ADOT

Pedestrian Safety ACTION PLAN

Final Report • July 2017

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Pedestrian Safety Action Plan

Final Report

July 2017

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1. INTRODUCTION

The 2017 Pedestrian Safety Action Plan (PSAP) provides a strategic action plan that effectively focuses resources to reduce the greatest number of severe injury and fatal pedestrian-motor vehicle crashes on the Arizona State Highway System (SHS).

This plan, undertaken by the Arizona Department of Transportation (ADOT) Multimodal Planning Division (MPD), updates the 2009 Pedestrian Safety Action Plan (PSAP). The 2017 PSAP supplements the

- Arizona 2014 Strategic Highway Safety Plan (SHSP): Toward Zero Deaths by Reducing Crashes for a Safer Arizona, Section 11: Non-motorized | Pedestrians
- State of Arizona, Highway Safety Plan (HSP), prepared for U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), prepared by Arizona Governor's Office of Highway Safety (GOHS)

ADOT recognizes that the focus of the PSAP, the SHS (shown in **Figure 1**), addresses only a small percentage of the total number of pedestrian crashes that occur in the state of Arizona. As such, development of the PSAP is the first of many steps required to adequately address pedestrian safety in Arizona. ADOT will continue to collaborate with and support other agencies and jurisdictions in Arizona to address pedestrian safety within their own jurisdictions to meet their respective needs.

PSAP Objectives

The following objectives guide PSAP development:

- Evaluate the framework, strategies, progress, and effectiveness of the 2009 PSAP.
- Collect and analyze pedestrian crash data for the five most recent years available (2011-2015) for crashes that occurred within the ADOT-maintained state highway right-of-way.
- Identify specific steps, actions, and potential countermeasures that, upon implementation, will measurably reduce pedestrian crashes, injuries, and fatalities on the SHS.

Final Report Overview

This report is organized into the following chapters:

1. Introduction – Provides an overview of this PSAP.
2. Goals and Objectives – Provides an overview of 2016 goals and objectives and discusses progress in accomplishing 2009 PSAP goals for pedestrian crash reduction.
3. Crash Data Analysis – Presents an analysis of pedestrian crashes and the identification of high-crash segments and intersections and interchanges on the SHS.
4. Pedestrian Crash Risk Assessment – Discusses a risk assessment methodology to identify state highway segments and intersections where investment can help to lower the risk of pedestrian crashes.
5. Countermeasure Identification – Discusses potential countermeasures that were identified for each crash hot spot and high-risk location that identified in the crash analysis and identifies planning level costs.
6. Countermeasure Prioritization – Documents application of a countermeasure prioritization process to the high-pedestrian-crash and high-risk locations.

7. Opportunities in the 2017-2021 ADOT Five-Year Program – The 2017-2021 ADOT Five-Year Transportation Facilities Construction Program was reviewed to determine programmed projects within or near high-crash or high-risk segments.
8. Funding Sources for Pedestrian Infrastructure and Programs – Provides an overview of potential Federal, state, and regional pedestrian safety funding sources.
9. Recommended Policies and Programs – Categorizes recommendations to improve pedestrian safety into the following areas:
    - Education and outreach program recommendations
    - Legislative recommendations
    - Research and evaluation recommendations
    - Engineering treatment recommendations
    - Enforcement recommendations
    - Pedestrian crash reporting recommendations
    - Other recommended initiatives
    - Countermeasures to target specific pedestrian crash issues

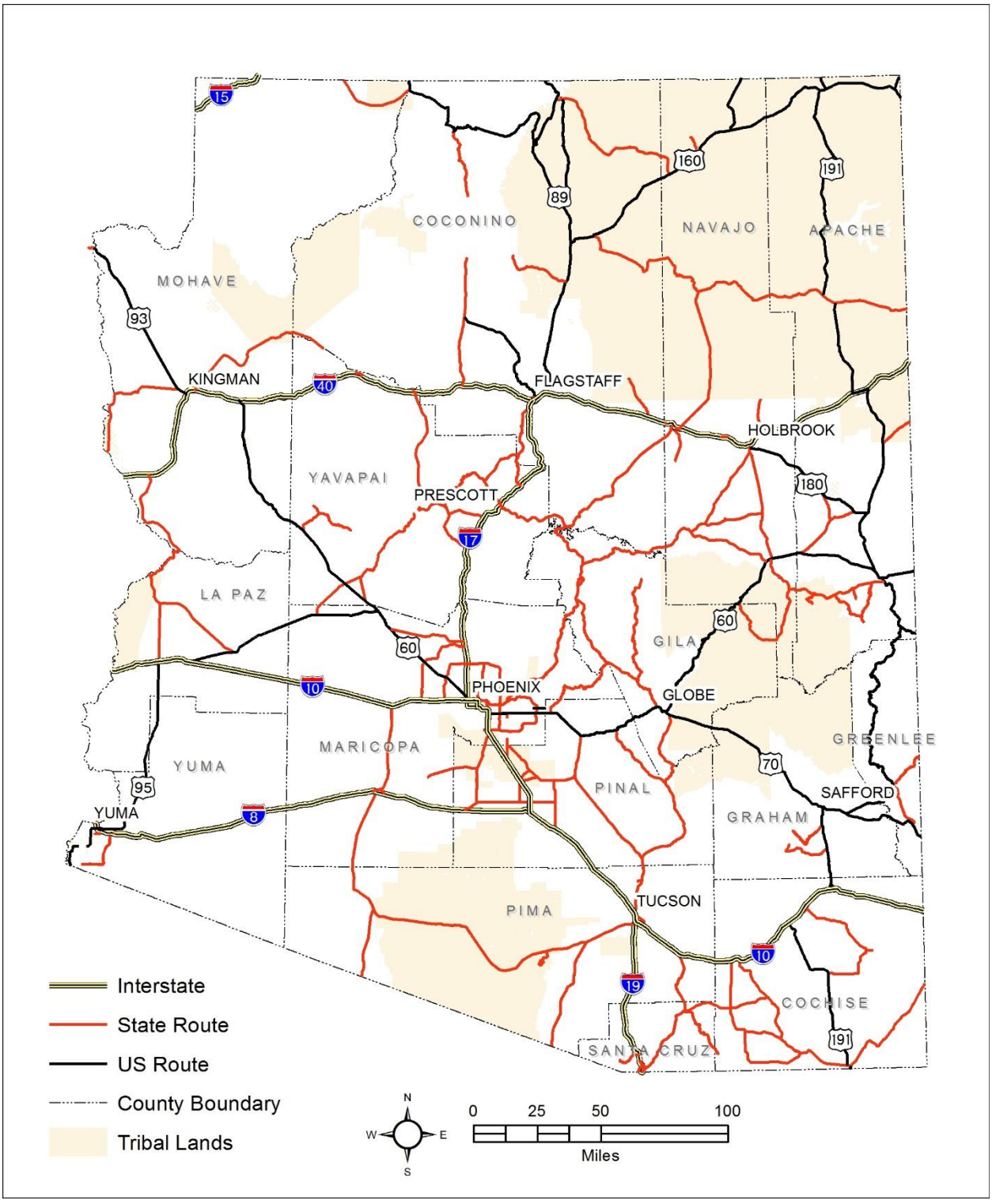


Figure 1: SHS Map

2. GOALS AND OBJECTIVES

The 2017 PSAP established goals and objectives through a process that considered:

- Goals and targets established in the Arizona 2014 SHSP
- Goals, objectives, and targets prepared by state and national plans
- Findings of the PSAP crash analysis (discussed in more detail in **Chapter 3**)

Goals developed for the PSAP are consistent with and support those established by the Arizona SHSP and the Arizona GOHS.

Table 1 introduces 2017 Pedestrian Safety Action Plan goals. Objectives summarized in **Table 2** target specific crash attributes or contributing factors that were identified during the development of the crash data analysis.

Table 1: 2017 PSAP Goals

Goal	Notes
Reduce the frequency of all pedestrian-involved crashes (including fatal, injury, and non-injury) on the SHS by 25% by the year 2025.	The 2011-2015 annual average of pedestrian-involved crashes is 165 crashes per year. **The target is to reduce these to fewer than 125 crashes/year by the year 2025**.
Reduce the frequency of pedestrian fatal and incapacitating injury crashes on the SHS by 25% by the year 2025.	The 2011-2015 annual average of pedestrian fatal and incapacitating injury crashes is 36 fatal crashes per year and 45 incapacitating injury crashes per year (an average of 81 fatal and incapacitating injury crashes per year). **The target is to reduce the combined fatal and incapacitating injury crashes per year to fewer than 60 fatal and incapacitating injury crashes per year**.

Table 2: 2017 PSAP Objectives

Objective	Notes
Objective 1: **Reduce crashes at high-crash locations.**	17 high-crash state highway segments were identified, including four on Tribal lands. For the five-year analysis period, a total of 134 pedestrian crashes occurred on these segments, 68 of which were fatal (K) or serious injury (A). A 25% reduction in crashes on these segments could result in seven fewer pedestrian crashes per year.
Objective 2: **Prevent crashes at high-risk crash locations as identified through the risk assessment process.**	This information is based on identification and evaluation of high-risk crash locations.
Objective 3: **Reduce pedestrian crossing roadway crash types (vehicle turning and vehicle not turning).**	44% of crashes (363) (during a five-year period) were crossing roadway. A 25% reduction in this crash type could result in 18 fewer pedestrian crashes per year.
Objective 4: **Reduce the number of pedestrian-involved crashes in which the pedestrian was 20–34 years of age.**	Pedestrians who are ages 20-34 comprise more than 40% of all pedestrians involved in a crash. A 25% reduction in crashes involving pedestrians in this age range could result in 16 fewer pedestrian crashes per year.
Objective 5: **Reduce the number of crashes in dark-not lighted conditions.**	27% of all crashes occurred in dark-not lighted/unknown lighting conditions. 40% of the total severe injury (K+A) pedestrian crashes occurred during dark-not lighted / unknown lighting conditions.

Objective	Notes
	A 25% reduction in crashes involving pedestrians in dark-not lighted/unknown lighting conditions could result in 11 fewer pedestrian crashes per year.
Objective 6: **Reduce pedestrian crashes on controlled access or interstate facilities.**	20% of pedestrian crashes occurred within controlled access freeway facilities; over 50% of these occurred in urban environments. A 25% reduction in crashes involving pedestrians on controlled access facilities could result in eight fewer pedestrian crashes per year.

Progress in Accomplishing 2009 PSAP Goals

Since the 2009 PSAP, positive improvements have been made at high-crash segments and intersections/interchanges. Many of these locations have experienced a reduction in pedestrian crashes. However, total pedestrian crashes on the SHS have increased in comparing the two analysis time periods for the 2009 and 2017 PSAP.

Table 3 compares the 2002-2006 pedestrian crash data with 2011-2015 pedestrian crash data within the context of goals established in the 2009 PSAP. As revealed by the data, the goals established in the 2009 PSAP have not been met. Pedestrian crashes on the SHS increased during the 2011-2015 period as compared to the 2002-2006 data.

Table 3: 2009 PSAP Goal Status Summary

	2002-2006 Crashes	2011- 2015 Crashes	% Change	2009 PSAP Goal
Total Pedestrian Crashes	8,033	7,633	**- 5.0%**	**20% Reduction by 2016**
Total Pedestrian Fatalities and Injuries	1,607	1,503	**- 6.5%**	**10% Reduction by 2011 (2007-2011 Average)**
Total Pedestrian Fatalities and Injuries	1,607	1,526	**- 5.0%**	**20% Reduction by 2016 (2011-2015 Average)**
Total SHS Pedestrian Crashes	771	824	**+ 6.9%**	**20% Reduction by 2016**

Crash Data Comparisons on 2009 PSAP High-Crash Segments

The 2009 PSAP identified 19 high-crash location segments (**Table 4**), 11 interchange locations (**Table 5**), and 15 segments on Tribal lands (**Table 6**).

- At segment locations, comparison of 2011-2015 crash data to 2002-2006 crash data showed a decrease in pedestrian crashes at all but two locations. Nine of nineteen segments received improvements since 2009.
- At interchange locations, all but one location experienced a reduction in pedestrian crashes.
- With respect to high-crash segments on Tribal lands, pedestrian crash data was not documented in the 2009 PSAP. Nine Tribal locations received pedestrian-focused improvements.

Table 4: Comparison of 2011-2015 Pedestrian Crashes to 2002-2006 (Segments Only)

2009 PSAP Segment	Area	Location From (BMP) To (EMP)	Pedestrian Improvements Implemented Since 2009 PSAP	2002-2006		2011-2015		Difference
				Total Crashes	F + I Crashes	Total Crashes	F + I Crashes	
1A	Bullhead City	SR 95 (MP 243.5 - MP 249.7)	Pedestrian hybrid beacon; leading pedestrian interval	24	12	13	4	**-11**
1B	Bullhead City	SR 68 (MP 249.7 - MP 251.3)	None	2	2	1	0	**-1**
2	Bullhead City	SR 95 (MP 236.4 - MP 238.4)	New traffic signal at El Rodeo Road	7	4	6	2	**-1**
4A	Flagstaff	SR 40B (MP 195.3 - MP 196.6)	Intersection improvements	28	10	14	3	**-14**
4B	Flagstaff	SR 89A (MP 402.5 - MP 216.1)	Increased pedestrian crossing time on the traffic signals	15	4	11	2	**-4**
4C	Flagstaff	US 180 (MP 215.4 - MP 216.1)	None	4	1	3	1	**-1**
5	Flagstaff	SR 40B (MP 198.3 - MP 199)	Roadway lighting between Arrowhead and 4th Street; new traffic signal with crosswalks; crosswalk improvements	11	3	4	3	**-7**
6	Flagstaff	US 89 (MP 420.1 - MP 420.7)	None	5	2	0	0	**-5**
7	Holbrook	SR 40B (MP 286.3 - MP 287.4)	None	17	3	3	1	**-14**
8A	Tucson	SR 77 (MP 68.1 - MP 71.0)	None	23	9	14	1	**-9**
8B	Tucson	SR 77 (MP 72.0 - MP 75.1)	None	21	10	19	7	**-2**
8C	Oro Valley	SR 77 (MP 75.9 - MP 76.2)	New pedestrian signals, crosswalk, ADA ramps, sidewalks at Magee Road/SR 77	6	3	1	0	**-5**
11	Sierra Vista	SR 90, SR-92 to Giulio Cesare Ave	Sidewalk ramp improvements, Pedestrian Hybrid Beacon at SR 90/Rainbow Way/Toscanini Avenue, shared-use pathway on south side of SR 90 and new roadway lighting	7	3	5	1	**-2**
14	Sedona	SR 89A (MP 371 - MP 372.9)	Roadway lighting from Dry Creek Road to Airport Road; new traffic signal at Andante Drive	14	4	10	0	**-4**
15	Casa Grande	SR 387 (Pinal Avenue) (MP 0 - MP 1)	Pedestrian hybrid beacon (MP 0.8)	7	0	2	1	**-5**
16	Tucson	SR 86 (MP 169.9 - MP 171.7)	None	12	4	10	5	**-2**
17	Coolidge	SR 87 (MP 131.5 - MP 133.5)	None	10	2	4	1	**-6**

2009 PSAP Segment	Area	Location From (BMP) To (EMP)	Pedestrian Improvements Implemented Since 2009 PSAP	2002-2006		2011-2015		Difference
				Total Crashes	F + I Crashes	Total Crashes	F + I Crashes	
20	Mesa	US 60X/Apache Trail (MP 193 - MP 194)	Pedestrian crossing warning signs; lowered posted speed limit to 45 mph	4	0	4	2	0
21	Mesa	US 60X/Apache Trail (MP 191 - MP 192)	Pedestrian crossing warning signs; lowered posted speed limit to 45 mph	4	3	4	1	0

Table 5: Comparison of 2011-2015 Pedestrian Crashes to 2002-2006 (Interchanges Only)

Interchange	Metro Area	Location	Pedestrian Improvements Implemented Since 2009 PSAP	2002-2006		2011-2015		Difference
				Total Crashes	F + I Crashes	Total Crashes	F + I Crashes	
1	Phoenix	Greenway Road/I-17	None	3	2	0	0	**-3**
3	Phoenix	7th Avenue/I-10 Interchange	None	2	2	0	0	**-2**
4	Tempe	Apache Boulevard/SR 101 Interchange	None	3	2	1	0	**-2**
5	Phoenix	Cactus Road/I-17 Interchange	None	4	2	0	0	**-4**
9	Phoenix	32nd St/SR 202 Interchange	None	5	2	1	1	**-4**
10	Phoenix	Bethany Home Road/I-17 Interchange	Sidewalk improvements	5	2	5	0	0
11	Phoenix	Camelback Road/I-17 Interchange	None	6	1	2	0	**-4**
12	Phoenix	Dunlap Avenue/I-17 Interchange	None	7	2	1	0	**-6**
13	Tempe	University Drive/SR 101 Interchange	None	9	4	1	1	**-8**
14	Tempe	Baseline Road/I-10 Interchange	None	5	0	3	0	**-2**
18	Phoenix	Indian School Road/I-17 Interchange	None	4	1	4	1	0

Table 6: 2009 PSAP High-Crash Segments (Tribal Locations Only)

Location	Tribal Community	Location	Milepost	Existing Pedestrian Facilities (2009)	Pedestrian Improvements Implemented Since 2009 PSAP
1	Gila River Indian Community	SR 587	MP 220	Paved shoulders	None
2	Gila River Indian Community	SR 87	MP 135 - MP 160	None	New traffic signal at SR 87/Hunt Highway (MP 159.38); programmed intersection reconstruction project
3	Navajo Nation (Cameron)	US 89	MP 464.7 - MP 470	Paved shoulders	MP 463.6 - MP 466.8New curb, gutter, separated sidewalk, four pedestrian underpasses, and roadway lighting, MP 463.6 - MP 466.8
4	Navajo Nation (Tuba City)	US 160	MP 321.7 - MP 323	Narrow paved shoulders	Roadway Lighting System (2010); programmed improvements: US 160 bus pullouts will install four school bus pullouts from MP 342 -MP 359.9
5	Navajo Nation (Kayenta)	US 160	MP 393 - MP 393.7	Narrow paved shoulders; existing intersection lighting at US 160/US 163 Jct., MP 393.57	None
6	Navajo Nation (Kayenta)	US 163	MP 393.5 - MP 395.4	Narrow paved shoulders	New traffic signal at MP 394.81
7	Navajo Nation (Chinle)	US 191	MP 446.6 - MP 448.2	Narrow paved shoulders,	New traffic signal at MP 446; programmed improvements: new sidewalk from MP 446.7 – 447.49
8	Navajo Nation (Ganado)	SR 264	MP 446.3 - MP 447.6	Narrow paved shoulders	Programmed improvements: five-foot shoulders to be constructed as part of H8246 2016
9	Navajo Nation (Window Rock)	SR 264	MP 474.7 - MP 475.8	Sidewalks	None
10	Tohono O'odham Nation	SR 86	MP 74 - MP 76	Unpaved shoulders	Implemented improvements: safety improvements including guardrail, signing, pavement marking, and shoulder rumble strips
11	Tohono O'odham Nation	SR 86	MP 90 - MP 94	Unpaved shoulders	None
12	Tohono O'odham Nation	SR 86	MP 111.1 - MP 116.6	Unpaved shoulders lighting in Sells, MP 112-115	Roadway widening, MP 112 - MP 115; pedestrian hybrid beacon, sidewalk, and pedestrian bridge over drainage channel installed at MP 114.9 - MP 115.10; pedestrian bridge over wash
13	Hopi Tribe	SR 264	MP 385 - MP 390	Narrow paved shoulders	None
14	Hopi Tribe	SR 264	MP 367 - MP 369	Narrow paved shoulders	None
15	White Mountain Apache Tribe	SR 73	Fort Apache Road - SR 260	Paved shoulders, sidewalks	Round Top Road - Milk Ranch Road, reconstruction; Programmed improvements: MP 339 – MP 343 spot pedestrian improvements will construct three pedestrian crossings, programmed for 2018

3. CRASH DATA ANALYSIS

This chapter presents an analysis of pedestrian crashes on the SHS and the identification of high-crash segments and intersections and interchanges on the SHS.

State Highway System Pedestrian Crashes

Arizona pedestrian crashes on the SHS are shown in **Figure 2**. 824 pedestrian crashes were reported on the SHS from 2011-2015. A visual inspection of the statewide distribution of pedestrian crashes shows that there may be "missing" or unsubmitted pedestrian crash reports in the northeast corner of the state. For example, along US 191, north of I-40, several fatal pedestrian crashes are shown, but no injury pedestrian crashes. This unusual distribution of fatal pedestrian crashes without any injury pedestrian crashes may indicate that pedestrian crash data of all severities is not being submitted to ADOT from some parts of the state, with only fatal crashes being reported.

