

# PEDESTRIAN SAFETY ACTION PLAN

CITY OF TUCSON



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**PREPARED FOR:**



CITY OF TUCSON  
201 N. STONE AVE. 6TH FLOOR  
TUCSON, AZ 85701

**PREPARED BY:**



KITTELSON & ASSOCIATES, INC.  
2 E CONGRESS STREET  
TUCSON, AZ 85710

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# EXECUTIVE SUMMARY



Between 2014 and 2018, there were nearly 1,200 pedestrians involved in traffic crashes in Tucson. These crashes took the lives of 96 people and severely injured 246 more.

## PLAN PURPOSE



REDUCE  
PEDESTRIAN  
CRASHES



MAKE WALKING  
SAFER FOR  
EVERYONE



PRIORITIZE  
HIGH CRASH  
LOCATIONS



IDENTIFY  
STRATEGIES &  
ACTIONS

## PEDESTRIAN CRASH ANALYSIS

**80%**

of pedestrian deaths  
& serious injuries  
occur on streets with  
speed limits of

**35+ mph**

**90%**

of pedestrian deaths &  
severe injuries occur on

**11%**

of Tucson streets

**70%**

of pedestrian crashes  
occur within

**300 ft**

**of a bus stop**

# RISK FACTORS

*Risk factors are roadway, land use, or behavioral characteristics associated with increased pedestrian crash and injury risk. These factors may be used to identify locations where crashes have not yet occurred to make proactive safety improvements. The following pedestrian risk factors were determined for intersections and roadway corridors.*



Intersections within **200 feet** of a transit or bus stop



Signalized intersections with **four and six lane roadways** with posted speeds of **35 or 40 mph**



**Six lane, two-way roadways**



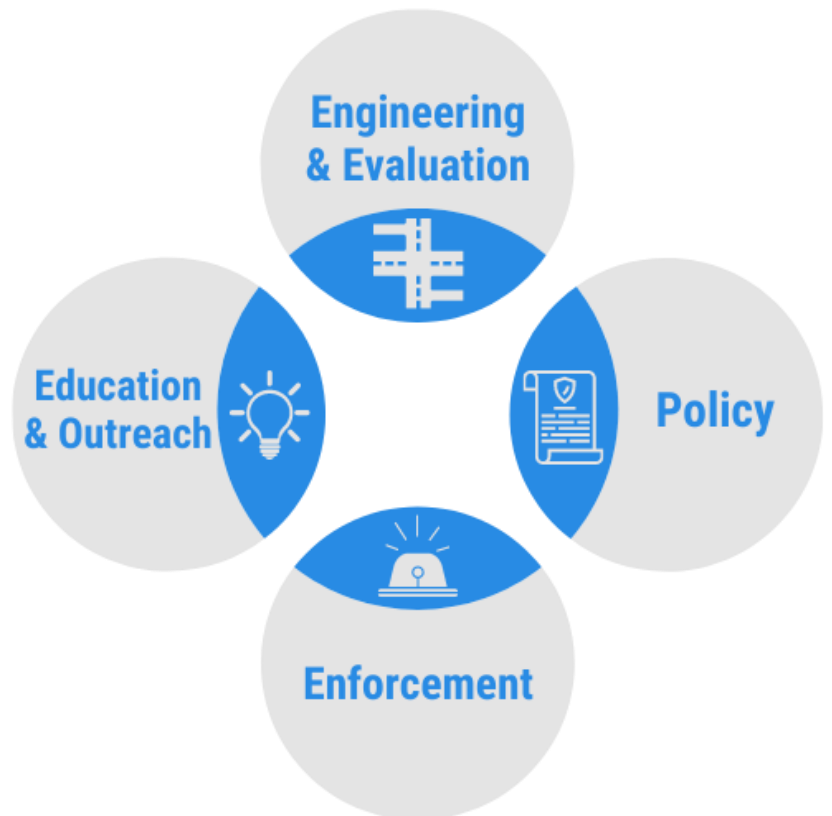
Roadway segments **within 300 feet of a transit or bus stop** and **more than 2,000 feet from a marked crosswalk**

# HIGH INJURY NETWORK

A pedestrian high injury network was developed as part of this project, representing 68% of all pedestrian deaths and severe injuries along 4% of city streets. The high injury network is presented at the end the summary.

# STRATEGIES & ACTION ITEMS

This is no single solution that solves all the issues related to pedestrian safety. Therefore, the PSAP lays out an Action Plan that identifies key strategies to improve pedestrian safety. The strategies fit under the following focus areas: engineering, evaluation, policy, enforcement, education and outreach. Within each strategy are specific action items - that when combined will help to make our streets safer for walking.



## STRATEGIES & ACTION ITEMS

### STRATEGY 1 | PRIORITIZE HIGH INJURY NETWORK (HIN) SAFETY IMPROVEMENTS

1.1	Work in partnership with Tucson Police Department (TPD) to identify locations for Pedestrian Safety Corridors and other infrastructure improvements on the High Injury Network (HIN)	ENGINEERING & ENFORCEMENT
1.2	Focus traffic safety enforcement on violations that result in severe injuries and deaths along the HIN ( <i>See Section 03 - Pedestrian Crash Analysis for more info</i> )	ENFORCEMENT
1.3	Regularly update HIN and prioritization tools to reflect changing conditions, best practices	ENGINEERING
1.4	Collaborate with community partners, neighborhoods, and TPD to conduct education and outreach efforts at key locations on the HIN	EDUCATION & ENFORCEMENT

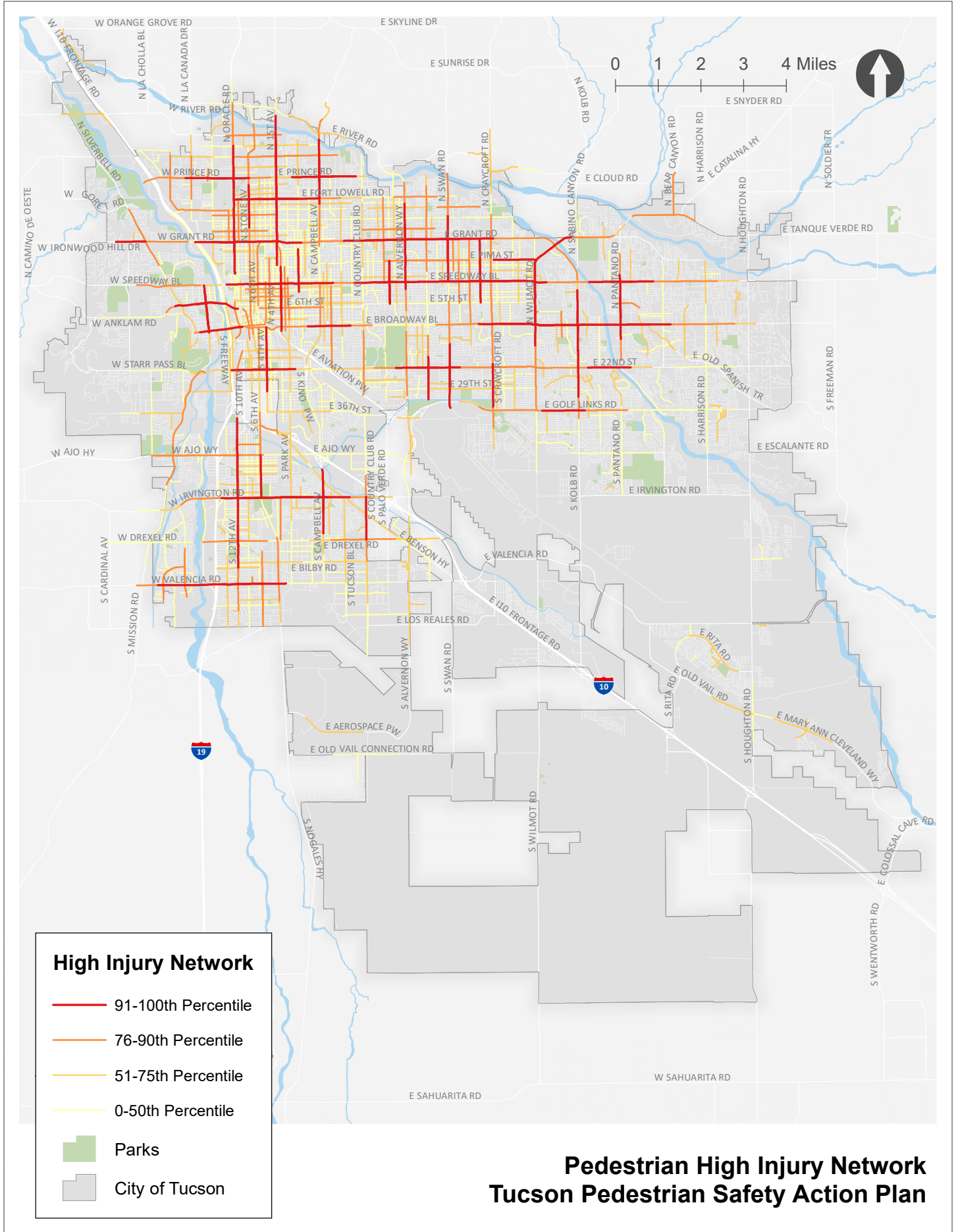
### STRATEGY 2 | IMPROVE PEDESTRIAN VISIBILITY AND COMFORT AT STREET CROSSINGS

2.1	Consider adopting guidelines for selecting countermeasures at uncontrolled crossing locations to determine when to include treatments like: refuge islands, Pedestrian Hybrid Beacons, or advance Yield Here To (Stop Here For) Pedestrian Signs ( <i>as established by FHWA</i> )	POLICY
2.2	Consider adopting the City of Tucson's draft Crosswalk Installation Policy	POLICY
2.3	Prioritize crosswalk treatments on streets with high concentrations of pedestrian injuries as identified in the HIN. Crosswalks should be installed in conjunction with appropriate countermeasures, as described in Tucson's Complete Streets Guidelines.	ENGINEERING
2.4	During repaving projects, evaluate uncontrolled marked crosswalks and ensure compliance with crosswalk installation policy	ENGINEERING
2.5	Consider updating existing policy ( <i>7.37: Ped Crosswalk Pavement Markings &amp; Signs</i> ) to include high visibility crosswalks at all marked crossings when restriping or installing new crosswalks	POLICY
2.6	Install on average five enhanced pedestrian crossing improvements per year	ENGINEERING
2.7	Consider amending existing city policy on Bus Stop Placement to allow stops to be placed closer to crossings - prioritizing user convenience and safety	POLICY

### STRATEGY 3 | MANAGE VEHICLE SPEEDS AND IMPROVE DRIVER AWARENESS

3.1	Review the top 10 HIN corridors to evaluate for speed reduction opportunities	ENGINEERING
3.2	Leverage roadway improvement opportunities to design roadways to a target speed ( <i>as described in ITE's Designing Walkable Urban Thoroughfares</i> )	ENGINEERING
3.4	Reduce the speed limit on roadways after installing physical improvements to reduce speeds	ENGINEERING
3.5	Establish guidelines for using vertical landscape elements as a speeding abatement strategy and to help delineate pedestrian versus vehicle spaces	POLICY
3.6	Consider establishing a city policy to expand definition of a school zone, to include the streets that are most often used by students walking to school ( <i>as referenced by New Jersey DOT</i> )	POLICY

<b>STRATEGY 4   REDUCE TURNING MOVEMENT CONFLICTS AT INTERSECTIONS</b>		
4.1	Evaluate appropriate locations to install Leading Pedestrian Intervals (LPis)	ENGINEERING
4.2	Identify and pursue funding for two major intersection designs per year	ENGINEERING
4.3	Identify 4 corridors along the HIN to evaluate adaptive signalization opportunities	ENGINEERING
<b>STRATEGY 5   PROVIDE ADEQUATE STREET LIGHTING FOR PEDESTRIANS</b>		
5.1	Consider establishing a unified policy that ensures sufficient lighting at crosswalks and includes corridor wide placement guidelines	POLICY
5.2	Use the HIN to identify roadways with a high concentration of injuries and limited lighting to prioritize roadways for lighting enhancements.	ENGINEERING
5.3	Establish a minimum level of Dark Sky compliant street lighting for collector and arterial streets that prioritizes bicycle and pedestrian safety	POLICY
<b>STRATEGY 6   SEEK COST-EFFECTIVE AND CREATIVE SOLUTIONS FOR PEDESTRIAN IMPROVEMENTS</b>		
6.1	Establish quick-build design guidelines to streamline and support community-led projects	POLICY
6.2	Continue to support community partnerships for implementing quick-build projects, such as intersection/crosswalk murals	EDUCATION
6.3	Install on average 10 low-cost safety improvements per year ( <i>including new road markings, signs, minor signal modifications, etc.</i> )	ENGINEERING
6.4	Leverage paving projects for cost-effective pedestrian improvements	ENGINEERING
<b>STRATEGY 7   EXPAND SAFETY EDUCATION &amp; OUTREACH EFFORTS FOCUSING ON PEOPLE DRIVING</b>		
7.1	Develop a Traffic Safety Campaign that prioritizes pedestrian safety and focuses on top contributing crash factors	EDUCATION & ENFORCEMENT
7.2	Collaborate with TPD to prioritize education over fines or other punishment. Traffic safety interactions should be treated as educational opportunities in most cases.	EDUCATION & ENFORCEMENT
7.3	Support the continuation and expansion of Safe Routes to School programs	EDUCATION
<b>STRATEGY 8   PROMOTE IMPORTANCE OF WALKING FOR TRANSPORTATION, RECREATION &amp; HEALTH</b>		
8.1	Support the continuation and expansion of Cyclovia Tucson	EDUCATION
8.2	Lead neighborhood walkability audits with residents, businesses and advocacy groups to identify opportunities to improve the safety and walkability in their neighborhood	EDUCATION
<b>STRATEGY 9   PRIORITIZE DATA-DRIVEN ENFORCEMENT AND EVALUATION TO IMPROVE SAFETY</b>		
9.1	Collaborate with partner agencies on crash data collection and reporting	ENGINEERING / ENFORCEMENT
9.2	Evaluate and report on the effectiveness of existing and newly installed pedestrian facilities to help inform future strategies	ENGINEERING
9.3	Identify existing City ordinances and State laws that can be strengthened, and explore potential new regulations needed, to better promote pedestrian safety	POLICY / ENFORCEMENT
9.4	Reassess the use of camera enforcement at traffic signals to detect drivers' red light running and/or along priority corridors to identify speeding-drivers	POLICY / ENFORCEMENT



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01

INTRODUCTION  
AND PURPOSE



# 01. INTRODUCTION & PURPOSE

## BACKGROUND AND MOTIVATION

Between 2014 and 2018, there were nearly 1,200 pedestrians involved in traffic crashes in Tucson. This resulted in 96 deaths and 246 severe injuries. These people are not just statistics. They are mothers, fathers, brothers, sisters, kids, and friends, who lost their lives in the course of the everyday act of moving from place to place. Walking is our most basic, universal form of transportation, available at no cost. The Tucson Pedestrian Safety Action Plan (PSAP) identifies key strategies and tools we will use to make walking safer and more comfortable across the city. Through the PSAP, the City of Tucson affirms walking as the most fundamental means of transportation, by putting pedestrians as the forefront of city policy, investments, and design.

***A pedestrian is a person traveling from place to place - using their own two legs, a wheelchair, a walker, or a cane.***

While the United States has made great improvements in safety for people in passenger vehicles, we have failed to make similar progress in protecting people walking. Whereas overall traffic deaths in the U.S. increased by 6% from 2010 to 2015, pedestrian fatalities increased by 25% over the same time period.<sup>1</sup> These trends hold true in the City of Tucson as well. In Tucson, people walking are involved in 5% of reported collisions but are involved in 27% of fatal collisions. People walking are the most vulnerable users on our streets.

These trends, both nationally and locally, underscore the critical need for cities to apply a strategic focus on improving pedestrian safety.

In the last decade, attention to pedestrian safety has increased in Tucson, but more work needs to be conducted to create safe, comfortable, and equitable walking environments for people of all ages and abilities. Tucson's PSAP provides a comprehensive approach to address pedestrian safety and contribute to making walking in Tucson safe, comfortable, convenient, and enjoyable for everyone.

The PSAP identifies citywide transportation safety trends and proposes engineering, policy, education, and enforcement solutions to achieve that vision. The PSAP also uses crash analysis results to develop recommendations that focus on addressing the factors that contribute to pedestrian crashes. It has been developed in concert with City staff and stakeholders regarding current policies, traffic laws, and ordinances relative to identified pedestrian safety issues. The recommendations presented in the PSAP reflect the intention of the family of City departments and stakeholders (see *Plan Development* below for more detail).

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<sup>1</sup> Traffic Fatalities by State, 2016 Preliminary Data. Governor's Highway Safety Association, [https://www.ghsa.org/sites/default/files/2017-03/2017ped\\_FINAL\\_4.pdf](https://www.ghsa.org/sites/default/files/2017-03/2017ped_FINAL_4.pdf)

## PLAN PURPOSE

Tucson's Pedestrian Safety Action Plan (PSAP) identifies key strategies and tools we will use to make walking safer and more comfortable across the city. The PSAP identifies a broad range of solutions to address pedestrian safety comprehensively while using data to identify and prioritize high-crash locations.



**REDUCE  
PEDESTRIAN  
CRASHES**



**MAKE WALKING  
SAFER FOR  
EVERYONE**



**PRIORITIZE  
HIGH CRASH  
LOCATIONS**



**IDENTIFY  
STRATEGIES &  
ACTIONS**

## CONTEXT AND CONNECTION TO OTHER PLANS

This plan has been developed as part of the overall City of Tucson Department of Transportation & Mobility (DTM) Five-Year Traffic Safety Plan and in conjunction with other transportation initiatives.

### Tucson's Five-Year Traffic Safety Plan

In January 2018, the City Manager's Office convened a Traffic Safety Working Group - a multi-agency and multi-departmental group - to lead the way on a comprehensive, data-driven effort to reduce the number of traffic related deaths and injuries. The working group was tasked with developing and implementing a plan that incorporated the "Five E's" of traffic safety: Engineering; Enforcement; Evaluation; Education; and Encouragement.

