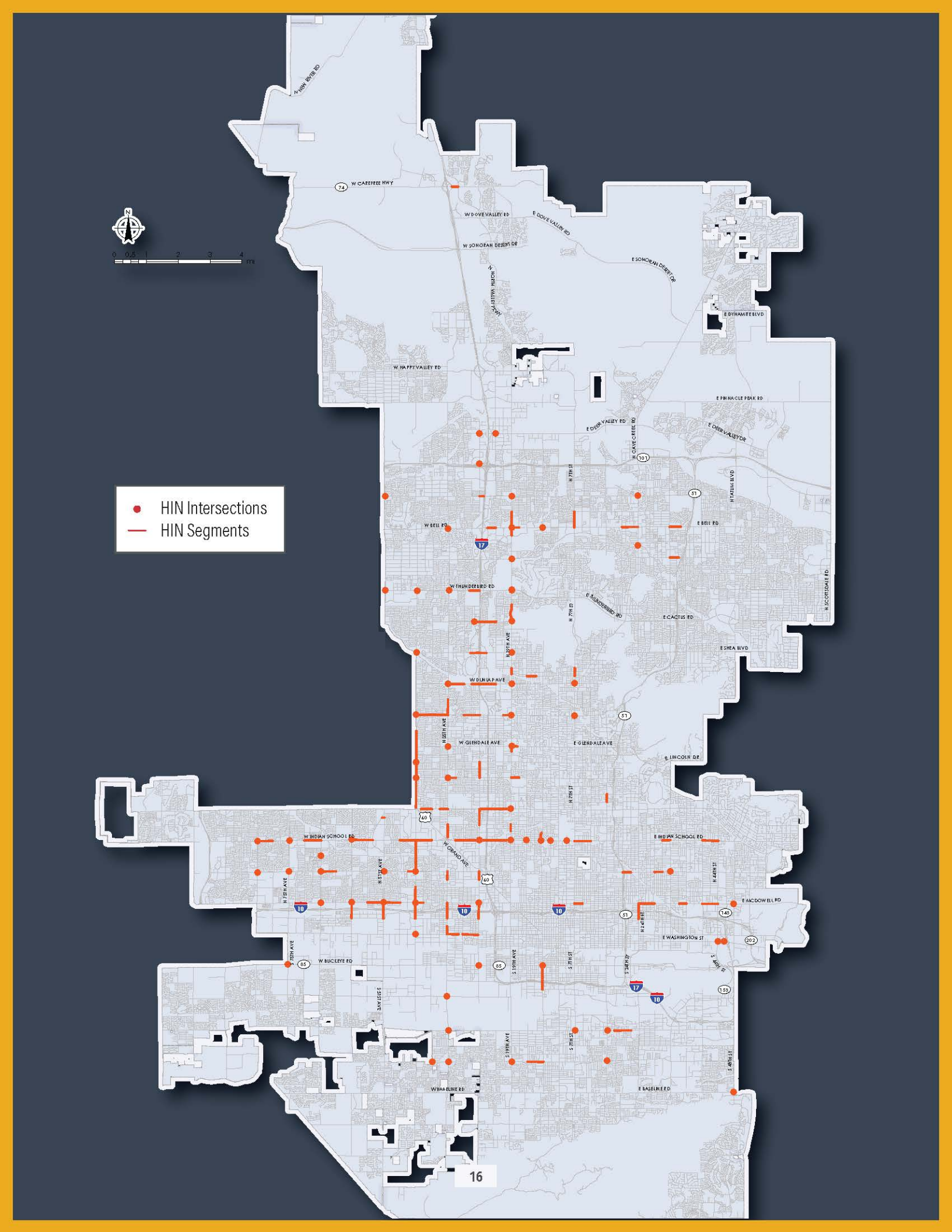
**The High Injury Network (HIN) is a map of corridors where the highest amount of people have been killed and severely injured in motor vehicle collisions, and is a tool for road safety initiatives. This approach will help city staff focus limited resources on what is needed and where so that funds can be invested in the areas that are most impacted by death and injury.**

**Five years of data (2016-2020) was analyzed, including 5,473 motor vehicle crashes that resulted in serious injury or death. This data was separated into the two separate categories of Signalized Intersections and Segments (Phoenix public roads).**

*Appendix-B contains detailed list of Intersections & Segments*

**This analysis shows that 12% of KSI crashes occur at less than 6% of Phoenix traffic signals, and 12% of KSI crashes occur on less than 3% of Phoenix public roads.**

**See more info here: HIN GIS Story Map**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CHAPTER 3

# THE 5 E'S

In addressing safety on Phoenix roadways, the City acknowledges that creating a safe transportation network for all users is accomplished through a combination of non-infrastructure and infrastructure projects and programs. The City currently takes a proactive and inclusive approach that recognizes the Five E's of Transportation Safety: **Evaluation, Engineering, Enforcement, Education,** and **Equity**. Formally recognizing this work as part of this plan allows the City to evaluate its programs, continue work efforts, consider expansion, propose emphasis areas, create cohesive strategies that respond to measures, and develop an implementation plan that is inclusive.

# THE 5 E'S OF TRANSPORTATION SAFETY

**EVALUATION** **ENGINEERING** **ENFORCEMENT** **EDUCATION** **EQUITY**


All five E's of Transportation Safety play a valuable role in supporting safety, but are most effective when implemented **together**. The RSAP encourages collaboration between City departments on these initiatives including, but not limited to the Street Transportation, Public Transit, Police, Fire, Planning and Development, Neighborhood Services Departments, and others as appropriate.

# EVALUATION

## Evaluation focuses on network screening & benchmarking efforts to measure effectiveness of implemented initiatives

Evaluation efforts review past safety trends, benchmark current conditions, and monitor conditions as improvements are implemented. Reviewing historical crash data is an important component in understanding current safety trends, identifying areas within the City experiencing higher crash frequencies, and prioritizing locations for improvements. Evaluation activities can be used to establish baseline data for planning projects and support in setting goals.

## GOALS

- **Automation of crash analysis & summary reporting**
- **Linkage of implementation strategies to specific crash types**
- **Identification of the High Injury Network (HIN)**
- **Further integration of safety in the project development process**
- **Modernization of the traffic engineering warrant analysis tools, including the traffic signal warrant tool, HAWK warrant tool, left-turn warrant tool, & prioritization**

## Current Initiatives

The City of Phoenix evaluates crash data for projects regularly and produces annual collision summary reports; a general traffic safety report, pedestrian safety report, and bicyclist safety report. The evaluation identifies trends over time, by collision manner, by injury severity, locations with the greatest number of collisions, crashes by violation type, and common characteristics of pedestrian and bicyclist related crashes.

The Phoenix Police Department (PD) coordinates with the Street Transportation Department on crash trends and reports on an annual basis. The annual collision summaries provide information to PD for consideration in their work efforts. PD reports crash data regularly to the Governor's Office of Highway Safety (GOHS), which is required for grant funding.

The City of Phoenix partners with the Maricopa Association of Governments (MAG) and Arizona Department of Transportation (ADOT) to further benchmark trends among the larger region. MAG produces an annual list of top 100 intersections ranked by crash risk within the metro-Phoenix area, which considers crash frequency, crash severity, and crash type. While Phoenix is the largest city within the MAG region; it also has the greatest number of intersections within the Top 100 list. Collaboration with MAG further supports the City's evaluation efforts, regional benchmarking, identification of priority locations for further study and improvements. In addition to evaluation, the MAG Top 100 list is also used to support regional funding pursuits.

The City regularly collects vehicular, pedestrian, and bicycle counts to monitor growth and trends within the City. Vehicular traffic counts are also collected to serve a critical role in traffic engineering studies; including traffic signal warrant analyses, pedestrian crossings, and left-turn signal phasing studies.

As the RSAP is implemented, benchmarking will be used to measure effectiveness of implemented strategies.

# ENGINEERING

## Engineering identifies improvement projects anticipated to address roadway safety through roadway design, traffic engineering, maintenance, operation & planning

Locations for engineering review are identified based on high crash locations and input from the public.

## GOALS

- **Identification of safety-focused emphasis areas to focus resources**
- **Development of engineering strategies to reduce fatal and serious injury crashes, based on focus areas and targeted locations**
- **Integration of safety analysis into project & program development processes**

## Current Initiatives

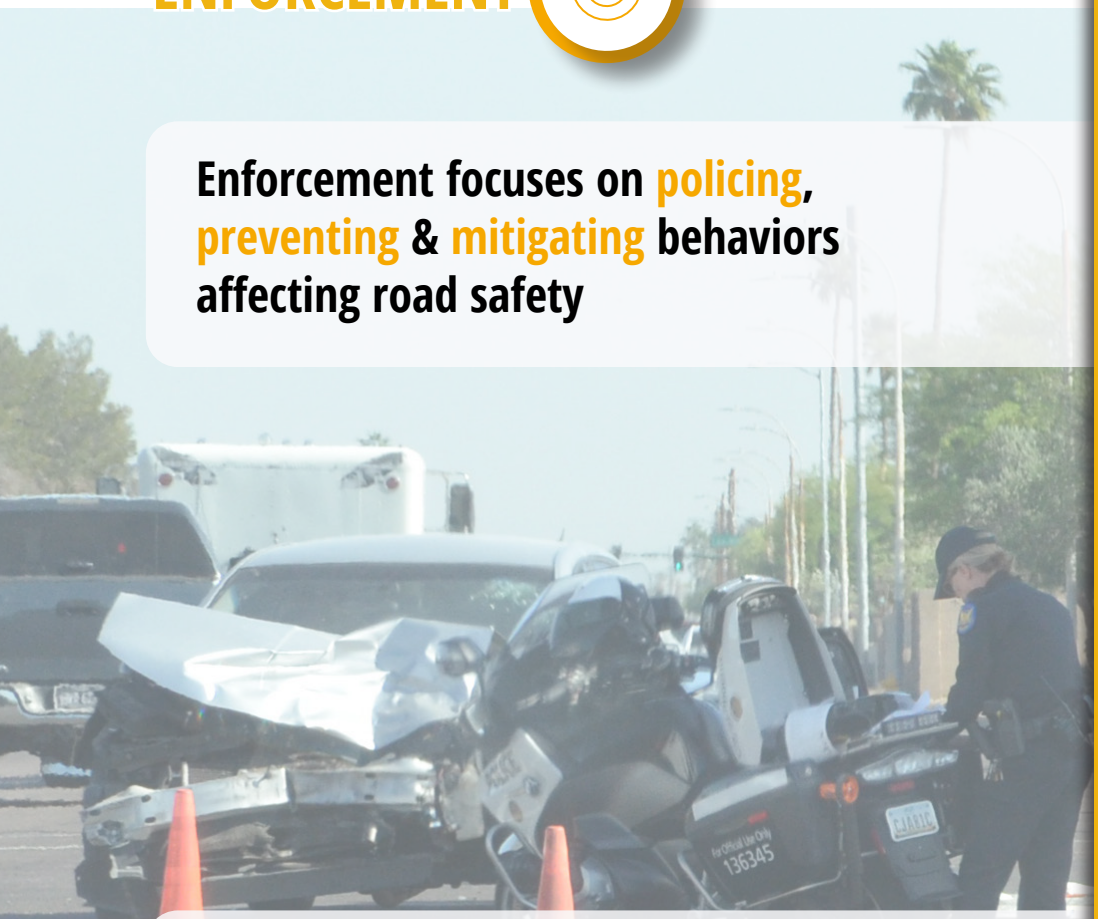
The City participates in formal Road Safety Assessments (RSA), which involve a multi-disciplinary, focused review of a specific intersection or roadway segment. Engineering solutions are developed to address specific safety concerns that may be present.

Intersection improvements may include additional lighting, traffic signal improvements, sight visibility improvements, crosswalk and curb ramp improvements, curb extensions, and signing and marking improvements. The City also reviews traffic signal operations to select appropriate left-turn phasing, re-time signals, and coordinate signals along a corridor. Roadway segment improvements may include raised medians and/or other forms of access control, lane re-purposing to provide bike lanes, sidewalk improvements, midblock pedestrian crossings, additional lighting, and signing and marking improvements.

Phoenix uses the High Intensity Activated Crosswalk (HAWK) beacon signal as a tool to help make it easier and safer for people to cross busy streets. HAWK signals can be installed on streets with regular traffic signals as part of the city's coordinated signal system. Phoenix has been installing HAWK signals since 2009 after they were approved by the Federal Highway Administration. Phoenix activated its 75th HAWK location in March 2022.

# ENFORCEMENT

## Enforcement focuses on policing, preventing & mitigating behaviors affecting road safety



## GOALS

**Generation of crash analysis tools and summary reports to support the Police Department**

**Development of enforcement strategies to reduce fatal and serious injury crashes, based on focus areas and trends in traffic user behavior and violations.**

**Support of efforts to enforce safety ordinances and development requirements**

## Current Initiatives

The Phoenix Police Department (PD) uses several different squads to target speeding, moving violations, and driving under the influence (DUI) with a nighttime focus. This enforcement is conducted by precinct squads that review past collision data reports that the Street Transportation Department shares, and through click-it or ticket grants from GOHS. The patrol location depends on the focus of the squad: DUI, street racing, enforcement, or traffic education and safety. The enforcement squads rotate throughout the city.

The Traffic Education and Safety squad is response driven through special requests from internal City departments, Council, and citizen concerns. Residents and community members can contact PD to share concerns through the PD Traffic Complaint Hotline, the dedicated email address (traffic.complaints@phoenix.gov), and a web-based submission form. These requests are documented, investigated, and reported out.

Complementary to the enforcement squads is the Traffic Impact Program that focuses on data driven location needs (crashes or complaints, not associated with rotation). Locations are identified by the speed complaint hotline, if there are a high number of crashes in a period of time, a high-profile crash, or information from council offices or neighboring jurisdictions.

Automated photo enforcement in the City of Phoenix ended in early 2020. While the program is no longer active, the PD has a Frequently Asked Questions (FAQ) webpage related to the previous red light camera enforcement program.

# EDUCATION

**Education efforts consist of communication campaigns & initiatives that teach & promote safe roadway behavior for all users, including people driving, riding transit, walking, or bicycling**

## GOALS

- **Development of education strategies to reduce fatal & serious injury crashes, based on emphasis areas & targeted locations**
- **Identification of new methods to communicate existing campaigns**
- **Expanded collaboration with state, regional, & local partners for funding opportunities & coordinated messages of safety analysis into project & program development processes**

## Current Initiatives

Many City departments work together to create traffic safety materials, organize school safety programs, and education within the community.

### School Events

The City provides leadership, assistance, and training to schools across the city to help ensure safety for students who walk or bike to school. The Street Transportation School Safety section is responsible for review and responding to pedestrian and traffic related concerns that affect all public, charter, private, and parochial K-12 schools within the City of Phoenix. Current initiatives include the Safe Routes to School (SRTS) program, Walk/Bike to School Days, Bike Rodeos, and resources for schools, students, parents, teachers, and crossing guards. Bike Rodeos are held at elementary schools in coordination with the SRTS program through efforts by the Street Transportation and PD, which teach younger students bicycle safety and provide bicycle helmets to the community.

### Safety Events

Phoenix PD leads educational DUI events at local high schools at the request of school/district administration. For example, PD has held events at high schools prior to Homecoming/Prom events to educate students on impaired driving and distracted driving. PD and Fire departments partner on child-safety restraint events, and at neighborhood block watch events as requested.

### Outreach and Education Campaigns

The City continues to increase awareness and education in roadway safety through education campaigns, which are integrated using social media, public service announcements, printed material, and engagement in community events. Current focused campaigns include:

- *Hands Free*
- *See Me AZ*
- *Heads Up*
- *Scan the Streets for Wheels & Feet*

# EQUITY

**Equity in transportation ensures that work efforts are free from bias, & identifies, understands, & eliminates barriers that exist for people using the network.**

## GOALS

**Evaluate characteristics of residents to understand if the transportation network is safe & accessible where they live**

**Equitable integration in community engagement to understand the diversity of residents, consider alternative outreach methods, & provide opportunities for all City residents to be involved**

## Current Initiatives

In 2021, the City of Phoenix included funding in their annual budget approval to open the Office of Diversity, Equity and Inclusion (DEI).

*"The charge of the office is to ensure equitability, equitable distribution of city services and to champion the delivery of racially equitable services for the community and for city staff across the city of Phoenix"*

*-Deputy City Manager Inger Erickson*

While the office is in its early stage of formation, the City, including the Street Transportation Department, has integrated equity into many of its current work efforts.

The Transportation 2050 Program (T2050) was approved by voters in 2015. This program both continues and expands funding for bus service, dial-a-ride, light rail, mobility improvements, traffic signal upgrades, paving, and other street improvements. A key component of this 35-year, $16.7 billion investment is the goal of ensuring that Phoenicians have a viable and equitable transit system. This system will support Phoenicians with frequent dial-a-ride, bus, and light rail service assisting residents who don't have or choose not to travel in a vehicle. The roadway program supports the transit system and is committed to install 135 miles of sidewalks, over 1,000 miles of bike lanes, install/upgrade 2,000 new street lights, replace aging traffic signals, and invest $240 million for major street improvements. A number of these programs have considered equity in their planning, prioritization, and implementation phases.

In addition, The City of Phoenix Street Transportation Department conducted an equity analysis to evaluate demographics of residents to understand if the transportation network is safe and accessible where they live. This analysis will also ensure equity is integrated into community engagement to understand the diversity of residents, consider alternative outreach methods, and provide opportunities for all City residents involved.

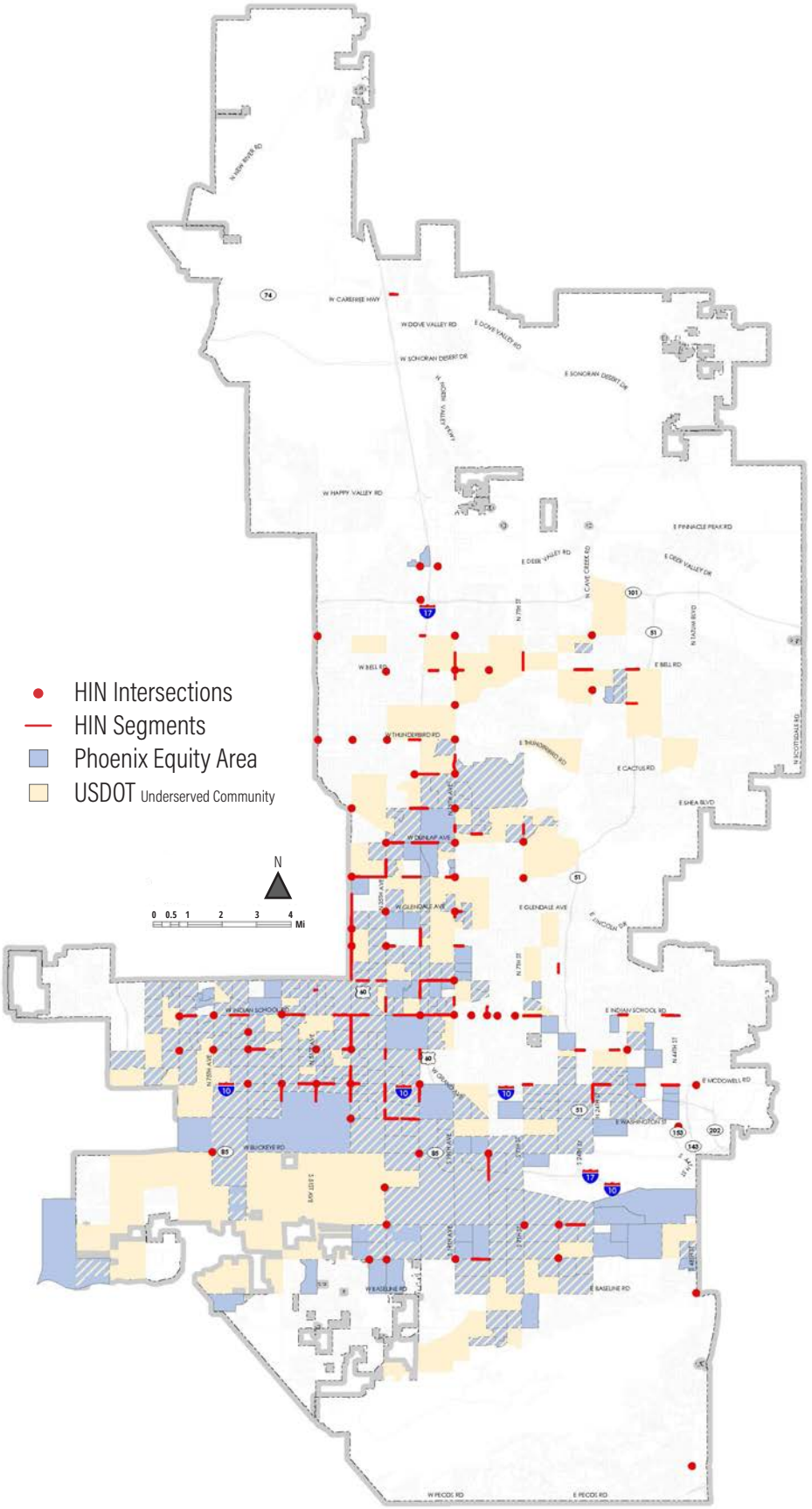
- The City of Phoenix Street Transportation Department Equity Analysis (shown in blue) highlights areas of the city that have concentrations of people and households that:
- Do Not Own a Car
- Are Low-Income / In Poverty
- Are Young (0-19)
- Are Elderly (65+)
- Are of a Minority Group
- Have a Disability

As shown right, there is a strong correlation between the HIN and equity areas.

Parallel to the City evaluation is the USDOT Underserved Community Analysis (shown in yellow) as part of the Federal Justice40 Initiative. This analysis included communities that are:

- Historically Disadvantaged
- Transportation Disadvantaged
- Health Disadvantaged
- Economically Disadvantaged
- Equity Disadvantaged
- Resilience Disadvantaged
- Environmentally Disadvantaged

When implementing strategies, projects, & programs noted in this plan, these equity analyses will be included and utilized.




CHAPTER 4

# ENGAGING PHOENICIANS

This plan would not exist without direction from engaged and concerned Phoenicians. The input of those who travel Phoenix's roadways, whether driving, walking, biking, or taking transit is essential to make streets safer for everyone. Public involvement was ongoing throughout the RSAP process, and included online and virtual engagement opportunities as well as in person. Both efforts were used to reach as many Phoenix residents as possible while COVID-19 precautions were in place, and to ensure an equitable approach was delivered. These tactics were successful; over 3,000 people participated online, over 4,500 location based safety comments provided, and staff met with residents and shared information at 21 community touchpoints.

## THE RSAP PUBLIC INVOLVEMENT EFFORT AIMED TO:

- Inform and educate Phoenicians about the traffic safety problem and the Road Safety Action Plan, and to
- Consult, involve, and understand the community's perspectives about safety issues and the high amount of people getting killed and severely injured on Phoenix roadways.

### Responding to these objectives, the project conducted three main work efforts to facilitate meaningful input:

- Continuous communication to ensure residents had an opportunity to learn about the project. This effort began with the launch of the project website and then integrated social media content, branding, email notifications, presentations, fact sheets, videos, and created posters/flyers throughout the life of the project.
- **Phase 1: Community Engagement** focused on learning which traffic safety issues Phoenicians were most concerned about and what they would like to see this plan accomplish.
- **Phase 2: Public Input** Provided an opportunity for review, comments, suggestions, and prioritization on the draft RSAP strategies (as presented in June 2022), and used Phoenix city libraries and community events to spread the word about the online survey and to ask residents to take the Vision Zero Pledge.

## WHAT PHOENIX IS SAYING...

Survey respondents said

# Preventing Traffic Deaths

is the number one priority for this plan

# >60%

of survey respondents think Phoenix streets are **unsafe**

# Driver Behavior

is the number one safety concern

# >1000

**comments related to missing/inadequate infrastructure**

bike facilities, street crossings, pedestrian facilities, & intersections

# >2600

people completed the Phase 1 online engagement exercise

# 72%

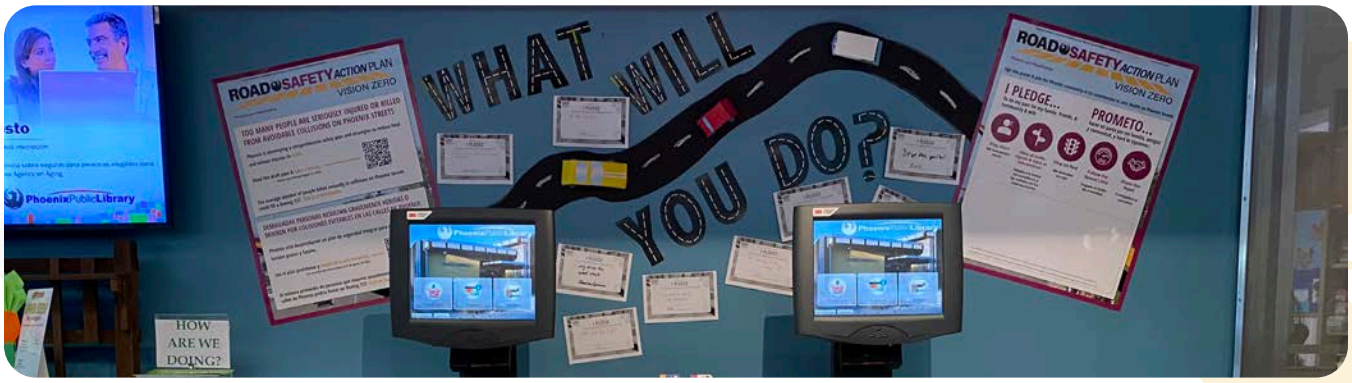
of survey respondents strongly agreed or agreed to all 40 proposed strategies

**Phase 1: Community Engagement** kicked off in November 2021 with a virtual meeting hosted by the City of Phoenix using the WebEx platform. 116 people attended the **virtual public meeting** that included both Spanish and English speaking attendees with a live Spanish speaking interpreter. The public meeting engaged participants with polling, breaks for questions and discussions, and a presentation about the project. The presentation included an overview of the project, the planning process, project background information, information about the High Injury Network and crash trends.

Since in-person engagement opportunities were limited, the project utilized an online engagement tool, **MetroQuest**, to gather information about residents safety concerns on Phoenix streets. MetroQuest is an engagement platform that is designed for transportation planning. Surveys that both educate the public and gather informed output, helping public involvement teams get tangible insights from diverse communities and consistently deliver outstanding public involvement. The MetroQuest Survey received over 2,600 responses and over 5,000 comments submitted through February 2022.

To ensure a diverse geographic outreach within the City that provided Phoenicians with an opportunity to learn about the RSAP, how to engage and use MetroQuest, and have time to discuss the project with Phoenix staff, a series of **community touchpoints** were completed after the initial public meeting through February 2022. This effort continued to drive residents to visit the RSAP website and complete the MetroQuest activity. Community touchpoints during this time included in person and online meetings, and a community event in Laveen. During Phase 1 Public Engagement, the Street Transportation Department created 35 tweets encouraging people to take the MetroQuest survey, which accounted for a total 14,727 impressions

**Phase 2: Public Input** began in June 2022 and focused on receiving feedback on the draft strategies by way of an on-line survey. This stage of involvement began with sharing the RSAP's draft five focus areas, fifteen objectives, and forty strategies. The draft strategies were posted online at the project webpage, an online video (accessed over 260 times) shared the details of strategies, city staff presented this information at a City Council sub-committee, emails and social media communications were sent to residents, staff attended community events to share information and talk with the public, and project posters with information about the draft strategies and survey were hung at City libraries. Over 550 people responded to the survey, staff connected with over 300 residents at events, and over 100 residents wrote their own pledge to help do their part to get to zero deaths on Phoenix streets.



# USING PHOENICIAN INPUT

With the goal of creating a series of actionable strategies in this plan, the integration of public feedback into the development and finalization of the strategies, and prioritization is vital to ensure that this plan works. Both phases of public input provided a platform to receive both open input, and specific feedback on trends revealed from the data analysis and planning process.

The feedback from **Phase 1** helped to:

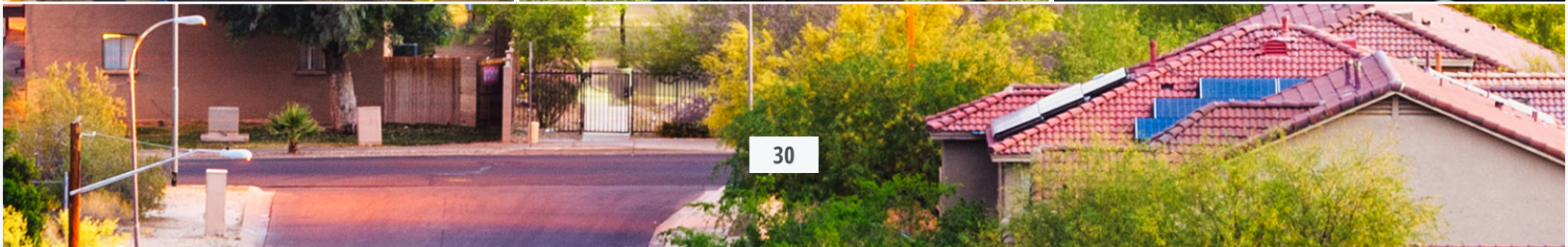
- Develop strategies around enforcement and education for driver behavior. A significant share of input received noted that driver behavior was a major issue. In the spirit of the 5 E's, this feedback also supports developing engineering strategies that address speeding, red light running, not-yielding, turn restrictions, and like counter measures to save people's lives.
- Prioritize preventing traffic deaths as the number one goal of the plan, which aligns with the City Council adoption of Vision Zero, and supports the prioritization of strategies for reducing and eliminating killed and serious injury (KSI) crashes.
- Develop strategies connected to improving signalization at intersections, pedestrian safety, assessing unsignalized crossings, and systematic roadway design concepts. Adequate transportation infrastructure for all users: people biking, walking, crossing the street, and driving is a high demand of Phoenicians.

The input from **Phase 2** informed:

- The implementation plan and performance measurements related to all focus areas presented in the following chapter. Survey respondents ranked Intersections the highest priority of the 5 focus areas of the RSAP. Behavior Related and Pedestrians & Bicyclists were tied in second place, with General Strategies and Segments following.
- The inclusion of all draft strategies presented in the following chapter into the final plan. 72% of survey respondents strongly agreed or agreed to all 40 strategies as presented in June 2022. For strategies in the Pedestrian & Bicyclist, and Intersection focus areas, agreement increased to 80% to 96%. Two additional strategies were included based on community input.
- The selection of projects to request funding through federal grant opportunities. Reviewing the public feedback from the survey, the strategy that received the highest amount of respondents that strongly agree or agree, 96%, was: Analyze the transportation network to identify locations that have the greatest number of risk-factors that contribute to pedestrian and bicyclist crashes, and then identify countermeasure improvements.


## Moving towards Vision Zero is a commitment that's only attainable when EVERYONE does their part


## We'd like to sincerely thank everyone who participated in developing this Road Safety Action Plan


CHAPTER 5

# TAKING ACTION

Vision Zero acknowledges that there are many factors that contribute to safe mobility - including roadway design, speeds, enforcement, behaviors, technology, and policies. One of the distinct goals of this Plan is to approve a group of actionable strategies that over time, will achieve the shared goal of zero fatalities and serious injuries that encompass evaluation, education, enforcement, engineering, and equitable activities. The evaluation of crash data and further public input led to the identification of **five Focus Areas** where implementation of safety strategies is anticipated to have the **highest impact on reducing traffic fatalities and serious injuries**.

## FOCUS AREAS

**GENERAL STRATEGIES** - Strategies focused on internal programmatic changes within Phoenix

**BEHAVIOR RELATED** - Strategies focused on mitigating speeding & other roadway user behavior

**PEDESTRIANS & BICYCLISTS** - Strategies focused on pedestrian/bicyclist safety policy & infrastructure

**INTERSECTIONS** - Strategies focused on improving safety at intersections

**SEGMENTS** - Strategies focused on improving safety on roadway segments

Within each Focus Area, there are **three objectives** (15 total) that provides distinct guidance on what needs to be accomplished. Each objective has time-bound **performance metrics** to measure success throughout implementation of the city's Vision Zero initiative. Performance metrics will track and evaluate either programmatic metrics, an increase/decrease in a given metric, or the installation/improvement of infrastructure. Where possible, metrics list items that should be completed within a given time-frame.

### Acronyms

| | |
|---|---|
| **HIN:** | High Injury Network |
| **STR:** | Street Transportation Department |
| **PTD:** | Public Transit Department |
| **PDD:** | Planning and Development Department |
| **NSD:** | Neighborhood Services Department |
| **PD:** | Police Department |
| **FD:** | Fire Department |
| **ExPA:** | External Public Agencies: USDOT, FHWA, ADOT, MAG, Maricopa County, Valley Metro, City of Phoenix Public School Districts, and Neighboring Cities |
| **ExA:** | External Associations: Private Businesses, Neighborhood Associations, Business Improvement Districts BIDs, Developers, etc. |

The heart of this RSAP are the **41 strategies** outlined in this section. Through this planning process, over a hundred strategies were initially evaluated, and through a series of workshops with the City of Phoenix RSAP Working Group alongside community input, pared down to those presented. The strategies presented were determined to be both implementable and have a high potential to make a significant impact in reducing KSI crashes in Phoenix. They are also connected to at least one of the 5 E's and will be applied through of the following categories: HIN Strategies, Systemic Implementation, and Location-Specific Strategies. Each strategy also has a list of departments and agencies that will be responsible for its implementation.

# HOW TO READ THIS SECTION

## Focus Area

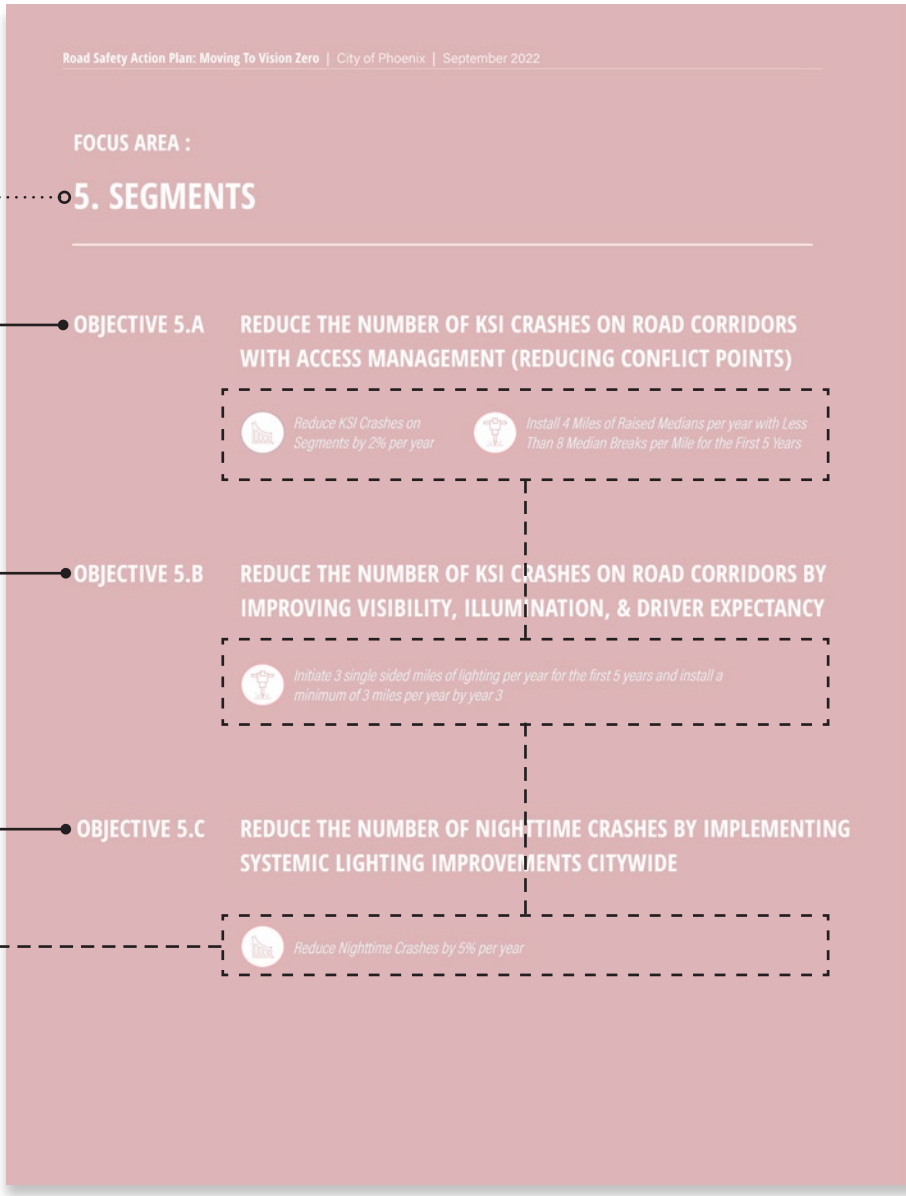
*There are 5 focus areas identified in this plan for safety improvements*

## Objective

*There are 3 objectives per focus area (15 total). Objectives are the overarching goal that each strategy & performance metric will support*

## Performance Metrics

*Each objective has 1-4 performance metrics that are time-bound measures by which Phoenix will track their success in implementation of this plan*




### Performance Metrics Symbol Key

**Programmatic Metric**

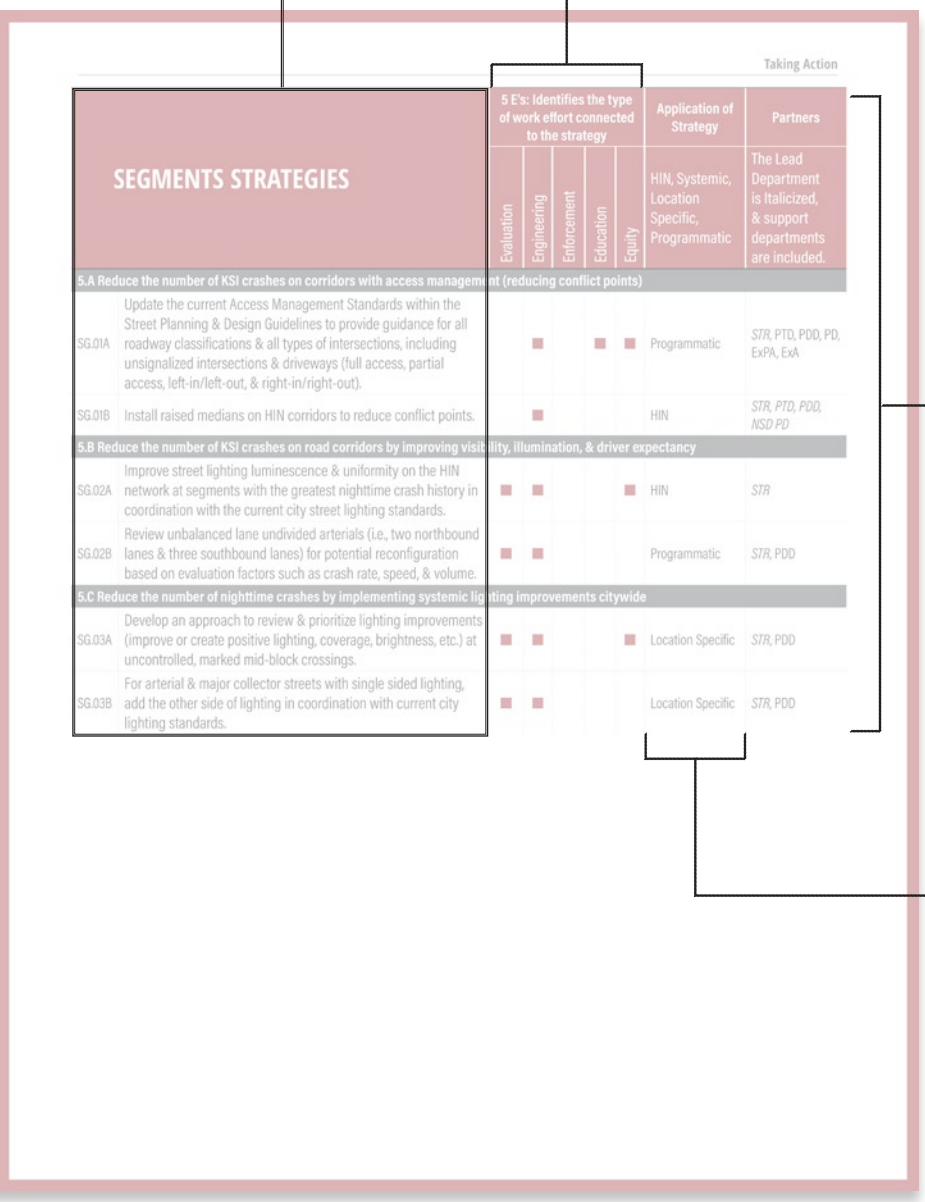
**Track Decrease**

**Track Increase**

**Build or Install Infrastructure**

## Strategies

*There are multiple strategies that contribute to the achievement of each objective*



Taking Action

| SEGMENTS STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| 5.A Reduce the number of KSI crashes on corridors with access management (reducing conflict points) | | | | | | | | |
| SG.01A | Update the current Access Management Standards within the Street Planning & Design Guidelines to provide guidance for all roadway classifications & all types of intersections, including unsignalized intersections & driveways (full access, partial access, left-in/left-out, & right-in/right-out). | | ■ | | ■ | ■ | Programmatic | *STR*, PTD, PDD, PD, ExPA, ExA |
| SG.01B | Install raised medians on HIN corridors to reduce conflict points. | | ■ | | | | HIN | *STR, PTD, PDD, NSD PD* |
| 5.B Reduce the number of KSI crashes on road corridors by improving visibility, illumination, & driver expectancy | | | | | | | | |
| SG.02A | Improve street lighting luminescence & uniformity on the HIN network at segments with the greatest nighttime crash history in coordination with the current city street lighting standards. | ■ | ■ | | | ■ | HIN | *STR* |
| SG.02B | Review unbalanced lane undivided arterials (i.e., two northbound lanes & three southbound lanes) for potential reconfiguration based on evaluation factors such as crash rate, speed, & volume. | ■ | ■ | | | | Programmatic | *STR*, PDD |
| 5.C Reduce the number of nighttime crashes by implementing systemic lighting improvements citywide | | | | | | | | |
| SG.03A | Develop an approach to review & prioritize lighting improvements (improve or create positive lighting, coverage, brightness, etc.) at uncontrolled, marked mid-block crossings. | ■ | ■ | | | ■ | Location Specific | *STR*, PDD |
| SG.03B | For arterial & major collector streets with single sided lighting, add the other side of lighting in coordination with current city lighting standards. | ■ | ■ | | | | Location Specific | *STR*, PDD |

## 5 E's

*Each strategy is connected to at least one of the 5 E's (Evaluation, Engineering, Enforcement, Education, Equity)*

## Responsible Partners

*Each strategy has a lead agency responsible for its implementation, along with partner agencies & departments that will provide support to the lead*

## Application

*Application describes how and where the strategy will be applied within the city - whether it be internal programmatic or systemic changes, strategies applied at specific locations, or strategies that are focused on the HIN*

FOCUS AREA :

# 1. GENERAL STRATEGIES

## OBJECTIVE 1.A ESTABLISH FOUNDATIONAL ELEMENTS OF VISION ZERO INCLUDING A TIMELINE & GOALS FOR IMPLEMENTATION & EVALUATION

- *Implement a Vision Zero Task Force consisting of a multi-departmental team for continued oversight of reducing KSI crashes*
- *Create a Vision Zero status report on objectives, updated every year in the fall & published in the spring*

## OBJECTIVE 1.B REDUCE CRASH RISK ON ROADWAYS BY ENHANCING SAFETY DATA COLLECTION & EVALUATION

- *Streamline RSA process to identify & implement feasible improvements by 2023*
- *Develop crash data dashboard to identify & rank crash locations by 2023*
- *Integrate crash data from Phoenix PD / ADOT on a monthly basis by 2023*
- *Conduct before/after evaluations for previously implemented safety projects*

## OBJECTIVE 1.C REDUCE CRASH RISK ON ROADWAYS BY CREATING A CULTURE OF ROAD SAFETY WITHIN THE CITY

- *Integrate safety review in development of CIP projects & private development projects by 2024*
- *Ensure that road safety expenditures are at least $60M per year*

| GENERAL STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| **1.A Establish foundational elements of Vision Zero including timeline & goals for implementation & evaluation** | | | | | | | | |
| GN.01A | Create a City of Phoenix inter-departmental Vision Zero Task Force. | ■ | ■ | ■ | ■ | ■ | Programmatic | *STR*, PTD, PDD, NSD, PD, FD |
| GN.01B | Create an annual Vision Zero status report including updated crash statistics from the crash dashboard, high injury network (HIN), & status of performance measure targets. | ■ | ■ | ■ | ■ | ■ | Programmatic | *STR*, PTD, PDD, NSD, PD, FD, ExPA, ExA |
| **1.B Reduce crash risk on roadways by enhancing safety collection & evaluation** | | | | | | | | |
| GN.02A | Continue to analyze safety data annually to identify high severity crash areas & implement countermeasures at prioritized locations. | ■ | ■ | | | ■ | Location Specific, Systemic, Programmatic | *STR*, PDD |
| GN.02B | Improve crash data sharing between the Street Transportation Department, Police Department, & Arizona Department of Transportation. | ■ | | | | | Programmatic | *STR*, PD, ExPA |
| GN.02C | Continue to conduct Road Safety Audits (RSA), focusing on the HIN, to identify appropriate countermeasures; develop & implement recommended countermeasures through projects at these locations. | ■ | ■ | | | | HIN, Programmatic, Location Specific | *STR*, PTD, PD, FD, ExPA |
| GN.02D | Enhance and streamline the process to implement RSA recommendations. | ■ | ■ | | | | Programmatic | *STR*, PTD, PD |
| **1.C Reduce crash risk on roadways by creating a culture of road safety within the City** | | | | | | | | |
| GN.03A | Incorporate analysis of crash history & countermeasure safety improvements for City of Phoenix capital improvement projects & private development projects. | ■ | ■ | | ■ | ■ | Systemic, Programmatic | *STR* |
| GN.03B | Create a road safety crash dashboard available to city staff for analysis & development of countermeasures into City practices. | ■ | ■ | | ■ | ■ | Systemic, Programmatic | *STR*, PTD, PDD, NSD, PD, FD |
| GN.03C | Incorporate a Vision Zero component into required driver training programs for City of Phoenix employees (including municipal courts) & contractors. | | | | ■ | | Programmatic | *STR* |
| GN.03D | Develop and maintain a list of prioritized planning, pre-design, design, & construction projects in pursuit of local, state, federal, & private grant funding as appropriate. | ■ | ■ | | | | Location Specific, Programmatic | *STR*, PTD, NSD, PD |
| GN.03E | Incorporate use of USLIMITS2, a free, web-based tool, to assess and establish speed limits for specific segments of roadway with high pedestrian/bicyclist activity, on-street parking, more than 30 driveways per mile, or above average crash history. USLIMITS2 produces an unbiased and objective suggested speed limit value based on 50th and 85th percentile speeds, traffic volumes, roadway type, roadway setting, number of access points, crash history, and pedestrian/bicyclist activity. | ■ | ■ | | | | Programmatic | *STR* |

FOCUS AREA :

# 2. BEHAVIOR RELATED

## OBJECTIVE 2.A REDUCE THE NUMBER OF KSI CRASHES INVOLVING PEDESTRIANS & BICYCLISTS THROUGH BEHAVIORAL CHANGES

- *Expand transportation safety enforcement impact programs by 10% per year*
- *Conduct pedestrian & bicyclist enforcement impact programs at least 12 times per year*

## OBJECTIVE 2.B REDUCE THE NUMBER OF KSI CRASHES RELATED TO SPEEDING, RED-LIGHT RUNNING, DISTRACTED DRIVING, & AGGRESSIVE DRIVING

- *Target KSI crashes associated with driver-behavior violations not to increase at a rate greater than population growth*
- *Conduct behavior-related enforcement impact programs at least 12 times per year*

## OBJECTIVE 2.C REDUCE THE NUMBER OF KSI CRASHES RELATED TO IMPAIRED DRIVING (DRUGS & ALCOHOL)

- *Conduct DUI enforcement programs at least 18 times per year*
- *Target KSI crashes associated with impaired driving not to increase at a rate greater than population growth*

| BEHAVIOR RELATED STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| **1.A Reduce the number of KSI crashes involving pedestrians and bicyclists through behavioral changes.** | | | | | | | | |
| BH.01A | Continue & enhance paid and earned media campaigns (electronic, print, radio, and broadcast) to promote public awareness of pedestrian and bicyclist safety. This includes using new & effective methods to reach target audiences. | | | | ■ | ■ | HIN, Programmatic | *STR*, PTD, PDD, NSD, PD, FD, ExPA, ExA |
| BH.01B | Expand enforcement of school zone laws. | | | ■ | | | Location Specific | *PD*, STR, ExA |
| BH.01C | Expand current efforts for student pedestrian & bicyclist education, safety, & awareness efforts, focusing on schools within 1/4 mile of the HIN network. | | | | ■ | ■ | HIN, Location Specific, Programmatic | *PD*, FD, STR, PDD |
| BH.01D | Conduct proactive enforcement of traffic laws amongst all road users on the HIN network, with emphasis on risk factors that contribute to pedestrians & bicyclists being involved in motor vehicle crashes. | | | ■ | | ■ | HIN | *PD*, STR, PDD |
| **2.B Reduce the number of KSI crashes related to speeding, red-light running, distracted driving, & aggressive driving** | | | | | | | | |
| BH.02A | Develop roadway safety awareness & education campaigns for people driving vehicles, in concert with enforcement efforts, to specifically target change in road user behavior related to speeding, red-light running, distracted driving, & aggressive driving. | | | | ■ | ■ | Programmatic | *STR*, PD, ExPA |
| BH.02B | Continue to evaluate & implement speed management techniques related to roadway design, roadway surface, traffic control, community education, and speed enforcement | ■ | ■ | ■ | ■ | ■ | Programmatic | *STR*, PD |
| **2.C Reduce the number of KSI crashes related to impaired driving (Drugs & Alcohol)** | | | | | | | | |
| BH.03A | Expand the DUI Enforcement through use of high-visibility enforcement techniques, saturation patrols, & integrated enforcement tactics. | | | ■ | | | Programmatic | *PD*, STR, NSD |

FOCUS AREA :

# 3. PEDESTRIANS & BICYCLISTS

## OBJECTIVE 3.A REDUCE CRASH RISK INVOLVING PEOPLE WALKING & BIKING BY EXPANDING SAFE ROUTES TO SCHOOL EFFORTS

*Implement safety improvements at 20 schools per year focused on schools on arterials, collectors, within mobility areas, and with high equity need.*

## OBJECTIVE 3.B REDUCE THE NUMBER OF KSI CRASHES INVOLVING PEOPLE WALKING & BIKING WITH GEOMETRIC RECONFIGURATION & SYSTEMIC COUNTERMEASURES

*Install 20 mid-block improvements per year*

*Reduce pedestrian-related fatal crashes by 10% per year*

*Develop pedestrian safety toolkit by 2027*

## OBJECTIVE 3.C REVIEW EXISTING GAPS IN PEDESTRIAN INFRASTRUCTURE & PRIORITIZE IMPROVEMENTS

*Develop a risk factor network to identify locations with greatest risk by 2025*

*Develop a plan to implement annual improvements to mitigate risk factors by 2027*

*Improve shade coverage at 60 transit stops per year*

| PEDESTRIANS & BICYCLISTS STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| **3.A Reduce crash risk involving people walking & biking by expanding safe routes to school efforts** | | | | | | | | |
| PB.01A | Develop Safe Routes to School plans for public, private, & charter elementary, middle, & high schools with crossings of arterial roads, & construct recommendations. | ■ | ■ | | ■ | ■ | HIN, Programmatic | *STR* |
| PB.01B | Implement school zone safety countermeasures for school crossings of collector roads. Develop school typologies for prioritization. | ■ | ■ | | ■ | | Systemic, Location Specific, Programmatic | *STR* |
| **3.B Reduce the number of KSI crashes involving people walking & biking with geometric reconfiguration & systemic countermeasures** | | | | | | | | |
| PB.02A | Continue constructing mid-block crossings at priority arterial road locations that include: HAWKs, signing, markings, & lighting to provide a safe place for people walking & bicycling to cross. | | ■ | | | ■ | HIN | *STR* |
| PB.02B | Develop a best practice approach for pedestrian crossings to improve safety in a context sensitive manner. | | ■ | | ■ | ■ | Systemic, Programmatic | *STR*, PTD |
| PB.02C | Develop a checklist or toolkit to improve safety for pedestrians & bicyclists through smart design choices for all to be used in designing City of Phoenix capital improvement program projects & private development projects. | | ■ | | ■ | | Systemic, Programmatic | *PTD*, STR |
| **3.C Review existing gaps in pedestrian infrastructure & prioritize improvements** | | | | | | | | |
| PB.03A | Analyze the transportation network to identify locations that have the greatest number of risk-factors (which contribute to pedestrian & bicyclist crashes), & then identify countermeasure improvements. | ■ | ■ | | | ■ | Systemic, Location Specific | *STR*, PTD, NSD, PD, FD |
| PB.03B | Establish natural or structural shade in pedestrian refuge & waiting areas. | | ■ | | | ■ | Location Specific | *STR*, PTD, PDD |

FOCUS AREA :

# 4. INTERSECTIONS

## OBJECTIVE 4.A REDUCE THE NUMBER OF KSI CRASHES AT UNSIGNALIZED INTERSECTIONS WITH GEOMETRIC RECONFIGURATION & SYSTEMIC COUNTERMEASURES

*Develop geospatial process for identifying unsignalized crashes by 2024*

*Develop list of priority intersections & improvements by 2024*

## OBJECTIVE 4.B REDUCE THE NUMBER OF KSI CRASHES AT SIGNALIZED INTERSECTIONS WITH GEOMETRIC RECONFIGURATION & SYSTEMIC COUNTERMEASURES

*Complete 15 HIN intersection rebuilds per year*

*Reduce KSI crashes at unsignalized intersections by 8% per year*

## OBJECTIVE 4.C REDUCE THE NUMBER OF KSI CRASHES AT SIGNALIZED INTERSECTIONS WITH SIGNAL PHASING OR TIMING

*Evaluate the 68 HIN intersections for appropriate pedestrian safety operations & left-turn operational improvements by 2024*

| INTERSECTIONS STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| **4.A Reduce the number of KSI crashes at unsignalized intersections w/ geometric reconfiguration & systemic countermeasures** | | | | | | | | |
| IT.01A | Develop a geospatial network screening process, that includes the frequency & severity of crashes, for unsignalized intersections to identify priority locations for improvements. | ■ | ■ | | | | Systemic, Location Specific | *STR* |
| IT.01B | For priority unsignalized intersections that do not or are not anticipated to meet traffic signal warrant criteria, evaluate & identify alternative countermeasures to improve traffic safety. | | ■ | | | | Systemic, Location Specific | *STR* |
| **4.B Reduce the number of KSI crashes at signalized intersections w/ geometric reconfiguration & systemic countermeasures** | | | | | | | | |
| IT.02A | Review sight visibility at HIN intersections to ensure adequate sight distance for left-turning vehicles. Re-stripe/reconstruct single left turn lanes to have zero or positive offsets, where protected lefts are not implemented. | ■ | ■ | | | ■ | HIN | *STR* |
| IT.02B | Continue efforts to identify existing traffic signals with legacy equipment including lighting level, & reconstruct them to current standards. | ■ | ■ | | | ■ | HIN, Programmatic | *STR* |
| IT.02C | Install additional far-side bus bays at priority locations. | ■ | ■ | | | ■ | Location Specific | *PTD*, STR, PDD |
| **4.C Reduce the number of KSI crashes at signalized intersections with signal phasing or timing** | | | | | | | | |
| IT.03A | Evaluate & modify left-turn phasing at signalized intersections on the HIN to reduce conflicting movements. | ■ | ■ | | | ■ | HIN, Programmatic | *STR* |
| IT.03B | Evaluate & implement use of leading pedestrian interval (LPI) at intersections with greatest crash risk of pedestrian-motor vehicle collisions. | ■ | ■ | | | ■ | Location Specific | *STR* |
| IT.03C | Review procedure on establishing yellow change & all-red clearance intervals. | ■ | ■ | | ■ | | Programmatic | *STR* |
| IT.03D | Continue to evaluate & implement ITS improvements to provide greater signal efficiency, coordination, communication, including piloting & evaluating adaptive traffic signal control. | ■ | ■ | | | | Systemic | *STR* |
| IT.03E | Install emergency vehicle preemption at locations with the greatest need. | ■ | ■ | | | | HIN, Systemic | *FD*, STR |

FOCUS AREA :

# 5. SEGMENTS

## OBJECTIVE 5.A REDUCE THE NUMBER OF KSI CRASHES ON ROAD CORRIDORS WITH ACCESS MANAGEMENT (REDUCING CONFLICT POINTS)

*Reduce KSI crashes on segments by 2% per year*

*Install 4 Miles of Raised Medians per year with less than 8 median breaks per mile for the first 5 Years*

## OBJECTIVE 5.B REDUCE THE NUMBER OF KSI CRASHES ON ROAD CORRIDORS BY IMPROVING VISIBILITY, ILLUMINATION, & DRIVER EXPECTANCY

*Initiate 3 single sided miles of lighting per year for the first 5 years and install a minimum of 3 miles per year by year 3*

## OBJECTIVE 5.C REDUCE THE NUMBER OF NIGHTTIME CRASHES BY IMPLEMENTING SYSTEMIC LIGHTING IMPROVEMENTS CITYWIDE

*Reduce nighttime crashes by 5% Per Year*

| SEGMENTS STRATEGIES | | 5 E's: Identifies the type of work effort connected to the strategy | | | | | Application of Strategy | Partners |
|---|---|---|---|---|---|---|---|---|
| | | Evaluation | Engineering | Enforcement | Education | Equity | HIN, Systemic, Location Specific, Programmatic | The Lead Department is Italicized, & support departments are included. |
| **5.A Reduce the number of KSI crashes on corridors with access management (reducing conflict points)** | | | | | | | | |
| SG.01A | Update the current Access Management Standards within the Street Planning & Design Guidelines to provide guidance for all roadway classifications & all types of intersections, including unsignalized intersections & driveways (full access, partial access, left-in/left-out, & right-in/right-out). | | ■ | | ■ | ■ | Programmatic | *STR*, PTD, PDD, PD, ExPA, ExA |
| SG.01B | Install raised medians on HIN corridors to reduce conflict points. | | ■ | | | | HIN | *STR, PTD, PDD, NSD PD* |
| **5.B Reduce the number of KSI crashes on road corridors by improving visibility, illumination, & driver expectancy** | | | | | | | | |
| SG.02A | Improve street lighting luminescence & uniformity on the HIN network at segments with the greatest nighttime crash history in coordination with the current city street lighting standards. | ■ | ■ | | | ■ | HIN | *STR* |
| SG.02B | Review unbalanced lane undivided arterials (i.e., two northbound lanes & three southbound lanes) for potential reconfiguration based on evaluation factors such as crash rate, speed, & volume. | ■ | ■ | | | | Programmatic | *STR*, PDD |
| **5.C Reduce the number of nighttime crashes by implementing systemic lighting improvements citywide** | | | | | | | | |
| SG.03A | Develop an approach to review & prioritize lighting improvements (improve or create positive lighting, coverage, brightness, etc.) at uncontrolled, marked mid-block crossings. | ■ | ■ | | | ■ | Programmatic, Location Specific | *STR*, PDD |
| SG.03B | For arterial & major collector streets with single sided lighting, add the other side of lighting in coordination with current city lighting standards. | ■ | ■ | | | | Location Specific | *STR*, PDD |

# TOOLBOXES

To support the implementation of various strategies presented in this chapter, the City of Phoenix will utilize proven best practices, guidelines, toolkits, and handbooks from external organizations that include the Federal Highway Administration (FHWA), National Cooperative Highway Research Program (NCHRP), National Highway Traffic Safety Administration (NHTSA), and the Institute of Transportation Engineers (ITE). These resources are collectively referred to as toolboxes. These toolboxes are to be used to support advancing the RSAP strategies, apply proven engineering, enforcement, education, and evaluation designs and methods, and as **quick references** to determine how to best approach and solve a traffic safety issue within the city. Below are several examples of toolboxes presented by focus area. *Appendix-C contains the entire list of toolboxes*

## GENERAL STRATEGIES

**Strategies to Coordinate Zero Deaths Efforts for State and Local Agencies, FHWA-SA-20-061, November 2020** – The document is designed to help state and local agencies foster and build stronger relationships that support coordinated zero deaths efforts. The document describes work toward the Safe System Approach for reaching the zero deaths goal, including managing speed for safety, strengthening safety culture, and leveraging data and community input to prioritize changes. **Access**: https://safety.fhwa.dot.gov/zerodeaths/docs/Strategies_for_VZ_Coordination_112020.pdf

**A Strategic Approach to Transforming Traffic Safety Culture to Reduce Deaths and Injuries, NCHRP Document 25, 2018** – A strategic approach to transform traffic safety culture should leverage the values and change the beliefs of all relevant traffic safety stakeholders across the social environment. The purpose of this report is to provide state agencies responsible for traffic safety (and their traditional, as well as non-traditional, traffic safety partners) with guidance for a strategic approach to transform the traffic safety culture of road users and stakeholders. The goal is to use this approach to sustain improvements in traffic safety for all road users, including non-motorized users. **Access**: https://nap.nationalacademies.org/download/25286#

## BEHAVIOR RELATED

**Noteworthy Speed Management Practices, FHWA-SA-20-047, August 2020** – This report provides an avenue of information for practitioners in that it summarizes eight case studies which highlight noteworthy practices over a range of speed management issues. The case study strategies include Strategic Speed Management Program; Self-Enforcing Roadways; Setting Credible Speed Limits; High Visibility Enforcement; Successful Strategies for Adoption of Safety Cameras; Targeted Reporting of Speeding-Related Crashes; Consistent Speed Limit for Vulnerable Road Users; and Network Approach to Setting Speed Limits. **Access:** https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/fhwasa20047.pdf

**High Visibility Enforcement (HVE) Toolkit, NHTSA** – Provides information on types of enforcement (Saturation Patrol, Wave, Integrated Enforcement, and Multi-Jurisdictional Enforcement), placement of HVE, visibility elements, training and measuring effectiveness. Also provides information on publicity methods for HVE, implementation and resources on the website. In addition, NHTSA provides template materials (press releases, talking points, posters, etc.), for the following individual program areas: Impaired Driving; Occupant Protection; Speed/Aggressive Driving; and Distracted Driving. **Access:** https://www.nhtsa.gov/enforcement-justice-services/high-visibility-enforcement-hve-toolkit

## PEDESTRIANS & BICYCLISTS

**Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA-SA-17-072, July 2018** – This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines. This guide provides a Countermeasure Selection Table for uncontrolled intersections based on posted speed limit, ADT and roadway configuration. This guide also provides a table listing the safety issues addressed by countermeasure type. **Access:** https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf

**Improving Intersections for Pedestrians and Bicyclists Informational Guide, FHWA-SA-22-017, April 2022** – The purpose of this guide is to inform the state of the practice concerning intersection planning and design to implement solutions that help achieve the goal for zero fatalities and serious injuries while improving mobility for bicyclists and pedestrians. The primary intersection types discussed in this guide include traditional signalized intersections, roundabouts, Median U-Turn (MUT) intersections, Reduced Crossing U-Turn (RCUT) intersections, Quadrant Roadway (QR) intersections, Displaced Left Turn (DLT) intersections, and Diverging Diamond Interchanges (DDI). This guide also includes discussion about stop-controlled and uncontrolled intersection crossings for bicyclists and pedestrians. This guide illustrates integration of bikeways and pedestrian pathways at and across traditional and alternative intersections, describes countermeasures applicable to pedestrian and bicyclist crossings at intersections, and summarizes the application of intersection analysis methods for the safety and mobility of pedestrians and bicyclists. **Access:** https://safety.fhwa.dot.gov/intersection/about/fhwasa22017.pdf

## INTERSECTIONS

**Unsignalized Intersection Improvement Guide (UIIG) Toolkit, ITE, 2015** – The purpose of the UIIG is to assist and guide users through the process of evaluating their unsignalized intersections and identifying opportunities to enhance their safety and operational performance. The contents of the UIIG are presented under two sections: Information and Toolkit. The Information section provides important background material related to the types, users, common problems and treatments, and general considerations associated with unsignalized intersections. The Toolkit provides several resources to assist the user in: (1) collecting data on the existing conditions and characteristics of the intersection; and (2) identifying potential treatments that may improve the safety and mobility at the intersection. **Access:** https://toolkits.ite.org/uiig/

**Manual on Pedestrian and Bicycle Connections to Transit, FTA-FL-26-7012-00, July 2017** – Provides a compendium of best practices to help transportation professionals improve pedestrian and bicycle safety and access to transit, including information on evaluating, planning for, and implementing improvements to pedestrian and bicycle access to transit. In addition to covering key concepts such as access sheds, connected networks, and station area comfort, safety, and legibility, the manual covers needs specific to pedestrians, such as complete sidewalks and safe, convenient crossings, and to bicyclists, such as bicycle parking and on-transit accommodations. **Access:** https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/64496/ftareportno0111.pdf

SEGMENTS

**Intersection Proven Safety Countermeasure Technical Summary: Corridor Access Management, FHWA-SA-15-005, Updated July 2020** - This Technical Summary was prepared to assist transportation professionals with decisions pertaining to Corridor Access Management, including planning, permitting, design, selection, and implementation. This document provides a substantive overview of important access-related issues: safety performance (i.e. crashes), effects on pedestrian and bicycle facilities, and community and business economic impacts. **Access:** https://safety.fhwa.dot.gov/intersection/cam/fhwasa15005.pdf

**Web-Based Training for FHWA Roadway Lighting Workshop Module 3: Street and Roadway Lighting Design, FHWA-SA-18-035, May 2018** – Participant workbook for Web-Based Training for FHWA Roadway Lighting Workshop, Module 3: Street and Roadway Lighting Design. Module 3 covers lighting design criteria, calculations, field measurements, and light pollution. Other modules include Module 1: Roadway Lighting Design Overview, Module 2: Lighting Hardware and Light Source Considerations for Roadway Lighting, and Module 4: Other Roadway Lighting Topics. **Access:** https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway_lighting_workshop/Module3Workbook_021219.pdf

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CHAPTER 6

# A PATH FORWARD

# STRATEGY PRIORITIZATION

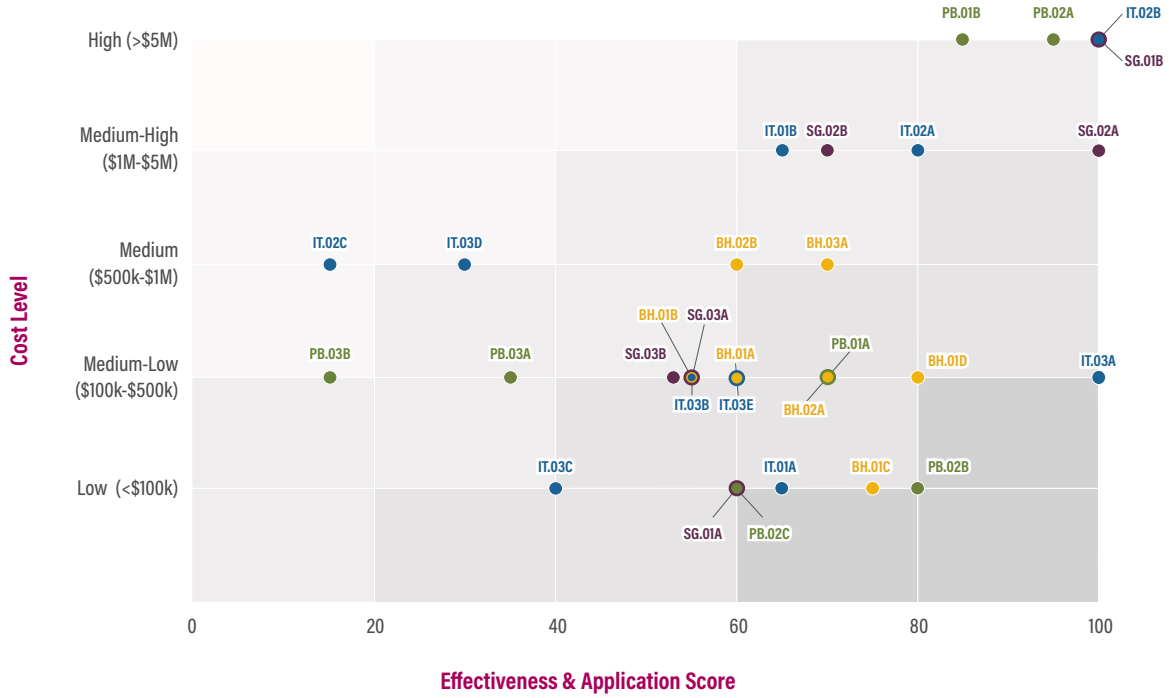
Recognizing resources are finite and that some actions will have a more immediate impact reducing traffic fatalities and improving safety, the strategies presented in the previous section were prioritized based on the following factors:

**Effectiveness:** Strategies that have been proven to have a higher impact on reducing serious and fatal crashes are prioritized higher in this plan. Resources used to quantify strategy effectiveness include: the Crash Modification Factors Clearinghouse, FHWA Proven Safety Countermeasures, and the National Highway Traffic Safety Association. General Strategies were not applicable and not included in this evaluation.