Note that within this data, the severity of 22 pedestrian crashes was reported as "unknown." Crash rates for Arizona cities based on the 100 million vehicle miles -traveled (VMT) of the SHS within incorporated limits are summarized in **Table 7.**

Table 7: Pedestrian Crashes by Area

Area	Count	SHS VMT (2015)	Pedestrian Crashes per 100 Million VMT
Flagstaff	54	824,028	3.6
Sierra Vista	18	295,596	3.3
Bullhead City	27	448,048	3.3
Safford	8	150,054	2.9
Payson	14	279,261	2.7
San Luis	9	189,238	2.6
Sedona	16	339,296	2.6
Cottonwood	13	359,828	2.0
Globe	8	234,911	1.9
Nogales	8	249,357	1.8
Pinetop-Lakeside	6	195,771	1.7
Kingman	13	472,043	1.5
Casa Grande	21	774,148	1.5
Tucson	86	3,191,089	1.5
Lake Havasu City	6	292,057	1.1
Oro Valley	6	396,834	0.8
Apache Junction	7	467,096	0.8
Show Low	7	469,975	0.8
Benson	6	523,492	0.6
Prescott Valley	6	559,615	0.6
Scottsdale	12	1,154,165	0.6
Camp Verde	6	647,929	0.5
Mesa	48	5,558,830	0.5
Phoenix	127	15,825,207	0.4

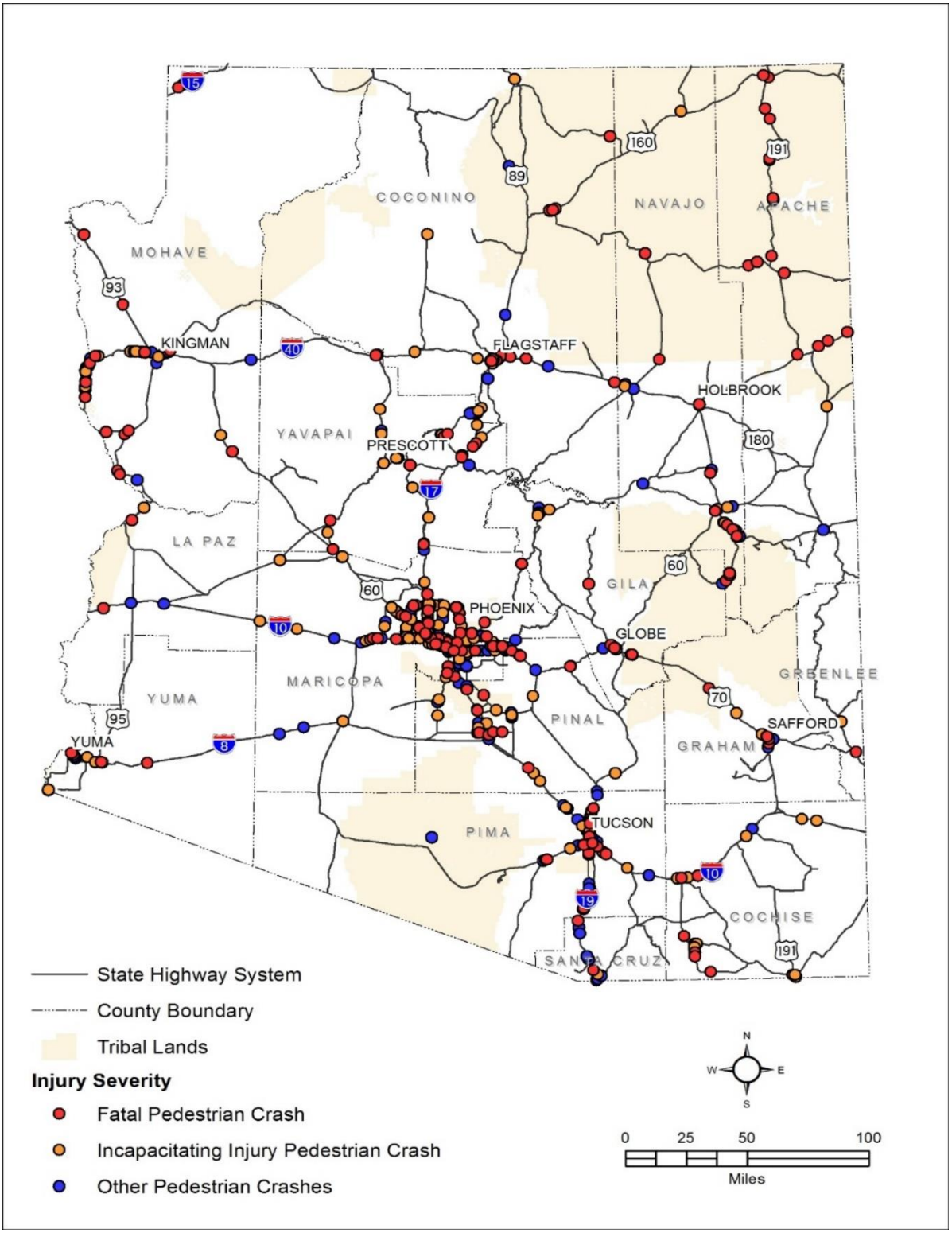


Figure 2: Arizona Pedestrian Crashes (SHS), 2011-2015

SHS Pedestrian Crashes in Rural and Urban Areas

Crashes in rural and urban areas are summarized by year in the bar chart in **Figure 3**. Sixty-eight percent (68%) of crashes on the statewide system occurred within urban areas (incorporated city boundaries).

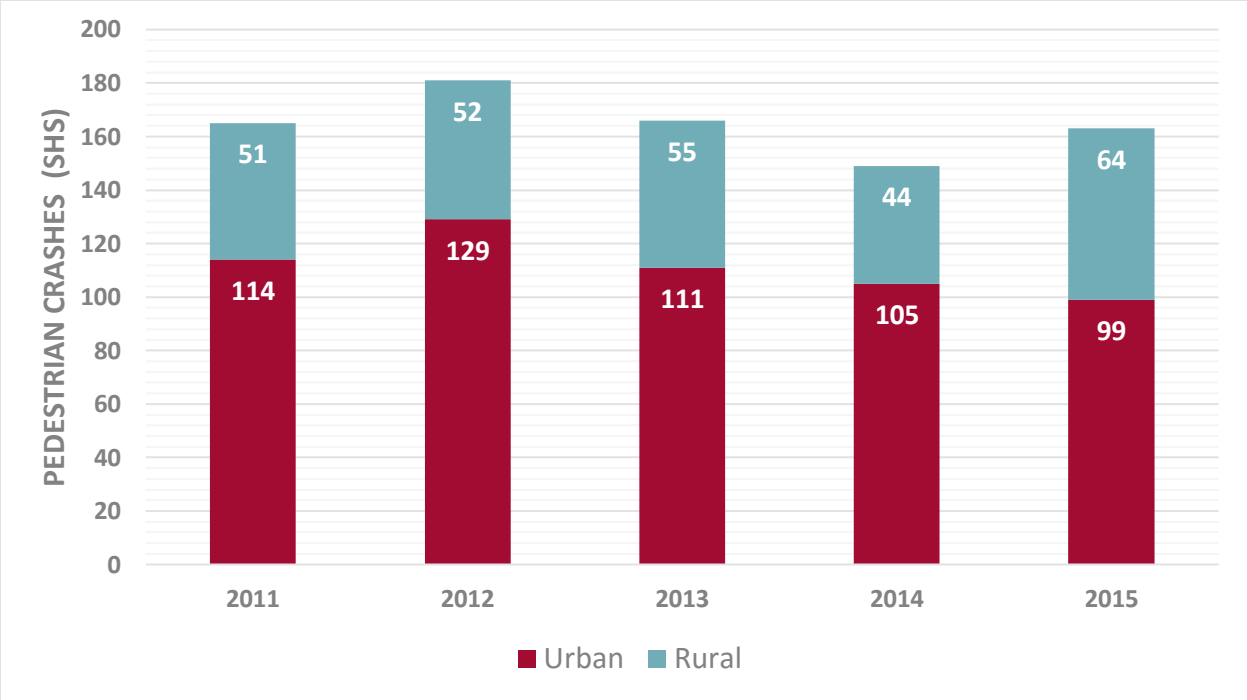


Figure 3: Total Pedestrian Crashes (SHS), 2011-2015

SHS Pedestrian Crash Severity

SHS pedestrian crashes were categorized into the severity levels as defined by the Highway Safety Manual's (HSM) KABCO scale, which provides five levels of injury severity:

- **K** – Fatal injury: An injury that results in death
- **A** – Incapacitating injury: Any injury, other than a fatal injury, that prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before the injury occurred
- **B** – Non-incapacitating evident injury: Any injury, other than a fatal injury or an incapacitating injury, that is evident to observers at the scene of the crash in which the injury occurred
- **C** – Possible injury: Any injury reported or claimed that is not a fatal injury, incapacitating injury, or non-incapacitating evident injury and includes claim of injuries not evident
- **O** – No injury/property damage only (PDO)

Most SHS injury-, possible injury-, and no injury-related crashes occurred in urban areas (**Figure 4**). However, occurrences of fatal crashes are higher in rural areas than in urban areas (Note: Injury severity of 22 pedestrian crashes marked as "unknown").

There were 179 fatal crashes on the SHS (2011-2015). This is a slight increase from the 173 crashes that occurred in the 2002-2006 analysis period of the 2009 PSAP.

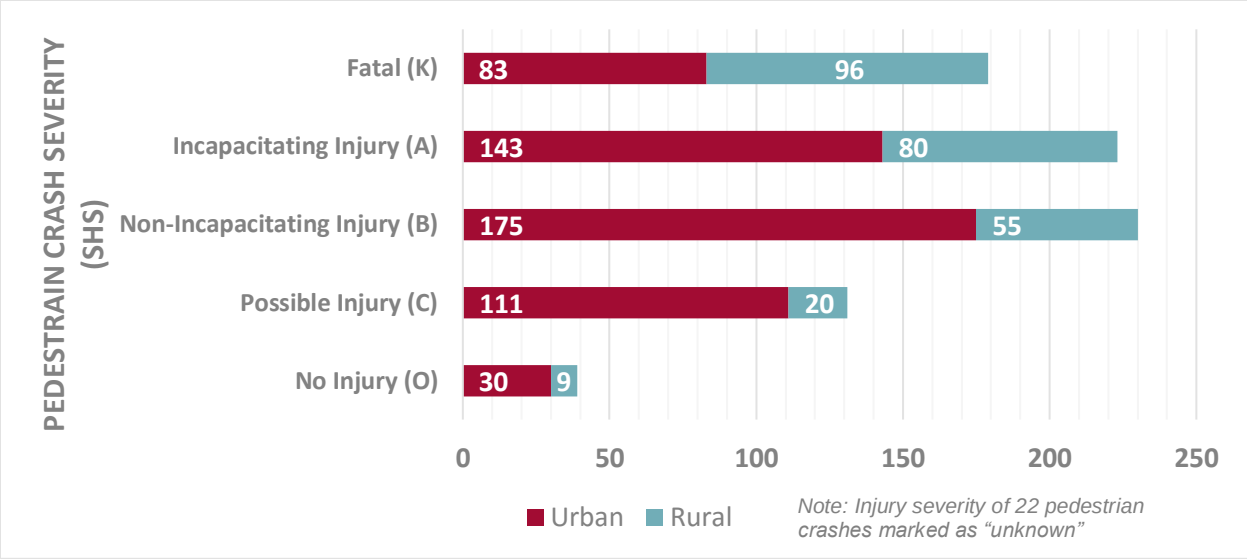


Figure 4: Pedestrian Crash Severity (SHS), 2011-2015

Pedestrian-Bicycle Crash Analysis Tool Database

Crash reports for each SHS crash were obtained from ADOT for the 2011-2015 analysis period. Each report was thoroughly reviewed to retrieve any significant information that could lead to a better understanding of the contributing factors for that crash. Crash details were entered into the Federal Highway Administration (FHWA) PBCAT software. Data from the ADOT Safety Data Mart, as well as Google Earth and Street View, were also utilized to incorporate additional details of the crash locations such as the presence of a crosswalk or sidewalk.

PBCAT was used to crash type each SHS pedestrian crash. Crash typing provides enhanced insight into the sequence of events that led up to the pedestrian-motor vehicle crash. The FHWA's Pedestrian Safety Guide and Countermeasure Selection System online tool (PEDSAFE) includes 12 crash types that each describe possible contributing factors to the crash.

Table 8 summarizes the crash type groups with descriptions from the PBCAT software and the results on the Arizona SHS. Crossing-at-intersection or midblock crashes were the most prevalent crash types in terms of crash frequency. The other common crash type fell within the "unusual circumstances" description. It was found that these crashes were the result of a person stepping out of a possibly disabled vehicle on the side of the highway/freeway and getting struck by a vehicle. Nearly 15% of all crashes were categorized in this class and had a 52% severe injury (K+A) percentage. A majority of the crashes (61%) that were typed as "unusual circumstances" occurred on non-interstate facilities.

Table 8: PBCAT Crash Type Summary (SHS)

Crash Type (PBCAT Group ID) Description	Total Crashes	% of Total	% Urban	% Rural	% K+A
Crossing Roadway/Vehicle Turning (790)					
The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.	**201**	24%	91%	9%	19%
Crossing Roadway/Vehicle Not Turning (750)					
The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.	**163**	20%	73%	27%	62%
Unusual Circumstances (100) – Disabled Vehicle					
The crash involved a pedestrian and a disabled vehicle (including assisting emergency/tow truck personnel), an emergency vehicle, or driverless vehicle, or the pedestrian was hit while trying to remove something from the freeway (i.e., debris, pet, etc.).	**91**	11%	64%	36%	49%
Unusual Circumstances (100) – Intentionally Struck					
Modified definition (from PBCAT): Crashes where the pedestrian was struck intentionally, was clinging to a vehicle, or was struck as the result of other unusual circumstances. Examples include clinging to vehicle, vehicle hitting a sign structure that then struck the pedestrian, police pursuit/evading police, motor vehicle loss of control, crash occurring as a result of a dispute/argument, assault by vehicle.	**22**	3%	64%	36%	45%
Dash/Dart-Out (740)					
The pedestrian walked or ran into the roadway at an intersection or midblock location and was struck by a vehicle. The motorist's view of the pedestrian may have been blocked until an instant before the impact.	**73**	9%	59%	41%	62%
Walking Along Roadway (400)					
The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.	**72**	9%	38%	63%	53%
Pedestrian in Roadway/Circumstances Unknown (600)					
The pedestrian was standing, walking, or lying in the road right-of-way at an intersection or midblock location but the circumstances are unknown.	**75**	9%	45%	54%	76%
Other/Unknown/Insufficient Details (990)					
The circumstances do not clearly fit any of the situations described or are unknown.	**41**	5%	42%	59%	66%
Crossing Expressway (910)					
The pedestrian was struck by a motor vehicle while crossing an expressway or expressway ramp.	**31**	4%	84%	16%	81%

Crash Type (PBCAT Group ID) Description	Total Crashes	% of Total	% Urban	% Rural	% K+A
Crossing Driveway or Alley (460)					
The pedestrian was standing or walking near the roadway edge, on a sidewalk, in a driveway or alley, or in a parking lot when struck by a vehicle.	**22**	3%	82%	18%	18%
Working or Playing in Roadway (310)					
The pedestrian was struck when playing or working in the roadway, including highway workers who were struck within a work zone.	**14**	2%	57%	43%	43%
Backing Vehicle (200)					
The pedestrian was struck by a vehicle backing up on a street, in a driveway, on a sidewalk, in a parking lot, or at another location.	**8**	1%	50%	50%	25%
Unique Midblock (350)					
The pedestrian was struck while crossing the road to/from a mailbox, newspaper box, ice cream truck, or similar unique/temporary destinations, or while getting into or out of a stopped vehicle.	**6**	< 1.0%	50%	50%	33%
Bus-Related (340)					
The pedestrian was struck by a vehicle while crossing in front of a public bus stopped at a bus stop, going to/from a school bus stop, or going to/from or waiting near a public bus stop.	**4**	< 1.0%	100%	< 1.0%	50%
Multiple Threat/Trapped (720)					
The pedestrian entered the roadway in front of stopped or slowed traffic and was struck by a multiple-threat vehicle in an adjacent lane after becoming trapped in the middle of the roadway.	**1**	< 1.0%	100%	< 1.0%	0%

The following sections further describe the SHS pedestrian-motor vehicle crashes, as extracted from the PBCAT database.

Pedestrian Crash Lighting Conditions

Most crashes (approximately 53%) occurred during “nighttime” or “dark” conditions. These crashes either occurred during “dark/lighted” conditions (26%), “dark-not lighted” conditions (24%), or "dark-unknown lighting" (3%), as shown in **Table 9**. The second most common light condition for pedestrian crashes occurred in “daylight”, at approximately 41%. What stands out when reviewing the lighting conditions by severity is how a higher percentage of pedestrian crashes result in a fatality during “dark-not lighted/unknown” or “dark/lighted” conditions when compared to “daylight” and “dawn/dusk” conditions.

Table 9: Lighting Conditions by Pedestrian Crash Severity

Condition	Fatal	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	No Injury	Unknown	Total
Daylight	17	92	125	73	20	9	336
Dark/Lighted	43	65	46	38	11	10	213
Dark/Not Lighted/Unknown	103	56	45	12	5	3	224
Dawn/Dusk	16	10	14	8	3	0	51

As shown in **Figure 5**, the hours between 6:00 PM – 9:00 PM show higher crash frequencies as compared to other periods of the day. This concludes a statewide trend that a higher number of the SHS pedestrian crashes were reported to occur in the late afternoon and evening hours, peaking during the 8:00 PM – 9:00 PM hour.

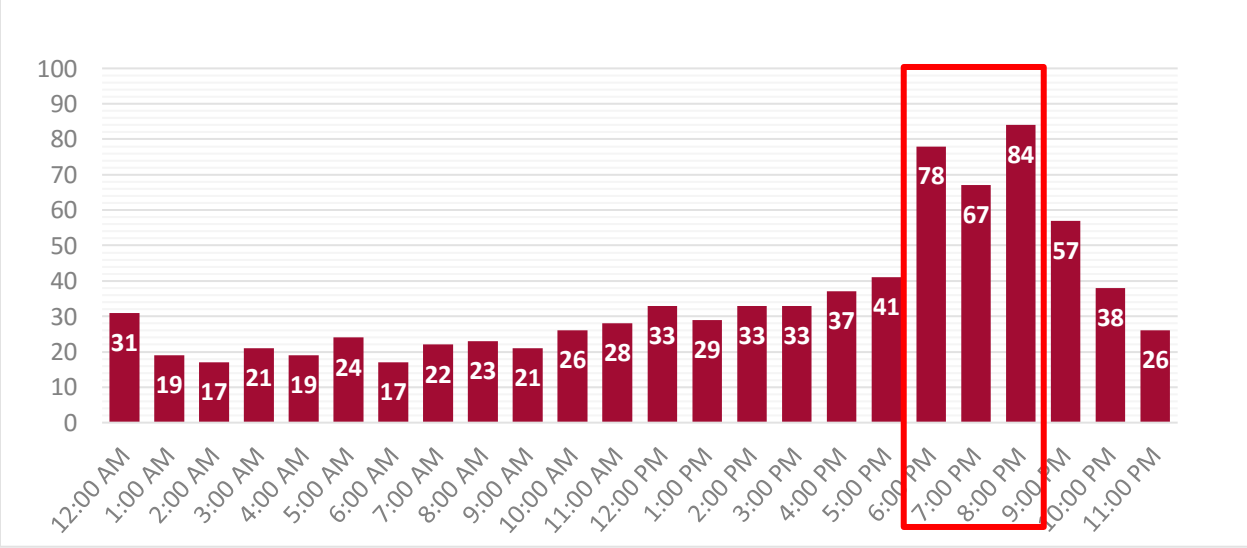


Figure 5: Pedestrian Crashes by Time of Day (SHS), 2011-2015

Pedestrian Crashes by Highway Characteristics

Figure 6 lists significant roadway feature characteristics of the 824 SHS pedestrian crashes that occurred from 2011 to 2015. Crash statistics are shown for intersection/non-intersection crash, traffic control, and the presence of pedestrian facilities such as sidewalks and crosswalks where the crash occurred.

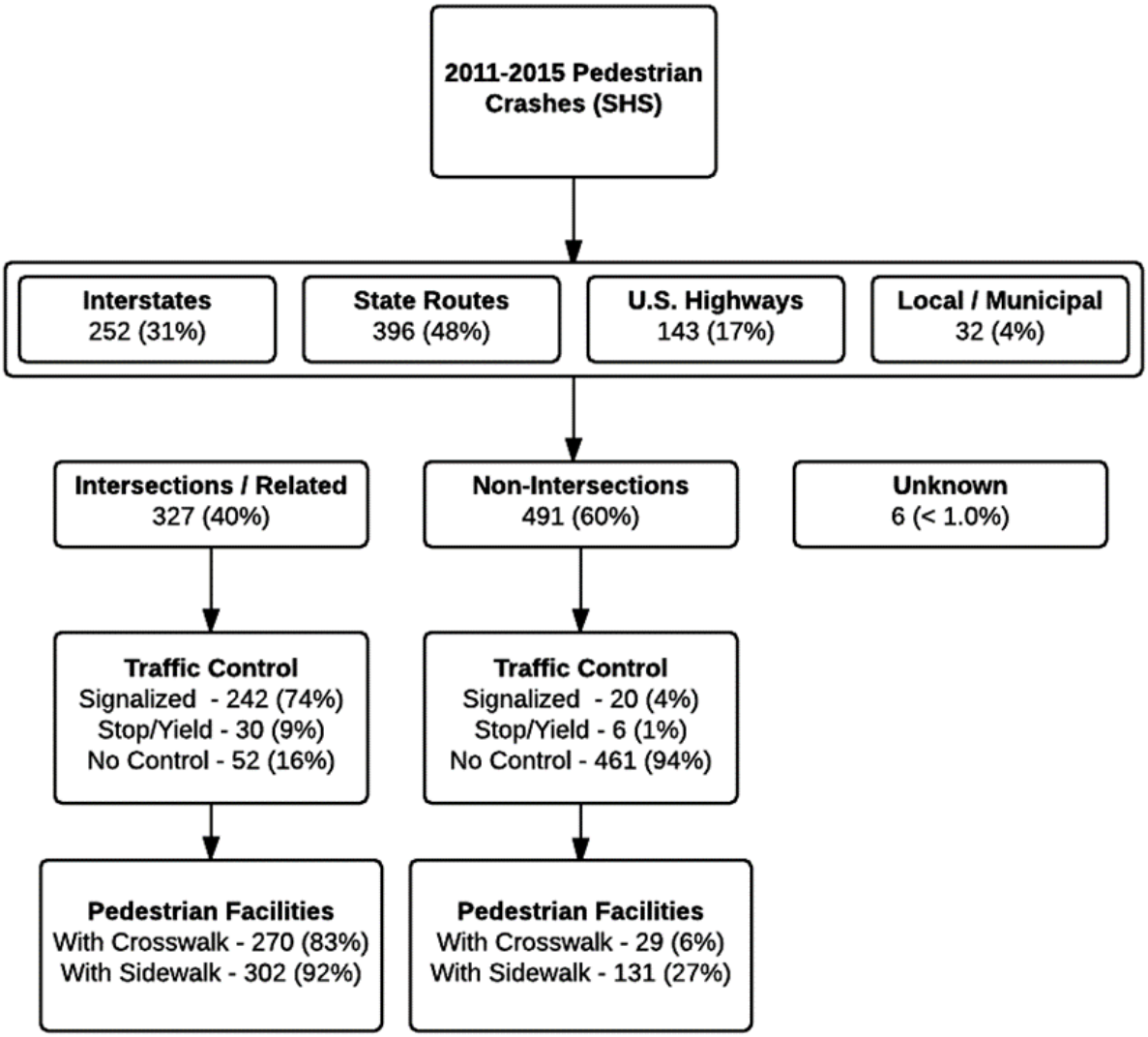


Figure 6: Highway Characteristics Summary for Pedestrian Crashes on the SHS

Figure 7 shows additional facility details including one-way/two-way and divided/undivided at the location of the pedestrian crash. A general summary shows that a two-way divided-highway with a median barrier had the most pedestrian crashes, approximately 34%. Note that this statistic is not normalized for the number of miles of this facility type in Arizona.