This plan was officially adopted by Mayor and Council in 2019 as Tucson's Five-Year Traffic Safety Plan. The plan includes each of the "Five E's" with shared, overlapping, and coordinated efforts between the Tucson Department of Transportation and Mobility and the Tucson Police Department. There are 40 specific strategies - some of which have been completed or are underway - including data analysis, road safety assessments, targeted enforcement, traffic signal improvements, youth education and speed feedback signs.

The PSAP will be integrated into the Five-Year Traffic Safety Plan to inform all goals, strategies and action items related to pedestrian safety.



The Tucson Mayor and Council adopted the Tucson Complete Streets Policy (Policy) in February 2019. The stated vision and intent of the Policy is the following:

*The City of Tucson views all transportation improvements as opportunities to foster a vibrant, healthy, equitable, interconnected, accessible, environmentally-sustainable, and more livable city where everyone can move about safely, comfortably, and with dignity. The City's Complete Streets Policy shall guide the development of a safe, connected, and equitable transportation network that promotes enhanced mobility for people of all ages and abilities including, but not limited to, people walking, biking, using transit, driving, using wheelchairs or other mobility devices.*

## Tucson Complete Streets Policy

Pursuant to Mayor and Council direction at the January 23, 2018 study session, the City of Tucson Department of Transportation and Mobility staff developed a Complete Streets Policy based on key guiding principles with input from Mayor and Council and a community outreach effort. Living Streets Alliance, a local non-profit, provided community engagement opportunities that will also help provided feedback to Mayor and Council on the policy. Through this process, a variety of community stakeholders participated in a Task Force providing input to ensure the policy is balanced and implementable vision with a framework to guide future transportation developments throughout the City.

The Policy, adopted in 2019 (see sidebar), articulates the need to consider all road users in the funding, planning, engineering, designing, and operation of all transportation projects. The Policy can help to ensure successful PSAP implementation. The goals of the Policy have considerable overlap with PSAP recommendations and will provide an opportunity to prioritize pedestrians in the City's transportation network. *Resource Link:* [tucsonaz.gov/tdot/complete-streets-tucson](http://tucsonaz.gov/tdot/complete-streets-tucson)

## Move Tucson

The City of Tucson is in the process of developing a comprehensive, multi-modal transportation plan, known as Move Tucson. The plan will develop transportation strategies - including programs, policies, and projects - to guide investments in the city's transportation system over 20+ years. Move Tucson will include a detailed list of pedestrian, bicycle, roadway, freight, and other improvements which will be identified through a combination of broad community input, technical analysis, and by incorporating existing and on-going plans. All significant transportation improvements and budgeting decisions the City will make over the two-decade horizon of the plan will be guided by the outcomes of the Move Tucson effort. The recommendations and key elements of the PSAP, such as the Pedestrian High Injury Network, will be incorporated into Move Tucson and used to inform the project and priority development.

# ADA Inventory

The Department of Transportation & Mobility has been working on an Americans with Disabilities Act (ADA) Inventory since 2014, collecting data on the existing condition of Tucson streets and sidewalks relative to ADA compliance based on proposed ADA standards from 2011.

## PLAN DEVELOPMENT

The PSAP represents the collective efforts of a team made up of city staff, consultants, community members and stakeholders. Plan development was guided by the following bodies:

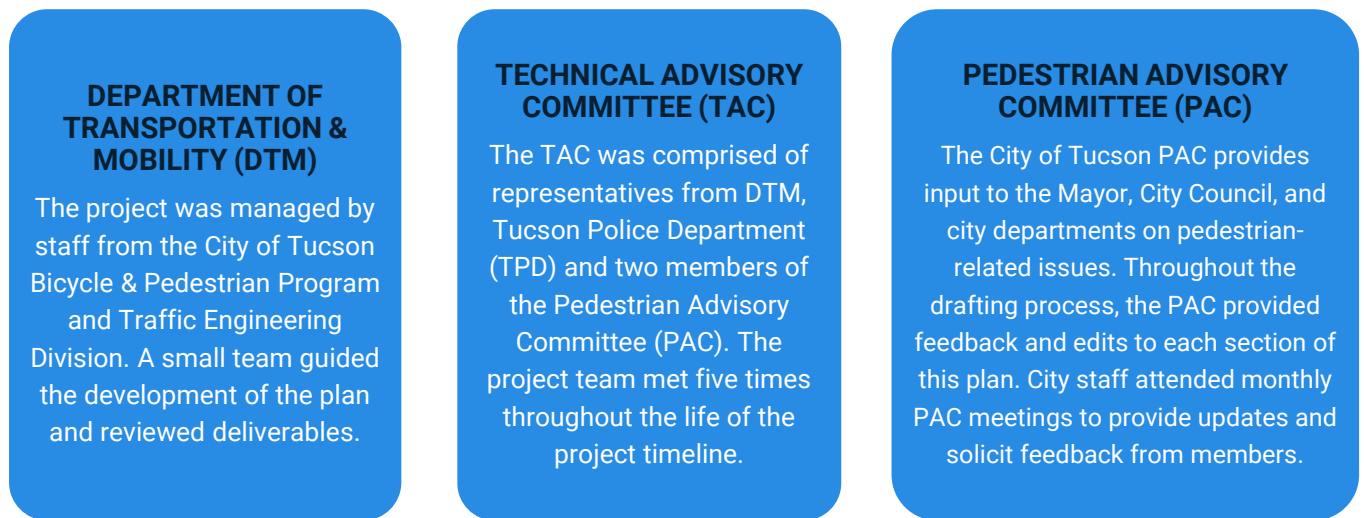
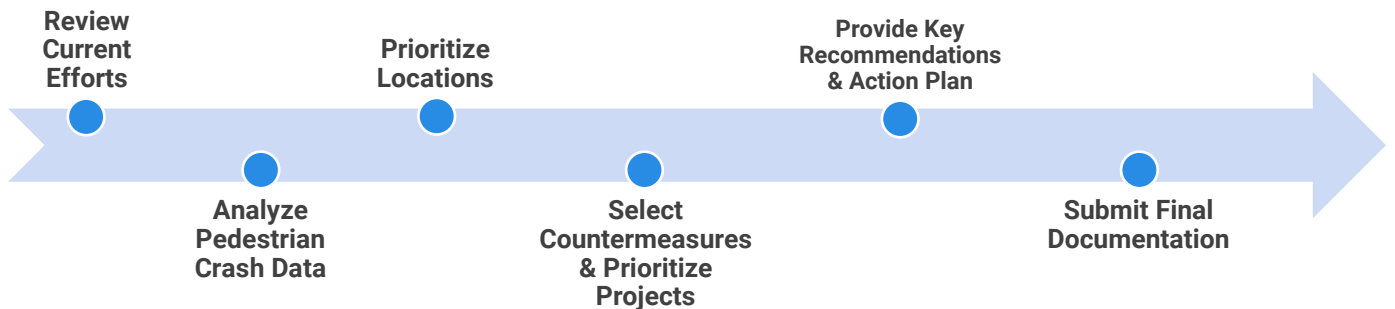


Figure 1. Plan Development Process





02

VISION & GOALS

# 02. MISSION, VISION & GOALS

## MISSION

Through the Pedestrian Safety Action Plan, the City of Tucson affirms walking as the most fundamental means of transportation, by putting pedestrians at the forefront of city policy, investments, and design.

## VISION

Tucson is a place where vibrant, safe and attractive streets give everyone the opportunity to walk to their destinations and to enjoy the convenience and health benefits of walking.

## GOALS

- ▶ **Safety** – Save lives by reducing the number and severity of pedestrian crashes on Tucson streets
- ▶ **Equity** – Recognizing historical patterns of disinvestment, focus investment and resources to create equitable, accessible walking conditions to meet the needs of Tucson’s diverse communities
- ▶ **Connectivity** – Complete and maintain a pedestrian network that encourages walking and connects people to their essential daily needs



*People crossing 7<sup>th</sup> Street at "Corbett Porch" – a temporary, quick-build project. Source: AZ Daily Star*





03

PEDESTRIAN  
CRASH ANALYSIS

# 03. PEDESTRIAN CRASH ANALYSIS

## CONTRIBUTING RISK FACTORS

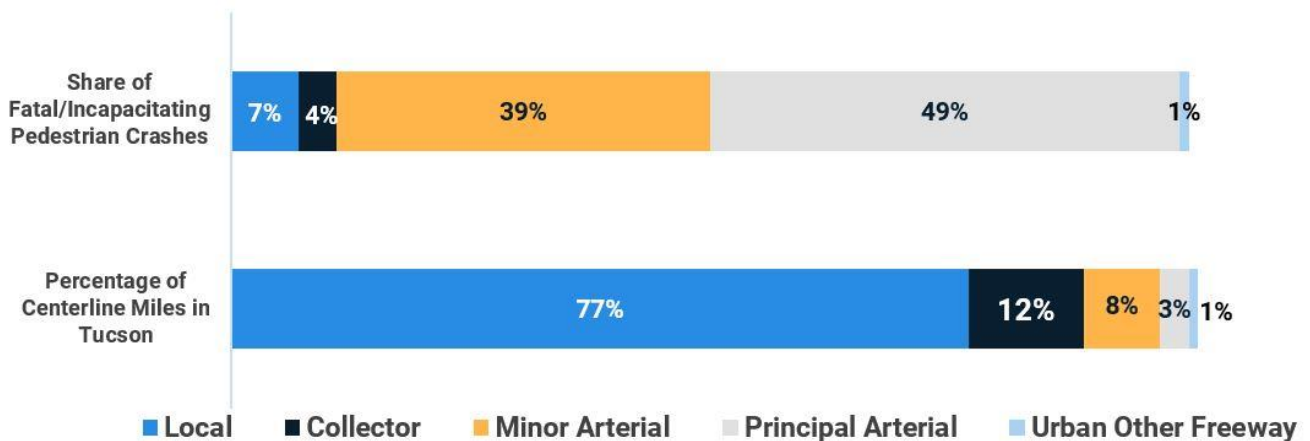
A pedestrian crash analysis was conducted to identify high-injury locations, social equity impacts, and contributing risk factors. The top five risk factors for pedestrian crashes are summarized below: **Street Design, Land-Use, Lighting, Speed, and Behaviors** (see Appendix A and Appendix B for more details).



### Factor 1: Street Design

- ▶ Between 2014 and 2018, **66% of all pedestrian crashes and 68% of fatal and incapacitating injury pedestrian crashes occurred on just 4% of our streets.** Figure 2 compares the share of fatal and incapacitating pedestrian crashes to the percentage of centerline miles in the city.
- ▶ More crashes, **49%, occurred on or at principal arterial roadways** than on any other roadway type; this share far outweighs the relative proportion of the roadway that principal arterials constitute by centerline miles (3%).
- ▶ **88% of fatal and incapacitating pedestrian crashes** occur on or at minor or principal arterial roadways, which collectively comprise **11% of centerline miles in Tucson.**

Figure 2: Pedestrian Crashes by Roadway Functional Classification



Note: Due to rounding, percentages may not sum to exactly 100%. Source: City of Tucson, 2014-2018



## Factor 2: Land-Use

- ▶ **70%** of crashes occurred within **300 feet of a Sun Tran or Sun Link stop.**

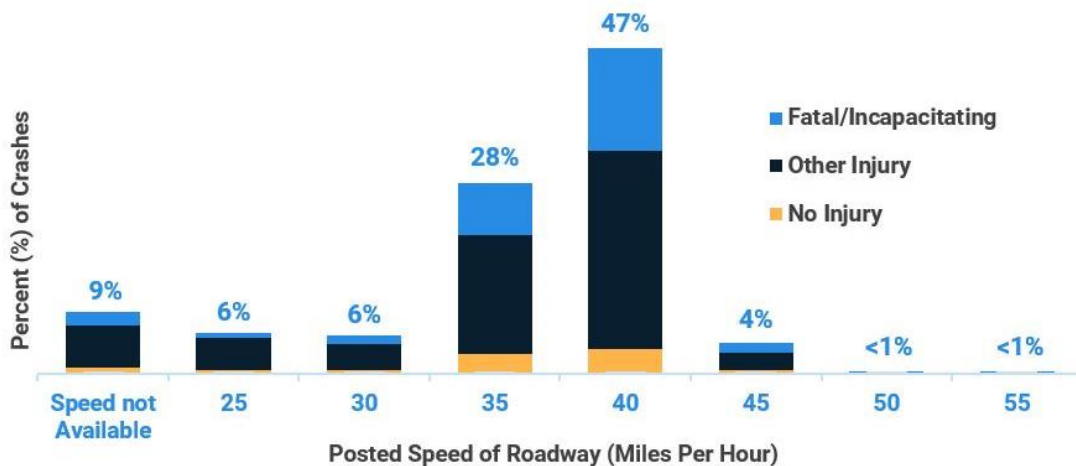
## Factor 3: Lighting

- ▶ While more crashes happen during the day, **crashes at night are more severe.**
- ▶ **1 in 3** crashes occurred between **6 and 10 PM** during primarily dark conditions.
- ▶ **Over half** (53%) of crashes occurred during daylight hours.
- ▶ **8%** of crashes occurred in **dark conditions without lighting.**
- ▶ **Between 7 PM and 6 AM, 40%** of pedestrian crashes are fatal or incapacitating.

## Factor 4: Speed

- ▶ The majority of crashes, **75%**, occur on roadways with posted speeds of **35 and 40 miles per hour.** Figure 3 presents pedestrian crash severity by the posted speed limit.
- ▶ Speed is correlated with pedestrian fatalities and incapacitating injuries. Approximately **88% of fatal and incapacitating pedestrian crashes were along arterial roadways,** which generally have higher posted speeds relative to other roadways in the network (35 miles per hour and higher).

Figure 3. Pedestrian Crash Severity by Posted Speed



Note: Posted speed of highest-speed roadway is presented if crash occurred at an intersection. Source: City of Tucson, 2014-2018

## Factor 5: Behaviors

- ▶ Driver violations were cited in at least **48%** of crashes with **failure to yield right-of-way** representing 34% of pedestrian crashes.
- ▶ Pedestrian violations/behaviors were cited in at least **34%** of crashes with **“Did not use crosswalk”** representing the leading violation with 23% of reports.

## SPEED IS A FUNDAMENTAL PREDICTOR OF CRASH SURVIVAL

*As vulnerable road users, pedestrians are disproportionately impacted by relatively modest increases in vehicle impact speed. Research shows that increasing vehicle speeds from 20 mph to 40 mph increases the likelihood of a pedestrian death when hit from 10 percent to 80 percent. Slower speeds also increase the field of vision and allow for more time to react to unexpected situations on the roadway (see Figure 4).*

Figure 4. Impact of Vehicle Speed on Field of Vision and Risk of Pedestrian Death



Source: Vision Zero Los Angeles



04

HIGH INJURY  
NETWORK

# 04. HIGH INJURY NETWORK

## PRIORITY INTERSECTIONS & CORRIDORS

### NETWORK SCREENING

As part of the safety analysis conducted for the project, two citywide network screenings were conducted with complementary objectives:

- ▶ **An intersection- and segment-based network screening**, conducted to identify high-injury *locations* and citywide risk factors with respect to pedestrian safety. This screening treated intersection-related and segment-related crashes separately, resulting in high-injury intersections and roadway segments. The highest severity-weighted locations were classified as **Tier 1** locations, with a second category of high crash locations classified as **Tier 2** locations. Collectively, Tier 1 and Tier 2 locations accounted for approximately the top 10% of locations with crash history citywide.
- ▶ **A segment-based network screening** to aggregate high-injury locations to a citywide pedestrian high-injury network (HIN). This screening did not distinguish between intersection- and segment-based crashes, and the results were aggregated high-injury corridors (locations with segment and intersection crashes, or a series of intersections with significant crash history).

In both cases, the analysis locations were segmented into percentile categories based on the calculated severity-weighted crash frequency using the crash severity score described below.

A crash severity score assigns weight to individual crashes based on the severity of the crash. The weighting is based on the relative differences in crash costs by crash severity, giving each crash a relative score in terms of the equivalent number of property damage only (PDO) crashes. These weights, shown below, are based on the Oregon Safety Priority Index System (SPIS) scoring method, which assign weights of 100 to fatal and incapacitating crashes and 10 to other injury crashes.

- ▶ **Fatal and Incapacitating Injury Crashes:** *100 points*
- ▶ **Non-incapacitating and possible injury crashes:** *10 points*
- ▶ **Non-injury crashes:** *1 point*

## WHY DO WE PRIORITIZE?

*Given the enormity of sidewalk and crossing needs across the city, the PSAP aims to direct resources to locations with the greatest need first.*

*The PSAP identifies priority locations for pedestrian investment within the High Injury Network (HIN) using a data-based approach. A data-based approach helps ensure we are directing limited resources to the greatest needs first and allows us to provide a proactive, programmatic approach for addressing pedestrian infrastructure needs.*

*The prioritization framework identifies pedestrian investments based on three main factors:*

- 1. Safety**
- 2. Risk Factors**
- 3. Equity**

## PRIORITIZING NEEDS

Building-off the systemic findings, risk factor identification, and intersection/segment network screening results, a prioritization framework was used to identify locations with the greatest need and guide future investments. Three factors formed the basis for location prioritization:

### Safety

The City's road network was screened to find the top severity-weighted crash locations, using a crash severity score. Among 647 intersections with crash history over the 2014-2018 period, 120 high-injury intersections and three roadway segments were identified.

### Risk Factors

We combined descriptive and spatial analysis to identify risk factors. Risk factors are roadway, land use, transit ridership or behavioral characteristics associated with increased crash and injury risk. These may be used as part of a systemic safety approach to identify locations where crashes have not yet occurred to make proactive safety improvements.

### Equity

We associated high-injury locations with socio-economic and demographic factors to identify locations with a high relative transportation disadvantage in addition to crash frequency. This measure is based on a *transportation disadvantaged population* (TDP) index. The TDP measures the level of relative transportation disadvantage faced by the population within the Census block group containing each intersection or segment. A visual presentation of TDP score by is provided in Figure 5.