**Application:** Strategies that will be applied to the HIN are prioritized higher in this plan, with location specific, systemic, or programmatic strategies prioritized secondarily.

**Cost:** Annual average cost of implementation is an additional factor for strategy prioritization in this plan.

Using these factors, the chart below illustrates each strategy's composite effectiveness and application score distributed by annual average cost. Each strategy serves a purpose towards the ultimate vision of eliminating fatalities and serious injuries. **Strategies closest to the lower right corner are anticipated to have the highest benefit-cost ratio**.




## Legend

BH: Behavior Related | PB: Pedestrians & Bicyclist | IT: Intersections | SG: Segments

As the City moves forward with the goal of reducing fatal and serious injury on City streets, an implementation plan was developed to identify the when, where, and how projects will be implemented. This section develops a framework for moving the objectives and strategies to actionable projects, including further details on work phases and timeline. This implementation plan is divided into three categories based on timing, sequence, and location: **Foundational Change**, **Systemic Implementation**, & **Addressing the HIN**. Strategies may apply to one or more of these categories.

# FOUNDATIONAL CHANGE

Foundational change strategies include internal initiatives and process improvements to support the City's goals of becoming a Vision Zero community, improving crash data collection and evaluation, and creating a culture of roadway safety within the City. Foundational change strategies will serve as the building blocks to support implementation of the other strategies within the plan and, as such, are excluded from the previous strategy prioritization effort. Most of these strategies will be substantially complete with one-time efforts to establish policies, procedures, or framework needed to execute other strategies. Each foundational change strategy is provided in the following table along with a justification statement, the process to complete the strategy, and proposed timeline for completion.

# FOUNDATIONAL CHANGE STRATEGIES

## GN.01A - CREATE A CITY OF PHOENIX INTER-DEPARTMENTAL VISION ZERO TASK FORCE

| Justification | Process Phases | Timeline |
|---|---|---|
| Developing an inter-departmental task force is a foundational element of a Vision Zero Plan. A diverse, committed team is needed to lead in the goal of reducing & eliminating serious injury & fatal crashes, as many factors contribute to crash safety. The success of the program will be dependent on involvement from internal departments & external stakeholders, with different knowledge, experience, & roles, but the same shared goal of improving safety. | -PHX RSAP Project Team to develop Vision Zero Task Force draft framework, including the group's goals, growth phases, coordination schedule, & stakeholder roles/functions.<br>-PHX leadership team to finalize framework<br>-Designation of Task Force Chair/Department<br>-Engagement with department supervisors for commitment & key team members.<br>-Tier 1: Establish Executive Task Force<br>-Tier 2: Establish RSAP Implementation Team<br>-Tier 3: Establish Community Advisory Committee | *Q4 2022* - Executive Task Force begins quarterly meetings; RSAP Implementation Team begins monthly meetings<br>*Q2 2023* - Establishment of the Community Advisory Committee with quarterly meeting cadence |

## GN.01B - CREATE AN ANNUAL VISION ZERO STATUS REPORT INCLUDING UPDATED CRASH STATISTICS FROM THE CRASH DASHBOARD, HIGH INJURY NETWORK (HIN), & STATUS OF PERFORMANCE MEASURE TARGETS.

| Justification | Process Phases | Timeline |
|---|---|---|
| The annual Vision Zero Status Report will provide benchmarking information on the City's progress in reaching safety goals. The status report is intended to keep focus on the short term & long term goals, provide information to the public, Council, & other stakeholders, review effectiveness of strategies implemented, & inform future implementation decisions. | -Development of a crash dashboard with enhanced evaluation features.<br>-Development of a high injury network (HIN).<br>-Development of performance measure targets.<br>-Development of a status report template for all performance measure targets.<br>-Complete a Vision Zero Status Report once annually, reporting on the current status of all performance measure targets.<br>-Update the HIN every three years based on the most recent five years of crash data. | *Q4 2022* - Development of crash dashboard, HIN, performance measure targets, status report template<br>*Q4: Annual* - Data analysis for each status report<br>*Q2: Annual* - Status reports complete |

## GN.02A - CONTINUE TO ANALYZE SAFETY DATA ANNUALLY TO IDENTIFY HIGH SEVERITY CRASH AREAS AND IMPLEMENT COUNTERMEASURES AT PRIORITIZED LOCATIONS.

| Justification | Process Phases | Timeline |
|---|---|---|
| The City currently conducts an annual safety review of trends Citywide, & uses supporting data to inform project-specific analyses throughout the year. This strategy aims to develop more dynamic evaluation capabilities to better understand hot spot areas with particular crash types. The network screening improvements could be developed to rank locations based on crash frequency, crash severity, & user type. Potential evaluations include: top signalized intersections by left-turn & angle crashes, top unsignalized intersections by left-turn & angle crashes, top segments by pedestrian crashes, top intersections by percent of nighttime collisions, top segments by percent of nighttime collisions, most crashes within a set radius of a school, top locations by children & elderly pedestrian crashes, top locations involving transit corridors, & consideration of equity factors. | -Integrate a more frequent data transfer (weekly/monthly) for the Streets Department to obtain new crash data for analysis.<br>-Collaborate to identify the network screening features desired.<br>-Integrate GIS elements with crash data (equity, traffic signals, HAWKs, unsignalized intersections, street lighting, transit corridors, etc.).<br>-Develop features within the crash dashboard to quickly query data. | *Q1 2023* - Integration of automated crash data transfer & GIS elements<br>*Q3 2023* - Development of evaluation features |

# FOUNDATIONAL CHANGE STRATEGIES (CONT.)

**GN.02B - IMPROVE CRASH DATA SHARING BETWEEN THE STREET TRANSPORTATION DEPARTMENT, POLICE DEPARTMENT, & ARIZONA DEPARTMENT OF TRANSPORTATION.**

| Justification | Process Phases | Timeline |
|---|---|---|
| Crash data is initially collected & reviewed by Phoenix PD, reported to ADOT, reviewed/scrubbed through ADOT, & shared back to Phoenix Streets on an annual basis for crash data analysis. Improvements to the crash data sharing process are intended to reduce the data latency between the date of a crash & the date in which it is available for review by Phoenix Streets. | *-Method A: ADOT Data Transfer*<br>•Establish an FTP to share crash data directly from ADOT, on a more frequent basis (weekly or monthly).<br>•Develop connections to integrate the data format directly into the existing crash data dashboard.<br>*-Method B: Phoenix PD Data Transfer*<br>•Establish an FTP to share crash data directly between departments, from PHX PD to Streets, on a more frequent basis (weekly or monthly).<br>•Develop connections to integrate the data format directly into the existing crash data dashboard. | *Q1 2023* - Establish crash data connection(s)<br>*Q3 2023* - Integrate fully within dashboard |

**GN.02C - CONTINUE TO CONDUCT ROAD SAFETY AUDITS (RSA), FOCUSING ON THE HIN, TO IDENTIFY APPROPRIATE COUNTERMEASURES; DEVELOP & IMPLEMENT RECOMMENDED COUNTERMEASURES THROUGH PROJECTS AT THESE LOCATIONS.**

| Justification | Process Phases | Timeline |
|---|---|---|
| The formal RSA program is funded by the Maricopa Association of Governments (MAG), based on the intersections ranking highest in safety need. The MAG list of Top 100 intersections, published every few years, typically includes a significant number of locations within Phoenix. When Phoenix intersections are selected for study, continue support & involvement from Phoenix staff to provide background information on existing issues, participate in discussion of proposed recommendations, & develop a response to each proposed recommendation. | -Continue to submit applications for the MAG Road Safety Assessment Program to conduct RSAs at intersections, along corridors, & in conjunction with preliminary design of projects on the HIN.<br>-Identify candidate locations by crosschecking the MAG Top 100 list with the City's HIN & excluding any past RSA locations or recently completed safety improvement projects.<br>-Designate one staff position within Traffic Services to identify & pursue funding sources (outside of CIP funds) to support safety improvement implementation. | *Continuous* |

**GN.02D - ENHANCE AND STREAMLINE THE PROCESS TO IMPLEMENT RSA RECOMMENDATIONS.**

| Justification | Process Phases | Timeline |
|---|---|---|
| RSAs generate a list of recommendations to improve safety at an intersection, ranging from signing & marking, signal operation & phasing, ADA considerations, access management, & minor maintenance items. The improvement efforts are carried out by various teams within the City (signals, sign shop, police, fire, maintenance, transit, etc.) & tracking the status of ongoing improvements is currently challenging. | -Designate one staff position within Traffic Services to manage the documentation of RSA recommendations (excluding maintenance items) & obtain feedback from internal staff and other departments (Transit, PD, etc.) to program the improvements.<br>-Improve collaboration between departments on RSA recommendations that are not led by Streets (Transit, PD, etc.)<br>-Following implementation of safety improvements, conduct before & after evaluations to track the changes/benefits of the improvements. The evaluation is recommended to include 3 years of data before & after the improvements. | *Q3 2023* -Create central tracking process to program safety |

# FOUNDATIONAL CHANGE STRATEGIES (CONT.)

## GN.03A - INCORPORATE ANALYSIS OF CRASH HISTORY & COUNTERMEASURES SAFETY IMPROVEMENTS FOR CITY OF PHOENIX CAPITAL IMPROVEMENT PROJECTS & PRIVATE DEVELOPMENT PROJECTS

| Justification | Process Phases | Timeline |
|---|---|---|
| Evaluation of crash data & safety trends is an important aspect as the City plans for & implements projects. A historical crash review & associated countermeasure identification is recommended to be added as a required element in CIP project development & in the private development review process. | -Review CIP program types to identify which should require crash evaluation in planning process, & which may be excluded.<br>-City management engagement to facilitate coordination between Streets & other involved departments for CIP process modifications.<br>-Streets to develop proposed criteria for crash data evaluation (number of years, intersection radius, segment bounds, reporting summaries).<br>-Create process flow & assign responsibility to staff person who will query crashes using dashboard or provide methodology for submitter to be able to pull key crash information. | *Continuous* - Begin in 2023 |

## GN.03B - MAKE THE ROAD SAFETY CRASH DASHBOARD AVAILABLE TO CITY STAFF TO ACCESS FOR ANALYSIS & DEVELOPMENT OF COUNTERMEASURES INTO CITY PRACTICES.

| Justification | Process Phases | Timeline |
|---|---|---|
| Safety reviews help the City make fiscally responsible decisions & to improve the safety for all roadway users. The objective of the road safety crash dashboard is to extract useful information from centrally stored safety data & display the information using graphs, tables, maps & other visualizations so that staff across departments (e.g. project-specific stakeholders) can make informed decisions. Providing department access to this tool will reduce the risk of schedule delays when incorporating safety reviews in projects & encourage involvement in safety review in other departments, outside of Streets. | -Establish an FTP to share crash data directly from ADOT, on a more frequent basis (weekly or monthly).<br>-Broaden geographical analysis of crash data to include crashes near jurisdictional boundaries with other agencies.<br>-Develop a crash dashboard that allows crash data to be more easily accessible & provide enhanced analytics.<br>-Improve investigation & procedural requirements to shorten time from when a fatal or serious injury motor vehicle crash occurs & when the records are submitted to ADOT. | *Q1 2023* - Establish crash data connection(s)<br>*Q3 2023* - Integrate crash data scrubbing elements<br>*Q4 2024* - Improve timeframe for submitting fatal crash records to ADOT |

## GN.03C - INCORPORATE A VISION ZERO COMPONENT INTO REQUIRED DRIVER TRAINING PROGRAMS FOR CITY OF PHOENIX EMPLOYEES (INCLUDING MUNICIPAL COURTS) & CONTRACTORS.

| Justification | Process Phases | Timeline |
|---|---|---|
| The City of Phoenix has more than 14,000 employees working across 35 departments. Both the Occupational Safety and Health Administration (OSHA) & the National Highway Traffic Administration (NHTSA), agree that by implementing an effective program of corporate driver training, the number of crashes your employees might be involved in will be dramatically lowered. Instilling & reinforcing Vision Zero safe driving practices for city staff & contractors reduces the likelihood that they contribute to serious & fatal accidents. | -Work with appropriate team member to add a Vision Zero component to required employee on-boarding & annual training. Expand this training to the Municipal Courts.<br>-Create & publish a series of webinars or videos to provide Vision Zero training specific to the City of Phoenix.<br>-Ask vendors registered with ProcurePHX to self-certify that key personnel have participated in Phoenix's Vision Zero Training within the past three years. | *Q3 2023* - Add Vision Zero component for internal staff training & expand<br>*Q2 2023* - Publish Vision Zero Training |

# FOUNDATIONAL CHANGE STRATEGIES (CONT.)

**GN.03D - DEVELOP AND MAINTAIN A LIST OF PRIORITIZED PLANNING, PRE-DESIGN, DESIGN, & CONSTRUCTION PROJECTS IN PURSUIT OF LOCAL, STATE, FEDERAL, & PRIVATE GRANT FUNDING AS APPROPRIATE.**

| Justification | Process Phases | Timeline |
|---|---|---|
| Maintaining a list of prioritized projects will streamline application processes as new funding opportunities become available. Maintaining the prioritized list will reduce delay and deliberation during the grant application process, and will allow City staff to focus time into crafting the best applications possible to be selected for funding. | -The projects listed in the "Addressing the HIN" section of this chapter will serve as the initial list of prioritized projects.<br>-As the HIN is updated in the future, new locations will be identified and prioritized based on the number of historical KSI crashes or predicted injury crashes. | *Continuous* |

**GN.03E - INCORPORATE USE OF USLIMITS2, A FREE, WEB-BASED TOOL, TO ASSESS & ESTABLISH SPEED LIMITS FOR SPECIFIC SEGMENTS OF ROADWAY WITH HIGH PEDESTRIAN/BICYCLIST ACTIVITY, ON-STREET PARKING, MORE THAN 30 DRIVEWAYS PER MILE, OR ABOVE AVERAGE CRASH HISTORY. USLIMITS2 PRODUCES AN UNBIASED AND OBJECTIVE SUGGESTED SPEED LIMIT VALUE BASED ON 50TH AND 85TH PERCENTILE SPEEDS, TRAFFIC VOLUMES, ROADWAY TYPE, ROADWAY SETTING, NUMBER OF ACCESS POINTS, CRASH HISTORY, & PEDESTRIAN/BICYCLIST ACTIVITY**

| Justification | Process Phases | Timeline |
|---|---|---|
| The City of Phoenix has authority per ARS 28-703 to set appropriate speed limits on the basis of an engineering & traffic investigation. There is broad consensus among global roadway safety experts that speed control is one of the most critical methods to reduce the significant risks drivers impose on others—especially vulnerable road users—and on themselves. Addressing speed is fundamental to the Safe System Approach for reducing fatalities and serious injuries. | -Use USLIMITS2 at: https://safety.fhwa.dot.gov/uslimits/<br>-Document the factors or thresholds that constitute "high pedestrian/bicyclist activity" beyond the examples provided in the user guide.<br>-Determine the average crash rate per 100 million vehicle miles for different types of roads in the City of Phoenix to replace the national Highway Safety Information System (HSIS) rates.<br>-Determine the average injury & fatal rates for different types of roads in the City of Phoenix to replace the national HSIS rates. | *Q4 2022* - Begin |

**PB.02B - DEVELOP A BEST PRACTICE APPROACH FOR PEDESTRIAN CROSSINGS TO IMPROVE SAFETY IN A CONTEXT SENSITIVE MANNER.**

| Justification | Process Phases | Timeline |
|---|---|---|
| Judgment on the application of a marked crosswalk should be based on multiple factors, including land uses, present & future demand, pedestrian compliance, speed, safety, and crash history. Volumes alone are not enough to determine whether or not a particular device should be used. The presence of a marked crosswalk does not in & of itself render a street safe. Based on their surrounding context, speed, & overall roadway width, marked crosswalks often require additional safety measures such as safety islands, signals, or traffic calming. | -Establish process to standardize all uncontrolled marked crosswalk locations.<br>-Set up annual reviews of marked crosswalk locations for maintenance purposes.<br>-Develop & implement warrant criteria for when to designate a new crossing location. | *Q4 2022* - Establish new crossing warrant criteria<br>*Q4 2023* - Complete standardization process for uncontrolled locations; Establish annual review cadence of crosswalk locations |

# FOUNDATIONAL CHANGE STRATEGIES (CONT.)

**PB.02C - DEVELOP A CHECKLIST OR TOOLKIT TO IMPROVE SAFETY FOR PEDESTRIANS & BICYCLISTS THROUGH SMART DESIGN CHOICES FOR ALL TO BE USED IN DESIGNING CITY OF PHOENIX CAPITAL IMPROVEMENT PROGRAM PROJECTS & PRIVATE DEVELOPMENT PROJECTS.**

| Justification | Process Phases | Timeline |
|---|---|---|
| Checklists can help professionals identify roadway crash risk early on in the lifespan of a project. Early identification of issues allows time for safety countermeasures to be identified, evaluated, & budgeted for during final design & construction. Checklists offer a systematic procedure that empowers staff & other professionals to play a role in road safety without extensive training or education in road safety principles. Checklists may be complemented by design toolkits, which provide further guidance for the application of specific countermeasures given site-specific conditions. | -Develop a fillable form PDF checklist that guides the user in design choices that are likely to improve safety for pedestrians & bicyclists. Reference existing toolkits when available.<br>-Develop internal & external processes for use of the checklist. | *Q4 2023* - Implement for CIP Program<br>*Q2 2024* - Implement for private development projects |

# SYSTEMIC IMPLEMENTATION

Expanding **beyond the HIN,** systemic implementation takes a broader view and addresses risk across the City's entire roadway system. A systemic safety approach involves continuous evaluation, engineering, enforcement, and education initiatives to allocate resources to proactively address safety concerns. Systemic actions build upon resources and programs the City already has and may have an annual implementation goal to track progress. The strategies identified in this plan target the City's high risk crash types and should be widely implemented as resources allow. Most of these strategies will be continually implemented through annual programs. The following sections are organized by 4 of the 5E's and recommend actions to start in the first year of plan implementation. The 5th E, Equity, is incorporated for each strategy during project development and prioritization, and thus, does not have a dedicated table.

## SYSTEMIC EVALUATION

Quality data is the foundation for making important decisions regarding the design, operation, and safety of roadways. The combination of analyzing crash, roadway and traffic data leads to more precise and prioritized safety decisions. Safety analysis helps the City make decisions that are fiscally responsible and to improve the safety of the roadway for all users. Phoenix has been conducting safety analysis for decades to better identify safety problems and prescribe solutions to inform the CIP and respond to citizen feedback and input from elected officials. The City receives 50 to 70 requests for traffic signals and 40 to 50 requests for signalized mid-block pedestrian crossings (HAWKs) each year. To advance the City's ability to incorporate explicit, quantitative consideration of safety into planning and project development decision making, several safety enhancements and process changes will be made to: *modernize and manage existing safety analysis tools in a centralized database and software system, implement city-wide network screening to identify candidate locations, update evaluation and prioritization methodologies, implement a centralized tracking system for traffic and safety study requests, incorporate available safety analysis tools at the project level including USLIMITS2 and IHSDM, shorten the installation time for safety countermeasures, and record outcome data to measure progress over time.*

### FIRST YEAR EVALUATION ACTIONS:

**PB.02A: CONTINUE TO ANALYZE SAFETY DATA ANNUALLY TO IDENTIFY HIGH SEVERITY CRASH AREAS & IMPLEMENT COUNTERMEASURES AT PRIORITIZED LOCATIONS.**

- Re-instate collection of traffic volumes city-wide on arterials and major collectors at least once every three years.
- Modernize existing safety analysis tools in a centralized database and software system. (UNDERWAY)

**GN.02B: IMPROVE CRASH DATA SHARING BETWEEN THE STREET TRANSPORTATION DEPARTMENT, POLICE DEPARTMENT, & ARIZONA DEPARTMENT OF TRANSPORTATION.** (UNDERWAY)

**GN.03B: MAKE THE ROAD SAFETY CRASH DASHBOARD AVAILABLE TO CITY STAFF TO ACCESS FOR ANALYSIS & DEVELOPMENT OF COUNTERMEASURES INTO CITY PRACTICES.** (UNDERWAY)

**GN.03E: INCORPORATE USE OF USLIMITS2, A FREE, WEB-BASED TOOL, TO ASSESS AND ESTABLISH SPEED LIMITS FOR SPECIFIC SEGMENTS OF ROADWAY WITH HIGH PEDESTRIAN/BICYCLIST ACTIVITY, ON-STREET PARKING, MORE THAN 30 DRIVEWAYS PER MILE, OR ABOVE AVERAGE CRASH HISTORY.**

**PB.03A: ANALYZE THE TRANSPORTATION NETWORK TO IDENTIFY LOCATIONS THAT HAVE THE GREATEST NUMBER OF RISK-FACTORS (WHICH CONTRIBUTE TO PEDESTRIAN & BICYCLIST CRASHES), & THEN IDENTIFY COUNTERMEASURE IMPROVEMENTS.**

### 2-5 YEAR EVALUATION ACTIONS:

**BH.02B: CONTINUE TO EVALUATE & IMPLEMENT SPEED MANAGEMENT TECHNIQUES RELATED TO ROADWAY DESIGN, ROADWAY SURFACE, TRAFFIC CONTROL, COMMUNITY EDUCATION, AND SPEED ENFORCEMENT.** (UNDERWAY)

**PB.01B: IMPLEMENT SCHOOL ZONE SAFETY COUNTERMEASURES FOR SCHOOL CROSSINGS OF COLLECTOR ROADS. DEVELOP SCHOOL TYPOLOGIES FOR PRIORITIZATION.**

**IT.03B: DEVELOP A GEOSPATIAL NETWORK SCREENING PROCESS, THAT INCLUDES THE FREQUENCY & SEVERITY OF CRASHES, FOR UNSIGNALIZED INTERSECTIONS TO IDENTIFY PRIORITY LOCATIONS FOR IMPROVEMENTS.**

## SYSTEMIC ENGINEERING

Engineering strategies address roadway safety through roadway design, traffic engineering, maintenance, operations, and planning. Certain strategies are better suited for widespread implementation across the City to proactively address crash risk or to provide consistency and equitability. Additionally, some engineering strategies are currently being targeted for location-based implementation on the HIN because there are limited resources to allocate. In future years, as those locations are addressed and additional funding may become available, the strategies identified in this plan will continue to merit widespread implementation to accelerate the achievement of safety goals. The Capital Improvement Program (CIP) in the Street Transportation Department includes a comprehensive pavement maintenance program, improvements to existing streets for mobility and safety issues, technology upgrades to signals, building new street and drainage infrastructure, expanding roadways, and much more. The 2020-2025 five-year program will provide over $750 million in improvements to the City's infrastructure. As these CIP projects are implemented, they should be viewed through a safety lens to determine applicable road safety strategies to incorporate.

### FIRST YEAR ENGINEERING ACTIONS:

**PB.02A:** **CONTINUE CONSTRUCTING MID-BLOCK CROSSINGS AT PRIORITY ARTERIAL ROAD LOCATIONS THAT INCLUDE: HAWKS, SIGNING, MARKINGS, & LIGHTING TO PROVIDE A SAFE PLACE FOR PEOPLE WALKING & BICYCLING TO CROSS.**
EFFECTIVENESS & APPLICATION SCORE = 95; 20 PER YEAR AT $440K EACH.

**PB.01A:** **DEVELOP SAFE ROUTES TO SCHOOL PLANS FOR PUBLIC, PRIVATE, & CHARTER ELEMENTARY, MIDDLE, & HIGH SCHOOLS WITH CROSSINGS OF ARTERIAL ROADS.**
EFFECTIVENESS & APPLICATION SCORE = 70; 20 STUDIES OR INSTALLATIONS PER YEAR AT $40K EACH.

**IT.03B:** **CONTINUE EVALUATION AND IMPLEMENTATION OF LEADING PEDESTRIAN INTERVAL (LPI) AT INTERSECTIONS WITH GREATEST CRASH RISK OF PEDESTRIAN-MOTOR VEHICLE COLLISIONS.**
EFFECTIVENESS & APPLICATION SCORE = 55; INSTALL AT 30 LOCATIONS PER YEAR, ASSUME 10 INVOLVE NEW CONTROLLERS ($35K EACH) AND 20 CAN USE EXISTING EQUIPMENT ($1K).

**SG.03A:** **DEVELOP AN APPROACH TO REVIEW & PRIORITIZE LIGHTING IMPROVEMENTS (IMPROVE OR CREATE POSITIVE LIGHTING, COVERAGE, BRIGHTNESS, ETC.) AT UNCONTROLLED, MARKED MID-BLOCK CROSSINGS.**
EFFECTIVENESS & APPLICATION SCORE = 55; 10 LOCATIONS PER YEAR (20 NEW STREETLIGHTS) AT $20K EACH.

**SG.03B:** **FOR ARTERIAL & MAJOR COLLECTOR STREETS WITH SINGLE SIDED LIGHTING, ADD THE OTHER SIDE OF LIGHTING IN COORDINATION WITH CURRENT CITY LIGHTING STANDARDS.**
EFFECTIVENESS & APPLICATION SCORE = 53; 2 MILES OF SINGLE SIDED LIGHTING PER YEAR AT $585K PER MILE.

**PB.03B:** **ESTABLISH NATURAL OR STRUCTURAL SHADE IN PEDESTRIAN REFUGE & WAITING AREAS.**
EFFECTIVENESS & APPLICATION SCORE = 15; SHADE INSTALLATION AT 60 TRANSIT STOPS PER YEAR AT $8K EACH.

**IT.02B:** **CONTINUE EFFORTS TO IDENTIFY EXISTING TRAFFIC SIGNALS WITH LEGACY EQUIPMENT INCLUDING LIGHTING LEVEL, & RECONSTRUCT THEM TO CURRENT STANDARDS. (UNDERWAY)** EFFECTIVENESS & APPLICATION SCORE = 100 ; REBUILD 15 HIN INTERSECTIONS PER YEAR AT $1M EACH.

**IT.03D:** **CONTINUE TO EVALUATE & IMPLEMENT ITS IMPROVEMENTS TO PROVIDE GREATER SIGNAL EFFICIENCY, COORDINATION, COMMUNICATION, INCLUDING PILOTING & EVALUATING ADAPTIVE TRAFFIC SIGNAL CONTROL. (UNDERWAY)** EFFECTIVENESS & APPLICATION SCORE = 30; 18 INTERSECTIONS AT $55K EACH.

## 2-5 YEAR ENGINEERING ACTIONS:

**PB.01B:** **IMPLEMENT SCHOOL ZONE SAFETY COUNTERMEASURES FOR SCHOOL CROSSINGS OF COLLECTOR ROADS. DEVELOP SCHOOL TYPOLOGIES FOR PRIORITIZATION.** EFFECTIVENESS & APPLICATION SCORE = 85; IMPLEMENT SAFETY IMPROVEMENTS AT 20 SCHOOLS PER YEAR AT $500K EACH.

**IT.01B:** **FOR PRIORITY UNSIGNALIZED INTERSECTIONS THAT DO NOT OR ARE NOT ANTICIPATED TO MEET TRAFFIC SIGNAL WARRANT CRITERIA, EVALUATE & IDENTIFY ALTERNATIVE COUNTERMEASURES TO IMPROVE TRAFFIC SAFETY.** EFFECTIVENESS & APPLICATION SCORE = 65; COMPLETE IMPROVEMENTS AT 10 UNSIGNALIZED INTERSECTIONS PER YEAR AT $150K EACH.

**IT.02A:** **REVIEW SIGHT VISIBILITY AT HIN INTERSECTIONS TO ENSURE ADEQUATE SIGHT DISTANCE FOR LEFT-TURNING VEHICLES. RE-STRIPE/RECONSTRUCT SINGLE LEFT TURN LANES TO HAVE ZERO OR POSITIVE OFFSETS, WHERE PROTECTED LEFTS ARE NOT IMPLEMENTED.** EFFECTIVENESS & APPLICATION SCORE = 80; CORRECT LEFT TURN OFFSET ISSUES AT 10 INTERSECTIONS PER YEAR AT $250K EACH.

**IT.02C:** **INSTALL ADDITIONAL FAR-SIDE BUS BAYS AT PRIORITY LOCATIONS.** EFFECTIVENESS & APPLICATION SCORE = 15; INSTALL 5 FAR-SIDE BUS BAYS PER YEAR AT $200K EACH.

**IT.03A:** **EVALUATE & MODIFY LEFT-TURN PHASING AT SIGNALIZED INTERSECTIONS ON THE HIN TO REDUCE CONFLICTING MOVEMENTS.** EFFECTIVENESS & APPLICATION SCORE = 100; 10 LOCATIONS AT $4.5K WITH SIGNAL MODIFICATIONS OF 150K EACH.

**IT.03C:** **REVIEW PROCEDURE ON ESTABLISHING YELLOW CHANGE & ALL-RED CLEARANCE INTERVALS.** EFFECTIVENESS & APPLICATION SCORE = 40; STUDY/COMMUNICATIONS EFFORT EST. $150K.

**IT.03E:** **INSTALL EMERGENCY VEHICLE PREEMPTION AT LOCATIONS WITH THE GREATEST NEED.** EFFECTIVENESS & APPLICATION SCORE = 60; INSTALL/UPGRADE EVP AT 10 LOCATIONS PER YEAR AT $20K PER INTERSECTION.

**SG.01A:** **UPDATE THE CURRENT ACCESS MANAGEMENT STANDARDS WITHIN THE STREET PLANNING & DESIGN GUIDELINES TO PROVIDE GUIDANCE FOR ALL ROADWAY CLASSIFICATIONS & ALL TYPES OF INTERSECTIONS, INCLUDING UNSIGNALIZED INTERSECTIONS & DRIVEWAYS (FULL ACCESS, PARTIAL ACCESS, LEFT-IN/LEFT-OUT, & RIGHT-IN/RIGHT-OUT).** EFFECTIVENESS & APPLICATION SCORE = 60; STUDY/DESIGN GUIDE EST. $325K.

**SG.01B:** **INSTALL RAISED MEDIANS ON HIN CORRIDORS TO REDUCE CONFLICT POINTS.** EFFECTIVENESS & APPLICATION SCORE = 100; INSTALL 4 MILES OF RAISED MEDIAN PER YEAR AT $2.25M PER MILE.

**SG.02A:** **IMPROVE STREET LIGHTING LUMINESCENCE & UNIFORMITY ON THE HIN NETWORK AT SEGMENTS WITH THE GREATEST NIGHTTIME CRASH HISTORY IN COORDINATION WITH THE CURRENT CITY STREET LIGHTING STANDARDS.** EFFECTIVENESS & APPLICATION SCORE = 100; 3 MILES OF SINGLE SIDED LIGHTING PER YEAR AT $585K PER MILE.

**SG.02B:** **REVIEW UNBALANCED LANE UNDIVIDED ARTERIALS (I.E., TWO NORTHBOUND LANES & THREE SOUTHBOUND LANES) FOR POTENTIAL RECONFIGURATION BASED ON EVALUATION FACTORS SUCH AS CRASH RATE, SPEED, & VOLUME.** EFFECTIVENESS & APPLICATION SCORE = 70; IMPROVE 2 MILES PER YEAR AT $1M PER MILE.

## SYSTEMIC ENFORCEMENT

The two primary goals of traffic law enforcement are to: promote sustained compliance with traffic laws through deterrence and prevent risky traffic situations from occurring and thus preventing or reducing the number of motor vehicle crashes. Some roadway users will ignore traffic laws if they perceive that their actions will not be detected or enforced, even with the potential of fines, mandatory training (loss of time), and losing licensure. In general, road users obey road rules when they perceive a substantial risk. Deterrence through enforcement should be: 1) accompanied by widespread publicity, 2) unpredictable and difficult to avoid, 3) a mix of highly visible and less visible activities, 4) continued over a long period of time, and 5) well resourced.

A goal of this plan is to further integrate the five E's (evaluation, engineering, enforcement, education, and equity) into different City Departments. Collaboration between the Street Transportation Department and Police Department will bolster enforcement efforts with crash analysis (evaluation) to inform resource allocation and targeted areas for enforcement such as types of crashes, factors, days of the week, times of the day, and locations.

Law enforcement agencies across the United States are struggling to recruit and hire police officers. It is anticipated to take multiple years to expand staffing for the Traffic Bureau to achieve greater performance metrics in the area of enforcement. The current performance metrics align with existing staff levels and may be reviewed and revised in the future.

**FIRST YEAR ENFORCEMENT ACTIONS:**

**BH.01D:** **PROACTIVE ENFORCEMENT ON THE HIN, WITH EMPHASIS ON RISK FACTORS THAT CONTRIBUTE TO PEDESTRIAN AND BICYCLIST RELATED CRASHES.** EFFECTIVENESS & APPLICATION SCORE = 80

**BH.03A:** **EXPANDED DUI ENFORCEMENT.** EFFECTIVENESS & APPLICATION SCORE = 70

**BH.01B:** **EXPANDED ENFORCEMENT OF SCHOOL ZONE LAWS.** EFFECTIVENESS & APPLICATION SCORE = 55

## SYSTEMIC EDUCATION

The behavior of drivers, pedestrians, motorcyclists, and cyclists is the human factor element in traffic crashes. Traffic safety education is an integral component in changing behavior and encouraging safety in every trip, whether it is walking, biking, riding transit, or driving.

Awareness campaigns are important tools of systemic education. The objective of Phoenix's Vision Zero awareness campaigns are to educate the public and encourage safe behaviors for all road users specifically targeting change in road user behavior related to speeding, red-light running, distracted driving, impaired driving and address crashes involving pedestrians and bicyclists. These campaigns will include organic grassroots outreach and paid media.

**Organic Grassroots Outreach.** Most programs are community-based and involve local, grassroots organizations (i.e., schools, faith-based, business, service/civic/social, advocacy, public health) and law enforcement agencies, that can help to sustain and institutionalize the initiative. These potential partners are able to connect to the public as they speak as community members, supporters and friends to audiences who – as employers, students, parishioners, customers, members, etc. – are naturally receptive to their messages. Organic campaigns featuring reels, challenges and videos will be created on Facebook, Twitter, and Instagram and cross shared with school districts, to promote eye-catching statistics and safe road-use tips. Additional outreach items such as stickers may be developed for distribution.

**Paid Media.** Messaging will be developed and displayed through multiple channels, including billboards near freeways, and via social media campaigns on Facebook, Twitter, and Instagram. Statewide TV & radio PSA spots will be developed in English & Spanish and boosted with YouTube and Google Ads.

### FIRST YEAR ACTIONS (EDUCATION):

**BH.01C:** **EXPAND CURRENT EFFORTS FOR STUDENT PEDESTRIAN & BICYCLIST EDUCATION, SAFETY, & AWARENESS EFFORTS, FOCUSING ON SCHOOLS WITHIN 1/4 MILE OF THE HIN NETWORK.** EFFECTIVENESS & APPLICATION SCORE = 75

**BH.02A:** **DEVELOP ROADWAY SAFETY AWARENESS & EDUCATION CAMPAIGNS FOR PEOPLE DRIVING VEHICLES, IN CONCERT WITH ENFORCEMENT EFFORTS, TO SPECIFICALLY TARGET CHANGE IN ROAD USER BEHAVIOR RELATED TO SPEEDING, RED-LIGHT RUNNING, DISTRACTED DRIVING, & AGGRESSIVE DRIVING.** EFFECTIVENESS & APPLICATION SCORE = 70

**BH.01A:** **CONTINUE & ENHANCE PAID AND EARNED MEDIA CAMPAIGNS (ELECTRONIC, PRINT, RADIO, AND BROADCAST) TO PROMOTE PUBLIC AWARENESS OF PEDESTRIAN AND BICYCLIST SAFETY. THIS INCLUDES USING NEW & EFFECTIVE METHODS TO REACH TARGET AUDIENCES.** EFFECTIVENESS & APPLICATION SCORE = 60

# ADDRESSING THE HIN

Projects targeted within the first five years of the Road Safety Action Plan adoption are focused on the geographic locations within the City with the greatest demonstrated pattern of motor vehicle crashes resulting in fatalities and serious injuries – the **High Injury Network (HIN)**. Projects implemented on the HIN will have the highest immediate impact on safety and will be prioritized for funding and implementation. Locations from the HIN are grouped into three project type categories that identify the overarching characteristics of improvements: Intersections, Segments, and Composite (Segments + Intersections). Several Intersection locations on the HIN have been recently addressed by the City, and thus have been removed from these lists. **To determine which locations should be prioritized, three factors were applied per project category:**

- **The amount of KSI crashes** at/on the location. Locations were rank ordered by amount of KSI crashes in that project category, then the category was divided into thirds: Tier 1, 2, and 3.

- Within each Tier, the locations were prioritized in an area of need determined by the **Phoenix RSAP Equity Analysis**. If the location is either fully in, adjacent - one side, or at least one corner (intersections) it is noted as a 'yes.'

- **Status of location/project**. The intent of this information is to help determine what RSAP strategies should be implemented at these locations. The status of the location/project are **RC = recently completed, PC = partially completed, P = programmed in the upcoming Phoenix Capital Improvement Program (CIP), or F = future project is needed.**

Additionally, key crash characteristics are identified per location providing a snapshot of the factors and crash types that have occurred at this location from the 5-year crash data (2015-2019). This will be used to identify RSAP Strategies and other safety countermeasures to develop the context sensitive solutions to incorporate into the scope of work for each project. RSAP strategies that will be evaluated for integration into these projects include **GN.03E**, **BH.01D**, **PB.02A**, **PB.02B**, **PB.02C**, **PB.03B**, **IT.01A**, **IT.01B**, **IT.02A**, **IT.02B**, **IT.03C**, **IT.03A**, **IT.03B**, **IT.03C**, **IT.03D**, **IT.03E**, **SG.01A**, **SG.01B**, **SG.02A**, **SG.02B**, **SG.03A**, and **SG.03B**.

Moving from analysis and identifying improvements on the HIN is just the first step in constructing a project and/or making operational changes. While some quick build options can be done in the short term, many of these locations require a three-phase project development process that includes design, right-of-way and utilities, and construction. Depending on the complexity of the location and type of delivery method, each phase could take 1 to 1.5 years to complete, which leads to a 3 to 4.5 year project completion timeline. All HIN locations ranked by priority are displayed in the following tables.

## HIN INTERSECTIONS

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 35th Ave & Glendale Ave | 1 | Yes | Yes | - 50% Left-Turn (LT) crashes<br>- 50% nighttime<br>- 3 ped & 1 bike crashes (40%)<br>- Fatal crash ped south of crosswalk | P |
| 51st Ave & McDowell Rd | 1 | Yes | Yes | - 56% nighttime or dawn/dusk<br>- 44% peds (3 on west leg)<br>- 75% peds at night or dawn/dusk<br>- Fatal at night<br>- Decreasing by year | P |
| 51st Ave & Thomas Rd | 1 | Yes | Yes | - 33% peds<br>- 33% LT crashes<br>- Decreasing by year<br>- 66% nighttime or dawn/dusk<br>- 67% fatals are peds | F |
| 16th St & Southern Ave | 1 | Yes | Yes | - Crashes declining by year<br>- 2 ped & 1 bike crash<br>- Both ped crashes fatal<br>- 38% nighttime | F |
| 19th Ave & Peoria Ave | 1 | Yes | Yes | - 4 ped crashes & 1 bike crash (63%)<br>- Both fatals are peds<br>- 38% LT crashes / 50% other<br>- 5 nighttime & 1 dawn/dusk (75%) | F |
| 75th Ave & Indian School Rd | 1 | Yes | Yes | - 63% LT crashes<br>- 50% nighttime<br>- Fatal crash (ped at night) | P |
| 7th St & Broadway Rd | 1 | Yes | Yes | - 63% < 25 years old<br>- 50% LT crashes<br>- 63% nighttime<br>- Decreasing by year<br>- 0 ped/bike crashes | F |
| 43rd Ave & Peoria Ave | 1 | No | Yes | - 50% LT crashes<br>- 50% nighttime or dawn/dusk<br>- 2 ped &1 bike crash (21%)<br>- 43% in 2018 | F |
| 19th Ave & Union Hills Dr | 1 | No | Yes | - 4 ped and 1 bike crash (45%)<br>- 54% Nighttime<br>- 36% LT crashes<br>- Both fatals in 2020<br>- Both fatals at night | F |
| Cave Creek Rd & Union Hills Dr | 1 | No | Yes | - 30% Nighttime<br>- 50% LT crashes<br>- 50% ped, bike or not reported<br>- Highest 2016 & 2020 | F |

## HIN INTERSECTIONS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 51st Ave & Thunderbird Rd | 1 | No | Yes | - Decreasing by year<br>- 44% LT crashes<br>- 44% angle crashes<br>- 56% at night<br>- 58% <30 years old | F |
| 7th Ave & Bell Rd | 1 | No | Yes | - 56% LT crashes<br>- 2 peds & 2 bikes (44%)<br>- 67% nighttime or dawn/dusk<br>- Both peds fatal at night<br>- 56% in 2017 | P |
| Greenway Pkwy & Cave Creek Rd | 1 | No | Yes | - Declining by year<br>- 56% LT crashes<br>- 1 ped & 1 Bike (22%)<br>- 44% nighttime<br>- 67% fatals at night<br>- 47% <25 years old | F |
| 3rd St & Indian School Rd | 1 | No | No | - 2 fatal crashes (22%)<br>- 2 ped crashes & 1 bike crash (33%)<br>- 56% LT crashes<br>- 44% in 2019 | P |
| 16th St & Broadway Rd | 2 | Yes | Yes | - 43% nighttime<br>- 43% ped crashes<br>- Fatal crash (ped at night)<br>- 28% angle crashes<br>- 28% LT crashes<br>- 59% < age 30 | P |
| 19th Ave & Southern Ave | 2 | Yes | Yes | - 57% nighttime<br>- 1 ped crash (fatal & nighttime)<br>- 73% <30 years old<br>- 28% LT crash<br>- 28% rear end crash | P |
| 75th Ave & Thomas Rd | 2 | Yes | Yes | - 43% LT crashes<br>- 29% angle crashes<br>- 57% nighttime<br>- Fatal crash (ped at night) | P |
| 7th St & Cave Creek Rd & Dunlap Ave | 2 | Yes | Yes | - 71% in 2020<br>- 43% LT crashes<br>- 29% angle crashes<br>- 0 nighttime<br>- 0 ped/bike crashes | F |
| 35th Ave & Lower Buckeye Rd | 2 | Yes | Yes | - 71% angle crashes<br>- 57% in 2017<br>- 57% nighttime or dawn/dusk<br>- 0 Ped/bike | P |

## HIN INTERSECTIONS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 19th Ave & Thunderbird Rd | 2 | Yes | Yes | - 33% Nighttime<br>- Constant all years<br>- 1 ped crash (night) | F |
| 19th Ave and Dunlap Ave | 2 | Yes | Yes | - 83% peds<br>- 17% bike<br>- 50% nighttime or dawn/dusk<br>- 50% in 2019<br>- 1 fatal (Bike crash) | F |
| 27th Ave & Indian School Rd | 2 | Yes | Yes | - 50% peds<br>- 83% nighttime<br>- 50% in 2016<br>- Both fatals are ped crashes at night<br>- 33% angle crashes | F |
| 35th Ave & Southern Ave | 2 | Yes | Yes | - 33% LT crashes<br>- 50% in 2019<br>- 1 bike crash in 2017<br>- 1 nighttime crash | P |
| 35th Ave & Thunderbird Rd | 2 | Yes | Yes | - 50% LT crashes<br>- 67% nighttime<br>- 1 ped crash<br>- 1 fatal in 2020<br>- 55% <25 years | F |
| 39th Ave & Southern Ave | 2 | Yes | Yes | - 50% fatal<br>- 67% ped crashes<br>- 83% nighttime<br>- 50% in 2020 | P |
| 48th St & Chandler Blvd | 2 | No | No | - 86% LT crashes<br>- Both fatals in 2018<br>- Both fatals LT<br>- 1 nighttime/1 unk.<br>- 2016 to 2018 only | F |
| 48th St & McDowell Rd | 2 | No | No | - 57% ped crashes<br>- Ped crash fatal at night<br>- 57% nighttime<br>- 43% LT crashes<br>- 61% <30 years old | F |
| 27th Ave & Deer Valley Dr | 2 | No | No | - 28% ped crashes (both night or dawn/dusk)<br>- 71% LT<br>- 57% night or dawn/dusk | F |
| 27th Ave & Beardsley Rd | 2 | No | No | - 50% same Dir SS<br>- 67% 2018, 33% 2018<br>- 33% nighttime or dawn/dusk<br>- 0 ped/bike | F |

## HIN INTERSECTIONS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 43rd Ave & Van Buren St | 3 | Yes | Yes | - 67% nighttime<br>- 50% LT crashes<br>- 1 Bike crash (nighttime) | F |
| 59th Ave & McDowell Rd | 3 | Yes | Yes | - 50% LT crashes<br>- 2 Ped crashes (1 at night)<br>- 50% in 2017<br>- 1 nighttime crash | F |
| 67th Ave & Osborn Rd | 3 | Yes | Yes | - 50% Angle crashes<br>- 33% LT crashes<br>- 50% nighttime or dawn/dusk<br>- 0 Ped/bike crashes | F |
| 83rd Ave & Thomas Rd | 3 | Yes | Yes | - 50% nighttime (2 in AM)<br>- Both fatal crashes at night (AM)<br>- 50% LT crashes<br>- 83% in 2020<br>- Ped crash at night | F |
| 35th Ave & Broadway Rd | 3 | Yes | Yes | - 1 ped & 1 bike (33%)<br>- 33% nighttime<br>- 67% LT crashes<br>- 50% in 2018 | F |
| 27th Ave & Buckeye Rd | 3 | Yes | Yes | - 50% angle crashes<br>- 67% in 2016<br>- 33% nighttime or dawn/dusk<br>- Decreasing by year<br>- 0 ped/bike crashes | P |
| 48th St & Baseline Rd | 3 | No | No | - 50% LT crashes<br>- Fatal - dawn/dusk<br>- Crashes increasing<br>- 0 ped/bike crashes | P |
| 51st Ave & Union Hills Dr | 3 | No | No | - 67% LT crashes<br>- 50% nighttime<br>- 2016 & 2019 worst | P |
| 23rd Ave & Deer Valley Rd | 3 | No | No | - 33% single vehicle<br>- 57% <30 years old | F |
| 7th St & Northern Ave | 3 | No | Yes | - 67% LT crashes<br>- 33% nighttime<br>- 50% in 2017<br>- 0 ped/bike | F |

## HIN INTERSECTIONS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 44th St & Washington St | 3 | No | No | - 2 peds & 1 bike (33%)<br>- 67% nighttime<br>- 50% angle crashes<br>- 50% in 2019 | F |
| 43rd Ave & Thunderbird Rd | 3 | No | No | - 53% of crashes involve a ped or bicyclist<br>- Unusually high number of fatal crashes<br>- Total crashes have declined from a peak in 2017, but fatal crashes have remained constant every year | F |

## HIN SEGMENTS PROJECTS

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 35th Ave: Moreland St to Van Buren St | 1 | Yes | Yes | - 8 ped crashes (32% of all crashes) accounted for 4 fatalities (57%). All but 1 ped crash were within 300' of a signalized intersection<br>- 1 bicyclist crash accounted for an additional fatality<br>- Near even mix of daytime and darkness crashes | P |
| 7th St: Hatcher Rd to Mountain View Rd | 1 | Yes | Yes | - 55% peds (2 fatal)<br>- 1 bike crash (fatal)<br>- 64% nighttime<br>- 55% in 2017<br>- 27% fatal | P |
| 51st Ave: Roosevelt St to McDowell Rd | 1 | Yes | Yes | - 57% nighttime or dawn/dusk<br>- 29% peds<br>- 36% in 2018<br>- 29% angle & 21% LT crashes<br>- 36% in I-10 interchange | F |
| Indian School Rd: 27th Ave to 19th Ave | 1 | Yes | Yes | - 33% of crashes involved a ped, including 3 of 4 fatals<br>- Note: Existing PHB at Grand Canal crossing (east of 23rd Ave) was not in place during entire crash analysis period. Installed in 2019<br>- 57% of crashes occurred during darkness or dawn/dusk | PC |
| 19th Ave: Hatcher Rd to Mountain View Rd. | 1 | Yes | Yes | - 60% nighttime<br>- 60% LT crashes<br>- 20% ped (at night)<br>- Fatal at Vogel (at night) | F |
| 27th Ave: Campbell Ave to Camelback Rd | 1 | Yes | Yes | - 47% nighttime<br>- 40% peds<br>- 40% fatal<br>- 47% LT or angle crashes | P |
| McDowell Rd: 40th St to 44th St | 1 | Yes | No | - 53% of crashes involve a ped or bicyclist<br>- Unusually high number of fatal crashes<br>- Total crashes have declined from a peak in 2017, but fatal crashes have remained constant every year<br>- Crashes concentrated from 40th to 43rd St | PC |
| McDowell Rd: 24th St to 28th St | 1 | Yes | Yes | - 42% nighttime<br>- 33% peds<br>- 1 bike | F |
| Indian School Rd: 7th St to 12th St | 1 | No | Yes | - 71% ped (2 fatal)<br>- 29% fatal (100% at night)<br>- 86% nighttime | P |
| Carefree Hwy: N North Valley Pkwy to I-17 (eastside) | 1 | No | No | Further review needed | F |

## HIN SEGMENTS PROJECTS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| Union Hills Dr: 27th Ave to I-17 | 1 | No | No | - No nighttime crashes<br>- All crashes of different types<br>- No ped or bike crashes | F |
| Thunderbird Rd: 30th Ave to 26th Ave | 1 | No | Yes | - No crashes in 2020<br>- No ped or bike crashes<br>- Most crashes (67%) have left-turn collision manner<br>- Equal mix of daytime and dark crashes<br>- Most common crash location: traffic signal at 2900 W | F |
| 43rd Ave: Thomas Rd to Indian School Rd | 2 | Yes | Yes | - 40% peds<br>- 70% nighttime<br>- 40% in 2016<br>- 20% fatal (peds at Pinchot/Verde) | RC, P |
| 43rd Ave: McDowell Rd to Encanto Blvd | 2 | Yes | Yes | - 60% nighttime or Dawn/Dusk<br>- 40% ped (75% fatal)<br>- 60% fatal | P, F |
| 7th Ave: Buckeye Rd to Watkins St | 2 | Yes | Yes | - 33% fatal<br>- 67% peds<br>- 67% nighttime or dawn/dusk<br>- 42% in 2017 | PC |
| 19th Ave: Wood Dr to Cactus Rd | 2 | Yes | Yes | - 38% single vehicle<br>- 50% in 2017<br>- 38% at night<br>- 1 ped (fatal/night) | F |
| 19th Ave: Glenrosa Ave to Campbell Ave | 2 | Yes | Yes | - Decreasing over the years<br>- 33% nighttime<br>- 33% ped<br>- 50% LT crashes | RC |
| 24th St: Roosevelt St to McDowell Rd | 2 | Yes | Yes | - 67% nighttime or dawn/dusk<br>- 33% ped (100% nighttime)<br>- 33% bikes (1 night & 1 dawn/dusk)<br>- 33% angle crashes<br>- 50% at Loop 202 interchange | P |
| 27th Ave: Bethany Home Rd to Maryland Ave | 2 | Yes | Yes | - 45% fatal<br>- 100% nighttime<br>- 64% peds<br>- 9% bikes<br>- 45% in 2017 | P |

## HIN SEGMENTS PROJECTS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| Thomas Rd: 28th St to 32nd St | 2 | No | Yes | - 57% ped (100% fatal)<br>- 57% fatal<br>- 71% nighttime | P |
| Bell Rd: 20th St to Cave Creek Rd | 2 | No | Yes | - 40% fatal<br>- 20% nighttime<br>- 30% peds (100% fatal)<br>- 50% angle crashes | P, F |
| 7th Ave: Glenrosa Ave to Indian School Rd | 2 | No | No | - Crashes only shown in 2017 and 2018<br>- No collision manner or first harmful event that are in common among any crashes.<br>- No two crashes at the same location<br>- Note: Existing PHB at Glenrosa<br>- Note: Existing reversible lane precludes raised median | PC |
| Bell Rd: 32nd St to 34th Way | 2 | No | Yes | - 24% fatal (LT crashes)<br>- 38% nighttime of dawn/dusk<br>- 38% LT crashes<br>- 1 ped crash<br>- 2 per year | F |
| Greenway Rd: 32nd St to 34th St | 2 | No | Yes | - 50% angle crashes<br>- 1 ped crash (fatal/night)<br>- 1 bike crash | F |
| 7th St: Bell Rd to Grovers Ave | 2 | No | Yes | - No crashes in 2019 or 2020.<br>- Most crashes (82%) involve either angle or left-turn<br>- Mix of daylight and darkness crashes<br>- Fewer ped crashes (9%) than most segments. However, the one ped crash was the segment's only fatality | PC |
| Maryvale Pkwy: 51st Ave to N. Maryvale Pkwy | 3 | Yes | Yes | - 1 LT crash<br>- Dawn/Dusk | P |
| McDowell Rd: 32nd St to 36th St | 3 | Yes | No | - 33% of crashes involve a ped or bicyclist. Both fatal crashes involve a ped<br>- 56% of crashes at dark or dawn/dusk<br>- No crashes in 2016 or 2019<br>- Note: Existing PHB at 34th St | PC |
| Thomas Rd: 63rd Ave to 67th Ave | 3 | Yes | Yes | -33% peds (2 fatal)<br>-33% nighttime | P, F |
| 19th Ave: Maryland Ave to Glendale Ave | 3 | Yes | Yes | -75% ped<br>-25% bike<br>-50% nighttime | P |

## HIN SEGMENTS PROJECTS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| 59th Ave: Roosevelt St to McDowell Rd | 3 | Yes | Yes | - 71% nighttime<br>- 43% single vehicle<br>- 43% in 2018 & 43% in 2019<br>- 1 ped crash (night)<br>- 71% in Freeway interchange | PC |
| 35th Ave: Northern Ave to Butler Dr | 3 | Yes | Yes | - 27% peds (1 fatal & 2 nighttime)<br>- Both fatals at Griswold Rd<br>- 36% nighttime | P |
| Southern Ave: 7th Ave to 15th Ave | 3 | Yes | Yes | - 79% nighttime or dawn/dusk<br>- 67% fatal<br>- 33% peds (1 fatal)<br>- 1 bike crash (fatal)<br>- 44% in 2020 | P |
| McDowell Rd: 7th St to 10th St | 3 | Yes | Yes | - 44% nighttime<br>- 33% peds (2 fatal, 3 nighttime)<br>- 33% fatal<br>- Most at west end of corridor | PC, P |
| Bell Rd: 15th Ave to 19th Ave | 3 | No | Yes | - 13% nighttime<br>- 25% ped<br>- 38% angle, 28% LT crashes<br>- Fatal at 17th Ave signal | P, F |
| Indian School Rd: 40th St to 44th St | 3 | No | No | - 4 ped crashes, all during darkness<br>- Crashes declining since the high in 2017<br>- Other than ped crashes, left-turn crashes are highest frequency Left-turn crashes are distributed along corridor | F |
| Indian School Rd: 28th St to 32nd St | 3 | No | No | - Peds account for more than half of crashes (average 1 per year) 2 of 5 ped crashes occurred at signal.<br>- No crashes in 2016 or 2020<br>- Crashes about evenly split between daytime and darkness<br>- No more than one crash involving any known collision manner<br>- Note: Existing PHB at 30th St is one of the highest-ped-volume PHBs in the city | F |
| 16th St: Colter St to Missouri Ave | 3 | No | No | - Most crashes (86%) in daylight<br>- No ped crashes, 1 bike crash<br>- Most common crash type: Angle crashes (43%)<br>- No crashes in 2020 | F |

## HIN COMPOSITE PROJECTS

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| Glendale Ave: 19th Ave to 17th Ave | 1 | Yes | Yes | - 71% of segment crashes involved a ped, including both fatal crashes<br>- 57% of segment crashes occurred during darkness or dawn/dusk<br>- 71% of intersection crashes involved a ped, including all 3 fatals<br>- 86% of intersection crashes occurred during darkness | P |
| McDowell Rd: 55th Ave to 43rd Ave | 1 | Yes | Yes | - Segments: 46% of crashes involved a ped or bike, including 5 of 6 fatal crashes<br>- Two hot-spots for segment fatal crashes: 41st to 42nd Ave and 51st to 52nd Ave<br>- 63% of segment crashes occurred during darkness<br>- 4 ped crashes, including 2 fatals, occurred within 500' of existing PHB at 41st Ave<br>- Left-turn and angle crashes account for 60% of intersection crashes<br>- 80% of intersection crashes occurred during darkness<br>- 1 intersection fatal crash was angle type<br>- 1 intersection ped crash was serious injury | RC, P |
| Thomas Rd: 45th Ave to 43rd Ave | 1 | Yes | Yes | - 57% of segment crashes are single-vehicle, all of these crashes occurred within 100' of the existing PHB at 4400 W<br>- 86% of segment crashes at dark or dawn/dusk<br>- Both segment ped crashes occurred at 44th Ln, one was the only fatality on the segment<br>- 67% of intersection crashes occurred in daylight<br>- Half of intersection crashes involved a ped | P |
| Northern Ave: 21st Ave to 19th Ave | 1 | Yes | Yes | - 60% of segment crashes involved a pedestrian or bicyclist.<br>- 60% of crashes occurred during darkness or dawn/dusk<br>- Only 13% of intersection crashes involved pedestrians despite the presence of the LRT station just south of the intersection<br>- Intersection crashes are an even mix of daytime and nighttime<br>- Intersection crashes have been consistent over time, never fewer than 1 or more than 2 KSI crashes per year | RC, F |
| Bell Rd: 26th Ave to 17th Ave | 1 | No | Yes | - 29% of segment KSI crashes and 33% of fatalities involved a pedestrian or bicyclist<br>- 71% of segment crashes occurred during daylight<br>- Segment crashes peaked in 2020, contrary to COVID crash trends<br>- Peds account for 44% of intersection crashes and 67% of fatalities<br>- 67% of intersection crashes occurred during daylight<br>- Angle and left-turn crashes accounted for 56% of intersection crashes | P, F |

## HIN COMPOSITE PROJECTS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| Indian School Rd: 83rd Ave to 67th Ave | 2 | Yes | Yes | - 47% of segment crashes involved a ped, including 3 of 6 fatals<br>- 53% of segment crashes occurred at dark or dawn/dusk<br>- Segment crashes did not decline in 2020 as occurred in much of the rest of the city<br>- Half of intersection crashes involved a ped, including 1 of 2 fatals<br>- Half of intersection crashes occurred during darkness or dawn/dusk<br>- No intersection crashes in 2019 or 2020 | P |
| Indian School Rd: 59th Ave to 27th Ave | 2 | Yes | Yes | - Pedestrians and bicyclists accounted for 33% of segment crashes and 40% of fatalities<br>- 46% of segment crashes occurred during daylight.<br>- Both segment and intersection crashes peaked in 2020, contrary to COVID crash trends<br>- Left-turn and angle crashes were most common in the segments, accounting for 48% of crashes<br>- No ped or bike segment crashes occurred west of 47th Ave.<br>- Pedestrians were involved in 16% of intersection crashes and represented the only fatality<br>- Intersection crashes were evenly split between daytime and darkness<br>- Left-turn crashes were the most common intersection crash type, accounting for half of KSI crashes | P |
| Cactus Rd: 31st Ave to 23rd Ave | 2 | Yes | Yes | - Segment: 42% of crashes involved a ped, including the only fatality<br>- Segment: 58% of crashes occurred during darkness or dawn/dusk.<br>- Segment crashes did not decline in 2020<br>- Intersection: Half of crashes involved a ped or bike<br>- Intersection: 75% of crashes occurred during darkness | F |
| 19th Ave: Greenway Rd to Grovers Ave | 2 | Yes | Yes | - 33% of segment crashes and 33% of segment fatalities involved a bicyclist or pedestrian<br>- 58% of segment crashes occurred during daylight<br>- 25% of intersection crashes, but no fatalities, involved bicyclists or pedestrians<br>- 38% of intersection crashes occurred during darkness or dawn/dusk<br>- Intersection: left-turn crashes were the most common crash type, accounting for 63% of crashes | P |
| Bethany Home Rd: 35th Ave to 31st Ave | 2 | No | No | - Segment: 14% of crashes involved a ped, but no fatals<br>- 3 segment head-on crashes occurred, an unusually high number<br>- 43% of segment crashes occurred during darkness<br>- Intersection: 43% of crashes involved a ped, including both fatals<br>- Intersection: Mix of daylight and dark crashes | PC |

## HIN COMPOSITE PROJECTS (CONT.)

| Location | HIN Segment Tier (1-3) | RSAP Equity Analysis | USDOT Underserved Community | Key Crash Characteristics | Status: RC, PC, P, F |
|---|---|---|---|---|---|
| Peoria Ave: 25th Ave to 28th Dr | 3 | Yes | Yes | - 73% of segment crashes occurred during darkness.<br>- 53% of segment crashes involved a ped or bike. Both fatal segment crashes involved a ped.<br>- Left-turn and angle crashes comprise 40% of segment crashes.<br>- 75% of intersection crashes occurred during darkness or dawn/dusk.<br>- 63% of intersection crashes involved a ped or bike. Both fatal intersection crashes involved a ped. | F |
| 27th Ave: Thomas Rd to Roosevelt St | 3 | Yes | Yes | - 25% of segment crashes involved a ped or bike, but no fatalities.<br>- Half of segment crashes occurred during daylight and half during darkness.<br>- 14% of intersection crashes involved a pedestrian, including 1 fatality.<br>- No intersection crashes occurred in 2020.<br>- 43% of intersection crashes occurred during darkness. | PC, P |
| Northern Ave: 43rd Ave to 35th Ave | 3 | Yes | Yes | - 19% of segment KSI crashes and 25% of fatalities involved a pedestrian or bicyclist.<br>- All segment fatal crashes occurred between 36th and 39th Ave.<br>- 56% of segment crashes occurred during daylight.<br>- No intersection ped crashes but 1 bike crash (14% of all crashes).<br>- 86% of intersection crashes occurred during daylight.<br>- No intersection KSI crashes in 2019 or 2020." | P, F |
| 43rd Ave: Maryland Ave to Camelback Rd | 3 | Yes | Yes | - Very high number of fatal crashes (12) in these segments.<br>- Segments: Ped crashes account for 18% of crashes and 33% of fatalities.<br>- 59% of segment crashes occurred during darkness or dawn/dusk, including all ped crashes.<br>- Intersection: 29% of crashes involved a pedestrian, including the one fatal crash.<br>- Intersection: 71% of crashes occurred during darkness or dawn/dusk. | P |
| Dunlap Ave: 35th Ave to 31st Ave | 3 | Yes | Yes | - Peds account for half of segment crashes and the segment fatality. (The PHB at 34th Avenue was previously an RRFB and was converted to PHB control in 2018 or 2019. The ped crash there occurred while it was an RRFB in 2016.)<br>- 33% of segment crashes occurred during dark conditions.<br>- 33% of intersection crashes involve a ped, including the only fatal.<br>- 83% of intersection crashes occurred during darkness. | PC |
| 43rd Ave: Orangewood Ave to Maryland Ave | 3 | No | Yes | - Segments: 25% of crashes involved a pedestrian, including 2 of 3 fatals.<br>- Half of crashes occurred during daylight and half during darkness.<br>- Intersection: 33% of crashes involved a pedestrian and accounted for both intersection fatalities.<br>- Intersection: 83% of crashes occurred during daylight.<br>- No intersection crashes in 2020. | P |

# RESOURCES

While the City of Phoenix currently funds a significant amount of projects, operations, programs, and staff to improve safety on its streets across many departments, the commitment to Vision Zero will require additional resources. These resources can be understood as **on-going costs**, **a one-time (project specific) cost**, and **costs for a specific time period**. The table below outlines a resource need framework categorized by 4 of the 5 E's, costs for implementation of strategies and projects, additional staff, and potential funding sources. This framework will be fully developed separately from this Plan by December 2022.

| | | Strategy/ Project Costs | Additional Staff | Potential Funding Sources |
|---|---|---|---|---|
| Evaluation | Ongoing | Low | Low | City |
| | One Time | Low | Low | City, Regional, State, Federal |
| | Specific # of Years | - | - | City, Regional, State, Federal |
| Engineering | Ongoing | High | Medium | City, Regional, State, Federal |
| | One Time | High | Medium | City, Regional, State, Federal |
| | Specific # of Years | High | Medium | City, Regional, State, Federal |
| Enforcement | Ongoing | Medium | High | City, State, Federal |
| | One Time | Medium | High | City, , State, Federal |
| | Specific # of Years | Medium | High | City, State, Federal |
| Education | Ongoing | Low | Low | City, Regional, State, Federal |
| | One Time | Low | Low | City, Regional, State, Federal |
| | Specific # of Years | Low | Low | City, Regional, State, Federal |

Strategy/Project Costs: Low = <$1 million, Medium = $1 - $5 million, High = >$5 million

Additional Staff: Low = 1 - 3 staff, Medium = 4 - 10, High = 10+

# REPORTING & TRACKING

The Phoenix RSAP stands apart from other transportation planning efforts due to the diverse range of strategies, coverage of strategies beyond engineering solutions, the defined vision, and the tracking and monitoring elements. The RSAP progress will involve review of the implementation plan outcomes, adjusting measures and action items, consistently reporting on an annual basis, and continuous effort and involvement from the Vision Zero Executive Task Force, RSAP Implementation Team, and the Community Advisory Committee.