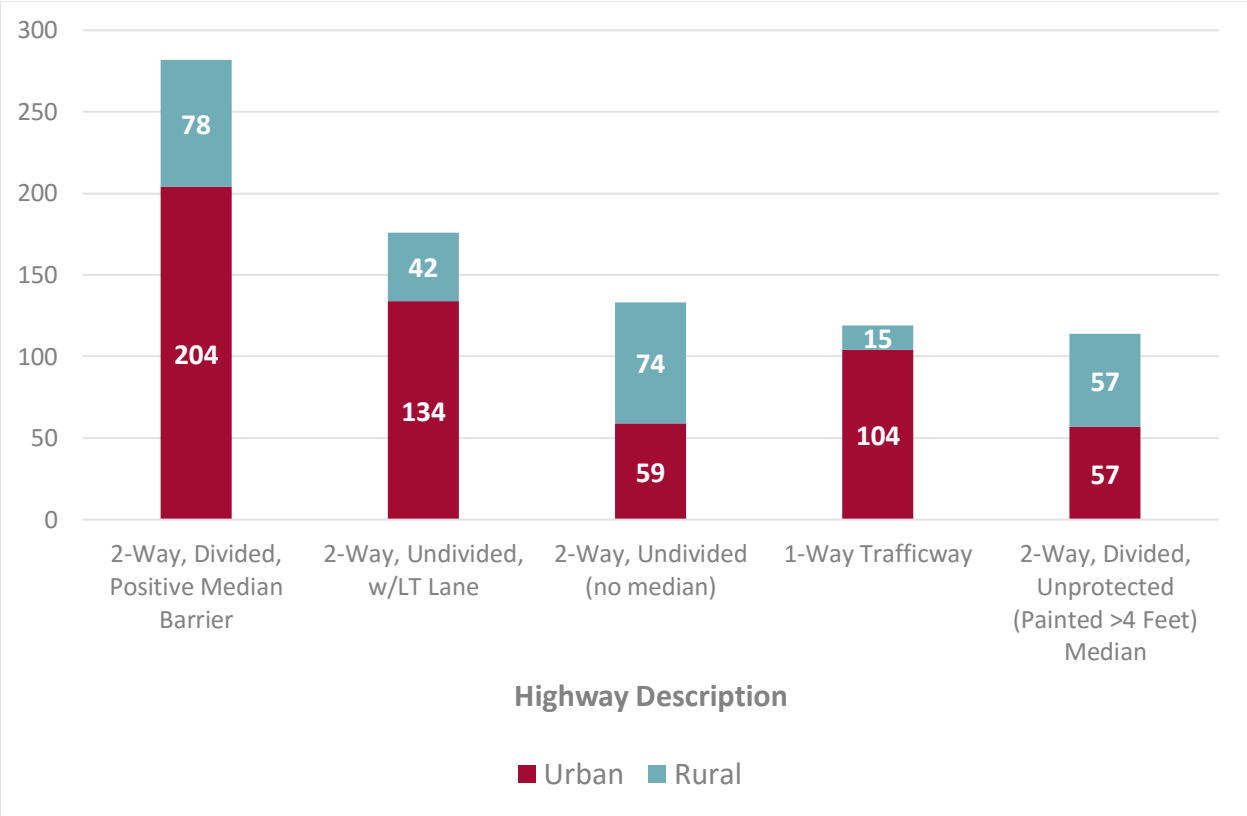


Figure 7: Pedestrian Crashes by Highway Description

2011-2015 High-Pedestrian Crash Locations

The SHS locations with high numbers of pedestrian crashes were identified from the 2011-2015 pedestrian crash data (**Figure 8**). Locations were categorized as a segment or intersection/interchange. Note that while interstates have a high percentage (31%) of pedestrian crashes, clustering of crashes was not observed on interstates. It should be noted that interstates comprise approximately 19% of the state highway system mileage. For each high-crash location, characteristics from the crash typing were noted and are summarized in **Table 10** and **Table 11**. The pedestrian crash types are based on definitions in PBCAT and PEDSAFE. The most frequent pedestrian crash types identified for the high-crash segments are a pedestrian crossing the roadway (without a vehicle turning movement involved) and the pedestrian walking along the roadway. For intersections/traffic interchanges, the most frequent crash type was the pedestrian crossing the roadway with the vehicle involved in making a turning maneuver.

The 2011-2015 crash data was reviewed to provide an updated list of high-crash locations. The high-crash locations were identified based on a GIS density analysis of the state highway crash locations, with subsequent visual review to identify appropriate and logical endpoints to the segment description. A total of 17 segments (134 crashes total) and 13 intersections (47 crashes total) were identified as high pedestrian crash locations. **Table 12** and **Table 13** summarize the high-crash locations for the segments and intersection/interchanges with general pedestrian crash statistics relevant to the locations.

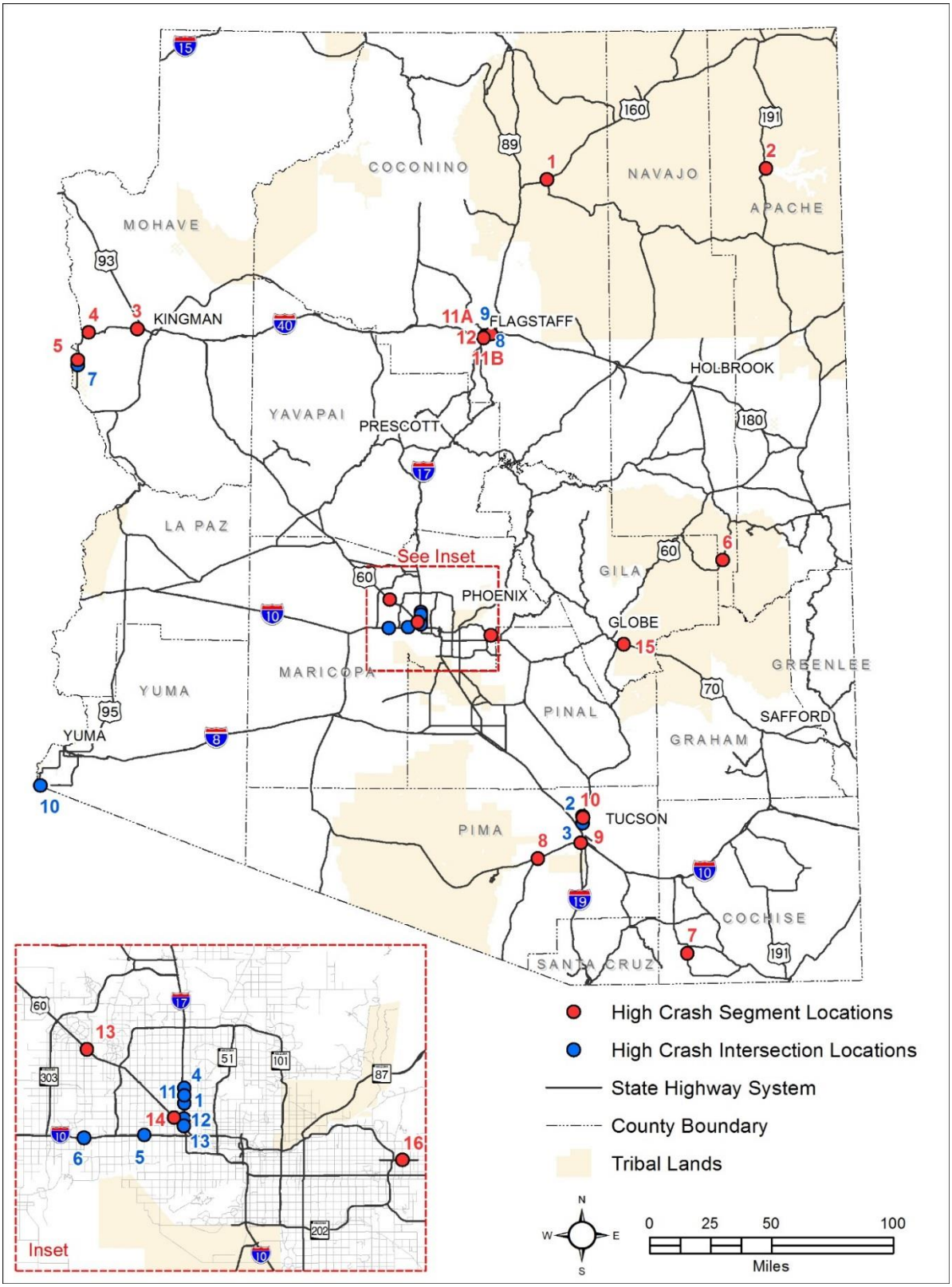


Figure 8: High-Pedestrian-Crash Locations

Table 10: 2011-2015 High-Pedestrian-Crash Locations Crash Type Summary (Segments Only)

Crash Type (Group ID)	Description	Total	%
Crossing Driveway or Alley (460)	The pedestrian was standing or walking near the roadway edge, on a sidewalk, in a driveway or alley, or in a parking lot when struck by a vehicle.	5	4%
Crossing Roadway/Vehicle Not Turning (750)	The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.	30	22%
Dash/Dart-Out (740)	The pedestrian walked or ran into the roadway at an intersection or midblock location and was struck by a vehicle. The motorist's view of the pedestrian may have been blocked until an instant before the impact.	21	16%
Crossing Roadway/Vehicle Turning (790)	The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.	25	19%
Other/Unknown/Insufficient Details (990)	The circumstances do not clearly fit any of the situations described or are unknown.	6	4%
Pedestrian in Roadway/Circumstances Unknown (600)	The pedestrian was standing, walking, or lying in the road right-of-way at an intersection or midblock location but the circumstances are unknown.	20	15%
Unusual Circumstances (100)	The crash involved a pedestrian and a disabled vehicle (including assisting emergency/tow truck personnel), an emergency vehicle, or driverless vehicle, or the pedestrian was struck intentionally, was clinging to a vehicle, or was struck as the result of other unusual circumstances.	5	4%
Walking Along Roadway (400)	The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.	21	16%
Backing Vehicle (200)	A pedestrian was struck by a vehicle backing up on a street, in a driveway, on a sidewalk, in a parking lot, or at another location.	1	<1%

Table 11: 2011-2015 High-Pedestrian-Crash Locations Crash Type Summary (Intersections Only)

Crash Type (Group ID)	Description	Total	%
Crossing Roadway/Vehicle Not Turning (750)	The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.	10	21%
Crossing Roadway/Vehicle Turning (790)	The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.	30	64%
Other/Unknown/Insufficient Details (990)	The circumstances do not clearly fit any of the situations described or are unknown.	2	4%
Pedestrian in Roadway/Circumstances Unknown (600)	The pedestrian was standing, walking, or lying in the road right-of-way at an intersection or midblock location but the circumstances are unknown.	2	4%
Unusual Circumstances (100)	An uncommon occurrence such as a driverless vehicle from a driveway colliding with a pedestrian or a crash that involves an emergency vehicle.	3	6%

Table 12: High-Crash Segments and Intersections/Interchanges

Segment ID	Area	Highway (BMP-EMP)	Identified in 2009 PSAP	Total Crashes	K+A Crashes	Pedestrian Crash Characteristics
1	Tuba City	US 160 (MP 323 - MP 324.5)	Yes	4	4	Dark/not lighted conditions; 3 of the 4 crashes involved the pedestrian under alcohol influence; crash types included *Dash/Dart-Out* and *Walking Along Roadway*
2	Chinle	US 191 (MP 448 - MP 449)	Yes	3	3	Dark/not lighted conditions; crash types included *Pedestrian in Roadway* for 2 of the 3 crashes
3	Golden Valley	SR 68 (MP 18.0 - MP 24.3)	No	7	6	Dark/not lighted conditions; crash types included *Crossing Roadway – Vehicle Not Turning*; pedestrian drug and alcohol involvement for 3 crashes
4	Bullhead City	SR 68 (MP 2.0 - MP 3.5)	No	3	2	Dawn and dark/not Lighted conditions; crash types included *Walking Along Roadway* and *Unusual Circumstance*; pedestrian alcohol involvement for 3 crashes
5	Fort Mohave	SR 95 (MP 237.4 - MP 239.2)	No	5	3	Daylight conditions for 3 crashes and dark/not lighted for 2 crashes; crash types included *Dash/Dart-Out, Crossing Roadway,* and *Unusual Circumstances*
6	Whiteriver	SR 73 (MP 339 - MP 341)	Yes	5	4	Dark/not lighted conditions; crash types included *Pedestrian in Roadway* and *Crossing Roadway;* pedestrian alcohol involvement for all crashes
7	Sierra Vista	SR 92 (MP 326.7 – SR 90)	No	12	3	Daylight conditions for 5 crashes, dark/not lighted for 5 crashes and dark/lighted conditions for 2 crashes; crash types included *Crossing Roadway*, *Walking Along Roadway*, *Backing Vehicle,* and *Pedestrian in Roadway*
8	Three Points	SR 86 (MP 151.0 - MP 153.0)	No	3	2	Dark/not lighted conditions; crash types included *Walking Along Roadway*; pedestrian alcohol involvement for all crashes
9	Tucson	SR 86 (MP 170.3 - MP 171.62)	Yes	12	5	Dark/lighted and dark/not lighted conditions for 8 crashes, daylight conditions for 4 crashes, and dusk for 2 crashes;

Segment ID	Area	Highway (BMP-EMP)	Identified in 2009 PSAP	Total Crashes	K+A Crashes	Pedestrian Crash Characteristics
						crash types included *Crossing Roadway*, *Walking Along Roadway*, *Dash/Dart-Out*, and *Pedestrian in Roadway;* pedestrian alcohol and drug involvement for 4 crashes
10	Pima County	SR 77 (Roller Coaster Road - Suffolk Drive)	Yes	17	7	Daylight conditions for 12 crashes, dark/lighted and dark/not lighted conditions for 4 crashes; crash types included *Crossing Roadway or Driveway/Alley*, *Walking Along Roadway,* and *Dash/Dart-Out*
11A	Flagstaff	SR 89A (Forest Meadows - SR40B)	Yes	12	3	Half of crashes occurred in dark/lighted and the other half occurred during daylight conditions; the crash type majority included *Crossing Roadway or Driveway/Alley* and *Dash/Dart-Out*
11B	Flagstaff	SR 40B (Intersection of SR 40B/Route 66/SR 89A - Elden Street)	Yes	14	3	Half of crashes occurred in dark/lighted and the other half occurred during daylight conditions; the crash type majority included *Crossing Roadway*
12	Flagstaff	SR 40B (Arrowhead Avenue – Park Drive)	Yes	6	1	Dark / Lighted and Dark / Not Lighted conditions for 5 crashes; The crash type majority included *Crossing Roadway* and *Pedestrian in Roadway*
13	Surprise	US 60 (MP 143 - MP 145)	No	4	4	Dark/lighted and dark/not lighted conditions; crash types include *Crossing Roadway*, *Pedestrian in Roadway*, and *Dash/Dart-Out*; pedestrian alcohol involvement for 2 crashes
14	Phoenix	US 60 (MP 158.5 - MP 159.5)	No	9	6	More than half of the crashes occurred under dark conditions; the crash type majority included *Crossing Roadway*, *Dash/Dart-Out* and *Pedestrian in Roadway*; pedestrian alcohol and drug involvement for 3 crashes
15	San Carlos	US 70 (MP 257.0 - MP 259.0)	No	3	3	Dark/not lighted conditions; crash types included *Pedestrian in Roadway* and *Walking Along Roadway*; pedestrian alcohol involvement for all crashes
16	Mesa	US 60X, Apache Trail (Meridian Road - 83rd Place)	Yes	15	9	A majority of the crashes occurred in dark/not lighted conditions; the crash type majority included *Walking Along Roadway*, *Dash/Dart-Out*, and *Pedestrian in Roadway*; pedestrian alcohol involvement for 6 crashes

Table 13: 2011-2015 High-Pedestrian-Crash Locations (Intersections/Interchanges)

Intersection / Interchange ID	Area	Type	Location	Identified in 2009 PSAP	Total Crashes	K+A Crashes	Pedestrian Crash Characteristics
1	Phoenix	Traffic Interchange	I-17/Bethany Home Road	Yes	5	0	Dark/lighted and daylight conditions; the crash type majority included *Crossing Roadway – Vehicle Turning*
2	Tucson	Intersection	SR 77/River Road	No	4	1	Dark/lLighted and daylight conditions; the crash type included *Crossing Roadway – Vehicle Not Turning/Vehicle Turning*
3	Tucson	Intersection	SR 77/Ina Road	No	3	1	Daylight conditions; the crash type included *Crossing Roadway – Vehicle Not Turning/Vehicle Turning*
4	Phoenix	Traffic Interchange	I-17/Northern Avenue	No	3	1	Daylight and dark/lighted conditions; the crash types included *Crossing Roadway – Vehicle Turning* and *Unusual Circumstances*; pedestrian alcohol and drug involvement for 2 crashes
5	Phoenix	Traffic Interchange	I-10/67th Avenue	No	3	1	Daylight and dark/lighted conditions; the crash type included *Crossing Roadway – Vehicle Turning/Vehicle Not Turning*
6	Phoenix	Traffic Interchange	I-10/Dysart Road	No	4	2	Daylight and dusk conditions; the crash type included *Crossing Roadway – Vehicle Turning*
7	Fort Mohave	Intersection	SR 95/Joy Lane	No	3	1	Dark/lighted and daylight conditions; the crash type included *Crossing Roadway – Vehicle Turning*
8	Flagstaff	Intersection	I-40B/Milton Road	No	3	1	Daylight and dark/lighted conditions; crash types included *Crossing Roadway – Vehicle Turning/Vehicle Not turning* and *Dash/Dart-Out*
9	Flagstaff	Intersection	US 180/Birch Avenue	No	3	1	Daylight and dark/lighted conditions; the crash type included *Crossing Roadway – Vehicle Turning*
10	San Luis	Intersection	US 95/B Street	No	5	2	Daylight and dark/lighted conditions; the crash type included *Crossing Roadway – Vehicle Not Turning/Vehicle Turning*
11	Phoenix	Traffic Interchange	I-17/Glendale Avenue	No	3	1	All crashes occurred during daylight conditions; the common crash type included *Crossing Roadway – Vehicle Turning*
12	Phoenix	Traffic Interchange	I-17/Indian School Road	Yes	3	1	Dark/lighted or daylight conditions; the most common crash type included *Crossing Roadway – Vehicle Not Turning*
13	Phoenix	Traffic Interchange	I-17/Thomas Road	No	5	1	Daylight conditions; the common crash type included *Crossing Roadway – Vehicle Turning*

Pedestrian Safety Locations Tribal Communities

ADOT recognizes a deficiency in the reporting of crash data on Tribal lands. In January 2017, ADOT, in support of the PSAP, requested input from tribal communities regarding pedestrian safety issues. A response was received from the Hopi Tribe, which is summarized in **Table 14**. It is recommended that these locations be considered for pedestrian safety improvements.

Table 14: Pedestrian Safety Issues Identified by Tribal Communities

Tribal Name and State Route Number	Segment Beginning Milepost	Segment Ending Milepost	Brief description of existing pedestrian facilities	Brief description of pedestrian attraction
Hopi Tribe, State Route 264	322.0	323.4	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Commercial business, motel, convenience store, Moenkopi community, elementary school and village
	366.9	368.6	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Hotevilla convenience store, Hotevilla and Bacavi community, elementary school and village
	370.6	371.8	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Community businesses, residence & village of Oraibi
	372.7	375.9	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Community businesses, commercial, schools, residential, village of Kykotsmovi, health and wellness center
	378.6	381.4	No pedestrian facility. Existing is a dirt path on both shoulders adjacent to paved route	Commercial business, motel, Shungopovi community & village
	384.0	385.0	No pedestrian facility. Existing is a dirt path on shoulder adjacent to paved route	Commercial business, elementary school, post office, lower Mishongnovi and Sipaulovi communities
	388.0	393.4	No pedestrian facility. Existing is a dirt path on both shoulders adjacent to paved route	Commercial business, elementary school, hospital, airport, lower First Mesa communities
	396.0	397.0	No pedestrian facility. Existing is a dirt path on west-bound shoulder adjacent to paved route	High school, police department, courts & Low Mountain road community
Hopi Tribe, State Route 87	405.0	406.0	No pedestrian facility. Existing is a dirt path on west-bound shoulder adjacent to paved route	Residential community center, some business.

4. PEDESTRIAN CRASH RISK ASSESSMENT

A key element of improving pedestrian safety in Arizona is to proactively identify locations where pedestrian improvements are needed, leading to projects to address the need. This chapter introduces a risk assessment methodology to identify state highway segments and intersections where investment can help to lower the risk of pedestrian crashes. The assessment methodology represents an approach through which high-probability locations can be identified and addressed before pedestrian crashes occur. This is sometimes referred to as a proactive approach, or a systemic analysis approach. The risk assessment identified SHS locations that exhibit characteristics associated with pedestrian crashes, including roadway geometry, number of lanes, traffic speed, traffic volume, population density, and land-use features that generate or attract pedestrian activity.

The risk assessment procedure was performed in two steps:

- **Step 1 – Initial Screening (Geographic Information System [GIS]-Based Screening):** Identify and screen potential SHS locations utilizing available statewide GIS data consistent with the established set of risk criteria outlined in **Appendix A**.
- **Step 2 – Final Screening (Visual Review Screening):** Utilize Google Earth and other visual resources (ADOT Highway Photolog) to review and evaluate the preliminary high-risk locations identified in Step 1.

The risk assessment resulted in over 70 SHS locations categorized into three tiers. Tier 1 (17 locations, shown **Table 15** and **Figure 9***)* was advanced to countermeasure identification.