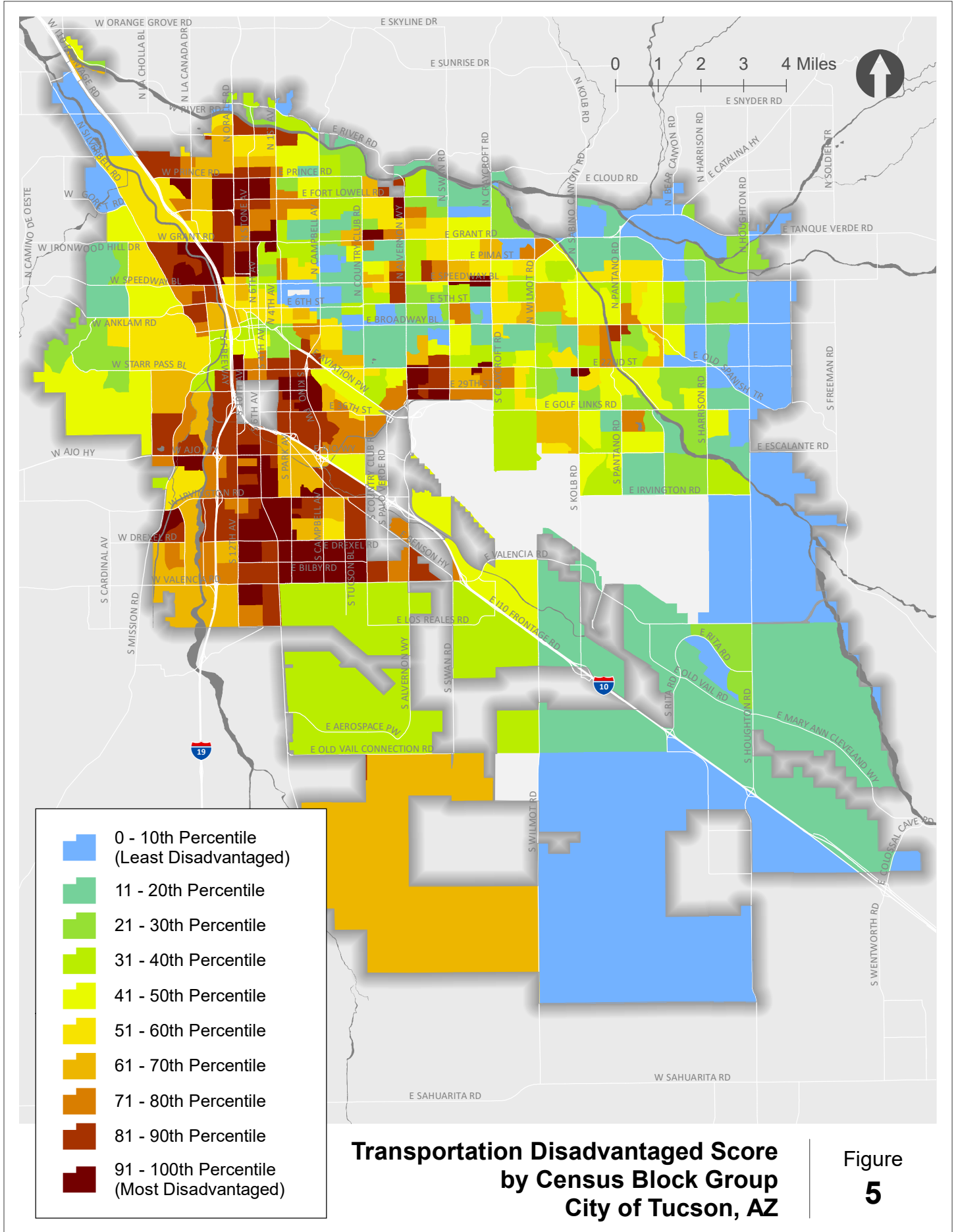


Figure 5

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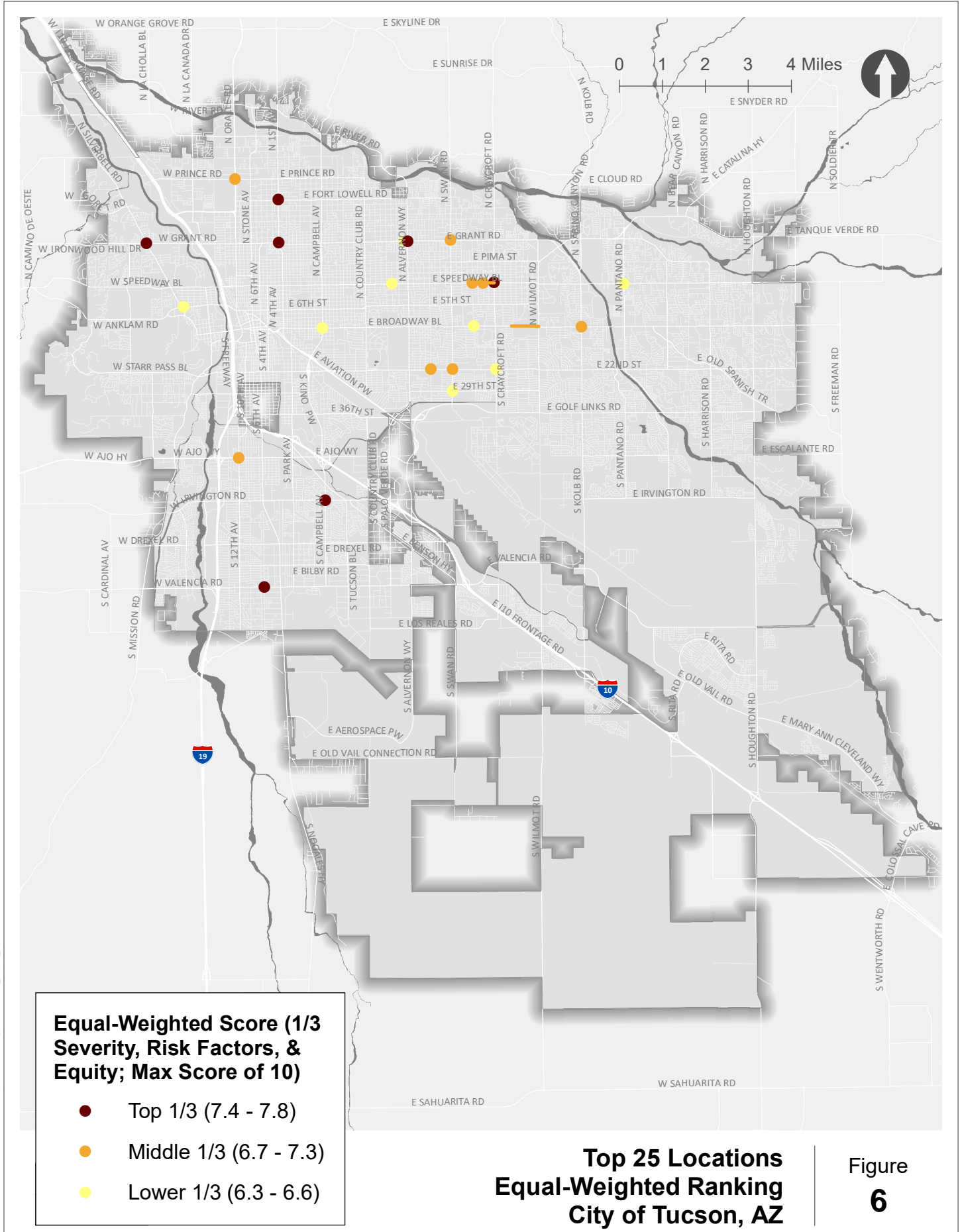


The City's preferred prioritization method was an equal-weighted ranking, which considers crash severity, risk factors, and social equity equally (1/3 each). This method of prioritization provides a straightforward methodology that equally weighs crash history to prioritize where crashes have occurred, presence of risk factors to apply a systemic approach, and equity to prioritize. The ranking of the top 25 locations based on this weighting is shown in Table 1 and Figure 6.

**Table 1. Potential Priority Locations**

LOCATION	NORMALIZED EQUAL WEIGHTS SCORE (MAX OF 10)
E Grant Rd / N Alvernon Way	7.8
E Speedway Blvd/ N Craycroft Road	7.5
E Valencia Road / S 6th Avenue	7.4
<b>East Broadway, between Craycroft and Wilmot</b>	7.3
E Irvington Road / S Campbell Ave	7.0
E Fort Lowell Road / N 1st Avenue	6.9
<b>E Speedway Boulevard, between Craycroft and Woodland</b>	6.9
E Grant Rd / N 1st Avenue	6.9
W Ironwood Hill Drive / N Silverbell Road	6.8
E Speedway Blvd/ N Beverly Avenue	6.6
E Grant Rd / N Swan Road	6.6
E 22nd Street / S Craycroft Road	6.6
E Grant Rd / N Haskell Drive	6.6
E 22nd Street / S Swan Road	6.3
E 22nd Street / S Columbus Boulevard	6.3
W Ajo Way / S 12th Avenue	6.3
E Speedway Blvd/ N Rosemont Boulevard	6.2
E Broadway Blvd/ N Kolb Road	6.2
W Grant Rd / N Oracle Road	6.2
W Valencia Road / S Fiesta Avenue	6.1
E 22nd Street / S Alvernon Way	6.1
E Tanque Verde Road / E Pima Street	6.1
W Prince Road / N Oracle Road	6.1
E 29th Street / S Swan Road	6.0
E Speedway Blvd/ N Alvernon Way	5.9

\*Note: **bolded locations** are roadway segments, and all others are intersections.



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# PEDESTRIAN HIGH INJURY NETWORK

This section describes the network screening and data-driven evaluation process used to develop a pedestrian high-injury network. Geolocated pedestrian crashes were associated with the roadway segment on which they occurred. Those crashes reported to have occurred within 250 feet of an intersection were attributed to *both* intersecting streets for the purposes of the screening. This analysis segmented the street network into one-half (1/2) of a mile segments, incrementing the segments by one-quarter (1/4) of a mile to create overlapping analysis segments. The crash severity score was calculated per increment of each segment as the analysis window “slides” along each street in the network. It includes intersections as part of the analysis. This methodology helps to identify portions of roadways with the greatest potential for safety improvements.

Using a 1/2-mile analysis segment allows for aggregation across multiple intersections, resulting in the identification of *corridors* rather than individual intersection locations.

## High Injury Network | Development & Facts

The pedestrian HIN includes approximately 78 miles of roadway (out of approximately 2,113 miles of city roadway). The HIN represents 4% of the city’s roadway network.

Out of 1,199 recorded pedestrian crashes (339 fatal and incapacitating) in 2014-2018:

- ▶ 786 pedestrian crashes occurred on the HIN
- ▶ 232 fatal and incapacitating pedestrian crashes occurred on the HIN

**4% of Tucson’s roadway network accounted for 66% of pedestrian crashes and 68% of fatal and incapacitating injury pedestrian crashes from 2014 through 2018.**



## High Injury Network | Risk Factors

Risk factors are roadway, land use, transit ridership or behavioral characteristics associated with increased pedestrian crash and injury risk. These may be used as part of a systemic safety approach to identify locations where crashes have not yet occurred to make proactive safety improvements.

To identify risk factors, crashes were attributed the functional classification of the underlying roadway. For crashes at intersections, the higher-classification roadway is displayed (e.g., *arterial* would be listed for an arterial-collector intersection). Based on the roadway characteristics among Tier 1 high-injury locations, general risk factors were determined for intersections and roadway corridors.

### INTERSECTION RISK FACTORS

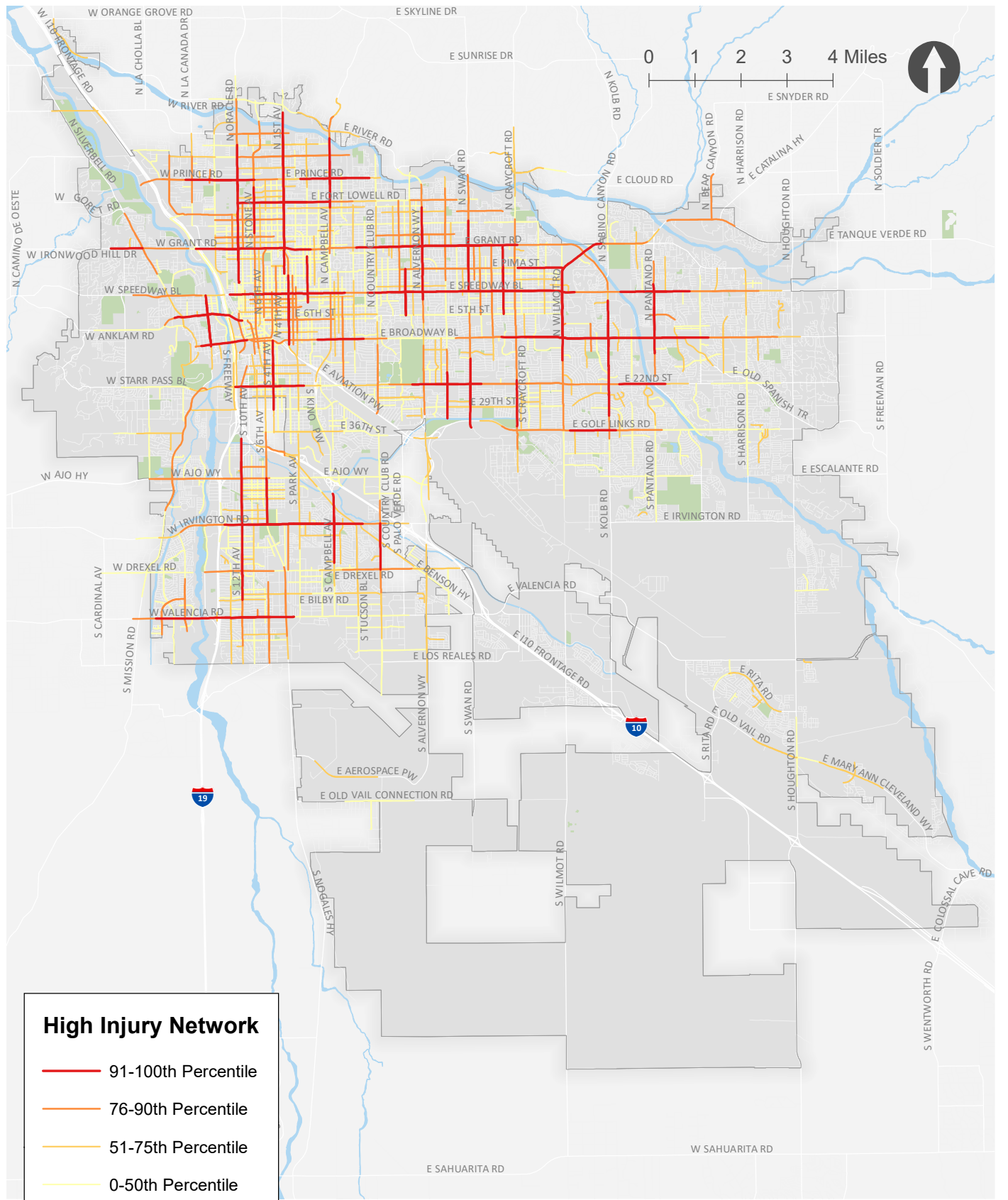
Based on review of the intersection characteristics present across the Tier 1 intersections, we identified the following characteristics as intersection risk factors:

- ▶ Locations within 200 feet of at a bus or transit stop
- ▶ Signalized intersections with four and six lane roadways of 35 or 40 miles per hour

### SEGMENT RISK FACTORS

A review of the crashes at the three high-injury segments indicated the following risk factors for non-intersection crashes:

- ▶ Six-lane roadways
- ▶ Locations within 300 feet of a bus or transit stop and more than 2,000 feet



**High Injury Network**

- 91-100th Percentile
- 76-90th Percentile
- 51-75th Percentile
- 0-50th Percentile
- Parks
- City of Tucson

**Pedestrian High Injury Network  
Tucson Pedestrian Safety Action Plan**

**Figure  
7**

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**Table 2. Pedestrian High Injury Network**

ROADWAY	EXTENTS (LISTED NORTH TO SOUTH OR WEST TO EAST)
Alvernon Way	Presidio St to E 2nd St
Kolb St	E Rosewood St to Calle Pegaso
Mountain Ave	E Hampton St to E N Campus Dr
Oracle Rd	E Limberlost Dr to W Drachman St
Pantano Rd	E Speedway Blvd to E Uhl St
Pima St	N Craycroft Rd to N Wilmot Rd
Prince Rd	N Iroquois Ave to N Stone Ave
Richey Blvd	E Pima St to E 5th St
St Mary's Rd	N San Rafael Ave to N Main Ave
1st Ave	N Campana Dr to E Elm St
Speedway Blvd	Rail undercrossing east of I-10 to N Wilson Ave
Speedway Blvd	N Stewart Ave to N Barbara Worth Dr
Speedway Blvd	Overcrossing at N Finance Center Dr to N Huntington Park Pl
N Stone Ave	W Yavapai Rd to W Kelso St
Swan Rd	E Malvern St to Golf Links Rd
Valencia Rd	S Sandpiper Ave to S Euclid Ave
Wilmot Rd / Tanque Verde Rd	N Sabino Canyon Rd to E Hayne St
22nd St	S Dodge Blvd to S Mountain View Ave
22nd St	S Turquoise Vista to S Sherwood Village Dr
Beverly Ave	E Grant Rd to E 5th St
Broadway Blvd	N Vine Ave to N Treat Ave
Broadway Blvd	N Beverly Ave/S Williams Blvd to N Rayburn Place
12th Ave	W 38th St to W Calle Margarita
Campbell Ave	Rillito River crossing to E Hedrick Rd
Columbus Blvd	E Paseo Dorado to E 32nd St
Congress St	S Westmoreland Ave to W Pennington St
4th Ave	W Broadway Blvd to 29th St
Craycroft Rd	E Douglas St to Golf Links Rd
Country Club Rd	E Irvington Rd to E Drexel Rd
6th Ave	E Ajo Way to Irvington Rd
Euclid Ave	E Lee St to E 12 <sup>th</sup> St
Fort Lowell Rd	N Oracle Rd to N Campbell Ave
Grande Ave	Speedway Blvd to W Congress St
Golf Links Rd	S Calle Polar to S Calle Yucatan
Grant Rd	Interstate 10 to N Highland Ave
Grant Rd	N Forgeus Ave to N Craycroft Rd
Irvington Rd	Interstate 19 to E Benson Highway
Ironwood Hill Dr	Highlands Ranch/Saddlewood Ranch Dr to N Silverbell Rd

## High-Injury Network | Application

The HIN should be updated on a three- to five-year basis and can be a useful planning and prioritization tool. It is applied as such in subsequent sections of the PSAP. Some example applications of high-injury networks are presented below:

### ALAMEDA COUNTY PEDESTRIAN & BICYCLE HIGH-INJURY NETWORK

The Alameda County Transportation Commission’s 2019 Countywide Active Transportation Plan (CATP) update included the development of separate pedestrian and bicycle high-injury networks based on crash history. The HINs were incorporated into project prioritization, with priority for county capital investment given to projects either along HINs or that provide direct proximate alternatives to existing HIN. Figure 8 illustrates the CATP’s prioritization criteria. *Resource Link:* <http://bit.ly/ACactivetransportationplan>

**Figure 8. Alameda County Active Transportation Plan Prioritization Criteria**

Criteria		Goals			
		Safety	Multimodal	Encouragement	Impactful Investment
Primary	Countywide High Injury Network	●			
	Major Barriers	●	●	●	
	Communities of Concern				●
Secondary	Local High Injury Network	●			
	Access to Major Activity Centers			●	●

Source: Alameda County Transportation Commission

### SAN FRANCISCO VISION ZERO HIGH-INJURY NETWORK

The City of San Francisco initially developed a high-injury network concept in 2015 as part of its Vision Zero efforts. The City has since issued a revised network in 2017. The HIN is publicly available at the resource link below. With its 2017 update, the San Francisco has also layered in its communities of concern (which identify disproportionately vulnerable populations, including low income residents, residents of color, seniors, people with disabilities, and residents with limited English proficiency) to establish that 51% of the city’s HIN is comprised within its most vulnerable communities.