The Phoenix RSAP's ultimate goal is to have zero traffic related fatalities on its streets by 2050. This goal aligns with the City's street and transit improvement plan and funding source, known as Transportation 2050 – T2050. The T2050 Plan is funded by a City of Phoenix 0.7 percent sales tax; this sales tax dedicates 7/10ths of a cent or 70 cents on a $100 purchase to transit and street improvements.

Recognizing the 28-year timeframe to reach vision zero, **two interim targets are set to ensure that implementation is on track**:

**2050: ZERO Fatal and Serious Injury Crashes on Phoenix Streets**

**&**

**2027: 25% reduction in fatal crashes***
**-Potential 22% reduction from addressing the HIN**

**2035: 60% reduction in fatal crashes***

***Baseline Year: 2020**

## PERFORMANCE MEASURES

The proposed set of 31 performance measures were developed to directly connect to the 15 objectives of the RSAP, which are equally divided into the five focus areas: **general**, **behavior**, **pedestrian & bicycle**, **intersections**, and **segments**.

The performance measures act as the guide between the focus areas and implementation of the strategies. Setting these metrics allows the RSAP to move forward, assess the impact, report out, adapt and modify strategies and/or measures if needed, and continue. *Appendix-D outlines the proposed outcomes and data needed to support this effort*

## VISION ZERO TASK FORCE

An internal City of Phoenix RSAP Working Group worked together over the past 13 months to develop this Plan. To continue this important work and implement the RSAP, the City has shifted gears and formally established a Vision Zero Task Force Framework.

The Vision Zero Task Force is organized into a three-tiered system that includes a network of department liaisons, sponsors, and members of the community. The framework includes: the Executive Task Force, the Roadway Safety Action Plan (RSAP) Implementation Team, and the Community Advisory Committee. City of Phoenix administration, management, department sponsors, and liaisons are included in Tier 1 and 2 who will serve as department leads responsible for implementation of the RSAP. Departments considered for inclusion are Community & Economic Development, Mayor and City Council Offices, Fire, Housing, Human Services, Information Technology Services, Neighborhood Services, Parks and Recreation, Planning and Development, Police, Public Transit, and Street Transportation.

**Tier 1: The Executive Task Force** will offer overarching guidance and direction on the implementation of the RSAP. This includes reviewing and approving quarterly, and annual RSAP updates created by the RSAP Implementation Team and assisting with presentations to the Community Advisory Committee and City Council as needed. The final role of the Executive Task Force is to ensure Department Liaisons are assisting with RSAP Implementation Team objectives.

**Meeting Cadence:** Quarterly

**Composition**: A Deputy City Manager, executive Street Transportation Department (STR) staff, the project team lead from the RSAP Implementation Team, a Council or Mayor's Office representative, and Department Sponsors.

**Tier 2: RSAP Implementation Team**, will be responsible for carrying out and tracking progress of the RSAP Implementation Plan. They will work with the Executive Task Force to provide quarterly Vision Zero updates to the Community Advisory Committee related to the status of the City's Vision Zero goal and incorporate recommendations from the Executive Task Force and Community Advisory Committee into the RSAP. The RSAP Implementation Team will work with relevant Department Liaisons on related projects and work to create the annual Vision Zero status update.

**Meeting Cadence:** Monthly

**Composition:** The Street Transportation Department Deputy Director, a Principal Planner related to pedestrian safety, a Community and Public Engagement Team member or Directors Office representative, and Department Liaisons.

**Tier 3: Community Advisory Committee**, will review quarterly updates from the RSAP Implementation Team, provide feedback and recommendations regarding the action plan to both the RSAP Implementation Team and Executive Task Force, request future agenda items, and coordinate with related City Council Offices.

**Meeting Cadence:** Quarterly

**Composition:** 11 members of the public (1 per council district and 3 by mayoral appointment from key stakeholder groups).

## PERFORMANCE REVIEW CYCLE

The performance review cycle ties the different pieces of the implementation plan together in systematic, transparent, and adaptable process that has distinct deliverables. Part of this cycle is the developing and delivering the annual RSAP status report. An annual report is proposed due to the nature of crash data collection, project delivery, and post-project analysis. Supporting this effort will be updating the HIN every three years, based on the previous 5-years of crash data (Strategy GN.01B). This analysis will be included in the report accordingly.

The Vision Zero Task Force will utilize existing and new tools, such as the crash data dashboard, to collect, track, and analyze data to understand the status of performance metrics. Information will be shared through the Vision Zero Task Force to determine if modifications to the Plan and/or performance measures should occur.

### The annual RSAP status report is anticipated to include the following elements:

- Vision Zero Performance Metrics (baseline & benchmark data)
- Map illustrating projects and status of addressing the HIN
- Examples of completed safety improvements
- Strategy success stories
- Refresh of "The Facts"

**FOR MORE INFORMATION, PLEASE VISIT [PHOENIX.GOV/ROADSAFETY](PHOENIX.GOV/ROADSAFETY)**

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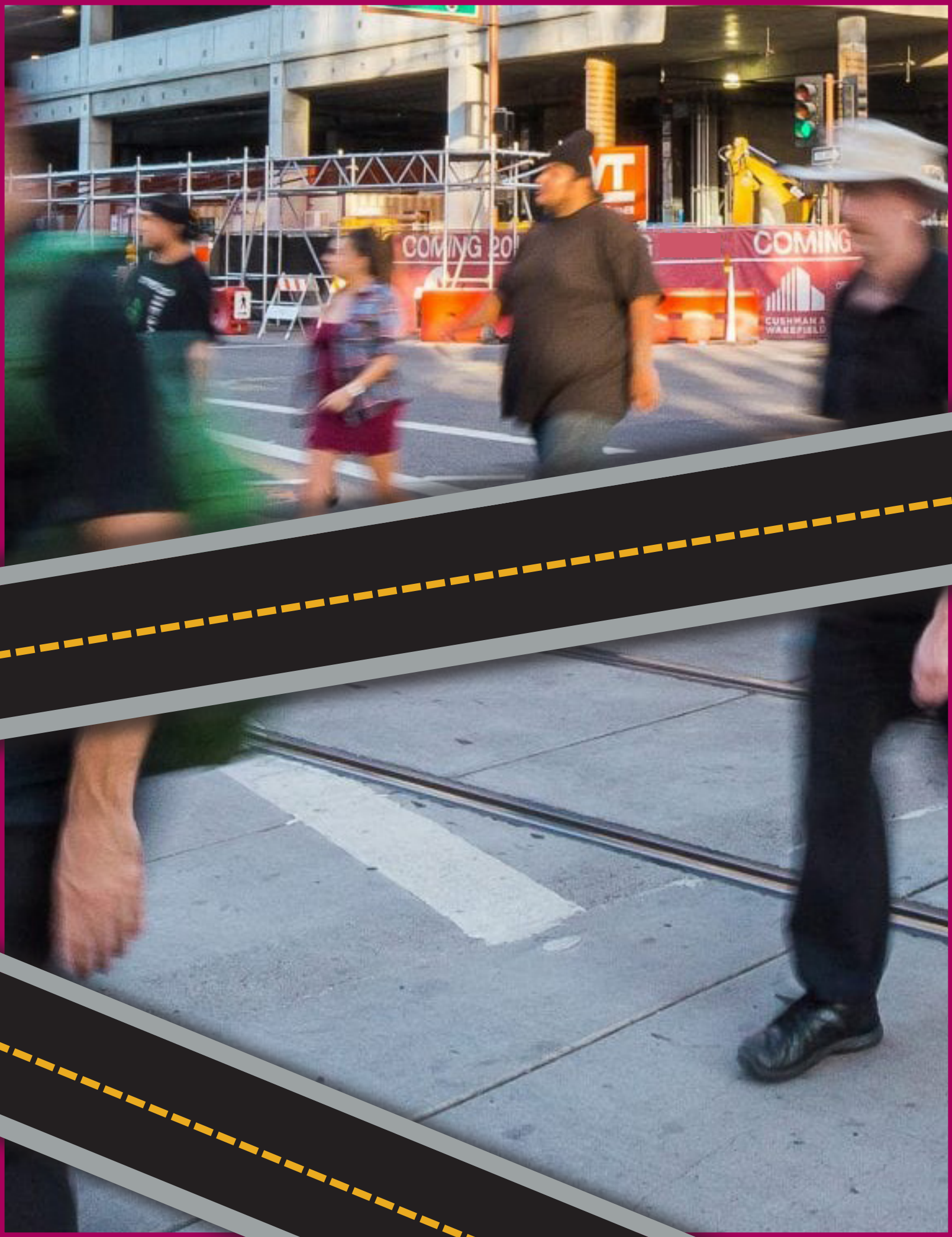
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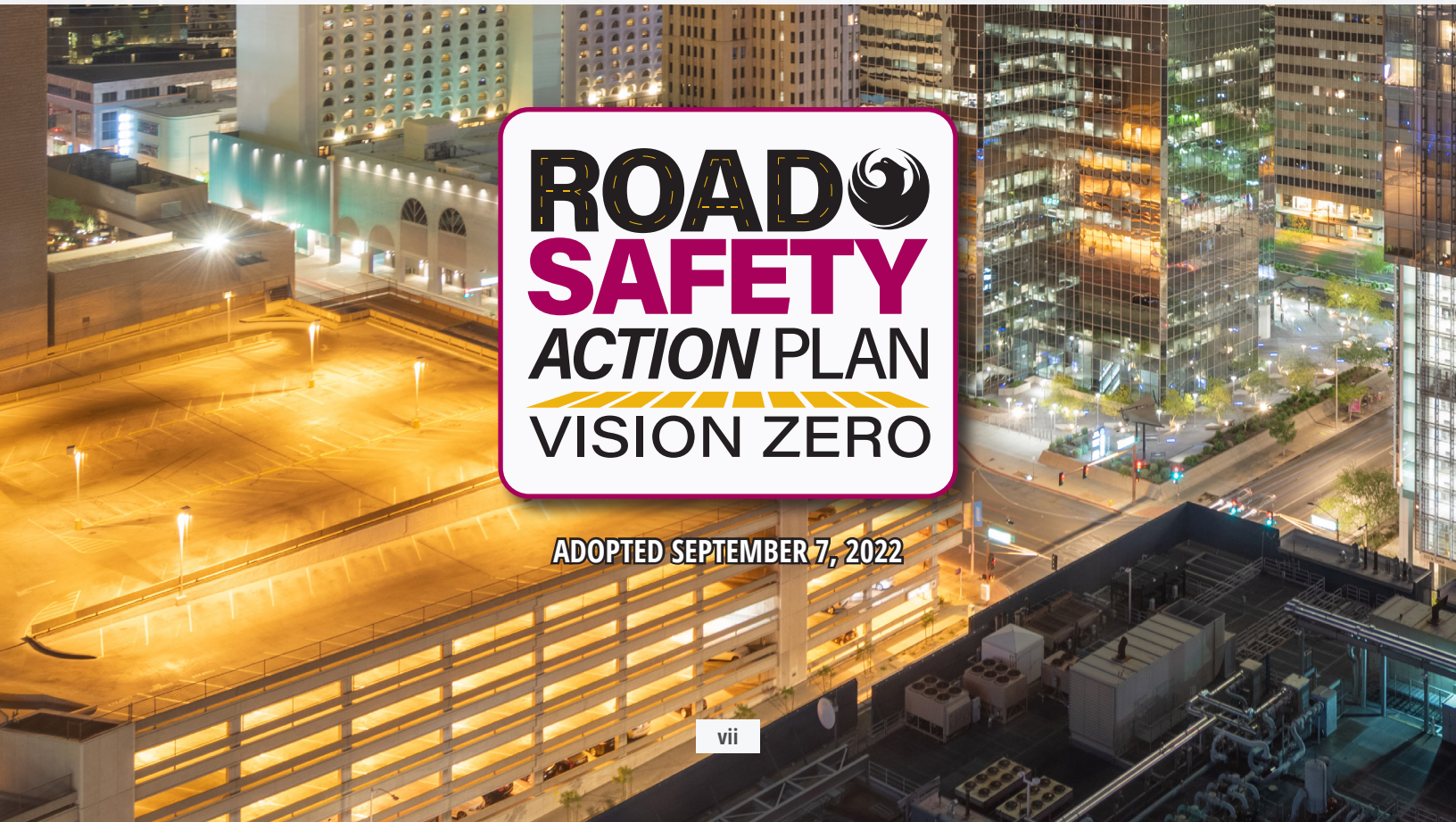
# APPENDICES





# APPENDIX A: PHOENIX CRASH SAFETY REVIEW USING MAG RTSIMS DATA

## FINAL REPORT: SEPTEMBER 28, 2021

## PREPARED FOR:

Streets PHX
STREET TRANSPORTATION DEPARTMENT

## PREPARED BY:

**Y2K Engineering, LLC**

**Project No. 21-059B**

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## EXECUTIVE SUMMARY

The City of Phoenix is currently in the process of developing a Comprehensive Roadway Safety Action Plan, which will further shape the City's planning efforts in roadway safety. This project involves a review of current safety trends, existing programs and processes, and public/stakeholder involvement to create a vision and plan for the future. This memorandum is intended to provide a preliminary overview of historical crash trends within the City of Phoenix within the past five years. In later stages of this project, a dynamic crash dashboard will be developed to provide enhanced abilities in data analytics and reporting.

In the initial stages of this project, crash queries were obtained through the Maricopa Association of Governments (MAG) software tool for crash analysis, the Regional Transportation Safety Information Management System (RTSIMS). This report uses existing tools to conduct a safety analysis of the past five years, and compares trends to regional and statewide data. The following key findings are based on a review of RTSIMS crash data from 2015 to 2019:

- An annual average 30,376 crashes per year were reported during the five year study period. This equates to 83 crashes per day.
- Crashes on arterial and local roadways in the City of Phoenix increased by a rate of about 4.4% per year. This trend suggests that the crash frequency increased at a higher rate than the City's population, which in the same period grew 1.5% per year, on average.
- Most crashes result in no injury (70%), approximately one-quarter result in possible or minor injury (27%), 2.6% result in serious injury, and 0.6% result in fatal injury. This equates to two serious injury crashes occurring each day, and one fatal crash occurring every other day.
- The percentage of fatal and serious injury crashes has remained generally consistent over the past five years; however the percentage of no injury crashes has steadily increased over time.
- For all crash severities, rear end crashes were the most common collision manner, followed by left-turn crashes. These two crash types account for about half of all crashes.
- For fatal and serious injury crashes, the "Other" collision manner was reported most frequent (25%), which is commonly selected for crashes involving pedestrians and bicyclists. Other frequent crash types for fatal and serious injury crashes were left-turn (23%) and angle (21%).
- Crashes involving unrestrained drivers (i.e, lack of seatbelt or helmet use) have reduced in frequency.
- Due to lack of protection on impact, pedestrians and bicyclists (vulnerable users) are more frequently seriously injured when involved in motor vehicle crashes. In the City of Phoenix, crashes involving bicyclists and pedestrians represent nearly half (48%) of all fatal crashes.
- A greater share of pedestrian crashes is occurring in Phoenix compared to other agencies within the MAG Region. Phoenix represents 36% of Maricopa County's population and about 43% of the County's local and arterial road crashes; however, 63% of County crashes involving pedestrians occurred on City of Phoenix's local and arterial roads.
- Bicyclist crashes are occurring at a greater rate in Phoenix than in other agencies within the MAG Region. About 43% of all crashes involving bicyclists in Maricopa County occurred on City of Phoenix's local and arterial roads.
- For all crash severities, the majority of crashes occur during daylight hours (71%), with the remaining 29% of crashes occurring during dawn, dusk, or dark conditions.
- A correlation exists between injury severity and lighting condition; fatal and serious injury crashes occurred more frequently during dawn, dusk, and dark conditions (45%) compared to daylight conditions (55%).

MAG RTSIMS tool provided the ability to retrieve data quickly for numerous Citywide statistics. During the analysis process, several discrepancies were identified when comparing to past Phoenix data, which is common when comparing different datasets. The City of Phoenix conducts a robust data scrubbing process each year, which confirms crashes exist within the City of Phoenix boundaries, omits freeway crashes, and reviews characteristics of crashes in detail to correct the manner of collision if originally mis-coded. The RTSIMS crash data is not scrubbed, and comes directly from ADOT ACIS. These differences, along with variations in the querying process, are acknowledged as part of this report. This data contained in this report is intended to provide preliminary information; later stages of this project will modernize the existing City of Phoenix crash analysis process to improve and enhance data analytics and visualization.

# INTRODUCTION

The City of Phoenix is currently in the process of developing a Comprehensive Roadway Safety Action Plan, which will further shape the City's planning efforts in roadway safety. This project involves a review of current safety trends, existing programs and processes, and public/stakeholder involvement to create a vision and plan for the future. This memorandum is intended to provide a preliminary overview of historical crash trends within the City of Phoenix within the past five years. Through the development of the project, a dynamic crash dashboard will be developed to provide enhanced abilities in data analytics and reporting. In the initial stages of the project, crash queries were obtained through the Maricopa Association of Governments (MAG) software tool for crash analysis, the Regional Transportation Safety Information Management System (RTSIMS).

The City of Phoenix prepares comprehensive collision summary reports each year, documenting the past year of motor vehicle, pedestrian, and bicycle-related crashes. This report uses existing tools (RTSIMS) to conduct a supplementary safety analysis of the past five years, and compare trends to regional and statewide data.

Crash data within the City of Phoenix was obtained for the past five years through the RTSIMS tool, from January 1, 2015, to December 31, 2019. At the time of the analysis, 2020 crash data was not available. The RTSIMS platform compiles historical crash data from the Arizona Crash Information System (ACIS) crash database maintained by the Arizona Department of Transportation (ADOT). The RTSIMS data excludes freeways, highways, and ramps; only arterial, collector, and local roadways are included. RTSIMS refers to this group as "Arterial and Local Roads". This naming refers to roadway classification and does not imply roadway ownership. The results of traffic safety data queries may differ slightly based on data source, filtering assumptions, modifications to raw data, and/or query techniques. The RTSIMS safety review is intended to identify trends and inform decisions to support roadway safety.

Due to the limited sample size of fatal crashes, fatal and serious injury crashes were combined to analyze trends in critical crashes. Unlike less severe crashes, the most common collision manner for fatal and serious injury crashes is "Other", which primarily represents bicyclist and pedestrian crashes, followed by left-turn and angle crashes. It was also observed that KA crashes are overrepresented in non-daylight conditions.

According to the US Census Bureau Annual Population Estimates (Figure 1), the City of Phoenix's population has grown about 6% during the five years under study, from 2015 to 2019. In 2020, the City of Phoenix's residents represented 23% of Arizona's population and 36% of Maricopa County's Population.

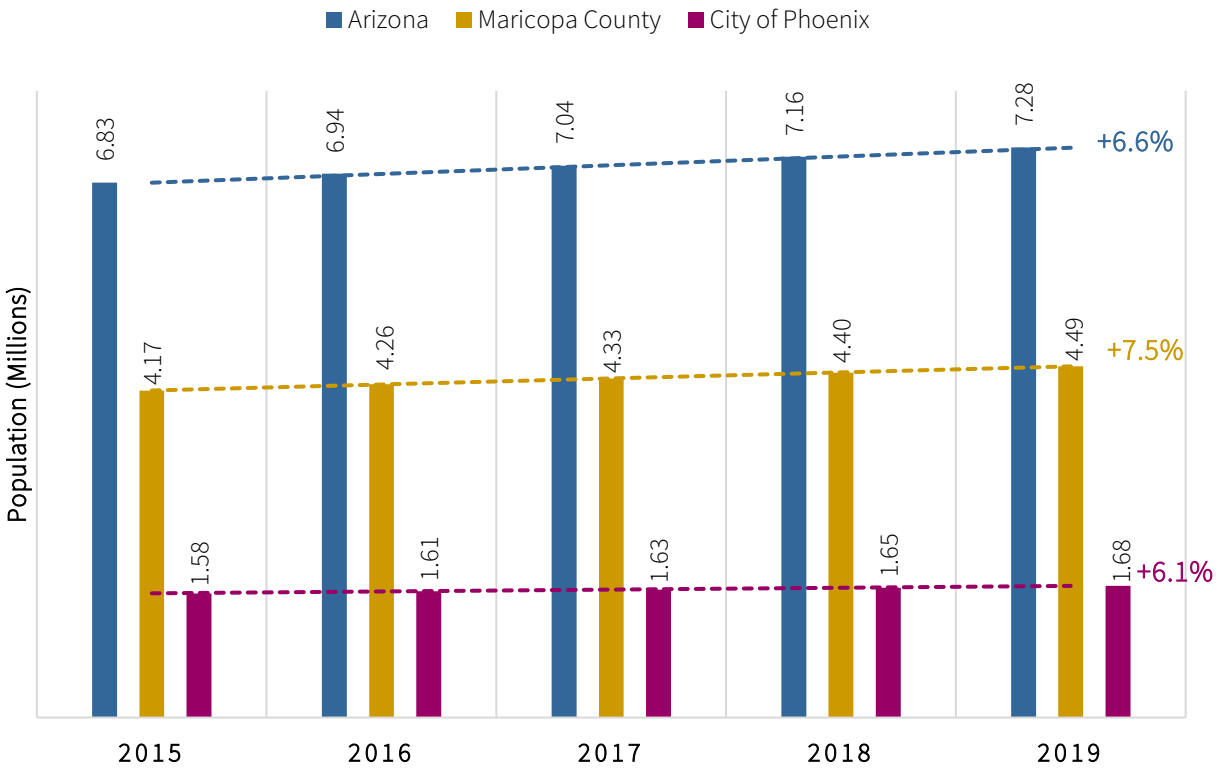



Figure 1: City of Phoenix Population Comparison to State and County
*(Source: US Census Bureau, Annual Estimates of Resident Population)*

## GENERAL TRENDS

Since 2015, the total number of crashes within the City of Phoenix has been steadily increasing, with a total of 31,827 crashes occurring in 2019 on the City's local and arterial roadway network. Figure 2 shows the number of crashes by injury severity for each year in the analysis period. The percentage of fatal crashes has stayed relatively constant, ranging from 0.5% to 0.7% of all crashes. The percentage of serious injury crashes varied between 2.1% and 3.2% of fatal crashes. The combined minor injury and possible injury ranged has steadily decreased over the past five years, from 30.7% (2015) to 23.8% (2019). The share of no injury crashes has increased over the past five years, from 66.0% (2015) to 73.6% (2019). This data suggests a slight downward trend in the severity of crashes.

Figure 3 shows the number of fatal and serious injury crashes from 2015 to 2019, which combined are trending towards fewer crashes since 2016.

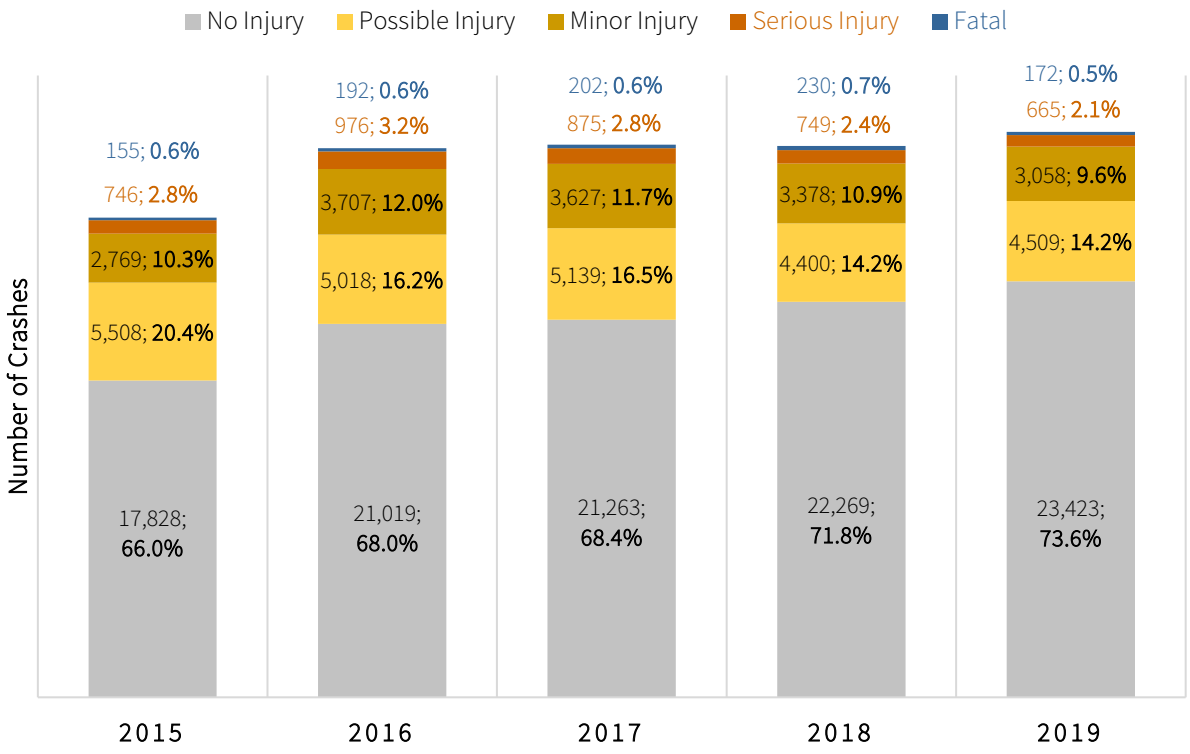



Figure 2: Total Number of Crashes per Year and Injury Severity (Local and Arterial Roads)

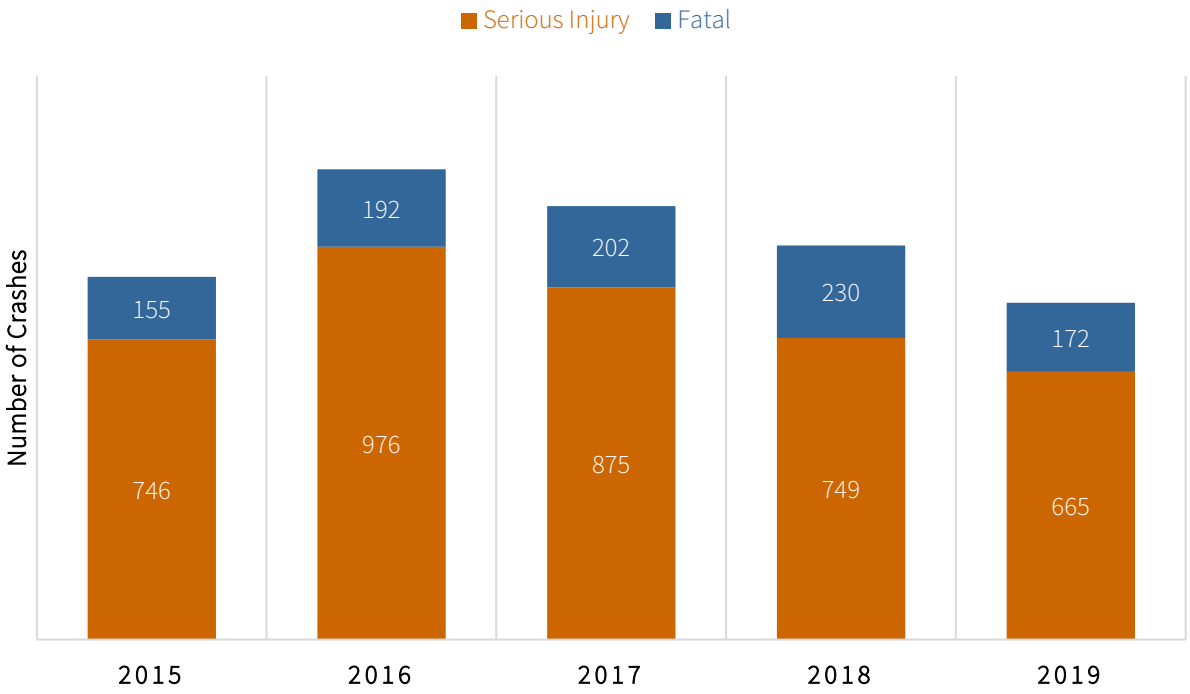



Figure 3: Total Number of Fatal and Serious Injury Crashes per Year (Local and Arterial Roads)

Crash data from 2020 was not available through RTSIMS at the time of this report. Based on a preliminary review of 2020 crash data, total number of crashes decreased by about 20% from 2019 crashes, which is presumed to be related to lower vehicle miles travelled as a result of the COVID-19 pandemic. The share of fatal and incapacitating injury crashes remained generally consistent with the previous five years; however, the share of no injury crashes followed the same positive trend (increasing from 73.6% in 2019 to 74.2% in 2020). Preliminary 2021 crash data, obtained through the Phoenix Police Department Vehicle Crimes Unit (VCU), indicate that there were 114 fatal crashes during the first six months of 2021.

Table 1 shows the distribution of crashes on City of Phoenix local and arterial roads by collision manner for the past five years. The most frequently-reported crash types were rear-end crashes (29% of all reported crashes) followed by left-turn crashes (23% of all crashes). Together, rear-end and left-turn crashes represent about half of all crashes.

Table 1: Number of Crashes per Year and Collision Manner

| | 2015 | 2016 | 2017 | 2018 | 2019 | Total | % |
|---|---|---|---|---|---|---|---|
| Rear-end (Front-To-Rear) | 8,319 | 9,144 | 9,002 | 8,811 | 8,870 | 44,146 | 29.1% |
| Left Turn | 5,864 | 6,658 | 7,070 | 7,120 | 7,678 | 34,390 | 22.6% |
| Angle (Front to Side) (Other Than Left Turn) | 5,246 | 5,434 | 5,448 | 5,434 | 5,404 | 26,966 | 17.8% |
| Sideswipe, Same Direction | 3,259 | 4,176 | 4,149 | 4,374 | 4,602 | 20,560 | 13.5% |
| Single Vehicle | 2,045 | 2,223 | 2,192 | 2,224 | 2,191 | 10,875 | 7.2% |
| Other (Includes Pedestrians and Bicyclists) | 1,002 | 1,309 | 1,324 | 1,116 | 1,046 | 5,797 | 3.8% |
| Head-on (Front-To-Front) (Other Than Left Turn) | 488 | 666 | 673 | 696 | 743 | 3,266 | 2.2% |
| Sideswipe, Opposite Direction | 349 | 556 | 616 | 625 | 645 | 2,791 | 1.8% |
| Rear-To-Rear | 163 | 430 | 277 | 230 | 195 | 1,295 | < 1 % |
| Rear-To-Side | 161 | 183 | 193 | 193 | 208 | 938 | < 1% |
| Unknown | 110 | 133 | 162 | 203 | 245 | 853 | < 1% |
| Total | 27,006 | 30,912 | 31,106 | 31,026 | 31,827 | 151,877 | |

*Note: The City of Phoenix uses a data scrubbing process to improve consistency of coding for collision manner. For example, the City of Phoenix defines left-turn crashes as involving vehicles originally traveling in the opposing (parallel) direction. If a crash involves a left-turning movement, but the vehicles originate in perpendicular paths, the collision is defined as an angle crash. The results of Table 1 were summarized using RTSIMS data, which does not involve the City of Phoenix scrubbing process. Therefore, these results vary from City of Phoenix scrubbed data, which identifies that the leading manner of collision is rear-end crashes, followed by angle crashes, then left-turn crashes.*

Table 2 shows the number of pedestrian and bicyclist crashes per year, as well as the injury severity. Pedestrian crashes have been slowly increasing over the past five years, while bicyclist crashes have been decreasing. An initial review of 2020 data indicates consistency with these trends.

Over the five-year period, pedestrians were involved in an average of 86 fatal crashes per year, and bicyclists were involved in an average of 8 fatal crashes per year. Combined, crashes involving pedestrians and bicyclists represent nearly half (48.6%) of all fatal crashes. Preliminary 2021 crash data, obtained through the Phoenix Police Department VCU, indicate that there a total of 114 fatal crashes reported in the first six months of 2021, 52 (45.6%) of which involved pedestrians, and 4 (3.5%) of which involved bicyclists.

Table 2: Number of Pedestrian and Bicyclists Crashes per Year and Collision Manner

| | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|---|---|---|---|---|---|---|
| Bicyclists | 438 | 485 | 470 | 384 | 298 | 2,075 |
| No Injury | 35 | 35 | 17 | 14 | 0 | 101 |
| Possible Injury | 157 | 151 | 152 | 129 | 118 | 707 |
| Minor injuries | 185 | 219 | 235 | 186 | 147 | 972 |
| Serious Injury | 53 | 71 | 52 | 52 | 26 | 254 |
| Fatal | 8 | 9 | 14 | 3 | 7 | 41 |
| Pedestrians | 617 | 771 | 813 | 825 | 820 | 3,846 |
| No Injury | 30 | 24 | 9 | 9 | 0 | 72 |
| Possible Injury | 153 | 164 | 194 | 186 | 247 | 944 |
| Minor injuries | 247 | 306 | 319 | 332 | 347 | 1,551 |
| Serious Injury | 127 | 189 | 197 | 187 | 148 | 848 |
| Fatal | 60 | 88 | 94 | 111 | 78 | 431 |
| All Crashes | 27,006 | 30,912 | 31,106 | 31,026 | 31,827 | 151,877 |

## CRASHES BY MONTH

Figure 4 and Figure 5 show the frequency of crashes in the City of Phoenix (arterial and local roads) by month. The month-to-month trends are consistent between all crashes, serious injury crashes, and fatal crashes. March registered the highest number of crashes, including fatal and injury crashes. The month with the fewest reported crashes was July, which correlates with lower summer traffic volumes. Lower traffic volumes in June and July are often associated with school breaks, seasonal resident travel, lower pedestrian and bicyclist activity, and lower traffic volumes in general due to the high temperatures.

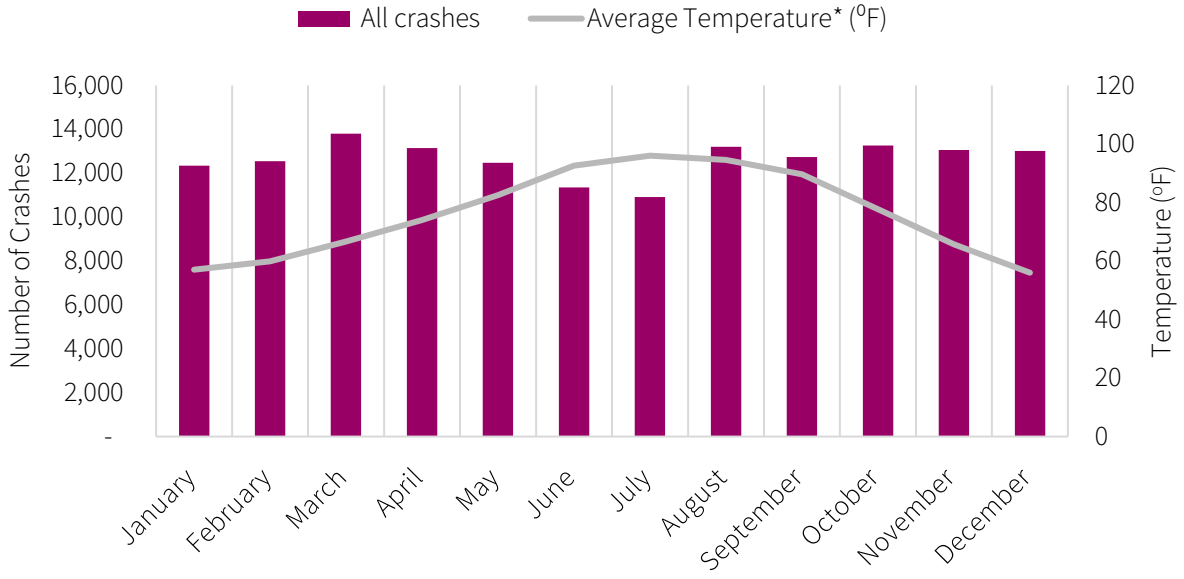



Figure 4: Number of Crashes by Month (2015-2019)

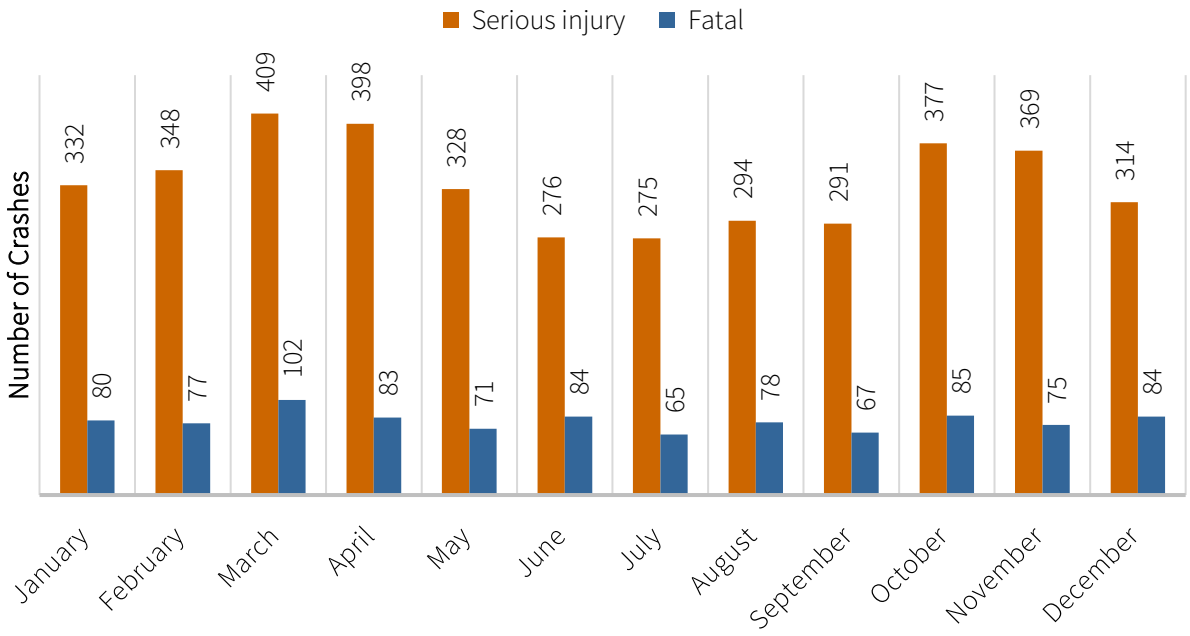



Figure 5: Number of Serious Injury and Fatal Crashes by Month (2015-2019)

## CRASHES BY DAY OF WEEK

Figure 6 shows the distribution of crashes by weekday. Crashes occur most frequently on Fridays, while the fewest crashes occur on Sundays. Fatal crashes occur most often on Saturdays and Sundays, and occur less frequently on Mondays.

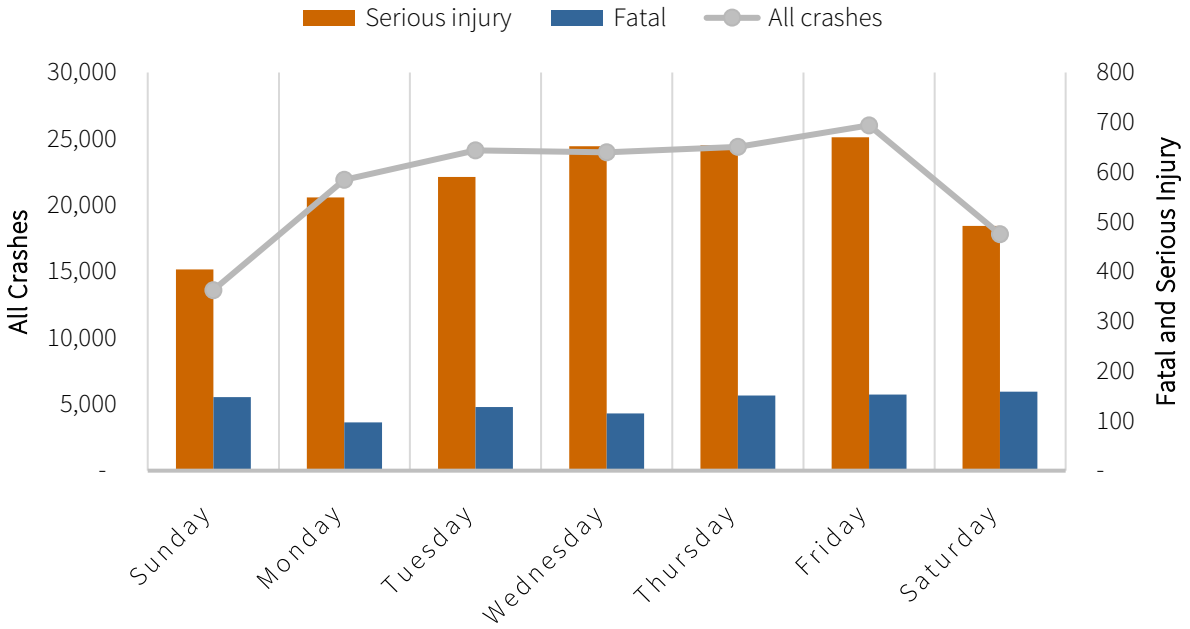



Figure 6: Number of Crashes by Day of the Week (2015-2019)

## CRASHES BY TIME OF DAY

Figure 7 shows that the majority of crashes (71%) occurred under daylight conditions, with 29% of crashes occurring during dawn, dusk, or dark conditions.

Figure 8 shows how the crashes are distributed by lighting conditions over the course of the day. In addition to the AM peak around 7 to 8 AM, a large number of crashes occur during the PM peak from 3 to 6 PM.

Crashes involving dawn and dusk conditions were limited between 4 to 7 AM and 4 to 7 PM, respectively.

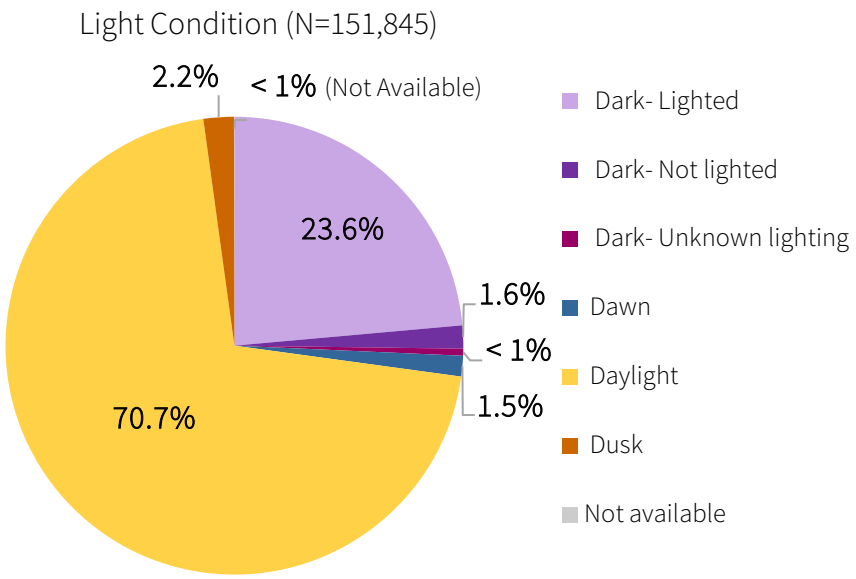



Figure 7: Share of Crashes by Light Condition, 2015-2019

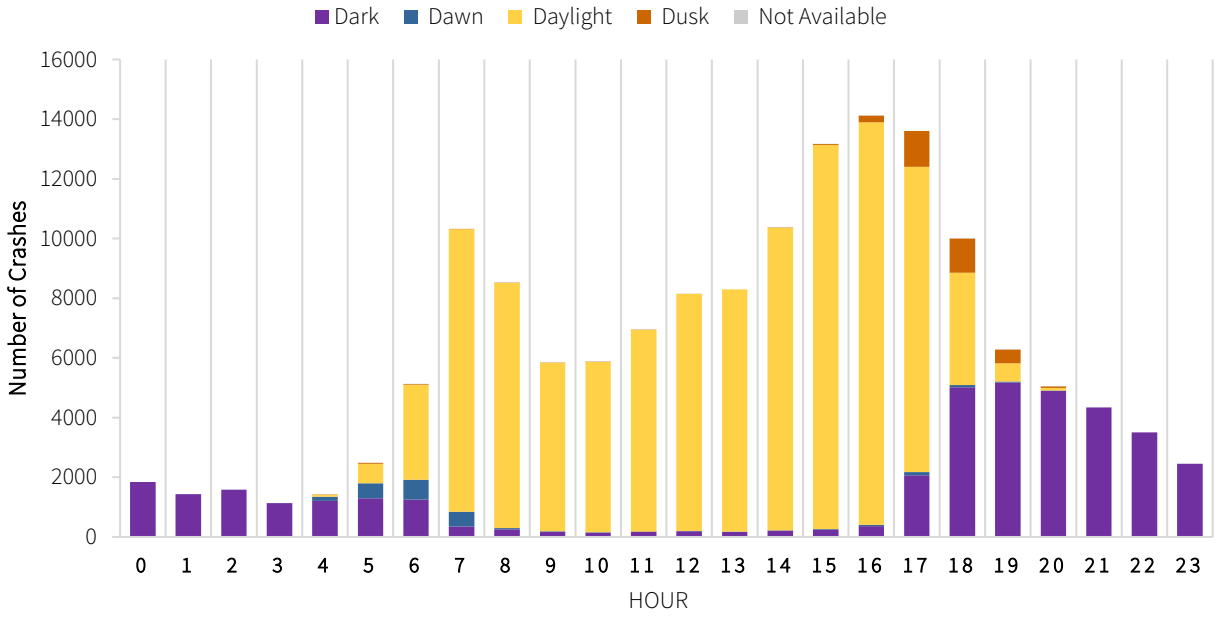



Figure 8: Number of Crashes by Hour of the Day and Light Condition (2015-2019)

## CRASHES BY LOCATION

To classify a crash's relation to the junction, crashes were separated by Junction Type as either an Intersection/Interchange crash or a Non-Intersection/Non-Interchange crash. Figure 9 shows where the location type of crashes that occurred during the study period of 2015 to 2019.

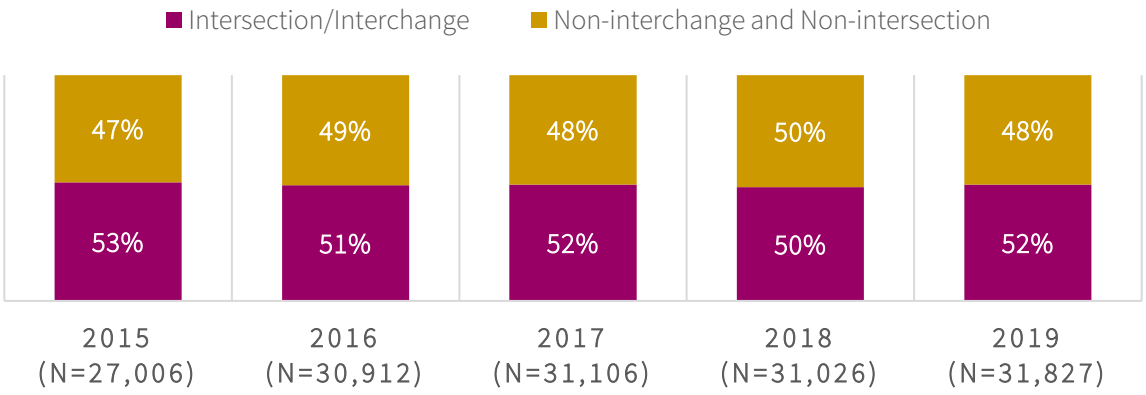



Figure 9: Crash Location Relative to Junctions, by Year

Figure 10 shows the injury severity between the three location types. In general, crashes are slightly more severe at intersections and interchanges, compared to segment collisions, which correlates with the greater frequency and types of collisions/conflict points possible.

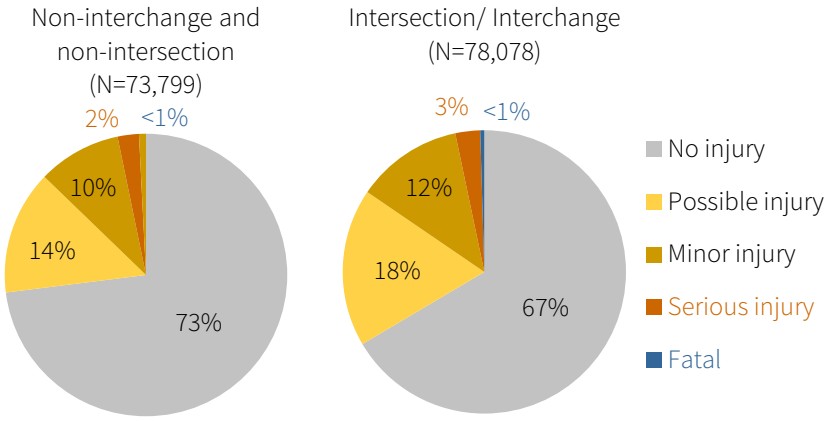



Figure 10: Injury Severity of Intersection/Interchange-Related Crashes

The collision manner of intersection and interchange crashes is shown in Figure 11. The three most common crash types at intersections are left-turns, rear-ends, and angle crashes, respectively.

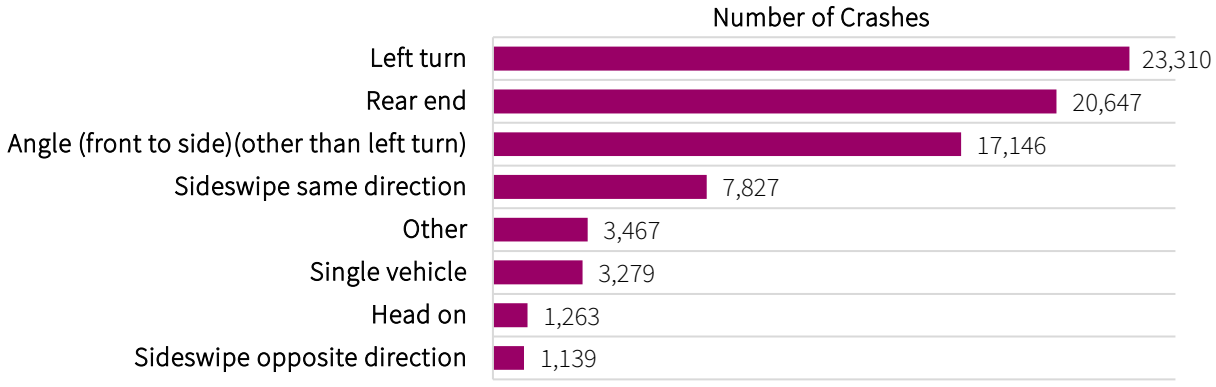



Figure 11: Collision Manner of Intersection/Interchange-Related Crashes

To rank the intersections based on a holistic safety analysis, the MAG's network screening methodology was used to classify the City of Phoenix's intersections per their safety score. The scoring methodology combines three safety attributes on the intersection, including crash frequency, crash severity, and crash type. The three factors are weighted together for the final Intersection Safety Score, with crash severity as 50%, crash frequency as 25%, and crash type as 50% of the weighting. Table 3 and Figure 12 show the Top 20 intersections with the highest Intersection Safety Score within the City of Phoenix.

The intersections with the greatest crash risk exist at 1) 75th Avenue and Indian School Road, 2) 67th Avenue and Indian School Road, and 3) 67th Avenue and McDowell Road. Formal Road Safety Assessments (RSA) have been conducted at 10 of the Top 20 high crash risk intersections.

Table 3: High Crash Risk Intersections (Intersection Safety Score)

| Rank, City of Phoenix | Rank, MAG Region | RSA Conducted? | Location | # Crashes | Crash Frequency Score (CF) | Crash Severity Score (CS) | Crash Type Score (CT) | Final Score |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2015*,2021* | 75th Ave & Indian School Rd | 251 | 1.06 | 1.36 | 1.29 | 1.26 |
| 2 | 2 | 2013, 2015*, 2021* | 67th Ave & Indian School Rd | 273 | 1.15 | 1.32 | 1.18 | 1.24 |
| 3 | 3 | 2016 | 67th Ave & McDowell Rd | 246 | 1.04 | 1.30 | 1.27 | 1.23 |
| 4 | 4 | | 99th Ave & Lower Buckeye Rd | 316 | 1.33 | 1.23 | 0.91 | 1.17 |
| 5 | 6 | | 51st Ave & McDowell Rd | 201 | 0.85 | 1.09 | 1.23 | 1.06 |
| 6 | 8 | | 43rd Ave & Bethany Home Rd | 194 | 0.82 | 1.08 | 1.16 | 1.03 |
| 7 | 9 | 2021* | 75th Ave & McDowell Rd | 215 | 0.91 | 1.07 | 0.97 | 1.01 |
| 8 | 10 | 2019* | 27th Ave & Camelback Rd | 203 | 0.86 | 1.07 | 0.97 | 1.00 |
| 9 | 13 | | 7th Ave & Indian School Rd | 191 | 0.81 | 0.97 | 1.10 | 0.96 |
| 10 | 14 | | 75th Ave & Thomas Rd | 192 | 0.81 | 1.01 | 1.01 | 0.96 |
| 11 | 15 | | 35th Ave & Bethany Home Rd | 194 | 0.82 | 0.99 | 1.04 | 0.96 |
| 12 | 16 | 2018 | 43rd Ave & Peoria Ave | 196 | 0.83 | 1.06 | 0.89 | 0.96 |
| 13 | 17 | 2021 | 35th Ave & Glendale Ave | 188 | 0.79 | 0.99 | 1.05 | 0.96 |
| 14 | 18 | 2021 | 24th St & Baseline Rd | 204 | 0.86 | 1.00 | 0.92 | 0.95 |
| 15 | 19 | 2013 | 51st Ave & Indian School Rd | 193 | 0.81 | 0.96 | 1.03 | 0.94 |
| 16 | 21 | | 43rd Ave & Northern Ave | 186 | 0.79 | 0.95 | 0.97 | 0.91 |
| 17 | 23 | | 43rd Ave & McDowell Rd | 184 | 0.78 | 0.97 | 0.90 | 0.91 |
| 18 | 24 | 2021* | 83rd Ave & Indian School Rd | 170 | 0.72 | 0.95 | 1.00 | 0.90 |
| 19 | 27 | | 43rd Ave & Glendale Ave | 190 | 0.80 | 0.94 | 0.82 | 0.88 |
| 20 | 28 | 2018 | 35th Ave & Bell Rd | 150 | 0.63 | 0.89 | 1.08 | 0.87 |

*Note: *Location was studied as part of a corridor RSA.*

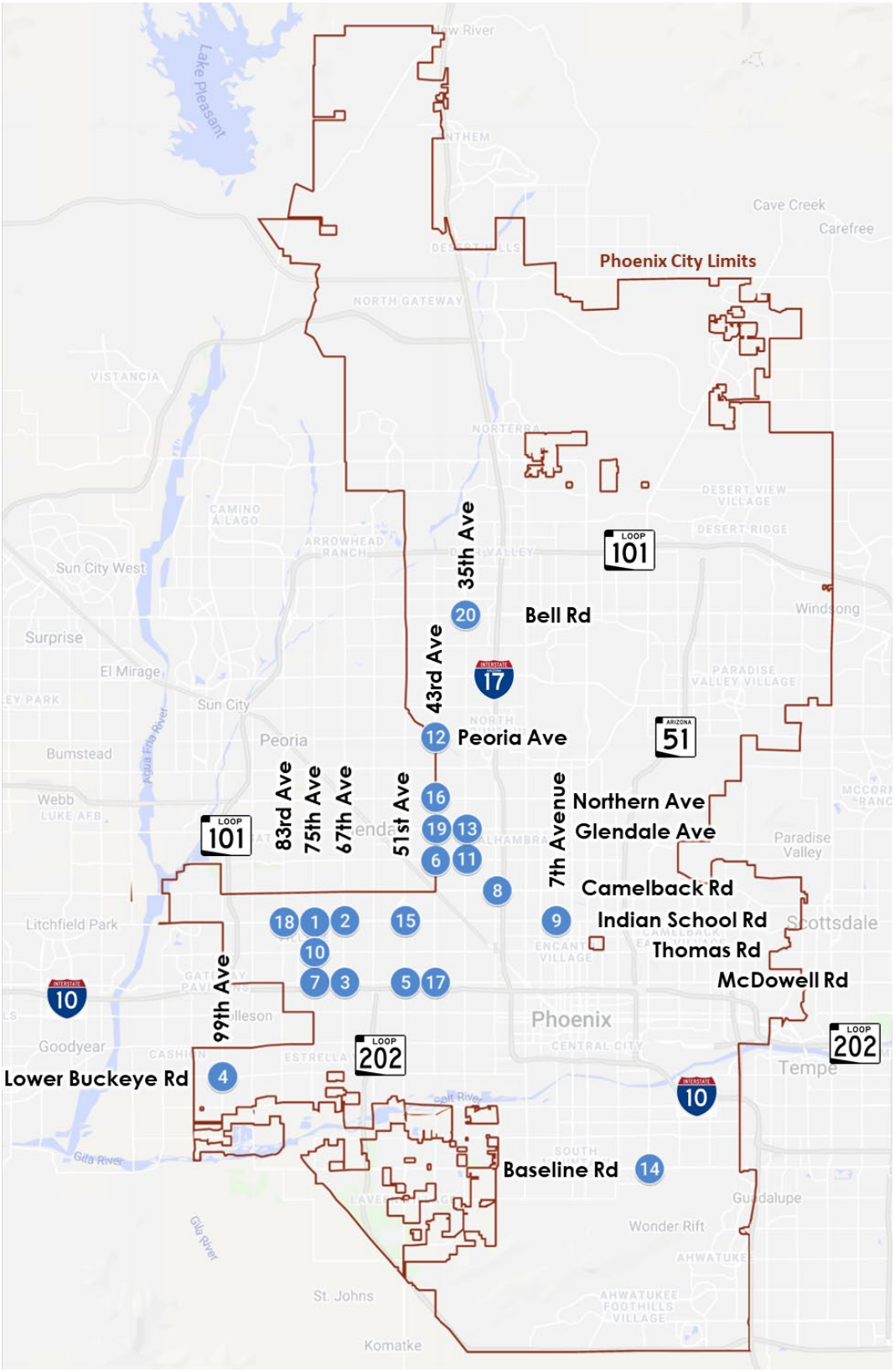



Figure 12: High-Crash Intersections (Top 20 Intersection Safety Score)

## BEHAVIOR CHARACTERISTICS

In the period of 2015 to 2019, alcohol and drug-impaired drivers were responsible for 7,487 crashes, which represents 5% of all crashes on local and arterial roads in the City of Phoenix. However, of all 4,962 fatal and serious injury crashes, 1,117 (22%) were associated with impaired drivers. Figure 13 shows the distribution of crashes involving impaired drivers (alcohol, drugs) by the hour of the day. Unlike the total number of crashes that show two distinct peaks of crashes over the AM and PM traffic peaks (Figure 8), crashes involving impaired drivers are mostly concentrated during the late hours of the night (7 PM to 3 AM).

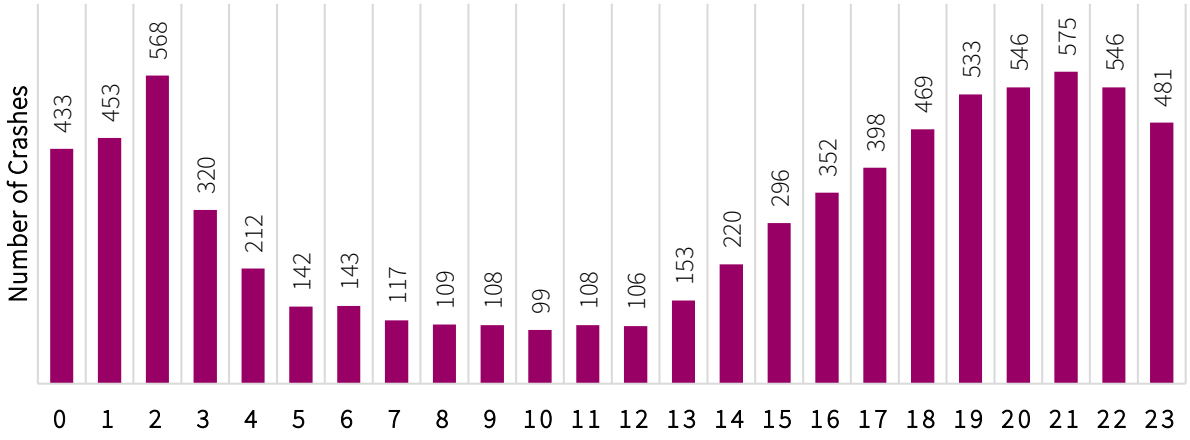



Figure 13: Number of Crashes Involving Impaired Drivers, by Hour

During the five years analyzed in this report, the total number of crashes involving unrestrained drivers show a steady decline. From 2015 to 2019, unrestrained driver crashes have reduced by approximately 20%. Figure 14 shows the injury severity of such crashes over the years. On average, about 7% of unrestrained driver crashes are fatal crashes, which is a significantly larger share compared to all crashes.