Table 15: High-Risk Segments – Tier 1

High-Risk Segments	
Segment 1	SR 95, MP 244 - MP 246
Segment 2	SR 95, MP 241.5 - MP 244
Segment 3	SR 95, MP 235.5 - MP 239.5
Segment 4	SR 95, MP 229.4 - MP 230.5
Segment 5	SR 347, MP 171.4 - MP 175.4
Segment 6	US 60, MP 156.5 - MP 160.0
Segment 7	US 60, MP 152.0 - MP 155.6
Segment 8	US 60, MP 149.0 - MP 152.0
Segment 9	US 60, MP 146.3 – MP 148.0
Segment 10	US 60, MP 143.0 - MP 146.3
Segment 11	SR 69, MP 286.5 - MP 289.7
Segment 12	US 191, MP 365.5 - MP 366.1
Segment 13	SR 90, MP 320.0 - MP 323.8
Segment 14	SR 86, MP 169.7 - MP 171.3
Segment 15	SR 77, MP 69.5 - MP 72.0
Segment 16	SR 77, MP 72.0 - MP 74.9
Segment 17	SR 77, MP 74.9 - MP 79.1
Segment 18	US 60X, MP 189.0 - MP 194.0

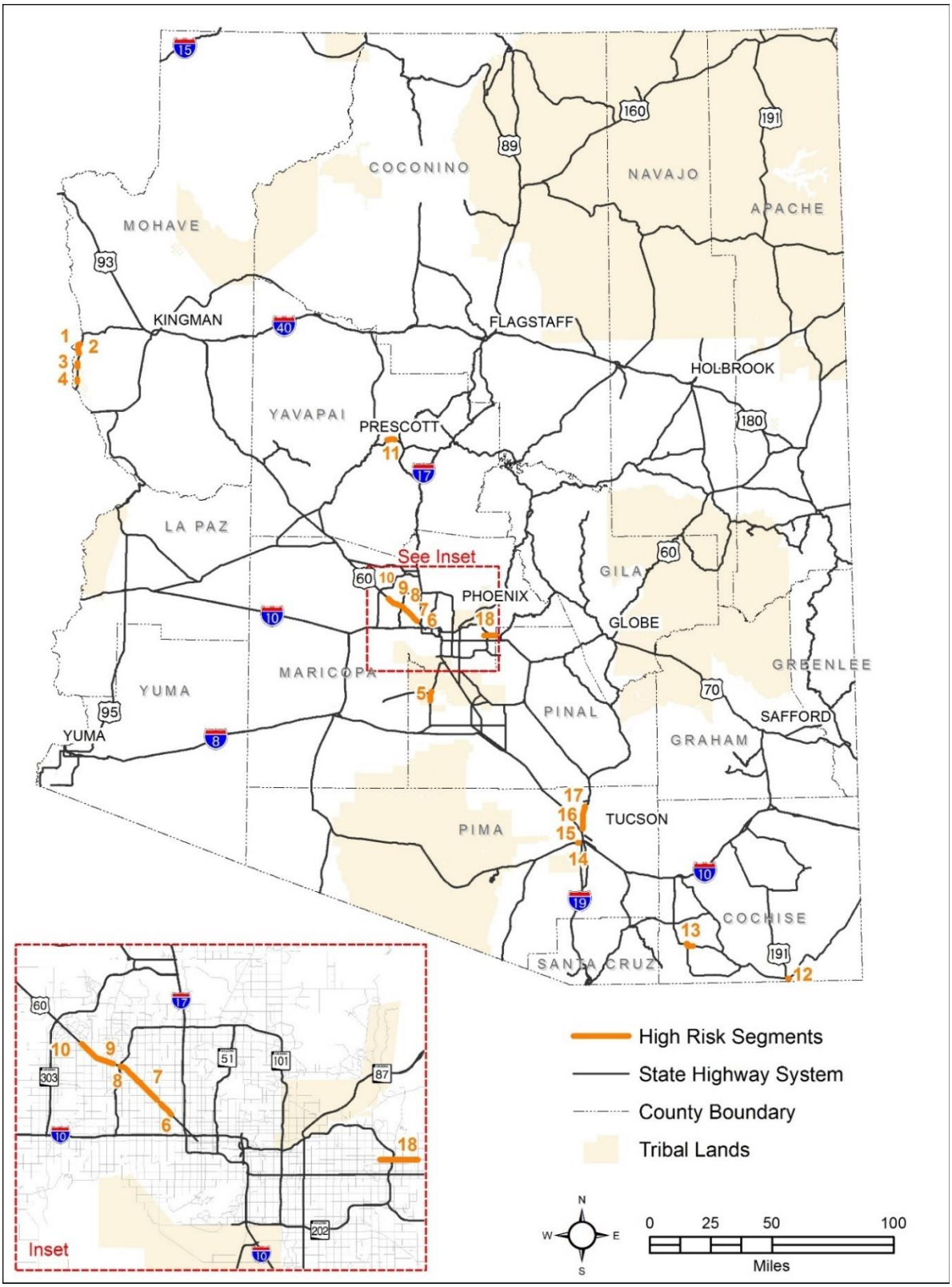


Figure 9: High-Risk Locations

5. COUNTERMEASURE IDENTIFICATION

This chapter discusses the menu of potential countermeasures that was identified for each crash hot-spot and high-crash/high-risk segment that was identified in the crash analysis. For each potential countermeasure, a planning-level unit cost was developed.

Countermeasure Selection

The countermeasure selection process included the following steps:

1. Review the location's context for pedestrian safety issues, deficiencies, and patterns.
2. Document site characteristics using ADOT GIS data, ADOT Photolog, and geometric conditions: roadway cross-section, posted speed limit, existing pedestrian facilities.
3. Identify potential countermeasures utilizing the following resources:
    - Study team experience and engineering judgment
    - PEDSAFE[1]: This online tool provides a list of possible engineering, education, or enforcement treatments and an analysis feature to find the most appropriate countermeasure for specific crash types
    - FHWA, Office of Safety, Proven Safety Countermeasures (http://safety.fhwa.dot.gov/provencountermeasures/)
    - Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices (http://www.ghsa.org/resources/countermeasures2015)
    - A Guide for Reducing Collisions Involving Pedestrians (NCHRP Report 500)
    - Human Factors Guidelines for Road Systems (NCHRP Report 600)
    - Unsignalized Intersection Improvement Guide (http://ite.org/uiig/)

All countermeasures are subject to a comprehensive engineering review. While a menu of countermeasures is identified, further detailed site-specific analysis, field review, and engineering analysis are required at each crash hot-spot or high crash or high risk segment to determine which of the listed countermeasures should be implemented.

Summary of Selected Preliminary Countermeasures

Countermeasures may consist of a combination of engineering, education, and enforcement solutions:

- **Engineering solutions** involve changes to the roadway environment or operations that affect the movement of pedestrians, vehicles, and other road users.
- **Education measures** raise awareness of a law, practice, or behavior and motivate a change in behavior that will have a positive effect on safety.
- **Enforcement** is used to change behavior by promoting compliance with laws, ordinances, and regulations related to pedestrian safety.

A menu of potential location-specific countermeasures for the high-crash and high-risk locations is summarized in **Table 16.** A description of the countermeasure, planning-level costs, and the Crash Modification Factor (CMF) utilized in the prioritization process are also presented. Note that a detailed engineering study is required to determine the actual project cost at each site, as site conditions vary.

A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. For example, if a countermeasure with a CMF of 0.80 for angle crashes is applied to an intersection experiencing 10 angle crashes and 50 rear-end crashes per year,

[1] http://www.pedbikesafe.org/PEDSAFE/index.cfm

then one can expect to see 8 angle crashes per year following the implementation of the countermeasure (10 x 0.80 = 8). If the same countermeasure also has a CMF of 1.10 for rear-end crashes (meaning that rear-end crashes would likely increase with the countermeasure), then one would also expect to also see 55 rear-end crashes per year following the countermeasure (50 x 1.10 = 55).[2]

The CMFs are derived from:

- FHWA's *Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes (2013)*
- FHWA's *CMF Clearinghouse*
- *NCHRP 17-56*

The above resources provide additional information about each countermeasure such as countermeasure quality, where available. When conducting additional detailed analysis following publication of this 2017 PSAP, it is advised to review the above resources for updated CMF information (value, quality, etc.). The CMFs presented in **Table 16** apply to ***pedestrian crashes only***; however, some CMFs, such as median treatments, may have a reduction factor for "all crashes." These are also shown in **Table 16** in parentheses.

Appendix B provides Location and Countermeasure Sheets that summarize the characteristics of each high-crash and high-risk location (roadway, traffic, and pedestrian crash characteristics) and provide a menu of potential countermeasures for each site. The identified countermeasures at each location generally include one of the following:

1. A specific treatment or package of treatments
2. Treatment alternatives (e.g., low-cost option and higher-cost option)
3. No improvements (e.g., crashes are due to distraction or alcohol involvement, and not a site deficiency)

Table 16: Menu of Potential Location-Specific Countermeasures

Conduct Road Safety Assessments (RSA)	**Description:** An RSA is a formal safety performance examination that qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety. The audits involve a multidisciplinary team and include a field review and a review of the police crash reports for existing locations.	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	$20,000 per study
Reduce Curb Radii	**Description:** The curb radii influence a turning vehicle's speed when executing a right-turn, for example. Larger curb radii, which were typically observed on the ADOT SHS, allow for higher-speed turning movements, thus increasing the risk of being struck by right-turning vehicles. Reducing the radii can reduce vehicle speed by making the turn sharper, decreasing the pedestrian crossing distance, and improving the visibility of the pedestrian or sight-distance.	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	$24,720 each

[2] http://www.cmfclearinghouse.org/about.cfm

Widen Shoulders	**Description:** This countermeasure typically applies to highways in rural and suburban areas without sidewalks where there have been cases of crashes that involved pedestrians "walking along the roadway." The countermeasure also applies to vehicle crashes. A shoulder width of approximately 4' to 5' is recommended to provide a separation between the pedestrians the general-purpose vehicle lane. A 4' to 5' shoulder would also better accommodate bicyclists. Note that the CMF only applies to pedestrian crashes that involved a pedestrian walking along the roadway.	
	CMF	0.29 (0.64 for vehicular crashes)
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	$540,000 per mile
Provide Roadway Lighting	**Description:** Roadway lighting is recommended at locations where a significant number of pedestrian crashes occurred during the night or would likely be present. Lighting would not necessarily be recommended for isolated segments far from developed areas; rather, it would be recommended at segments that are in or near developed areas or for segments that already have partial lighting, and where a power source is reasonably available. Roadway lighting also applies to run-off-road nighttime vehicle-only crashes.	
	CMF	0.77 (0.72 for vehicular crashes)
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	$8,000 each
Provide Intersection Lighting	**Description:** This countermeasure recommends appropriate lighting and illumination at specific intersections, particularly at a location that has or has the potential for pedestrian crashes occurring during dark/nighttime conditions. Intersection lighting placement is based on ADOT Traffic Engineering Guidelines and Processes, Section 700 (Figure 700-3).	
	CMF	0.73 (pertains to nighttime crashes only)
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	$8,000 each
Install Crossing Treatments	**Description:** This countermeasure provides various techniques to enhance pedestrian crossings. This includes in-roadway gateway signing, two-stage crosswalks, rectangular rapid flashing beacon (RRFB), pedestrian hybrid beacon, or a traffic signal.	
	In-Roadway Gateway Signing	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	$5,000
	Two-Stage Pedestrian Crossing	
	CMF	0.54
	Source	FHWA CMF Clearinghouse
	Conceptual Unit Cost	$16,500
	Rectangular Rapid Flash Beacon[3]	
	CMF	0.53
	Source	FHWA CMF Clearinghouse
	Conceptual Unit Cost	$22,300

[3] The FHWA has suspended Interim Approval 11 for RRFBs pending the outcome of a patent lawsuit on behalf of the device originator. Agencies who have received prior approval from the FHWA to install RRFBs may continue to install additional RRFBs. Those agencies who have not received permission will not receive permission until this matter is resolved. While the State of Arizona is not on record for requesting permission to install RRFBs, there are some agencies within Arizona that have received prior permission to do so. The list of agencies can be found at https://mutcd.fhwa.dot.gov/resources/interim_approval/ialistreq.htm#ia11.

Install Crossing Treatments (Continued)	**Pedestrian Hybrid Beacon (PHB)**	
	CMF	0.45
	Source	NCHRP 17-56
	Conceptual Unit Cost	$173,959
Install Barrier/Fencing	**Description:** This countermeasure is for special cases where it is not practical to encourage crossing or for an undesirable crossing location to direct pedestrians to a desirable crossing location. In terms of pedestrian mobility, it is typically not recommended to implement obstructions that would create longer walking distances and discourage walking. However, this treatment may be applied to restrict pedestrians from crossing through private/hazardous areas (e.g., along railroad tracks or freeways).	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	$568,131 per mile
Traffic Signal Improvements	**Description:** This is a general recommendation and would include evaluation of existing signal phasing or timing operations to determine if there is a safety issue for pedestrians. Note that most of these treatments do not have a cost associated with them as they may only require a few hours of staff time, or costs are highly variable dependent upon existing infrastructure.	
	Implement Leading Pedestrian Interval	
	CMF	0.63
	Source	FHWA CMF Clearinghouse
	Conceptual Unit Cost	$3,000
	Separate Protected Left-turn Phase from Pedestrian Crossing	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	Cost is dependent upon current equipment
	Exclusive Pedestrian Phasing	
	CMF	0.65
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	Cost is dependent upon current equipment
	Change Left-turn Phase to Protected Phasing on One or More Approaches	
	CMF	0.57
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	Cost is dependent upon current equipment
	Prohibit Right-Turn-on-Red	
	CMF	0.97
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	Cost is dependent upon current equipment
Road Diet (Roadway Reconfiguration)	**Description:** Reduce the number of moving lanes that a pedestrian must cross and convert a moving lane to another purpose (bike lanes, walkway, or turn lane). This is one of the nine FHWA Proven Safety Countermeasures. This can only be done where the roadway reconfiguration reduction will not unduly deteriorate traffic conditions.	
	CMF	0.71
	Source	FHWA Toolbox of Countermeasures
	Conceptual Unit Cost	Cost is dependent upon current equipment

Table 16: Menu of Potential Location-Specific Countermeasures (Continued)

Install Sidewalks	**Description:** Sidewalks are recommended in developed areas that lack a continuous sidewalk system or are not continuous, which may result in the pedestrian crossing mid-block rather than using a signalized crossing or walking in the roadway. Sidewalks must comply with the Federal Americans with Disabilities Act (ADA) guidelines. The conceptual unit cost assumes 6'-wide sidewalks.	
	CMF	0.12
	Source	FHWA Toolbox of Countermeasures; note that the CMF only applies to pedestrian crashes that involved the pedestrian walking along the roadway
	Conceptual Unit Cost	$487,188 per mile (per side)
Construct Paved Shared-Use Path (Off-Road)	**Description:** This countermeasure provides a paved path for pedestrians along one or both sides of a roadway and can be constructed in a suburban or rural area to provide a continuous path for non-motorized modes to prevent them from sharing the street with motor vehicles.	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	$600,000 per mile
Construct Raised Median	**Description:** This countermeasure is typically recommended for locations that are five-lane facilities or more with a center two-way left-turn lane (TWLTL). Raised medians facilitate pedestrian crossings, improve pedestrian visibility to motorists and help to slow motor vehicle speeds. The conceptual unit cost assumes a 12'-wide raised median replacing a TWLTL.	
	CMF	0.75 (0.61 for vehicular crashes) 0.54 (raised median at marked crosswalk) 0.61 (raised median at unmarked crosswalk)
	Source	FHWA CMF Clearinghouse
	Conceptual Unit Cost	$1,431,051 per mile
Provide Refuge Island	**Description:** A refuge island (raised island or continuous median) would facilitate pedestrian crossings on higher-speed, multi-lane segments (e.g. five-lane, six-lane facilities).	
	CMF	0.54 (with a marked crosswalk) 0.61 (with no crosswalk)
	Source	FHWA CMF Clearinghouse
	Conceptual Unit Cost	$17,600 (cost variable depending upon size and conditions)
Access Management Improvements	**Description:** This countermeasure considers minimizing driveway crossings by consolidating driveways, eliminating unnecessary driveways, or reducing driveway crossing width.	
	CMF	N/A
	Conceptual Unit Cost	$10,600 per driveway

Pedestrian Education Campaign	**Description**: Provide education to drivers and pedestrians to change behaviors and improve safety for pedestrians. The types of education treatments could include a public awareness campaign, public involvement workshops, education of traffic officers, or media-based education.	
	CMF	N/A
	Source	N/A
	Conceptual Unit Cost	Varies
Increase Enforcement	**Description:** This countermeasure applies to crash reduction on corridors where sustained enforcement is used related to motorist speeding or yielding at marked crosswalks combined with a public education campaign.	
	CMF	N/A
	Conceptual Unit Cost	Varies

6. COUNTERMEASURE PRIORITIZATION

This chapter documents application of a countermeasure prioritization process to the high-pedestrian-crash and high-risk locations.

Benefit-Cost Evaluation

The benefit-cost ratio analysis (BCR) analysis compares benefits of potential countermeasures to the project costs. As outlined in the HSM, Chapter 7, the BCR enables potential countermeasures and locations to be prioritized in order of their:

- Project costs
- Monetary value of benefits
- Number of total crashes reduced
- Number of fatal and incapacitating injury crashes reduced
- BCR

Ranking sites and countermeasures can assist ADOT to select sites that will provide the most impact and benefit to reducing pedestrian crashes statewide.

Project Cost

The conceptual costs for each countermeasure and location were used as an input to calculate the BCR.

The total cost for the combined set of countermeasures on the SHS, statewide, are summarized in **Table 17.** As shown, the raised median, roadway lighting, and PHB were recommended on over 15 sites.

Table 17: SHS Countermeasures Cost Summary

Countermeasure	Number of Sites	Total Cost Estimate
Construct a Raised Median	15	$23,698,204
Install Sidewalks	8	$23,635,115
Provide Roadway Lighting	16	$10,182,656
Install PHB	15	$2,609,385
Widen Shoulders	2	$2,214,000
Install Barrier/Fencing	4	$1,772,568
Construct Paved Shared-Use Path	2	$1,710,000
Reduce Curb Radii	11	$890,960
Road Diet (Roadway Reconfiguration)	3	$535,124
Enhance Signal Operations – Modify Signal Phasing to Leading Pedestrian Interval (LPI)	27	$81,000
Provide Intersection Lighting	1	$48,000
Separate Left-turns from Pedestrian Crossing Movements	2	$9,000
Enhance Signal Operations – Increase Pedestrian Crossing (Clearance) Time	1	$6,000

To estimate the annual cost of each project/location, a service life was assigned to each countermeasure using guidance from the *Arizona Highway Safety Improvement Program (HSIP) Manual, May 2015 (Revised February 2017)*. As stated in the *HSIP Manual, May 2015 (Revised February 2017)* the following procedures were used to determine the annual cost:

1. Determine the total construction cost
2. Determine the service life of the countermeasure
3. Obtain or assume an interest rate, which is appropriate for current economic conditions, in percent (3.5 percent was assumed)
4. Compute the annual construction cost by multiplying the total construction cost by the appropriate capital recover factor, based on the interest rate and service life of the countermeasure
5. Determine the annual estimated operating and maintenance cost for the countermeasure
6. Compute the total annual cost of the project

Expected Project Benefits

Countermeasure benefits are expressed in terms of projected future change (decrease in pedestrian crashes) in average crash frequency as a result of implementing the countermeasure. This is done by applying the HSM Part C Predictive Method to estimate the expected crash frequency of both the existing condition and the proposed condition (after countermeasure implementation).

Conversion of the estimated change in crash frequency to a monetary value is accomplished using societal crash costs by injury severity. The societal cost per crash in Arizona is based on the average economic cost per incident as published in the *HSIP Manual, May 2015 (Revised February 2017)*, and carried forward into the 2018 Application for HSIP Projects spreadsheet tool:

- Fatality $ 5,800,000
- Incapacitating Injury $ 400,000
- Non-Incapacitating Injury $ 80,000
- Possible Injury $ 42,000
- No Injury $ 4,000

A benefit results when a crash, and the associated societal cost, are avoided. However, many factors influence whether a pedestrian crash results in a fatality or a less-severe injury. These factors include health or age of the pedestrian, availability of medical attention, and speed of the vehicle involved. At a given location, these conditions may have resulted in a fatality while an incident at a different, yet similar location, resulted in a severe injury. As such, there is significantly variability in injury severity at locations with similar conditions across the SHS.

To mitigate the effect of variability in injury severity for similar conditions in the benefits calculation, the study team calculated the statewide SHS average severity cost for each pedestrian crash type that occurred on the SHS (824 total pedestrian crashes in the five-year analysis period). The average cost for each pedestrian crash type, summarized in **Table 18,** was then applied to each high-pedestrian-crash location.

The Average SHS Injury Severity Cost calculation is shown in the example below for the *Crossing Expressway* pedestrian crash type:

Average Pedestrian Crash Type Cost Calculation =

$$\frac{[Crashes(K)x\$5{,}800{,}000] + [Crashes(A)x\$400{,}000] + [Crashes(B)x\$80{,}000] + [Crashes(C)x\$42{,}000] + [Crashes(O)x\$4{,}000]}{Crashes(K) + Crashes(A) + Crashes(B) + Crashes(C) + Crashes(O)}$$

Average Pedestrian Crash Type Cost (Crossing Expressway) =

$$\frac{17x\$5{,}800{,}000 + 8x\$400{,}000 + 3x\$80{,}000 + 2x\$42{,}000 + 1x\$4{,}000}{17 + 8 + 3 + 2 + 1} = \mathbf{\$3{,}294{,}452}$$

Table 18: Average SHS Injury Severity Cost by Pedestrian Crash Type

Pedestrian Crash Type	Fatal (K)		Incapacitating Injury (A)		Non-Incapacitating Injury (B)		Possible Injury (C)		No Injury (O)*		Average SHS Pedestrian Crash Cost
	SHS Crashes	Total Cost	SHS Crashes	Total Cost	SHS Crashes	Total Cost	SHS Crashes	Total Cost	SHS Crashes	Total Cost	
Backing Vehicle	0	$0	2	$800,000	3	$240,000	3	$126,000	0	$0	$145,750
Bus-Related	0	$0	2	$800,000	1	$80,000	1	$42,000	0	$0	$230,500
Crossing Driveway or Alley	0	$0	4	$1,600,000	10	$800,000	5	$210,000	3	$12,000	$119,182
Crossing Expressway	17	$98,600,000	8	$3,200,000	3	$240,000	2	$84,000	1	$4,000	$3,294,452
Crossing Roadway – Vehicle Not Turning	39	$226,200,000	62	$24,800,000	29	$2,320,000	22	$924,000	11	$44,000	$1,560,049
Crossing Roadway – Vehicle Turning	3	$17,400,000	36	$14,400,000	81	$6,480,000	58	$2,436,000	23	$92,000	$203,025
Dash/Dart-Out	17	$98,600,000	28	$11,200,000	16	$1,280,000	8	$336,000	4	$16,000	$1,526,466
Multiple Threat/Trapped	0	$0	0	$0	0	$0	1	$42,000	0	$0	$42,000
Other/Unknown – Insufficient Details	22	$127,600,000	5	$2,000,000	10	$800,000	1	$42,000	3	$12,000	$3,181,805
Pedestrian in Roadway – Circumstances Unknown	38	$220,400,000	10	$4,000,000	12	$960,000	5	$210,000	1	$4,000	$3,417,788
Unique Midblock	0	$0	2	$800,000	3	$240,000	1	$42,000	0	$0	$180,333
Unusual Circumstances	19	$110,200,000	44	$17,600,000	38	$3,040,000	13	$546,000	8	$32,000	$1,077,197
Walking Along Roadway	24	$139,200,000	14	$5,600,000	20	$1,600,000	9	$378,000	5	$20,000	$2,038,861
Working or Playing in Roadway	0	$0	6	$2,400,000	4	$320,000	2	$84,000	2	$8,000	$200,857
Other Applicable Crash Descriptions											
Dark/Not Lighted Conditions	103	$597,400,000	56	$22,400,000	45	$3,600,000	12	$504,000	8	$32,000	$2,785,429

**No Injury includes crash severities classified as "Unknown"*

Benefit Cost Ratio Calculation

A BCR was calculated for each high-crash and high-risk segment. To calculate the benefits (reduction in future crashes), the CMFs were only applied to those crashes that would be mitigated by the pedestrian safety improvement. For example, a CMF for a shoulder widening countermeasure only applies to pedestrian crashes that involved the pedestrian *Walking Along the Roadway*, and lighting only applies to pedestrian crashes that occurred at night.

A summary of the countermeasure benefits calculation for each high-crash and high-risk segment is provided in the **Table 19.** The information is organized by potential projects. A given project may consist of improvements on multiple segments or intersections that are within proximity. Within **Table 19,** a BCR is presented for each segment as well as an overall combined project BCR.