City agencies use the HIN concept in several ways, including to inform decisions about safety improvements, education, and enforcement. The San Francisco Municipal Transportation Agency (SFMTA) has developed vision zero quick-build capital improvement projects along identified HIN corridors. With development review, the Planning Department documents when projects are built on or adjacent to a high-injury network to identify potential exacerbation or mitigation opportunities relative to pedestrian hazards. *Resource Link:* <http://bit.ly/SFgovVisionZero>

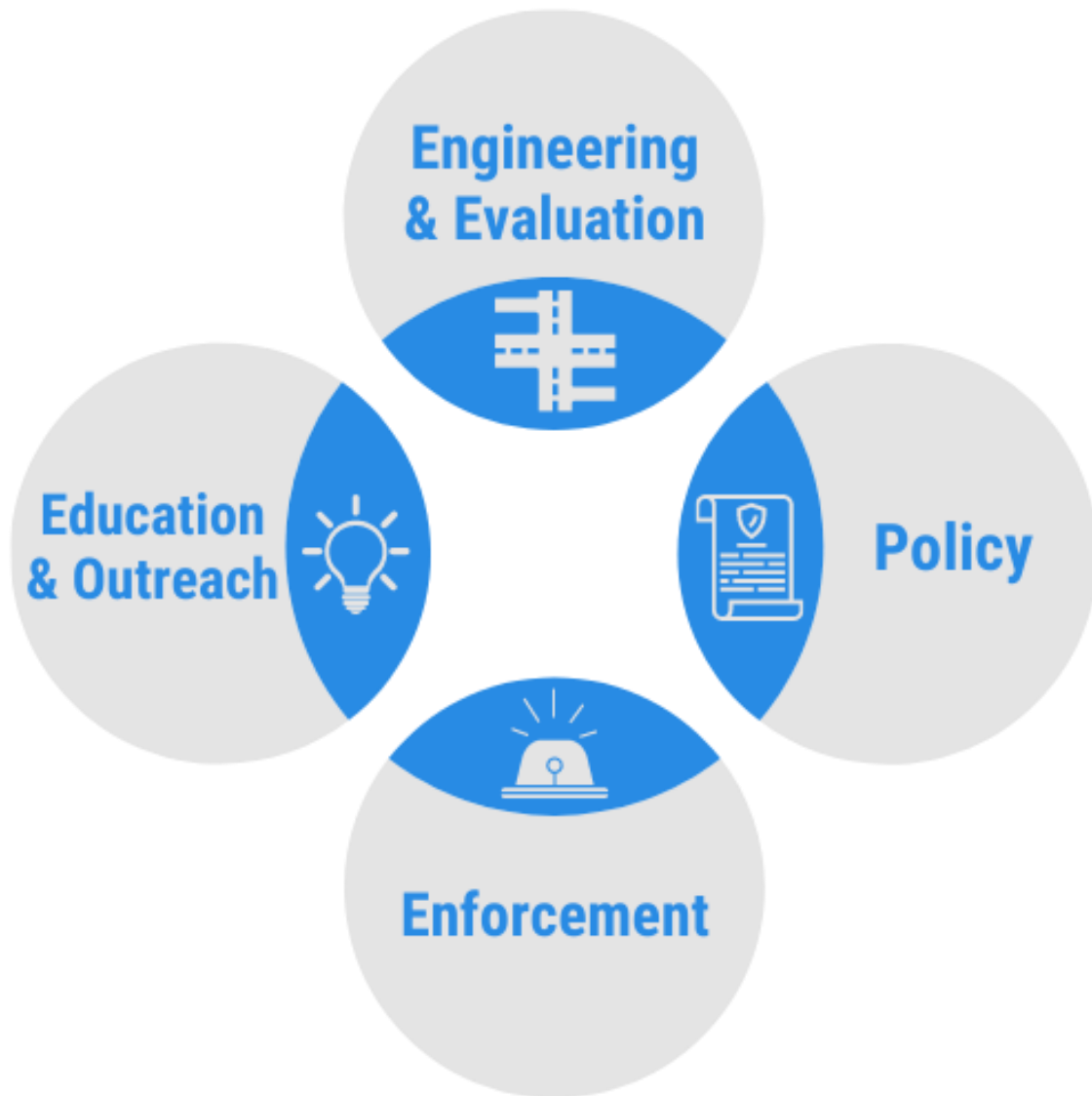


05

ACTION PLAN

# 05. ACTION PLAN

The Action Plan identifies key strategies and action items to address pedestrian safety through: Engineering & Evaluation, Policy, Education & Outreach, and Data-Driven Enforcement.





# ENGINEERING | STRATEGIES & ACTIONS

## PRIORITIZE HIGH INJURY NETWORK (HIN) SAFETY IMPROVEMENTS

- ▶ Work in partnership with Tucson Police Department (TPD) to identify locations for Pedestrian Safety Corridors and other infrastructure improvements on the High Injury Network (HIN)
- ▶ Regularly update HIN and prioritization tools to reflect changing conditions, best practices

## IMPROVE PEDESTRIAN VISIBILITY AND COMFORT AT STREET CROSSINGS

- ▶ Prioritize crosswalk treatments on streets with high concentrations of pedestrian injuries as identified in the HIN. Crosswalks should be installed in conjunction with appropriate countermeasures, as described in Tucson's Complete Streets Guidelines.
- ▶ During repaving projects, evaluate uncontrolled marked crosswalks and ensure compliance with crosswalk installation policy
- ▶ Install on average five enhanced pedestrian crossing improvements per year

## MANAGE VEHICLE SPEEDS AND IMPROVE DRIVER AWARENESS

- ▶ Review the top 10 HIN corridors to evaluate for speed reduction opportunities
- ▶ Leverage roadway improvement opportunities to design roadways to a target speed (*as described in ITE's Designing Walkable Urban Thoroughfares*)
- ▶ Reduce the speed limit on roadways after installing physical improvements to reduce speeds

## REDUCE TURNING MOVEMENT CONFLICTS AT INTERSECTIONS

- ▶ Evaluate appropriate locations to install Leading Pedestrian Intervals (LPis)
- ▶ Identify and pursue funding for two major intersection designs per year
- ▶ Identify 4 corridors along the HIN to evaluate adaptive signalization opportunities

## PROVIDE ADEQUATE STREET LIGHTING FOR PEDESTRIANS

- ▶ Use the HIN to identify roadways with a high concentration of injuries and limited lighting to prioritize roadways for lighting enhancements.

## SEEK COST-EFFECTIVE AND CREATIVE SOLUTIONS FOR PEDESTRIAN IMPROVEMENTS

- ▶ Install on average 10 low-cost safety improvements per year (*including new road markings, signs, minor signal modifications, etc.*)
- ▶ Leverage paving projects for cost-effective pedestrian improvements

## PRIORITIZE DATA-DRIVEN ENFORCEMENT AND EVALUATION TO IMPROVE SAFETY

- ▶ Collaborate with partner agencies on crash data collection and reporting
- ▶ Evaluate and report on the effectiveness of existing and newly installed pedestrian facilities to help inform future strategies



The following engineering solutions focus on countermeasures that support strategies to reduce the risk of vehicle-pedestrian crashes by:

- ▶ Reducing vehicle speeds
- ▶ Enhancing pedestrian visibility/conspicuity
- ▶ Improving motorists' yielding behavior
- ▶ Providing frequent and appropriately designed crossing opportunities for pedestrians
- ▶ Reducing or limiting pedestrian exposure to vehicular traffic

## Dual Approach

A high proportion of pedestrian crashes occur on a relatively small fraction of the city's roadway network. However, a 78-mile HIN cannot be re-engineered overnight – or within the life of this Plan. With that in mind, the PSAP takes two approaches for engineering recommendations:

### 1) SYSTEMIC SOLUTIONS

These solutions are cost effective safety improvements that can be deployed widely at locations exhibiting risk factors. The PSAP provides a toolbox of systemic countermeasures and demonstrates project identification and screening prioritization for two such countermeasures: *signal modifications* and *pedestrian hybrid beacons*.

### 2) SITE-SPECIFIC PROJECT LOCATIONS

Based on the location screening and prioritization process conducted as part of this project, the PSAP makes specific engineering recommendations at four intersection locations and a roadway segment. These recommendations represent significant capital projects and provide a demonstration of the types of improvements that could be undertaken throughout the city to improve pedestrian safety.

# SYSTEMIC SOLUTIONS

This section focuses on **signalized intersection improvements** and **pedestrian hybrid beacons** (also referred to as “HAWKS”) and provides the results of a preliminary screening for candidate locations of both types of improvements. See Appendix D for a detailed toolbox of systemic solutions.

## Signalized Intersection Improvements

Intersections are locations where modes come together, and where the most conflicts and crashes occur on the roadway. Signalized intersections provide pedestrians with a controlled crossing, with either some or all conflicting traffic required to stop.

**The primary needs for pedestrians at intersections include:**

- ▶ **Safety** – lower motor vehicle speeds, less exposure to conflicts, accessible crossings
- ▶ **Convenience** – crossings that reflect pedestrian desire lines, appropriate sidewalk widths
- ▶ **Minimal Delay** – frequent opportunities to cross, direct routes across complex intersections

**The following treatments are examples of signalization modifications to enhance the pedestrian experience at intersections:**

- ▶ **Leading Pedestrian Interval (LPI):** A leading pedestrian interval gives pedestrians a 2-5 second head start before the concurrent vehicle phase turns green to allow pedestrians to enter and occupy the crosswalk before turning vehicles get there.
- ▶ **Protected Left Turn Phasing:** Adjust signal phasing to allow left-turning vehicles a protected or protected/permissive left-turn phase instead of a permissive phase.
- ▶ **Flashing Yellow Arrow (FYA):** A flashing yellow arrow with a leading pedestrian interval gives pedestrians a 2-5 second period when vehicles may turn if no conflicts are present but must yield to crossing pedestrians.
- ▶ **Retiming Walk Phases:** Adjusting existing signal timings to better accommodate pedestrians. This could include reducing the amount of vehicular green time to decrease pedestrian wait time at signals.
- ▶ **Restricted Right Turns on Red:** Mounted signs eliminate the right of motorists to make a right turn at a red light. Can be implemented full-time or under restricted time intervals.

## Pedestrian Connectivity to Transit

Every transit rider is also a pedestrian during some point of their trip. Transit ridership and crash history were analyzed at 130 signalized intersections identified along the pedestrian HIN:



- ▶ **13 locations near top tier ridership transit stops**
  - 4 locations identified as Tier 1 locations in safety screening
  - 4 locations identified as Tier 2 locations in safety screening
  - 3 locations outside the top tier locations in safety screening
  - 2 locations with no crash history
- ▶ **45 locations near high ridership transit stops (outside top tier)**
  - 16 locations identified as Tier 1 locations in safety screening
  - 6 locations identified as Tier 2 locations in safety screening
  - 20 locations outside the top tier locations in safety screening
  - 3 locations with no pedestrian crash history

Table 3 and Table 4 provide the locations with crash history by proximity to transit, and Figure 9 illustrates these signalized intersections.

**Table 3. Signalized Intersection Candidates Near Top Tier Ridership Stops**

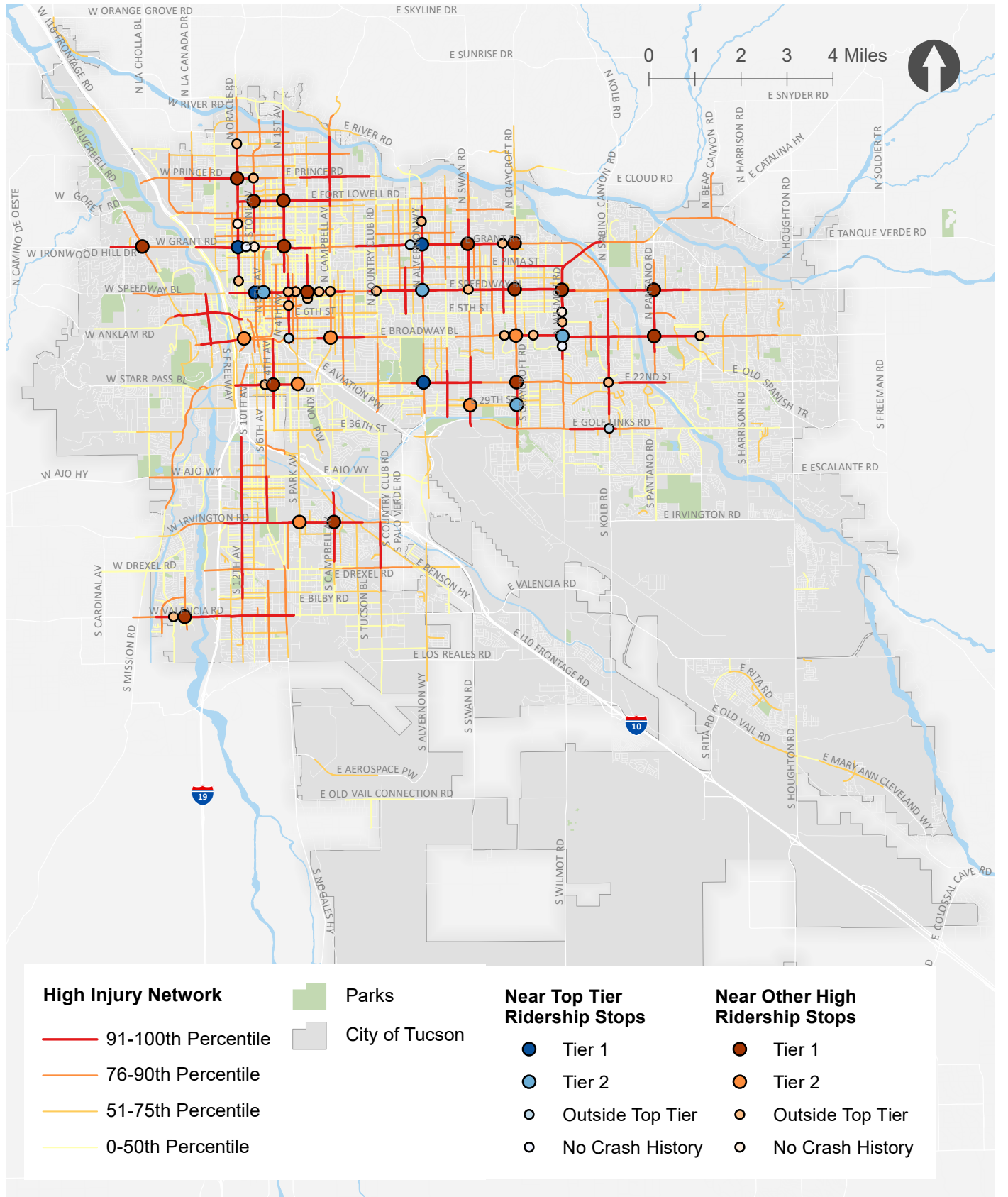
LOCATION	TIER (FROM SAFETY SCREENING)
W Grant Rd & N Oracle Rd	Tier 1
S Alvernon Way & E 22nd St	Tier 1
E Grant Rd & N Alvernon Way	Tier 1
N Stone Ave & E Speedway Blvd	Tier 1
E Speedway Blvd & N Alvernon Way	Tier 2
N Wilmot Rd & S Wilmot Rd	Tier 2
E 29th Street & S Craycroft Rd	Tier 2
E Speedway Blvd & N 6th Ave	Tier 2
S Kolb Rd & E Golf Links Rd	Outside Top Tier
E Grant Rd & N Dodge Blvd	Outside Top Tier
E Broadway Blvd & N Euclid Ave	Outside Top Tier
N 10th Ave & W Grant Rd	No Pedestrian Crash History
S Wilmot Rd & E Park Place Dr	No Pedestrian Crash History

Source: Kittelson & Associates, Inc.