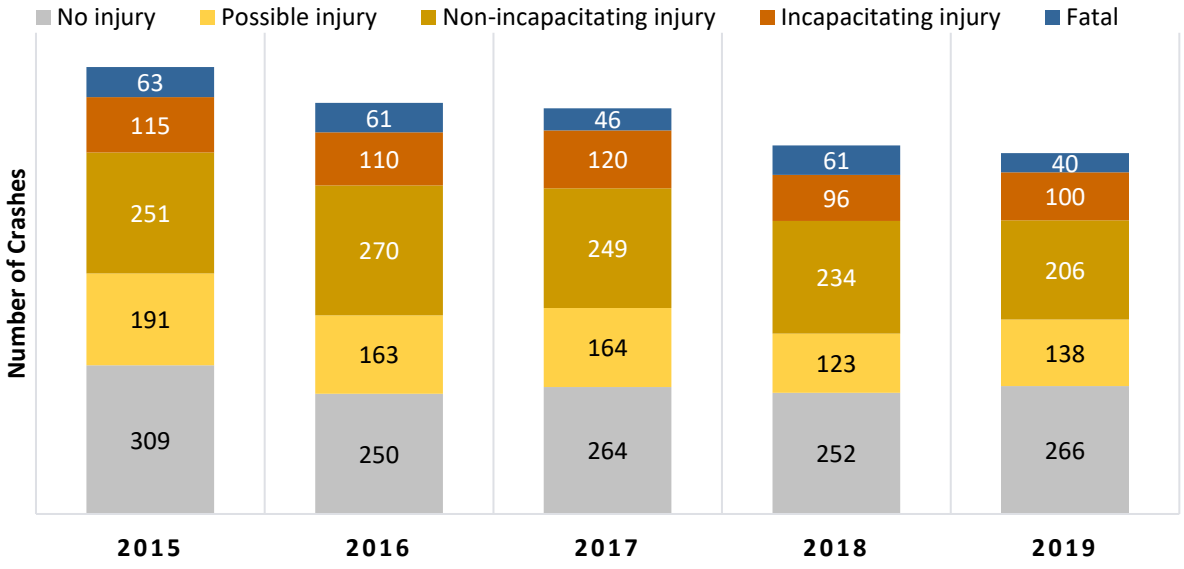
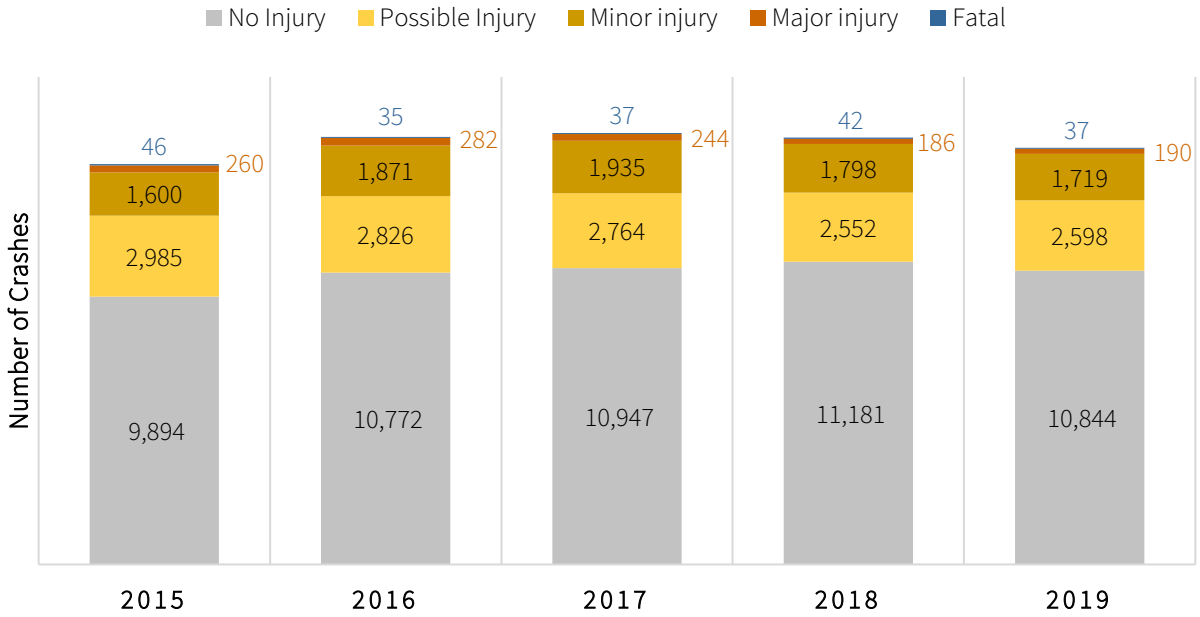



Figure 14: Number of Crashes Involving Unrestrained Drivers, by Year and Injury Severity

Figure 15 shows the severity associated with speed-related crashes across the study period. While on average about 70% of speed-related crashes result in no injury, close to 2% of such crashes result in serious injury or fatality.




*Note: Violation considered was "Speed too fast for conditions".*

Figure 15: Speed-Related Collisions, by Year and Injury Severity

## TRENDS BY PERSON TYPE

This sub-section of the report further explores crashes involving pedestrians, bicyclists, older drivers, and younger drivers. The analysis period is from 2015 to 2019. Pedestrian and bicyclists are considered to be vulnerable roadway users; as there is little to no protection in collisions with motor vehicles. Crashes involving pedestrians and bicyclists are more likely to result in critical injuries.

### PEDESTRIANS

Figure 16 shows the injury severity of crashes involving pedestrians on the City of Phoenix's local and arterial roads from 2015 to 2019. While most (70%) motor-vehicle crashes result in no injury, that is not the case for crashes that involve pedestrians. Rather, 11% of crashes involving pedestrians were fatal and 22% resulted in serious injuries. In the five studied years, the number of crashes involving pedestrians trended upward, with 2019 crashes representing a 33% increase from 2015.

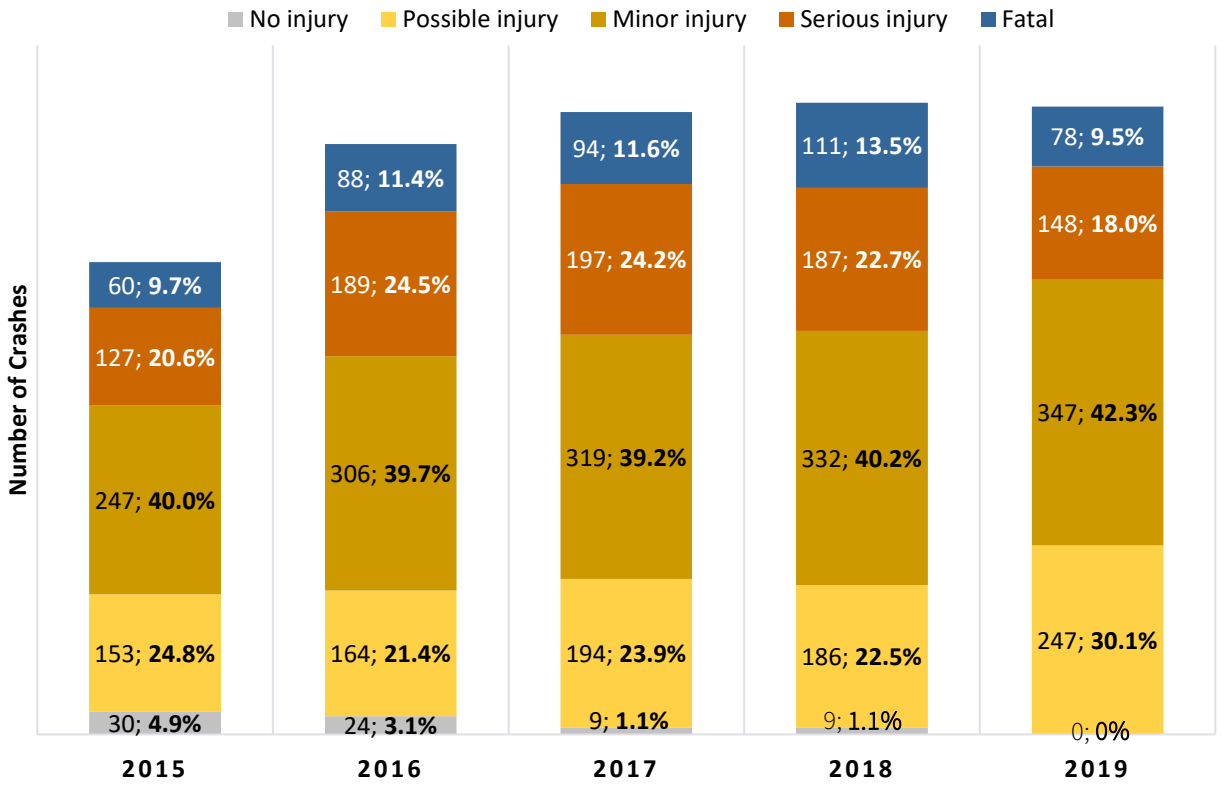



Figure 16: Injury Severity for Crashes Involving Pedestrians, by Year

Figure 17 shows the collision manner for the crashes involving pedestrians. As most of the collision manner categories developed for the Arizona Crash Report form are oriented towards motor vehicles, the most common collision manner reported on pedestrian crashes was "Other", which is often selected by the responding police officer for crashes involving pedestrians or bicyclists.

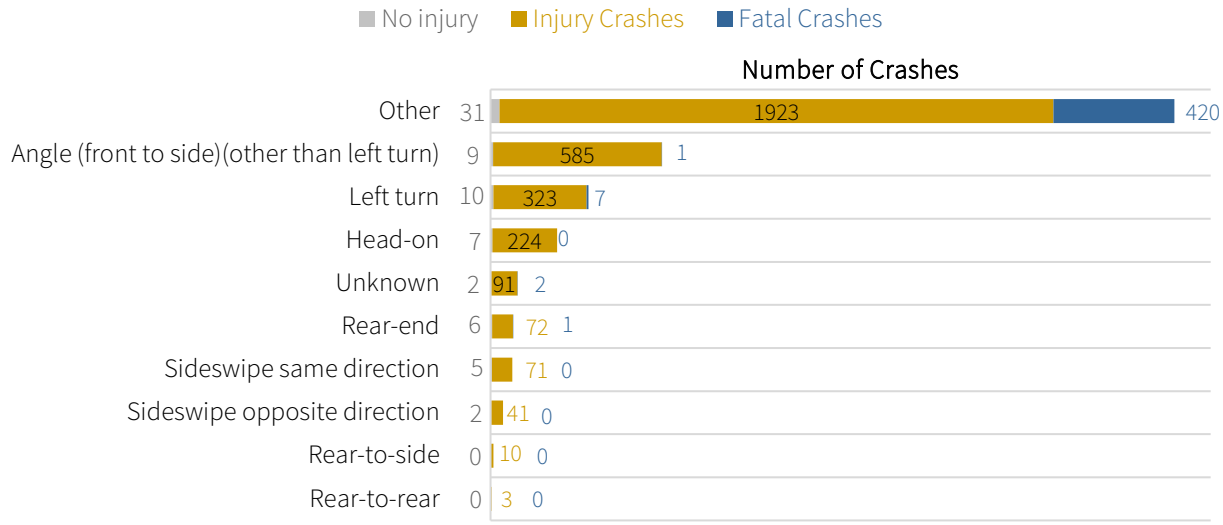



Figure 17: Collision Manner for Crashes Involving Pedestrians, by Year

Figure 18 and Figure 19 show the distribution of pedestrian crashes by month and by hour, respectively. The months with the highest frequency of crashes involving pedestrians are November and December. The hours with the highest frequency of crashes involving pedestrians occur in the evening, from 6:00 pm to 9:00 pm.

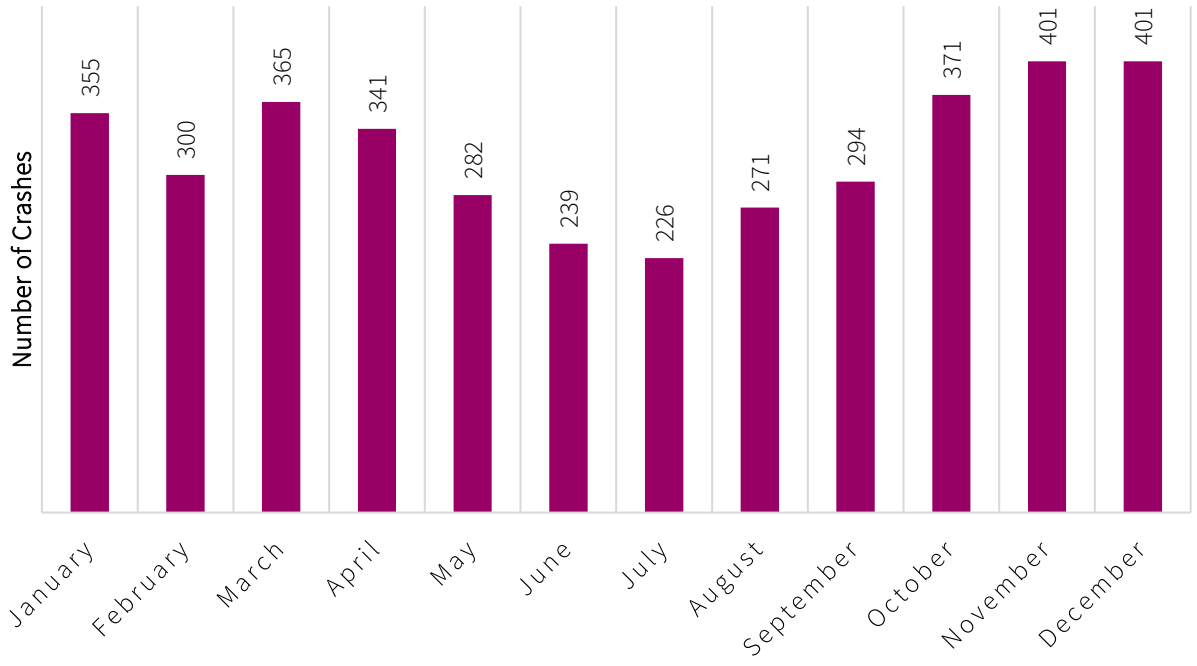



Figure 18: Number of Crashes Involving Pedestrians, by Month

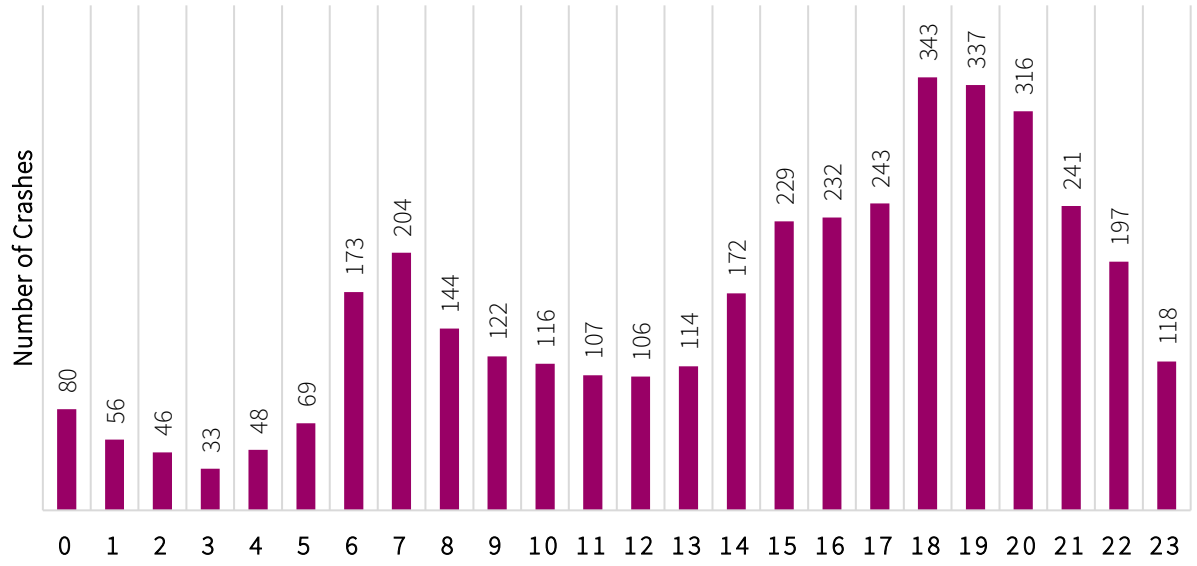



Figure 19: Number of Crashes Involving Pedestrians, by Hour

## BICYCLISTS

Similar to pedestrian crashes, crashes involving bicyclists registered higher rates of fatalities and serious injuries, with virtually no crashes being reported as property damage only (Figure 20). During the past five years, the number of bicycle-related crashes have trended downward. From 2015 to 2019, the number of crashes involving bicyclists has reduced by 32%.

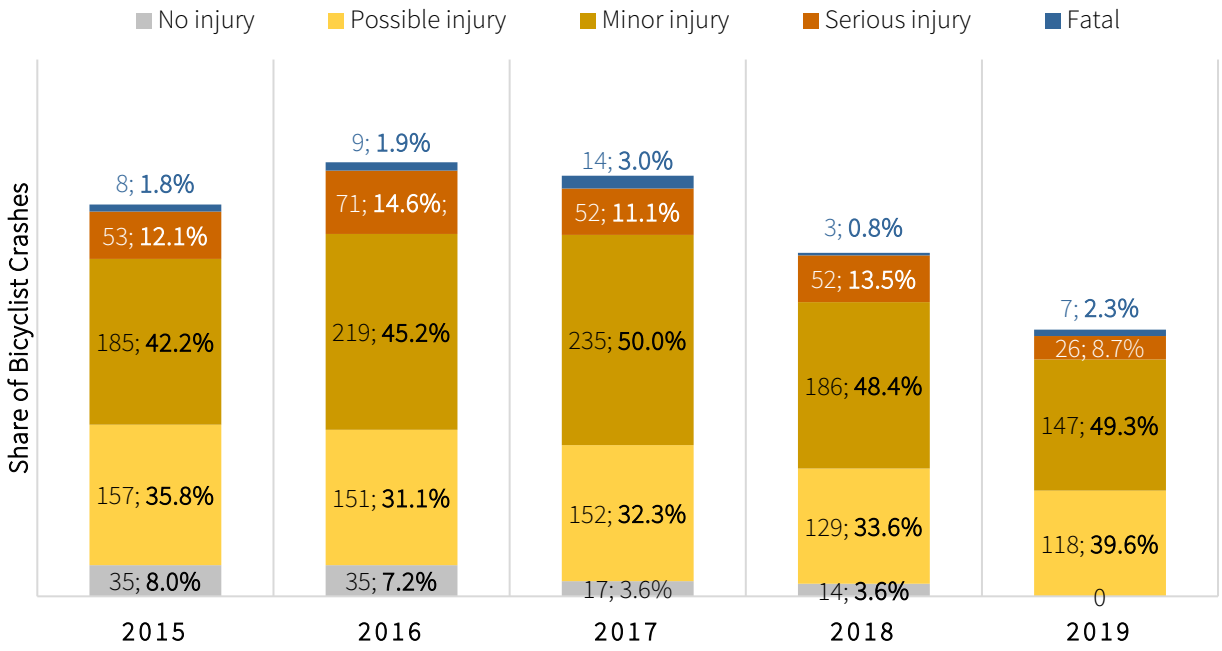



Figure 20: Injury Severity for Crashes Involving Bicyclists, by Year

Figure 21 shows the collision manner for crashes involving bicyclists. As it was observed for pedestrian crashes, the most common collision manner was "Other". However, for crashes involving bicyclists, a significant share of crashes was a result of angle crashes.

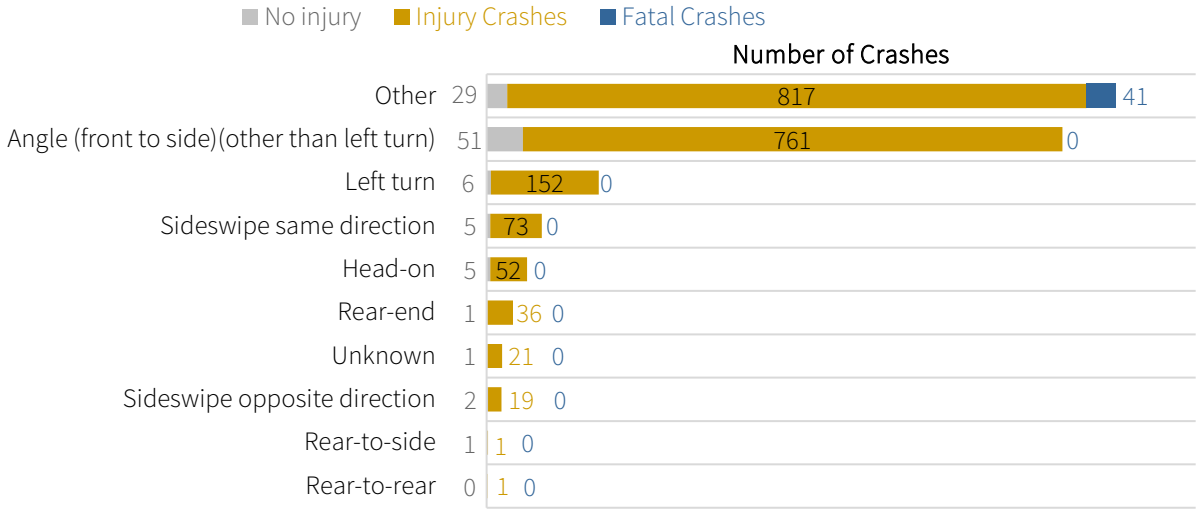



Figure 21: Injury Severity for Crashes Involving Bicyclists, by Collision Manner (2015-2019)

Figure 22 and Figure 23 show the distribution of crashes involving bicyclists by month and by hour, respectively. The month with the highest number of crashes involving bicyclists was March. The highest number of crashes involving bicyclists correlates with vehicular morning and afternoon peak hours.

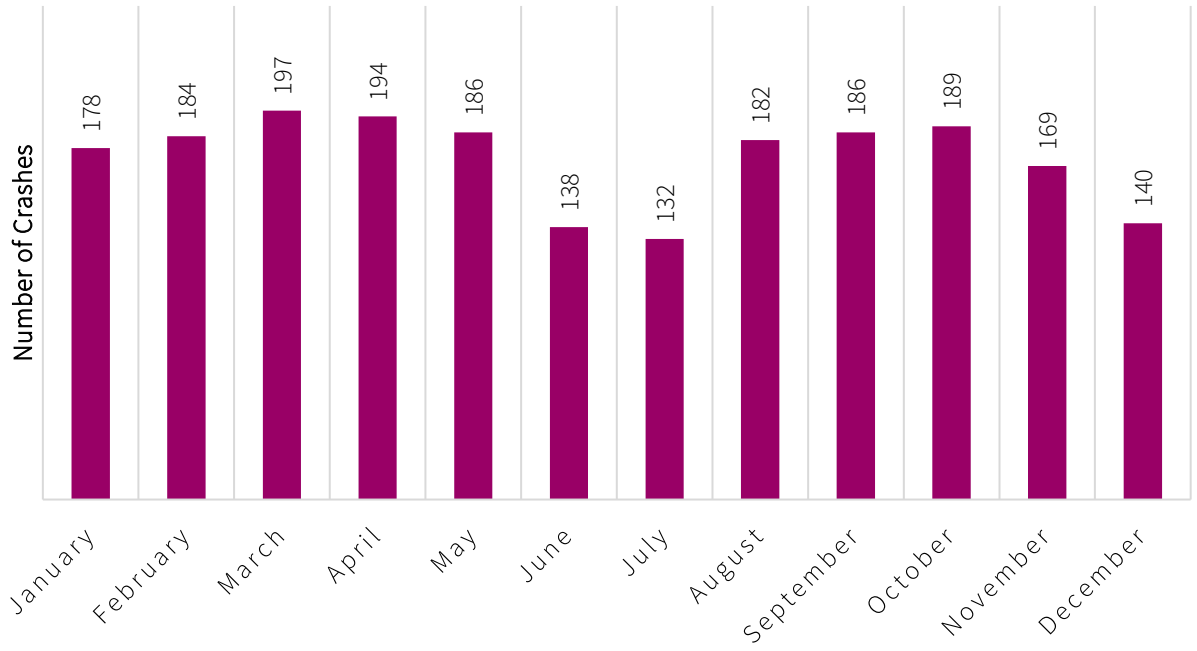



Figure 22: Number of Crashes Involving Bicyclists, by Month

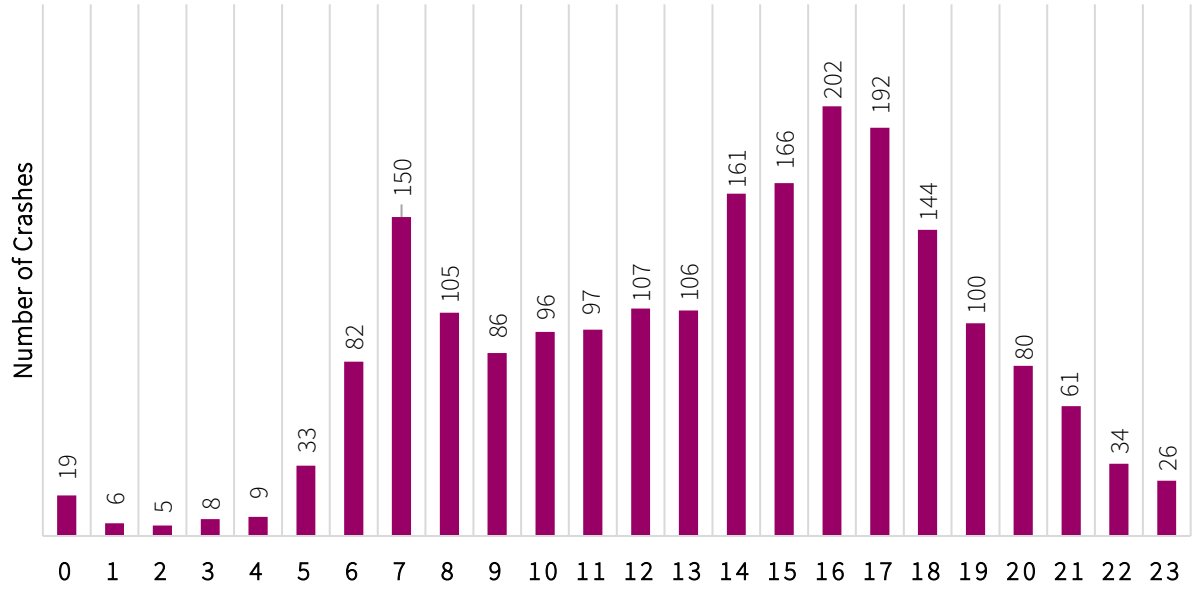



Figure 23: Number of Crashes Involving Bicyclists, by Hour

## OLDER DRIVERS (Age 65 and Older)

Older drivers (age 65 and older) were involved in 20,425 (13%) of all incidents reported in the City of Phoenix's local and arterial roads from 2015 to 2019. Figure 24 shows the injury severity of those crashes.

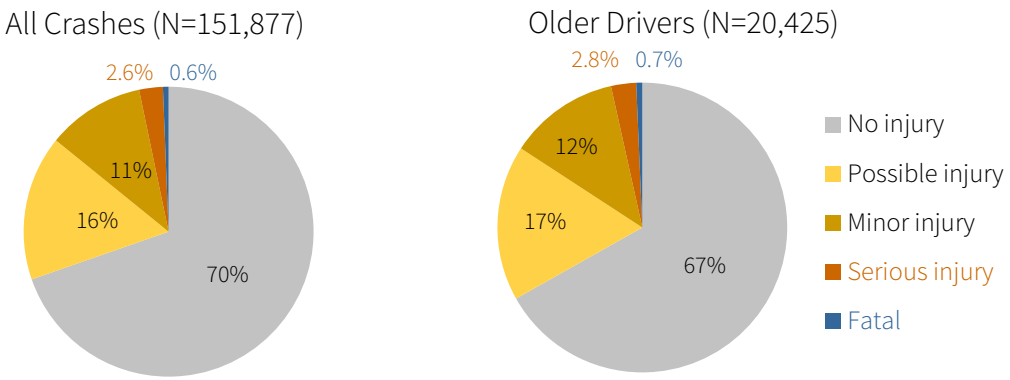



Figure 24: Injury Severity for Crashes Involving Older Drivers, 2015-2019

The most common collision manner of crashes involving older drivers were rear-end and left-turn crashes are shown in Figure 25. Figure 26 shows the distribution of older driver crashes by month and Figure 27 shows the distribution by hour of the day. The month with the highest number of crashes involving older drivers was March. The greatest frequency of older driver crashes occurs in the afternoon, from 2pm to 4pm.

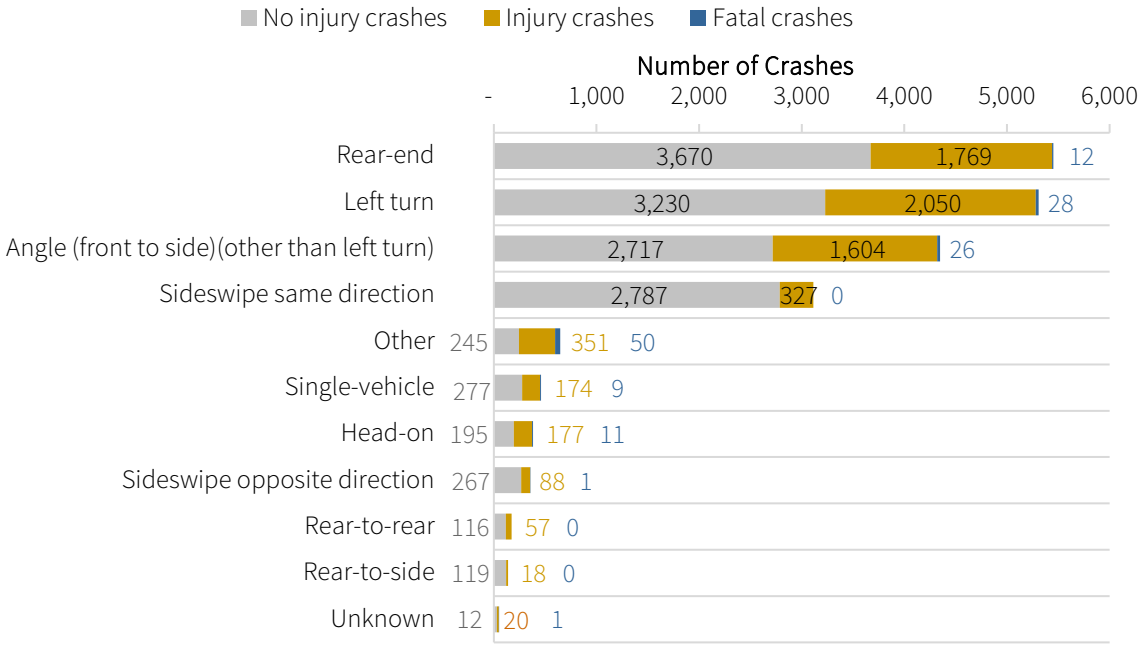



Figure 25: Collision Manner for Crashes Involving Older Drivers, by Year

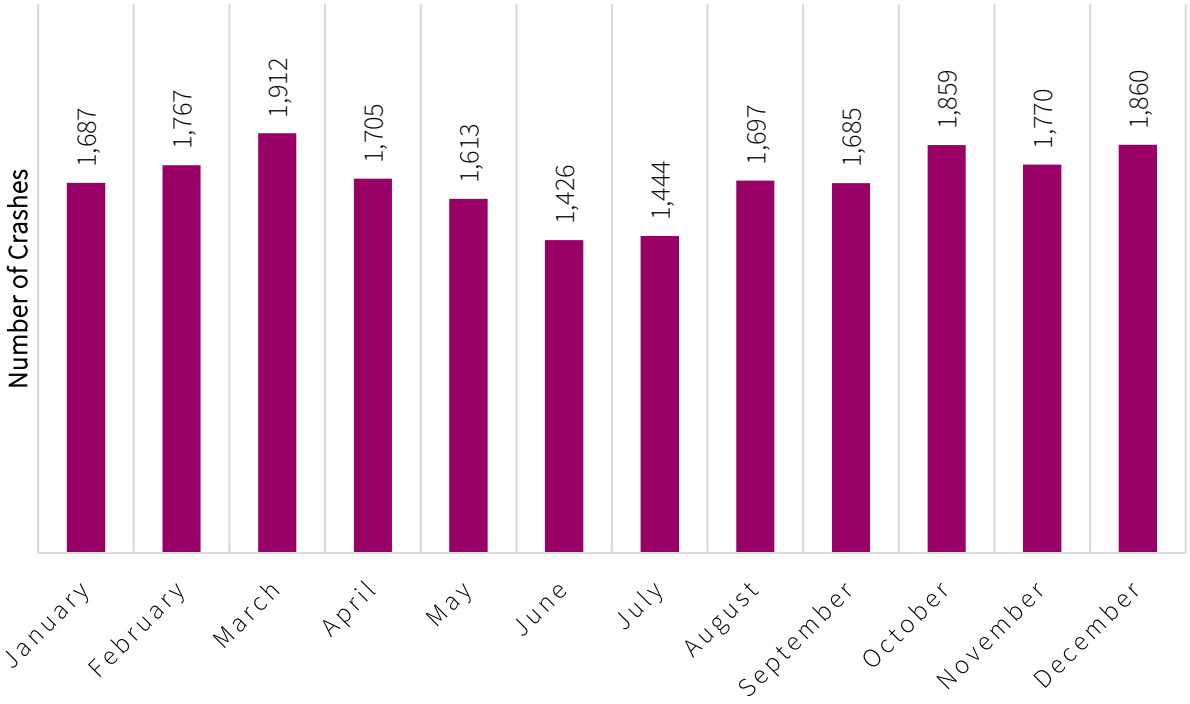



Figure 26: Number of Crashes Involving Older Drivers, by Month

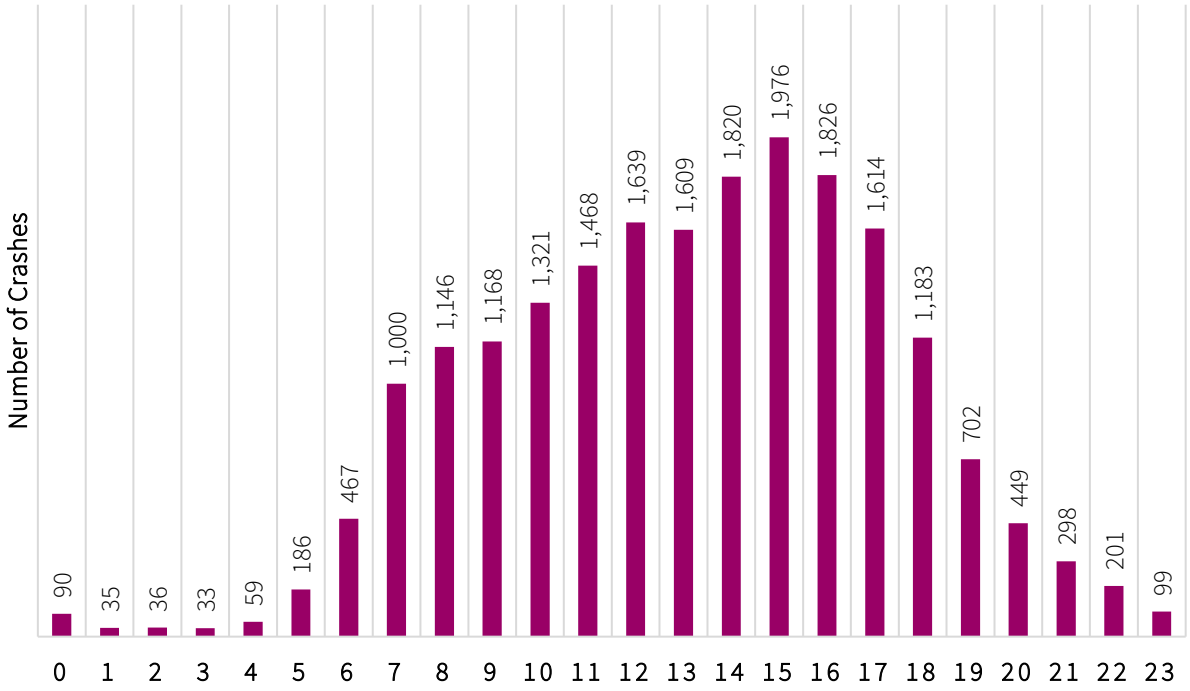



Figure 27: Number of Crashes Involving Older Drivers, by Hour

## YOUNGER DRIVERS (Age 24 and Younger)

Younger drivers (age 24 and below) were involved in 62,512 (41%) of all incidents reported in the City of Phoenix's local and arterial roads from 2015-2019. Figure 28 shows the injury severity of those crashes.

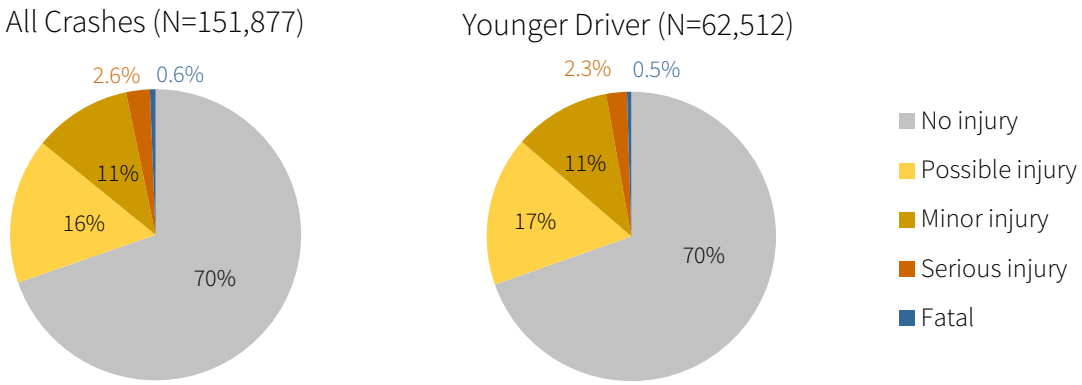



Figure 28: Injury Severity for Crashes Involving Younger Drivers, 2015-2019 (N=62,512)

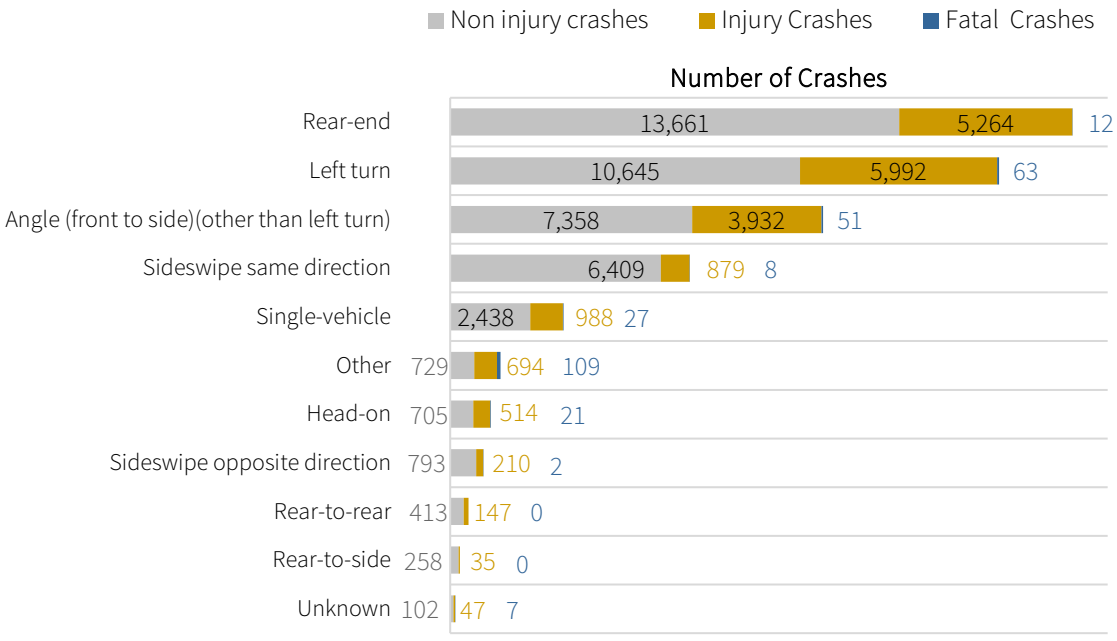



Figure 29: Collision Manner for Crashes Involving Younger Drivers, by Year

The most common collision manners of crashes involving younger drivers were rear-end and left-turn crashes (Figure 29). Figure 30 shows the distribution of younger driver crashes by month and Figure 31 shows the distribution by hour of the day. The month with the highest number of crashes involving younger drivers was March. An increase in crash frequency was associated with the AM and PM peaks of vehicular travel.


Figure 30: Number of Crashes Involving Younger Drivers, by Month

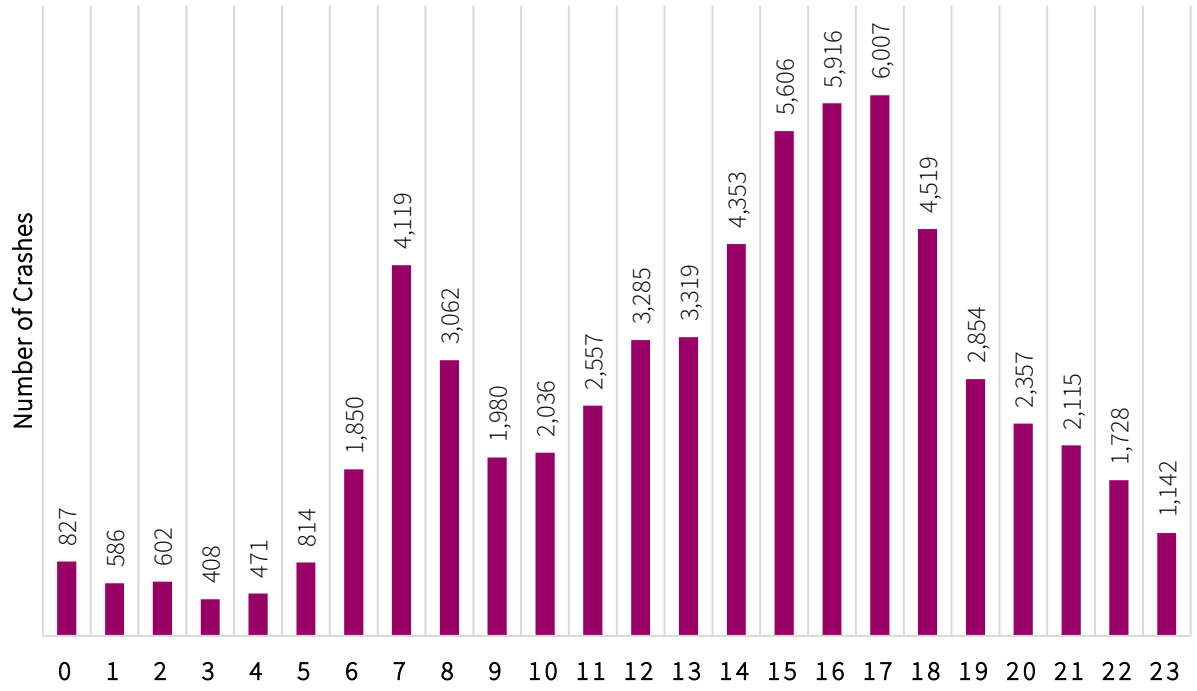



Figure 31: Number of Crashes Involving Younger Drivers, by Hour

## TRENDS OF FATAL AND SERIOUS INJURY CRASHES

This analysis uses the KABCO scale of crash severity, where "K" denotes a fatal crash, "A" is a serious injury crash, "B" is a minor injury crash, "C" is a possible injury crash, and "O" is a property damage-only crash. This subsection of the report further details crashes that resulted in at least one serious injury or fatality, and this sub-set of crashes are referred to as "KA" or "KSI" Crashes. A review of critical crashes can identify key trends for further investigation. Compared to reviewing fatal crashes only, reviewing the combination of fatal and serious injury crashes provides a greater sample size and reduces the volatility between years.

### KA CRASHES BY COLLISION MANNER

Figure 32 compares the collision manner of KA crashes with crashes that resulted in no injury, possible injury, or minor injuries (BCO crashes). The most common collision manner of BCO crashes is rear-end crashes, while the most common collision manner for KA crashes is "Other". It is important here to note that the "Other" category is often used to describe the collision manner of crashes involving pedestrians (Figure 17) and crashes involving bicyclists (Figure 21). The second and third most common collision manners for KA crashes are left-turn and angle crashes, respectively.

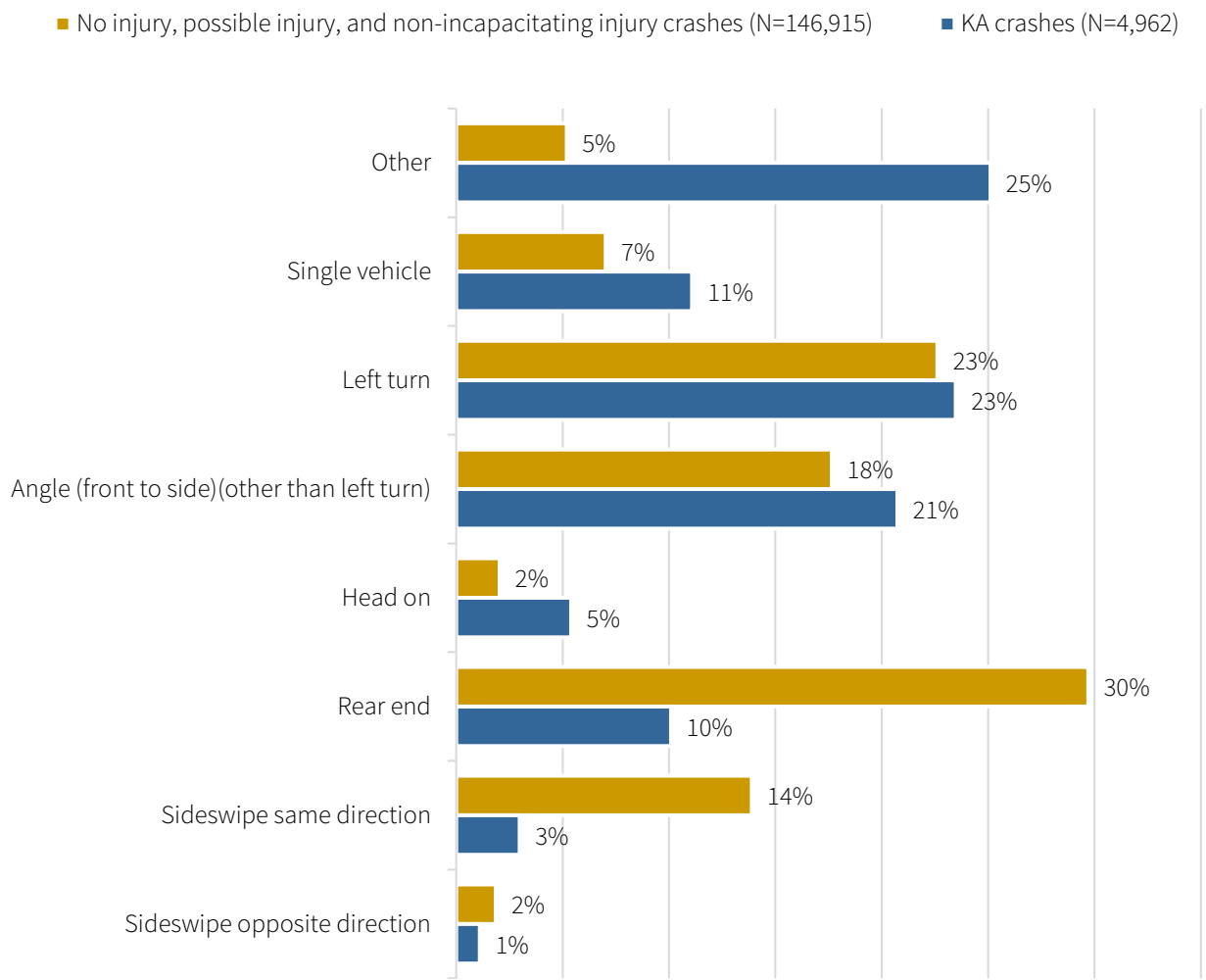



Figure 32: Crashes by Collision Manner and Severity, 2015-2019

## KA CRASHES BY MONTH

Figure 33 shows the distribution of KA crashes by month in the period of 2015 to 2019. Consistent with overall crash trends, the month with the highest number of fatal crashes was March and the lowest number of fatal crashes was observed in July.

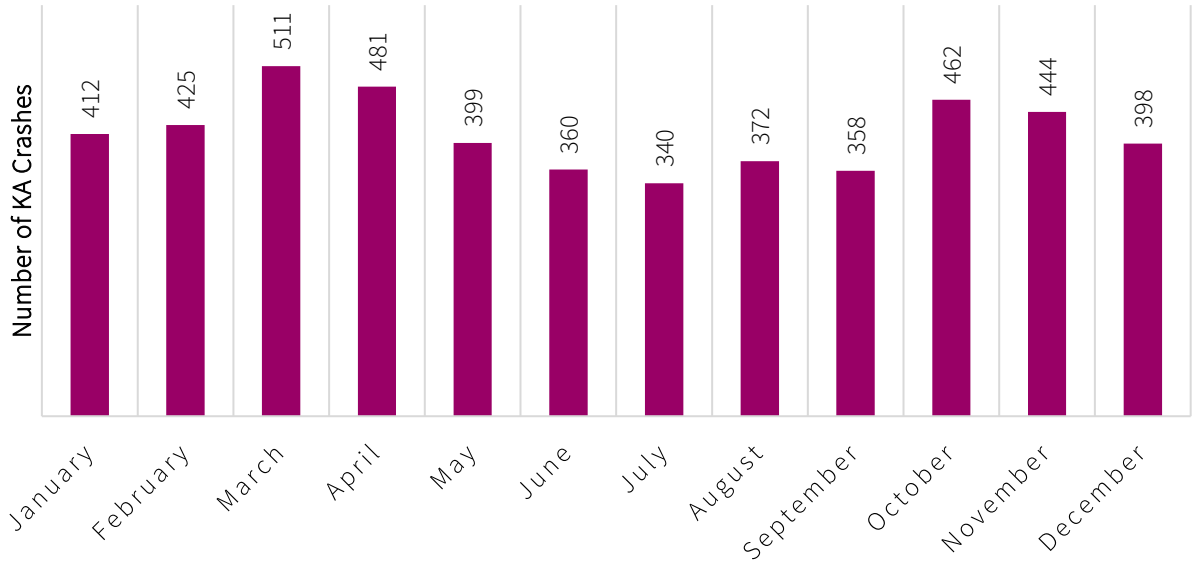



Figure 33: Number of Fatal and Serious Injury Crashes, by Month, 2015-2019

## KA CRASHES BY DAY OF WEEK

Figure 34 shows the distribution of fatal and serious injury crashes by day of the week. The day with the highest frequency of serious crashes was Friday, and Sunday was the day with the lowest frequency of KA crashes.

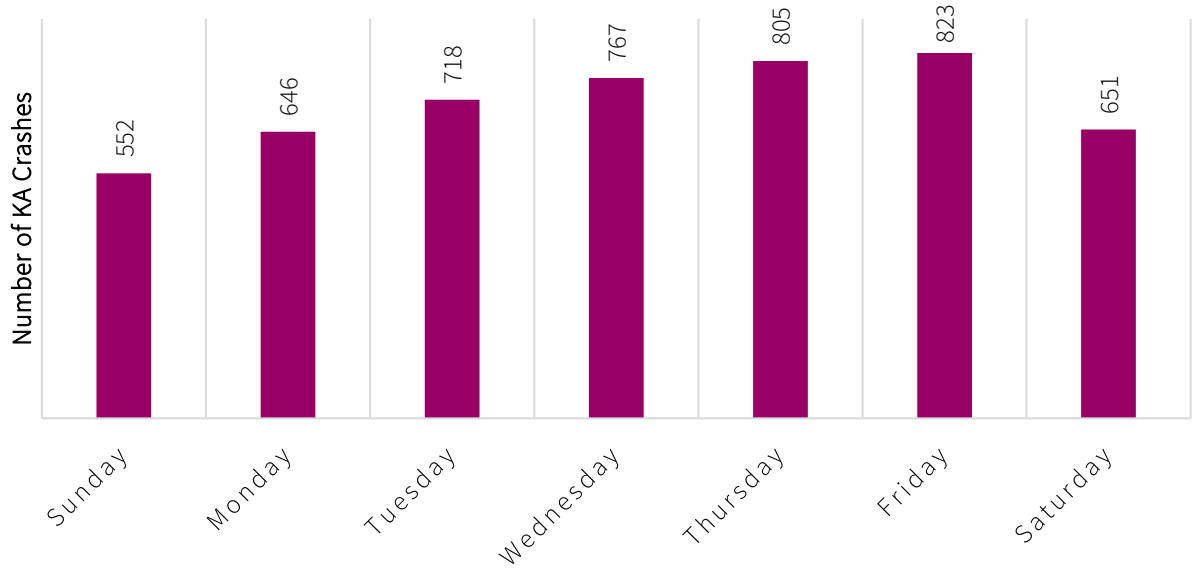



Figure 34: Number of Fatal and Serious Injuries Crashes, by Day of the Week

## KA CRASHES BY TIME OF DAY

When analyzing all crashes in the City of Phoenix's local and arterial roads together, only 26% of them occur in dark conditions (Figure 7). However, 40% of KA crashes were reported to have occurred in dark conditions.

Figure 35 shows that KA crashes are overrepresented in non-daylight conditions.

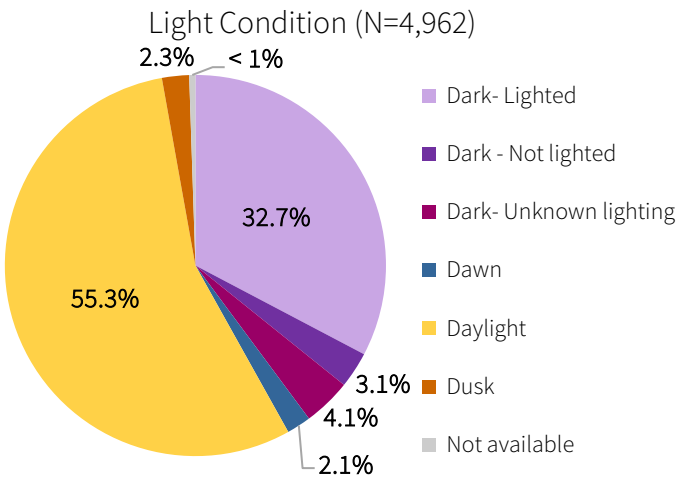



Figure 35: Share of Fatal and Serious Injuries Crashes by Light Condition, 2015-2019

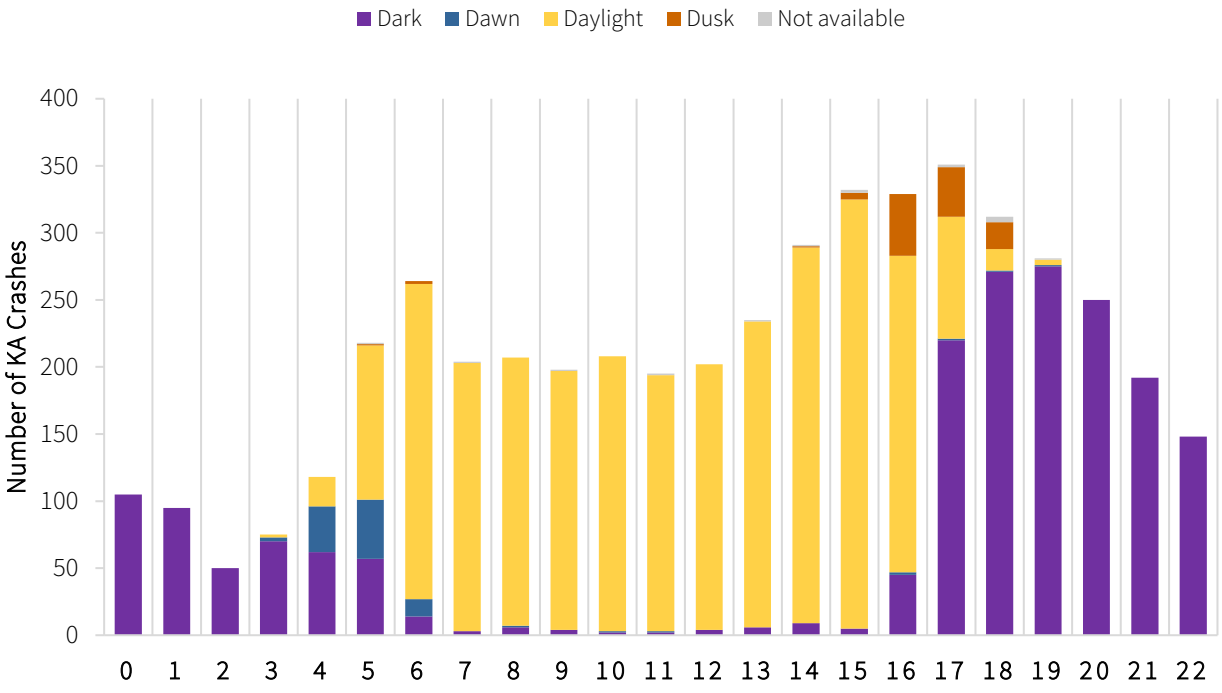



Figure 36: Number of Fatal and Serious Injuries Crashes, by Hour and Lighting Condition

## KA CRASHES BY LOCATION

The same criteria to determine the relationship to the closest junction applied to all crashes was applied to KA crashes. Figure 37 shows the crash location by year; about 50% of KA crashes were related to intersections or interchanges.

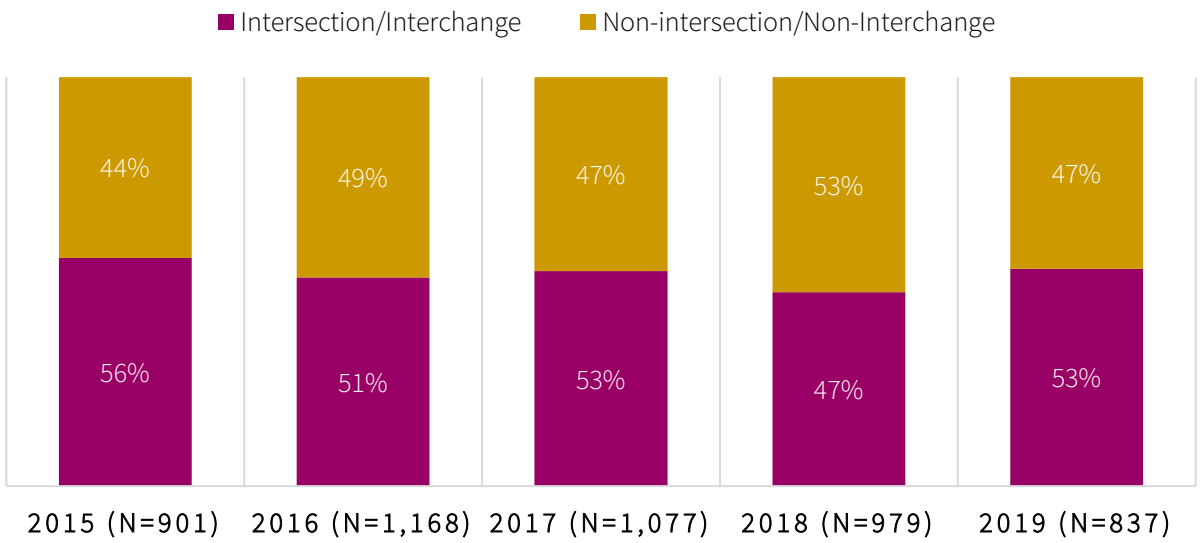



Figure 37: Number of Fatal and Serious Injuries Crashes, by Relation to the Intersection

When comparing the collision manner on intersection-related serious crashes (Figure 38) and all crashes (Figure 11), it can be seen that while rear-end crashes are the second most common intersection-related crashes, they represent less than 10% of serious crashes. The most common collision manner of intersection-related KA crashes were left-turn and angle crashes.

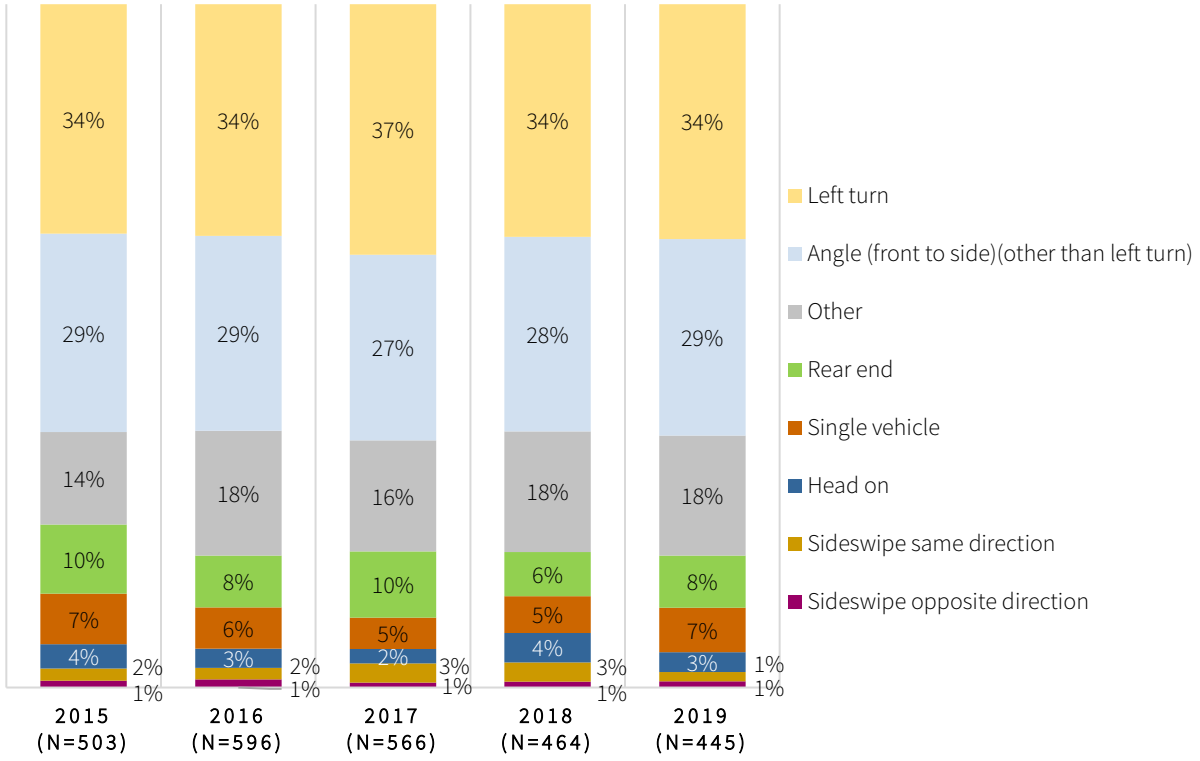



Figure 38: Number of Intersection/Interchange-Related Fatal and Serious Injuries Crashes, by Collision Manner

## KA CRASHES BY BEHAVIOR

Figure 39 depicts the frequency of unrestrained driving and speed violation in serious injury and fatal injury crashes. Crashes involving unrestrained drivers represent 16% of KA crashes, and speed-related crashes represent 29% of KA crashes.

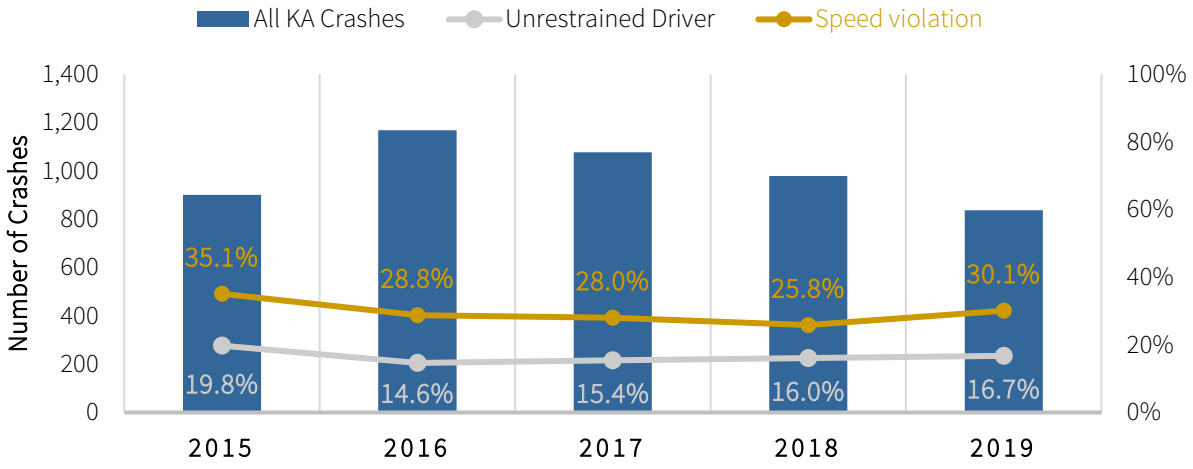



Figure 39: Frequency of Unrestrained Driving and Speed Violation in KA Crashes

## COMPARISON TO STATEWIDE AND REGIONAL SAFETY TRENDS

Nationwide summaries of all crashes are available from the National Highway Traffic Safety Administration (NHTSA) Annual Report Tables. NHTSA reports on a yearly basis crash summaries by diverse aspects, such as injury severity, first harmful event, and collision manner.