Recognizing that many pedestrian safety improvements also provide safety benefits to other modes (e.g., motor vehicle traffic), the potential benefit to other non-pedestrian motor vehicle crashes was also calculated. An example is raised medians, which reduce head-on and angle motor vehicle crashes. Benefits, expressed in terms of crash reduction, are calculated in **Table 19.**

Table 20 presents the benefits and costs for intersection and interchange projects. Most of the potential interchange and intersection countermeasures are very low-cost improvements such as traffic signal timing modifications that would be performed in-house by ADOT technicians and engineers. However, additional field review is required to evaluate the feasibility and effectiveness of each of these intersection and interchange improvement options. As such, to emphasize that further evaluation is required at each of these locations, a final BCR is not calculated. The final BCR can be calculated following confirmation of the appropriate improvements.

To calculate the pedestrian BCR, the following calculations were performed (Project 1 in **Table 19** is used as an example):

Project 1: SR 95 Pedestrian Safety Improvement, MP 237.4 - MP 239.2

Project Description:

Countermeasure	Total Cost	Capital Recovery Factor	Annual Cost
RSA	$20,000	-	-
Roadway Lighting	$1,013,760	0.0868	$87,994
PHB	$173,959	0.1202	$20,909
Sidewalk	$2,681,035	0.0704	$188,745

Estimated Total Project Cost = $3,888,754

Estimated Annual Cost = $297,649

Estimated Annual Benefit = $513,256

Benefit-Cost Ratio = $513,256 / $448,767 = 1.7

Potential projects for consideration on Tribal communities are presented in **Table 21**. These are based on input from the Hopi nation. As no crash data was available, a BCR is not calculated for these projects. The BCR based on the Arizona Highway Safety Improvement Program Manual is provided in **Appendix D**. In addition, a ranking of each project is provided in **Appendix E**.

Table 19: Pedestrian Safety Projects Summary

High-Crash Segment	Location	Project Description	Estimated Total Project Cost	Annualized Cost	Total Pedestrian Crashes (5-Year Period)	Estimated Pedestrian Crashes with Improvements (5-Year Period)	Annualized Benefit	Benefit-Cost Ratio (Pedestrian Crashes)	Benefit-Cost Ratio (Vehicle Crashes)
Project 1: SR 95 Pedestrian Safety Improvement, MP 237. 4 - MP 239.2									
H-C Segment 5	MP 237.4 - MP 239.2	• Construct sidewalks between Valencia Road and Courtney Place • Provide roadway lighting • Provide a PHB between Aztec Road and Camp Mohave Road	*$3,888,754*	$297,649	5	4	$513,256	1.7	0.5
		• Construct raised median (currently programmed in 2018– 2022 ADOT Transportation Facilities Construction Program)	*Already programmed*	-					
Project 2: Flagstaff Area Pedestrian Safety Improvement, SR 89A/SR 40B									
H-C Segment 11A	SR 89A (Milton Road) MP 402.1 - MP 403.2	• Construct a raised median • Provide a PHB between University Drive and Plaza Way	*$1,719,563*	$127,054	12	8	$863,719	6.8	31.8
H-C Segment 11B	SR 40B, MP 195.48 (Intersection of Historic Route 66 / Milton Road) - MP 196.5 (Elden Street)	• Construct a raised median between SR 40B and Phoenix Avenue	*$609,731*	$41,666	14	12	$642,961	15.4	41.2
		Project total	**$2,329,294**	**$168,720**	**26**	**20**	**$1,506,680**	**8.9**	**34.1**
Project 3: SR 73 Pedestrian Safety Improvement, MP 339.0 - MP 341.0									
H-C Segment 6	SR 73, MP 339.0 -MP 341.0	• Perform a road diet (roadway reconfiguration) as existing traffic volumes do not require a four-lane roadway	*$140,822*	$9,914	5	4	$298,117	30.1	0.0
Project 4: SR 86 Pedestrian Improvement Project, MP 170. 3 - MP 171.6									
H-C Segment 9	SR 86, MP 170.3 -MP 171.6	• Construct a raised median as recommended in the SR 86 – Kinney Road to Santa Cruz River Project Assessment (2016)	*$1,339,567*	$93,408	12	10	$513,994	5.5	17.9
Project 5: US 191/SR 80 Roadway Reconfiguration, MP 365.5 - MP 366.1									
H-R Segment 12	US 191, MP 365.5 - MP 366.1	• Perform a road diet (roadway reconfiguration)	*$62,246*	$2,974	4	3	$74,529	25.1	19.2
Project 6: US 191 Highway Lighting and Shoulder Improvement, MP 448.0 - MP 449.0									
H-C Segment 2	US 191, MP 448.0 - MP 449.0	• Widen shoulders along the project limits • Extend the highway lighting	*$903,760*	$68,705	3	1	$1,355,041	19.7	0.0
Project 7: SR 95 Pedestrian Safety Improvements, Fort Mohave and Bullhead City Area									
H-R Segment 1	SR 95, MP 244.0 - MP 246.0	• Construct a raised median and provide a PHB between Hancock Road and Ramar Road • Reduce curb radii at intersections where feasible	*$4,042,881*	$291,874	8	6	$513,994	1.8	11.3
H-R Segment 2	SR 95, MP 241.5 - MP 244.0	• Construct a raised median and provide a PHB between Mohave Drive and Riverview Drive • Reduce curb radii at intersections where feasible	*$3,915,907*	$281,874	4	3	$256,997	0.9	8.9
H-R Segment 4	SR 95, MP 229.4 - MP 230.5	• Construct sidewalks from Cottonwood Lane to Commercial Street • Provide a PHB adjacent to the casino if warranted • Install intersection lighting at major intersections, access points, and future crosswalks	*$1,851,359*	$138,527	0	0	$0	0.0	0.0
		Project total	**$9,810,147**	**$712,275**	**12**	**9**	**$770,991**	**1.1**	**8.1**

High-Crash Segment	Location	Project Description	Estimated Total Project Cost	Annualized Cost	Total Pedestrian Crashes (5-Year Period)	Estimated Pedestrian Crashes with Improvements (5-Year Period)	Annualized Benefit	Benefit-Cost Ratio (Pedestrian Crashes)	Benefit-Cost Ratio (Vehicle Crashes)
Project 8: SR 40B, Pedestrian Safety Improvements, MP 198.45 - MP 195.5									
H-C Segment 12	SR 40B, MP 198.45 - MP 195.5	• Construct a raised median between 1st Street and Park Drive • Construct a PHB southwest of 4th Street	*$1,992,242*	$152,358	12	9	$751,999	4.9	7.6
Project 9: SR 68 Pedestrian Safety Improvements, Golden Valley - Bullhead City Area									
H-C Segment 3	SR 68, MP 18.0 - MP 24.3	• Construct a raised median and provide roadway • Evaluate the need for a PHB with a median refuge between Aztec Road and Bacobi	*$6,879,379*	$506,826	7	3	$1,256,313	2.5	0.9
H-C Segment 4	SR 68, MP 2.0 - MP 3.5	• Construct a raised median and improve crossing improvements as needed • Install roadway lighting	*$759,479*	$58,178	3	2	$320,509	5.5	1.7
		Project total	**$7,638,858**	**$565,004**	**10**	**5**	**$1,576,821**	**2.8**	**1.0**
Project 10: US 160 Roadway Lighting Improvements, MP 323.0 - MP 324.5									
H-C Segment 1	US 160, MP 323.0 - MP 324.5	• Provide roadway lighting from MP 322.4 to MP 324.3	*$535,040*	$46,441	4	3	$512,519	11.0	0.5
Project 11: SR 69 Pedestrian Safety Improvements, MP 286.5 - MP 289.7									
H-R Segment 11	SR 69, MP 286.5 - MP 289.7	• Construct a sidewalk along the south side of SR 69	*$4,138,590*	$289,948	3	3	$0	0.0	0.0
		• Construct raised median (currently programmed in 2018– 2022 ADOT Transportation Facilities Construction Program)	*Already programmed*	-					
Project 12: SR 90 Pedestrian Safety Improvements, MP 320.0 - 323.8									
H-R Segment 13	SR 90, MP 320.0 - MP 323.8	• Evaluate the need for lighting along SR 90 from MP 321 south to the SR 90 Bypass / SR 90 and east of South Avenue Del Sol along SR 90 • Construct a raised median between MP 321.2 - MP 323.0	*$2,936,628*	$219,643	5	3	$878,332	4.0	4.6
Project 13: SR 347 Pedestrian Safety Improvements, MP 171.4 - MP 175.4									
H-R Segment 5	SR 347, MP 171.4 - MP 175.4	• Construct a raised median between MP 172.9 - MP 173.8 and sidewalk. Provide a PHB at the intersection of Alterra Parkway/MLK Jr. Boulevard.	*$4,409,435*	$317,829	2	1	$64,249	0.2	2.0
Project 14: SR 95 Pedestrian Safety Improvements									
H-R Segment 3	SR 95, MP 235.5 - MP 237.4	• Construct a raised median along MP 235.5 - MP 237.4 • Construct sidewalks between MP 235.5 - MP 237.4 • Provide roadway lighting between MP 235.0 - MP 237.5	*$7,968,937*	$582,080	3	2	$256,628	0.4	1.3
Project 15: SR 86 Highway Lighting Enhancement, MP 151.0 - MP 153.0									
H-C Segment 8	SR 86, MP 151.0 - MP 153.0	• Provide roadway lighting along the segment	*$506,880*	$43,997	3	2	$384,389	8.7	1.4
Project 16: US 60X Pedestrian Safety Improvements, MP 190.0 - MP 194.0									
H-C Segment 16	US 60X, MP 190.0 - MP 194.0	• Provide roadway lighting along the segment between 104th Street and 83rd Place • Provide a PHB to increase pedestrian crossing opportunities • Install sidewalks between Silver Spur Ranch to Signal Butte and SR 202 to 104th Street	*$5,674,258*	$422,887	15	9	$2,126,762	5.0	5.8
H-R Segment 18	US 60X, MP 189.0 - MP 190.0	• Provide roadway lighting along the segment between 104th Street and 83rd Place • Provide a PHB to increase pedestrian crossing opportunities • Install sidewalks	*$2,996,970*	$231,479	0	0	$0	0.0	0.0

High-Crash Segment	Location	Project Description	Estimated Total Project Cost	Annualized Cost	Total Pedestrian Crashes (5-Year Period)	Estimated Pedestrian Crashes with Improvements (5-Year Period)	Annualized Benefit	Benefit-Cost Ratio (Pedestrian Crashes)	Benefit-Cost Ratio (Vehicle Crashes)
		Project total	**$8,671,228**	**$654,366**	**15**	**9**	**$2,126,762**	**3.3**	**3.8**
Project 17: SR 77 Pedestrian Safety Improvements									
H-C Segment 10	SR 77, MP 72.9 - MP 75.40	• Install roadway lighting along the segment • Provide a PHB south of Orange Grove Road • Enhance signal operations for pedestrians	*$698,368* *$173,959* *$3,000*	$81,889	18	16	$768,778	9.4	4.5
		• Construct a sidewalk (currently programmed in 2016 – 2020 ADOT STIP)	*Already programmed*	-					
H-R Segment 17	SR 77, MP 75.0 - MP 79.1	• Install roadway lighting	*$1,146,400*	$102,692	4	4	$0.00	0.0	0.0
		Project total	**$2,021,727**	**$184,581**	**22**	**20**	**$768,778**	**4.2**	**2.0**
Project 18: SR 92 Pedestrian Safety Improvements, MP 321.0 - MP 326.7									
H-C Segment 7	SR 92, MP 321.0 - MP 326.7	• Install roadway lighting along the segment • Provide a PHB • Install a raised median • Construct a shared-use path • Implement LPI	*$5,415,956*	$411,779	12	6	$1,936,695	4.7	1.6
Project 19: US 60 Pedestrian Safety Improvements									
H-R Segment 6	US 60, MP 156.5 - MP 158.5	• Evaluate the need for signal operations for pedestrians	*$29,000*	$1,082	2	2	$0.00	0.0	0.0
H-R Segment 8	US 60, MP 149.0 - MP 152.0	• Evaluate the need for signal operations for pedestrians • Install barrier/fencing along the railroad tracks east of Cotton Crossing	*$360,878*	$40,974	2	2	$0.00	0.0	0.0
H-R Segment 9	US 60, MP 146.3 - MP 148.0	• Install sidewalks along the south side of US 60 (approximately 1.35 miles) • Provide roadway lighting	*$2,147,485*	$169,149	5	4	$128,130	0.8	0.0
H-C Segment 14	US 60, MP 158.5 - MP 159.5	• Construct a raised median	*$193,959*	$20,910	9	8	$239,112	11.4	0.0
		Project total	**$2,731,322**	**$232,115**	**18**	**16**	**$367,242**	**1.6**	**0.0**
Project 20: US 70 Pedestrian Safety Improvements									
H-C Segment 15	US 70, MP 257.0 - MP 259.0	• Widen shoulders • Provide roadway lighting	*$2,183,200*	$162,933	3	2	$256,628	1.6	0.0
Project 21: US 60 Pedestrian Safety Improvements									
H-R Segment 7	US 60, MP 152.0 - MP 155.6	• Install fencing/barrier along the railroad where there are gaps and enhance signal operations for pedestrians	*$179,395*	$19,159	2	2	$0.00	0.0	0.0
H-R Segment 10	US 60, MP 145.0 - MP 146.3	• Install a barrier/fencing along the railroad tracks	*$758,570*	$88,776	7	7	$0.00	0.0	0.0
H-C Segment 13	US 60, MP 143.0 - MP 145.0	• Install a barrier/fencing south of Greenway Road to Dysart Road	*$559,724*	$64,875	4	4	$0.00	0.0	0.0
		Project total	**$1,497,689**	**$172,810**	**12**	**12**	**0.0**	**0.0**	**0.0**
Project 22: SR 86 Pedestrian Safety Improvements									
H-R Segment 14	SR 86, MP 169.7 - MP 170.3	• Construct a raised median and enhance signal operations for pedestrians	*$2,023,471*	$141,044	0	0	$0.00	0.0	0.0
Project 23: SR 77 Pedestrian Safety Improvements									
H-R Segment 15	SR 77, MP 69.5 - MP 72.0	• Evaluate the need for additional pedestrian crossing opportunities such as a PHB or two-stage pedestrian crossing • Enhance signal operations for pedestrians	*$196,959*	$21,270	0	0	$0.00	0.0	0.0

Table 20: High-Crash Intersection/Interchange Countermeasure Summary

High-Crash Intersection / Interchange	Location	Project Description	Estimated Total Cost	Annualized Cost	Total Pedestrian Crashes (5-Year Period)	Estimated Pedestrian Crashes with Improvements (5-Year Period)	Annualized Benefit	Benefit-Cost Ratio (Pedestrian Crashes)
H-C Intersection 1	Bethany Home Road TI at I-17	Evaluate signal operations (e.g., LPI and pedestrian crossing time).	$23,000	$361	5	2	$ 608,648	-*
H-C Intersection 2	SR 77/River Road	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Reduce curb radii as feasible.	$64,440	$3,278	4	2	$ 486,918	-
H-C Intersection 3	SR 77/Ina Road	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Improve curb radii as feasible.	$43,720	$1,819	4	2	$ 486,918	-
H-C Intersection 4	Northern Avenue TI at I-17	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Improve curb radii as feasible	$64,440	$3,278	3	2	$ 365,189	-
H-C Intersection 5	67th Avenue TI at I-10	Evaluate signal operations (e.g., LPI and pedestrian crossing time).	$23,000	$361	3	2	$ 365,189	-
H-C Intersection 6	Dysart Road at I-10	Evaluate signal operations (e.g., LPI and pedestrian crossing time).	$23,000	$361	4	2	$ 486,918	-
H-C Intersection 7	SR 95/Joy Lane	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Consider other improvements such as separating left-turn movements and pedestrian crossing with protected arrow.	$43,720	$1,819	3	2	$ 365,189	-
H-C Intersection 8	SR 40B/Milton Road	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Reduce curb radii as feasible.	$64,440	$3,278	3	2	$ 365,189	-
H-C Intersection 9	US 180/Birch Avenue	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Evaluate the need for enhanced intersection lighting.	$23,000	$361	3	2	$ 365,189	-
H-C Intersection 10	US 95/B Street	Evaluate the need for a PHB.	$193,959	$20,910	5	2	$ 597,779	-
H-C Intersection 11	Glendale Avenue TI at I-17	Evaluate signal operations (e.g., LPI and pedestrian crossing time).	$3,000	$361	4	2	$ 486,918	-
H-C Intersection 12	Indian School Road TI at I-17	Evaluate signal operations (e.g., LPI and pedestrian crossing time). Reduce curb radii as feasible.	$44,440	$3,278	4	2	$ 486,918	-
H-C Intersection 13	Thomas Road TI at I-17	Evaluate signal operations (e.g., LPI and pedestrian crossing time).	$23,720	$1,819	6	3	$ 730,377	-

** BCR is not calculated for intersections and interchanges; detailed field reviews are required to determine feasibility and applicability of menu of countermeasures and calculation of a meaningful BCR.*

Table 21: Tribal Community Projects for Consideration

Tribal Name and State Route Number	Segment Beginning Milepost	Segment Ending Milepost	Brief description of existing pedestrian facilities	Brief description of pedestrian attraction	Potential Improvement	Project Length	Estimated Total Cost
Hopi Tribe, State Route 264	322.0	323.4	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Commercial business, motel, convenience store, Moenkopi community, elementary school and village	Shared use path eastbound between MP 322 (SR 160 intersection) to 322.75 (residential intersection). Consider extending the path further north on Main Street to Edgewater Drive	0.75	$450,000
	366.9	368.6	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Hotevilla convenience store, Hotevilla and Bacavi community, elementary school and village	Shared use path between MP 367 (road to Bacavi) and 367.4. A path in this area could connect to neighborhoods east and west of SR 264 in the future	0.4	$240,000
	370.6	371.8	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Community businesses, residence & village of Oraibi	There is a school bus stop in this vicinity, however the development in this section is sparse.	N/A	-
	372.7	375.9	No pedestrian facility. Existing is a dirt path on east-bound shoulder adjacent to paved route	Community businesses, commercial, schools, residential, village of Kykotsmovi, health and wellness center	Shared use path to serve development between MP 373 (intersection SR 264 and Main St) and MP 373.4.	0.4	$240,000
	378.6	381.4	No pedestrian facility. Existing is a dirt path on both shoulders adjacent to paved route	Commercial business, motel, Shungopovi community & village	Development along SR 264 is relatively sparse unless there is a desire to link to the Hopi Cultural Center	N/A	-
	384.0	385.0	No pedestrian facility. Existing is a dirt path on shoulder adjacent to paved route	Commercial business, elementary school, post office, lower Mishongnovi and Sipaulovi communities	A shared use path between MP 383.7 and 384.2 (intersection of SR 264 with SR 87) would provide better pedestrian access to school.	0.5	$300,000
	388.0	393.4	No pedestrian facility. Existing is a dirt path on both shoulders adjacent to paved route	Commercial business, elementary school, hospital, airport, lower First Mesa communities	A shared use path provides access to a variety of land uses, MP 388 to MP 393.25	5.25	$3,150,000
	396.0	397.0	No pedestrian facility. Existing is a dirt path on west-bound shoulder adjacent to paved route	High school, police department, courts & Low Mountain road community	A shared use path to connect residences near SR 264/ Indian Route 60 and road to the high school, and other land uses	1.0	$600,000
Hopi Tribe, State Route 87	405.0	406.0	No pedestrian facility. Existing is a dirt path on west-bound shoulder adjacent to paved route	Residential community center, some business.	A shared use path on SR 87 between MP 405 - 406 (intersection SR 87/SR 264) would connect the residential area to land uses on SR 264	1.0	$600,000

Recommended Roadway Safety Assessments

The following (**Table 22**) is a list of pedestrian-focused RSAs recommended to be conducted at high-crash and high-risk locations.

Table 22: Recommended RSAs

RSA Name	Location	Project Description
I-17 Traffic Interchanges	High-Crash Intersections 1, 4, 11, 12, and 13	Several traffic interchanges were identified as being high-crash locations. A series of RSAs is recommended to be performed at traffic interchanges along the I-17 corridor. The RSAs should identify signal operation and lighting conditions deficiencies for pedestrians.
SR 95, MP 229.4 - MP 246.0	High-Risk Segments 1, 2,3 and 4 and High-Crash Intersections 7 and 10	A series of RSAs is recommended along the SR 95 corridor from MP 229.4 to MP 246.0. The RSAs should include a review of pedestrian crossing behaviors and current access control. An RSA was completed for MP 242 to MP 250, October 20-22, 2008. Recommendations should be reviewed and updated with an emphasis on pedestrian safety.
US 60, MP 143.0 -MP 160.0	High-Risk Segments 6, 9, 10 and High-Crash Segments 13, 14	RSA(s) are recommended on the SR 95 corridor from MP 143.0 to MP 156.0. The RSA(s) should focus on high-crash segment 1 and segment 2. However, the other segments identified as high-risk should be observed. Pedestrian crossing behavior and lighting conditions should be evaluated.
SR 40B and SR 89A, Flagstaff	High-Crash Segment 11A, 11B, and 12 and High-Crash Intersections 8 and 9	RSAs are recommended along the SHS within the City of Flagstaff along Milton Road and SR 89A.
SR 77, MP 69.5 - MP 79.1	High-Crash Segment 16, High-Risk Segment 15, and High-Crash Intersection 2 and 3	RSAs are recommended on SR 77 from MP 69.5 to MP 79.1. The assessments should evaluate existing traffic signal operational deficiencies for pedestrians at major intersections and segment deficiencies. An RSA was conducted for MP 72.9 to 74.85 in October 2012. This RSA should be reviewed.
US 60X, MP 189 - MP 194.0	High-Crash Segment 16 and High-Risk Segment 18	An RSA was conducted in 2014. ADOT is currently completing a project assessment for this segment. Additional investigation focused on pedestrian safety within this segment of US 60X may be required to further evaluate safety issues.
SR 90, MP 320.0 - MP 223.8	High-Risk Segment 13	An RSA is recommended on SR 90 from MP 320.0 to MP 223.8. The safety assessment should evaluate the need for roadway lighting and a raised median.
SR 347, MP 171.4 - MP 175.4	High-Risk Segment 5	An RSA is recommended on SR 347 from MP 171.4 to MP 175.4.
SR 86, MP 169.7 - MP 171.0	High-Crash Segment 8 and 9 and High-Risk Segment 14	An RSA is recommended on SR 86 from MP 169.7 to MP 171.0.
SR 69, MP 286 - MP 284	High-Risk Segment 11	An RSA is recommended on SR 69 from MP 286.0 to MP 284.0.