**Table 4. Signalized Intersection Candidates Near High Ridership Stops Outside Top Tier**

LOCATION	TIER	LOCATION	TIER
N Oracle Rd & W Prince Rd	Tier 1	N Oracle Rd & W Limberlost Dr	Outside Top Tier
E Grant Rd & N Craycroft Rd	Tier 1	N Swan Rd & E Speedway Blvd	Outside Top Tier
E Grant Rd & N 1st Ave	Tier 1	E 22nd St & S Kolb Rd	Outside Top Tier
E Grant Rd & N Swan Rd	Tier 1	N Alvernon Way & E Glenn St	Outside Top Tier
S Craycroft Rd & E 22nd St	Tier 1	N Park Ave & E Speedway Blvd	Outside Top Tier
S Campbell Ave & E Irvington Rd	Tier 1	N Euclid Ave & E University Blvd	Outside Top Tier
E 22nd St & S 4th Ave	Tier 1	N Cherry Ave & E Speedway Blvd	Outside Top Tier
N Pantano Rd & E Speedway Blvd	Tier 1	S Oak Tree Dr & W Valencia Rd	Outside Top Tier
E Fort Lowell Rd & N Stone Ave	Tier 1	N Euclid Ave & E Speedway Blvd	Outside Top Tier
E Fort Lowell Rd & N 1st Ave	Tier 1	S 6th Ave & E 22nd S	Outside Top Tier
W Grant Rd & N Silverbell Rd	Tier 1	E Park Place Dr & E Broadway Blvd	Outside Top Tier
N Wilmot Rd & E Speedway Blvd	Tier 1	N Stone Ave & W Prince Rd	Outside Top Tier
N Craycroft Rd & E Speedway Blvd	Tier 1	S Camino Seco & N Camino Seco	Outside Top Tier
N Mountain Ave & E Speedway Blvd	Tier 1	E Speedway Blvd & N Campbell Ave	Outside Top Tier
N Pantano Rd & S Pantano Rd	Tier 1	E Broadway Blvd & S Williams Blvd	Outside Top Tier
W Valencia Rd & S Midvale Park Rd	Tier 1	E 2nd St & N Mountain Ave	Outside Top Tier
S Park Ave & E Irvington Rd	Tier 2	E Grant Rd & N Beverly Ave	Outside Top Tier
S Park Ave & E 22nd St	Tier 2	N Country Club Rd & E Speedway Blvd	Outside Top Tier
N Craycroft Rd & E Broadway Blvd	Tier 2	W Drachman St & N Oracle Rd	Outside Top Tier
E 29th St & S Swan Rd	Tier 2	N Wilmot Rd & E Carondelet Dr	Outside Top Tier
N Granada Ave & S Granada Ave	Tier 2	-	-
E Broadway Blvd & S Kino Parkway	Tier 2	-	-

Source: Kittelson & Associates, Inc.



**Signalized Intersections Near High Ridership Transit Stops  
Tucson Pedestrian Safety Action Plan**

**Figure  
9**

H:\23\23710 - Tucson Pedestrian Safety Action Plan\GIS\Task 6 MKDs updated 1-2020\F9 Signalized Intersections Near High Ridership Transit Stops.mxd - mblston - 1:26 PM 1/8/2020

## Leading Pedestrian Interval Guidance

One treatment of particular focus for the City of Tucson is the leading pedestrian interval, which in essence gives the pedestrian a head start and is intended to make them more visible to motorists. The LPI is a time-based measure to establish a pedestrian's presence within the intersection footprint. A curb extension is an accompanying infrastructure improvement that provides a space-based measure to position pedestrians within the intersection footprint. LPIs have become a popular tool because they require no additional infrastructure beyond the signal infrastructure already present at the intersection.

It is important that LPI implementation be accompanied by an accessible pedestrian signal (APS) with audible indication. Pedestrians typically with vision impairment or blindness use the sound of moving traffic as an indication to begin crossing, so the APS takes the place of this audible cue.

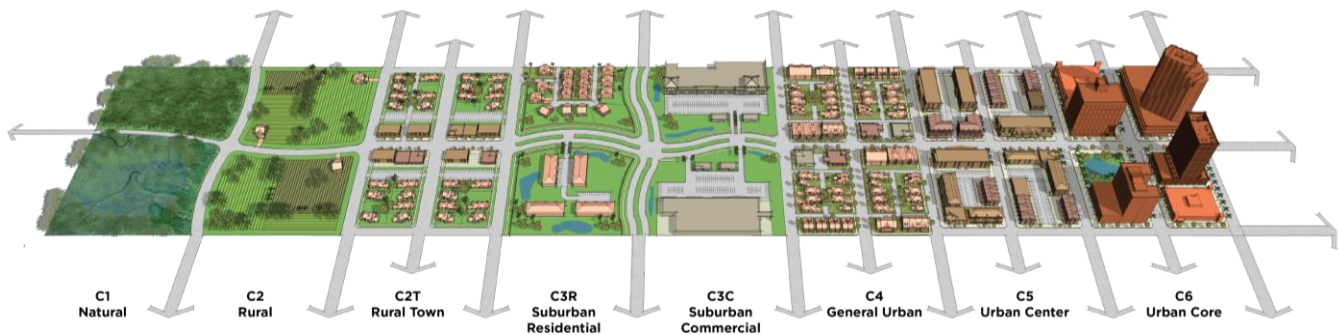
### FLORIDA DOT | LEADING PEDESTRIAN INTERVAL GUIDANCE

The recently updated Florida *Traffic Engineering Manual* (TEM) provides the nation's first statewide implementation of LPIs. Section 3.11 of the TEM includes implementation criteria and guidance (available at the resource link below).

The Florida DOT (FDOT) uses a context classification system comprising eight classifications. for planning and engineering. The TEM allows for implementation of LPIs without any study within its three *urban* context classifications; at locations within the remaining five context classification types, further study is required to implement an LPI. See Table 5 for a comparison and description of context classifications.

Much of the City of Tucson could be either considered within the *urban* classifications C5 or C4, but more still of the City may be within the *suburban* types C3R or C3C. Applying the FDOT criteria, various locations within Tucson would require further study and some would qualify for LPI implementation without further study.

When further study is required per FDOT TEM guidance, it must include a yielding study. Such a study would show the extent to which turning drivers currently yield to yield to pedestrians at the location in question.



Source: FDOT

Resource Link: <https://bit.ly/3hc2wir>

**Table 5. FDOT LPI Implementation Criteria by Context Classification**

CONTEXT CLASSIFICATION		DESCRIPTION	LPI IMPLEMENTATION
<b>C1</b>	Natural	Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.	Traffic Engineering Study Required
<b>C2</b>	Rural	Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands	
<b>C2T</b>	Rural Town	Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns	
<b>C3R</b>	Suburban Residential	Mostly residential uses within large blocks and a disconnected/sparse roadway network	
<b>C3C</b>	Suburban Commercial	Mostly non-residential uses with large building footprints and large parking lots. Buildings are within large blocks and a disconnected/sparse roadway network	
<b>C4</b>	Urban General	Mix of uses set within small blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.	No Traffic Engineering Study Required
<b>C5</b>	Urban Center	Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of the community, town, or city of a civic or economic center.	
<b>C6</b>	Urban Core	Areas with the highest densities and with building heights typically greater than four floors within FDOT classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network	

Source: FDOT



## Pedestrian Hybrid Beacon Locations

The city maintains a list of requested Pedestrian Hybrid Beacon (PHB) locations and uses a number screening steps to rank and evaluate these potential locations. The City’s current list of 161 candidate PHB locations were spatially evaluated for their presence along the pedestrian HIN and for their proximity to high ridership transit, yielding the following results:

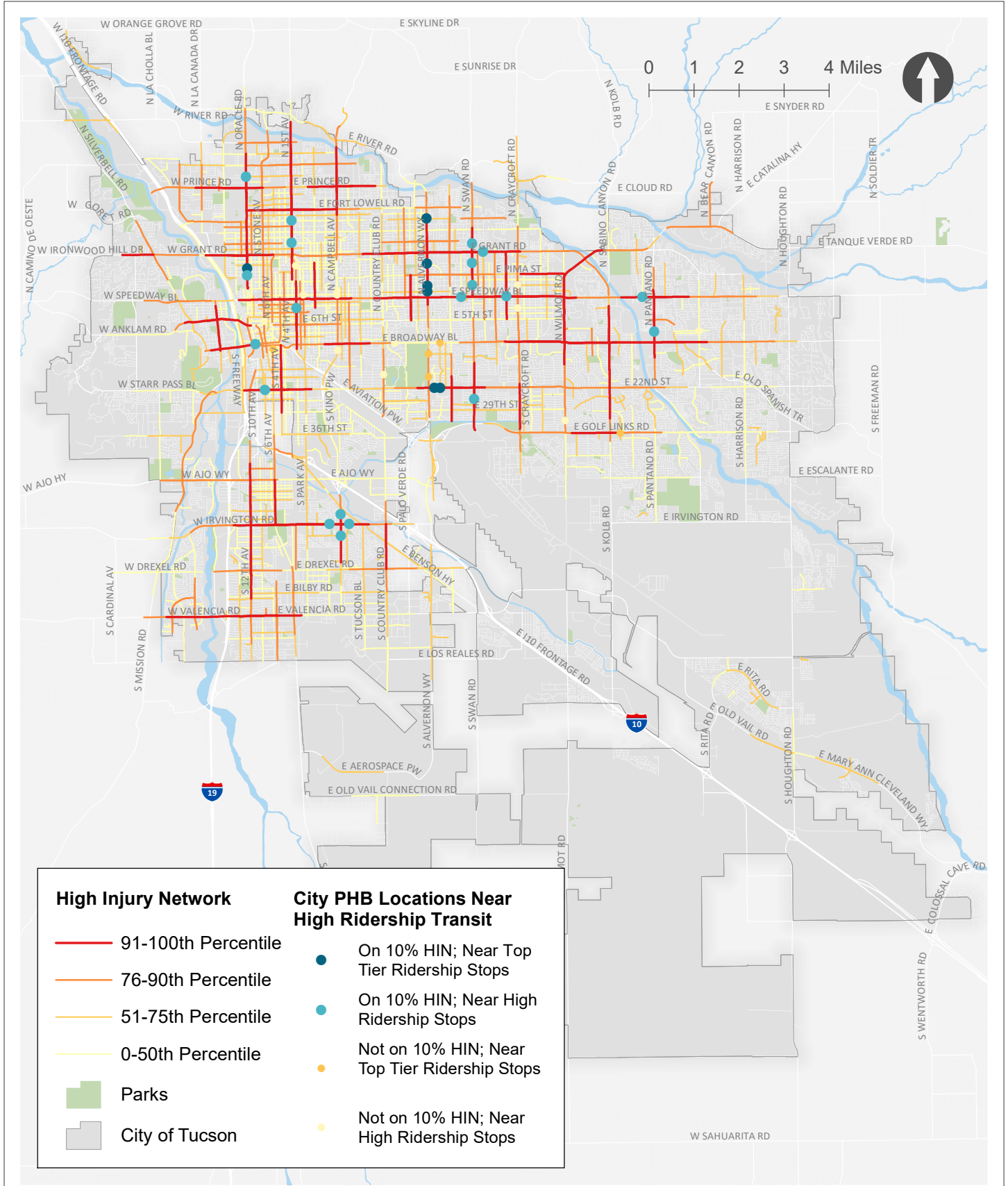
- ▶ 65 locations along the pedestrian HIN
  - 7 locations in proximity to top tier ridership transit stops
  - 20 locations in proximity to high ridership transit stops outside the top tier
  - 38 locations not near high ridership transit
  
- ▶ 96 locations not along the pedestrian HIN
  - 5 locations in proximity to top tier ridership transit stops
  - 12 locations in proximity to high ridership transit stops outside the top tier
  - 79 locations not near high ridership transit

The 65 locations along the pedestrian HIN are shown in Figure 10. The locations within ¼-mile of high ridership or top tier ridership transit stops are presented in Table 6.

**Table 6. Potential PHB Locations**

LOCATION	CITY RANK (OUT OF 161)	LOCATION	CITY RANK (OUT OF 161)
<b>NEAR TOP TIER RIDERSHIP STOPS</b>			
E 22nd St & S Irving Av	3	N Alvernon WY & E Seneca St	88
N Alvernon Wy & E Bellevue St	40	N Alvernon Wy & E Blacklidge Dr	97
N Oracle Rd & W Ventura St	65	N Alvernon Wy & E Fairmount St	122
E 22nd St & S Longfellow Ave	70		
<b>NEAR HIGH RIDERSHIP STOPS OUTSIDE TOP TIER</b>			
E Speedway Blvd & N Beverly Ave	1	S Campbell Ave & E Wyoming St	49
E Irvington Rd & S Cherry Ave	2	N Swan Rd & E Fairmount St	52
E Speedway Blvd & N Grady Ave	4	N Oracle Rd & W Lester St	79
N 1st Ave & E Jacinto St	11	N Swan Rd & E Water St	83
E Grant Rd & N Arcadia Ave	17	N Pantano Rd & E Centrepark Dr	87
W 22nd St & S 8th Ave	20	N Oracle Rd & W Pastime Rd	89
N Swan Rd & E Seneca St	24	N Euclid Av & E 2nd St	102
E Speedway Blvd & N Belvedere Ave	35	W Congress St & W Pennington St	104
N 1st Ave & E Blacklidge Dr	39	S Swan Rd & E Andrew St	116
S Campbell Ave & E Missouri St	44	E Irvington Rd & S Greenway Dr	121

Source: Kittelson & Associates, Inc.



**Pedestrian Hybrid Beacon Candidate Locations  
Tucson Pedestrian Safety Action Plan**

**Figure  
10**

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## Additional PHB Candidate Locations

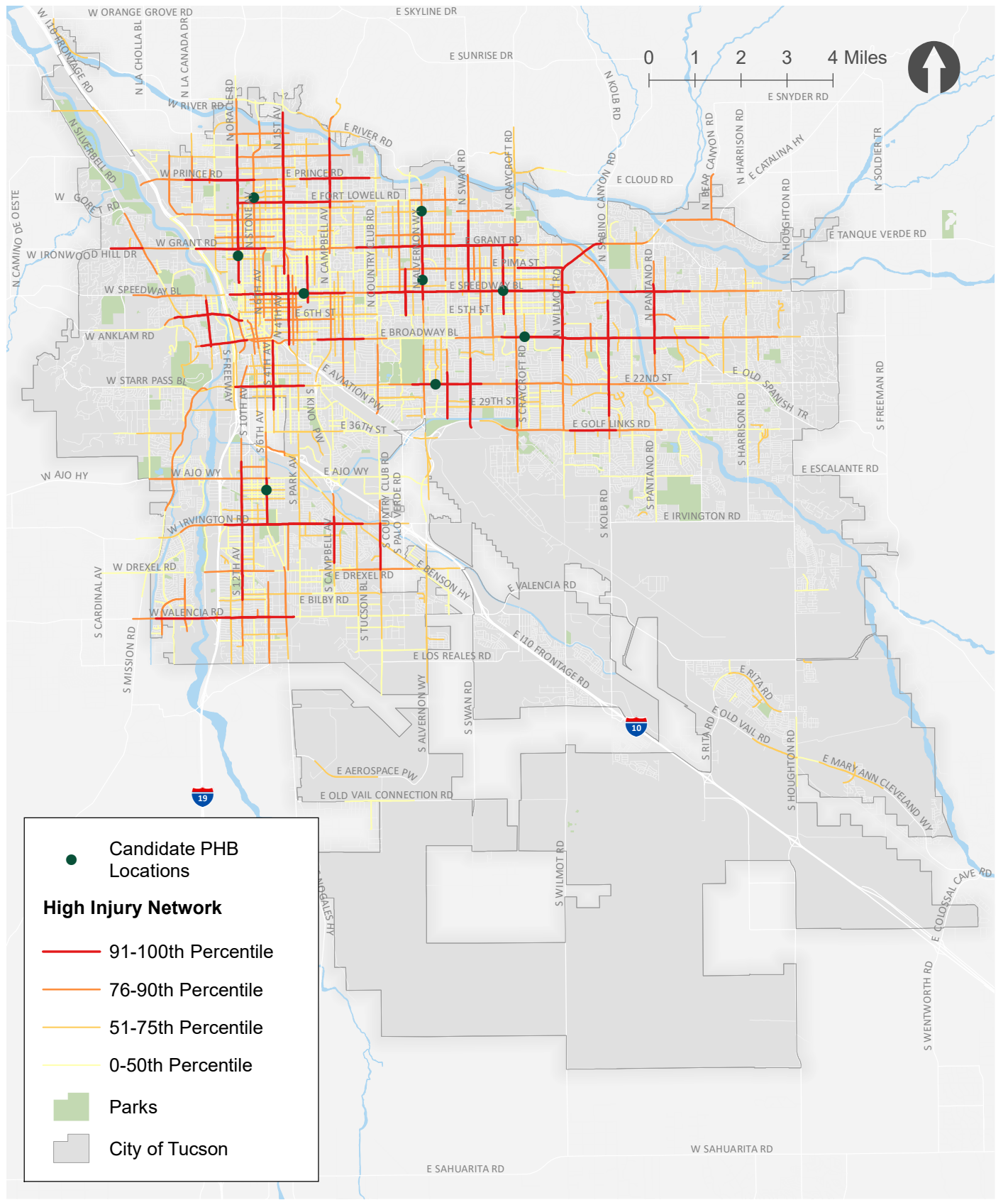
In addition to the list of 161 locations populated by citizen requests and evaluated and ranked among those options, nine additional candidate locations were found by overlaying high ridership transit stops along the pedestrian HIN *not at* signalized intersections. These locations represent either an unsignalized intersection or a location along a roadway segment or corridor that merits further study for PHB feasibility. They are presented visually in Figure 11.

- ▶ N Stone Avenue & E Navajo Road
- ▶ N Alvernon Way & E Fairmount Street
- ▶ N Alvernon Way & E Blacklidge Drive
- ▶ W Rillito Street & N Oracle Road
- ▶ E Broadway Blvd & N Leonora Avenue
- ▶ S 6<sup>th</sup> Avenue & W District Street
- ▶ E 22<sup>nd</sup> Street & S Irving Avenue



*Enhanced push-button crossing at 5<sup>th</sup> St and Euclid*





**Additional PHB Candidate Locations**  
**Unsignalized Locations Near High Ridership Transit Along High Injury Network**  
**Tucson Pedestrian Safety Action Plan**

**Figure**  
**11**

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# SITE-SPECIFIC PROJECT LOCATIONS

In addition to the pedestrian HIN and the systemic treatments outlined above, the PSAP proposes capital improvement projects at a set of five locations identified through the prioritization process described in Appendix B.