The Arizona Strategic Traffic Safety Plan (ADOT STSP), published in October 2019, summarizes crash data from the ACIS database from 2009 to 2018. The crash statistics in the ADOT STSP are primarily reported at the person-level, which varies from the RTSIMS reporting, which is primarily at the crash-level. Furthermore, the ADOT STSP does not make any distinction between local roads and freeways while RTSIMS reports (for the purpose of this summary) focus on local and arterial roads only. For the purposes of this comparison, statewide data at the crash-level was retrieved from the ACIS database.

From 2015 to 2018, 43% of the MAG Region's local and arterial road collisions were registered in the City of Phoenix (Figure 40). In terms of population, City of Phoenix residents represent 36% of Maricopa County's population. Figure 41 compares the injury severity of collisions reported in the state of Arizona, MAG Region local and arterial roads, and City of Phoenix local and arterial roads. The results indicate that the fatality rate (at the crash level) is rather similar among the geographies; from 2015 to 2018, 0.6% of all crashes reported on local and arterial roads were fatal crashes, both in the City of Phoenix and in the MAG Region, at the state level, about 0.7% of all reported crashes were fatal.

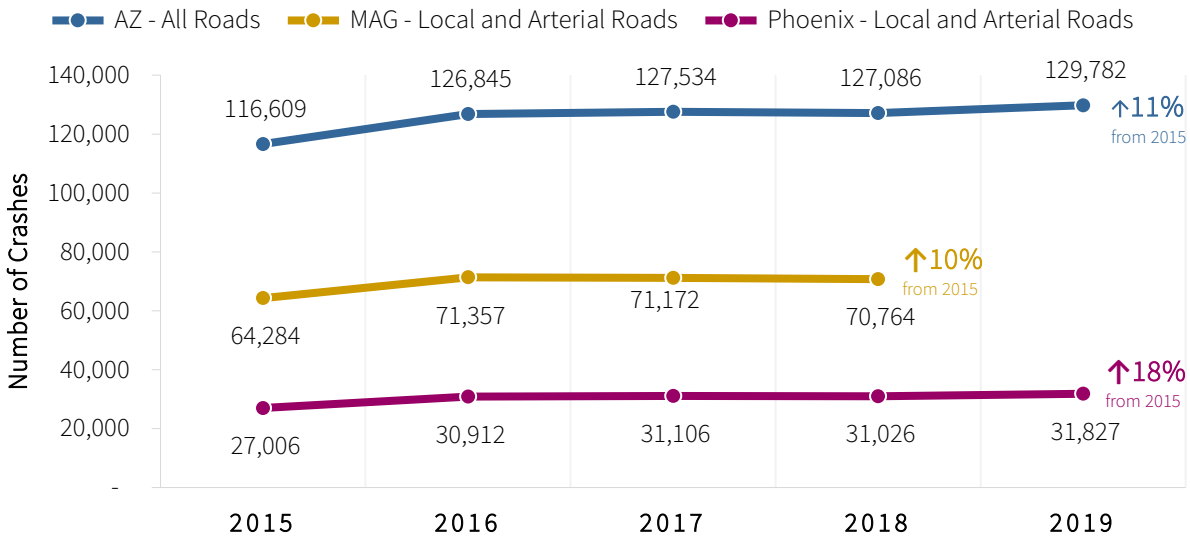



Figure 40: Total Crashes Comparison of State of Arizona, MAG Region, and City of Phoenix

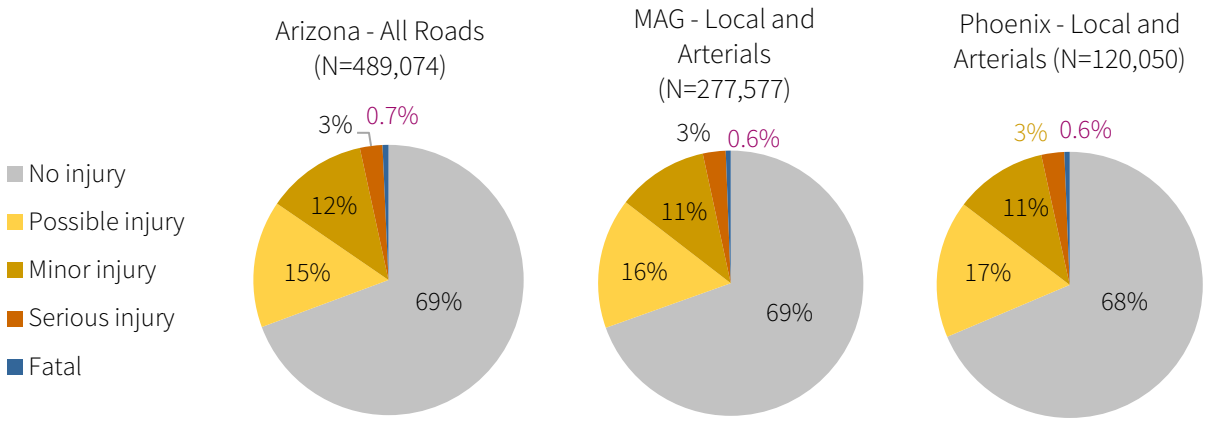
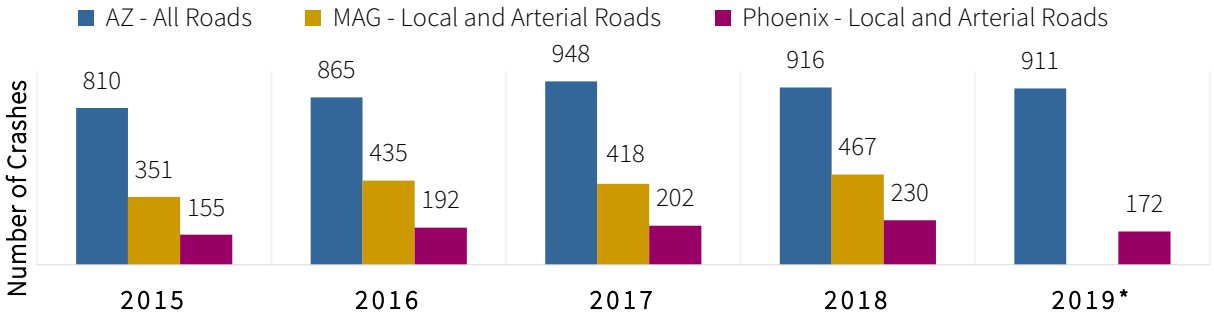



Figure 41: Crash Severity Comparison of State of Arizona, MAG Region, and City of Phoenix (2015-2018)

In the same period, fatal crashes in the City of Phoenix corresponded to 46.6% of the MAG Region's fatal crashes. Figure 42 shows a similar comparison for fatal crashes registered on the two areas, in addition to the total crashes in the state of Arizona. Figure 43 shows the number of fatalities (person-level) registered per year in the state of Arizona and the City of Phoenix. During the five years under study, fatalities on the City of Phoenix's local and arterial roads represented 21% of all Arizona's traffic-related fatalities. This percentage is slightly lower than the share of Arizona residents living in Phoenix in the same period (23%).




**Note: MAG data was sourced from the MAG Strategic Transportation Safety Plan, which analyzed data from 2009 to 2018. Data from 2019 was not available for comparison.*

Figure 42: Fatal Crashes Comparison of Arizona, Maricopa County, and City of Phoenix

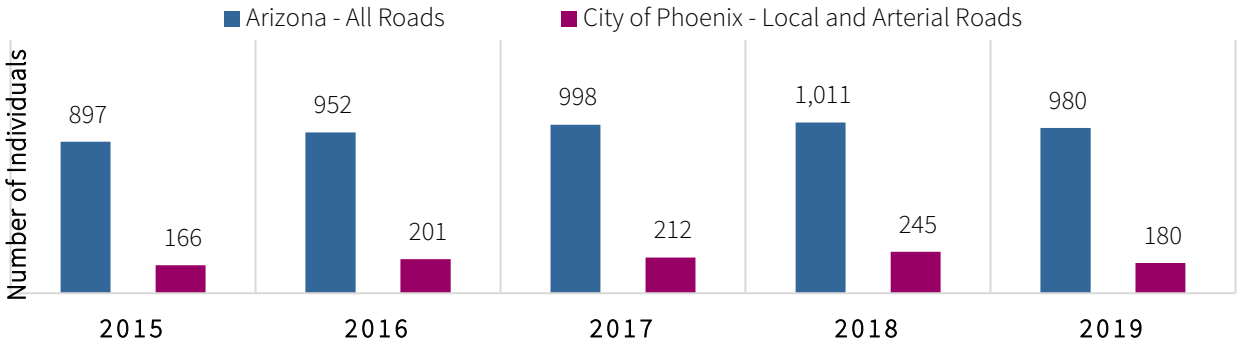
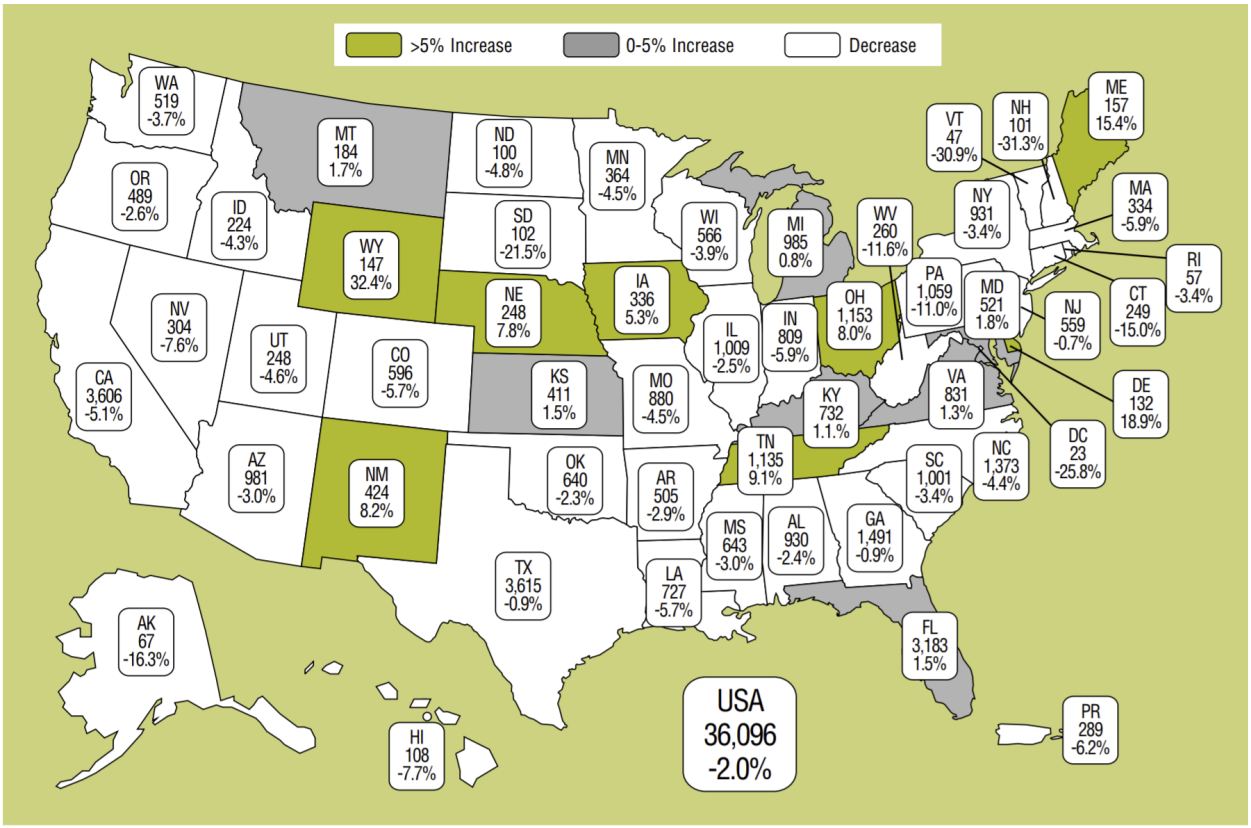



Figure 43: Total Number of Fatalities (Persons) per Year Comparison, Arizona and City of Phoenix

From 2018 to 2019, the number of fatalities in Arizona decreased by 3%. Fatalities in the City of Phoenix (local and arterial roads) decreased by 26% from 2018 to 2019 (Figure 43); however, the year-to-year fluctuation in this data does not indicate a clear trend. National statistics on 2019 fatalities and percent change trends from 2018 are shown in Figure 44.

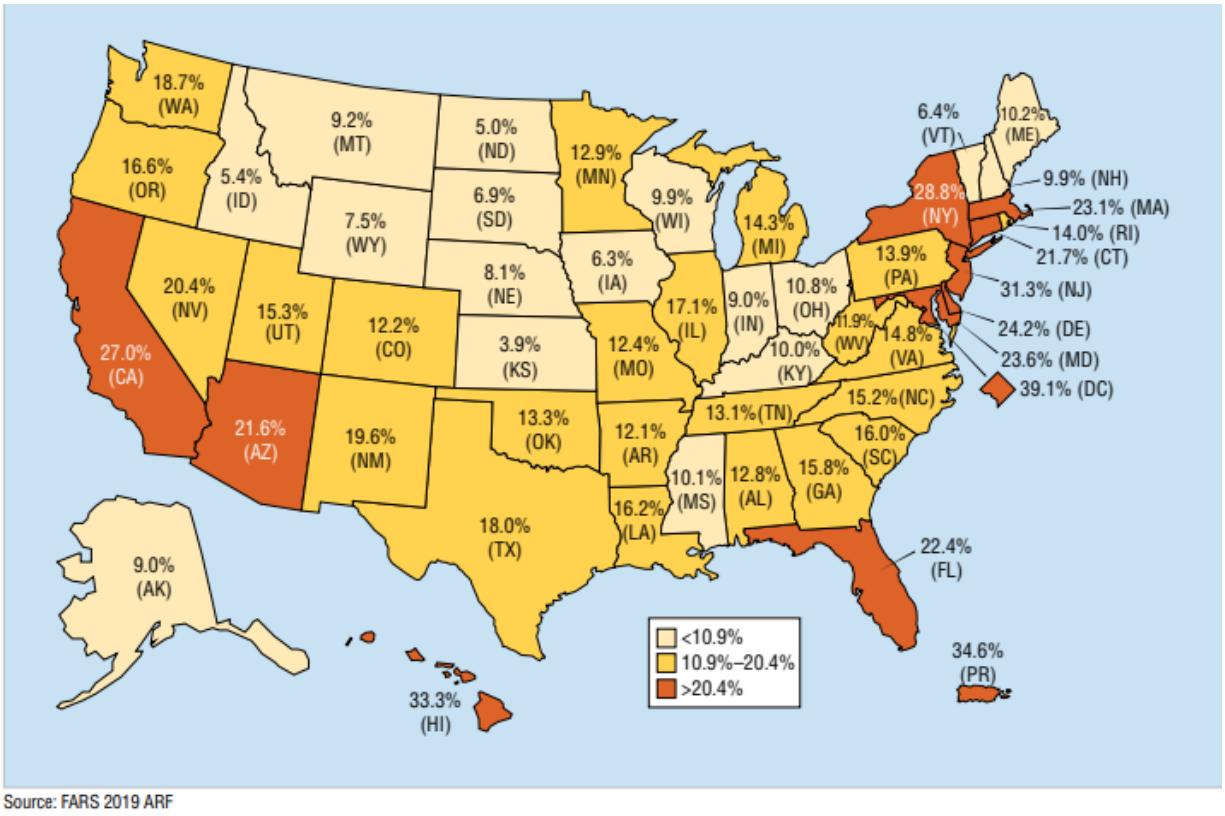



Source: FARS 2018 Final File, 2019 ARF
Note: Puerto Rico is not included in the USA total.

Figure 44: 2019 Fatalities and Percent Changes From 2018, by State (Person-Level).
*(Source: FARS Data, NHTSA Graph)*

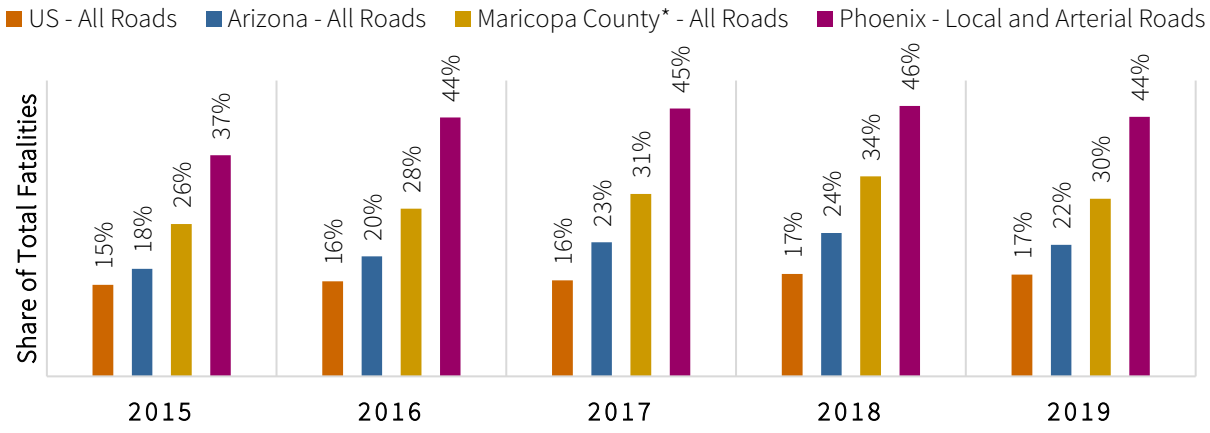
## PEDESTRIANS

A large share of traffic fatalities involve pedestrians. Figure 45 shows that the State of Arizona was above the national average, with pedestrians accounting for approximately 22% of 2019 fatalities. In the City of Phoenix, the share of fatalities that is represented by pedestrians grew from 37% in 2015 to 44% in 2019 (Figure 46).




Source: FARS 2019 ARF

Figure 45: Percentage of Total Fatalities Involving Pedestrians, by State (Persons)
*Source: FARS Data, NHTSA Graph*

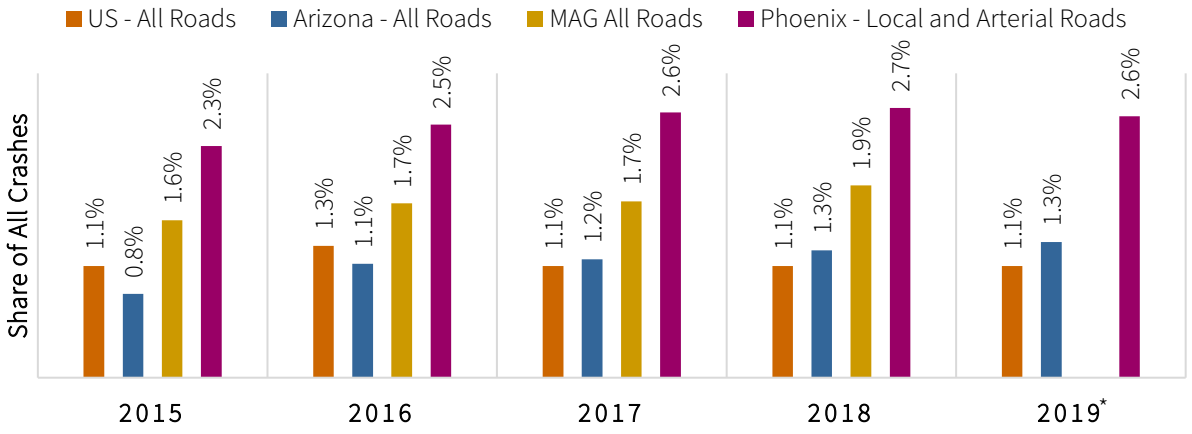



**Note: Maricopa County information obtained from ACIS database.*

Figure 46: Share of Total Fatalities Who Were Pedestrians, Comparison across Geographies

Although the MAG STSP data does not exclude freeway crashes, an analysis of the data found that 98% of total pedestrian crashes in the 10-year studied period (2009-2018) occurred off-freeway, on the local and arterial roadway network. The analysis also found that the same percentage was true for bicycle-related crashes. Therefore; the MAG STSP and RTSIMS datasets are reasonably similar for comparison purposes. As shown in Figure 47, The percentage of pedestrian-related crashes was found to be 1.1% in all United States, 1.1% in the State of Arizona, 1.7% in the MAG region, and 2.5% in the City of Phoenix.

Phoenix represents 36% of the County's population and about 43% of local and arterial road crashes; however, 63% of Maricopa County's pedestrian-related crashes occurred in the City of Phoenix's local and arterial roads.




**Note: MAG data was sourced from the MAG Strategic Transportation Safety Plan, which analyzed data from 2009 to 2018. Data from 2019 was not available for comparison.*

Figure 47: Pedestrian Crashes per Year, Comparison across Geographies

In terms of injury severity, the distribution of pedestrian-related crashes is very similar in the MAG Region and the City of Phoenix (Figure 48). The majority of crashes (63%) of both datasets result in possible or minor injury, while nearly one-quarter (22-23%) result in serious injury, and about 12% result in fatal injury. Only a very small portion of pedestrian-related crashes result in no injuries (2-3%).

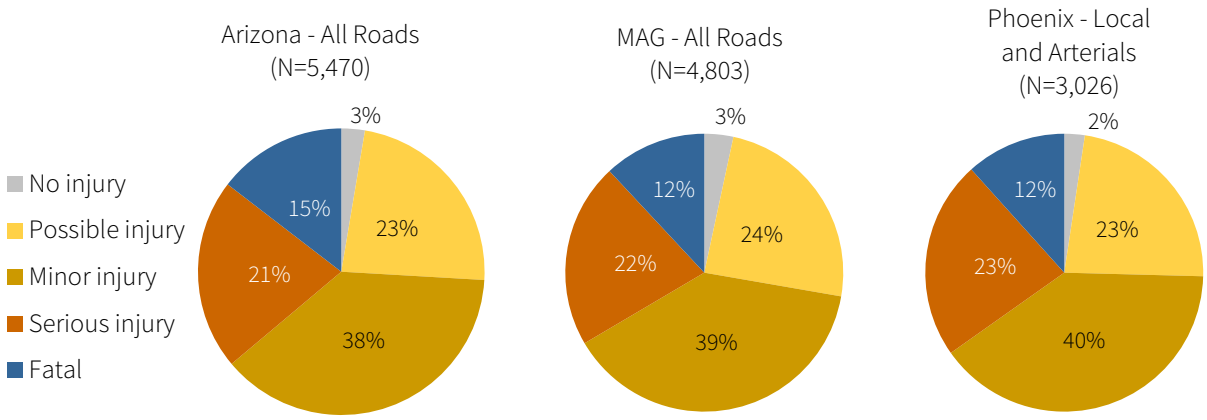
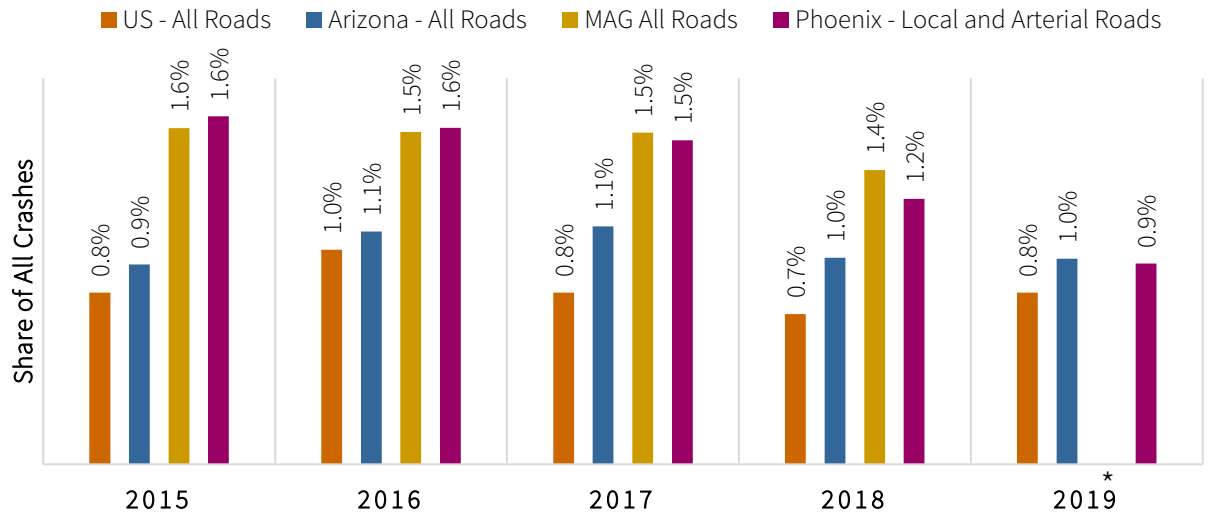



Figure 48: Severity of Pedestrian Crashes, Comparison across Geographies (2015-2018)

## BICYCLISTS

As shown in Figure 49, the percentage of crashes involving bicyclists was similar between the two areas, with an average of 1.5% of total crashes in the MAG Region and 1.5% in the City of Phoenix. The injury severity distribution of bicyclist-related crashes is also similar between the two areas, as shown in Figure 50. The majority of crashes (78-79%) of both datasets result in possible or minor injury, 13% result in serious injury, and 2% result in fatal injury. About 6-7% of bicyclist-related crashes resulted in no injuries.




**Note: MAG data was sourced from the MAG Strategic Transportation Safety Plan, which analyzed data from 2009 to 2018. Data from 2019 was not available for comparison.*

Figure 49: Bicycle Crashes per Year, Comparison across Geographies

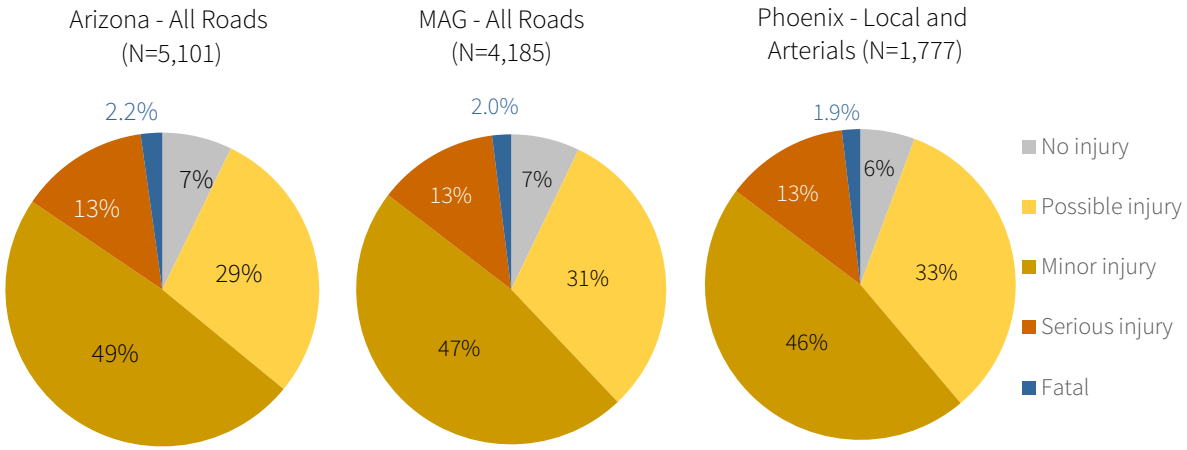
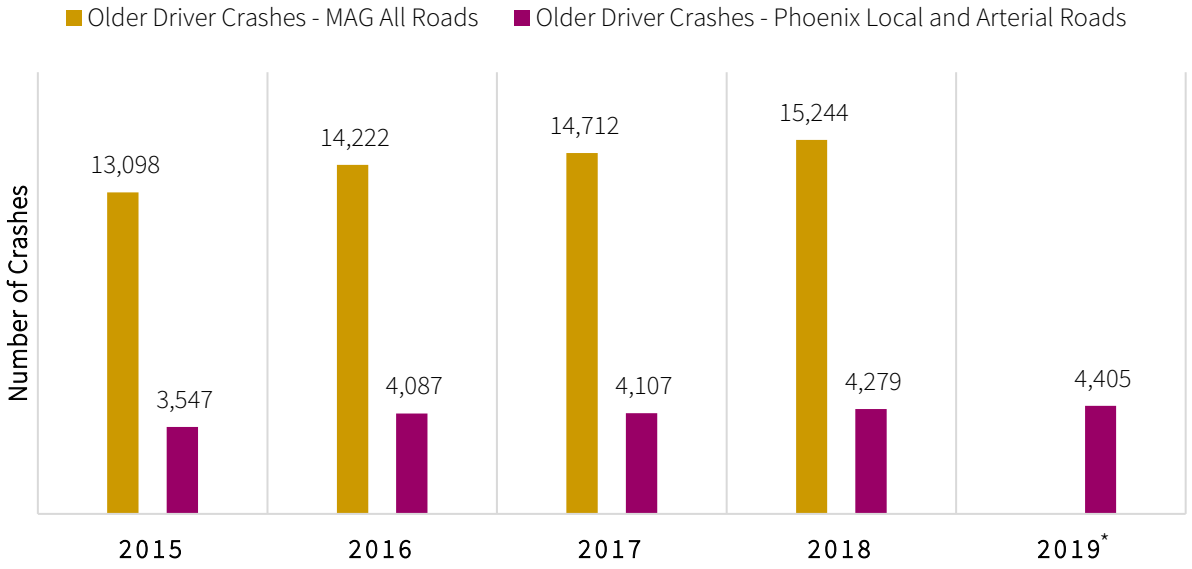



Figure 50: Severity of Bicycle Crashes, Comparison across Geographies (2015-2018)

## OLDER DRIVERS (65 and older)

Other vulnerable user groups were also analyzed, including older drivers and younger drivers. Figure 51 compares the number of crashes involving older drivers on all roads of the MAG Region and City of Phoenix's local and arterial roads. Approximately 28% of the older driver crashes in the MAG Region were registered on City of Phoenix's local and arterial roads.




*Note: 2019 data was not available for the MAG Region per its Strategic Transportation Safety Plan.*

Figure 51: Older Driver Crashes per Year, MAG Region, and City of Phoenix

Figure 52 shows a breakdown by injury severity for crashes on local and arterial roads involving older drivers in the period of 2015-2018. Compared to crashes involving all age groups, the percentage of fatal and serious injury crashes remained the same, with a slight shift from no injury to possible and minor injury crashes. The trends of older drivers are quite similar between the MAG Region and City of Phoenix.

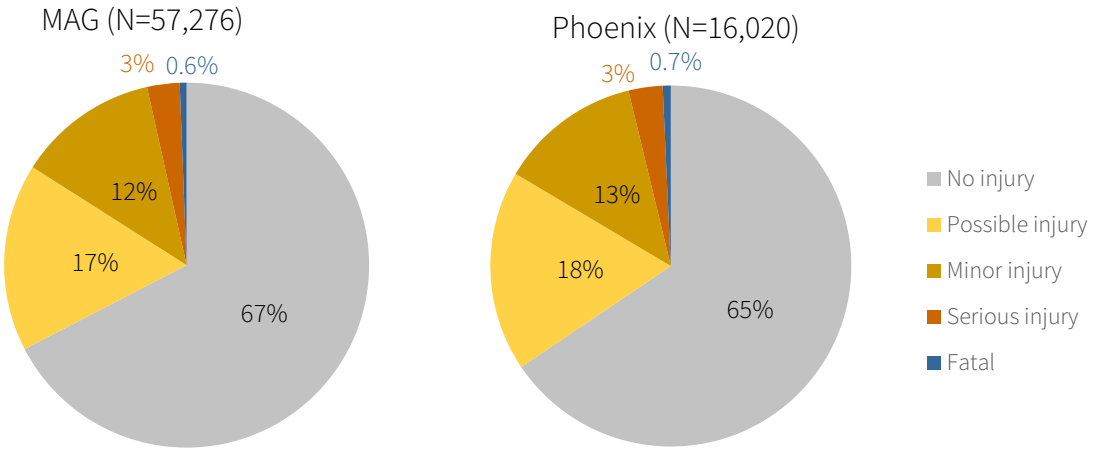
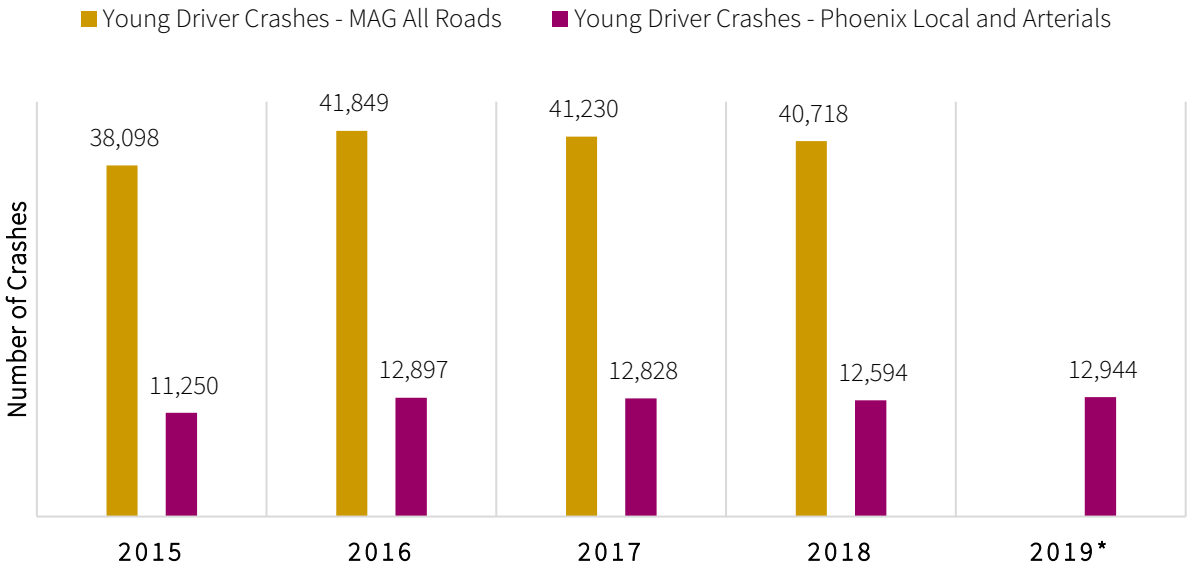



Figure 52: Severity of Older Driver Crashes, MAG Region and Phoenix (2015-2018)

## YOUNGER DRIVERS (24 and below)

Figure 53 compares the number of crashes involving younger drivers on all roads of the MAG Region and City of Phoenix's local and arterial roads. Younger driver crashes on the City of Phoenix's local and arterial roads represented about 31% of crashes involving younger drivers in the MAG Region.




**Note: MAG data was sourced from the MAG Strategic Transportation Safety Plan, which analyzed data from 2009 to 2018. Data from 2019 was not available for comparison.*

Figure 53: Younger Driver Crashes per Year, MAG Region, and City of Phoenix

Figure 54 shows that the severity of crashes on local and arterial roads involving younger drivers was similar in both geographies. In addition, the younger driver crashes are generally consistent with the overall crash summaries of each area for all age groups.

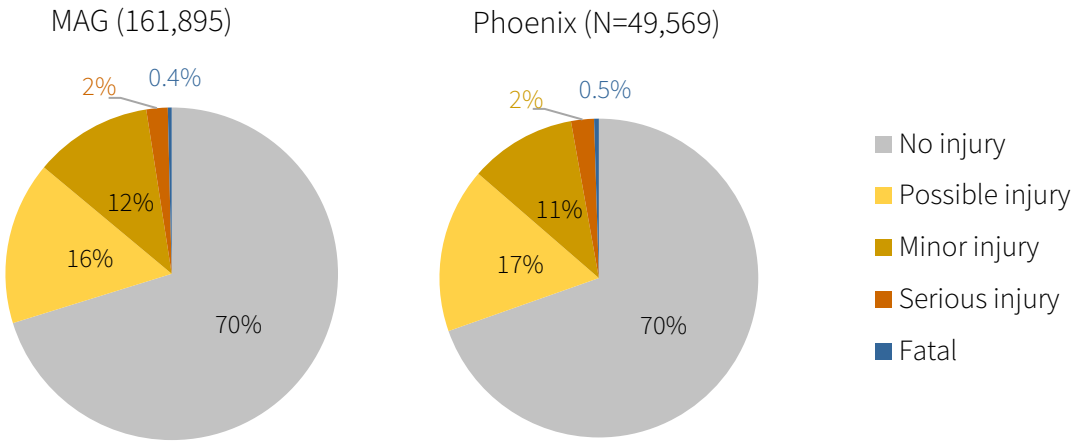



Figure 54: Severity of Younger Driver Crashes, MAG Region and Phoenix (2015-2018)

## CONCLUSION

Crash queries were obtained through the Maricopa Association of Governments (MAG) software tool for crash analysis, the Regional Transportation Safety Information Management System (RTSIMS). This report used existing tools to conduct a safety analysis of the past five years, and compared trends to regional and statewide data. The following key findings are based on a review of RTSIMS crash data from 2015 to 2019:

- An annual average 30,376 crashes per year were reported during the five year study period. This equates to 83 crashes per day.
- Crashes on arterial and local roadways in the City of Phoenix increased by a rate of about 4.4% per year. This trend suggests that the crash frequency increased at a higher rate than the City's population, which in the same period grew 1.5% per year, on average.
- Most crashes result in no injury (70%), approximately one-quarter result in possible or minor injury (27%), 2.6% result in serious injury, and 0.6% result in fatal injury. This equates to two serious injury crashes occurring each day, and one fatal crash occurring every other day.
- The percentage of fatal and serious injury crashes has remained generally consistent over the past five years; however the percentage of no injury crashes has steadily increased over time.
- Rear end crashes were the most common collision manner, followed by left-turn crashes. These two crash types account for about half of all crashes.
- For fatal and serious injury crashes, the "Other" collision manner was reported most frequent (25%), which is commonly selected for crashes involving pedestrians and bicyclists. Other frequent crash types for fatal and serious injury crashes were left-turn (23%) and angle (21%).
- Crashes involving unrestrained drivers (i.e, lack of seatbelt, helmet use) have reduced in frequency.
- Due to lack of protection on impact, pedestrians and bicyclists (vulnerable users) are more frequently seriously injured when involved in motor vehicle crashes. In the City of Phoenix, crashes involving bicyclists and pedestrians represent nearly half (48%) of all fatal crashes.
- A greater share of pedestrian crashes is occurring in Phoenix compared to other agencies within the MAG Region. Phoenix represents 36% of Maricopa County's population and about 43% of the County's local and arterial road crashes; however, 63% of County crashes involving pedestrians occurred on City of Phoenix's local and arterial roads.
- Bicyclist crashes are occurring at a greater rate in Phoenix than in other agencies within the MAG Region. About 43% of all crashes involving bicyclists in Maricopa County occurred on City of Phoenix's local and arterial roads.
- For all crash severities, the majority of crashes occur during daylight hours (71%), with the remaining 29% of crashes occurring during dawn, dusk, or dark conditions.
- A correlation exists between injury severity and lighting condition; fatal and serious injury crashes occurred more frequently during dawn, dusk, and dark conditions (45%) compared to daylight conditions (55%).

The MAG RTSIMS tool provided the ability to retrieve data quickly for numerous Citywide statistics. During the analysis process, several discrepancies were identified when comparing to past Phoenix data, which is common when comparing different datasets. The City of Phoenix conducts a robust data scrubbing process each year, which confirms crashes exist within the City of Phoenix boundaries, omits freeway crashes, and reviews characteristics of crashes in detail to correct the manner of collision if originally mis-coded. The RTSIMS crash data is not scrubbed, and comes directly from ADOT ACIS. These differences, along with variations in the querying process, are acknowledged as part of this report. This data contained in this

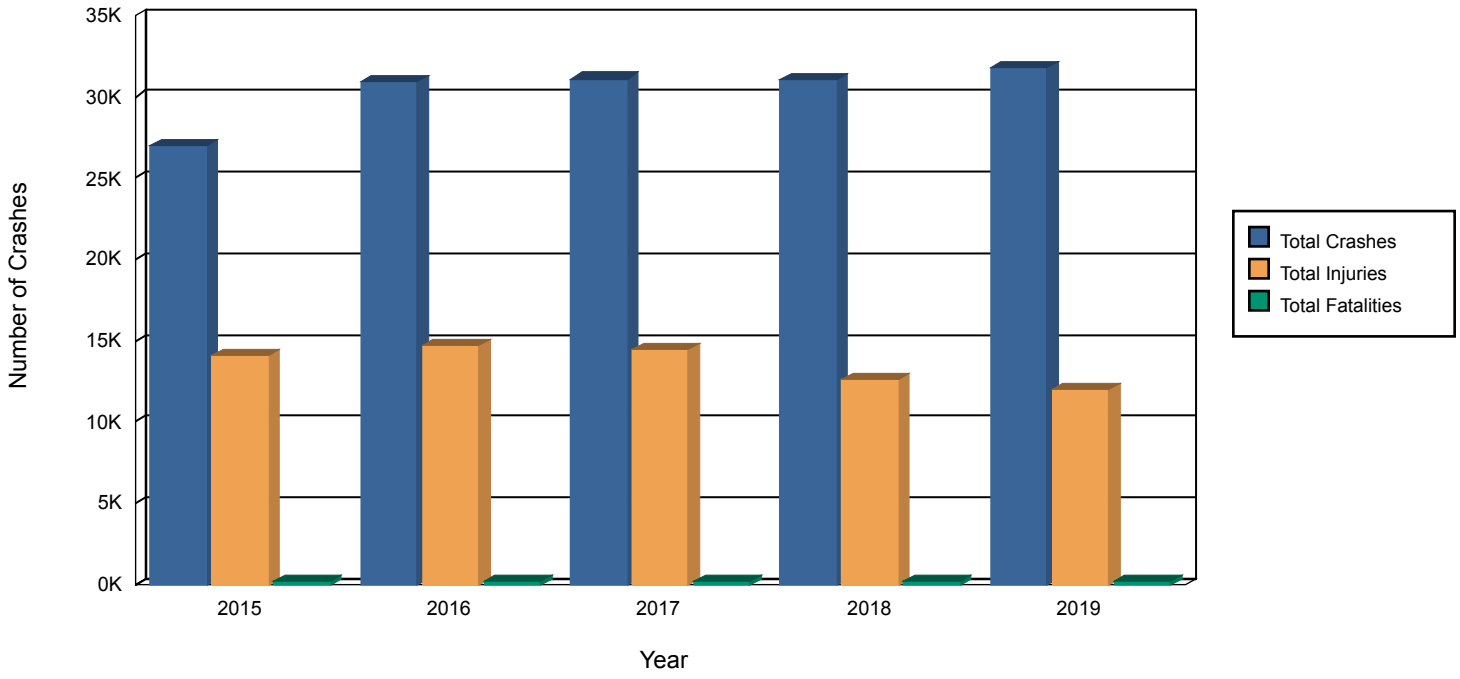
report is intended to provide preliminary information; later stages of this project will modernize the existing City of Phoenix crash analysis process to improve and enhance data analytics and visualization.

# APPENDIX A: RTSIMS QUERY OUTPUTS

# Safety Analysis Report

Years:
2015,2016,2017,2018,2019

## All Arterials and Local Roads Crashes by Year (Phoenix)

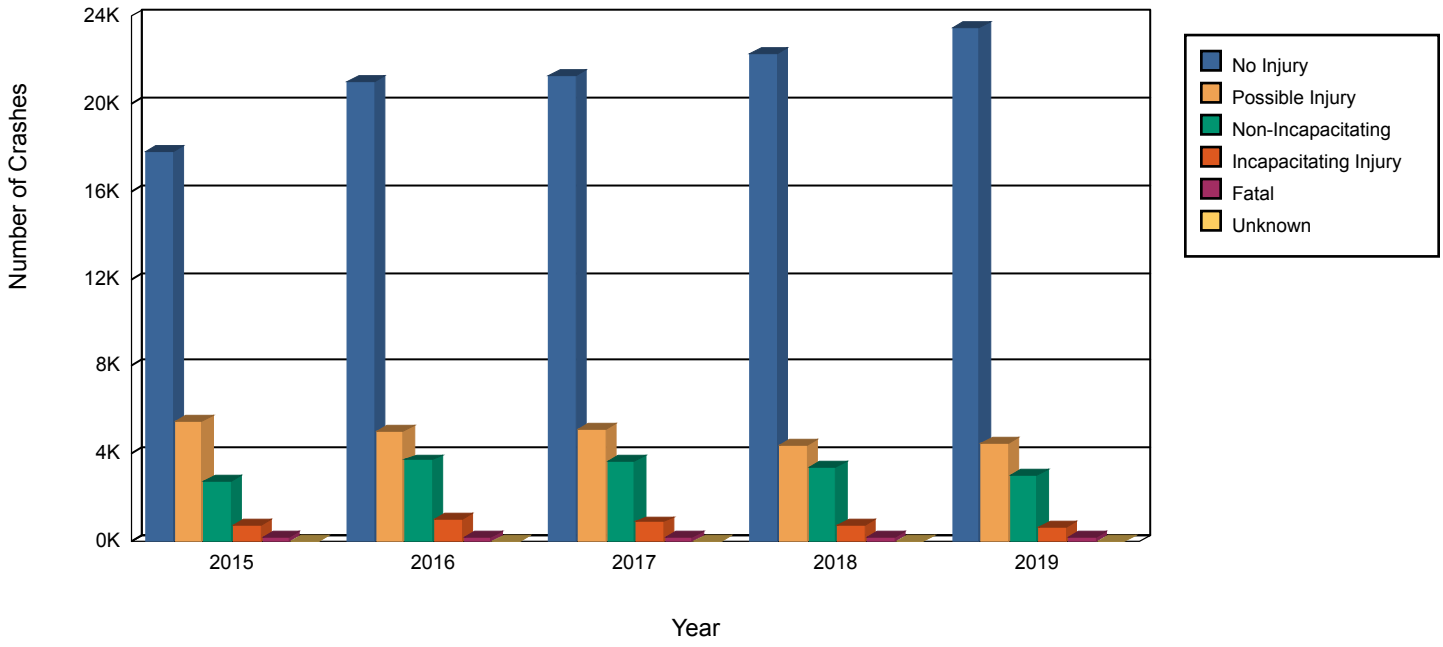



| Year | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 2015 | 27,006 | 9,023 | 155 | 14,120 | 166 |
| 2016 | 30,912 | 9,701 | 192 | 14,688 | 201 |
| 2017 | 31,106 | 9,641 | 202 | 14,463 | 212 |
| 2018 | 31,026 | 8,527 | 230 | 12,637 | 245 |
| 2019 | 31,827 | 8,232 | 172 | 12,008 | 180 |

# Safety Analysis Report

Years:
2015,2016,2017,2018,2019

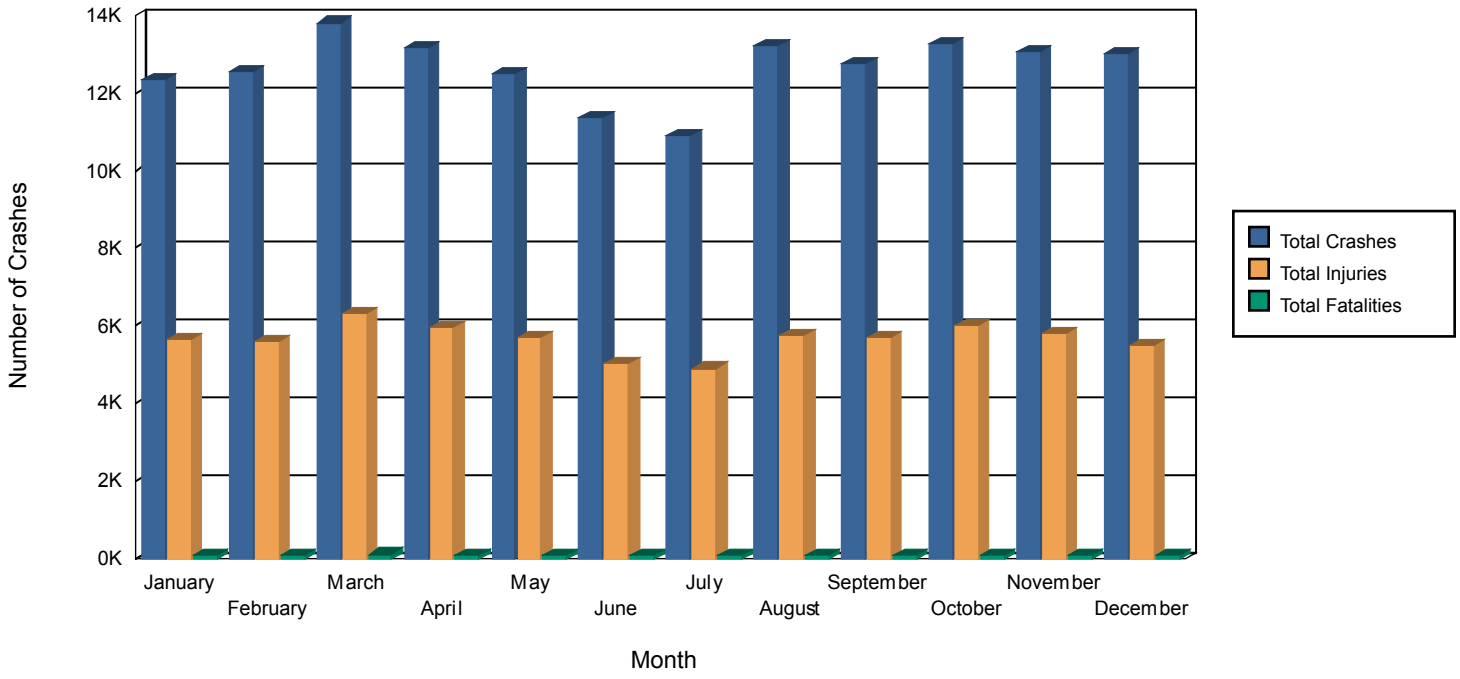
## All Arterials and Local Roads Crashes by Year (Phoenix)




| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 17,828 | 5,508 | 2,769 | 746 | 155 | 0 | 27,006 |
| 2016 | 21,019 | 5,018 | 3,707 | 976 | 192 | 0 | 30,912 |
| 2017 | 21,263 | 5,139 | 3,627 | 875 | 202 | 0 | 31,106 |
| 2018 | 22,269 | 4,400 | 3,378 | 749 | 230 | 0 | 31,026 |
| 2019 | 23,423 | 4,509 | 3,058 | 665 | 172 | 0 | 31,827 |

# Safety Analysis Report

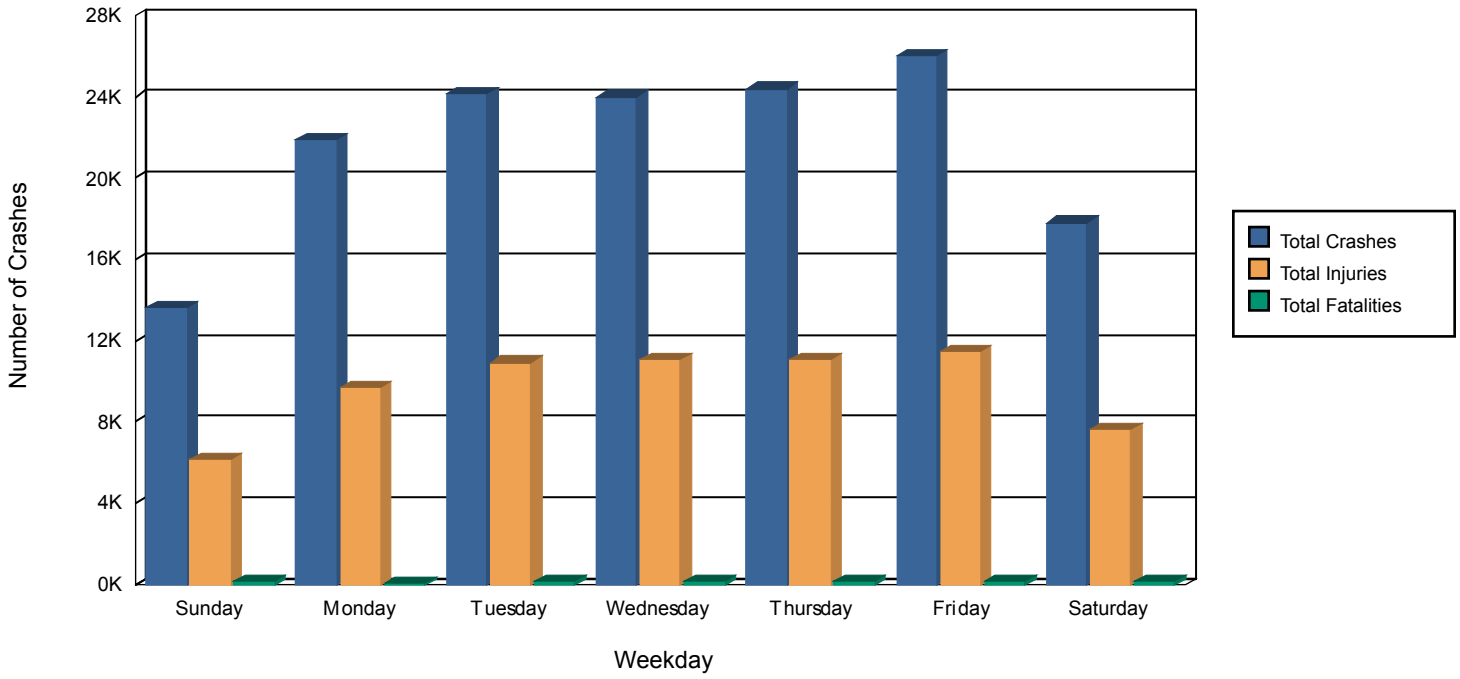
## All Arterials and Local Roads Crashes by Month (Phoenix)




| Month | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| January | 12,337 | 3,781 | 80 | 5,668 | 87 |
| February | 12,553 | 3,726 | 77 | 5,602 | 83 |
| March | 13,809 | 4,188 | 102 | 6,320 | 107 |
| April | 13,146 | 3,948 | 83 | 5,978 | 88 |
| May | 12,474 | 3,761 | 71 | 5,679 | 75 |
| June | 11,359 | 3,334 | 84 | 5,035 | 86 |
| July | 10,920 | 3,239 | 65 | 4,901 | 67 |
| August | 13,199 | 3,800 | 78 | 5,732 | 83 |
| September | 12,736 | 3,786 | 67 | 5,698 | 68 |
| October | 13,267 | 4,028 | 85 | 6,009 | 93 |
| November | 13,065 | 3,825 | 75 | 5,789 | 80 |
| December | 13,012 | 3,708 | 84 | 5,505 | 87 |

# Safety Analysis Report

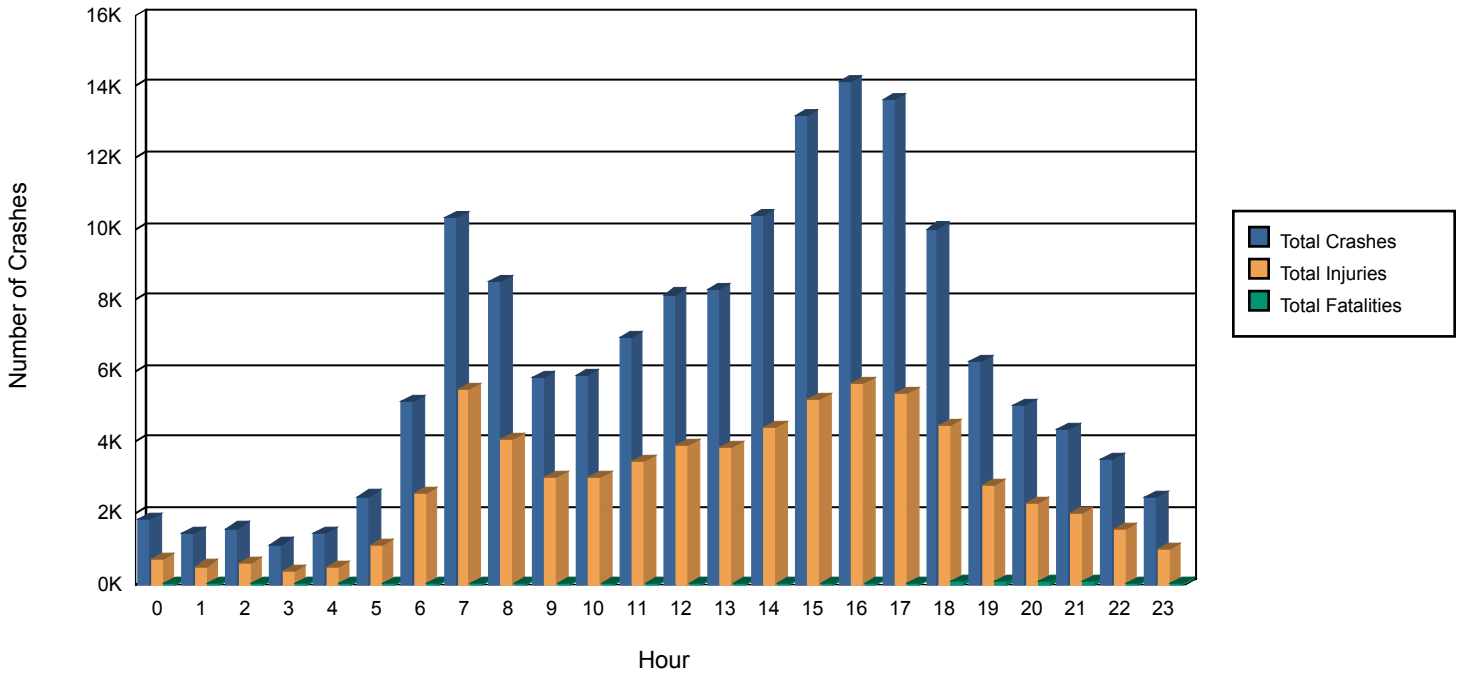
## All Arterials and Local Roads Crashes by Weekday (Phoenix)




| Weekday | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| Sunday | 13,603 | 3,924 | 148 | 6,163 | 165 |
| Monday | 21,920 | 6,501 | 97 | 9,677 | 104 |
| Tuesday | 24,139 | 7,352 | 128 | 10,925 | 128 |
| Wednesday | 23,994 | 7,462 | 115 | 11,067 | 124 |
| Thursday | 24,394 | 7,367 | 151 | 11,059 | 162 |
| Friday | 26,020 | 7,533 | 153 | 11,430 | 157 |
| Saturday | 17,807 | 4,985 | 159 | 7,595 | 164 |

# Safety Analysis Report

## All Arterials and Local Roads Crashes by Hour (Phoenix)

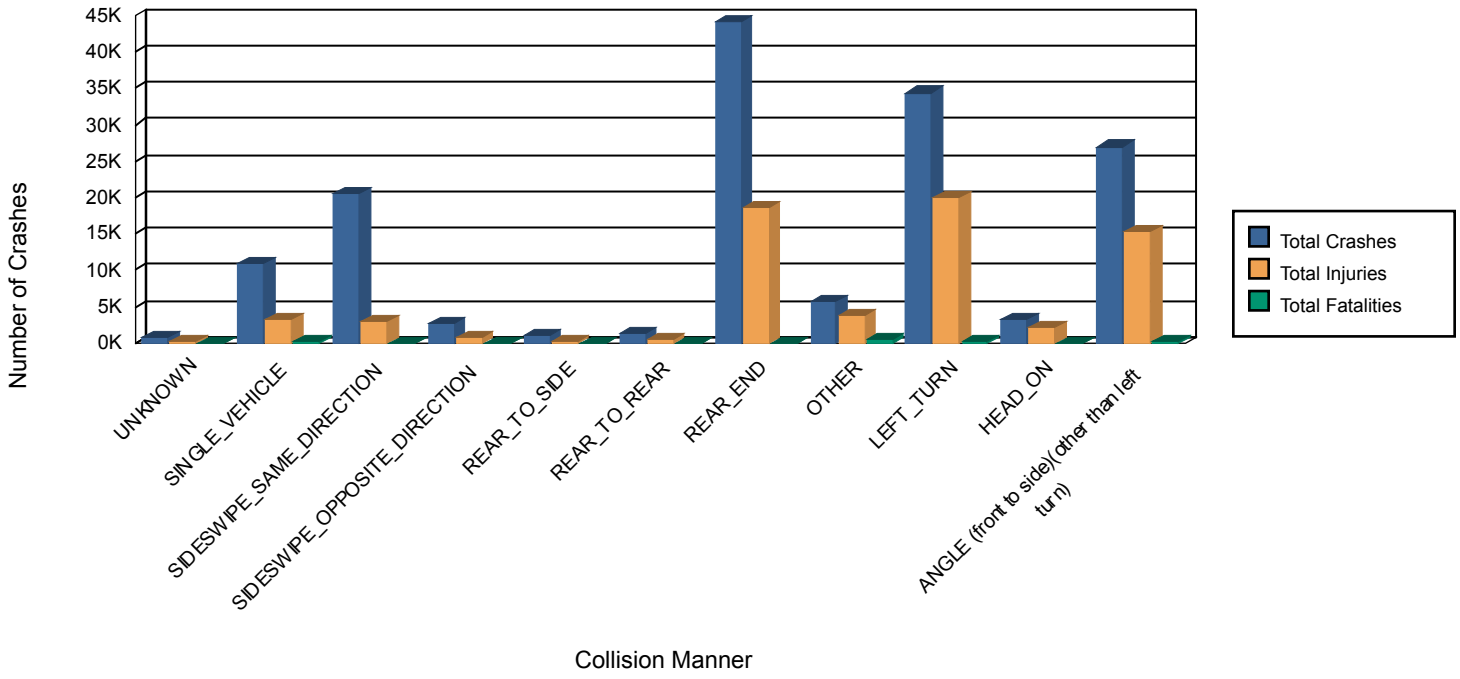



| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0 | 1,846 | 492 | 43 | 686 | 45 |
| 1 | 1,438 | 357 | 43 | 515 | 49 |
| 2 | 1,581 | 415 | 31 | 603 | 34 |
| 3 | 1,133 | 282 | 15 | 384 | 15 |
| 4 | 1,424 | 367 | 24 | 492 | 26 |
| 5 | 2,481 | 791 | 24 | 1,123 | 24 |
| 6 | 5,128 | 1,709 | 46 | 2,551 | 48 |
| 7 | 10,326 | 3,447 | 22 | 5,498 | 22 |
| 8 | 8,515 | 2,684 | 17 | 4,081 | 18 |
| 9 | 5,832 | 1,949 | 21 | 3,008 | 27 |
| 10 | 5,866 | 1,962 | 20 | 2,995 | 21 |
| 11 | 6,934 | 2,247 | 23 | 3,454 | 24 |
| 12 | 8,150 | 2,553 | 22 | 3,902 | 22 |
| 13 | 8,296 | 2,485 | 28 | 3,847 | 28 |
| 14 | 10,377 | 2,924 | 30 | 4,396 | 32 |
| 15 | 13,166 | 3,529 | 33 | 5,222 | 34 |
| 16 | 14,120 | 3,817 | 48 | 5,662 | 50 |
| 17 | 13,608 | 3,668 | 47 | 5,387 | 48 |
| 18 | 10,005 | 2,944 | 67 | 4,493 | 68 |
| 19 | 6,286 | 1,875 | 81 | 2,799 | 88 |

| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 20 | 5,054 | 1,584 | 88 | 2,270 | 91 |
| 21 | 4,345 | 1,332 | 81 | 1,994 | 88 |
| 22 | 3,508 | 1,027 | 51 | 1,553 | 56 |
| 23 | 2,458 | 684 | 46 | 1,001 | 46 |