RSA Name	Location	Project Description
US 191/ SR 80, MP 365.5 - MP 366.1	High-Risk Segment 12	An RSA is recommended on US 191 from MP 365.5 to MP 366.1.
Dysart Road/I-10 and 67th Avenue/I-10	High-Crash Intersections 5 and 6	An RSA is recommended at the Dysart Road and 67th Avenue interchanges with I-10.
SR 92, MP 321.0 - MP 326.7	High-Crash Segment 7	An RSA is recommended on SR 92 from MP 321.0 - MP 326.7

Societal Costs of Pedestrian Crashes

This section provides an excerpt of the analysis relating to the societal costs of pedestrian crashes to provide context to the benefits of providing pedestrian safety improvements.

Table 23 summarizes the annual societal costs of pedestrian crashes at high-pedestrian-crash locations on state highways. The calculations are based on the average annual number of pedestrian crashes that occurred at the high-crash segments from 2011-2015, and the societal costs displayed above.

The annual societal cost of pedestrian crashes for segments and interchanges for the five-year period is approximately $46.8 million.

Table 23: Societal Costs for Segments and Interchanges

Injury Severity	Annual Average Number of Crashes on High-Crash and High-Risk Segments (2011–2015)	Annual Societal Costs for High-Crash and High-Risk Segments (2011–2015)	Annual Average Crashes at High-Crash and High-Risk Interchanges (2011–2015)	Annual Societal Costs for High-Pedestrian-Crash Interchanges (2011–2015)
Fatal	7.0	$40,600,000	0.2	$1,160,000
Incapacitating Injury	7.4	$2,960,000	2.4	$960,000
Non-Incapacitating Injury	7.4	$592,000	4.0	$320,000
Possible Injury	3.2	$134,400	2.0	$84,000
PDO	1.0	$4,000	0.6	$2,400
Unknown	2.0	N/A	1.0	N/A
Total	**28.0**	**$44,290,400**	**10.2**	**$2,526,400**

7. OPPORTUNITIES IN THE 2017-2021 ADOT FIVE-YEAR PROGRAM

Pedestrian safety countermeasures are most economically constructed when done as part of reconstruction or construction projects. The *2018-2022 ADOT Five-Year Transportation Facilities Construction Program* was reviewed to determine programmed projects within or near high-crash or high-risk segments.

Ten programmed projects were identified in areas with demonstrated pedestrian safety needs. Two of these projects are projects that will directly benefit pedestrians:

- SR 69, Truwood Drive to Fain Road, MP 284 - MP 288, construct raised curbed median
- SR 95, Teller Lane to Aztec Road, MP 237 – MP 238, construct raised median and roundabout

Opportunities to incorporate pedestrian safety improvements into the other projects currently programmed should be considered. They may also be considered in projects constructed by private development. Pedestrian safety facilities should be a consideration in the planning, design, and construction of these projects.

Table 24 lists each pedestrian safety project location, programmed projects in the area (as included in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program), programmed project description, milepost location, construction fiscal year, funding source, and cost. This information indicates where the pedestrian safety improvement project areas can potentially overlap with programmed projects.

Table 24: Programmed Projects on Pedestrian Safety Project Locations

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost
Project 1: SR 95 Pedestrian Safety Improvement, MP 237. 4 - MP 239.2					
SR 95, Teller Lane to Aztec Road, TRACS F005601C	MP 237 - MP 238	Construct raised median and roundabout	2019	National Highway Performance Program (NHPP) / Highway Safety Improvement Program (HSIP)	$3,622,000
Project 2: Flagstaff Area Pedestrian Safety Improvement, SR 89A/SR 40B, MP 402.1 - MP 403.2 on SR 89 A and MP 403.2 (Route 66/SR 89A) - MP 196.5 (Elden Street) on SR 40B					
SR 40B, Rio De Flag Bridge, STR #295, TRACS H890501C	MP 196	Bridge replacement	2019	NHPP	$2,500,000
Project 3: SR 73 Pedestrian Safety Improvement, MP 339.0 - MP 341.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 4: SR 86 Pedestrian Improvement Project, MP 170. 3 - MP 171.6					
I-19/Ajo Way (SR 86) Interchange Construction (in progress)	MP 171 - MP 171.6	Replace the existing interchange with a new single point urban interchange. Construction includes replacing the Michigan Avenue pedestrian bridge.	Phase I - 2016 Phase II - 2018	FA	Phase I- $54,000,000 Phase II - $29,000,000
Project 5: US 191/SR 80 Roadway Reconfiguration, MP 365.5 - MP 366.1					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 6: US 191 Highway Lighting and Shoulder Improvement, MP 448.0 - MP 449.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 7: SR 95 Pedestrian Safety Improvements, Fort Mohave and Bullhead City Area, MP 229.4 - MP 230.5 and MP 241.5 – MP 246.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 8: SR 40B, Pedestrian Safety Improvements, MP 198.45 - MP 195.5					
SR 40B, Rio De Flag Bridge, STR #295, TRACS H890501C	MP 196	Bridge replacement	2019	NHPP	$2,500,000
Project 9: SR 68 Pedestrian Safety Improvements, Golden Valley - Bullhead City Area					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 10: US 160 Roadway Lighting Improvements, MP 323.0 - MP 324.5					
US 160, IR 6731-SR 98, TRACS F005901C	MP 318 - MP 325	Construct bus pullouts	2019	NHPP	$450,000
Project 11: SR 69 Pedestrian Safety Improvements, MP 286.5 - MP 289.7					
SR 69, Truwood Drive to Fain Road, TRACS F006101C	MP 284 - MP 288	Construct raised curb median	2019	NHPP	$2,500,000

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost
Project 12: SR 90 Pedestrian Safety Improvements, MP 320.0 - MP 323.8					
No projects identified in *2017-2021 ADOT Five-Year Transportation Facilities Construction Program*					
Project 13: SR 347 Pedestrian Safety Improvements, MP 171.4 - MP 175.4					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 14: SR 95 Pedestrian Safety Improvements, MP 235.5 - MP 237.4					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 15: SR 86 Highway Lighting Enhancement, MP 151.0 - MP 153.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 16: US 60X Pedestrian Safety Improvements, MP 190.0 - MP 194.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 17: SR 77 Pedestrian Safety Improvements, MP 72.9 - MP 79.1					
SR 77, Genematas – Calle Concordia, TRACS F14401C	MP 72 - MP 77	Pavement rehabilitation	2021	NHPP	$11,446,000
Project 18: SR 92 Pedestrian Safety Improvements, MP 321.0 - MP 326.7					
SR 92 at Foothills Boulevard, TRACS #H826501C	MP 322	Intersection improvements & Right of Way	2018	NHPP/HSIP	$4,650,000
SR 92, Jct. SR 90 – Kachina, TRACS H871701C	MP 321.2 - MP 325.3	Pavement rehabilitation	2018	NHPP	$4,900,000
Project 19: US 60 Pedestrian Safety Improvements, MP 146.3 - MP 159.5					
New River WB #314 Bridge	MP 148 - MP 149	Bridge repair	2017	FA	$250,000
Project 20: US 70 Pedestrian Safety Improvements, MP 257 - MP 259					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 21: US 60 Pedestrian Safety Improvements, Fencing, MP 143 - MP 155.6					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 22: SR 86 Pedestrian Safety Improvements, MP 169.7 - MP 170.3					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Project 23: SR 77 Pedestrian Safety Improvements, MP 69.5 - MP 72.0					
No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					

8. FUNDING SOURCES FOR PEDESTRIAN INFRASTRUCTURE AND PROGRAMS

Funding for pedestrian improvements and/or new pedestrian facilities is available from a variety of sources, including federal programs and state and regional revenue sources. This chapter provides an overview of these potential funding sources.

Federal Programs

There are several federal funding sources that have potential to be used for pedestrian improvement projects:

- Transportation Investment Generating Economic Recovery (TIGER) Grant Program
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Federal Transit Administration (FTA) Grant Programs
- Congestion Mitigation/Air Quality (CMAQ) Program
- Highway Safety Improvement Program (HSIP)
- National Highway Performance Program (NHPP)
- Surface Transportation Block Grant Program (STBG)
- Transportation Alternatives Set-Aside (TA Set-Aside)
- Recreational Trails Program (RTP)
- Safe Routes to School (SRTS)
- Statewide Planning and Research (SP&R) or Metropolitan Planning Funds
- NHTSA Section 402: State and Community Highway Safety Grant Program
- NHTSA Section 405: National Priority Safety Programs (Nonmotorized Safety)
- Federal Lands and Tribal Transportation Programs

A summary of these funding programs is provided in **Table 25**, which provides information on:

- Funding program
- Project type (construction, non-construction, or both)
- Required matching funds (percent)
- 2017 Arizona apportionment
- Eligible projects
- Comments
- Source (website link for more information)

A brief overview of these programs is provided as follows.

Transportation Investment Generating Economic Recovery (TIGER) Grant Program

The competitive TIGER grant program supports innovative projects, including multi-modal and multi-jurisdictional projects, which are difficult to fund through traditional federal programs. In each round of TIGER, the Department of Transportation (DOT) receives hundreds of applications to build and repair critical pieces of our freight and passenger transportation networks. Projects are evaluated on the benefits their project would deliver for five long-term outcomes: safety, economic competitiveness, state of good repair, quality of life, and environmental sustainability. DOT also evaluates projects on innovation, partnerships, project readiness, benefit cost analysis, and cost share.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

The TIFIA program provides credit assistance for qualified projects of regional and national significance. Many large-scale, surface transportation projects – highway, transit, railroad, intermodal freight, and port access – are eligible for assistance. Eligible applicants include state and local governments, transit agencies, railroad companies, special authorities, special districts, and private entities. The program's fundamental goal is to leverage Federal funds by attracting substantial private and other non-Federal co-investment in critical improvements to the nation's surface transportation system.

Federal Transit Administration (FTA) Grant Programs

The following FTA grant programs listed pedestrian improvements as eligible for funding to provide access to transit:

- FTA Section 5310: Enhanced Mobility of Seniors and Individuals with Disabilities – Information on this program cites examples of funding for pedestrian improvements to improve transit access such as building an accessible path to a bus stop or providing curb-cuts, sidewalks, accessible pedestrian signals, or other accessible features.
- FTA Section 5311: Rural Areas – Grants can support a joint development improvement, such as pedestrian and bicycle access to a public transportation facility.

Congestion Mitigation/Air Quality (CMAQ) Program

The Fixing America's Surface Transportation (FAST) Act continued the CMAQ program to provide a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (air quality maintenance areas).

Highway Safety Improvement Program (HSIP)

The FAST Act continued the HSIP. The purpose of this program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on Tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance.

National Highway Performance Program (NHPP)

The FAST Act continued the NHPP, which was established under MAP-21. The NHPP provides support for the condition and performance of the National Highway System (NHS). All pedestrian/bicycle improvements must be associated with a NHS facility.

Surface Transportation Block Grant Program (STBG)

The STBG provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway. Eligible projects related to pedestrian safety include pedestrian and bicycle projects, safety projects, recreational trails, safe routes to school projects, and projects within the pre-FAST Act Title 23 definition of “transportation alternatives” (see the Transportation Alternatives Set-Aside description below). Projects must be identified in the Statewide Transportation Improvement Program (STIP) and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan.

Transportation Alternatives Set-Aside

The FAST Act eliminated the MAP-21 Transportation Alternatives Program (TAP) and replaced it with a set-aside of STBG program funding for transportation alternatives (TA). These set-aside funds include all projects and activities that were previously eligible under the TAP, encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, and safe routes to school projects.

Recreational Trails Program (RTP)

The RTP provides funds to the states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses.

The FAST Act reauthorized the RTP for Federal fiscal years 2016 through 2020 as a set-aside of funds from the TA Set-Aside under the STBG.

Safe Routes to School (SRTS)

SRTS funds are available until expended (they are not subject to the usual Federal-aid highway four-year rule of availability). SRTS is now funded within the TA Set-Aside.

Statewide Planning and Research (SP&R) or Metropolitan Planning Funds

Funding is provided for SP&R by a 2% set-aside from each state's apportionments of four programs: NHPP, Surface Transportation Program (STP), HSIP, and CMAQ. A minimum of 25% must be used for research purposes, and the remaining funds are used for statewide and metropolitan planning.

NHTSA Section 402: State and Community Highway Safety Grant Program

To receive Section 402 grant funds, a state must have an approved HSP and provide assurances that it will implement activities in support of national goals that also reflect the primary data-related factors within the state, as identified by the state highway safety planning process. States can distribute highway safety grant funds to a wide network of sub-grantees, including local law enforcement agencies, municipalities, universities, health care organizations, and other local institutions.

States may spend 402 funds in accordance with an approved HSP that complies with the uniform national guidelines for highway safety programs. One of the eligible programs is to improve pedestrian and bicycle safety.

NHTSA Section 405: National Priority Safety Programs (Nonmotorized Safety)

Under the FAST Act, Section 405 is the National Priority Safety Program, which provides grant funding to address selected national priorities for reducing highway deaths and injuries. The FAST Act added two new grants under this program, one of which is for nonmotorized safety. States are eligible if the annual combined pedestrian and bicyclist fatalities in the state exceed 15 percent of the total annual crash fatalities in the state using the most recently available final data from NHTSA's Fatality Analysis Reporting System (FARS). Eligible states may use Section 405 grant funds only for training law enforcement on state laws applicable to pedestrian and bicycle safety; enforcement mobilizations and campaigns designed to enforce those state laws; or public education and awareness programs designed to inform motorists, pedestrians, and bicyclists of those state laws.

Federal Lands and Tribal Transportation Programs

Programs under the FHWA, Office of Federal Lands Highway relate to projects to improve transportation to and within Federal and Tribal lands. Programs that can potentially fund pedestrian safety improvements are:

- Federal Lands Access Program
- Federal Lands Transportation Program
- Tribal Transportation Program
- Nationally Significant Federal Lands and Tribal Projects

Arizona Funding Sources

Highway User Revenue Fund

The state of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration and operation of motor vehicles on the public highways of the state. These collections include gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the Arizona Highway User Revenue Fund (HURF) and are then distributed to the cities, towns, and counties and to the State Highway Fund. These taxes represent a primary source of revenues available to the state for highway construction, improvements, and other related expenses.

Regional Funding Sources

Maricopa County Transportation Excise Tax and Regional Area Road Fund (RARF)

In November 2004, the voters of Maricopa County approved the extension of the levy of the Maricopa County Transportation Excise Tax for an additional 20 years, ending December 31, 2025. Often referred to as the "half-cent sales tax," the tax is levied upon business activities in Maricopa County. The tax revenues are distributed as follows:

- 66.7% goes into the Maricopa County RARF consisting of 56.2% for freeways and routes on the SHS, including design, right-of-way, construction, maintenance, and debt service for projects included in the Regional Transportation Plan (RTP) for Maricopa County and 10.5% for major arterial streets and intersection improvements, including debt service, capital expense, and implementation studies.
- 33.3%goes to a public transportation fund to be used solely for capital costs, maintenance, and operation of public transportation classifications along with capital costs and utility relocation costs associated with a light rail public transit system.

Pima Association of Governments (PAG) Regional Transportation Authority (RTA) Half-Cent Sales Tax

Pima County voters approved the half-cent sales tax on May 16, 2006 to fund the RTA Plan. The state, in turn, transfers the collected funds to a regional transportation fund. The RTA is limited to collecting the tax for up to 20 years. Over 20 years, the tax levy is expected to generate $2.1 billion. Of the $2.1 billion, $80 million will fund pedestrian improvements (as part of the Safety and Environmental Elements in the RTA Plan) such as crosswalks and sidewalks to increase pedestrian accessibility. The Roadway Element in the RTA Plan is expected to receive $1.2 billion over 20 years and is comprised of 35 distinct roadway projects that also have pedestrian components.

Table 25: Potential Funding Sources for Pedestrian Safety Projects

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	2017 Arizona Apportionment	Eligible Projects	Comments	Source
Federal Funding Programs						
Transportation Investment Generating Economic Recovery (TIGER) Grant Program	Both	20%	Total federal funding in 2016 is $500M, ADOT maximum funding is $100M	Construction of pedestrian and bicyclist facilities, rest areas, access improvements, crosswalks, curb ramps, lighting, lane road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, and bridges/tunnels for pedestrians or bicyclists.	The Consolidated Appropriations Act (2016) appropriated $500M to be awarded by DOT for national infrastructure improvements. Grants are awarded on a competitive basis for projects that will have a significant impact on the nation, a metropolitan area, or a region. Funds are subject to annual appropriations.	https://www.transportation.gov/tiger https://www.transportation.gov/sites/dot.gov/files/docs/2016%20TIGER%20NOFO%20FR.pdf
Transportation Infrastructure Finance and Innovation Act (TIFIA)	Both	N/A	Total federal funds for credit assistance in 2017: $275M	Pedestrian and bicycle infrastructure networks – construction of pedestrian and bicyclist facilities, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, and bridges/tunnels for pedestrians or bicyclists.	TIFIA provides credit assistance for qualified projects of regional and national significance. The credit assistance is limited to 33% of reasonable anticipated eligible project costs. The program offers assistance only in the form of secured loans, loan guarantees, or standby lines of credit, but can be combined with other grant sources, subject to total federal assistance limitations.	https://www.transportation.gov/tifia/tifia-credit-program-overview
Federal Transit Administration (FTA) Grant Programs	Both	10% - 20%	Varies by grant	FTA Section 5310 – Enhanced Mobility of Seniors and Individuals with Disabilities: Fact sheet for this program cites examples of non-traditional use of funds as including building an accessible path to a bus stop, such as curb-cuts, sidewalks, accessible pedestrian signals, or other accessible features. FTA Section 5311 – Rural Areas: Grants can support a joint development improvement, an example being pedestrian and bicycle access to a public transportation facility.	Grant opportunities as of April 2017, that noted pedestrian projects as potentially eligible for funding include: • FTA Section 5310 – Enhanced Mobility of Seniors and Individuals with Disabilities • FTA Section 5311 – Formula Grants for Rural Areas FTA Section 5307 – Urbanized Area Formula Grants: Note the previous requirement for spending 1% of grant funds on associated improvements (which could be used for pedestrian improvements) has been removed under the FAST Act.	https://www.transit.dot.gov/grants
Congestion Mitigation/Air Quality (CMAQ) Program	Both	0% - 20%	$52.5M	Limiting portions of roads to be used for non-motorized transportation, constructing sidewalks, constructing and maintaining trails, promotional programs, and funding pedestrian and bicycle coordinator positions at the state and local levels. CMAQ funds may be used for shared-use paths but may not be used for trails that are primarily for recreational use.	Most activities require a 20% match; a 10% match is required for certain interstate activities; and no match is required for projects such as traffic control signalization and carpooling. Projects must demonstrate emissions reduction and benefit to air quality.	https://www.fhwa.dot.gov/environment/air_quality/cmaq/
Highway Safety Improvement Program (HSIP)	Construction	10% (Except as provided in 23 U.S.C 120 and 130)	$43.2M	Pedestrian and bicycle safety improvements on any public road or publicly owned pedestrian or bicycle pathway. Funding for bike lanes, separated bike lanes, shared-use paths, paved shoulders, road diet (roadway reconfiguration), bridges/tunnels for bicyclists and/or pedestrians, sidewalks, crosswalks, curb ramps, signs, counting equipment, data collection for pedestrians and bicyclists, maps, training, and RSAs.	The HSIP is a core Federal-aid highway program, the purpose of which is to achieve a significant reduction in fatalities and serious injuries on all public roads. A state must develop a State SHSP to be eligible for Federal funding.	https://safety.fhwa.dot.gov/hsip/hsip.cfm
National Highway Performance Program (NHPP)	Construction	10% - 20%	$418.4M	Construction of pedestrian and bicycle facilities, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, bridges/tunnels for pedestrians or bicyclists, counting equipment, data collection for pedestrians and bicyclists, and RSAs.	All bicycle/pedestrian improvement projects or activities must be associated with an NHS facility. Projects must be identified in the STIP and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan(s).	https://www.fhwa.dot.gov/specialfunding/nhpp/160309.cfm

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	2017 Arizona Apportionment	Eligible Projects	Comments	Source
Surface Transportation Block Grant Program (STBG)	Both	10% - 20%	$209.6M	RTP projects eligible under 23 U.S.C. 206, pedestrian and bicycle projects in accordance with 23 U.S.C. 217, and SRTS projects under Section 1404 of SAFETEA-LU (23 U.S.C 402 note). Includes: Pedestrian or bicycle improvements, bicycle and/or pedestrian plans, bicycle helmets, maps, bicycle parking, bicycle share, coordinator positions, training, safety education, safety enforcement, safety program technical assessment, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, bridges/tunnels for pedestrians or bicyclists, counting equipment, data collection for pedestrians and bicyclists, RSAs, access improvements to public transportation ADA improvements, historic preservation, and landscaping.	The STBG program provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge, and tunnel project on any public road; pedestrian and bicycle infrastructure; and transit capital projects, including intercity bus terminals. Projects must be identified in the STIP and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan.	https://www.fhwa.dot.gov/specialfunding/stp/160307.cfm#d
Transportation Alternatives Set-Aside (TA Set-Aside)	Both	10% - 20%	$17.4M Note: $1.93M is set aside for the RTP and up to 25% of the statewide TA funds can be transferred to other federal aid categories (25% was transferred in FY 2016)	Eligible projects are *transportation alternatives*, which include on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity; recreational trail projects; SRTS projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former divided highways.	The TA Set-Aside projects are set-aside projects under the STBG program. Although separate funding sources in the past, the RTP and SRTS programs are now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/fastact/factsheets/transportationalternativesfs.cfm
Recreational Trails Program (RTP)	Both	10% - 20%	$1.93M	Develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Eligible projects include recreational trails, trail bridges and intersections, construction and maintenance equipment for trails, trailside and trailhead facilities, shared-use paths, ADA improvements, sidewalks, crosswalks, curb ramps, bicycle parking, bridges/tunnels for pedestrians and/or bicyclists, counting equipment, data collection for pedestrians and/or bicyclists, lighting, spot improvements, stormwater improvements, and training.	The RTP is intended to fund recreational trails. Each state develops its own procedures to solicit projects from applicants and to select projects for funding, in response to the recreational trail needs within the state. RTP is now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/environment/recreational_trails/
Safe Routes to School (SRTS)	Both	10% - 20%	N/A - funded within the TA Set-Aside	Infrastructure-related and behavioral projects that provide a safe and appealing walking atmosphere. Eligible infrastructure projects include sidewalk improvements, traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street bicycle facilities, secure bike parking facilities, and traffic diversion programs near schools. Eligible non-infrastructure improvements include public awareness campaigns and outreach, traffic education and enforcement, student sessions on bicycle and pedestrian safety, and funding for training volunteers and managers of SRTS programs.	SRTS funds are available until expended (they are not subject to the usual Federal-aid highway four-year rule of availability). 10-30% of each state's funding is to be spent on non-infrastructure activities. SRTS is now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/environment/safe_routes_to_school/guidance/#toc123542199 https://www.fhwa.dot.gov/environment/transportation_alternatives/
Statewide Planning and Research (SP&R) or Metropolitan Planning Funds	Non-Construction	20%	$5.9M (Metropolitan Planning)	Eligible projects include engineering and economic surveys, planning of future highway programs, planning and funding of local transportation systems, development and implementation of management systems/plans/processes,	Funding is provided for SP&R by a 2% set-aside from each state's apportionments of four programs: NHPP, STP, HSIP, and CMAQ. A minimum of 25% must be used for research	https://www.fhwa.dot.gov/map21/factsheets/spr.cfm