These capital projects are not intended to be implemented as is or to be presented to the exclusion of similar projects elsewhere. Rather, based on the City’s prioritization framework, these locations were chosen as demonstrations of the types of safety improvements that could improve pedestrian safety. In many locations, the cut sheets suggest improvements that would need to be considered on a corridor basis rather than at a spot location (e.g., lane reconfiguration). The locations are presented in Figure 12 and cut sheets are included in Appendix C.

## PEDESTRIAN TREATMENT TOOLBOX

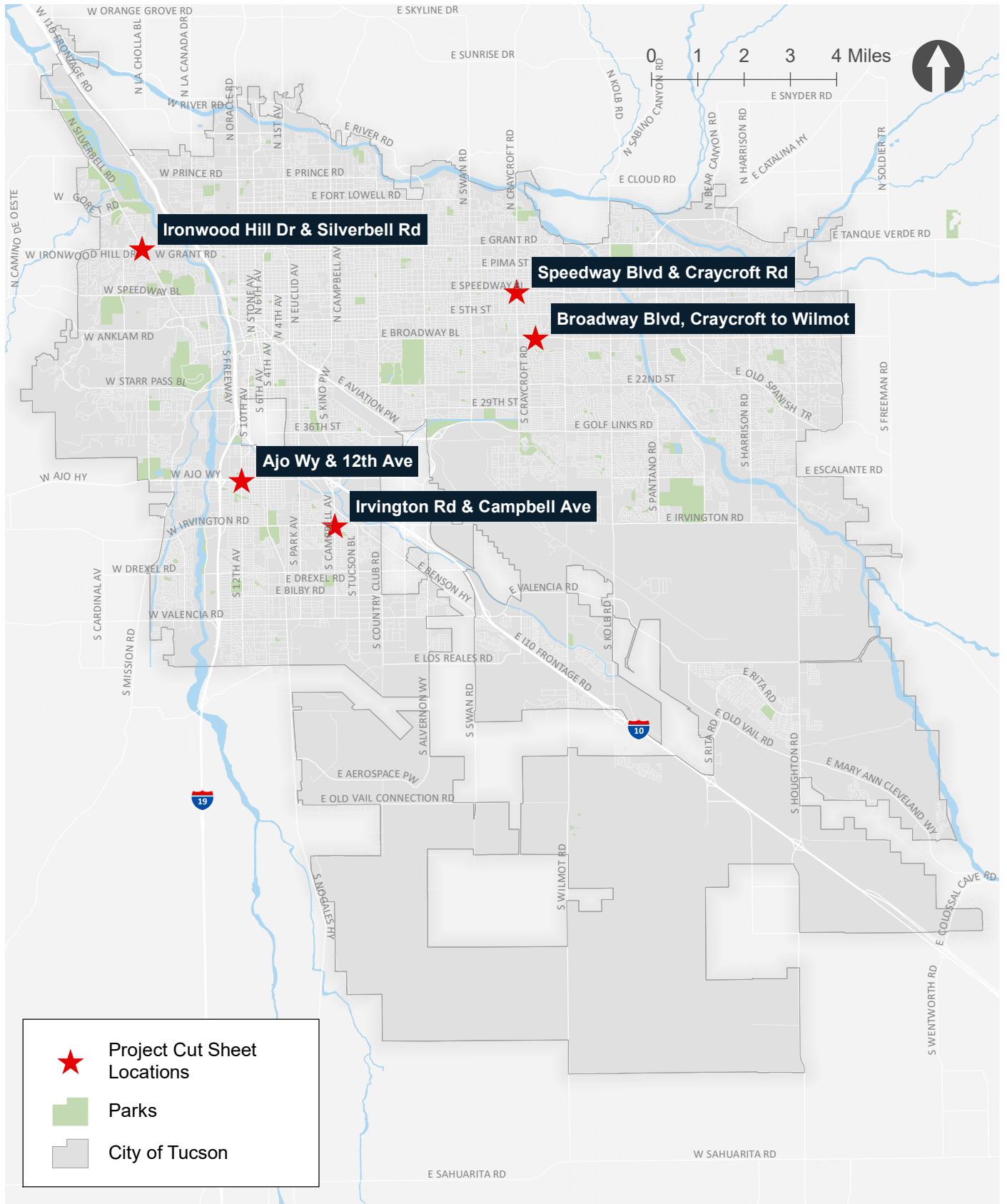
A treatment toolbox was developed for the PSAP and organized into the following three program areas:

- ▶ Signalized intersections
- ▶ Marked uncontrolled crosswalks at two-way stop-controlled locations
- ▶ Marked uncontrolled crosswalks at midblock locations

Appendix D includes the treatment toolbox along with considerations for applying the toolbox and 23 engineering treatments designed to improve pedestrian safety. The toolbox utilized for the site-specific project locations are summarized in the following table.

**Table 7: Countermeasures Recommended**

Location	S-7 Leading Pedestrian Interval	S-8 Flashing Yellow Arrow	MB-7 Stripe High Visibility Crossings	MB-2 Install Enhanced Crossing	TWSC-6 Install/ Improve Ped-Scale Lighting	S-2 Restrict Right Turn on Red	TWSC-2 Install Pedestrian Refuge
Broadway Blvd, Craycroft Rd to Wilmot Rd			✓	✓	✓		
Speedway Blvd & Craycroft Rd	✓	✓	✓		✓	✓	✓
Irvington Rd & Campbell Ave	✓	✓	✓			✓	✓
Ajo Way & S12th Ave	✓	✓	✓			✓	✓
Ironwood Hill Dr & Silverbell Dr	✓	✓	✓				✓



**Capital Improvement Cut Sheet Locations  
Tucson Pedestrian Safety Action Plan**

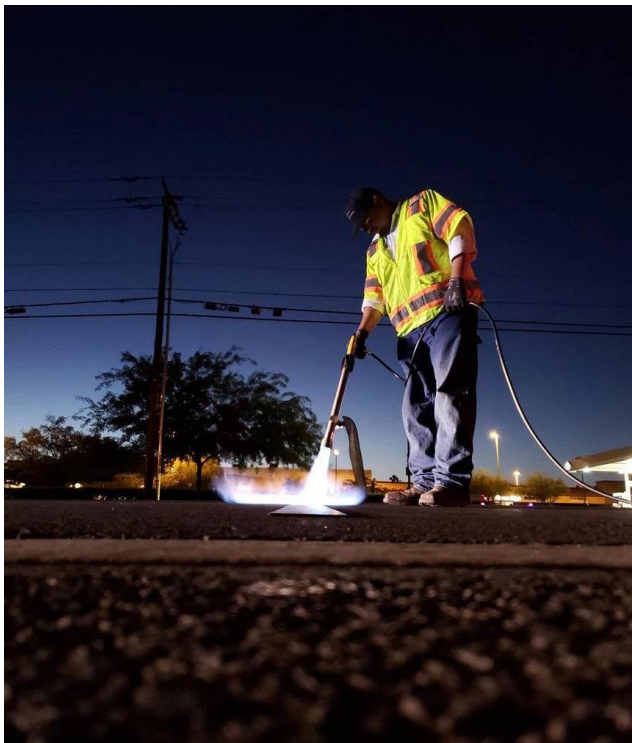
**Figure  
12**

H:\23\23710 - Tucson Pedestrian Safety Action Plan\GIS\Task 6 MKDs updated 1-2020\F12 Project Cut Sheet Locations.mxd - mainston - 1:42 PM 1/8/2020

## Pedestrian Safety Corridors

The HIN was utilized to identify pedestrian safety corridors which are one-mile segments where the City of Tucson could install warning signs and flashing beacons and provide targeted police enforcement of pedestrian laws. The identified pedestrian safety corridors included:

- ▶ 1st Avenue from Roger Road to Fort Lowell Road
- ▶ Broadway Blvd from Craycroft Road to Wilmot Road
- ▶ Speedway Blvd from Swan Road to Craycroft Road
- ▶ Valencia Road from Mission Rd (City limits) to Midvale Park Road
- ▶ 22nd Street from Alvernon Road to Swan Road
- ▶ Pantano Road from Speedway Blvd to Broadway Boulevard
- ▶ 12th Avenue from Irvington Road to Drexel Road
- ▶ Prince Road from Flowing Wells Road to Oracle Road
- ▶ Fort Lowell Road from Oracle Road to Stone Road
- ▶ Oracle Road from Grant Rd to Glenn Street
- ▶ Wilmot Road from Speedway Blvd to Broadway Boulevard
- ▶ Valencia Road from 12<sup>th</sup> Avenue to Nogales Highway



*Elements of a pedestrian safety corridor installed on Broadway Blvd, between Craycroft Rd and Wilmot Rd.*



# POLICY | STRATEGIES & ACTIONS

## IMPROVE PEDESTRIAN VISIBILITY AND COMFORT AT STREET CROSSINGS

- ▶ Consider adopting guidelines for selecting countermeasures at uncontrolled crossing locations to determine when to include treatments like: refuge islands, Pedestrian Hybrid Beacons, or advance Yield Here To (Stop Here For) Pedestrian Signs (*as established by FHWA*)
- ▶ Consider adopting the City of Tucson's draft Crosswalk Installation Policy
- ▶ Consider updating existing policy (7.37: *Ped Crosswalk Pavement Markings & Signs*) to include high visibility crosswalks at all marked crossings when restriping or installing new crosswalks
- ▶ Consider amending existing city policy on Bus Stop Placement to allow stops to be placed closer to crossings - prioritizing user convenience & safety

## MANAGE VEHICLE SPEEDS AND IMPROVE DRIVER AWARENESS

- ▶ Establish guidelines for using vertical landscape elements as a speeding abatement strategy and to help delineate pedestrian versus vehicle spaces
- ▶ Consider establishing a city policy to expand definition of a school zone, to include the streets that are most often used by students walking to school (*New Jersey DOT*)

## PROVIDE ADEQUATE STREET LIGHTING FOR PEDESTRIANS

- ▶ Consider establishing a unified policy that ensures sufficient lighting at crosswalks and includes corridor wide placement guidelines
- ▶ Establish a minimum level of Dark Sky compliant street lighting for collector and arterial streets that prioritizes bicycle and pedestrian safety

## PRIORITIZE DATA-DRIVEN ENFORCEMENT AND EVALUATION TO IMPROVE SAFETY

- ▶ Identify existing City ordinances and State laws that can be strengthened; explore new regulations needed to better promote pedestrian safety
- ▶ Reassess the use of camera enforcement at traffic signals to detect drivers' red light running or along priority corridors to identify speeding-drivers.



Examples of pedestrian facilities impacted by city policies

The following policy solutions provide a framework for modifying existing policies and adopting new polices to strengthen pedestrian safety.

**Table 12 summarizes specific recommendations based on the evaluation of existing policies and review of best practices.**

## Review of Existing Policies

One strategy to operationalize the Pedestrian Safety Action Plan is to adopt policies, laws, and ordinances related to pedestrian safety that align with the goals of the plan and adhere to best practices. These goals align with the vision and objectives of the City's *Bicycle and Pedestrian Program* and Tucson's *Complete Streets Policy*. The Bicycle and Pedestrian Program's mission is to "create a complete transportation network where walking and biking are safe, convenient, and comfortable ways of moving around the city for people of all ages and abilities."<sup>2</sup> The Tucson Complete Streets Policy was adopted on February 5, 2019 and guides the City to develop a "safe, connected, and equitable transportation network."<sup>3</sup> The goals of the Pedestrian Safety Action Plan provide a pedestrian focus and support the objectives of the City's existing plans.

A review of existing policies is required to determine which policies to adopt and/or change to achieve the plan's goals as wells as the with the vision and objectives of the City's *Bicycle and Pedestrian Program* and *Complete Streets Policy*. Eleven existing city policies related to pedestrian activity where identified for review. Each policy has been evaluated by looking at the language of the policy document to determine if the policy addresses each goal of the Pedestrian Safety Action Plan. This review identifies potential gaps in existing policy and provides an opportunity to incorporate best practices from other cities and organizations to improve the policies. Table 8 shows the 11 policies and the existing goals established as part of the City's *Bicycle and Pedestrian Program* and *Complete Streets Policy*.

The evaluation in Table 8 shows that existing policies are primarily aligned with pedestrian safety and increasing the pedestrian network. From an engineering perspective these policies focus on establishing minimum requirements to meet local and national standards to promote safety of pedestrians and motorists. These policies promote walking trips by considering pedestrian use and activity. Few of the policies specifically emphasize prioritizing vulnerable communities or environmental sustainability. This presents an opportunity to the City of Tucson to develop prioritizing policies that include equity and sustainability in implementing pedestrian improvements.

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<sup>2</sup> City of Tucson, Department of Transportation and Mobility (n.d.). *About the Bicycle & Pedestrian Program*. Retrieved from <https://www.tucsonaz.gov/bicycle/about>

<sup>3</sup> City of Tucson, Department of Transportation (2019). *Complete Streets Tucson*. Retrieved from <https://www.tucsonaz.gov/tdot/complete-streets-tucson>

Table 8. Review of Existing Policy

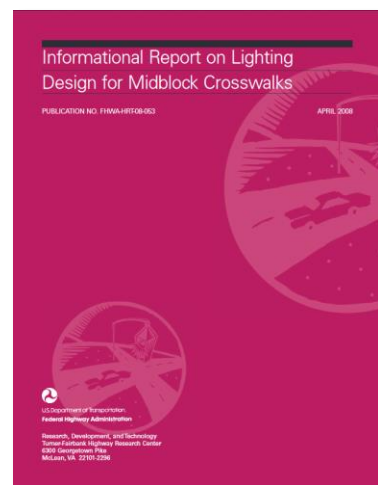
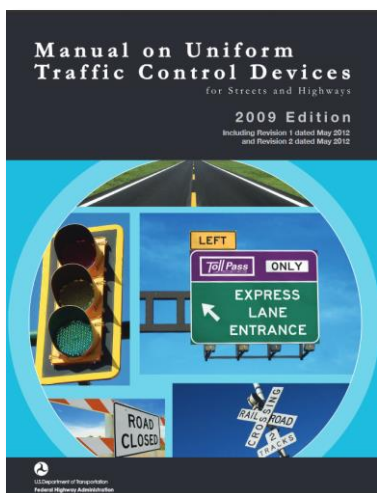
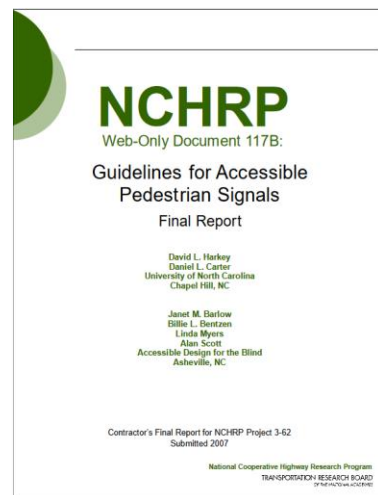
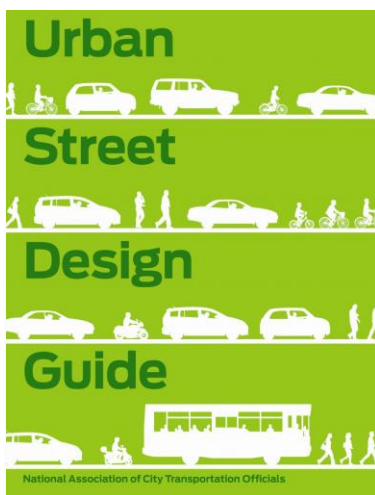
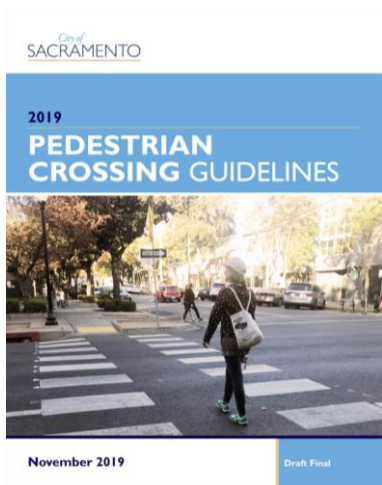
POLICY	GOALS					
	Improve pedestrian network	Promote walking trips	Enhance pedestrian safety	Prioritize underserved communities	Preserve the environment; promote public health	Increase mobility & accessibility
7.25 Statutory Speed Limits on Roadways			✓			
7.30 School Pedestrian Signs	✓	✓	✓			✓
7.37 Pedestrian Crosswalk Pavement Markings & Signs	✓	✓	✓			
7.39.01 Accessible Pedestrian Signals	✓	✓	✓	✓		✓
7.41 Roadway Lighting Policy	✓	✓	✓	✓	✓	
7.44 Removal of Pedestrian Crosswalk Pavement Markings			✓			
7.44 Crosswalk Installation Policy – Draft	✓	✓	✓	✓		✓
7.71 Bus Stop Placement	✓	✓	✓	✓		
APG 24: Sidewalk Widths	✓	✓	✓			✓
Urban Landscape Framework	✓	✓	✓	✓	✓	
Technical Standards Manual: Section 7 - Pedestrian Access	✓	✓	✓			✓

## Best Practices | Resources

To help address the limitations of existing policy, Table 9 looks at other cities and national organizations to identify some best practices that the City of Tucson can adopt to improve their existing policies and advance the goals of the Pedestrian Safety Action Plan.