# Safety Analysis Report

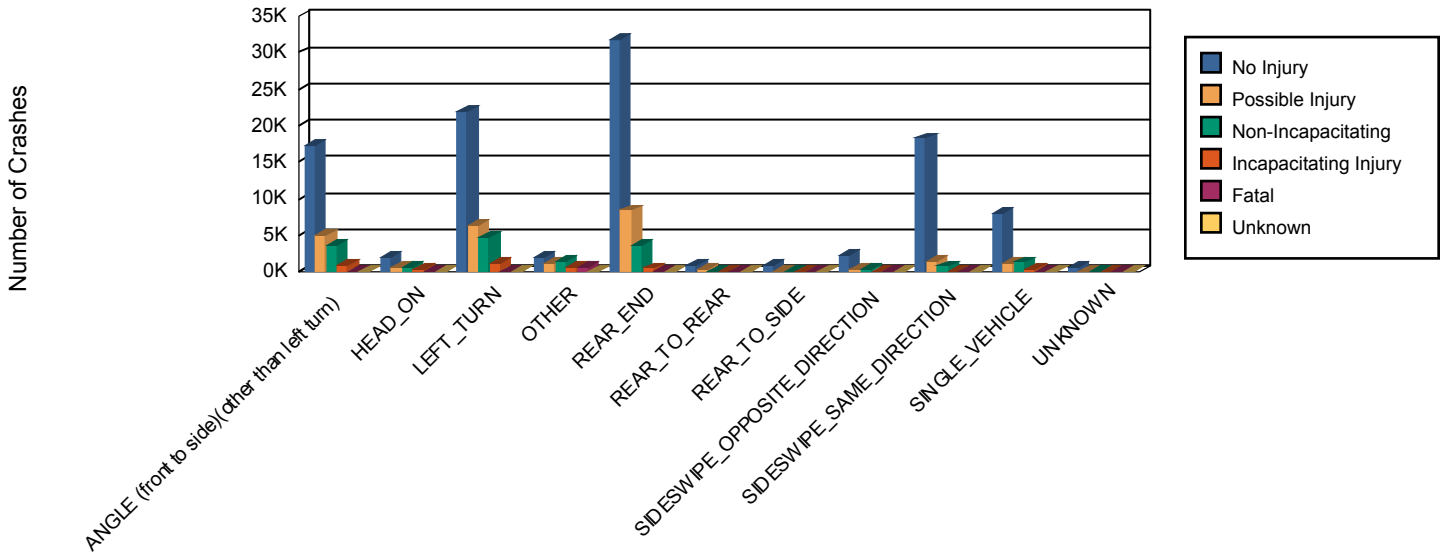
## All Arterials and Local Roads Crashes by Collision Manner (Phoenix)




| Collision Manner | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| UNKNOWN | 853 | 208 | 21 | 267 | 23 |
| SINGLE_VEHICLE | 10,875 | 2,824 | 114 | 3,301 | 129 |
| SIDESWIPE_SAME_DIRECTION | 20,560 | 2,312 | 11 | 3,071 | 13 |
| SIDESWIPE_OPPOSITE_DIRECTION | 2,791 | 530 | 4 | 801 | 5 |
| REAR_TO_SIDE | 938 | 88 | 0 | 123 | 0 |
| REAR_TO_REAR | 1,295 | 315 | 0 | 483 | 0 |
| REAR_END | 44,146 | 12,372 | 42 | 18,618 | 43 |
| OTHER | 5,797 | 3,264 | 491 | 3,718 | 504 |
| LEFT_TURN | 34,390 | 12,247 | 117 | 20,044 | 123 |
| HEAD_ON | 3,266 | 1,340 | 43 | 2,226 | 50 |
| ANGLE (front to side)(other than left turn) | 26,966 | 9,624 | 108 | 15,264 | 114 |

# Safety Analysis Report

## All Arterials and Local Roads Crashes by Collision Manner (Phoenix)

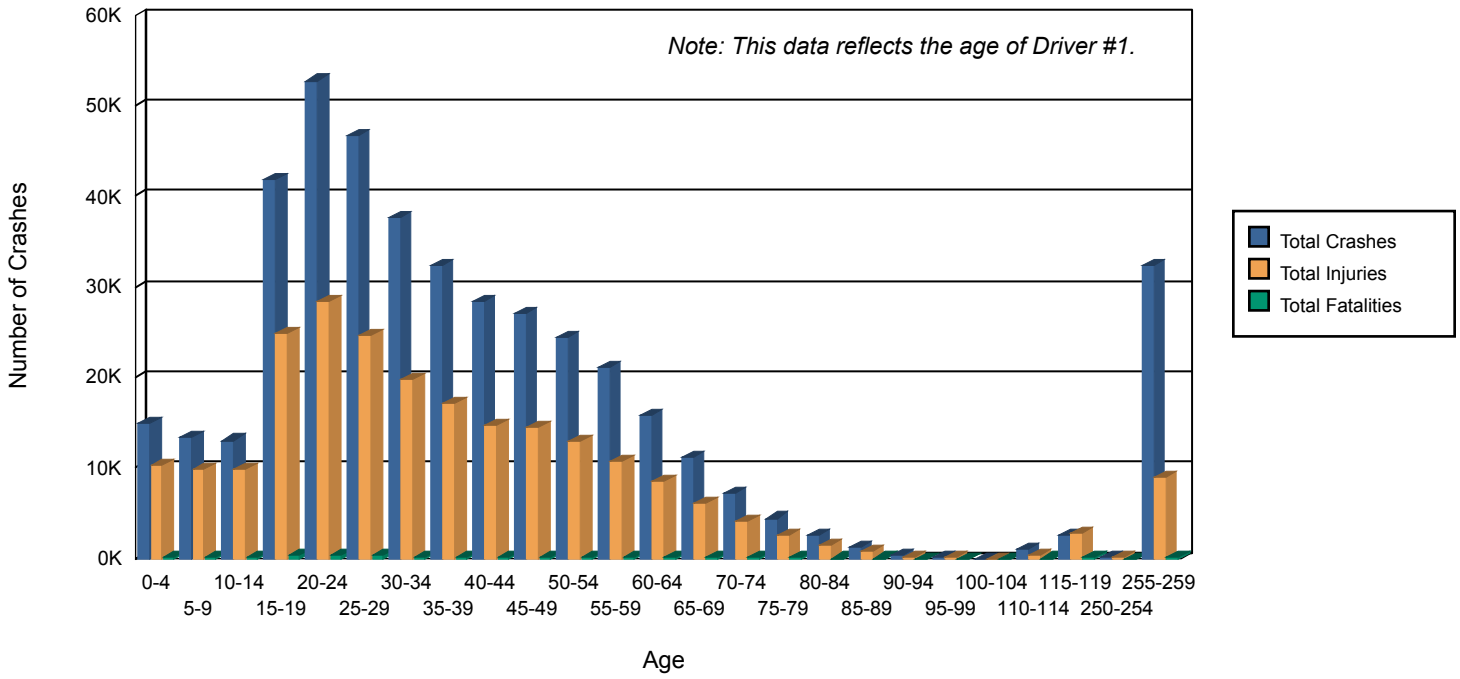



Collision Manner

| Collision Manner | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| UNKNOWN | 624 | 92 | 83 | 33 | 21 | 0 | 853 |
| SINGLE_VEHICLE | 7,937 | 1,092 | 1,296 | 436 | 114 | 0 | 10,875 |
| SIDESWIPE_SAME_DIRECTION | 18,237 | 1,434 | 741 | 137 | 11 | 0 | 20,560 |
| SIDESWIPE_OPPOSITE_DIRECTION | 2,257 | 273 | 206 | 51 | 4 | 0 | 2,791 |
| REAR_TO_SIDE | 850 | 51 | 32 | 5 | 0 | 0 | 938 |
| REAR_TO_REAR | 980 | 214 | 87 | 14 | 0 | 0 | 1,295 |
| REAR_END | 31,732 | 8,394 | 3,519 | 459 | 42 | 0 | 44,146 |
| OTHER | 2,042 | 1,118 | 1,464 | 682 | 491 | 0 | 5,797 |
| LEFT_TURN | 22,026 | 6,375 | 4,824 | 1,048 | 117 | 0 | 34,390 |
| HEAD_ON | 1,883 | 547 | 568 | 225 | 43 | 0 | 3,266 |
| ANGLE (front to side) (other than left turn) | 17,234 | 4,984 | 3,719 | 921 | 108 | 0 | 26,966 |

# Safety Analysis Report

## All Arterials and Local Roads Crashes by Age (Phoenix)

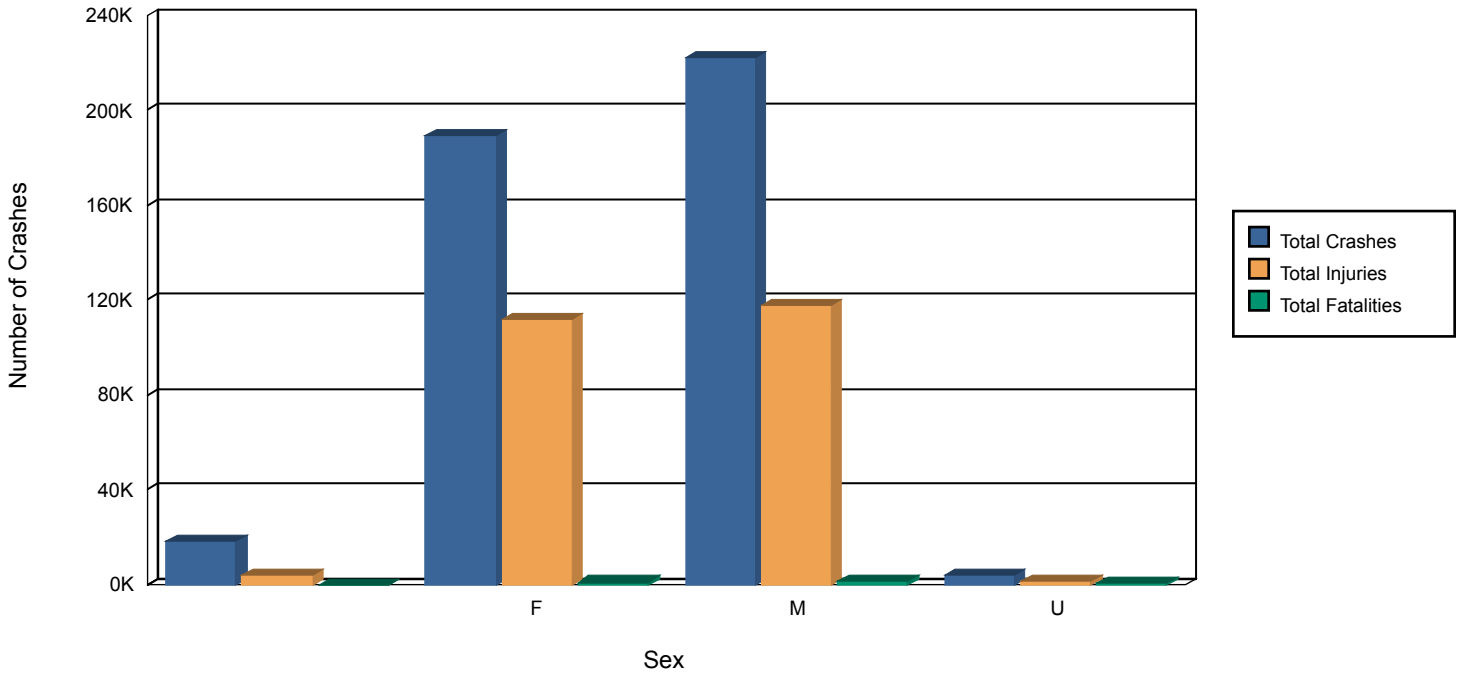



| Age | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0-4 | 15,012 | 5,044 | 58 | 10,327 | 79 |
| 5-9 | 13,433 | 4,610 | 57 | 9,807 | 72 |
| 10-14 | 13,047 | 4,686 | 66 | 9,808 | 74 |
| 15-19 | 41,762 | 13,697 | 216 | 24,805 | 275 |
| 20-24 | 52,790 | 16,849 | 312 | 28,302 | 352 |
| 25-29 | 46,706 | 14,698 | 255 | 24,645 | 283 |
| 30-34 | 37,610 | 12,038 | 194 | 19,859 | 212 |
| 35-39 | 32,390 | 10,307 | 189 | 17,208 | 207 |
| 40-44 | 28,351 | 9,012 | 150 | 14,790 | 159 |
| 45-49 | 27,132 | 8,924 | 146 | 14,531 | 153 |
| 50-54 | 24,501 | 8,072 | 186 | 13,036 | 192 |
| 55-59 | 21,184 | 6,869 | 148 | 10,821 | 153 |
| 60-64 | 15,723 | 5,305 | 136 | 8,482 | 138 |
| 65-69 | 11,171 | 3,798 | 91 | 6,159 | 93 |
| 70-74 | 7,282 | 2,520 | 64 | 4,168 | 64 |
| 75-79 | 4,441 | 1,567 | 55 | 2,594 | 57 |
| 80-84 | 2,528 | 887 | 31 | 1,510 | 31 |
| 85-89 | 1,327 | 465 | 20 | 755 | 21 |
| 90-94 | 386 | 134 | 8 | 225 | 9 |
| 95-99 | 60 | 23 | 1 | 40 | 1 |

| Age | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 100-104 | 4 | 2 | 1 | 8 | 1 |
| 110-114 | 1,088 | 260 | 22 | 441 | 22 |
| 115-119 | 2,525 | 1,137 | 163 | 2,842 | 178 |
| 250-254 | 151 | 38 | 0 | 58 | 0 |
| 255-259 | 32,424 | 6,618 | 43 | 8,987 | 45 |

# Safety Analysis Report

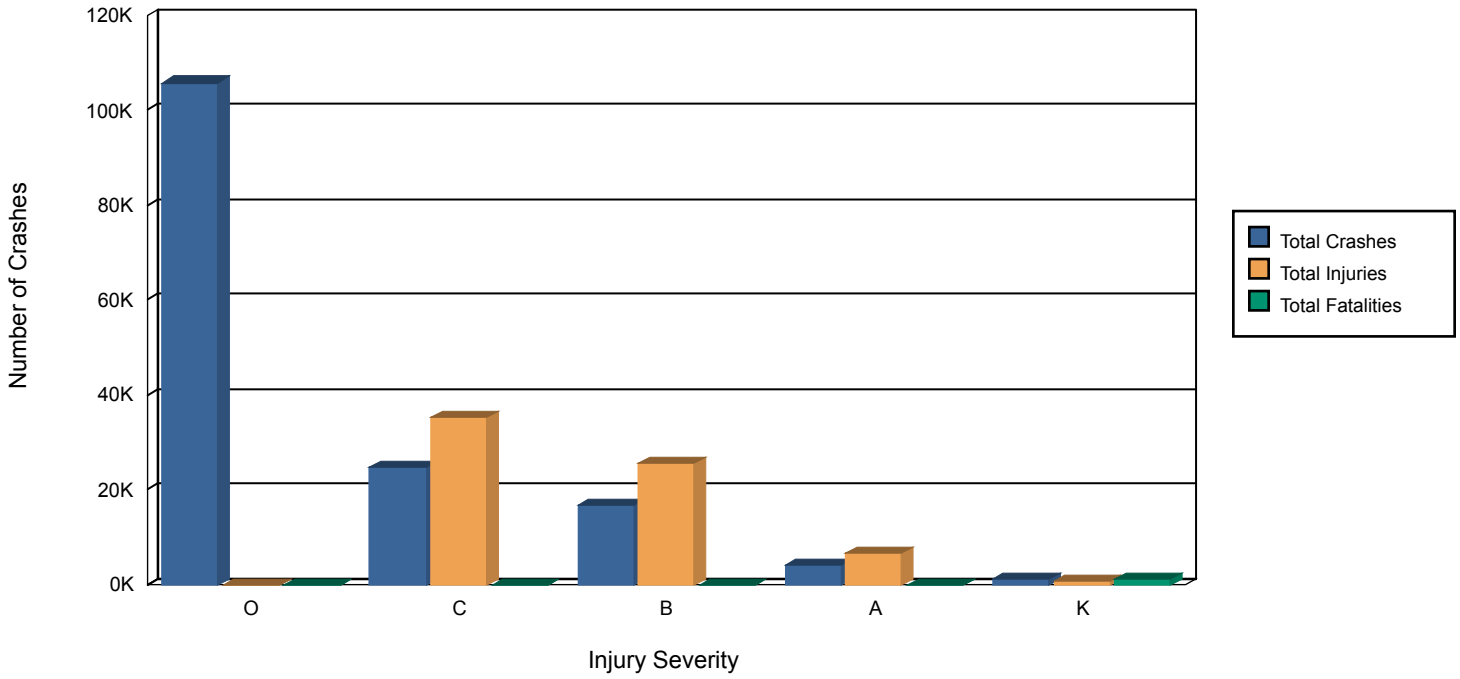
## All Arterials and Local Roads Crashes by Sex (Phoenix)




| Sex | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| | 18,466 | 3,093 | 43 | 3,885 | 45 |
| F | 188,984 | 63,102 | 841 | 111,383 | 937 |
| M | 221,819 | 70,564 | 1,581 | 117,777 | 1,731 |
| U | 3,759 | 801 | 147 | 1,163 | 158 |

# Safety Analysis Report

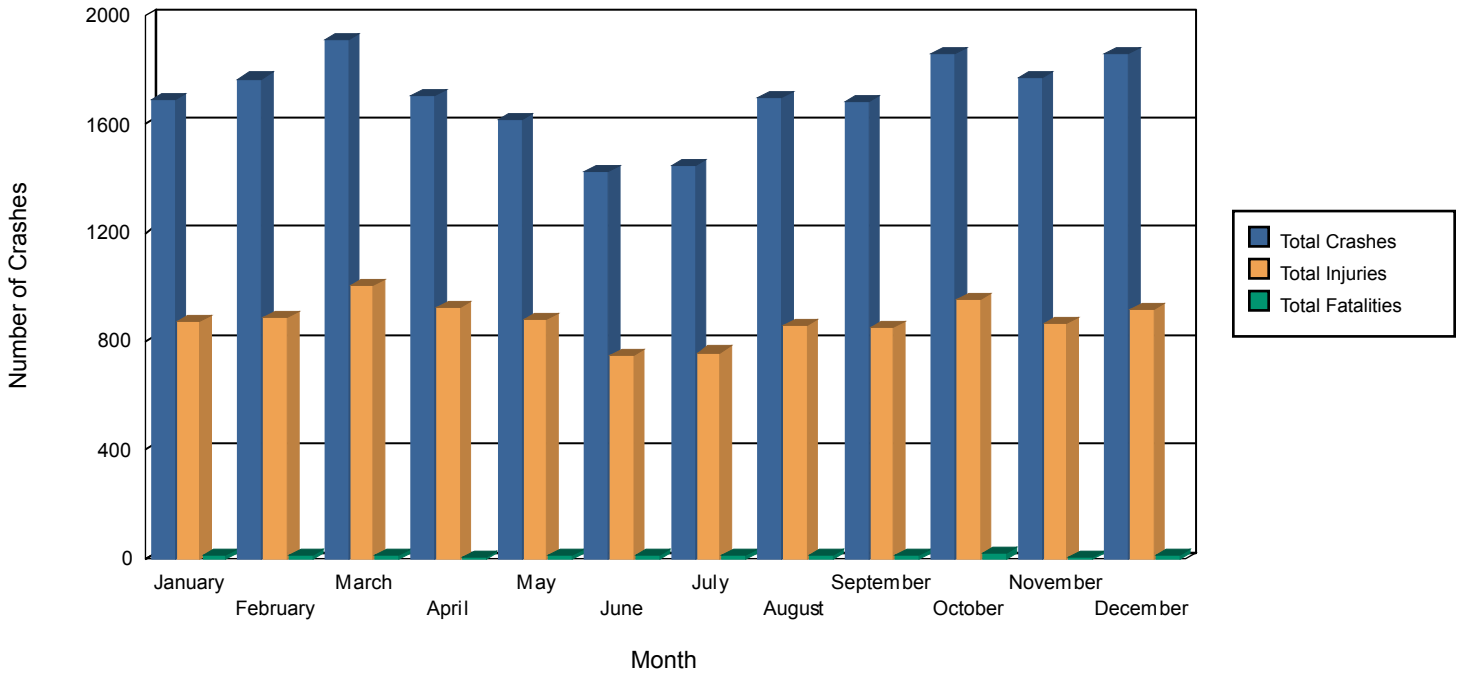
## All Arterials and Local Roads Crashes by Injury Severity (Phoenix)




| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 105,802 | 0 | 0 | 0 | 0 |
| C | 24,574 | 24,574 | 0 | 35,153 | 0 |
| B | 16,539 | 16,539 | 0 | 25,533 | 0 |
| A | 4,011 | 4,011 | 0 | 6,710 | 0 |
| K | 951 | 0 | 951 | 520 | 1,004 |

# Safety Analysis Report

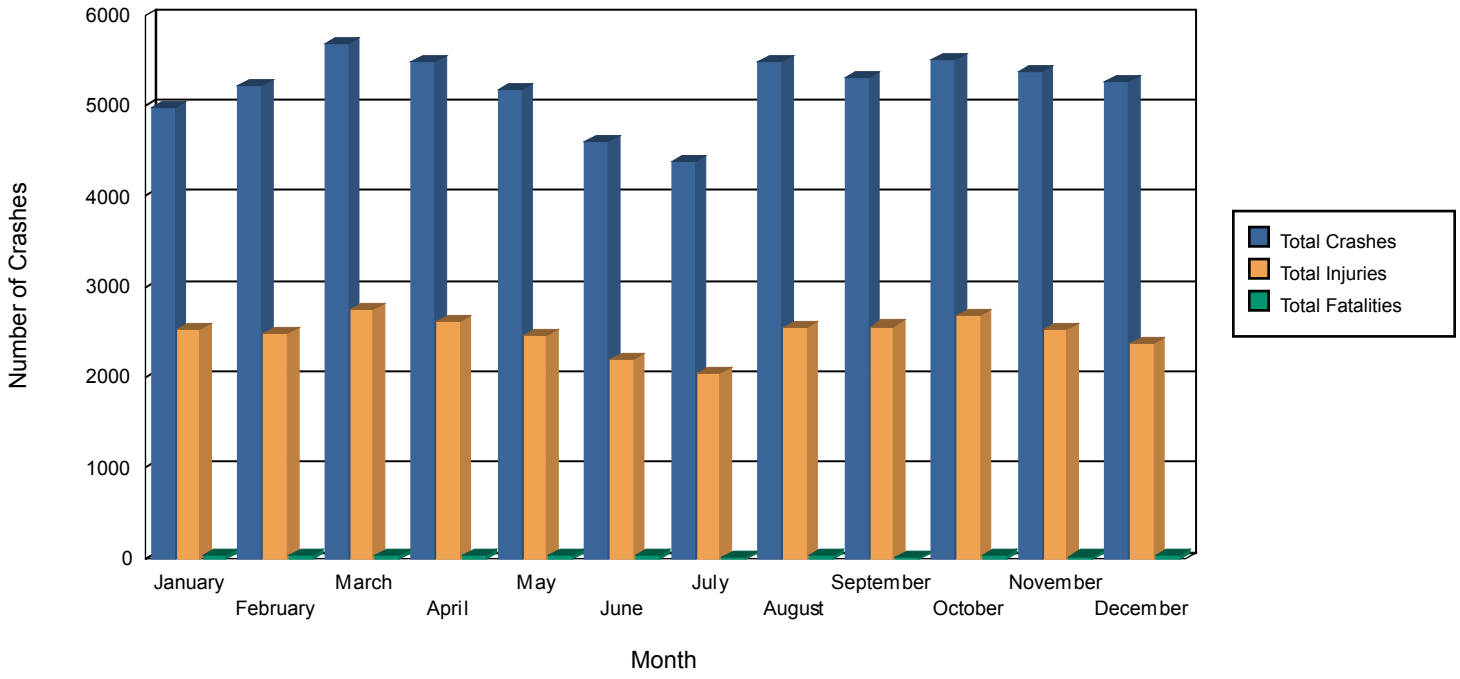
## All Arterials and Local Roads Older Driver Crashes by Month (Phoenix)




| Month | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| January | 1,687 | 556 | 11 | 874 | 11 |
| February | 1,767 | 575 | 14 | 885 | 14 |
| March | 1,912 | 619 | 12 | 1,004 | 14 |
| April | 1,705 | 590 | 7 | 925 | 7 |
| May | 1,613 | 556 | 11 | 881 | 11 |
| June | 1,426 | 457 | 12 | 748 | 13 |
| July | 1,444 | 463 | 9 | 759 | 9 |
| August | 1,697 | 536 | 9 | 856 | 9 |
| September | 1,685 | 539 | 14 | 854 | 14 |
| October | 1,859 | 595 | 18 | 955 | 18 |
| November | 1,770 | 560 | 7 | 864 | 7 |
| December | 1,860 | 589 | 14 | 914 | 14 |

# Safety Analysis Report

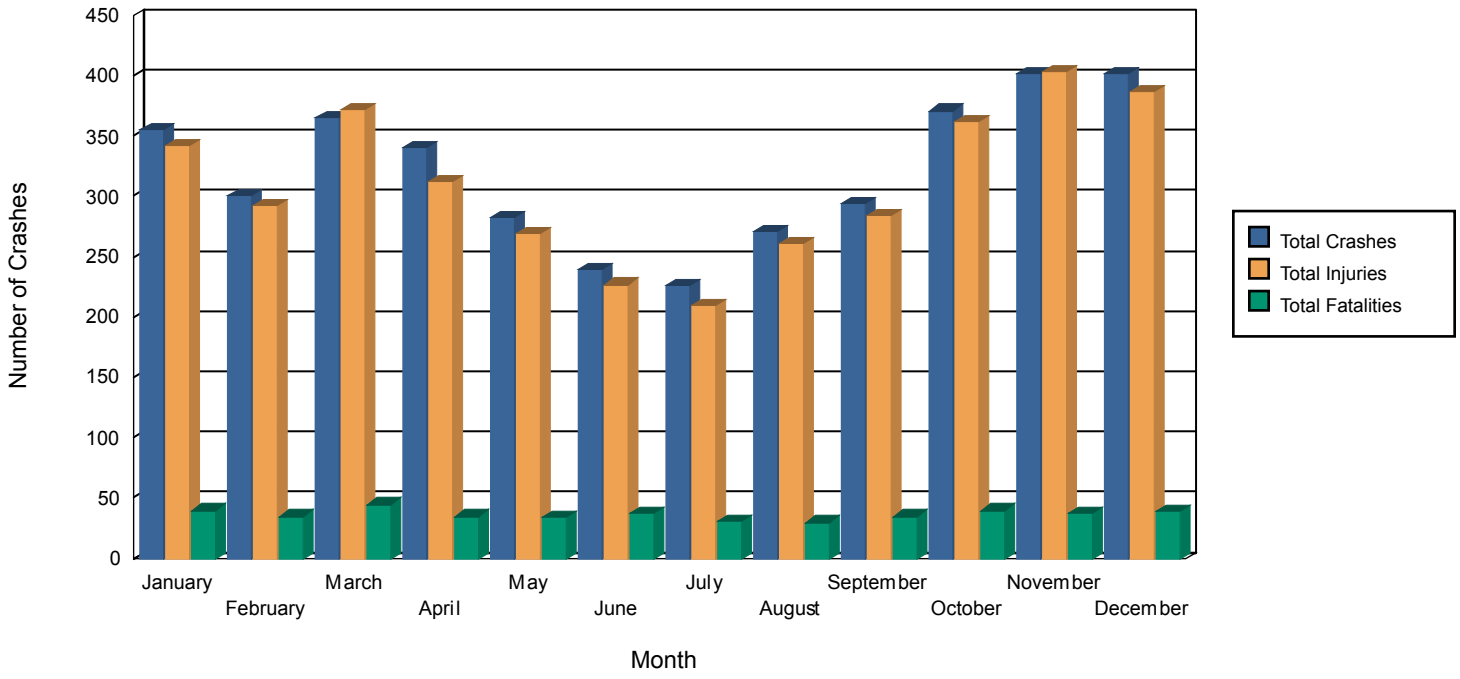
## All Arterials and Local Roads Younger Driver Crashes by Month (Phoenix)




| Month | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| January | 4,975 | 1,579 | 31 | 2,538 | 33 |
| February | 5,225 | 1,567 | 23 | 2,477 | 29 |
| March | 5,685 | 1,724 | 35 | 2,749 | 38 |
| April | 5,496 | 1,607 | 29 | 2,627 | 30 |
| May | 5,180 | 1,557 | 28 | 2,471 | 30 |
| June | 4,604 | 1,386 | 26 | 2,195 | 28 |
| July | 4,383 | 1,297 | 15 | 2,053 | 17 |
| August | 5,494 | 1,587 | 26 | 2,556 | 29 |
| September | 5,317 | 1,618 | 15 | 2,563 | 15 |
| October | 5,516 | 1,703 | 22 | 2,686 | 30 |
| November | 5,380 | 1,576 | 24 | 2,536 | 26 |
| December | 5,258 | 1,501 | 26 | 2,375 | 28 |

# Safety Analysis Report

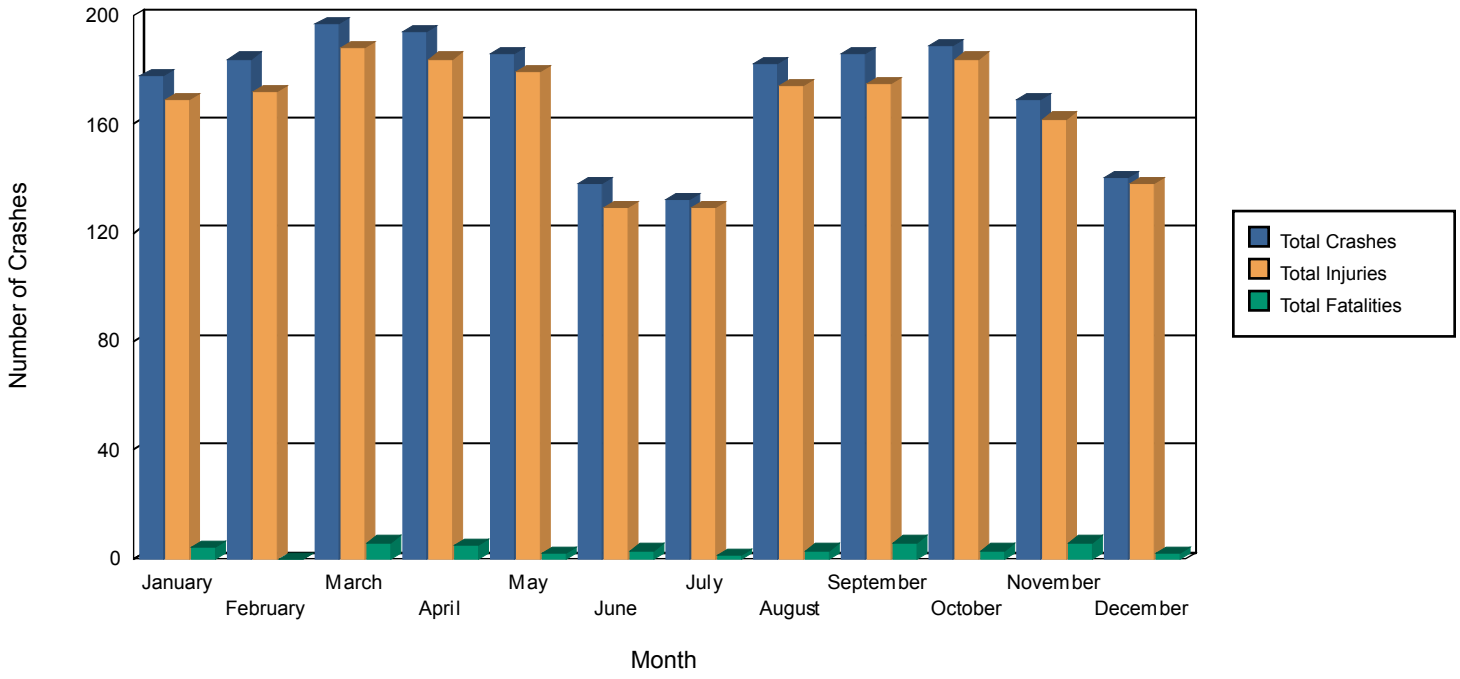
## All Arterials and Local Roads Pedestrian Crashes by Month (Phoenix)




| Month | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| January | 355 | 310 | 40 | 342 | 40 |
| February | 300 | 260 | 35 | 293 | 35 |
| March | 365 | 314 | 44 | 372 | 45 |
| April | 341 | 294 | 35 | 313 | 35 |
| May | 282 | 240 | 32 | 269 | 34 |
| June | 239 | 200 | 36 | 227 | 37 |
| July | 226 | 192 | 30 | 209 | 31 |
| August | 271 | 237 | 29 | 261 | 30 |
| September | 294 | 254 | 34 | 284 | 35 |
| October | 371 | 325 | 40 | 362 | 40 |
| November | 401 | 361 | 37 | 403 | 38 |
| December | 401 | 356 | 39 | 387 | 39 |

# Safety Analysis Report

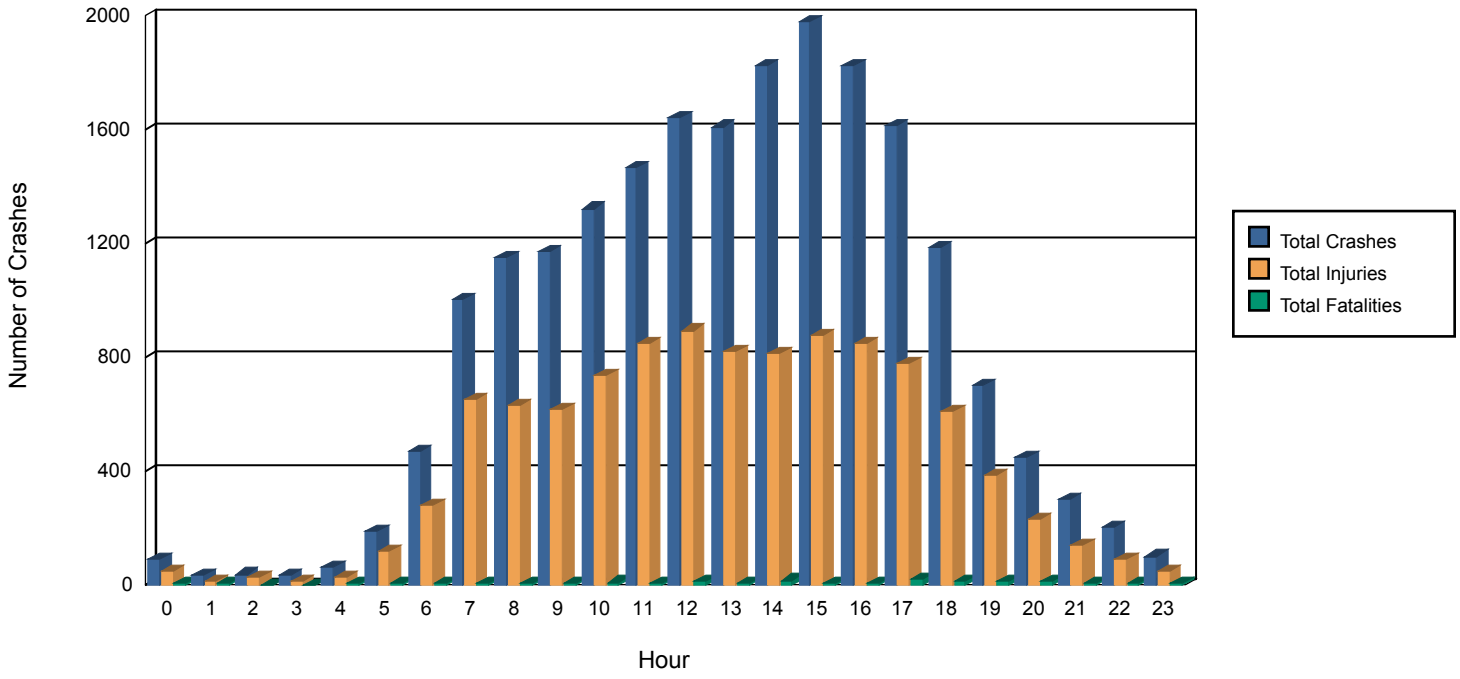
## All Arterials and Local Roads Bicyclist Crashes by Month (Phoenix)




| Month | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| January | 178 | 163 | 4 | 169 | 4 |
| February | 184 | 169 | 0 | 172 | 0 |
| March | 197 | 182 | 6 | 188 | 6 |
| April | 194 | 179 | 5 | 184 | 5 |
| May | 186 | 175 | 2 | 179 | 2 |
| June | 138 | 128 | 3 | 129 | 3 |
| July | 132 | 128 | 1 | 129 | 1 |
| August | 182 | 169 | 3 | 174 | 3 |
| September | 186 | 171 | 6 | 175 | 6 |
| October | 189 | 177 | 3 | 184 | 3 |
| November | 169 | 158 | 6 | 162 | 6 |
| December | 140 | 134 | 2 | 138 | 2 |

# Safety Analysis Report

## All Arterials and Local Roads Older Driver Crashes by Hour (Phoenix)

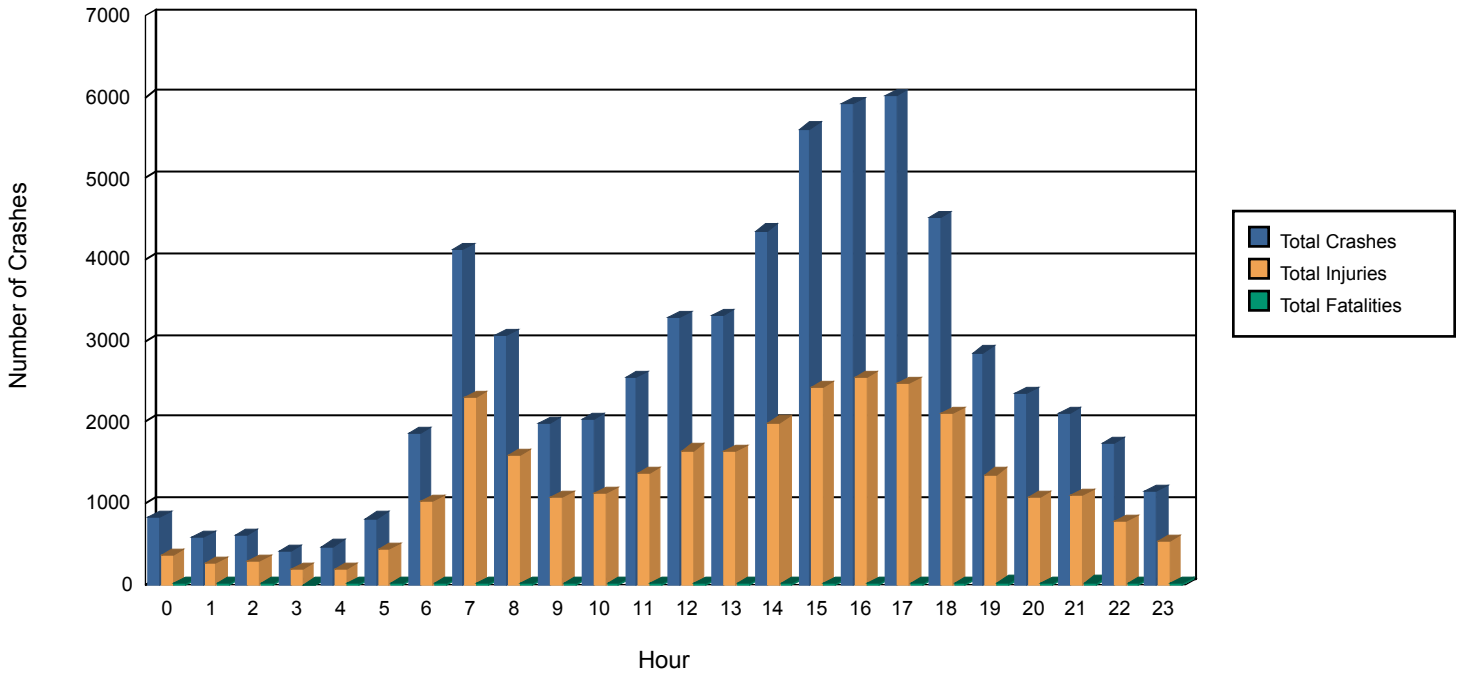



| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0 | 90 | 30 | 2 | 46 | 2 |
| 1 | 35 | 10 | 2 | 14 | 2 |
| 2 | 36 | 19 | 0 | 25 | 0 |
| 3 | 33 | 10 | 0 | 14 | 0 |
| 4 | 59 | 15 | 4 | 24 | 4 |
| 5 | 186 | 72 | 2 | 117 | 2 |
| 6 | 467 | 170 | 4 | 280 | 4 |
| 7 | 1,000 | 373 | 3 | 652 | 3 |
| 8 | 1,146 | 399 | 5 | 629 | 5 |
| 9 | 1,168 | 408 | 4 | 616 | 4 |
| 10 | 1,321 | 468 | 8 | 734 | 8 |
| 11 | 1,468 | 504 | 4 | 849 | 5 |
| 12 | 1,639 | 569 | 9 | 893 | 9 |
| 13 | 1,609 | 501 | 4 | 818 | 4 |
| 14 | 1,820 | 521 | 14 | 811 | 15 |
| 15 | 1,976 | 571 | 6 | 877 | 6 |
| 16 | 1,826 | 535 | 7 | 848 | 7 |
| 17 | 1,614 | 471 | 17 | 777 | 17 |
| 18 | 1,183 | 402 | 11 | 611 | 12 |
| 19 | 702 | 246 | 11 | 386 | 11 |

| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 20 | 449 | 153 | 10 | 226 | 10 |
| 21 | 298 | 96 | 5 | 138 | 5 |
| 22 | 201 | 61 | 2 | 88 | 2 |
| 23 | 99 | 31 | 4 | 46 | 4 |

# Safety Analysis Report

## All Arterials and Local Roads Younger Driver Crashes by Hour (Phoenix)

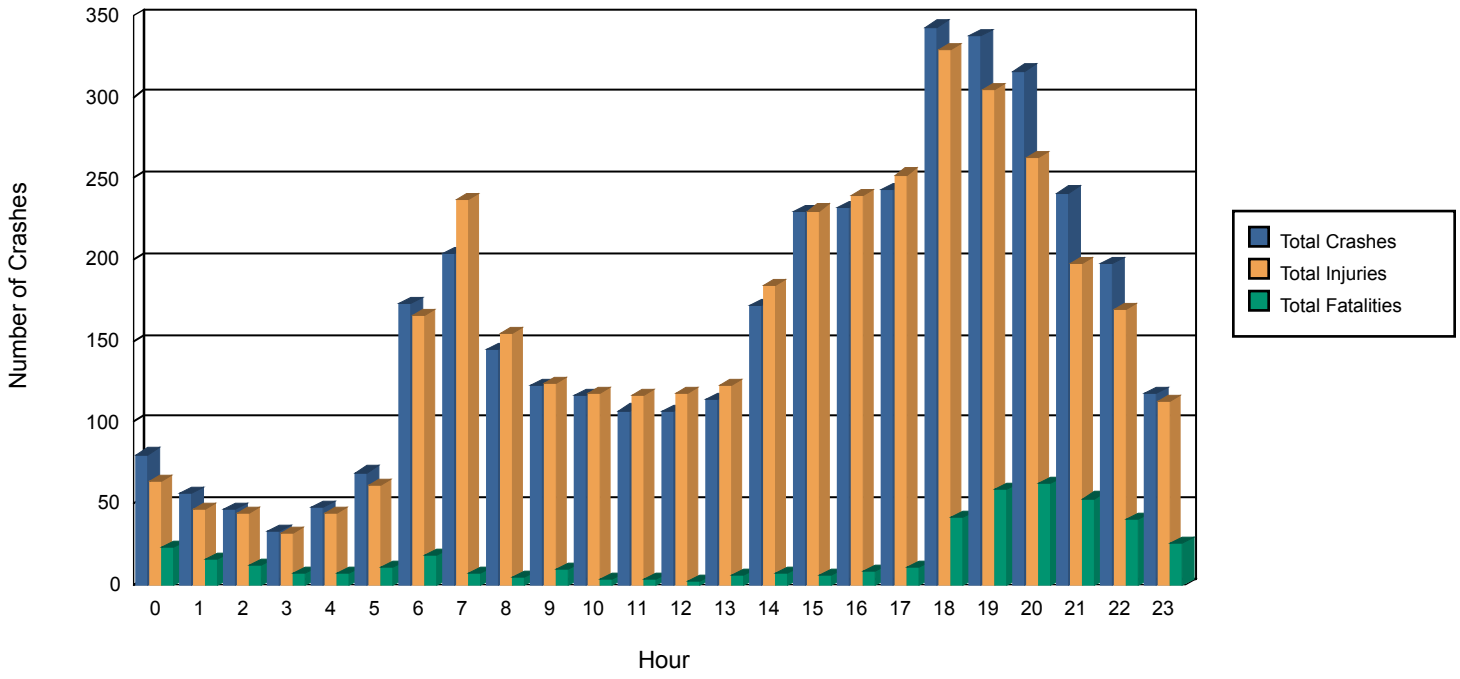



| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0 | 827 | 233 | 16 | 359 | 18 |
| 1 | 586 | 165 | 14 | 266 | 20 |
| 2 | 602 | 180 | 8 | 282 | 11 |
| 3 | 408 | 123 | 3 | 179 | 3 |
| 4 | 471 | 138 | 6 | 193 | 8 |
| 5 | 814 | 274 | 7 | 428 | 7 |
| 6 | 1,850 | 654 | 11 | 1,022 | 12 |
| 7 | 4,119 | 1,383 | 8 | 2,294 | 8 |
| 8 | 3,062 | 990 | 6 | 1,599 | 7 |
| 9 | 1,980 | 660 | 10 | 1,078 | 14 |
| 10 | 2,036 | 696 | 10 | 1,122 | 10 |
| 11 | 2,557 | 846 | 11 | 1,359 | 12 |
| 12 | 3,285 | 1,031 | 10 | 1,649 | 10 |
| 13 | 3,319 | 1,015 | 10 | 1,634 | 10 |
| 14 | 4,353 | 1,212 | 12 | 1,995 | 13 |
| 15 | 5,606 | 1,547 | 11 | 2,417 | 12 |
| 16 | 5,916 | 1,634 | 12 | 2,542 | 12 |
| 17 | 6,007 | 1,592 | 9 | 2,468 | 10 |
| 18 | 4,519 | 1,310 | 15 | 2,114 | 15 |
| 19 | 2,854 | 824 | 23 | 1,356 | 27 |

| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 20 | 2,357 | 703 | 21 | 1,066 | 24 |
| 21 | 2,115 | 672 | 28 | 1,089 | 28 |
| 22 | 1,728 | 484 | 21 | 786 | 24 |
| 23 | 1,142 | 336 | 18 | 529 | 18 |

# Safety Analysis Report

## All Arterials and Local Roads Pedestrian Crashes by Hour (Phoenix)

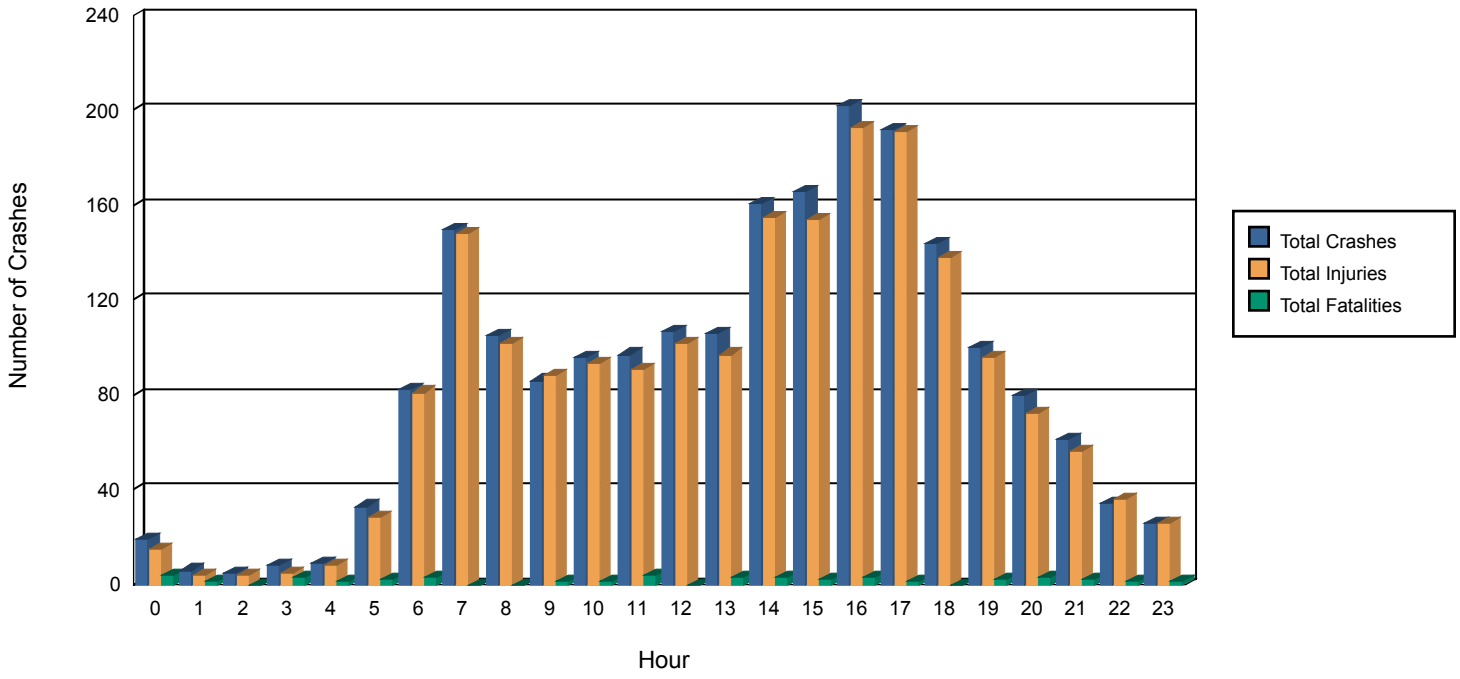



| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0 | 80 | 57 | 23 | 63 | 23 |
| 1 | 56 | 39 | 16 | 46 | 16 |
| 2 | 46 | 34 | 12 | 44 | 12 |
| 3 | 33 | 26 | 7 | 31 | 7 |
| 4 | 48 | 41 | 7 | 44 | 7 |
| 5 | 69 | 58 | 11 | 61 | 11 |
| 6 | 173 | 152 | 18 | 165 | 18 |
| 7 | 204 | 194 | 7 | 237 | 7 |
| 8 | 144 | 139 | 4 | 154 | 4 |
| 9 | 122 | 113 | 9 | 124 | 9 |
| 10 | 116 | 113 | 2 | 118 | 3 |
| 11 | 107 | 97 | 3 | 116 | 3 |
| 12 | 106 | 101 | 2 | 117 | 2 |
| 13 | 114 | 106 | 6 | 122 | 6 |
| 14 | 172 | 163 | 6 | 184 | 7 |
| 15 | 229 | 218 | 6 | 230 | 6 |
| 16 | 232 | 216 | 8 | 239 | 8 |
| 17 | 243 | 224 | 11 | 252 | 11 |
| 18 | 343 | 296 | 41 | 329 | 41 |
| 19 | 337 | 278 | 56 | 304 | 58 |

| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 20 | 316 | 245 | 60 | 263 | 62 |
| 21 | 241 | 184 | 53 | 197 | 53 |
| 22 | 197 | 156 | 38 | 169 | 40 |
| 23 | 118 | 93 | 25 | 113 | 25 |

# Safety Analysis Report

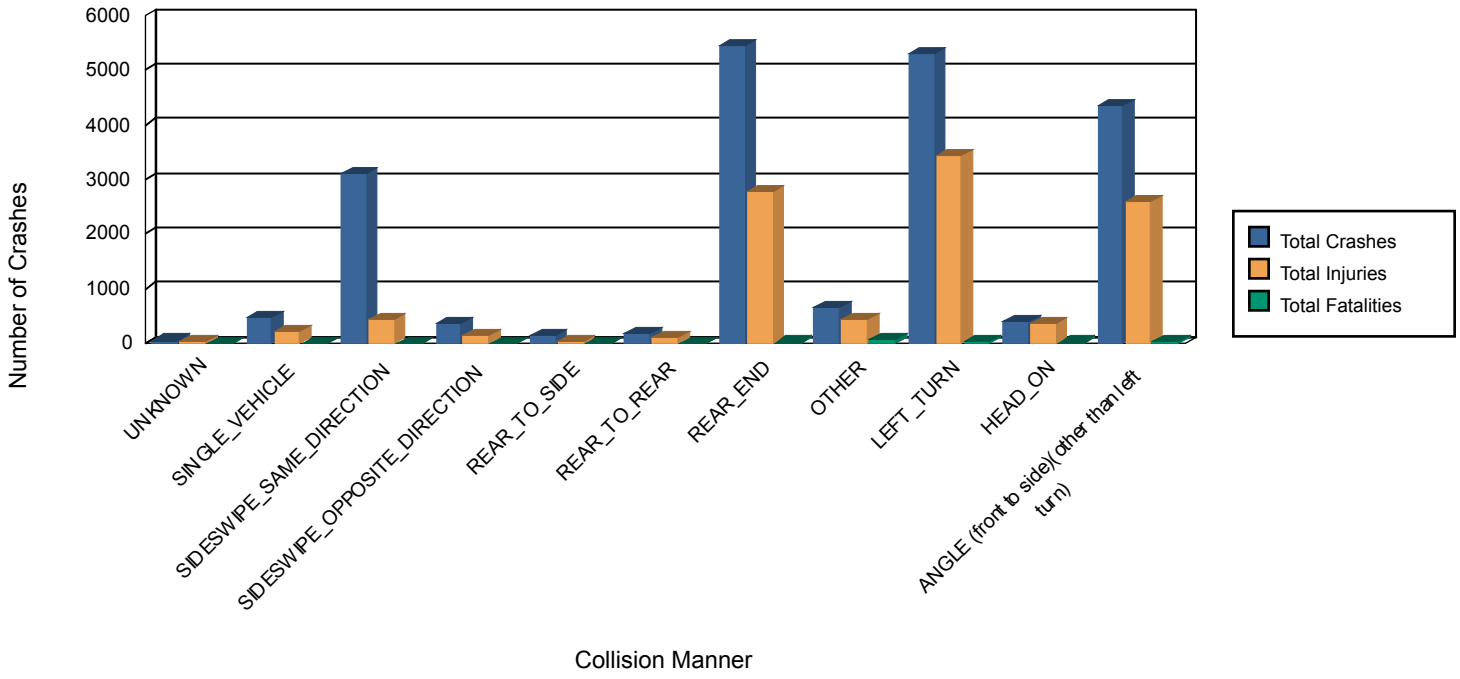
## All Arterials and Local Roads Bicyclist Crashes by Hour (Phoenix)




| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 0 | 19 | 15 | 4 | 15 | 4 |
| 1 | 6 | 4 | 1 | 4 | 1 |
| 2 | 5 | 4 | 0 | 4 | 0 |
| 3 | 8 | 5 | 3 | 5 | 3 |
| 4 | 9 | 8 | 1 | 8 | 1 |
| 5 | 33 | 28 | 2 | 28 | 2 |
| 6 | 82 | 76 | 3 | 81 | 3 |
| 7 | 150 | 141 | 0 | 148 | 0 |
| 8 | 105 | 101 | 0 | 102 | 0 |
| 9 | 86 | 85 | 1 | 88 | 1 |
| 10 | 96 | 92 | 1 | 93 | 1 |
| 11 | 97 | 89 | 4 | 91 | 4 |
| 12 | 107 | 102 | 0 | 102 | 0 |
| 13 | 106 | 96 | 3 | 97 | 3 |
| 14 | 161 | 152 | 3 | 155 | 3 |
| 15 | 166 | 153 | 2 | 154 | 2 |
| 16 | 202 | 190 | 3 | 193 | 3 |
| 17 | 192 | 183 | 1 | 191 | 1 |
| 18 | 144 | 137 | 0 | 138 | 0 |
| 19 | 100 | 91 | 2 | 96 | 2 |

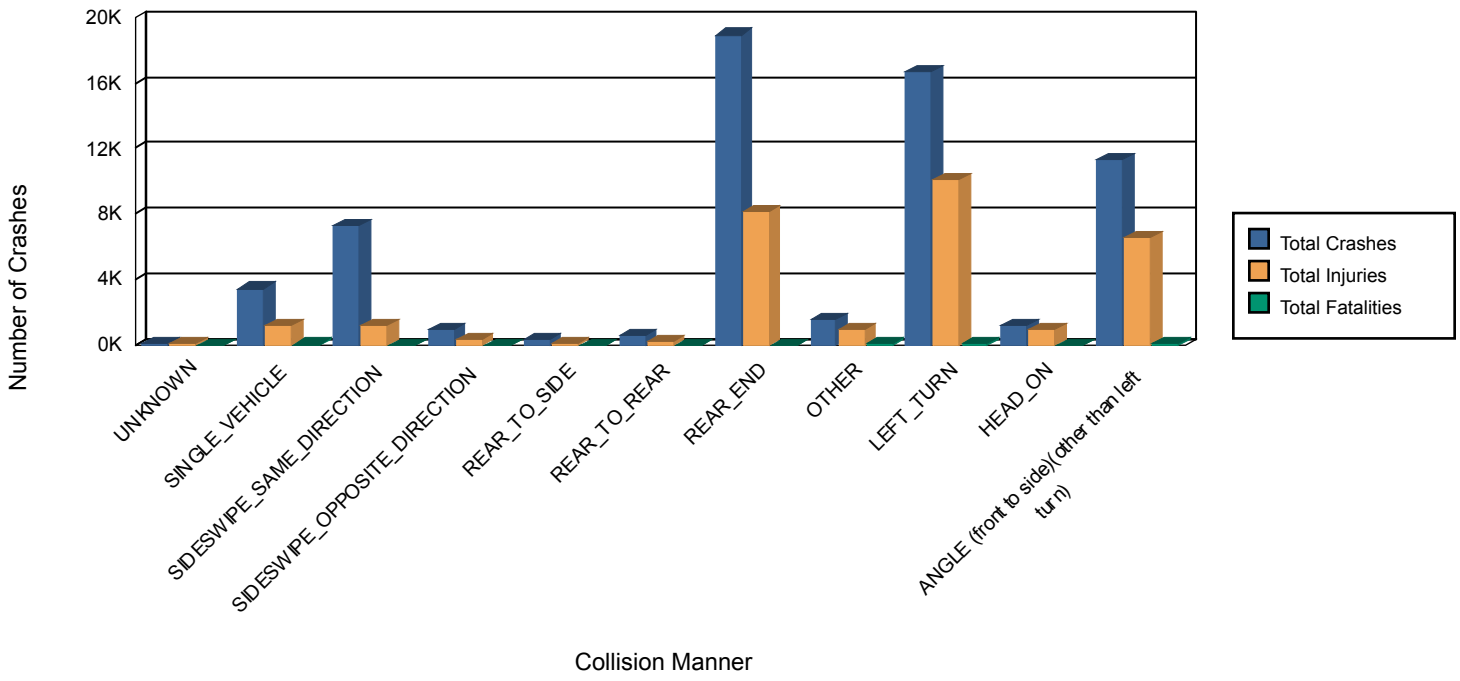
| Hour | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 20 | 80 | 70 | 3 | 72 | 3 |
| 21 | 61 | 55 | 2 | 56 | 2 |
| 22 | 34 | 31 | 1 | 36 | 1 |
| 23 | 26 | 25 | 1 | 26 | 1 |

## All Arterials and Local Roads Older Driver Crashes byCollision Manner (Phoenix)



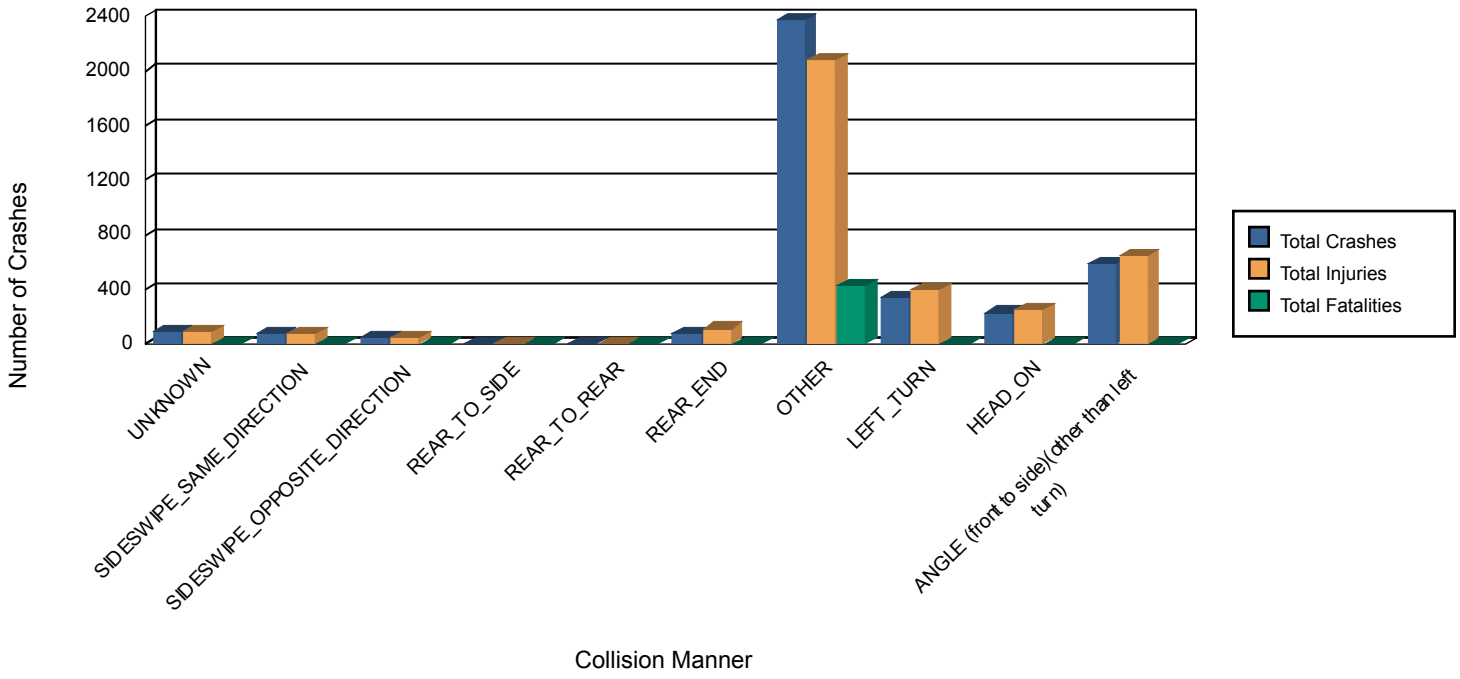

| Collision Manner | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| UNKNOWN | 50 | 20 | 1 | 26 | 1 |
| SINGLE_VEHICLE | 460 | 174 | 9 | 198 | 10 |
| SIDESWIPE_SAME_DIRECTION | 3,114 | 327 | 0 | 431 | 0 |
| SIDESWIPE_OPPOSITE_DIRECTION | 356 | 88 | 1 | 155 | 1 |
| REAR_TO_SIDE | 137 | 18 | 0 | 27 | 0 |
| REAR_TO_REAR | 173 | 57 | 0 | 96 | 0 |
| REAR_END | 5,451 | 1,769 | 12 | 2,774 | 12 |
| OTHER | 646 | 351 | 50 | 441 | 51 |
| LEFT_TURN | 5,308 | 2,050 | 28 | 3,430 | 28 |
| HEAD_ON | 383 | 177 | 11 | 346 | 11 |
| ANGLE (front to side)(other than left turn) | 4,347 | 1,604 | 26 | 2,595 | 27 |