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	2017 Arizona Apportionment	Eligible Projects	Comments	Source
				studies of surface transportation systems and taxation, research and development, and planning of real-time monitoring elements.	purposes, and the remaining funds are used for statewide and metropolitan planning.	
NHTSA Section 402: State and Community Highway Safety Grant Program	Non-Construction	5% - 20%	Varies Pedestrian and Bicycle Safety Enforcement Program: $0.165M - (FFY 2016), $0.004M (FFY 2017) Pedestrian and Bicycle Safety Awareness Program: $0.110M (FFY 2016), $0.115 (FFY 2017) School Zone and School Bus Operations Enforcement: $0.027M (FFY 2016), $0.076 (FFY 2017)	Highway safety projects, training courses for traffic engineers, safety-related events, enforcement, and educational materials. Funding for education, enforcement, and research programs designed to reduce traffic crashes and resulting deaths, injuries, and property damage.	A state is eligible for State Highway Safety Program grants by having and implementing an approved HSP.	https://safety.fhwa.dot.gov/legislationandpolicy/policy/section402/
NHTSA Section 405h: National Priority Safety Programs (Nonmotorized Safety)	Non-Construction	20%	$0.096M for Pedestrian and Bicycle Safety Enforcement Program (*State of Arizona HSP – Federal Fiscal Year 2017*)	Highway safety programs designed to reduce pedestrian/bicyclist deaths and injuries that result from crashes involving a motor vehicle.	States are eligible if the quantity of annual combined pedestrian and bicyclist fatalities exceeds 15% of the total annual crash fatalities. Grant funds can be used for: - Training of law enforcement officials on state laws applicable to pedestrian and bicycle safety -Campaigns to enforce traffic laws relating to pedestrian and bicyclist safety -Public education and awareness programs designed to inform motorists, pedestrians, and bicyclists of state traffic laws applicable to pedestrian and bicycle safety	See Section H: https://www.law.cornell.edu/uscode/text/23/405
Federal Lands and Tribal Transportation Programs	Both	0% - 10%	Varies by grant	Transportation planning, research, maintenance, engineering, rehabilitation, restoration, construction, and reconstruction of Tribal transportation facilities; the operation or maintenance of transit programs and facilities; and any transportation project eligible for assistance under 23 U.S.C. that is located within or provides access to a Tribal land and/or Tribal government	Includes: A) Federal Lands Access Program; B) Federal Lands Transportation Program; C) Tribal Transportation Program (0% match); D) Nationally Significant Federal Lands and Tribal Projects (10% match)	https://flh.fhwa.dot.gov/programs/ttp http://www.fhwa.dot.gov/map21/factsheets/ttp.cfm
Arizona Funding Sources						
Highway User Revenue Funds (HURF)	Construction	N/A	FY 2017 – $1,287.9M	Highway construction and improvements and other related expenses	HURF funds are collected from gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. Funds are distributed via formulas to the State Highway Fund, cities and towns, cities with a population over 300,000, and counties.	https://www.azdot.gov/docs/default-source/businesslibraries/hurfcastproc1726.pdf?sfvrsn=4 http://www.azdot.gov/docs/default-source/financial-management-services/hurfdist_formulas.pdf?sfvrsn=2
Regional Funding Sources						
Maricopa County						
Transportation Excise Tax (Half-Cent Sales Tax)	Both	N/A	FY 2017 forecast distribution – $411.4M	Freeway and regional arterial regional bus service and other special transportation services, and high capacity transit services such as light rail, bus rapid transit, and express buses	66.7% of the annual funds from the tax go to the RARF	https://www.azdot.gov/docs/default-source/businesslibraries/rarfcastproc1726.pdf?sfvrsn=4
Regional Area Road Fund (RARF)	Both	N/A	FY 2017 forecast distribution – $231.2M freeways $43.2M arterial streets	Construction of new freeways, widening of existing freeways and highways, improvements to the arterial street system, public transportation	Funds are used for freeways and arterial road networks	https://www.azdot.gov/docs/default-source/businesslibraries/rarfcastproc1726.pdf?sfvrsn=4

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	2017 Arizona Apportionment	Eligible Projects	Comments	Source
Pima County						
Regional Transportation Authority (RTA) Half-Cent Sales Tax	Construction	N/A	Total of $2.1B from 2006 through 2026 FY 2015-2016 revenues were $84.809M	Construction of crosswalks, sidewalks, and other projects that increase pedestrian accessibility	The RTA plan consists of 35 distinct roadway projects, which will have pedestrian components. The RTA funding source is, by the enabling legislation, restricted to those projects identified in the RTA plan approved by the voters. Therefore, RTA funds are not programmed through the same process as other regional funds. The RTA projects will be paid with funds generated from a half-cent excise tax over the 20-year life of the plan.	http://www.rtamobility.com/Home/tabid/38/Default.aspx http://www.pagregion.com/Default.aspx?tabid=36

9. RECOMMENDED POLICIES AND PROGRAMS

Successes from 2009 PSAP Recommendations

The 2009 PSAP[4] recommended new policies and programs to reduce pedestrian crashes on the SHS. An overview of recommendations which have been implemented are:

- **Develop an ADOT Pedestrian Safety Working Group** – A Nonmotorized Emphasis Area Team has continued to meet quarterly since completion of the Arizona SHSP in 2014.
- **Develop traffic impact study agreements with local agencies** – June 2015, TGP 240 Traffic Impact Analyses, was updated to require analysis of existing conditions for pedestrians and consideration of pedestrians in trip generation and improvements recommendations.
- **Review all ADOT design and maintenance guidelines and manuals to identify effective measures for accommodating pedestrians on the SHS** – Changes since 2009 include allowance for pedestrian-focused infrastructure such as PHBs.
- **Provide pedestrian facility training to state and local governments** – In 2015, the "Designing for Pedestrian Safety 201" course was conducted in both Phoenix and Tucson through FHWA (as part of a focus state program). In 2013, ADOT conducted "Designing for Pedestrian Safety 101" in both Phoenix and Tucson.
- **Complete Streets Policy** – Following a Complete Streets Policy Development Workshop for ADOT in September 2009, an "implementation team" led by Government Relations prepared a draft policy, but it was not adopted, due to concerns of "funding of maintenance for other features outside the roadway prism." Instead, ADOT leadership directed that guideline document be developed. In February 2016, ADOT developed the Complete Transportation Guidebook, which describes ADOT's approach to complete streets. In December 2014, ADOT conducted "Laying the Foundation for Complete Streets Workshop" and the "Complete Streets Implementation Workshop."
- **Expansion of Educational Programs** – ADOT continues to distribute thousands of the "Sharing the Road with Pedestrians" booklet. ADOT completed updates in 2011 and 2014, with 3,600 booklets distributed since 2014. An expanded update was reviewed by the SHSP Nonmotorized Emphasis Area Team.
- **Develop transition plan for implementation of pedestrian countdown signals** – A transition plan was developed for each region. Countdown pedestrian signals are now in place at all traffic signals located on the SHS (2014/2015).
- **Develop transition plan for implementation of the ADA** – A transition plan was completed in 2012.
- **Develop a pedestrian safety action plan evaluation program** - HSIP requires "before" and "after" evaluations for HSIP-funded projects.

2017 PSAP Recommendations

Building on 2009 PSAP successes, the 2017 PSAP has developed new recommendations, and in some cases, follow-up recommendations to 2009 PSAP recommendations. The following sections provide recommendations to further improve pedestrian safety. The section begins with specific

[4] http://apps.azdot.gov/files/ADOTLibrary/Multimodal_Planning_Division/Bicycle-Pedestrian/Pedestrian_Safety_Action_Plan-0906.pdf and http://azmemory.azlibrary.gov/cdm/ref/collection/statepubs/id/8040

recommendations to achieve the identified PSAP objectives, summarized in **Table 26**. Additional general recommendations are then provided and categorized into the following areas:

- Education and outreach program recommendations
- Legislative recommendations
- Research and evaluation recommendations
- Engineering treatment recommendations
- Enforcement recommendations
- Pedestrian crash reporting recommendations
- Other recommended initiatives

Table 26: Recommendations to Achieve PSAP Objectives

PSAP OBJECTIVE	RECOMMENDATION
Objective 1: **Reduce crashes at high-crash locations.**	1. Plan, design, program, and construct infrastructure improvements at identified high-crash and high-risk location. Specific countermeasures are identified in Appendix B for each high-crash and high-risk location. 2. Re-evaluate the number of crashes at the identified high-crash and high-risk locations on an annual basis. 3. Proactively identify opportunities to incorporate pedestrian safety improvements into currently programmed projects.
Objective 2: **Prevent crashes at high-risk crash locations as identified through the risk assessment process.**	
Objective 3: **Reduce pedestrian crossing roadway crash types (vehicle turning and vehicle not turning).**	PHBs are recommended for further consideration at 15 high-crash and high-risk locations. A review of the current Five-Year Program (**Table 24)** identified 15 programmed projects that are programmed within or in proximity to high-crash and high-risk locations. Bus stop locations away from traffic signals or PHBs on wide high-speed streets typically have pedestrian crossing crash concerns. ADOT should work with local agencies to ensure that bus stops are located properly and with amenities that can assist pedestrians (particularly seniors and pedestrians from low-income areas) to cross safely. Treatments such as PHBs, raised median islands, advanced yield lines and signs on the approach to the crossing, and overhead lighting are all proven safety countermeasures. Public education approaches are also successful, such as posters on buses (in English and Spanish) that educate pedestrians on proper and safe crossing behavior or safety messages used on buses, in hotels, and even on radio/TV that may help to supplement engineering treatments in high-crash areas. There is also a need for additional police enforcement of the requirement to yield to pedestrians where a pattern of violations exist.
Objective 4: **Reduce the number of pedestrian-involved crashes in which the pedestrian was 20–34 years of age.**	Pedestrian safety public awareness campaigns should specifically target this demographic. A separate analysis of crash types and characteristics of this age demographic is provided in **Appendix C** to assist in ways of better identifying appropriate safety treatments.
Objective 5: **Reduce the number of crashes in dark-not lighted conditions.**	Roadway lighting is recommended for further consideration at 15 high-crash and high-risk locations. Shoulder widening is recommended for further consideration at 2 high-crash and high-risk locations. Pedestrians being struck while walking at night along rural roads leading to Tribal lands is a significant issue that needs to be addressed. Treatments may include a combination of shoulder widening and lighting or finding ways to provide desired services within the community to avoid the need for walking outside of the community. Routine resurfacing of these high-crash corridors should always include consideration of adding or widening paved shoulders or narrowing lanes to provide wider (or at least some) shoulders.

PSAP OBJECTIVE	RECOMMENDATION
	Other treatments to consider should include installing motorist warning signs, and routine police nighttime enforcement of these routes. Obtaining a more complete record of pedestrian crashes on the SHS within tribal lands should be emphasized so that ADOT can better justify pedestrian safety improvements along those roads. ADOT should work with tribal leaders and police to obtain improved crash documentation for the justification of safety funding.
Objective 6: **Reduce pedestrian crashes on controlled access or interstate facilities.**	Pedestrian safety public awareness campaigns should specifically target this crash type. The campaign could include messages on interstate and state highway variable message signs. Education materials could be developed for dissemination at Department of Motor Vehicle locations. Law enforcement can also be provided with education materials for emergency responders to distribute to stranded motorists or those who the assist with road-side incidents. Continued motorist education on the Move Over Law (ARS §28-775E-1-2) would be beneficial, along with more rapid responses to breakdowns and crashes.

Education and Outreach Program Recommendations

1. **Targeted pedestrian safety communications and outreach to communities that are experiencing high numbers of or serious pedestrian crashes** – The outreach can include messages to address certain risky behaviors including:
    a) Limited conspicuity, or pedestrians not being detected, especially at night.
    b) Drivers speeding.
    c) Drivers failing to yield because of not knowing or choosing not to follow traffic safety laws.
    d) Crossing behaviors at transit and other crossing locations.

    Ideas for education campaigns can include posters on buses (in English and Spanish) and safety messages at bus stops, in hotels, and even on radio/TV may help to supplement engineering treatments and enforcement in high-crash areas.
2. **Adult crossing guard guidance and training** – Currently MAG offers region-wide training of adult school crossing guards, but there is a need for statewide guidance on the hiring, training, operation, and monitoring of adult crossing guards (and school officials who supervised the crossing guards) across Arizona for uniformity to ensure proper procedures, equipment, and safety vests are being used.
3. **Educate and encourage transportation agency staff to use the FHWA USLIMITS2 tool for establishing optimal speed limits** – USLIMITS2 is a web-based tool designed to help practitioners set reasonable, safe, and consistent speed limits for specific segments of roads, which takes pedestrians into consideration. USLIMITS is applicable to all types of roads ranging from rural local roads and residential streets to urban freeways.
4. **Continued emphasis on a complete streets approach to design** – Continue to emphasize use of ADOT's *2016 Complete Transportation Guidebook* in design development. Treatments like road diet (roadway reconfiguration), raised medians, separate left-turn phasing, paved shoulders, and traffic calming measures in general can benefit any type of motorist crashes, in addition to reducing pedestrian crashes.
5. **Conduct Designing for Pedestrian Safety Training for tribal/local agency staff and ADOT contractors –** Outreach should be conducted for local agency staff, especially those agencies along the SHS to encourage participation in the FHWA pedestrian-safety trainings hosted by ADOT. Some states, such as Ohio, require consultants to complete designing for pedestrian safety trainings (at the consultant's expense) to be qualified to bid on design projects for state highway design projects.

6. **Provide technical guidance to small agencies experiencing pedestrian challenges –** Tribal and smaller local communities may lack technical capacity in planning, design and operations within their communities to provide safe pedestrian environments to communities along the SHS. Provide technical expertise to these agencies. This can also help empower underserved communities in transportation planning processes to more fully participate in the transportation planning process and feel comfortable expressing their concerns and needs.
7. **Encourage more consistent crash reporting** – Work with DPS, local police agencies, and Tribal communities to encourage consistent collection of more detailed and consistent pedestrian crash reports at the state and local level. Work to ensure the crash report coding is accurate and the narrative descriptions by officers are comprehensive through training provided at the academies and at police/DPS briefings.
8. **Every Day Counts (EDC) initiative** – Continue to use the Every Day Counts (EDC) initiative to promote safety improvements for pedestrians through the EDC-3 effort on Road Diets (Roadway Reconfiguration) and the EDC-4 effort on Safe Transportation for Every Pedestrian. EDC is a state-based model to identify and rapidly deploy proven but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion, and improve environmental sustainability.

Legislative Recommendations

1. **Review the Arizona Revised Statutes (ARS)** – Review the language of Arizona state laws affecting how engineering treatments and educational messages are developed and enforcement is conducted. For example, Arizona is a “yield to pedestrians” state instead of a “stop for pedestrians” state. This will affect the type of signing or pavement markings that can be used in advance of crosswalks, and potentially the messaging to drivers and enforcement approach. This is a continuation of the 2009 recommendation to review ARS related to pedestrians.
2. **Review the status of distracted driver legislation** – State and local agencies within Arizona should implement strategies to address the growing problem of distracted driving. Arizona law, effective July 1, 2018, prohibits drivers under age 18 who have a Class G license from using any wireless device while they hold a learner’s permit and during the first six months of their license. Arizona only bars school bus drivers from texting. Other states such as Texas prohibit the use of cell phones while driving near schools. Any new laws will require public education and enforcement.
3. **Establish a Pedestrian Safety Fund from the enforcement of school and other pedestrian laws** – Through legislation set up a special fund to build pedestrian safety improvements from the fines received from the enforcement of pedestrian-related laws, most notably ARS 28-797 (school crosswalk). This money can be directed for pedestrian safety projects adjacent to schools or other pedestrian generators along the SHS and support the construction of sidewalks, PHBs or other pedestrian improvements.

Research and Evaluation Recommendations

1. **Annual high-crash evaluation program** – An annual review will help ADOT to dentify new hot-spot corridors or intersections. The annual update would review the most recent five-year pedestrian crash data to identify any new locations. The top ten to 20 locations would be the focus for conducting RSAs on an ongoing basis. This step would continue to identify attributes associated with pedestrian fatalities in order to inform policy decisions about high-risk pedestrian areas.
2. **Continue participation by ADOT staff in organizations that promote research and the application of research in pedestrian and traffic safety** – ADOT should be the statewide leader in traffic design, safety and operations and should take the lead in participation in TRB

activities, most notably on the Pedestrian Committee, in the ITE Complete Streets or Pedestrian/Bicycle Standing Committees, APBP, and in the National Committee on Uniform Traffic Control Devices. New concepts that promote pedestrian safety and service should be implemented on the SHS and be shared with agencies statewide.

3. **Research on pedestrian exposure to injuries and fatalities** – This project can create a standardized approach that agencies can use to estimate pedestrian exposure to risk in the form of a Scalable Risk Assessment Methodology. This resource will make it easier for stakeholders to assess exposure to risk and inform funding decisions for a region, which is especially important given the constrained fiscal environment.
4. **Research to identify and conduct pedestrian safety improvement experiments for new traffic control devices or device application in Arizona under the guidance of the Manual on Uniform Traffic Control Devices (MUTCD), Section 1A.10.** – Initiate or support local agencies to participate in the MUTCD experimentation process in order to proactively gather data on treatments that have the potential to improve pedestrian safety. The PHB (originally named the HAWK) was developed and evaluated in the City of Tucson using this process, and was adopted into the 2009 MUTCD. Other treatments that could be researched include automatic detection of pedestrians (instead of relying on passive detection such as pushbuttons), and treatments to assist vision-impaired pedestrians to identify the location of midblock crosswalks and provide these pedestrians directional guidance in skewed crosswalks. ADOT should also pursue permission from the FHWA to implement the RRFB for all agencies within the state (where appropriate). Further research on the application of PHBs could also be pursued.
5. **Conduct research on the relationship between pedestrian crashes and transit stops** – Work with local transit agencies and local agencies/DPS to determine the extent of pedestrian crossing crashes that involve pedestrians who are crossing to or from transit stops. There is very little research on why pedestrians are crossing and if the crossing maneuver was transit related. This research could lead to added crossing treatment at bus stops.
6. **Research pedestrian data collection and detection methods** – Support pooled-fund research into new pedestrian data collection methods, including video detection and crowdsourcing. This will help determine pedestrian exposure and can be used to justify pedestrian safety improvements.
7. **Research pedestrian safety related to vehicle-to-everything (V2X) technology** – Support pooled-fund research related to incorporating pedestrian safety in vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and V2X communication technologies. V2X communication is the passing of information from a vehicle to any entity that may affect the vehicle, and vice versa. It is a vehicular communication system that incorporates other more specific types of communication such as V2I, V2V, vehicle-to-pedestrian (V2P), vehicle-to-device (V2D), and vehicle-to-grid (V2G).

Engineering Treatment Recommendations

1. **Infrastructure improvements** – Plan, program, design, and implement infrastructure improvements at high-crash and high-risk segments, intersections, and interchanges (Refer to **Appendix B**).

While Appendix B provides recommendations at specific locations on the state highway system, the following systematic pedestrian safety countermeasures may be pursued at locations across the state highway system.

2. **Reduce and enforce speed limits** – This is focused on design speeds for state highways which will are frequently shared with pedestrians. Promote strategies to reduce vehicle speeds on

multimodal corridors. Apply FHWA Office of Safety Publication, *Methods and Practices for Setting Speed Limits: An Informational Report*. Educate transportation agency staff at all levels to use the FHWA USLIMITS2 tool, a web-based tool designed to help practitioners set reasonable, safe, and consistent speed limits for specific segments of roads. USLIMITS is applicable to all types of roads ranging from rural local roads and residential streets to urban freeways. USLIMITS2 is of particular benefit to local communities without ready access to engineers experienced in conducting speed studies for setting appropriate speed limits. USLIMITS2 can provide an objective second opinion and increase confidence in speed limit setting decisions.

3. **Explore treatments to reduce motorist speeds on the approach to urbanized areas** – Drivers on rural highways often fail to reduce their speeds as they enter built-up communities, Options may include gateway treatments, enforcement or changes in physical roadway features on the approach to a built-up community.
4. **Improved crosswalk visibility** – Crosswalk visibility enhancements, such as improved crosswalk lighting and enhanced signing and marking helps drivers detect pedestrians, particularly at night. Consider whether ladder or other types of enhanced markings should become standard at all uncontrolled crosswalks.
5. **Advance stop and yield lines** – Encourage the practice of advance yield lines 20 to 50 feet in advance of uncontrolled crosswalks on multi-lane streets, along with YIELD HERE TO PEDESTRIANS signs.
6. **Interchange design modification** – Consider modifications to interchange design practices to eliminate sweeping turn movements to allow shorter crossings and reduce the speed of motorists while turning. Provide corner right-turn bypass islands with a tail pointing upstream (the length twice as long as the width) with a compound radius to better accommodate pedestrians and turning motorists, especially large trucks.
7. **Intersection geometric design practices** – Improve intersection geometric design practices to provide a smaller radius where practical.
8. **Pedestrian signal equipment upgrades** – While all pedestrian signals on the SHS have been converted to countdown pedestrian signals, ensure that all traffic signals are equipped with pedestrian signals where pedestrians are expected to cross. Provide ADA pushbuttons at all new or modified traffic signals (which is expected to be a requirement when PROWAG is adopted) and pursue greater use of Accessible Pedestrian Signals (APS) and pedestrian beaconing for skewed crosswalks where appropriate. Review standard signal designs for the improved placement of pedestrian pushbuttons.
9. **Traffic signal phasing upgrades for pedestrians** –- Consider the use of protected left-turn arrows to separate crossing pedestrians and left turning vehicles. Through the use of the flashing yellow arrows, a signal can be designed to have a protected left-turn phase if there is a pedestrian actuation across the conflicting crosswalk.
10. **Sidewalks** – ADOT RDG, 107.2 – Pedestrian Facilities[5], states:

    "A) Sidewalks: Sidewalks are normally not constructed as a part of a highway project . . . In urban areas, the highway cross section should provide space for sidewalks to be constructed by others in the future."

    ADOT should consider revising the RDG to encourage routine provision of sidewalks, where pedestrians are expected.

[5] https://www.azdot.gov/docs/default-source/business/roadway-design-guidelines.pdf?sfvrsn=8.