The following resources were used as best practices and are referred to throughout this chapter:

- ▶ Alameda-Contra Costa Transit District – *Multimodal Corridor Design Guidelines*
- ▶ New York City Parks and Recreation – *Street Tree Planting Standards, 2016*
- ▶ City of Sacramento – *Pedestrian Crossing Guidelines, 2019*
- ▶ Federal Highway Administration (FHWA) – *Manual on Uniform Traffic Control Devices (MUTCD), 2009*
- ▶ FHWA – *Informational Report on Lighting Design for Midblock Crosswalk*
- ▶ FHWA – *Field Guide for Selecting Countermeasures at Uncontrolled Ped Crossing Locations*
- ▶ National Association of City Transportation Officials (NACTO) – *Urban Street Design Guide*
- ▶ Transportation Research Board (TRB) NCHRP 117B – *Accessible Ped Signals: A Guide to Best Practices*



**Table 9. Summary of Best Practices**

TOPIC & DESIGN CONSIDERATIONS	RESOURCES
<p><b>CROSSWALKS</b></p> <ul style="list-style-type: none"> <li>▶ Use high-visibility ladder, zebra, or continental markings over the standard parallel lines</li> <li>▶ Keep crossing distances as short as possible</li> <li>▶ Consider using tight corner radii, curb extensions, and raised medians</li> <li>▶ Advanced stop bar should be located at least 8 feet before the crosswalk to reinforce yielding to pedestrians</li> <li>▶ If drivers do not yield to pedestrians, the crosswalk is difficult to see, or there are noted conflicts at the crossing location, consider using additional crosswalk visibility improvements</li> <li>▶ Refer to FHWA Field Guide for guidance on adding refuge islands, PHBs, or advance Yield Here To (Stop Here For) Ped Signs</li> </ul>	<ul style="list-style-type: none"> <li>▶ NACTO</li> <li>▶ Sacramento, <i>Ped Crossing Guide</i></li> <li>▶ FHWA, <i>Selecting Countermeasures at Uncontrolled Ped Crossings</i></li> </ul>
<p><b>ACCESSIBLE PEDESTRIAN SIGNALS &amp; PHBs</b></p> <ul style="list-style-type: none"> <li>▶ Establish advisory committee of stakeholders (community members and transportation professionals) to prioritize locations for APS</li> <li>▶ PHBs could be considered at locations that do not meet warrants for a traffic signal and/or pedestrian volumes or school crossings</li> <li>▶ Install PHBs at least 100 ft from side streets or driveways that are controlled by STOP or YIELD signs</li> <li>▶ Figures 4F-1 and 4F-2 of the MUTCD provide guidance on installing a PHB on low-speed and high-speed roadways</li> </ul>	<ul style="list-style-type: none"> <li>▶ TRB, <i>Accessible Ped Signals</i></li> <li>▶ Sacramento, <i>Ped Crossing Guide</i></li> <li>▶ FHWA, MUTCD</li> </ul>
<p><b>ROADWAY LIGHTING</b></p> <ul style="list-style-type: none"> <li>▶ Overhead lights should be placed 10 to 15 ft in advance of crosswalks on both approaches to illuminate the front of pedestrians</li> <li>▶ Pedestrian refuge islands should be illuminated with streetlights, signs, and/or reflectors to ensure visibility</li> <li>▶ For continuous lighting in a given direction of travel, the next lighting feature after a crosswalk should be placed at least ten times farther away from the crosswalk to minimize changes in background luminance</li> </ul>	<ul style="list-style-type: none"> <li>▶ Sacramento, <i>Ped Crossing Guide</i></li> <li>▶ FHWA, <i>Lighting Design for Midblock Crosswalks</i></li> </ul>
<p><b>BUS STOP PLACEMENT</b></p> <ul style="list-style-type: none"> <li>▶ Bus stops should generally be placed on the far side of the intersection, as close as possible to a crosswalk. Bus stop siting should consider: ridership, distance to crosswalk, existing and future land uses, bus route connections, passenger amenities, connections and conditions, crossings, lighting, and sight distance</li> </ul>	<ul style="list-style-type: none"> <li>▶ NACTO</li> <li>▶ AC Transit, <i>Multimodal Corridor Design</i></li> </ul>
<p><b>SIDEWALK WIDTHS</b></p> <ul style="list-style-type: none"> <li>▶ When directly next to traffic, desired minimum width is 8 ft (<i>providing a min. 2 ft buffer for street furniture, utilities</i>)</li> <li>▶ Streets with high pedestrian volumes and/or high posted speed, should have wider than minimum sidewalks</li> <li>▶ Sidewalk width needs to be at least 8 ft at bus stop load points to ensure ADA compliance with bus boarding/ alighting</li> </ul>	<ul style="list-style-type: none"> <li>▶ NACTO</li> </ul>
<p><b>LANDSCAPING IN RAISED MEDIANS / PEDESTRIAN CROSSING ISLANDS</b></p> <ul style="list-style-type: none"> <li>▶ Street trees may be used to enhance pedestrian crossing islands, but extra maintenance is needed to ensure visibility of pedestrians</li> <li>▶ Street trees should be at least 3 ft from curb return and 5 ft from nearest stop sign (<i>min distance from corner of intersection to tree is 40 ft</i>)</li> </ul>	<ul style="list-style-type: none"> <li>▶ NACTO</li> <li>▶ NYC, <i>Street Tree Planting Standards</i></li> </ul>



## Pedestrian Crossing Treatments

As presented in Table 9, the FHWA Field Guide can provide guidance on adding treatments such as refuge islands, pedestrian hybrid beacons, or advance yield here to (stop here for) pedestrian signs.

Table 10 below is adapted from the 2018 FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*, which synthesizes the latest research and best practices for safety at uncontrolled pedestrian crossings. The table provides recommended treatments in a matrix by roadway configuration, posted speed, and traffic volumes. Given the conditions of each cell of the matrix, the treatments identified in the cell are classified into three levels of guidance:

- ▶ Treatments that are candidates for the location type;
- ▶ Treatments that should always be considered, but are not mandated or required (shown as a bolded number within a black outlined box); and,
- ▶ Crosswalk visibility enhancements that should always occur in conjunction with other identified countermeasures (shown as a bold number in a non-outlined cell).

More detail about these treatments can be found in the toolbox included as Appendix C; however, this table provides a reference point for the conditions in which each treatment is appropriate. Once a candidate location and associated treatments are identified, the selection of a treatment or package of treatments can proceed based on the specific site context and engineering judgment.



*Bike HAWK crossing at Speedway Blvd and 10<sup>th</sup> Ave. Source: City of Tucson Bicycle Boulevard Master Plan*

**Table 10. Application of Pedestrian Crossing Treatments by Location Type**

Roadway Configuration	Posted Speed Limit and ADT																														
	Vehicle ADT <9,000									Vehicle ADT 9,000-15,000									Vehicle ADT >15,000												
	≤30 mph			35 mph			≥40mph			≤30 mph			35 mph			≥40mph			≤30 mph			35 mph			≥40mph						
2 lanes	1	2		1		3	<b>1</b>		3	1		3	1		3	<b>1</b>		3	1		3	1		3	1		3	<b>1</b>		3	
	4	5	6		5	6		5	6	4	5	6		5	6	4	5	6	4	5	6		5	6		5	6		5	6	
				7		9	<b>7</b>		<b>9</b>			7		9	<b>7</b>		<b>9</b>			7		9	7		9	7		9		<b>9</b>	
2 lanes one-way	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
		5			5			<b>5</b>			5			5			<b>5</b>			5			5			5			<b>5</b>		
		7		9	7		9	7		<b>9</b>	7		9	7		<b>9</b>	7		9	7		<b>9</b>	7		9	7		9		<b>9</b>	
3 lanes with raised median	<b>1</b>	2	3	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
	4	5			5			<b>5</b>			4	5			5			<b>5</b>			4	5			5			<b>5</b>			
				7		9	<b>7</b>		<b>9</b>			7		8	7		<b>9</b>			7		8	7		9	7		9		<b>9</b>	
3 lanes without raised median	<b>1</b>	2	3	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
	4	5	6		5	6		5	6	4	5	6		5	6		5	6	4	5	6		5	6		5	6		5	6	
				7		9	7		9	7		9	7		9	7		9	7		9	7		9	7		9	7		9	
3 lanes one-way	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
		5			5			<b>5</b>			5			5			<b>5</b>			5			5			5			<b>5</b>		
		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8
4+ lanes with raised median	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
		5			5			<b>5</b>			5			5			<b>5</b>			5			5			5			<b>5</b>		
		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8
4+ lanes without raised median	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	<b>1</b>		<b>3</b>	
		5	6		5	6		5	6		5	6		5	6		5	6		5	6		5	6		5	6		5	6	
		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8	9	7	8	9		7	8

**Treatments:**

- 1: High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
- 2: Raised crosswalk
- 3: Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop line)
- 4: In-Street Pedestrian Crossing sign
- 5: Curb extension
- 6: Pedestrian refuge island
- 7: Rectangular Rapid-Flashing Beacon (RRFB)\*\*
- 8: Road Diet
- 9: Pedestrian Hybrid Beacon (PHB)\*\*

**Selection Guidance:**

- #: treatments that are candidates for the location type
- #**: treatments shown as a bolded number within a black outlined box that should always be considered, but are not mandated or required
- #: treatments shown as a bolded number without an outline are crosswalk visibility enhancements that should always occur in conjunction with other identified countermeasures.
- \*\*Note: The PHB and RRFB are not installed at the same crossing location



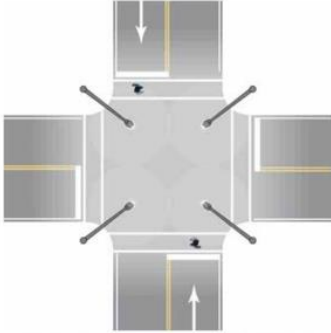
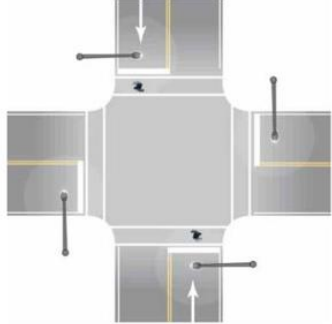
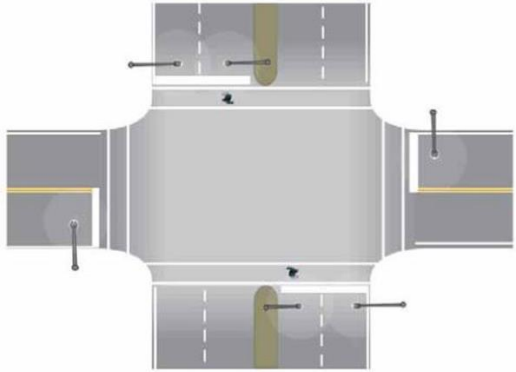
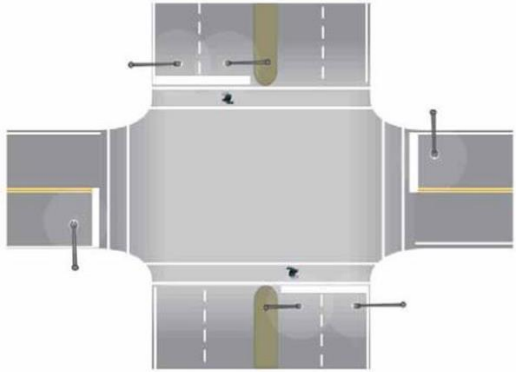
- Source: Adapted from FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (July 2018)



# Lighting

The recommendation in Table 9 provides that overhead lights should be placed 10 to 15 feet in advance of crosswalks on both approaches to illuminate the front of pedestrians. The FHWA *Information Report on Lighting Design for Midblock Crosswalks* provides three contextual examples of recommended lighting configuration. Table 11 provides a comparison between a more traditional lighting layout and a recommended layout for two locations, as well as a recommendation for the lighting layout and positioning at wide intersections with refuge islands—a common configuration in Tucson.

**Table 11. Recommended Lighting Layouts**

LOCATION	"TRADITIONAL" LAYOUT	RECOMMENDED LAYOUT
MIDBLOCK CROSSINGS		
INTERSECTION CROSSING		
WIDE INTERSECTIONS		

Source: FHWA *Information Report on Lighting Design for Midblock Crosswalks*

# Policy Recommendations

Table 12. Policy Summary & Recommendations

<b>7.25 STATUTORY SPEED LIMITS ON ROADWAYS</b>
<ul style="list-style-type: none"><li>▶ The State of Arizona sets the minimum speed limit on all roads</li><li>▶ The City may pass an ordinance to change the speed limit for a specific roadway section as deemed appropriate through engineering studies based on guidelines set in the MUTCD</li></ul>
<b>RECOMMENDATIONS</b>
<ul style="list-style-type: none"><li>▶ Follow NACTO guidelines to set speed limits. Pass an ordinance to set speed limits on all roadways in the city limits by functional class. Set the speed limit to 35 MPH during daytime and 30 MPH during nighttime for streets in the high-injury network</li><li>▶ Reduce the speed limit on roadways after installing physical improvements to reduce speeds</li><li>▶ Adopt USLIMITS2 as a tool for determining and revising speed limits only on corridors with low numbers of pedestrian crash rates</li></ul>
<b>7.30 SCHOOL PEDESTRIAN SIGNS</b>
<ul style="list-style-type: none"><li>▶ School Pedestrian Signs are placed in accordance with MUTCD guidelines as amended by the State of Arizona</li></ul>
<b>RECOMMENDATIONS</b>
<ul style="list-style-type: none"><li>▶ School Zones are defined by the MUTCD as a designated roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activities occur. The Safe Routes to School Guide states that school zones should encompass the school campus and extend for as many blocks as possible that have a high concentration of school-related trips.</li><li>▶ Adopt guidance set by the New Jersey Department of Transportation’s School Zone Design Guide and establish the school zone as the area encompassing the streets that students most often use to walk to the school</li></ul>
<b>7.37 PEDESTRIAN CROSSWALK PAVEMENT MARKINGS AND SIGNS</b>
<ul style="list-style-type: none"><li>▶ Follow and apply appropriate guidelines from State, County, and City</li><li>▶ Crosswalk markings are generally reserved for signalized intersections, PELICAN, TOCAN and HAWK pedestrian crossings, school crossings, business districts or other crossings where deemed desirable</li><li>▶ Zebra markings and “PED X-ING” signs may be considered at HAWK or other non-signalized crossings</li><li>▶ Crosswalk requests are evaluated using ADOT’s procedures and may be modified based on engineering judgement</li></ul>
<b>RECOMMENDATIONS</b>
<ul style="list-style-type: none"><li>▶ Use high-visibility ladder, zebra, or continental markings over standard parallel lines.</li><li>▶ Adopt the FHWA Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations to determine when to include additional treatments such as refuge islands, Pedestrian Hybrid Beacons, or advance Yield Here To (Stop Here For) Pedestrian Signs. See Table 10 for more details</li></ul>
<b>7.39.01 ACCESSIBLE PEDESTRIAN SIGNALS</b>
<ul style="list-style-type: none"><li>▶ Accessible Pedestrian Signals (APS) shall be installed at all newly constructed traffic signals</li><li>▶ Public requests for APS at existing traffic signals are evaluated and ranked using the APS Prioritization Tool from NCHRP Report 3-62 and are installed as annual operating budget allows.</li></ul>
<b>RECOMMENDATIONS</b>
<ul style="list-style-type: none"><li>▶ Consistent with recommendations from the Transportation Research Board, NCHRP Web-Only Document 117B, establish an advisory committee of relevant stakeholders from the city and public to help identify and prioritize locations to install APS</li></ul>

## 7.41 ROADWAY LIGHTING POLICY

- ▶ LED lighting is specified for all new roadway and retrofit projects
- ▶ Roadway lighting design needs to address the needs for public safety while minimizing adverse impacts of light pollution
- ▶ Roadway lighting system design must meet all local and national guidelines
- ▶ With four exceptions based on pedestrian activity, lighting design modeling must use a Pedestrian Conflict Area Classification of “Low.”

### RECOMMENDATIONS

- ▶ Establish requirements to ensure sufficient lighting at crosswalks to increase visibility of pedestrians, including placement guidelines of lighting features near crosswalks and at intersections.
- ▶ Use the high-injury network to identify roadways with a high concentration of injuries and limited lighting to prioritize for lighting enhancements.
- ▶ Require corridor wide lighting, not just at intersections.
- ▶ Establish a minimum level of Dark Sky compliant street lighting for collector and arterial streets that emphasis bicycle and pedestrian safety.
- ▶ Adopt guidance set in the FHWA report, Informational Report on Lighting Design for Midblock Crosswalks. See Table 11 for more details.

## 7.44 REMOVAL OF PEDESTRIAN CROSSWALK PAVEMENT MARKINGS

- ▶ An engineering study is conducted in accordance with the MUTCD.
- ▶ Crosswalks will be removed if there is no other traffic control device present or if the posted speed limit is 45 MPH or greater
- ▶ If the posted speed limit is less than 45 MPH the City will follow removal guidance set by Table 11 of the FHWA report titled, *Safety Effects of Marked vs Unmarked Crosswalks at Uncontrolled Locations*

### RECOMMENDATIONS

- ▶ Adopt guidance set by the Sacramento Pedestrian Crossing Guidelines.
- ▶ Evaluate an existing crosswalk when: There is a land use change due to a development project; the roadway design/characteristics change; the roadway is resurfaced; pedestrian safety concerns are identified.
- ▶ Determine if additional traffic control treatments are applicable before deciding to remove the crosswalk.
- ▶ Crosswalks should not be removed unless the area to cross the street is also relocated and there is an improved crossing is located within 300 feet
- ▶ Crosswalk removal is recommended if: Other treatments have not been effective; there are safety advantages to no marked crosswalk; recommended treatments cannot be installed in a reasonable timeline

## 7.44 CROSSWALK INSTALLATION POLICY – DRAFT

- ▶ Crosswalk installation guidance follows the procedure established by the City of Portland
- ▶ A marked crosswalk is installed after a pedestrian survey is conducted and the pedestrian crossings reach a minimum threshold
- ▶ A table comparing vehicle ADT, posted speed limit, number of lanes, and the presence of a raised median is used to determine if additional treatments are needed for the crosswalk

### RECOMMENDATIONS

- ▶ Adopt the draft policy
- ▶ Crosswalk locations should be prioritized on streets with high concentrations of pedestrian injuries as identified in the high-injury network. Crosswalk installation should include visibility enhancements to increase pedestrian safety

## 7.71 BUS STOP PLACEMENT

- ▶ Bus stop placement should be aligned with nationally accepted best practices and local policies that optimize transit service and traffic flow
- ▶ Guidance on placement is detailed in the Transportation Access Management Guidelines for the City of Tucson. Bus stops on major roadways should be placed at ¼ intervals for major routes and ½ mile intervals for express routes. Additional stops may be considered to serve major trip generators
- ▶ Unless otherwise warranted by safety or passenger convenience issues, bus stops shall be located on the far side of intersections
- ▶ When resources allow, traffic flow at bus stops should be optimized with the use of dedicated transit lanes, bus pullouts or other improvements

### RECOMMENDATIONS

- ▶ Evaluate additional factors for bus stop placement: ridership; existing and future land uses; bus route connections; passenger amenities; connections and conditions; crossings; lighting; sight distance; bus stops should be placed to have a 10-foot clearance from edge of crosswalk to back of the bus. ; bus stops should not be located more than 100 feet from a signalized intersection, crosswalk or transfer point
- ▶ Adopt FHWA guidance on best practices for bus stop siting

## APG 24: SIDEWALK WIDTHS

- ▶ For arterial and collector roadways, new sidewalks shall be designed and constructed to a maximum width of six feet within the limits of the project
- ▶ Designs shall explore all alternatives to provide this width along arterial and collector roadways and can incorporate offsetting the sidewalk from the curb and providing a paved buffer of at least two feet
- ▶ When constraints are present, the width may be reduced to five feet, and there are five specific situations where the sidewalk width may be reduced further. However, in any situation, the absolute minimum sidewalk width is four feet

### RECOMMENDATIONS

- ▶ Set standard width to six feet with a minimum of four-foot buffer
- ▶ Assess pedestrian activity and land uses when determining sidewalk widths above the minimum width

## URBAN LANDSCAPE FRAMEWORK

- ▶ Recommends developing guidelines for street types and design elements that enhance the pedestrian, bicycle and transit experience and expand green infrastructure
- ▶ Preserve greenspace for walking
- ▶ Maximize green infrastructure to promote walkability

### RECOMMENDATIONS

- ▶ Establish guidelines for using vertical landscape elements as a speeding abatement strategy and to help delineate pedestrian versus vehicle spaces.
- ▶ Adhere to city codes for sidewalk landscape height and width requirements.
- ▶ Adhere to the ADA Accessibility Guidelines and cut any landscaping that protrudes into the pedestrian zone between the heights of 27 to 80 inches.