## All Arterials and Local Roads Younger Driver Crashes by Collision Manner (Phoenix)



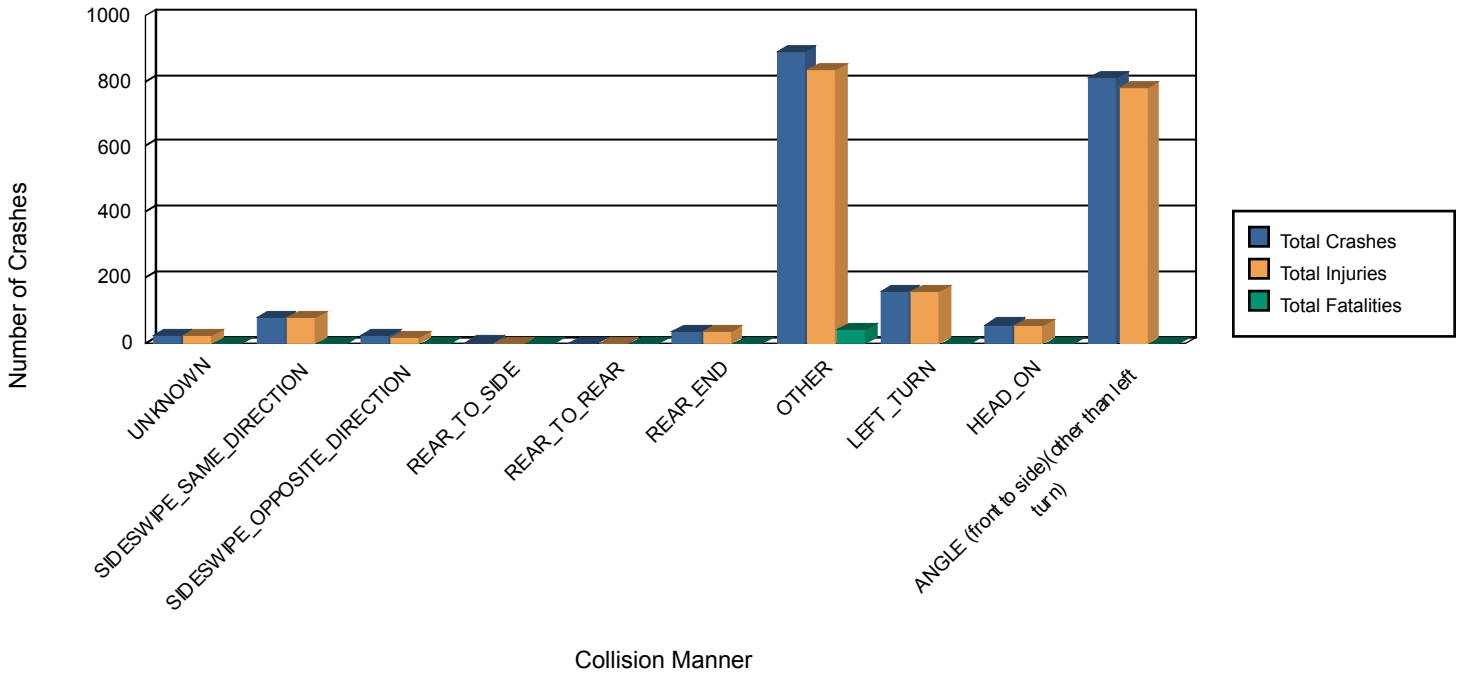

| Collision Manner | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| UNKNOWN | 156 | 47 | 7 | 75 | 9 |
| SINGLE_VEHICLE | 3,453 | 988 | 27 | 1,210 | 36 |
| SIDESWIPE_SAME_DIRECTION | 7,296 | 879 | 8 | 1,240 | 10 |
| SIDESWIPE_OPPOSITE_DIRECTION | 1,005 | 210 | 2 | 344 | 3 |
| REAR_TO_SIDE | 293 | 35 | 0 | 50 | 0 |
| REAR_TO_REAR | 560 | 147 | 0 | 240 | 0 |
| REAR_END | 18,937 | 5,264 | 12 | 8,162 | 13 |
| OTHER | 1,532 | 694 | 109 | 902 | 116 |
| LEFT_TURN | 16,700 | 5,992 | 63 | 10,079 | 66 |
| HEAD_ON | 1,240 | 514 | 21 | 915 | 25 |
| ANGLE (front to side)(other than left turn) | 11,341 | 3,932 | 51 | 6,609 | 55 |

## All Arterials and Local Roads Pedestrian Crashes by Collision Manner (Phoenix)




| Collision Manner | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| UNKNOWN | 95 | 91 | 2 | 98 | 2 |
| SIDESWIPE_SAME_DIRECTION | 76 | 71 | 0 | 82 | 0 |
| SIDESWIPE_OPPOSITE_DIRECTION | 43 | 41 | 0 | 47 | 0 |
| REAR_TO_SIDE | 10 | 10 | 0 | 10 | 0 |
| REAR_TO_REAR | 3 | 3 | 0 | 3 | 0 |
| REAR_END | 79 | 72 | 1 | 113 | 1 |
| OTHER | 2,374 | 1,923 | 420 | 2,076 | 427 |
| LEFT_TURN | 340 | 323 | 7 | 394 | 8 |
| HEAD_ON | 231 | 224 | 0 | 250 | 0 |
| ANGLE (front to side)(other than left turn) | 595 | 585 | 1 | 649 | 1 |

## All Arterials and Local Roads Bicyclist Crashes by Collision Manner (Phoenix)

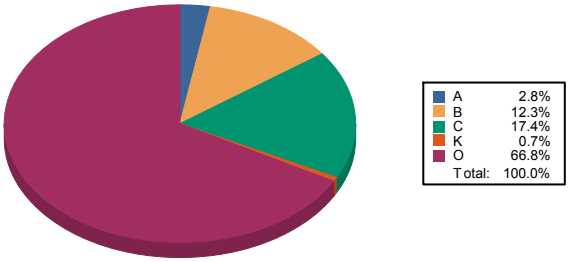



| Collision Manner | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| UNKNOWN | 22 | 21 | 0 | 21 | 0 |
| SIDESWIPE_SAME_DIRECTION | 78 | 73 | 0 | 77 | 0 |
| SIDESWIPE_OPPOSITE_DIRECTION | 21 | 19 | 0 | 19 | 0 |
| REAR_TO_SIDE | 2 | 1 | 0 | 1 | 0 |
| REAR_TO_REAR | 1 | 1 | 0 | 1 | 0 |
| REAR_END | 37 | 36 | 0 | 38 | 0 |
| OTHER | 887 | 817 | 41 | 836 | 41 |
| LEFT_TURN | 158 | 152 | 0 | 159 | 0 |
| HEAD_ON | 57 | 52 | 0 | 54 | 0 |
| ANGLE (front to side)(other than left turn) | 812 | 761 | 0 | 777 | 0 |

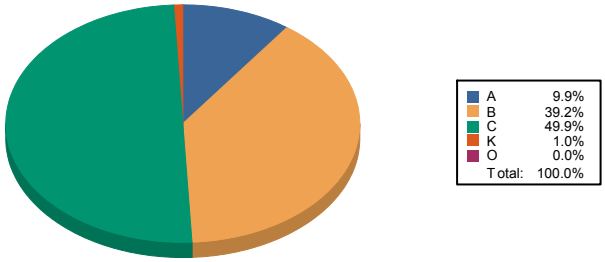
# Safety Analysis Report

## All Arterials and Local Roads Older Driver Crashes by Injury Severity (Phoenix)

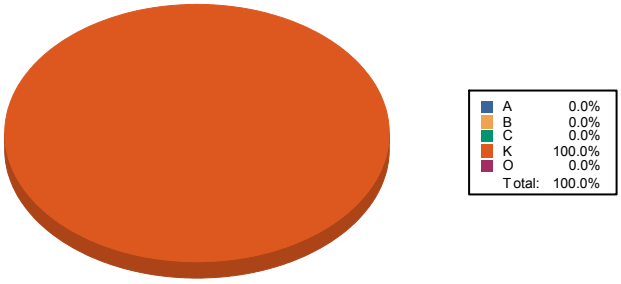
### All Crashes




### Injury Crashes




### Fatal Crashes

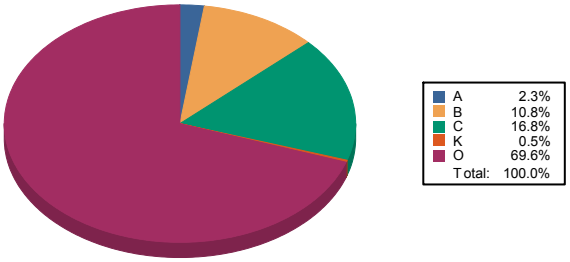



| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 13,652 | 0 | 0 | 0 | 0 |
| C | 3,545 | 3,545 | 0 | 5,248 | 0 |
| B | 2,518 | 2,518 | 0 | 4,127 | 0 |
| A | 572 | 572 | 0 | 1,044 | 0 |
| K | 138 | 0 | 138 | 100 | 141 |

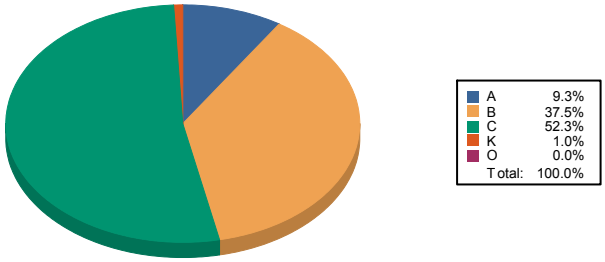
# Safety Analysis Report

## All Arterials and Local Roads Younger Driver Crashes by Injury Severity (Phoenix)

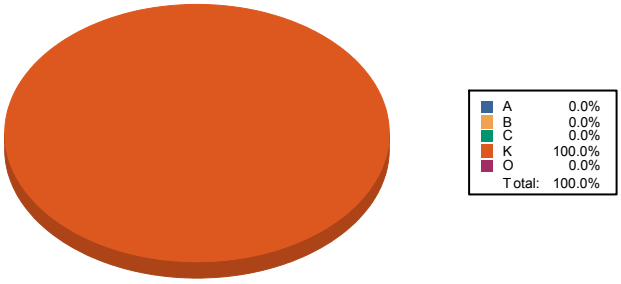
**All Crashes**




**Injury Crashes**




**Fatal Crashes**

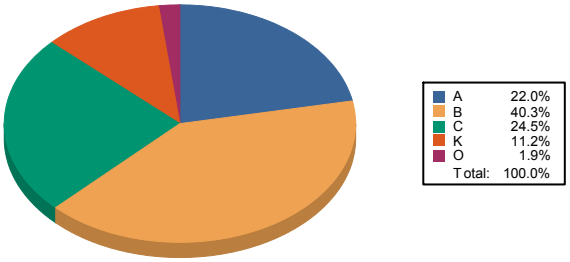



| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 43,511 | 0 | 0 | 0 | 0 |
| C | 10,472 | 10,472 | 0 | 15,597 | 0 |
| B | 6,776 | 6,776 | 0 | 11,170 | 0 |
| A | 1,454 | 1,454 | 0 | 2,773 | 0 |
| K | 300 | 0 | 300 | 286 | 333 |

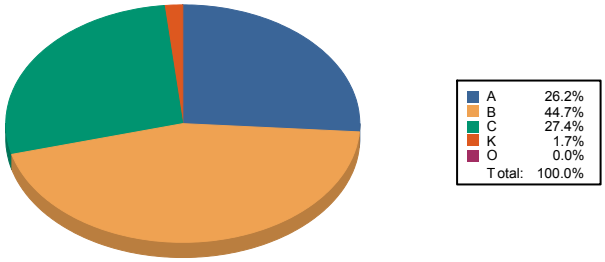
# Safety Analysis Report

## All Arterials and Local Roads Pedestrian Crashes by Injury Severity (Phoenix)

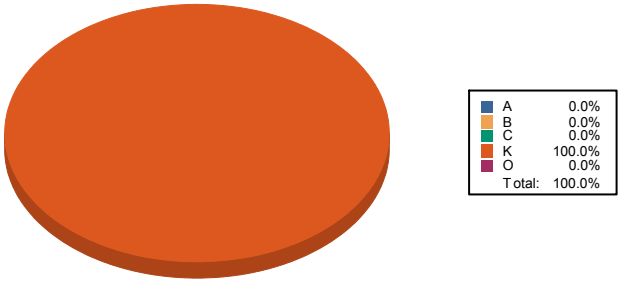
**All Crashes**




**Injury Crashes**




**Fatal Crashes**

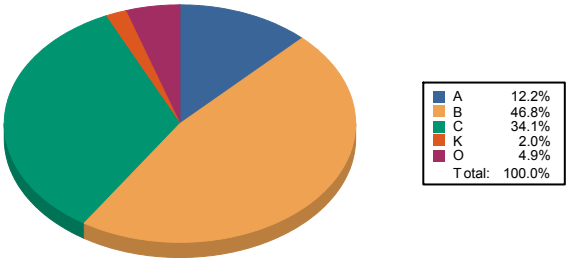



| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 72 | 0 | 0 | 0 | 0 |
| C | 944 | 944 | 0 | 1,021 | 0 |
| B | 1,551 | 1,551 | 0 | 1,664 | 0 |
| A | 848 | 848 | 0 | 974 | 0 |
| K | 431 | 0 | 431 | 63 | 439 |

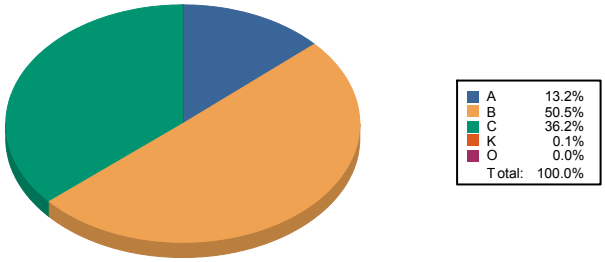
# Safety Analysis Report

## All Arterials and Local Roads Bicyclist Crashes by Injury Severity (Phoenix)

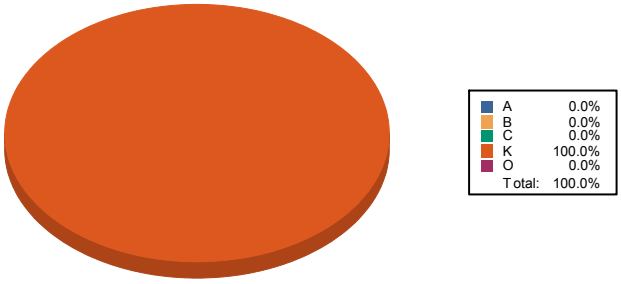
### All Crashes




### Injury Crashes



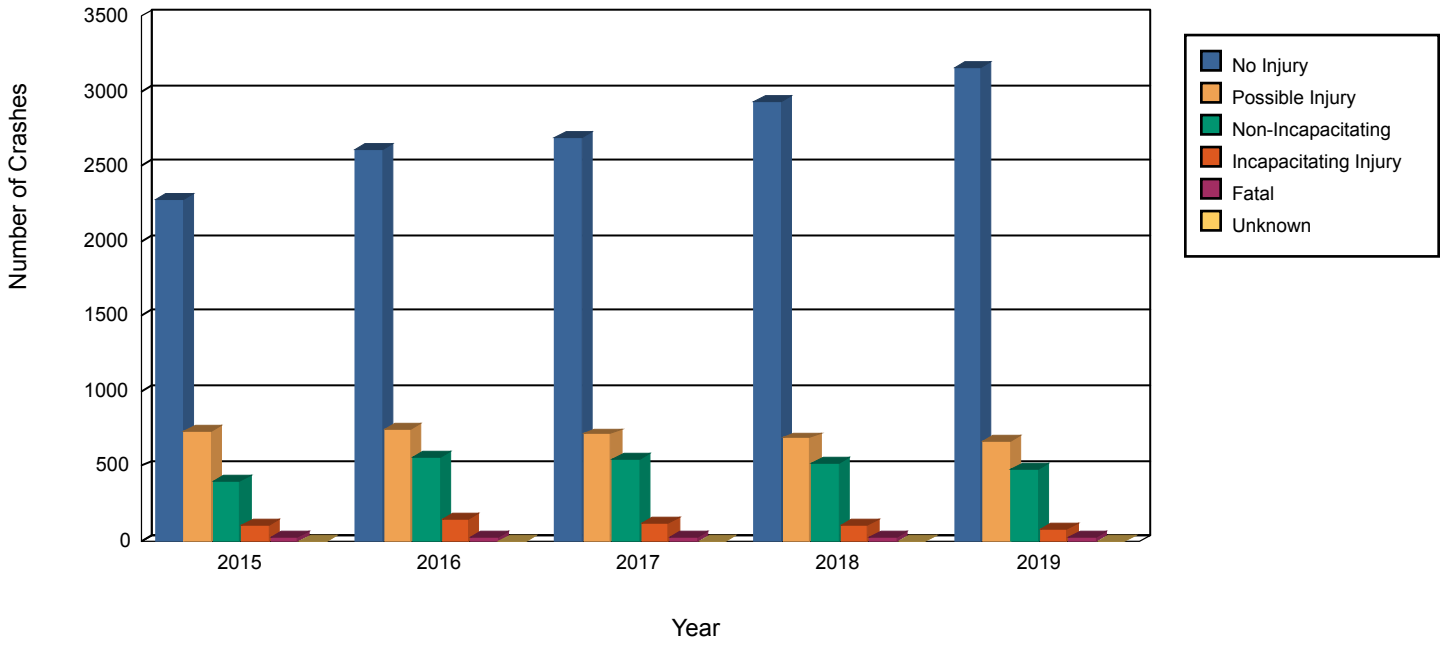

### Fatal Crashes




| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 101 | 0 | 0 | 0 | 0 |
| C | 707 | 707 | 0 | 718 | 0 |
| B | 972 | 972 | 0 | 1,001 | 0 |
| A | 254 | 254 | 0 | 262 | 0 |
| K | 41 | 0 | 41 | 2 | 41 |

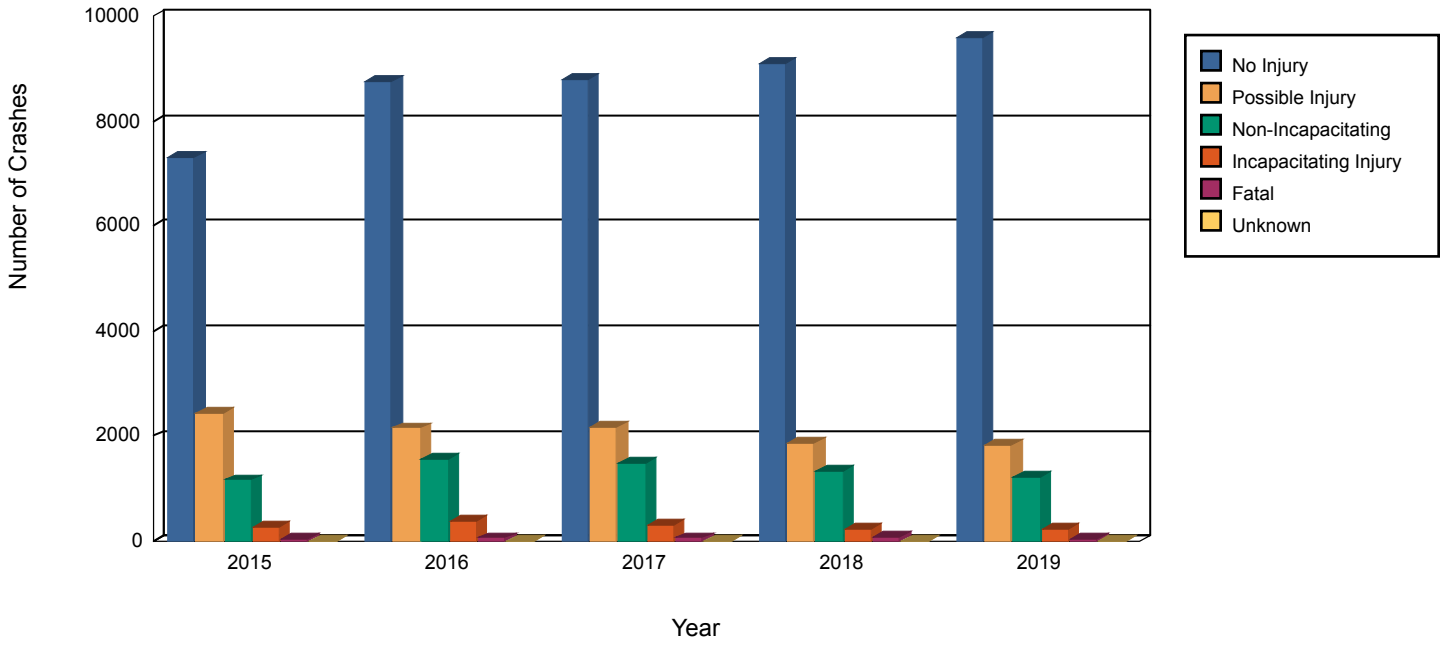
# Safety Analysis Report

## All Arterials and Local Roads Older Driver Crashes by Year (Phoenix)




| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 2,273 | 732 | 403 | 112 | 27 | 0 | 3,547 |
| 2016 | 2,604 | 750 | 559 | 146 | 28 | 0 | 4,087 |
| 2017 | 2,691 | 713 | 552 | 120 | 31 | 0 | 4,107 |
| 2018 | 2,932 | 687 | 519 | 111 | 30 | 0 | 4,279 |
| 2019 | 3,152 | 663 | 485 | 83 | 22 | 0 | 4,405 |

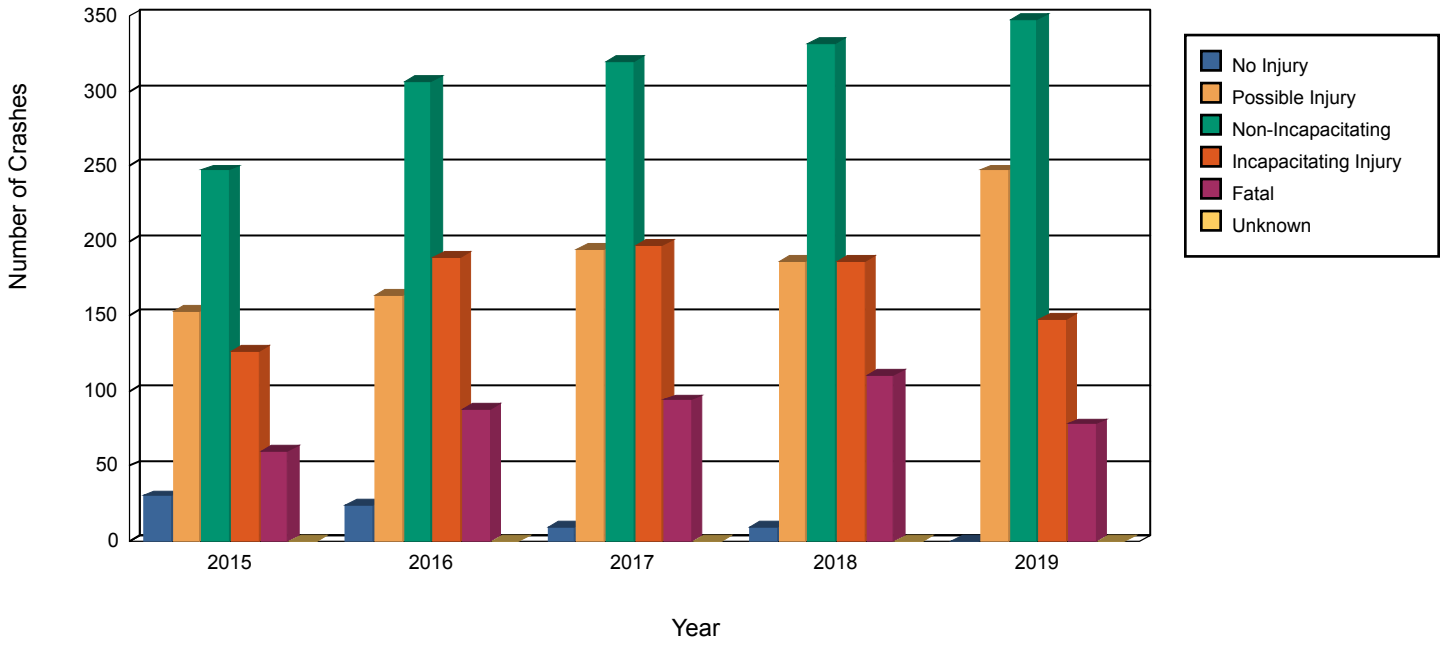
## All Arterials and Local Roads Younger Driver Crashes by Year (Phoenix)




| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 7,302 | 2,448 | 1,163 | 285 | 52 | 0 | 11,250 |
| 2016 | 8,758 | 2,150 | 1,552 | 378 | 59 | 0 | 12,897 |
| 2017 | 8,773 | 2,179 | 1,501 | 313 | 62 | 0 | 12,828 |
| 2018 | 9,089 | 1,859 | 1,334 | 240 | 72 | 0 | 12,594 |
| 2019 | 9,589 | 1,836 | 1,226 | 238 | 55 | 0 | 12,944 |

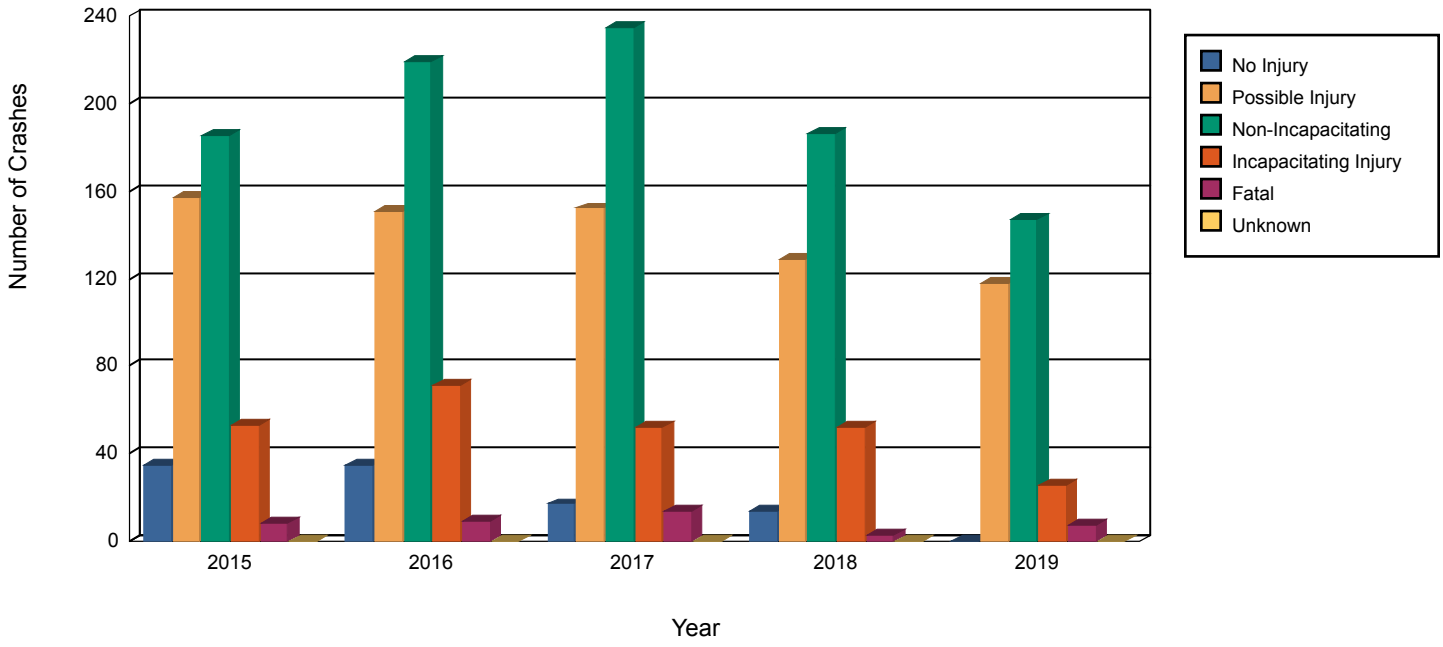
# Safety Analysis Report

## All Arterials and Local Roads Pedestrian Crashes by Year (Phoenix)



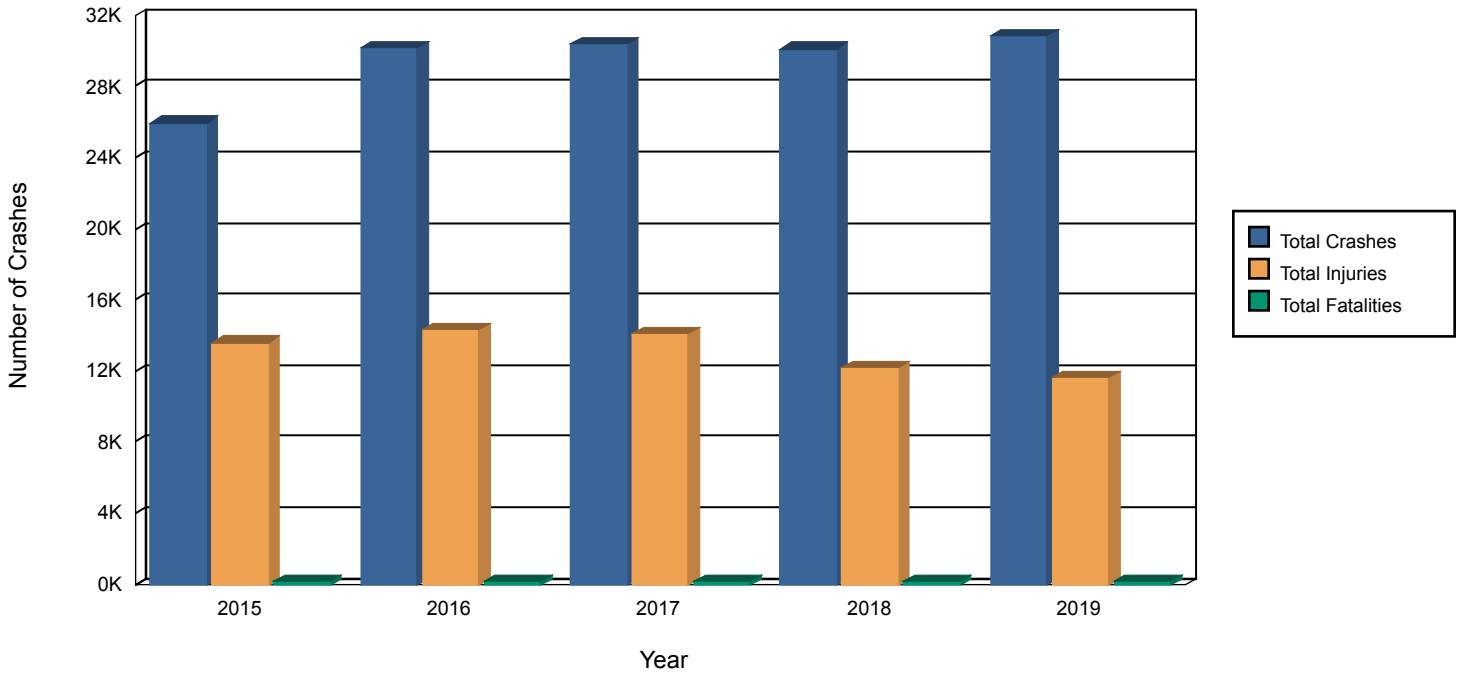

| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 30 | 153 | 247 | 127 | 60 | 0 | 617 |
| 2016 | 24 | 164 | 306 | 189 | 88 | 0 | 771 |
| 2017 | 9 | 194 | 319 | 197 | 94 | 0 | 813 |
| 2018 | 9 | 186 | 332 | 187 | 111 | 0 | 825 |
| 2019 | 0 | 247 | 347 | 148 | 78 | 0 | 820 |

## All Arterials and Local Roads Bicyclist Crashes by Year (Phoenix)



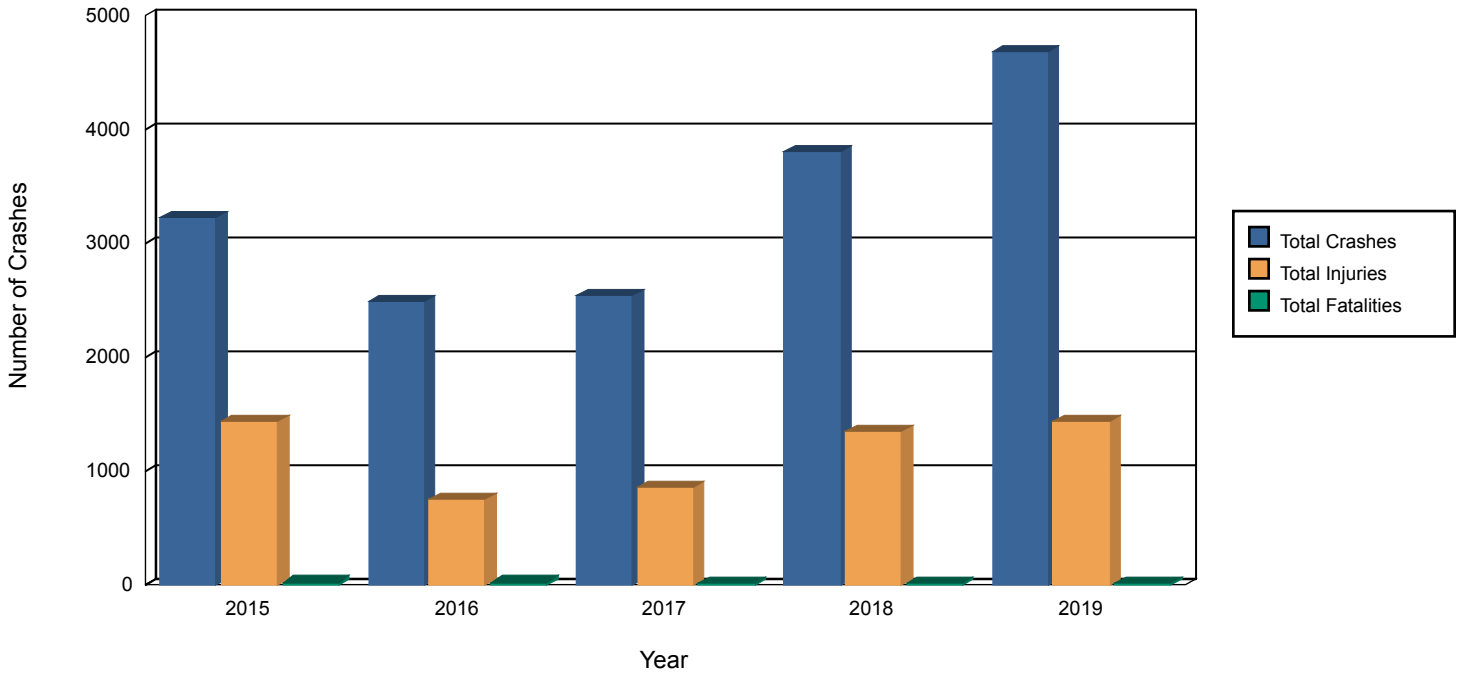

| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 35 | 157 | 185 | 53 | 8 | 0 | 438 |
| 2016 | 35 | 151 | 219 | 71 | 9 | 0 | 485 |
| 2017 | 17 | 152 | 235 | 52 | 14 | 0 | 470 |
| 2018 | 14 | 129 | 186 | 52 | 3 | 0 | 384 |
| 2019 | 0 | 118 | 147 | 26 | 7 | 0 | 298 |

## All Arterials and Local Roads Car Involved Crashes by Year (Phoenix)




| Year | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 2015 | 25,962 | 8,605 | 137 | 13,604 | 147 |
| 2016 | 30,195 | 9,393 | 167 | 14,343 | 175 |
| 2017 | 30,426 | 9,330 | 175 | 14,120 | 185 |
| 2018 | 30,130 | 8,148 | 182 | 12,196 | 197 |
| 2019 | 30,847 | 7,897 | 147 | 11,620 | 155 |

## All Arterials and Local Roads Truck Involved Crashes by Year (Phoenix)

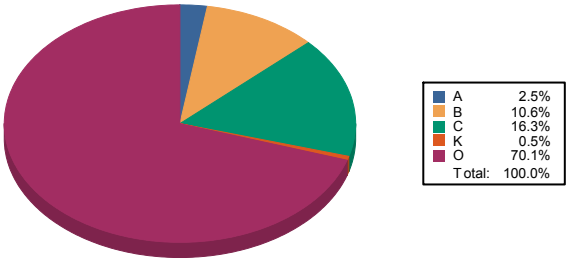



| Year | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| 2015 | 3,218 | 884 | 17 | 1,433 | 19 |
| 2016 | 2,487 | 511 | 19 | 746 | 19 |
| 2017 | 2,543 | 557 | 15 | 847 | 15 |
| 2018 | 3,807 | 905 | 18 | 1,347 | 18 |
| 2019 | 4,683 | 986 | 15 | 1,431 | 18 |

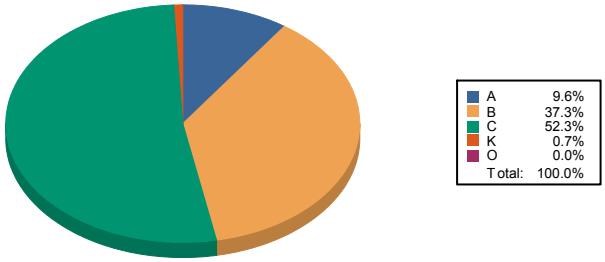
# Safety Analysis Report

## All Arterials and Local Roads Car Involved Crashes by Injury Severity (Phoenix)

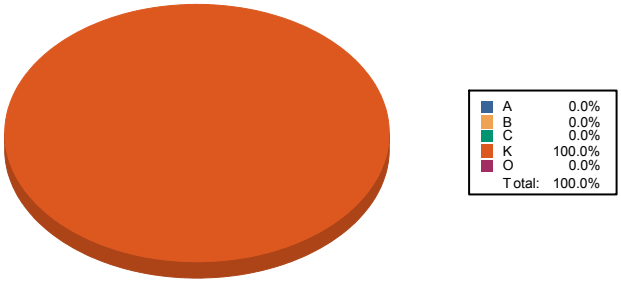
### All Crashes




### Injury Crashes



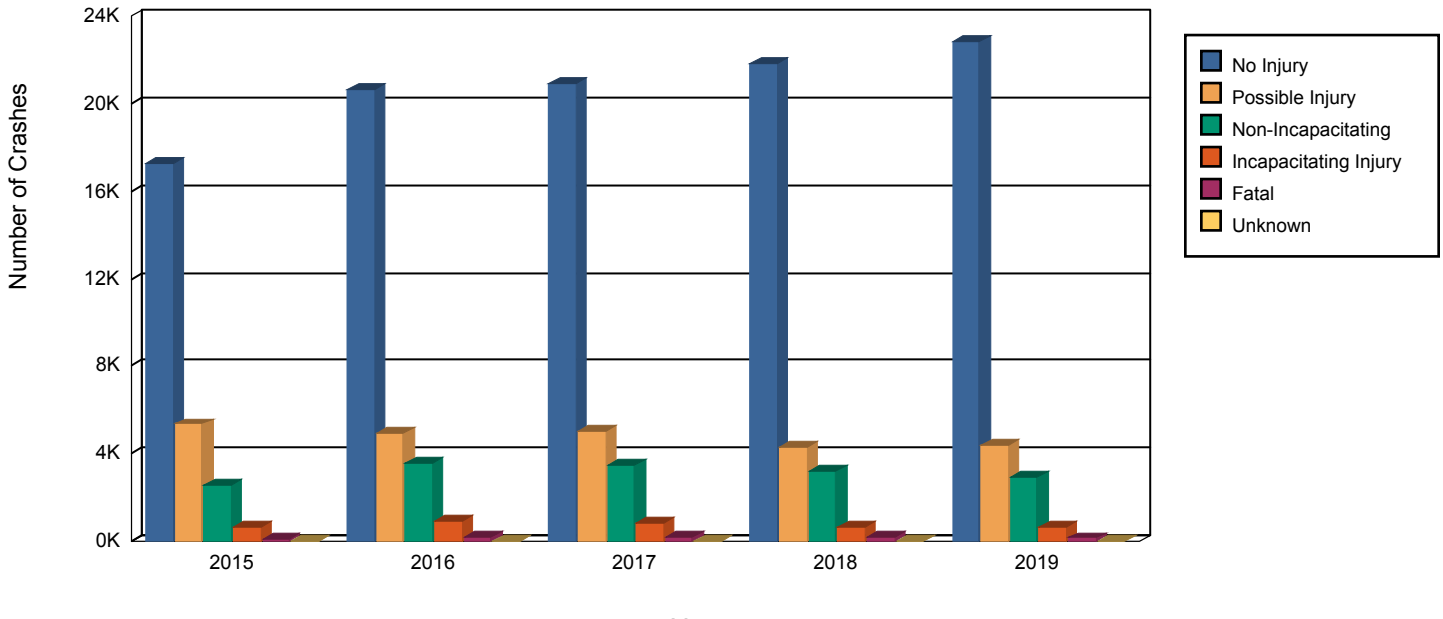

### Fatal Crashes




| Injury Severity | All Crashes | Injury Crashes | Fatal Crashes | Total Injuries | Total Fatalities |
|---|---|---|---|---|---|
| O | 103,379 | 0 | 0 | 0 | 0 |
| C | 23,984 | 23,984 | 0 | 34,446 | 0 |
| B | 15,709 | 15,709 | 0 | 24,602 | 0 |
| A | 3,680 | 3,680 | 0 | 6,343 | 0 |
| K | 808 | 0 | 808 | 492 | 859 |

# Safety Analysis Report

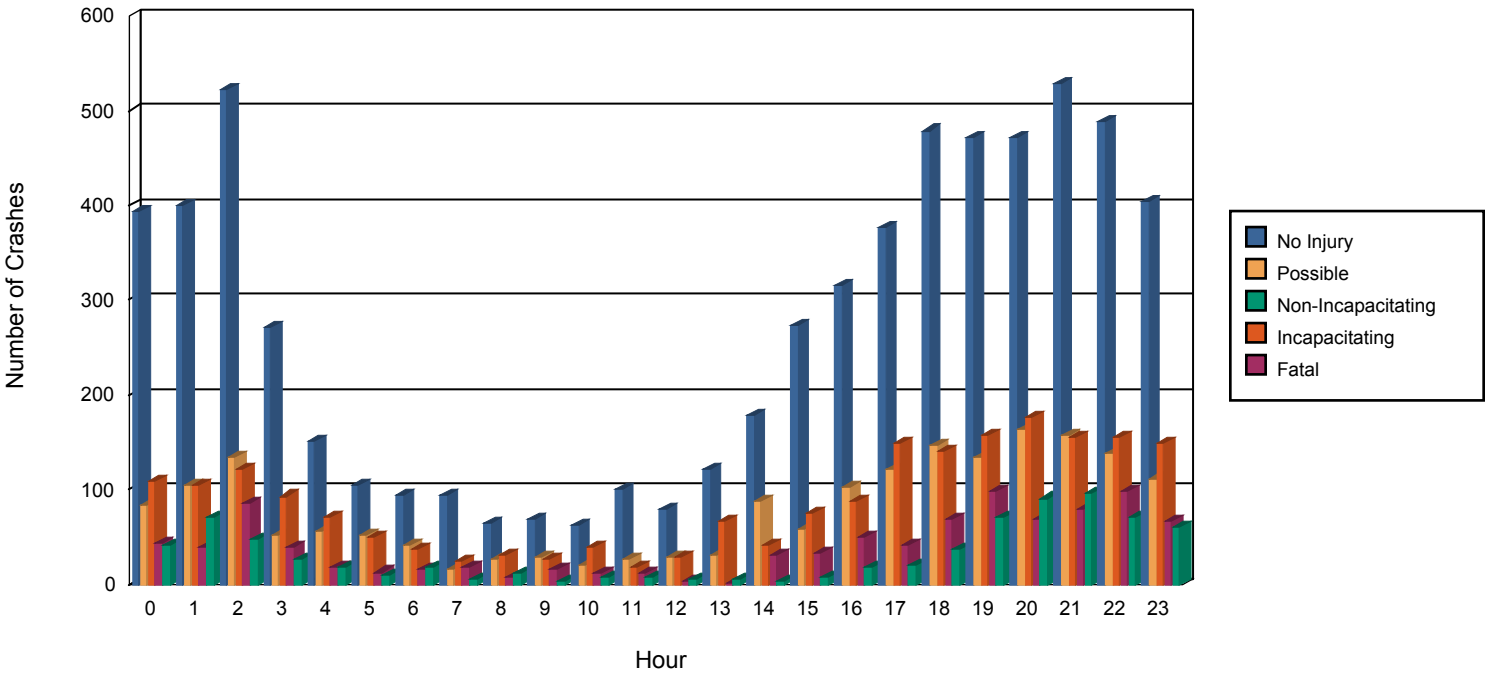
## All Arterials and Local Roads Car Involved Crashes by Year (Phoenix)




| Year | No Injury | Possible Injury | Non Incapacitating | Incapacitating Injury | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 17,220 | 5,347 | 2,589 | 669 | 137 | 0 | 25,962 |
| 2016 | 20,635 | 4,930 | 3,558 | 905 | 167 | 0 | 30,195 |
| 2017 | 20,921 | 5,051 | 3,468 | 811 | 175 | 0 | 30,426 |
| 2018 | 21,800 | 4,275 | 3,200 | 673 | 182 | 0 | 30,130 |
| 2019 | 22,803 | 4,381 | 2,894 | 622 | 147 | 0 | 30,847 |

# Safety Analysis Report

## Alcohol Impaired Drivers, 2015-2019 (Phoenix)



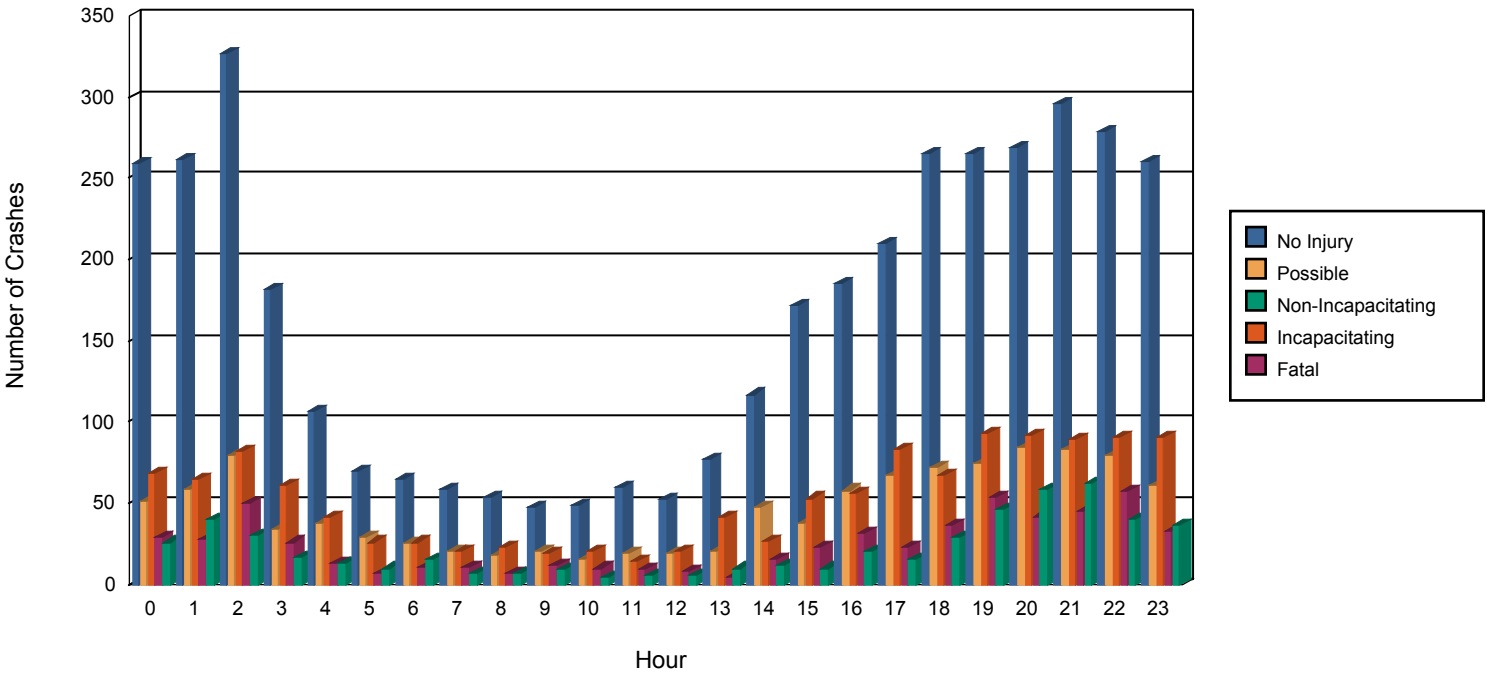

| Hour | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 0 | 394 | 83 | 108 | 43 | 42 | 0 | 670 |
| 1 | 399 | 105 | 104 | 39 | 71 | 0 | 718 |
| 2 | 522 | 135 | 122 | 86 | 47 | 0 | 912 |
| 3 | 271 | 52 | 93 | 40 | 27 | 0 | 483 |
| 4 | 151 | 56 | 70 | 18 | 19 | 0 | 314 |
| 5 | 104 | 51 | 49 | 13 | 10 | 0 | 227 |
| 6 | 95 | 41 | 37 | 16 | 18 | 0 | 207 |
| 7 | 95 | 17 | 25 | 18 | 5 | 0 | 160 |
| 8 | 65 | 26 | 30 | 7 | 11 | 0 | 139 |
| 9 | 69 | 28 | 26 | 16 | 4 | 0 | 143 |
| 10 | 63 | 20 | 39 | 11 | 7 | 0 | 140 |
| 11 | 100 | 27 | 19 | 11 | 7 | 0 | 164 |
| 12 | 79 | 29 | 29 | 4 | 6 | 0 | 147 |
| 13 | 121 | 30 | 67 | 2 | 6 | 0 | 226 |
| 14 | 179 | 87 | 42 | 30 | 4 | 0 | 342 |
| 15 | 273 | 59 | 76 | 33 | 7 | 0 | 448 |
| 16 | 316 | 103 | 87 | 50 | 19 | 0 | 575 |
| 17 | 376 | 121 | 148 | 42 | 21 | 0 | 708 |
| 18 | 479 | 147 | 140 | 68 | 38 | 0 | 872 |

| Hour | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total Total |
|---|---|---|---|---|---|---|---|
| 19 | 472 | 135 | 158 | 99 | 70 | 0 | 934 |
| 20 | 472 | 164 | 176 | 69 | 91 | 0 | 972 |
| 21 | 529 | 158 | 155 | 80 | 96 | 0 | 1,018 |
| 22 | 489 | 139 | 156 | 99 | 70 | 0 | 953 |
| 23 | 404 | 112 | 149 | 67 | 61 | 0 | 793 |

**Filters:**
TrafficUnit.UnitType = DRIVER
Person.Physical = ALCOHOL
Year Between 2015 2019

# Safety Analysis Report

## Impaired Drivers 2015 - 2019 (Phoenix)



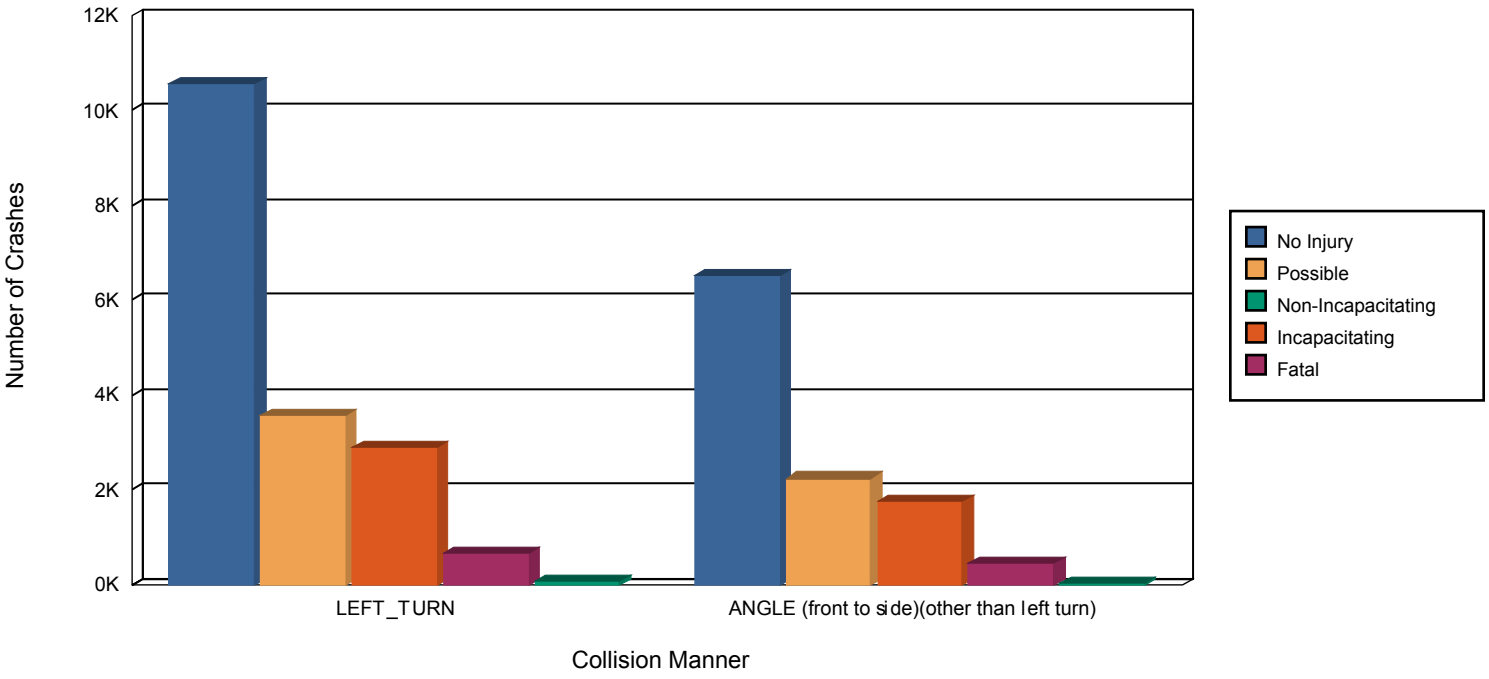

| Hour | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 0 | 259 | 51 | 68 | 29 | 26 | 0 | 433 |
| 1 | 261 | 59 | 65 | 28 | 40 | 0 | 453 |
| 2 | 327 | 79 | 82 | 50 | 30 | 0 | 568 |
| 3 | 182 | 34 | 61 | 26 | 17 | 0 | 320 |
| 4 | 107 | 38 | 41 | 13 | 13 | 0 | 212 |
| 5 | 70 | 29 | 26 | 7 | 10 | 0 | 142 |
| 6 | 65 | 25 | 26 | 11 | 16 | 0 | 143 |
| 7 | 59 | 20 | 20 | 11 | 7 | 0 | 117 |
| 8 | 54 | 18 | 23 | 7 | 7 | 0 | 109 |
| 9 | 48 | 20 | 19 | 12 | 9 | 0 | 108 |
| 10 | 49 | 16 | 20 | 10 | 4 | 0 | 99 |
| 11 | 60 | 19 | 14 | 9 | 6 | 0 | 108 |
| 12 | 52 | 19 | 21 | 8 | 6 | 0 | 106 |
| 13 | 77 | 21 | 41 | 4 | 10 | 0 | 153 |
| 14 | 117 | 48 | 27 | 16 | 12 | 0 | 220 |
| 15 | 172 | 38 | 53 | 23 | 10 | 0 | 296 |
| 16 | 185 | 58 | 56 | 32 | 21 | 0 | 352 |
| 17 | 210 | 67 | 83 | 23 | 15 | 0 | 398 |
| 18 | 265 | 72 | 67 | 36 | 29 | 0 | 469 |

| Hour | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total Total |
|---|---|---|---|---|---|---|---|
| 19 | 265 | 75 | 93 | 54 | 46 | 0 | 533 |
| 20 | 269 | 84 | 92 | 42 | 59 | 0 | 546 |
| 21 | 296 | 83 | 89 | 45 | 62 | 0 | 575 |
| 22 | 279 | 79 | 91 | 57 | 40 | 0 | 546 |
| 23 | 260 | 61 | 91 | 33 | 36 | 0 | 481 |

**Filters:**
Person.PersonType = DRIVER
Year Between 2015 2019
Person.Physical = ALCOHOL,DRUGS

# Safety Analysis Report

## Signalized Intersection Left Turn and Angle Collisions 2015 - 2019 (Phoenix)




| Collision Manner | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| LEFT_TURN | 10,555 | 3,555 | 2,880 | 656 | 72 | 0 | 17,718 |
| ANGLE (front to side)(other than left turn) | 6,523 | 2,244 | 1,751 | 445 | 44 | 0 | 11,007 |

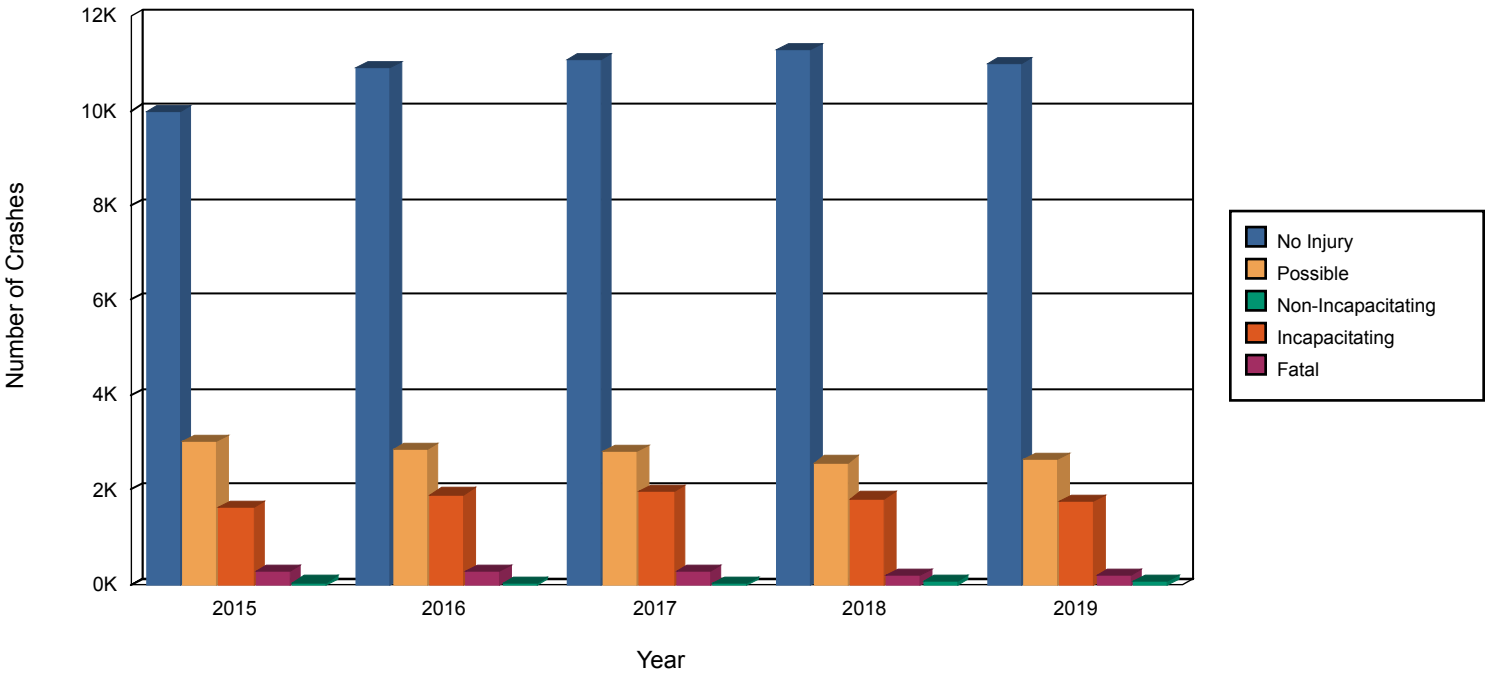
**Filters:**

Incident.CollisionManner = ANGLE (front to side)(other than left turn),LEFT_TURN
TrafficUnit.ControlType = TRAFFIC_CONTROL_SIGNAL,FLASHING_TRAFFIC_CONTROL_SIGNAL,SIGNAL

Year Between 2015 2019

# Safety Analysis Report

## Speed-Related Collisions 2015 - 2019 (Phoenix)




| Year | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 9,974 | 3,017 | 1,631 | 268 | 48 | 0 | 14,938 |
| 2016 | 10,894 | 2,860 | 1,902 | 297 | 39 | 0 | 15,992 |
| 2017 | 11,084 | 2,795 | 1,967 | 261 | 41 | 0 | 16,148 |
| 2018 | 11,282 | 2,580 | 1,818 | 199 | 54 | 0 | 15,933 |
| 2019 | 10,980 | 2,623 | 1,743 | 201 | 51 | 0 | 15,598 |

**Filters:**

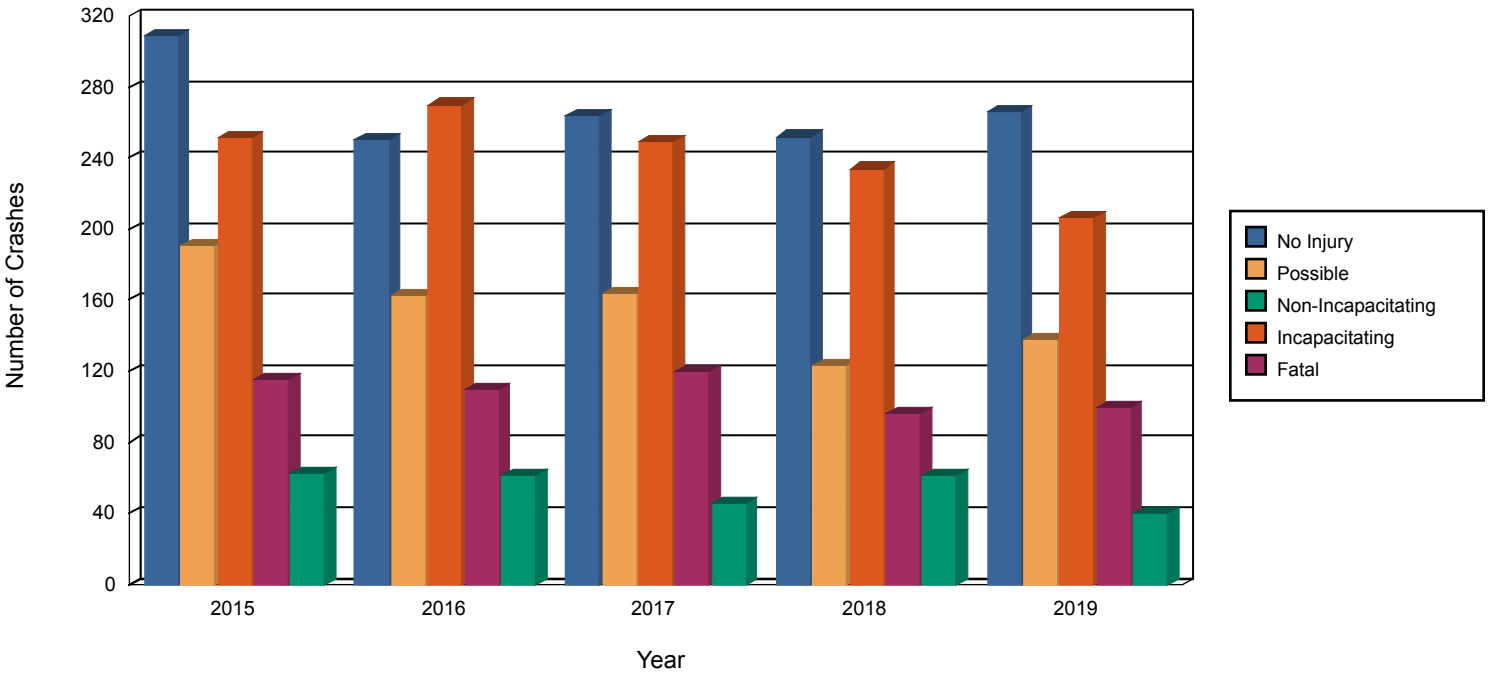
Person.Violation = SPEED_TO_FAST_FOR_CONDITIONS,EXCEEDED_LAWFUL_SPEED

Person.PersonType = DRIVER

Year Between 2015 2019

# Safety Analysis Report

## Unrestrained Driver Collisions 2015 - 2019 (Phoenix)




| Year | No Injury | Possible Injury | Non-Incapacitating | Incapacitating | Fatal | Unknown | Total |
|---|---|---|---|---|---|---|---|
| 2015 | 309 | 191 | 251 | 115 | 63 | 0 | 929 |
| 2016 | 250 | 163 | 270 | 110 | 61 | 0 | 854 |
| 2017 | 264 | 164 | 249 | 120 | 46 | 0 | 843 |
| 2018 | 252 | 123 | 234 | 96 | 61 | 0 | 766 |
| 2019 | 266 | 138 | 206 | 100 | 40 | 0 | 750 |

**Filters:**

Year Between 2015 2019
Person.PersonType = DRIVER
Person.SafetyDevice = None Used

# APPENDIX B: HIGH INJURY NETWORK (HIN)

## BACKGROUND

Development of the High Injury Network (HIN), or the mapping of corridors where high numbers of people have been killed and severely injured in traffic crashes, is a tool for road safety initiatives. This approach will help city staff focus limited resources on what's needed and where so that funds can be invested in the areas that are most impacted by death and injury. Further data analysis of roadway characteristics along the HIN will allow for identification and assignment of appropriate design solutions.

The HIN was and should continue to be used during the public engagement process to build greater public and political buy-in for changes. The HIN may also be used to inform decisions during cross-departmental collaboration and about prioritizing investments, safe street improvements, education, and police enforcement.

## CITY OF PHOENIX HIGH INJURY NETWORK (HIN) METHODOLOGY

The City of Phoenix's HIN used a 5-year historical data set (2016-2020) from the ADOT statewide crash database that included 5,473 motor vehicles crashes that resulted in serious injury or death (KSI). This data was separated into the two non-overlapping categories of Signalized Intersections (150-foot circular buffer from the center of intersections with a traffic signal or HAWK beacon) and Corridors (linear arterial and collector roadway segments).

From this dataset, it was brought into ESRI ArcGIS and location codes and joining exercises were done to connect crash data points to roads/corridors or at intersections. Once this was done, crashes per mile for corridors and crashes per intersection were calculated. The final stage was using the ESRI statistics to understand the standard deviation of crashes per mile and crashes per intersection. Standard deviation is a measure of how spread out a set of data is. The greater frequency of KSI crashes, the higher the standard deviation, which indicates the farther away the location is from the city-wide average. Locations with zero KSI crashes were included in their respective datasets.

After identifying the standard deviation of the crashes per mile and crashes per intersection, a classification analysis in ESRI was done that grouped the crashes per mile via its standard deviation into 5 groups.

Once the output from the data analysis was mapped, the RSAP project management team reviewed outcomes and decided to include signalized Intersections with 6 or more KSI crashes (standard deviation > 1.98) and corridors with 12 or more KSI crashes per mile (standard deviation > 2.17) on the HIN. After identifying the standard deviation of the crashes per mile and crashes per intersection, a classification analysis in ESRI was done that grouped the crashes per mile via its standard deviation into 5 groups.

### Intersections

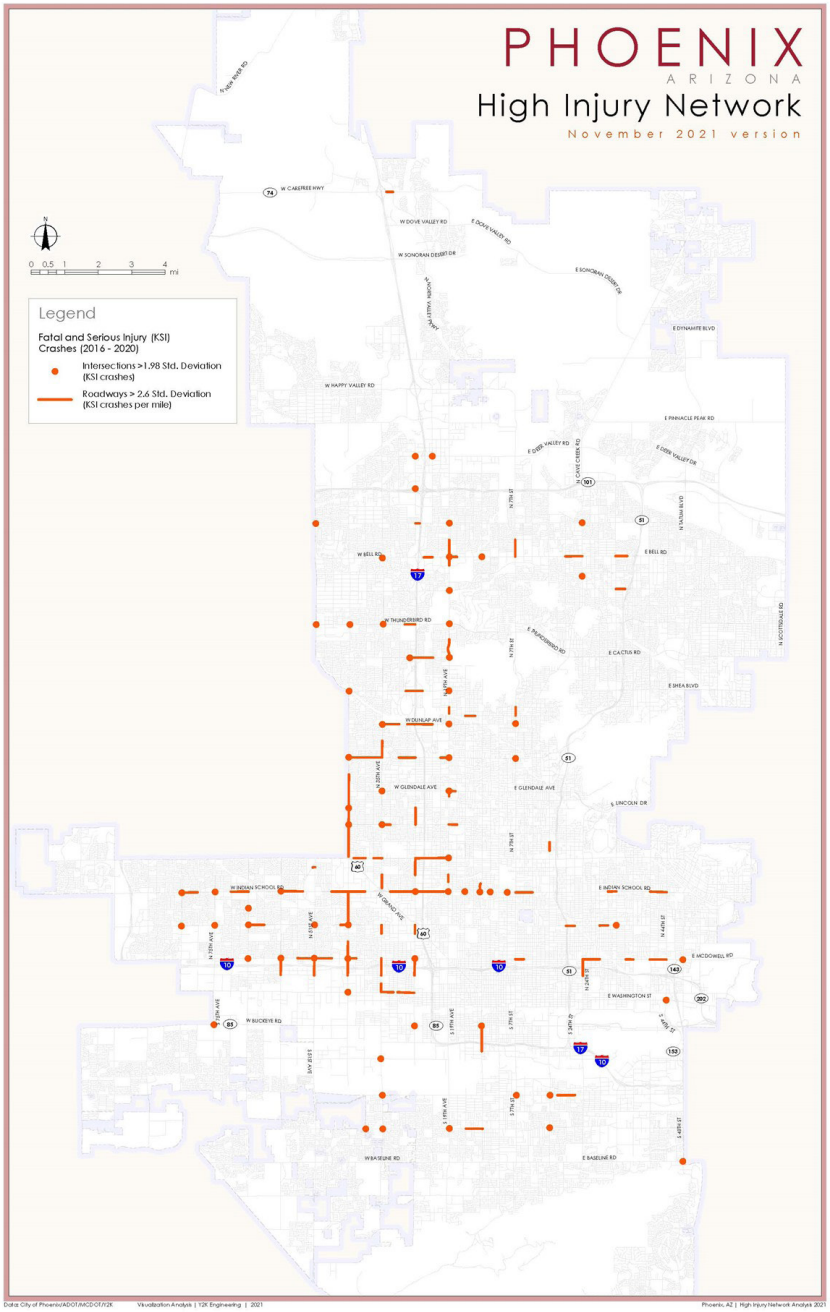
The City of Phoenix HIN identifies 68 signalized intersections with the highest propensity of KSI crashes. This group represents less than 6% of Phoenix's signalized intersections and 12% of all KSI crashes.

**TABLE 1 : ALPHABETIZED LIST OF NOV 2021 HIN INTERSECTIONS**

| Location | Location (Cont) | Location (Cont) |
|---|---|---|
| 3RD AVE & INDIAN SCHOOL RD | 23RD AVE & DEER VALLEY RD | 43RD AVE & THUNDERBIRD RD |
| 3RD ST & INDIAN SCHOOL RD | 27TH AVE & BEARDSLEY RD | 43RD AVE & VAN BUREN ST |
| 7TH AVE & BELL RD | 27TH AVE & BUCKEYE RD | 44TH ST & WASHINGTON ST |
| 7TH AVE & BUCKEYE RD | 27TH AVE & DEER VALLEY RD | 48TH ST & BASELINE RD |
| 7TH AVE & INDIAN SCHOOL RD | 27TH AVE & INDIAN SCHOOL RD | 48TH ST & CHANDLER BLVD |
| 7TH ST & BROADWAY RD | 27TH AVE & MCDOWELL RD | 48TH ST & MCDOWELL RD |
| 7TH ST & CAVE CREEK RD | 28TH DR & CACTUS RD | 51ST AVE & MCDOWELL RD |
| 7TH ST & NORTHERN AVE | 32ND ST & THOMAS RD | 51ST AVE & THOMAS Rd |
| 15TH AVE & INDIAN SCHOOL RD | 35TH AVE & BELL RD | 51ST AVE & THUNDERBIRD RD |
| 16TH ST & BROADWAY RD | 35TH AVE & BETHANY HOME RD | 51ST AVE & UNION HILLS DR |
| 16TH ST & SOUTHERN AVE | 35TH AVE & BROADWAY RD | 59TH AVE & INDIAN SCHOOL RD |
| 19TH AVE & BELL RD | 35TH AVE & DUNLAP AVE | 59TH AVE & MCDOWELL RD |
| 19TH AVE & CACTUS RD | 35TH AVE & GLENDALE AVE | 67TH AVE & MCDOWELL RD |
| 19TH AVE & CAMELBACK RD | 35TH AVE & LOWER BUCKEYE RD | 67TH AVE & OSBORN RD |
| 19TH AVE & DUNLAP AVE | 35TH AVE & SOUTHERN AVE | 67TH AVE & THOMAS RD |
| 19TH AVE & GLENDALE AVE | 35TH AVE & THUNDERBIRD RD | 75TH AVE & BUCKEYE RD |
| 19TH AVE & GREENWAY RD | 39TH AVE & SOUTHERN AVE | 75TH AVE & INDIAN SCHOOL RD |
| 19TH AVE & INDIAN SCHOOL RD | 43RD AVE & BETHANY HOME RD | 75TH AVE & THOMAS RD |
| 19TH AVE & NORTHERN AVE | 43RD AVE & MARYLAND AVE | 83RD AVE & INDIAN SCHOOL RD |
| 19TH AVE & PEORIA AVE | 43RD AVE & MCDOWELL RD | 83RD AVE & THOMAS RD |
| 19TH AVE & SOUTHERN AVE | 43RD AVE & NORTHERN AVE | CAVE CREEK RD & GREENWAY PKWY |
| 19TH AVE & THUNDERBIRD RD | 43RD AVE & PEORIA AVE | - |

## Segments

The City of Phoenix HIN identifies 87 roadway segments that have the highest propensity of KSI crashes. This group represents less than 3% of Phoenix's roads and 12% of all KSI crashes. A map of the HIN is provided below:



## HIN PROJECT CONSOLIDATION AND CROSS CHECK

**Step 1:** There were an original 155 locations (intersections and segments) on the HIN. After a review of intersecting, connecting, related, or contiguous locations that included review of projects that were recently completed, in process, or programmed the 155 locations were consolidated to 98 Projects. It is noted that there are some locations that did not move forward to projects based on need to hold due to upcoming projects or study efforts.

**Step 2:** Once the 98 Projects were identified, a high-level project type was assigned: Intersection Improvement, Corridor, or Corridor and Intersection Improvement. The Corridor and Intersection Improvement project type indicates that there was a consolidation of an intersection and a segment from the HIN.

**Step 3:** RSAP Equity Analysis and SS4A Underserved Communities (Federal40 Initiative) were evaluated next. Of the 98 Projects, 61 are identified in BOTH the RSAP Equity Analysis and the SS4A Underserved Communities. To determine if the Project was included in the RSAP Equity Analysis and SS4A Underserved Communities, a spatial review was completed. If a Project was either fully included, adjacent - one side of street, or at least one corner (intersections) of the RSAP Equity Analysis and SS4A Underserved Communities, the result is a 'yes.'

17 of the 98 Projects (not in the 61) are identified as part of the SS4A Underserved Communities, but not in the RSAP Equity Analysis. 2 of the 98 Projects (not in the 61) are identified as part of RSAP Equity Analysis, but not in the SS4A Underserved Communities. And 17 Projects are not identified in either.

**Step 4:** Understanding that this information will be used to consider projects for the SS4A grant application (2022) and to develop the implementation plan, the next step reviewed a series of capital and operation programs that include: the Phoenix Street Transportation CIP, Phoenix T2050 Major Arterial Program, Phoenix T2050 Mobility Areas, and the MAG Momentum 2050 plan. Phoenix staff also conducted a manual review of the project list to determine if any were recently completed, partially completed, or programmed. Projects that were substantially completed as of August 2022 were removed.

## HIN PROJECT PRIORITIZATION

To determine which locations should be prioritized and implemented, two factors were applied per type of project category: Intersections, Segments, and Composite (Segments + Intersections).

First, the locations were rank ordered by the amount of KSI crashes in that project type group, then the group was divided into thirds: Tiers 1, 2, and 3.

Then, within each Tier group, the locations were prioritized if it is part of an area of need determined by the Phoenix RSAP Equity Analysis. If the location is either fully in, adjacent – one side, or at least one corner (intersections), it is noted as a 'yes.'

Phoenix staff also conducted a manual review of the project list to determine if any were recently completed, partially completed, or programmed. Projects that were substantially completed as of August 2022 were removed.

## THE HIN AS A ROAD SAFETY TOOL

A high-level review of potential contributing factors and roadway characteristics along the HIN was performed during development of the Road Safety Action Plan. Further site specific evaluation may be required for identification and assignment of appropriate solutions at these high risk locations. The HIN should be updated every three years based on the most recent five years of crash data and continue to be used to inform decisions during cross-departmental collaboration and about prioritizing investments, safe street improvements, education, and police enforcement. The HIN is one of several tools and strategies the city will use to improve road safety. Locations outside of the HIN will not be precluded from funding and implementation of safety improvements

# APPENDIX C: ROAD SAFETY TOOLBOXES

## BACKGROUND

To support the implementation of various strategies presented in this Plan, the City of Phoenix will utilize proven best practices, guidelines, toolkits, and handbooks from external organizations that include the Federal Highway Administration (FHWA), National Cooperative Highway Research Program (NCHRP), National Highway Traffic Safety Administration (NHTSA), and the Institute of Transportation Engineers (ITE). These resources are collectively referred to as toolboxes. Several toolboxes have been identified that relate to the Strategies in this Plan and are organized by Focus Area. They are to be used to support advancing the RSAP strategies, apply proven engineering, enforcement, education, and evaluation designs and methods, and as quick references to determine how to best approach and solve a traffic safety issues within the city. This is not an exhaustive list of resources that apply to road safety.

## GENERAL STRATEGIES

**Lessons Learned from Development of Vision Zero Action Plans, FHWA-SA-20-073, January 2021.**

https://safety.fhwa.dot.gov/zerodeaths/docs/FHWA-SA-20-073_Lessons_Learned_from_Development_of_Vision_Zero_Action_Plans.pdf

*The FHWA assisted in the development of Vision Zero Action Plans (VZAPs) for two communities—City of Daly City (California) and Macon-Bibb County (Georgia). The VZAPs serve as a framework that details goals, objectives, and action items, using the Safe System Approach to the extent possible, to implement the safety programs that will guide each community toward zero fatalities. The Transportation Safety Planning and the Zero Deaths Vision: A Guide for Metropolitan Planning Organizations and Local Communities served as a guiding document in the processes. The purpose of this report is to summarize and generalize the two communities' plan-development processes. This report also includes information on opportunities, challenges and lessons learned.*

**Strategies to Coordinate Zero Deaths Efforts for State and Local Agencies, FHWA-SA-20-061, November 2020.**

https://safety.fhwa.dot.gov/zerodeaths/docs/Strategies_for_VZ_Coordination_112020.pdf

*The document is designed to help State and local agencies foster and build stronger relationships that support coordinated zero deaths efforts. The document describes work toward the Safe System Approach for reaching the zero deaths goal, including managing speed for safety, strengthening safety*

*culture, and leveraging data and community input to prioritize changes.*

**Transportation Safety Planning and the Zero Deaths Vision: A Guide for Metropolitan Planning Organizations and Local Communities, FHWA-SA-18-024, August 2018**.

https://safety.fhwa.dot.gov/tsp/fhwasa18024/MPOLocalSafetyPlanGuide_508compliant.pdf

*This document provides references to key information for metropolitan planning organizations and local communities to understand the safety planning process and develop their own local or regional safety plan.*

**Primer on Safe System Approach for Pedestrians and Bicyclists, FHWA-SA-21-065, May 2021**

https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa21065.pdf

*The Safe System approach acknowledges that humans make mistakes and, importantly, are vulnerable to the forces that occur during a crash. By focusing on eliminating fatal and serious injuries the Safe System approach inherently places a priority on pedestrians and bicyclists, who are at a higher risk of fatal or serious injury than a person driving or traveling in a motor vehicle. The purpose of this primer is to provide transportation agencies a baseline understanding of the Safe System approach and how it relates to bicycle and pedestrian safety.*

**A Strategic Approach to Transforming Traffic Safety Culture to Reduce Deaths and Injuries NCHRP Web-Only Document 252, 2018**

https://nap.nationalacademies.org/download/25286#

*A strategic approach to transform traffic safety culture should leverage the values and change the beliefs of all relevant traffic safety stakeholders across the social environment. The purpose of this report is to provide state agencies responsible for traffic safety (and their traditional, as well as non-traditional, traffic safety partners) with guidance for a strategic approach to transform the traffic safety culture of road users and stakeholders. The goal is to use this approach to sustain improvements in traffic safety for all road users, including non-motorized users.*

**Traffic Safety Culture Primer, Montana DOT, August 2019**

https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/tsc/TSC_PRIMER/PRIMER.pdf

*This primer provides a definition of traffic safety culture and explain how it influences road user behavior and traffic safety. With this understanding, traffic safety stakeholders can communicate to colleagues, existing and new partners, and leaders about its importance. Ultimately, growing a positive traffic safety culture needs to be integrated into safety planning processes including Strategic Highway Safety Plans*

*(among others). The report defines traffic safety culture as a system of beliefs about traffic safety. A basic model is presented that shows the relationship between belief systems and behaviors, which can affect traffic safety.*

**Guidance for Evaluating Traffic Safety Culture Strategies, FHWA/MT-21-001/8882-309-14, January 2021**

https://rosap.ntl.bts.gov/view/dot/55813/dot_55813_DS1.pdf

*This report summarizes a project that conducted a literature review of current practices in the evaluation of traffic safety culture strategies. This review focused on transportation safety literature but also extended to evaluating safety culture in other public health sectors. A description of the literature was provided as a report, which was also converted to a journal submission. A separate resource document was created to provide traffic safety stakeholders with guidance about the steps and conditions that are necessary for the evaluation of traffic safety culture strategies.*

**A Primer for Traffic Safety Culture, ITE Journal, May 2014**

https://westerntransportationinstitute.org/wp-content/uploads/2018/01/ITEJMay_TrafficSafetyCulturePrimer_Ward_Otto_linkenbach.pdf

*In November 2013, ITE Journal reported on the Institute of Transportation Engineers' participation in the first National Roadway Safety Culture Summit that took place in August 2013. The article, "Partnering Across Disciplines for Traffic Culture Change" detailed the summit's focus on the impact safety culture has on roadway crashes and how that culture can contribute to eliminating fatalities and serious injuries on roadways. The summit concluded with a call to action to create a toolkit, best practices, and guidance on models for measuring behavior and changes for reliability, validity, and interventions. Work is ongoing to develop a common, tangible definition of traffic safety culture and the associated materials to help promote it.*

**Sustainable & Safe: A Vision and Guidance for Zero Road Deaths, World Resources Institute, 2015.**

https://files.wri.org/d8/s3fs-public/sustainable-safe.pdf

*This report is to facilitate the application of the Safe System approach to road safety. It provides an overview of the concepts and evidence behind a Safe System, discusses the relevance of this approach to low- and middle-income countries, and the wider benefits to health and the environment, and presents practical guidance that can be applied to develop a strategy and action plan to reduce traffic deaths while also achieving broader sustainability goals. The guidance focuses on action areas that have been shown to save lives and reduce serious injuries.*

**Safe Systems: Guiding Principles and International Applications, CSCRS-R7, Collaborative Sciences Center for Road Safety, Chapel Hill, NC, June 2019**

https://www.roadsafety.unc.edu/wp-content/uploads/2019/07/CSCRS_R3_Final-Report.pdf

*This report examines the state-of-the-practice in Safe Systems. It is divided into two sections. The first examines the concept of Safe Systems, focusing on our emerging understanding of crash causation, as well as how this understanding may be applied to integrate safety considerations into transportation practice in the United States. The second presents a review of the practices of the four countries with the most established Safe Systems programs— Sweden, the Netherlands, Australia, and New Zealand—and details how each has structured their approach to road safety around Safe Systems principles.*

**Guidebook on Identification of High Pedestrian Crash Locations, FHWA-HRT-17-106, April 2018**.

https://www.fhwa.dot.gov/publications/research/safety/17106/17106.pdf

*This guidebook documents methods and examples used to identify or prioritize high pedestrian crash sites to assist State and local agencies in identifying high pedestrian crash locations such as intersections (points), segments, facilities, and areas. The process of identifying high pedestrian crash locations results in a prioritized list of potential locations on the roadway system that could benefit from safety improvement projects. Discusses performance measures and provides information on six different screening methods for identifying high pedestrian crash locations*

**FHWA Road Safety Audit Guidelines, FHWA-SA-06-06, 2006**

https://safety.fhwa.dot.gov/rsa/guidelines/documents/FHWA_SA_06_06.pdf

*The purpose of this document is to provide a foundation for public agencies to draw upon when developing their own Road Safety Audit (RSA) policies and procedures and when conducting RSAs within their jurisdiction. The availability of a consistent guideline is anticipated to lead to a better understanding of the core concepts of RSAs and to promote their use. An RSA program can range from something very simple to the full integration of safety into every stage of each project.*

## BEHAVIOR RELATED STRATEGIES

**Arizona Department of Transportation Traffic Safety for School Areas Guidelines, 2006**

https://azdot.gov/sites/default/files/2019/07/adot-traffic-safety-for-school-area-guidelines.pdf

*Provides guidelines for school zone traffic control and enforcement for Arizona. The guidelines are*

*published by the Arizona Department of Transportation (ADOT) and apply to the entire Arizona Highway System. These guidelines are applicable to school officials (public and private), school planners, traffic engineers, police, and other public safety personnel throughout Arizona. They identify the role for local officials, parents, and school officials in school area traffic control.*

**Bicycle Safety Education for Children From a Developmental and Learning Perspective, DOT HS 811 880, January 2014**

https://www.nhtsa.gov/sites/nhtsa.gov/files/bicycle_safety_education_for_children-811880.pdf

*The purpose of this literature review is two-fold. First, this report describes the nature of children and adolescents' bicycle injuries in addition to understanding the types of programs that exist and their effectiveness. Second, this report explores the psychological domains related to riding a bicycle in childhood and adolescence such as motor skill development, cognitive development, brain development, and risk-taking and social influences. Understanding how each of these interacts with children's abilities to learn and ride a bicycle safely in traffic allows researchers and safety practitioners to design more effective bicycle education programs to teach children and adolescents how to safely negotiate traffic as bicyclists.*

**Cycling Savvy Empowerment for Unlimited Travel – Online website**

https://cyclingsavvy.org/

*Cycling Savvy is a program of the American Bicycling Education Association. Their mission is to provide programs and resources for the education of bicyclists as drivers of vehicles, and bicycling-related education for traffic engineers, transportation planners, law enforcement professionals, educators, and the general public. Various educational courses are available from this website, including i-person and online courses.*

**Automated Enforcement Program Checklist For Red Light Cameras and Automated Speed Enforcement, May 2021**

https://www.iihs.org/media/431e551b-3f64-4591-8e30-ad35a069f41f/cF4n4g/News/2021/050621%20auto%20enforcement/AE-checklist-May-2021.pdf

*Two-page checklist created by AAA, Advocates for Highway Safety, GOHS, IIHS-ILD and NSC. The checklist provides a minimum list of considerations to help an agency follow best practices. The goal is to operate a successful program that reduces crashes and prevents deaths and injuries while maintaining strong public support.*

**Noteworthy Speed Management Practices, FHWA-SA-20-047, August 2020**

https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/fhwasa20047.pdf

*This report provides an avenue of information for practitioners in that it summarizes eight case studies which highlight noteworthy practices over a range of speed management issues. The case study strategies include Strategic Speed Management Program; Self-Enforcing Roadways; Setting Credible Speed Limits; High Visibility Enforcement; Successful Strategies for Adoption of Safety Cameras; Targeted Reporting of Speeding-Related Crashes; Consistent Speed Limit for Vulnerable Road Users; and Network Approach to Setting Speed Limits.*

**FHWA Website, Noteworthy Speed Management Practices: Successful Strategies for Adoption of Safety Cameras, September 2020**

https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/sec6.cfm

*A case study to show how the implementation of safety camera was implemented in New York City, along with some of the key takeaways and lessons learned. New York City faced typical oppositions to safety cameras such as legislative restrictions and citizen resistance. They successfully instituted a safety camera program in school zones through several strategies.*

**Red Light Camera Systems Operational Guidelines, FHWA, January 2005**

https://safety.fhwa.dot.gov/intersection/signal/fhwasa05002.pdf

*The Federal Highway Administration (FHWA) and the National Highway Traffic Safety Administration (NHTSA) have developed this operational guideline for use by State and local agencies for the implementation and operation of red light camera systems. The purpose of these guidelines is to assist jurisdictions who are considering the implementation of red light camera systems and help them avoid inconsistent or incorrect application of such systems. The information contained in this document is intended to foster discussions and initiatives that will improve intersection safety by reducing crashes due to red light running. This document is not a regulatory requirement and the decision to use red light cameras is a matter for local decision-makers.*

**Evaluation of NHTSA Distracted Driving Demonstration Projects in Connecticut and New York, DOT HS 811 635, March 2014**

https://www.nhtsa.gov/sites/nhtsa.gov/files/811635_eval_nhtsa_distracted_driving_demo_proj_comm_ct_and_ny.pdf

*The communities of Hartford, Connecticut, and Syracuse, New York, implemented year-long campaigns to test whether NHTSA's high-visibility enforcement (HVE) model could be applied to reduce two specific forms of distracted driving – driving while talking on a hand-held cell phone or texting. The HVE model applies strong laws, vigorous targeted law enforcement, extensive media that emphasizes the enforcement, and evaluation. Both sites conducted 4 waves of enforcement between April 2010 and April 2011. NHTSA developed and bought TV and radio spots featuring the tag line Phone in One Hand, Ticket in the Other. Both sites generated ample earned media. Police wrote 100 to 200 citations*

*per 10,000 population for each wave in each site. The results show that high-visibility enforcement campaigns can reduce the number of people who use hand-held cell phones while driving.*

**"See Me AZ" Public Safety Campaign: MAG Online website**

https://azmag.gov/Programs/Transportation/Safety-Programs/See-Me-AZ

*"See Me AZ" seeks to raise awareness of pedestrian and motorist laws and change the behaviors that lead to pedestrian and cyclist crashes and fatalities. Provides regional resources for improving pedestrian and bicyclist safety in the region, including YouTube campaign ads, video testimonials, safety tips for drivers, bicyclists and pedestrians, and relevant crash data visualizations.*

**NHTSA Traffic Safety Marketing Website**

https://www.trafficsafetymarketing.gov/

*Online site that contains marketing materials for numerous topics relating to traffic safety including Bicycle Safety, Distracted Driving, Drowsy Driving, Drug-Impaired Driving, Drunk Driving, Motorcycle Safety, Older Driver Safety, Pedestrian Safety, Speed Prevention, Teen Safety and Vehicle Safety. Specific safety campaign materials are provided within each safety topic area that may include pamphlets, videos, as well as guidebooks for the campaign. Some materials are available in Spanish.*

**NHTSA Website: High Visibility Enforcement (HVE) Toolkit**

https://www.nhtsa.gov/enforcement-justice-services/high-visibility-enforcement-hve-toolkit

*Provides information on types of enforcement (Saturation Patrol, Wave, Integrated Enforcement, and Multi-Jurisdictional Enforcement), placement of HVE, visibility elements, training and measuring effectiveness. Also provides information on publicity methods for HVE, implementation and resources in an online website. In addition, NHTSA provides template materials (press releases, talking points, posters, etc.), for the following individual program areas: Impaired Driving; Occupant Protection; Speed/ Aggressive Driving; and Distracted Driving.*

**Impaired Driving Guidebook: Three Keys to Renewed Focus and Success, IACP Impaired Driving Subcommittee**

https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/impaired_driving_guidebook-three_keys_to_renewed_focus_and_success.pdf

*This Guidebook is intended to serve as a guide to law enforcement executives on how to most effectively renew their efforts to eliminate impaired driving on our roadways. The Subcommittee came to agreement that success lies in three key areas, and this Guidebook has a section dedicated to each: (1) Law Enforcement Leadership; (2) Criminal Justice Collaboration; and (3) Effective Communication Strategies.*

## PEDESTRIANS AND BICYCLISTS STRATEGIES

**School Site Planning, Design, and Transportation, Informational Report, ITE Technical Committee TENC-105-01, June 2013**

https://ecommerce.ite.org/IMIS/ItemDetail?iProductCode=IR-137-E

*Provides information to aid school and local officials, engineers, architects, planners, and developers in creating walkable, community-based schools. A major emphasis is on the design of new schools for maximum walkability, traffic safety, and efficiency. This report also addresses these issues for the improvement or redevelopment of existing school sites.*

**Evaluation of Pedestrian Hybrid Beacons on Arizona Highways, SPR-756, September 2019**

https://apps.azdot.gov/files/ADOTLibrary/publications/project_reports/pdf/spr756.pdf

*The focus of this Arizona Department of Transportation (ADOT) research was to: investigate the safety and operational impacts of the PHB installations that have occurred on Arizona's state highways (higher-speed roads) to understand their impacts on vehicles and pedestrians; investigate the relationship between crashes at PHB locations and the spacing from nearby signalized intersections; investigate the relationship between crashes at PHB locations and other roadway characteristics; and determine whether modifications to ADOT guidance are needed to advise ADOT on site selection and use of PHBs.*

**Evaluation of Pedestrian Hybrid Beacons and Rapid Flashing Beacons, FHWA-HRT-16-040, July 2016**

https://www.fhwa.dot.gov/publications/research/safety/16040/16040.pdf

*This report documents an FHWA project that includes four studies that investigated how characteristics of rectangular rapid-flashing beacons (RRFBs) and pedestrian hybrid beacons (PHBs) affected the likelihood of drivers yielding to a pedestrian. The results of this project supported the development of two Manual on Uniform Traffic Control Devices official interpretations for the RRFB: Official Interpretation #4(09)-41 (I)—Additional Flash Pattern for RRFBs and Official Interpretation #4(09)-58 (I)—Placement of RRFB Units Above Sign. (1–3) The overall 96 percent high yielding for PHBs identified in this research, along with findings from previous studies, support the use of this device at a variety of locations, such as on high-speed roads, wide roads, and at residential intersections.*

**Rectangular Rapid Flashing (RRFB) Countermeasure Tech Sheet, June 2018**

https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_RRFB_508compliant.pdf

*Two-page technical sheet on the application of RRFBs. Developed as part of the FHWA STEP program.*

**Interim Approval 21 – Rectangular Rapid-Flashing Beacons at Crosswalks, FHWA, March 2018**

https://mutcd.fhwa.dot.gov/resources/interim_approval/ia21/index.htm

*Provides requirements, guidance, and options for the optional use of the RRFBs under the terms of the Interim Approval. (The next edition of the MUTCD is expected to contain requirements, guidance and options for the design and use of RRFBs, and at that time the IA will be archived.)*

**Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA-SA-17-072, July 2018**

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

*This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines. Provides a Countermeasure Selection Table for uncontrolled intersections based on posted speed limit, ADT and roadway configuration. Also provides a table listing the safety issues addressed by countermeasure type.*

**Pedestrian Lighting Primer, FHWA-SA-21-087, April 2022**

https://safety.fhwa.dot.gov/roadway_dept/night_visib/docs/Pedestrian_Lighting_Primer_Final.pdf

*Federal Highway Administration (FHWA) primer to used be a resource for transportation practitioners interested in the safety and security benefits of pedestrian lighting as well as lighting design considerations at locations with existing or future pedestrian activity. Presents a summary of existing research indicating the benefits of lighting for improving pedestrian safety, citing studies that resulted in CMFs that quantify reductions in the number of vehicle/pedestrian crashes due to lighting, provides an overview of the pedestrian lighting design process, and presents a lighting design example that depicts a typical scenario for pedestrian lighting facilities.*

**Research Report: Street Lighting for Pedestrian Safety, FHWA-SA-20-062, December 2020.**

https://safety.fhwa.dot.gov/roadway_dept/night_visib/docs/StreetLightingPedestrianSafety.pdf

*This document details three separate experiments used to form pedestrian lighting recommendations that consider the visibility needs of both children and adults. In the first study, participant drivers were evaluated on their ability to detect the presence of child-sized pedestrians under variations of luminaire type (2200 K, 4000 K, and 5000 K), mounting height (road scale and ped scale), as well as variations in luminance and illuminance of the visual target. A second experiment evaluated the ability for walking pedestrians (adults and children) to detect hazards in their path under the same lighting conditions used in the first experiment. The final experiment evaluated the abilities of adults and children to determine*

*when it would be no longer safe to cross a mid-block crosswalk as vehicles approach under varying lighting conditions. The outcomes of this research are presented as recommendations for crosswalk lighting design to include considerations for children, depending on pedestrian volume and road class.*

**Pedestrian and Bicyclist Road Safety Audit (RSA) Guide and Prompt Lists, FHWA-SA-20-042, September 2020**

https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa20042.pdf

*This guide is intended to support agencies that are interested in conducting pedestrian- and bicycle-focused RSAs and includes information on safety risks for both modes, the RSA process, necessary data, and the roles and responsibilities of the RSA Team. Also included are updated prompt lists for pedestrians and bicyclists to use in the field. This guide will aid practitioners understand pedestrian and bicyclist issues in their jurisdiction and potentially achieve other goals in addition to safety, like enhancing quality of life, improving community health, or increasing pedestrian and bicycle mode share. Describes overview of the 8-step RSA process.*

**Improving Intersections for Pedestrians and Bicyclists Informational Guide, FHWA-SA-22-017, April 2022**.

https://safety.fhwa.dot.gov/intersection/about/fhwasa22017.pdf

*The purpose of this guide is to inform the state of the practice concerning intersection planning and design to implement solutions that help achieve the goal for zero fatalities and serious injuries while improving mobility for bicyclists and pedestrians. The primary intersection types discussed in this guide include traditional signalized intersections, roundabouts, Median U-Turn (MUT) intersections, Reduced Crossing U-Turn (RCUT) intersections, Quadrant Roadway (QR) intersections, Displaced Left Turn (DLT) intersections, and Diverging Diamond Interchanges (DDI). This guide also includes discussion about stop-controlled and uncontrolled intersection crossings for bicyclists and pedestrians. This guide illustrates integration of bikeways and pedestrian pathways at and across traditional and alternative intersections, describes countermeasures applicable to pedestrian and bicyclist crossings at intersections, and summarizes the application of intersection analysis methods for the safety and mobility of pedestrians and bicyclists.*

**NCHRP 926 - Guidance to Improve Pedestrian and Bicyclist Safety at Intersections, 2020**

https://nap.nationalacademies.org/download/25808

*NCHRP Research Report 926 provides a succinct process for selecting intersection designs and operational treatments that provide safety benefits for pedestrians and bicyclists, and the most appropriate situation for their application. The Guide provides a step-by-step process for selecting intersection safety treatments based on site conditions, effectiveness, level of public process, and their potential to reduce certain common pedestrian and bicycle crash types. The appendix is a Countermeasure Glossary documenting 34 pedestrian and bicycle intersection safety countermeasures with two-page*

*listings of key information for each. Also provides design trade-off of safety countermeasures.*

**Bicycle Safety Guide and Countermeasure Selection System, BIKESAFE, FHWA (originally published 2006)**

http://www.pedbikesafe.org/bikesafe/

*The Bicycle Safety Guide and Countermeasure Selection System is intended to provide practitioners with the latest information available for improving the safety and mobility of those who bike. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve bicycle safety and/or mobility based on user input about a specific location. Provides countermeasure list, selection tool and selection matrices as well as case studies and resources.*

**Pedestrian Safety Guide and Countermeasure Selection Tool, PEDSAFE, FHWA (originally published 2004)**

http://www.pedbikesafe.org/pedsafe/

*The FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE) is an interactive tool for reviewing pedestrian safety countermeasures at intersections and along the network. PEDSAFE includes intersection features or countermeasures such as RRFBs, PHBs, countdown timers at pedestrian signals, and curb design. A total of 67 engineering, education, and enforcement countermeasures are discussed. The treatments and programs selected for inclusion in this on-line document are those that have been in place for an extended period of time and/or have proven effective. New countermeasures continue to be developed, implemented, and evaluated.*

**Bikeway Selection Guide, FHWA, 2019**

https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

*This document is a resource to help transportation practitioners consider and make informed decisions about tradeoffs relating to the selection of bikeway types. The report highlights linkages between the bikeway selection process and the transportation planning process. This guide presents these factors and considerations in a practical process-oriented way. It draws on research where available and emphasizes engineering judgment, design flexibility, documentation, and experimentation. Provides bicyclist design user profiles and a chart that relates preferred bikeway type to ADT and motorist speed.*

**FHWA Separated Bike Lane Planning and Design Guide, May 2015**

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf

*Outlines planning considerations for separated bike lanes (also sometimes called "cycle tracks" or "protected bike lanes") and provides a menu of design options covering typical one and two-way scenarios. It highlights different options for providing separation, while also documenting midblock*

*design considerations for driveways, transit stops, accessible parking, and loading zones. It provides detailed intersection design information covering topics such as turning movement operations, signalization, signage, and on-road markings. Case studies highlight best practices and lessons learned throughout the document.*

**Primer on Safe System Approach for Pedestrians and Bicyclists, FHWA-SA-21-065, May 2021**

https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa21065.pdf

*The Safe System approach acknowledges that humans make mistakes and, importantly, are vulnerable to the forces that occur during a crash. By focusing on eliminating fatal and serious injuries the Safe System approach inherently places a priority on pedestrians and bicyclists, who are at a higher risk of fatal or serious injury than a person driving or traveling in a motor vehicle. The purpose of this primer is to provide transportation agencies a baseline understanding of the Safe System approach and how it relates to bicycle and pedestrian safety. Topics include, safe speeds, safe roads, safe vehicles, safe road users and post-crash care.*

**Advancing Pedestrian and Bicyclist Safety: A Primer for Highway April 2016 Safety Professionals, DOT HS 812 258, April 2016**

https://www.nhtsa.gov/staticfiles/nti/pdf/812258-Peds_Bike_Primer.pdf

*This primer is intended for highway safety professionals, including State Highway Safety Officials, as well as their partners and grantees, as a reference for an integrated and comprehensive effort to improve pedestrian and bicycle safety and support broader transportation-related goals. The primer summarizes the most promising infrastructure treatments and behavioral programs available for addressing specific safety problems and highlights how these approaches can be combined and implemented. It identifies opportunities for various agencies to collaborate and combine their respective approaches and funding for a more comprehensive program. It also offers real-world examples of what States and local jurisdictions are doing to address pedestrian and bicycle issues in a comprehensive manner. Finally, the primer includes descriptions of key concepts and definitions of common terms and acronyms to help readers understand the essentials of pedestrian and bicycle safety issues when discussing and collaborating with diverse partners to develop comprehensive programs.*

**Maricopa Association of Governments Shade and Thermal Comfort Online Website**

https://azmag.gov/Programs/Transportation/Active-Transportation/Active-Transportation-Plan/Active-Transportation-Toolbox/Pedestrian-Infrastructure/Shade-and-Thermal-Comfort

*Provides recommendations on shade design considerations, that are based on weather data collected over the period 2005–2015 for the afternoon hours, defined as noon through 6pm. Summer months in this analysis are considered May through October. Provides several shade examples involving*

*landscape trees and structures. Quantifies a thermally comfortable pedestrian route (Developed by ASU researchers.)*

**Urban and Community Forestry 2016 Arizona Shade Tree Planting Prioritization, Arizona Department of Forestry and Fire Management, 2016.**

https://dffm.az.gov/sites/default/files/media/2016_AZ_STPP_Report_2017-01-06.pdf

*This report summarizes the intent, methodology, and results of the 2016 Shade Tree Planting Prioritization analysis of the Urban and Community Forestry Program (UCF) at the Arizona Department of Forestry and Fire Management (DFFM). The purpose of the analysis was to assess existing urban forests in Arizona's communities and identify shade tree planting needs.*

## INTERSECTION STRATEGIES

**AASHTO Highway Safety Manual User Guide, August 2014**

https://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp17-50_userguide.pdf

*The Highway Safety Manual (HSM) is the premier guidance document for incorporating quantitative safety analysis in the highway transportation project planning and development processes. The HSM includes predictive methods for infrastructure improvement project alternative analysis and development/design, including: (1) the use of national safety performance functions (models) developed to predict crashes by severity specific facility types and base conditions; and (2) associated crash modification factors (CMFs) to estimate the potential effects of design alternatives or changes from base conditions. The second edition of the HSM is expected to be published by AASHTO in 2022.*

**Screening Your Network to Improve Roadway Safety Performance – Getting Started**

https://safety.fhwa.dot.gov/systemic/fhwasa17008/fhwasa17008.pdf

*A 5-page FHWA document to describe a network screening in a five steps process. Network screening provides documentation and justification for prioritizing safety needs. The five steps are: 1. Establish a focus; 2. Identify the types of sites or facilities to be screened; 3. Select performance measures; 4. Choose a screening method; and 5. Screen and evaluate results. This is provided as part of the Every Day Counts (EDC) program.*

**Selecting Projects and Strategies to Maximize Highway Safety Improvement Program Performance, FHWA-SA-20-001, March 2021**

https://safety.fhwa.dot.gov/hsip/docs/FHWA-SA-20-001_Maximizing_HSI_Performance_508.pdf

*This guide presents fundamental analytical methods and a conceptual framework for maximizing the effectiveness of the HSIP by increasing the individual performance of its projects. To address fatal and serious-injury crashes, agencies should focus on the change in fatal and serious-injury crashes, rather than all crashes or all injuries, when selecting projects and should prioritize and select projects using quantitative methods such as the benefit-cost ratio (BCR) when possible. While intended primarily for State agencies, the guide contains helpful information that can be used by local agencies*

**Unsignalized Intersection Improvement Guide (UIIG) Toolkit, Online website maintained by ITE, 2015**

https://toolkits.ite.org/uiig/

*The purpose of the UIIG is to assist and guide users through the process of evaluating their unsignalized intersections and identifying opportunities to enhance their safety and operational performance. The contents of the UIIG are presented under two sections: information and Toolkit. The Information section provides important background material related to the types, users, common problems and treatments, and general considerations associated with unsignalized intersections. The Toolkit provides a number of resources to assist the user in: (1) collecting data on the existing conditions and characteristics of the intersection; and (2) identifying potential treatments that may improve the safety and mobility at the intersection.*

**MAG Left Turn Crash Mitigation Implementation Template & Guidance, May 2018**

https://azmag.gov/Portals/0/Documents/MagContent/LT-Crash-Mitigation-Implementation-Template-Guidance.pdf

*The overall goal of this guidance is to help address the "Eliminate Deaths and Serious Injuries Related to Crashes at Intersections" Action Area in the MAG STSP by assessing intersection safety improvements as they relate to creating positive offsets at left-turn lanes. The specific objective is to provide technical guidance to local agencies in identifying locations with left-turn safety concerns and in mitigating these issues, with a focus on improving negative offsets at opposing left-turn lanes. The guidelines were developed assuming agencies have limited staff, resources, and data. Important left-turn safety issues can be identified efficiently through aerial photography (e.g. Maricopa County aerials, Google Maps), with field reviews as needed.*

**Applying Transportation Asset Management to Traffic Signals: A Primer, FHWA-HOP-20-048, January 2022**

https://ops.fhwa.dot.gov/publications/fhwahop20048/fhwahop20048.pdf

*This primer provides information for applying transportation asset management (TAM) principles to traffic signals assets. It also describes how transportation agencies can benefit from including traffic signals in their asset management planning and integrating asset management practices for traffic signal assets. This primer provides information for transportation agencies responsible for: (1) Managing and maintaining traffic signals. (2) Improving asset management practices. (3) Planning new traffic*

*signal assets and understanding the long-term responsibility (and cost) involved.*

**The Evolution of ITS in Transportation Asset Management, ENT-2020-4, May 2020**

https://enterprise.prog.org/wp-content/uploads/ENT-ITS-Asset-Mgmt-final-report.pdf

*The report summarizes the current state of ITS asset management, both in the ENTERPRISE member agencies and across North America, and to describe the attributes and criteria being used to effectively support ITS asset management. ENTERPRISE pooled-fund study for the Michigan DOT.*

**Evolving and Phasing Out Legacy ITS Devices and Systems Final Report, ENT-2019-2, October 2019**

https://enterprise.prog.org/Projects/2019/ENT_PhasingOutLegacyITS_Report_FINAL_Oct2019.pdf

*This project documented nearly 60 case studies, including decision factors, criteria, approaches, and tools agencies use to help guide decision-making when evolving and phasing out ITS devices and systems. Based on the case studies, a set of criteria and applicable tools was developed for ten common ITS devices and systems. These criteria are intended to assist agencies with identifying and navigating through multiple considerations while assessing ITS devices and systems to determine potential evolutions or eliminations.*

**Manual on Pedestrian and Bicycle Connections to Transit, FTA-FL-26-7012-00, July 2017**

https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/64496/ftareportno0111.pdf

*Provides a compendium of best practices to help transportation professionals improve pedestrian and bicycle safety and access to transit, including information on evaluating, planning for, and implementing improvements to pedestrian and bicycle access to transit. In addition to covering key concepts such as access sheds, connected networks, and station area comfort, safety, and legibility, the manual covers needs specific to pedestrians, such as complete sidewalks and safe, convenient crossings, and to bicyclists, such as bicycle parking and on-transit accommodations.*

**Designing for Transit A Guide for Supporting Public Transit Through Complete Streets, Monterey-Salinas Transit, 2020**

https://mst.org/wp-content/media/DesigningForTransit-2020-Edition.pdf

*The guide addresses bus stops, which are the most fundamental infrastructure element of transit service. The bus stops section covers the minimum required dimensions for a bus to stop and for the sidewalk and curb space at the bus stop to provide Americans with Disabilities Act (ADA)-compliant access to the bus. The guide also addresses where and how bus stops interact with the street network to inform where around an intersection to place a stop, or what choices to make when placing a stop away from an intersection (including in suburban and rural areas). This section also addresses minimum street dimensions for accommodating buses and providing other transit-supportive or priority treatments*

*along roadways. Furthermore, the guide addresses access between bus stops and the places people want to go, for pedestrians, including people with disabilities, and bicyclists.*

**Signalized Intersections Informational Guide, Second Edition, FHWA-SA-13-027, July 2013**

https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf

*This document serves as an introduction to and guide for evaluating the safety, design, and operations of signalized intersections. It also provides tools to deliver better balanced solutions for all users. It takes a holistic approach to signalized intersections and considers the safety and operational implications of a particular treatment on all system users (e.g., motorists, pedestrians, bicyclists, and transit users). Readers will find the tools and information necessary to make insightful intersection assessments and to understand the impacts of potential improvement measures.*

**Decision-Making Guide for Traffic Signal Phasing, NCHRP 284, 2020**

https://nap.nationalacademies.org/catalog/25905/decision-making-guide-for-traffic-signal-phasing

*The TRB National Cooperative Highway Research Program's NCHRP Web-Only Document 284: Decision-Making Guide for Traffic Signal Phasing is designed to give professionals designing or operating signalized intersections the tools they need to provide safe and efficient overall operations, considering both crash risk and movement delays. The guide synthesizes existing best practices as well as new information from the accompanying research effort (NCHRP 03- 118). This guide covers right-turn, left turn, and pedestrian phasing mode and sequence concepts. Concept definitions and best practices are provided for right-turn and pedestrian phasing mode and sequence. For left-turn phasing, this guide summarizes the concepts / existing best practices and includes additional information from the accompanying research effort (NCHRP 03-118). The guide presents safety performance functions (SPFs) and crash modification factors (CMFs) for left-turn phasing modes as well as charts to determine the operational impact of each phase mode. A methodology for combining the effect of safety and operations of the various left-turn phase modes is also provided in this guide.*

**Leading Pedestrian Interval – FHWA Proven Safety Countermeasure, FHWA-SA-21-032, October 2018**

https://safety.fhwa.dot.gov/provencountermeasures/lead_ped_int.cfm

*FHWA Webpage for LPI as a Proven Safety Countermeasures, providing the typical duration and safety benefits.*

**NACTO Urban Street Design Guide – Leading Pedestrian Interval, September 2013**

https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/traffic-signals/leading-pedestrian-interval/

*Provides information on the application, benefits, and consideration with the use of LPI, as well as ways*

*to increase the effectiveness, along with three references on LPI studies.*

**SDOT Policy for Leading Pedestrian intervals, Seattle Department of Transportation, April 2019**

https://www.seattle.gov/documents/Departments/SDOT/VisionZero/SDOT%20Policy%20on%20Leading%20Pedestrian%20Intervals%20-%20Signed.pdf

*This policy applies to the selection of locations and implementation of LPI within the public right of way within the City of Seattle. Includes selection criteria, schedule, and design guidelines for LPI application.*

**Guidelines for Determining Traffic Signal Change and Clearance Intervals: An ITE Recommended Practice, 2020**

https://www.ite.org/technical-resources/topics/traffic-engineering/traffic-signal-change-and-clearance-intervals/2020

*Guidance on yellow change and red clearance intervals for signalized intersections. The goal of this guidance is to create a consensus methodology for calculating and evaluating traffic signal change intervals that can be consistently implemented by transportation agencies. The recommendations presented are intended to yield reasonable times for the yellow change and red clearance intervals for traffic signals, assisting transportation professionals in enhancing intersection safety, maintaining reasonable traffic flow, and providing for movement of vehicles, bicycles, and pedestrians. The calculation methodology in the report is based on the extended kinematic equation. The report provides guidance for applying the methodology and for selecting input values for both through and turning movements at signalized intersections. Input values include perception-reaction time, approach speed, deceleration rate, approach grade, intersection width, vehicle length, and conflicting movement start-up delay.*

**Guidelines for Determining Traffic Signal Change and Clearance Intervals, By Douglas E. Noble, P.E., PTOE (F), ITE Journal, March 2020**.

https://www.ite.org/pub/?id=20D7513D-BD0A-5BEF-5751-1C87F61F551B

*An ITE Journal article that summarizes the ITE Recommended Practice adopted by ITE.*

**A Methodology and Case Study: Evaluating the Benefits and Costs of Implementing Automated Traffic Signal Performance, FHWA-HOP-20-003, June 2020**

https://ops.fhwa.dot.gov/publications/fhwahop20003/fhwahop20003.pdf

*This primer describes a methodology to evaluate the benefits and costs of objectives- and performance-based traffic signal operations and maintenance. The methodology includes a quantitative component supported by a subjective analysis. The intent of the methodology is to describe advantages and disadvantages of using a performance-based traffic signal monitoring process, executed through the automated traffic signal performance measures (ATSPM), when compared to the traditional approaches of monitoring and retiming traffic signals.*

**ITS Strategic Plan 2012, Maricopa Association of Governments, December 2012**

https://azmag.gov/Portals/0/Documents/ITS_2013-01-10_2012-ITS-Strategic-Plan.pdf

*Provides ITS Strategic Plan and goals for the MAG Region. The MAG ITS Strategic Plan provides a framework, a set of regional ITS priorities and a strategy for focusing available funding toward achieving regional mobility and safety objectives, as well as continuing to support local agencies in deploying and enhancing their ITS programs.*

**Benefits of Adaptive Traffic Control Deployments – A Review of Evaluation Studies, NCHRP 20-07, TASK 414, November 2019**

https://onlinepubs.trb.org/Onlinepubs/nchrp/docs/NCHRP20-07_Task414FinalReport.pdf

*Study conducted for the AASHTO Standing Committee on Highways. This is a comprehensive analysis of ATCSs deployed and evaluated in the US and allows a detailed analysis of ATCS deployments and investigation of numerous criteria important for ATCS deployments and evaluation. Relevant data are collected through literature reviews and surveys of deploying agencies and used to populate a database of Assessment Tool for Adaptive Traffic Control ((AT)2C). The main purpose of the (AT)2C is to help practitioners and researchers to identify, compare, assess, and monitor statistics of relevant ATCS technologies, mainly from the perspective of their field benefits achieved in the field. The last sections of the report give a sample of analyses that can be performed in this direction.*

**A Safe System-Based Framework and Analytical Methodology for Assessing Intersections, FHWA-SA-21-008, January 2021.**

https://safety.fhwa.dot.gov/intersection/ssi/fhwasa21008.pdf

*This report presents a Safe System for Intersections (SSI) method that intersection planners and designers can readily implement, that dovetails with the typical U.S. project development process, and that uses commonly available project-level data. The SSI method is presented in the context of a Stage 1 Intersection Control Evaluation (ICE), at the scoping phase of project development. The method incorporates concepts of conflict point identification and classification, exposure, kinetic energy transfer, conflict point severity, and intersection movement complexity. Application of the SSI method results in multiple measures of effectiveness (MOEs) and a set of SSI scores that characterize the extent to which an intersection alternative in a given context aligns with the principles of kinetic energy management and a Safe System. The SSI MOEs and SSI scores can serve as additional safety metrics to inform the process of screening alternatives and identifying an optimal solution for an intersection. The report includes an overview of Safe System concepts and principles, a detailed description of the SSI method, example project applications, and a future vision for the method.*

**Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections, FHWA-SA-09-020, July, 2020.**

https://safety.fhwa.dot.gov/intersection/signal/fhwasa09020.pdf

*This document presents information on suggested effective, low-cost intersection countermeasures developed using intersection safety research results and input from an intersection safety expert panel. These low-cost countermeasures can be applied to a large number of intersections with a high frequency of crashes using a systematic approach. The net impact of such an approach can produce significant reductions in statewide intersection crashes, fatalities, and serious injuries. Low-cost countermeasures are defined as those ranging from $1,000 to $50,000 per intersection. The countermeasures include signing and pavement marking, J-turn treatments, traffic signal countermeasures, lighting, high friction surfaces and speed reductions.*

## ROADWAY SEGMENT STRATEGIES

**FHWA Proven Safety Countermeasures: Corridor Access Management, 2012**

https://safety.fhwa.dot.gov/provencountermeasures/corridor_access_mgmt.cfm

*One-page pdf that provides a listing of access management strategies (including raised medians that preclude across-roadway movements), and a crash modification factor of 25 to 31% in fatal and injury crashes along urban/suburban arterials.*

**Intersection Proven Safety Countermeasure Technical Summary: Corridor Access Management, FHWA-SA-15-005, Updated July 2020**

https://safety.fhwa.dot.gov/intersection/cam/fhwasa15005.pdf

*This Technical Summary was prepared to assist transportation professionals with decisions pertaining to Corridor Access Management, including planning, permitting, design, selection, and implementation. This document provides a substantive overview of important access-related issues: safety performance (i.e. crashes), effects on pedestrian and bicycle facilities, and community and business economic impacts.*

**Intersection Proven Safety Countermeasure Technical Summary: Executive Summary: Corridor Access Management, FHWA-SA-15-006**

https://safety.fhwa.dot.gov/intersection/cam/fhwasa15006.pdf

*Four-page document to summarize the FHWA report and highlight the key points with respect to access management and summarizes CMFs for medians for access management..*

**State of the Practice in Highway Access Management: A Synthesis of Highway Practice, NCHRP Synthesis 404, 2010**

https://accessmanagement.info/wp-content/uploads/2013/07/nchrp_syn_404.pdf

*This synthesis reports how various agencies have acted on the various components of an access management program, what have been barriers to action, and how new efforts might improve implementation of access management strategies. Primary focus areas considered are legal and legislative bases, contents of policies and programs, implementation aspects, reported effectiveness of program implementation, and profiles of contemporary practice. The emphasis is placed on states, but counties, municipalities, and metropolitan planning organizations are also considered.*

**State Best Practice Policy for Medians, FHWA Safety Program, FHWA-SA-11-019, 2013**

https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa11019/fhwasa11019.pdf

*FHWA's Safety Office has promoted the evidence-based safety benefits of raised medians (or refuge areas). This flyer highlights three agencies that have implemented policies and plans that promote the inclusion of raised medians: the New York State Department of Transportation (NYSDOT), the Oregon Department of Transportation (ODOT), and the Florida Department of Transportation (FDOT). Four-page pamphlet*

**2014 Median Handbook, Florida DOT, Updated October 2017**

https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/systems-management/sm-old-files/am-and-si/fdot-median-handbook-sept-2014-edits-10-25-2017.pdf?sfvrsn=401841d5_2

*The purpose of this document is to guide the professional through the existing rules, standards and procedures, as well as to provide current national guidance on the best ways to plan for medians and median openings. It is a comprehensive guide to allow the professional to make the best decisions on median planning. The primary thrust of this handbook is the unsignalized median opening. Even though much of this material can be used with signalized intersection planning. Includes information on medians for access management and landscaping and sight distance issues.*

**FHWA Proven Safety Countermeasures: Medians and Pedestrian Crossing Islands in Urban and Suburban Areas, FHWA-SA-12-011, 2012**

https://www.eesi.org/files/cs-fhwa_medians.pdf

*Two-page write-up on the benefits of raised medians and pedestrian crossing islands as proven Safety Countermeasures.*

https://safety.fhwa.dot.gov/provencountermeasures/ped_medians.cfm

*One page write-up and crash modification factor for the reduction of pedestrian crashes.*

**FHWA Lighting Handbook, August 2012**

https://safety.fhwa.dot.gov/roadway_dept/night_visib/lighting_handbook/pdf/fhwa_handbook2012.pdf

*Provides guidance to designers and State, city, and town officials concerning the application of roadway lighting. Supplementing and referring to other resources developed by AASHTO, IES, and CIE this document contains information on: Policy and Guidance – discussing references, policy, and recommendations used by FHWA in evaluating and administering funds for roadway and street lighting projects; Basic Terms and Concepts; Warranting Criteria – including various warranting methods available when considering lighting; Lighting Impacts – (both positive and negative) of lighting systems and ways to control and mitigate; Application Considerations; and Other Systems and Issues – discussing additional lighting and non-lighting elements impacting the roadway user.*

**Web-Based Training for FHWA Roadway Lighting Workshop Module 3: Street and Roadway Lighting Design, FHWA-SA-18-035, May 2018**

https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway_lighting_workshop/Module3Workbook_021219.pdf

*Participant workbook for Web-Based Training for FHWA Roadway Lighting Workshop, Module 3: Street and Roadway Lighting Design. Module 3 covers lighting design criteria, calculations, field measurements, and light pollution. Other modules include Module 1: Roadway Lighting Design Overview, Module 2: Lighting Hardware and Light Source Considerations for Roadway Lighting, and Module 4: Other Roadway Lighting Topics. The modules for the FHWA Web-Based Training for FHWA Roadway Lighting Workshop can be found at*: https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway_lighting_workshop/

# APPENDIX D: PERFORMANCE MEASURES

## PERFORMANCE MEASURES - ANALYSIS

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|---|---|---|---|---|
| General Strategies | **OBJECTIVE 1.A** | **ESTABLISH FOUNDATIONAL ELEMENTS OF VISION ZERO INCLUDING TIMELINE AND GOALS FOR IMPLEMENTATION AND EVALUATION OF THE INITIATIVE.** | | |
| | Performance Measures | Implement a Vision Zero Task Force consisting of a multi-departmental team for continued oversight of reducing KSI crashes | Proposed Analysis | These measures will be tracked as a completed or not completed. |
| | | Create a Vision Zero status report on objectives, updated every year in the fall & published in the spring. | | |
| | **OBJECTIVE 1.B** | **REDUCE CRASH RISK ON ROADWAYS BY ENHANCING SAFETY DATA COLLECTION AND EVALUATION.** | | |
| | Performance Measures | Streamline RSA process to identify & implement feasible improvements by 2023 | Proposed Analysis | In 2024, select a representative sample of RSA's to analyze if improvements were complete. |
| | | Develop crash data dashboard to identify & rank crash locations by 2023 | | This measure is underway, and will be tracked as a completed or not completed. |
| | | Integrate crash data from Phoenix PD / ADOT on a monthly basis by 2023 | | This measure is underway, and will be tracked as a completed or not completed. |
| | | Conduct before/after evaluations for previously implemented safety projects | | Complete evaluations at 25% or more of locations once three years of before and three years of after data is available. Evaluate the results to make a determination if the project improved safety and reduced crashes. |
| | **OBJECTIVE 1.C** | **REDUCE CRASH RISK ON ROADWAYS BY CREATING A CULTURE OF ROAD SAFETY WITHIN THE CITY'S TRANSPORTATION PROCESSES.** | | |
| | Performance Measures | Integrate safety review in development of CIP projects & private development projects by 2024 | Proposed Analysis | Starting in 2025, select a representative sample of projects from CIP and development projects to review and analyze IF a safety review and recommendations were included. |
| | | Ensure that road safety expenditures are at least $60M per year | | Analyze the City's Capital Improvement Plan, across departments, for amount invested in projects that implemented one or more road safety strategies. |

## PERFORMANCE MEASURES - ANALYSIS (CONT.)

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| Behavior Related Strategies | OBJECTIVE 2.A | REDUCE THE NUMBER OF KSI CRASHES INVOLVING PEDESTRIANS & BICYCLISTS THROUGH BEHAVIORAL CHANGES. | | |
| | Performance Measures | Expand transportation safety enforcement impact programs by 10% per year | Proposed Analysis | Starting in 2024, evaluate the safety enforcement impact program for rate of expansion (use 2023 as base year). |
| | | Conduct pedestrian & bicyclist enforcement impact programs at least 12 times per year | | Starting in 2024, evaluate the previous year to count the number of pedestrian & bicyclist enforcement impact programs conducted. |
| | OBJECTIVE 2.B | REDUCE THE NUMBER OF KSI CRASHES RELATED TO SPEEDING. RED-LIGHT RUNNING, DISTRACTED DRIVING, & AGGRESSIVE DRIVING. | | |
| | Performance Measures | KSI crashes associated with driver behavior violations do not increase at a rate greater than population growth | Proposed Analysis | Align evaluation with the annual report, analyze the # of crashes with driver behavior violations with the population growth rate. |
| | | Conduct behavior-related enforcement impact programs at least 12 times per year | | Starting in 2024, evaluate the previous year to count the number of behavior-related enforcement impact programs conducted. |
| | OBJECTIVE 2.C | REDUCE THE NUMBER OF KSI CRASHES RELATED TO IMPAIRED DRIVING (DRUGS & ALCOHOL). | | |
| | Performance Measures | Conduct DUI enforcement programs at least 18 times per year | Proposed Analysis | Starting in 2024, evaluate the previous year to count the number of DUI enforcement programs conducted. |
| | | KSI crashes associated with impaired driving do not increase at a rate greater than population growth | | Align evaluation with the annual report, analyze the # of crashes involving impairment with the population growth rate. |

# PERFORMANCE MEASURES - ANALYSIS (CONT.)

**Pedestrian & Bicyclists Strategies**

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| **OBJECTIVE 3.A** | **REDUCE CRASH RISK INVOLVING PEOPLE WALKING AND BICYCLING BY EXPANDING SAFE ROUTES TO SCHOOL EFFORTS.** | | | |
| **Performance Measures** | Implement safety improvements at 20 schools per year focused on schools on arterials, collectors, within mobility areas, and with high equity need. | **Proposed Analysis** | Starting in 2024, evaluate the previous year to count the number of school safety improvements completed. | |
| **OBJECTIVE 1.B** | **REDUCE THE NUMBER OF KSI CRASHES INVOLVING PEOPLE WALKING AND BICYCLING WITH GEOMETRIC RECONFIGURATION AND SYSTEMIC COUNTERMEASURES.** | | | |
| **Performance Measures** | Install 20 mid-block improvements per year | **Proposed Analysis** | Starting in 2024, count the number of mid-block crossing improvements installed. | |
| | Reduce pedestrian-related fatal crashes by 10% per year | | Align evaluation with the annual report, analyze the # of pedestrian-related fatal crashes. | |
| | Develop pedestrian safety toolkit by 2027 | | This measure will be tracked as a completed or not completed (2028) | |
| **OBJECTIVE 1.C** | **REVIEW EXISTING GAPS IN PEDESTRIAN INFRASTRUCTURE AND PRIORITIZE IMPROVEMENTS.** | | | |
| **Performance Measures** | Develop a risk factor network to identify locations with greatest risk by 2025 | **Proposed Analysis** | This measure will be tracked as a completed or not completed (2026) | |
| | Develop a plan to implement annual improvements to mitigate risk factors by 2027 | | This measure will be tracked as a completed or not completed (2028) | |
| | Improve shade coverage at 60 transit stops per year within cool corridors | | Starting in 2024, evaluate the previous year to count the number of transit stops that have improved shade coverage. | |

# PERFORMANCE MEASURES - ANALYSIS (CONT.)

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| Intersection Strategies | OBJECTIVE 4.A | REDUCE THE NUMBER OF KSI CRASHES AT UNSIGNALIZED INTERSECTIONS WITH GEOMETRIC RECONFIGURATION & SYSTEMIC COUNTERMEASURES. | | |
| | Performance Measures | Develop geospatial process for identifying unsignalized crashes by 2024. | Proposed Analysis | This measure will be tracked as a completed or not completed (2025) |
| | | Develop list of priority intersections & improvements by 2024 | | This measure will be tracked as a completed or not completed (2025) |
| | OBJECTIVE 4.B | REDUCE THE NUMBER OF KSI CRASHES AT SIGNALIZED INTERSECTIONS WITH GEOMETRIC RECONFIGURATION & SYSTEMIC COUNTERMEASURES. | | |
| | Performance Measures | Complete 15 HIN Intersection rebuilds per year | Proposed Analysis | Starting in 2024, evaluate the previous year to count the number of HIN intersections rebuilt |
| | | Reduce KSI crashes at unsignalized intersections by 8% per year | | Align evaluation with the annual report, analyze the # of KSI crashes at unsignalized intersections. |
| | OBJECTIVE 4.C | REDUCE THE NUMBER OF KSI CRASHES AT SIGNALIZED INTERSECTIONS WITH SIGNAL PHASING OR TIMING. | | |
| | Performance Measures | Evaluate the 68 HIN intersections for appropriate pedestrian safety operations & left-turn operational improvements by 2024 | Proposed Analysis | This measure will be tracked as a completed or not completed (2025) |

# PERFORMANCE MEASURES - ANALYSIS (CONT.)

**Segment Strategies**

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| **OBJECTIVE 5.A** | **REDUCE THE NUMBER OF KSI CRASHES ON ROAD CORRIDORS WITH ACCESS MANAGEMENT (REDUCING CONFLICT POINTS).** | | |
| **Performance Measures** | Reduce KSI crashes on segments by 2% per year. | **Proposed Analysis** | These measures will be tracked as a completed or not completed. |
| | Install 4 Miles of Raised Medians per year with less than 8 median breaks per mile for the first 5 Years. | | |
| **OBJECTIVE 5.B** | **REDUCE THE NUMBER OF KSI CRASHES ON ROAD CORRIDORS BY IMPROVING VISIBILITY, ILLUMINATION, AND DRIVER EXPECTANCY ON CORRIDORS.** | | |
| **Performance Measures** | Starting in 2023, begin process to install 3 single sided miles of lighting per year for 5 years. | **Proposed Analysis** | This measure will be tracked as a completed or not completed (2026) |
| **OBJECTIVE 5.C** | **REDUCE THE NUMBER OF NIGHTTIME CRASHES BY IMPLEMENTING SYSTEMIC LIGHTING IMPROVEMENTS CITYWIDE.** | | |
| **Performance Measures** | Reduce Nighttime Crashes by 5% per year | **Proposed Analysis** | Align evaluation with the annual report, analyze the # of nighttime crashes on segments. |

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