## TECHNICAL STANDARDS MANUAL – SECTION 7: PEDESTRIAN ACCESS

- ▶ Requires an accessible pedestrian circulation path that connects all public access areas of the development including all buildings, parking areas, recreation areas, and other common use areas
- ▶ Sets standards for sidewalk location and design

### RECOMMENDATIONS

- ▶ No changes

# ENFORCEMENT | STRATEGIES & ACTIONS

## PRIORITIZE HIGH INJURY NETWORK (HIN) SAFETY IMPROVEMENTS

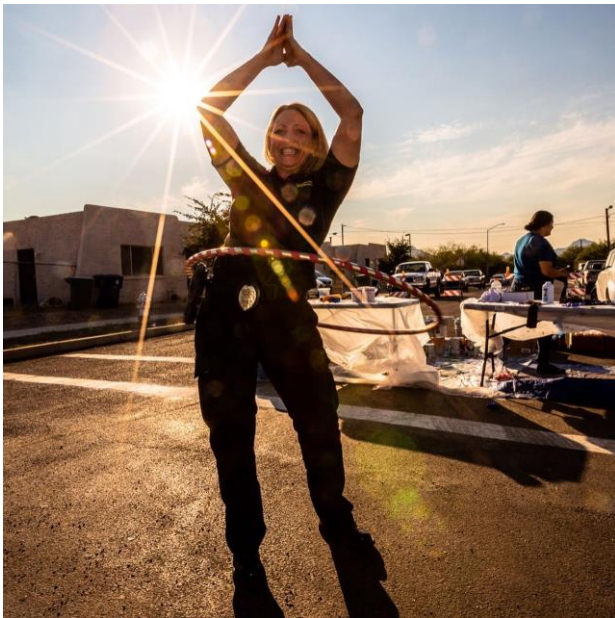
- ▶ Work in partnership with Tucson Police Department (TPD) to identify locations for Pedestrian Safety Corridors and other infrastructure improvements on the High Injury Network (HIN)
- ▶ Focus traffic safety enforcement on violations that result in severe injuries and deaths along the HIN (See Section 03 - Pedestrian Crash Analysis for more info)
- ▶ Collaborate with community partners, neighborhoods, and TPD to conduct education and outreach efforts at key locations on the HIN

## EXPAND SAFETY EDUCATION & OUTREACH EFFORTS FOCUSING ON PEOPLE DRIVING

- ▶ Develop a Traffic Safety Campaign that prioritizes pedestrian safety and focuses on top contributing factors: *Speeding, Impaired Driving, Other Dangerous Behavior*, to be disseminated to the community through TPD and other agency partners
- ▶ Collaborate with TPD to prioritize education over fines or other punishment. Traffic safety interactions should be treated as educational opportunities in most cases.

## PRIORITIZE DATA-DRIVEN ENFORCEMENT AND EVALUATION TO IMPROVE SAFETY

- ▶ Collaborate with partner agencies on crash data collection and reporting
- ▶ Identify existing City ordinances and State laws that can be strengthened, and explore potential new regulations needed, to better promote pedestrian safety
- ▶ Reassess the use of camera enforcement at traffic signals to detect drivers' red light running and/or along priority corridors to identify speeding-drivers



Traffic Safety officers participate in a quick-build demonstration project at Ochoa Elementary School. Source: Living Streets Alliance

## Prioritize Violations Resulting in Severe Crashes

**Focus traffic safety enforcement on violations that result in severe injuries and deaths along the HIN.**

Deploy targeted enforcement and education efforts in areas with high rates of crashes due to speed and impairment. Between 25 and 50 miles per hour, the share of fatal/incapacitating injuries increases with posted speed. Impairment is also important to focus on, since over 11% of the crashes involved an impaired driver or pedestrian. Currently, TPD officers take part in “strategic deployment missions” along the high-injury network.

- ▶ Officers are required to spend 10-12 minutes in each high-injury location daily.
- ▶ Officers are required to provide a verbal warning/education or written warning to a driver, bicyclist or pedestrian
- ▶ Sergeants and officers are asked to identify locations where additional crosswalks, lighting, or other environmental factors play a part in the location being a high-crash area. The Lieutenant assigned for each division will gather the data and send recommendations/concerns to the Department of Transportation & Mobility
- ▶ Program evaluation is focused on overall crash reduction, with fatalities and pedestrian injury collisions being the primary focus. Division commanders monitor weekly activity and address any shortcomings in performance. They communicate any information gathered by the officers to track the request/suggestions to DTM or other city departments

## Expand Automated Enforcement Activities

**Reassess the use of camera enforcement at traffic signals to detect drivers’ red light running or along priority corridors to identify speeding-drivers.**

In 2007, Tucson’s Mayor and Council approved a Traffic Safety Camera Program to help reduce speeding and red light running at eight high-crash locations. After one year, crashes at those intersections dropped by 70%. However, despite the safety benefits, Tucson voters approved Proposition 201 in 2015, ending red-light cameras and photo enforcement in Tucson.

## Prioritize Education & Outreach Opportunities

**Prioritize education over fines or other punishment – treating traffic safety interactions as educational opportunities in most cases.**

- ▶ Collaborate with community partners and neighborhoods to conduct education and outreach efforts at key locations on the HIN
- ▶ Develop a Traffic Safety Campaign that prioritizes pedestrian safety and focuses on top contributing factors: *Speeding, Impaired Driving, Other Dangerous Behavior*, to be disseminated to the community through TPD and other agency partners



# EDUCATION & OUTREACH | STRATEGIES & ACTIONS

## PRIORITIZE HIGH INJURY NETWORK (HIN) SAFETY IMPROVEMENTS

- ▶ Collaborate with community partners, neighborhoods, and TPD to conduct education and outreach efforts at key locations on the HIN

## SEEK COST-EFFECTIVE AND CREATIVE SOLUTIONS FOR PEDESTRIAN IMPROVEMENTS

- ▶ Continue to support community partnerships for implementing quick-build projects, such as intersection/crosswalk murals

## EXPAND SAFETY EDUCATION & OUTREACH EFFORTS FOCUSING ON PEOPLE DRIVING

- ▶ Develop a Traffic Safety Campaign that prioritizes pedestrian safety and focuses on top contributing crash factors
- ▶ Collaborate with TPD to prioritize education over fines or other punishment. Traffic safety interactions should be treated as educational opportunities in most cases.
- ▶ Support the continuation and expansion of Safe Routes to School programs

## PROMOTE THE IMPORTANCE OF WALKING FOR TRANSPORTATION, RECREATION & HEALTH

- ▶ Support the continuation and expansion of Cyclovia Tucson
- ▶ Lead neighborhood walkability audits with residents, businesses and advocacy groups to identify opportunities to improve the safety and walkability in their neighborhood



*Tessina Marie sits by a City of Tucson SLOW DOWN Yard Sign*



## Support Community-Led, Quick-Build Projects

**Seek cost-effective and creative solutions for pedestrian improvements.**

On October 20, 2018, the Department of Transportation & Mobility worked in partnership with Living Streets Alliance, local businesses, and dozens of volunteers and partners to implement “Corbett Porch” – Tucson’s first quick-build project at 6<sup>th</sup> Avenue and 7<sup>th</sup> Street. In under 24 hours, the intersection was transformed using only temporary materials like paint, flexible posts, planters and street furniture. The intention was to improve safety at the intersection and to encourage people to see what’s possible with our streets as public spaces.

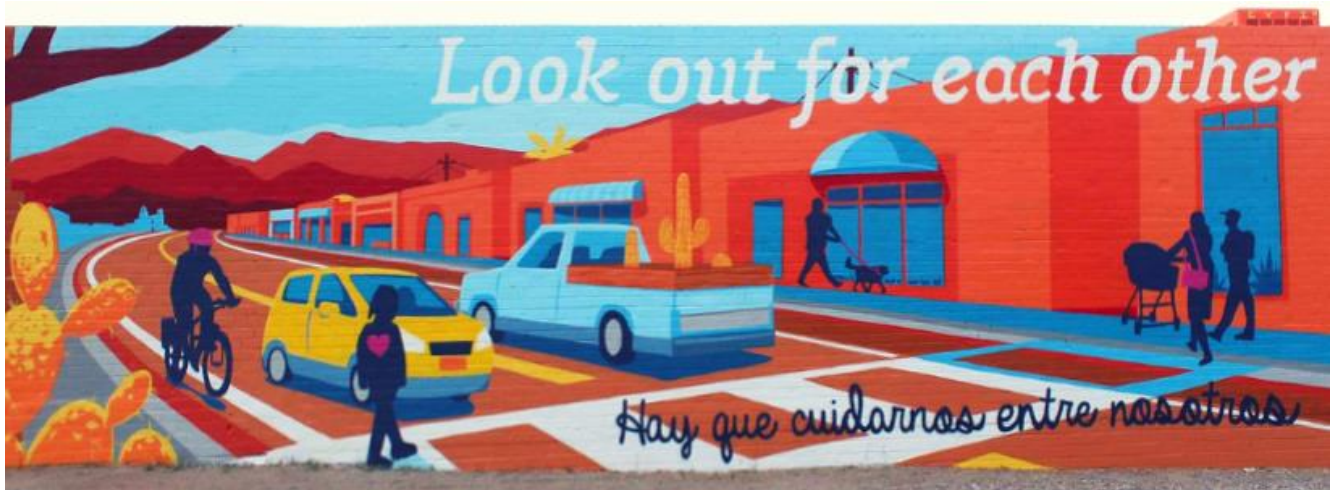


*“Corbett Porch” a quick-build demonstration project at 6<sup>th</sup> Ave & 7<sup>th</sup> St*

## Data-Driven Safety Messaging




**Develop a Traffic Safety Campaign that prioritizes pedestrian safety and focuses on top contributing crash factors.**

Together as a city, we all have a role to play in helping prevent crashes and save lives. In 2019, the Department of Transportation & Mobility launched **“Look out for each other”** as a call for all of us to pay attention to our actions, and the very real consequences of unsafe behavior, whether we’re behind the wheel or walking down the street. This campaign builds-off the mural that was funded through a pedestrian safety grant and painted by local graffiti artist, Rock ‘Cyfi’ Martinez and located at Cicli Noe Bike Shop.



*“Look out for each other” mural at Cicli Noe’s Bike Shop*

Table 13. City of Tucson Examples - Safety Communications Messaging

MEDIA EXAMPLE	DESCRIPTION & GOALS
	<p><b>Yard Sign Pilot Program</b></p> <p>SLOW DOWN – DRIVE LIKE YOU LIVE HERE  <i>DESPACIO – MANEJA COMO SI VIVIERAS AQUÍ</i></p> <p>The yard sign pilot program is designed to inform drivers that they're traveling on a neighborhood street and remind them that slowing down saves lives. During the pilot, free yard signs were available to Tucsonans who take the Traffic Safety Pledge and commit to making streets safer for everyone.</p>
	<p><b><i>The Days Are Getting Shorter</i></b></p> <p>SLOW DOWN, LOOK CLOSELY FOR PEOPLE, RIDE BRIGHT</p> <p>In the Fall, the sun rises and sets in line with Tucson's east-west streets - meaning more people are commuting during times of significant sun glare. The blinding glare impacts driver's visibility and reaction time - putting people walking, biking, and driving at greater risk.</p>
	<p><b><i>Watch out for our youngest Tucsonans - tonight (and every night!)</i></b></p> <p>The Department of Transportation &amp; Mobility used this Halloween social media message to remind drivers to watch out for kids trick-or-treating.</p>

# Build Upon What's Already Working

Support the continuation and expansion of Safe Routes to School and Cyclovia Tucson programs.

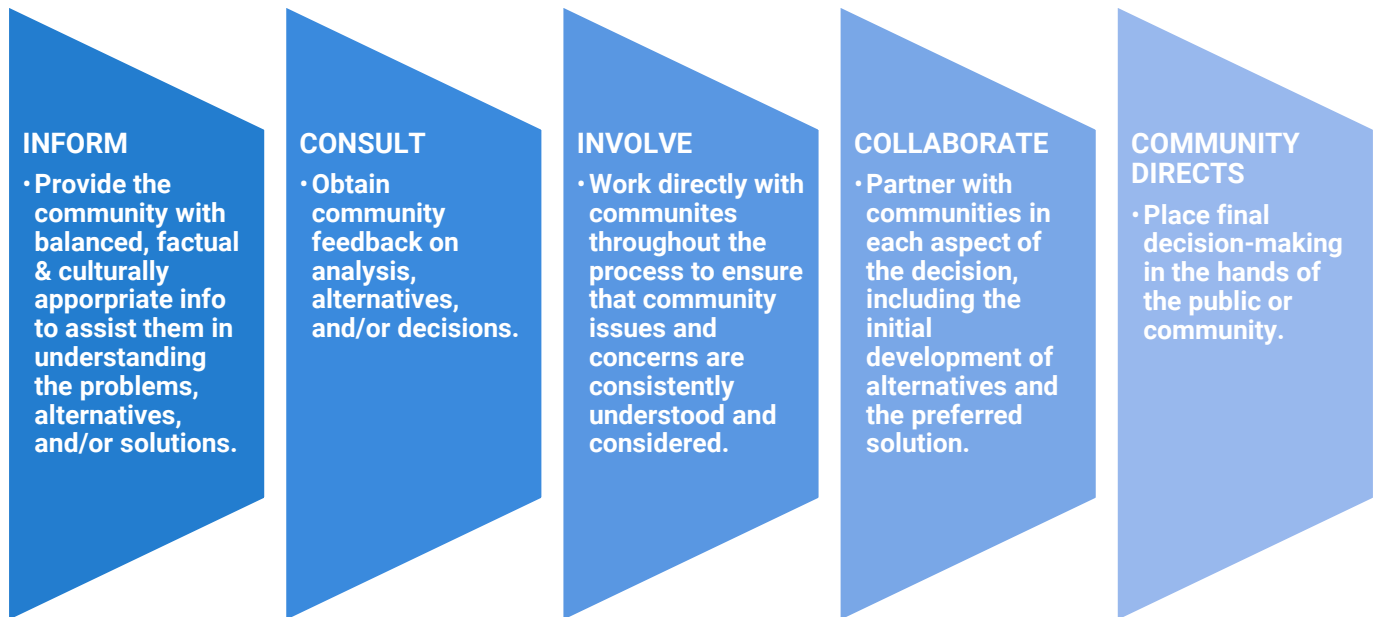


Left: Cyclovia Tucson; Right: Riders & Walkers Program

## Prioritize Equitable Community Engagement

“Strategies to Promote Equitable Community Engagement,” a report produced by the Arizona Prevention Research Center outlines a series of strategies to promote the appropriate level of engagement to the community. The report offers a toolkit based on a five-level framework of engagement. Figure provides more detail about the five levels, including examples of each type.

Figure 13. The Spectrum of Community Engagement



Source: Adapted from Arizona Prevention Research Center



The preceding sections of this chapter lay out a series of engineering, policy, education, and enforcement recommendations. Those recommendations should all be accompanied by an appropriate level of community engagement. Local knowledge can help to inform sound decisions at a city level. At the same time, outreach can help promote the success of a change – for example, an education and outreach campaign around leading pedestrian intervals can help neighborhood residents understand the intent of a signal timing change.

One example of applying this engagement framework can be provided through the lens of bus stop relocation.

- ▶ **Inform:** The first step in the process would be to inform community members of possible or proposed changes. This step should happen early, before the decision is locked in.
- ▶ **Consult:** Through a series of different venues, the community should be engaged on the decision. Community feedback may provide essential local knowledge that may otherwise be missed. For example, is there some critical access afforded by the current stop location that would be lost with relocation?
- ▶ **Involve and Collaborate:** Through collaborative processes (e.g., a task force, or a walking assessment), decision makers involve the community in the actual decision process. This follows the initial consultation. What are the bus stop location options, and what is the decision matrix for selecting location? Community members should have input to these processes throughout
- ▶ **Community Directs:** One option is to give the public the final decision-making authority. With bus stop relocation, this can ensure that decision and subsequent bus route changes were not “top-down” changes but rather judgments rendered by the local community, to serve their needs.

The full engagement report is included for more detail as Appendix E.



06

TECHNICAL  
APPENDIX

# **APPENDIX A:** **TASK 3 COLLISION MEMO**



# **APPENDIX B:** TASK 4 PRIORITIZATION MEMO

# **APPENDIX C:** **TASK 5 PROJECT CUT SHEETS**

# **APPENDIX D:** PEDESTRIAN SAFETY TOOLBOX

**APPENDIX E:**  
STRATEGIES TO PROMOTE  
EQUITABLE COMMUNITY  
ENGAGEMENT