11. **Speed display devices** – Install driver feedback speed display devices for driver feedback in areas of high speeds, entrances to local or Tribal communities, schools, or areas where elderly pedestrians are crossing in higher numbers. The devices may also be used to collect speed data to monitor speeds at a particular location.

Enforcement Recommendations

1. **Targeted police enforcement of pedestrian laws** – Pedestrian safety zones can be identified for targeted police enforcement where high numbers of pedestrian crashes or exposure exists. Targeted police enforcement of pedestrian laws that is visible and highly publicized should be coupled with a media campaign on pedestrian safety. Enforcement should be conducted to change behavior and not merely focusing on punishing offenders or raising funds.

APPENDIX A – RISK ASSESSMENT METHODOLOGY

Technical Memorandum No. 2B: Application of Risk Assessment Methodology

Updated: March 24, 2017

Introduction

A key element to improve pedestrian safety in Arizona is to proactively identify locations where pedestrian improvements are needed, leading to projects to address the need.

ADOT PSAP *Technical Memorandum # 2: Crash Data Analysis* identified high pedestrian-crash locations on the state highway system. *Technical Memorandum No. 2* also introduced a risk assessment methodology to proactively identify state highway segments and intersections where investment can help to lower the risk of pedestrian crashes. This document refines the methodology, and summarizes its application to the state highway system.

Risk Assessment Methodology

The risk assessment methodology represents an approach through which locations are identified before pedestrian crashes occur. The proactive methodology documented in this Technical Memorandum is patterned after methodologies proposed by National Cooperative Highway Research Program (NCHRP) Report 803: Pedestrian and Bicycle Transportation Roads—ActiveTrans Priority Tool Guidebook[6], and a risk assessment tool utilized by the Washington State Department of Transportation.[7]

The risk assessment methodology considers factors that are frequently identified as contributing factors to, or environmental/facility conditions that are common to pedestrian crashes on the SHS. The factors are separated into three categories:

- Existing Conditions: factors that relate to the absence of sufficient pedestrian accommodation
- Pedestrian Demand: factors that estimate the presence of pedestrians
- At-Risk Groups: factors in the degree of safety concern that the absence of facilities creates

Application of the methodology occurs in two steps:

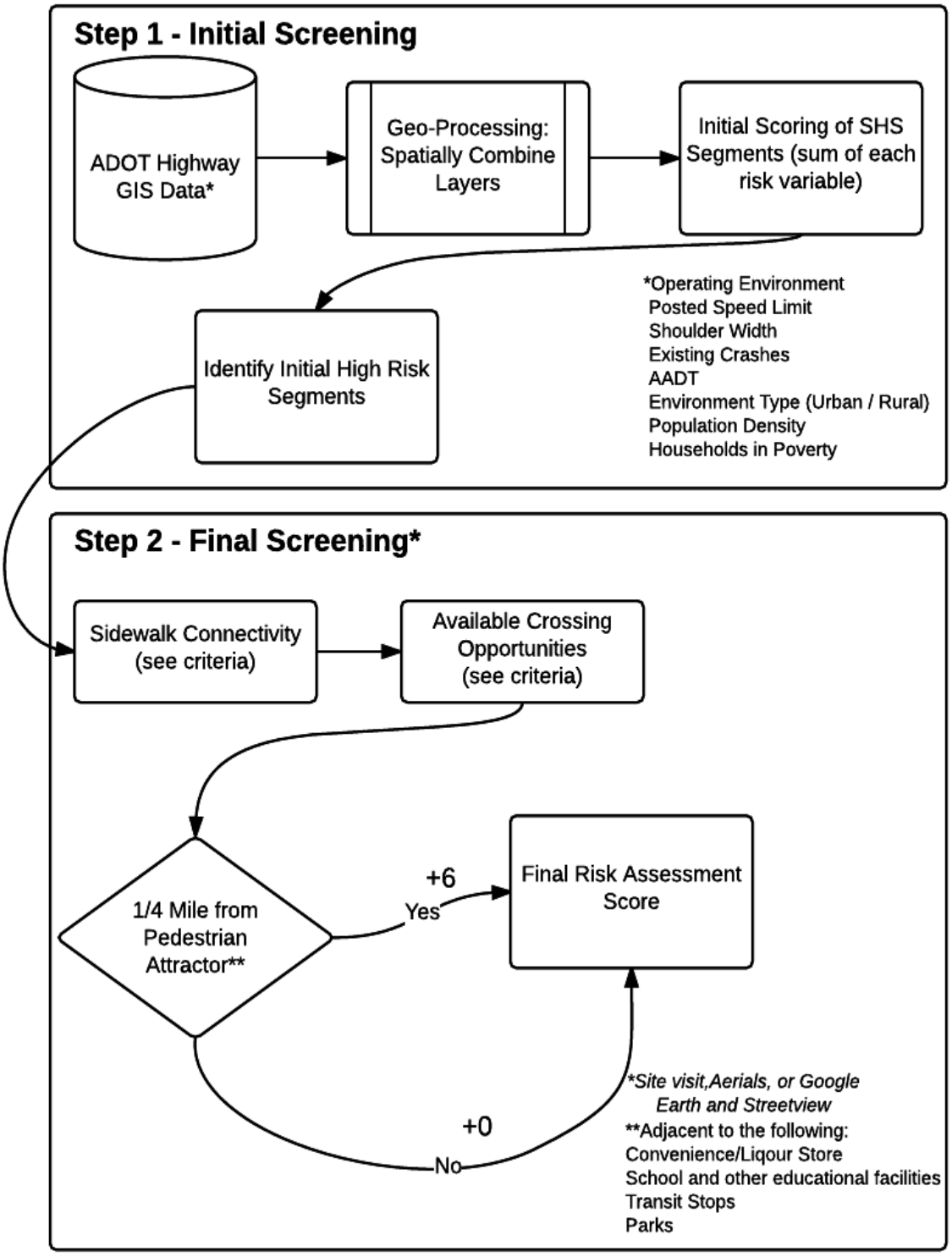
- ***Step 1 – Initial Screening (GIS-Based Screening):*** Utilizing available statewide GIS data, identify and screen potential SHS locations, consistent with established set of risk criteria (Step 1 criteria), where pedestrian facilities should be considered. Step 1 screening is GIS-based.
- ***Step 2 – Final Screening (Visual Review Screening):*** Step 2 utilizes Google Earth and other visual resources to review high-risk segments/location identified in Step 1.

The process is summarized in **Figure 1**.

With these high-risk locations identified, safety treatments or measures can be proactively planned, designed and implemented before a pedestrian crash has occurred.

[6] http://www.trb.org/Main/Blurbs/172459.aspx
[7] http://www.wsdot.wa.gov/NR/rdonlyres/E23FB0A4-C77B-4024-9A74-158C22D16D97/0/RiskPaper.pdf

Figure 10: Risk Assessment Process



Step 1 – Initial Screening (GIS-Based Screening)

Step 1 utilizes GIS data spatial analysis for data-sets listed in **Table 1**.

The risk assessment process identifies high-risk segments of the state highway system. The process excludes access controlled segments on interstates and other freeways. The study team recognizes that pedestrian safety improvements are needed at intersections on state highways, including interchange locations with access-controlled facilities. However, data availability limitations preclude the identification of specific intersection/interchanges, which would require review of items such as curb radii, turning lanes, roadway width, traffic signal timing and operations, etc**.** Detailed identification of each of state highway intersection is beyond the scope of this analysis. It should be noted, however, that 13 intersections/interchanges were identified as high crash locations (Working Paper No. 2), seven of which were interchanges in the Phoenix metropolitan area. Five of these seven interchanges were on I-17 between Indian School Road and Northern Avenue. 3 of the five are single-point urban interchanges.

Step 1 results in a risk score for each state highway roadway segment. A "Total" score was calculated for each roadway feature by summing the individual scores for each risk factor. Segments with the highest risk scores are advanced to the Step 2 assessment.

Step 2 uses recent aerial data or Google Street-View to identify and prioritize the final set of high-risk locations.

Table 2 lists each criterion and the respective points.

Table 27: Risk Assessment Factors, Variables, and Data Sources

Factor	Variable	Data Source
Existing Conditions	Posted Speed Limit	ADOT GIS
	Operating Environment /Number of lanes /Roadway width	ADOT GIS
	Missing Sidewalk Link	ADOT GIS/Visual Inspection/Google Earth/Street View
	Paved Shoulder Width	ADOT GIS
	Prior Crashes	ADOT Safety Data Mart / ALISS Database
	Traffic Volume	ADOT GIS
	Signalized Intersection Spacing	ADOT GIS
Pedestrian Demand	Population Density	U.S. Census Bureau
	Attractors (convenience/liquor stores, schools and education facilities, parks, transit stops)	This data may not be available at the macro/statewide level; it is available at the corridor level from land use maps and visual inspection.
	Land Use (commercial and high-density housing)	This data may not be available at the macro/statewide level; it is available at the corridor level from land use maps and visual inspection.
At-Risk Groups	% Households in Poverty	U.S. Census Bureau
	% Households with No Vehicle	U.S. Census Bureau
	At-Risk Groups: Children, Elderly, Handicapped	This data may not be available at the macro/statewide level; it is available at the corridor level from land use maps and visual inspection.

Table 28: Step 1 Risk Assessment Factors and Points

Factor	Points
Highway Characteristics	
Operating Environment/Width of Roadway	
6 Lane Highway	6
4 or 5 Lane Undivided Highway	3
2 or 3 Lane Undivided Highway	2
2 or 3 or 4 Lane Divided Highway	1
Posted Travel Speed	
>45 mph	6
35-45 mph	4
25-35 mph	2
<25 mph	0
Paved Shoulder Width	
0-4 feet	6
4-8	3
> 8 feet or sidewalk	0
Pedestrian Exposure to Vehicles	
>25,000	6
8,001-25,000 ADT	3
<8,000 ADT	0
Prior Vehicle-Pedestrian Crashes at Location within past Five Years	
4 or more	6
1 – 3	4
Pedestrian Demand	
Environment Type	
Within urbanized area (as designated by U.S. Census)	6
Within one mile of urbanized area (indicates an area with potential to urbanized)	3
Within a rural area	0
Population Density (Population per Square Mile)	
Low-density	0
Medium density	3
High-use recreational	6
At Risk Groups	
Households in Poverty	
% Households in Poverty 2 x statewide average	6
% Households in Poverty above statewide average	3

Step 1 Results

Step 1 segments were defined to be uniform in terms of facility characteristics and environment. Due to the geo-processing of the GIS data, a segment defined in the table commonly consists of multiple sub-segments; thus, an average was taken from each of the sub-segments within the defined segment.

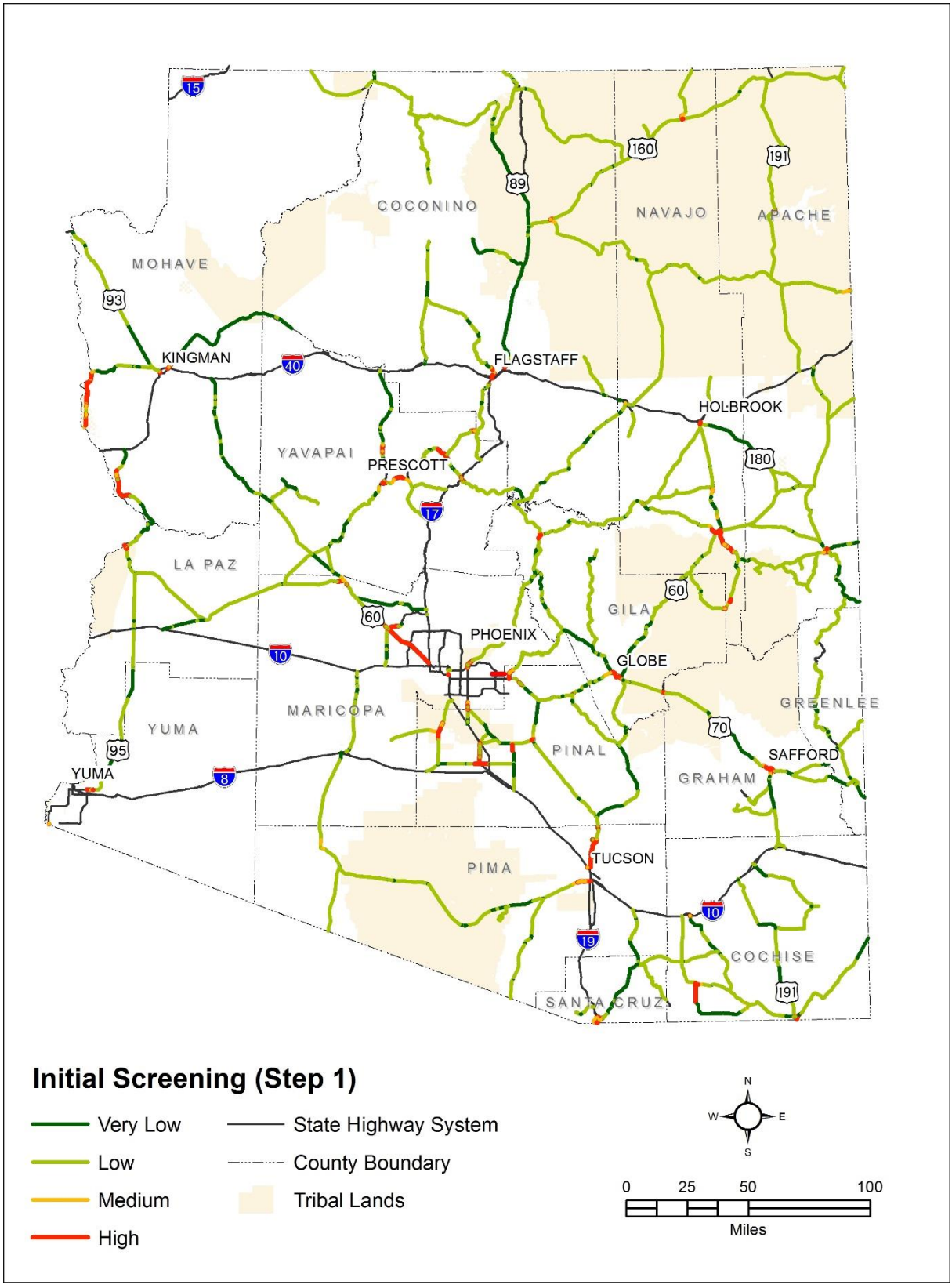
Scores for each roadway segment for each Step 1 criteria are summed to identify a Step 1 "Total" segment score.

A scale was developed based on the distribution of the overall scores assigned to the SHS. The scale is defined in **Table 3**. A map of the results is provided in **Figure 2**.

Table 29: Step 1 Risk Assessment Levels

Scale	Risk Level
1 – 15	Very Low Risk
16 – 25	Low Risk
27 – 31	Medium Risk
> 32	High Risk

Figure 11: Risk Factor Step 1 High Risk Segments



Step 2 – Visual Screening

Step 2 further examines each Step 1 "high risk" location and visually evaluate the segment's area-wide elements such as sidewalk connectivity, signalized intersection spacing or alternate crossing opportunities, and whether the segment is directly adjacent to pedestrian attractors.

This step either maintains the segment's status as being high risk or screens-out the initial high risk status.

The criteria for identifying the initial high-risk location includes the following factors listed in **Table 4.** The highest-scoring segments are classified as Tier 1 segments and are identified in red in **Table 4.**

Table 30: Step 1 Risk Assessment Levels

Factor	Points
Sidewalk Connectivity	
No walkway	6
Walkway connectivity exists but is fragmented	4
Continuous walkway on one side of highway	2
Continuous walkway on both sides of highway	0
Signalized Intersection Spacing or Distance to Alternate Crossing Facility	
>1320 feet	6
1,319 – 660 feet	3
< 660 feet	0
Attractors	
Directly adjacent to known pedestrian attractors: convenience/liquor stores, schools and education facilities, parks, transit stops (approximately ¼ mile)	6

The thresholds used to illustrate the level of risk is defined in **Table 5**.

Table 31: Final Risk Assessment Threshold

Scale	Risk Level
> 48	Tier 1
43 – 48	Tier 2
35 – 43	Tier 3

Table 6 summarizes the high-risk initial screening segments and the final risk assessment score.

Note that all the identified segments will require additional project-level analysis to determine the appropriate level and type of pedestrian accommodation.

Next Steps

The next step in the PSAP will be to define pedestrian safety priorities and document them in *Technical Memorandum No. 4: Countermeasures and Prioritization System.* Prioritized pedestrian safety countermeasures will be identified for high crash locations identified in Technical Memorandum No. 2, and those identified through the risk assessment documented in this Technical Memorandum.

Table 32: High Risk Score Summary

Segment	Area	Beginning Milepost	Ending Milepost	Length (miles)	Initial Average Score	Sidewalk Connectivity Score	Crossing Opportunity Score	Pedestrian Attractors Score	Final Risk Assessment Score
SR 95 (Mohave Valley Highway)	Bullhead City	248.5	250.0	1.5	33	0	6	0	39
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	247.5	248.5	1.0	32	0	6	6	44
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	246.0	247.5	1.5	36	0	6	0	42
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	244.0	246.0	2.0	39	0	6	6	51
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	241.5	244.0	2.5	37	2	6	6	51
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	239.0	242.0	3.0	38	2	6	0	46
SR 95 SR 95 (Mohave Valley Highway)	Bullhead City	235.5	239.0	3.5	37	4	6	6	53
SR 95 SR 95 (Mohave Valley Highway)	Fort Mojave	231.0	232.0	1.0	32	6	6	0	44
SR 95 SR 95 (Mohave Valley Highway)	Mohave Valley	229.4	230.5	1.1	34	6	3	6	49
SR 95 SR 95 (Mohave Valley Highway)	Mohave Valley	227.3	229.3	2.0	34	6	6	0	46
US 93	Kingman	70.1	71.0	0.9	32	0	6	0	38
SR 66 (Andy Devine Avenue)	Kingman	56.4	57.2	0.8	32	0	3	0	35
SR 66 (Andy Devine Avenue)	Kingman	57.8	58.5	1.3	33	4	6	0	43
SR 95	Lake Havasu City	186.0	192.0	6.0	35	4	6	0	45
SR 95	Lake Havasu City	183.0	186.0	3.0	34	2	3	6	45
SR 95	Lake Havasu City	181.5	183.0	1.5	32	2	0	6	40
SR 95	Lake Havasu City	177.0	181.5	4.5	36	2	6	0	44
SR 347 (Maricopa Road)	Maricopa	171.4	175.4	4.0	36	4	6	6	52
SR 347 (Maricopa Road)	Maricopa	175.4	177.0	1.6	35	6	6	0	47
SR 287 (Arizona Boulevard)	Coolidge	131.5	134.3	2.8	32	0	3	6	41
SR 87 (Beeline Highway)	Mesa / Scottsdale	177.0	181.0	4.0	33	6	6	0	45
US 60 (Grand Avenue)	Phoenix	159.0	160.0	1.0	39	2	6	6	53
US 60 (Grand Avenue)	Glendale	156.5	159.0	2.5	43	2	6	6	57
US 60 (Grand Avenue)	Glendale	152.0	155.6	3.6	44	2	6	6	58
US 60 (Grand Avenue)	Peoria	149.0	152.0	3.0	43	2	6	6	57
US 60 (Grand Avenue)	Sun City	146.3	148.0	1.7	38	6	3	6	53
US 60 (Grand Avenue)	Surprise	143.0	146.3	3.3	38	6	6	6	56
US 60 (Grand Avenue)	Surprise	138.0	143.0	5.0	34	2	6	0	42
US 60X	Apache Junction	189	194	5	40	6	6	6	58
US 60	Wickenburg	199.0	199.7	0.7	34	0	0	6	40
US 60	Wickenburg	107.5	109.7	2.2	33	2	6	6	47
SR 89	Chino Valley	326.0	329.3	3.3	33	0	6	6	45
SR 89	Prescott	312.0	313.5	1.5	35	6	6	0	47
SR 69	Prescott	294.5	296.0	1.5	34	6	3	0	43
SR 69	Prescott Valley	286.5	289.7	3.2	39	2	6	6	53
SR 89A	Cottonwood	349.8	356.0	6.2	35	0	6	6	47

Segment	Area	Beginning Milepost	Ending Milepost	Length (miles)	Initial Average Score	Sidewalk Connectivity Score	Crossing Opportunity Score	Pedestrian Attractors Score	Final Risk Assessment Score
SR 260	Cottonwood	206.0	209.0	3.0	36	0	6	6	48
SR 260	Camp Verde	217.5	219.0	1.5	32	6	6	0	44
SR 89A	West Sedona	371.0	373.0	2.0	32	0	6	6	44
SR 89A (S Milton Road)	Flagstaff	402.0	403.0	1.0	37	0	6	6	49
US 180 (N Fort Valley Road)	Flagstaff	216.0	218.7	2.7	32	0	6	6	44
US 89	Flagstaff	420.0	421.0	1.0	35	4	6	0	45
SR 260	Show Low	337.8	340.0	2.2	34	0	6	0	40
US 60	Show Low	340.0	341.1	1.1	32	0	6	6	44
SR 260	Show Low / Pinetop-Lakeside	341.0	343.5	2.5	33	0	6	0	39
SR 260	Pinetop-Lakeside	343.5	348.0	4.5	34	4	6	0	44
SR 260	Pinetop-Lakeside	348.0.	354.0	6.0	32	0	6	6	44
US 191	Springerville	400.0	402.5	2.5	32	6	6	0	44
US 260	Springerville	396.0	398.0	2.0	32	6	6	0	44
SR 80 (16th Street)	Douglas	366.0	367.0	1.0	35	0	6	0	41
US 191 (Pan American Avenue)	Douglas	0.0	1.0	1.0	35	2	6	6	49
US 191 (Pan American Avenue)	Douglas	365.0	366.0	1.0	35	2	6	0	43
SR 92	Sierra Vista	321.0	324.3	3.3	37	2	6	0	45
SR 92	Sierra Vista	324.3	329.5	5.2	36	6	6	0	48
SR 90 (Fry Boulevard)	Sierra Vista	320.0	323.8	3.8	36	2	6	6	50
SR 86 (Ajo Way)	Tucson	169.7	171.0	1.3	36	4	3	6	49
SR 86 (Ajo Way)	Tucson	166.2	168.7	2.5	32	6	0	0	38
SR 82 (E Patagonia Highway)	Nogales	1.5	3.0	1.5	33	4	6	0	43
SR 189 (N Mariposa Road)	Nogales	1.7	3.0	1.3	35	2	6	0	43
I-19 (Uncontrolled access near border)	Nogales	0.0, Arroyo Blvd (I-19 BL)	1.0	1.0	34	0	6	6	46
SR 77 (Miracle Mile)	Tucson	68.2	69.5	1.3	35	0	6	6	47
SR 77 (Oracle Road)	Tucson	69.5	72.0	2.5	41	0	4	6	51
SR 77 (Oracle Road)	Tucson	72.0	74.85	2.8	35	6	6	6	53
SR 77 (Oracle Road)	Tucson	74.9	79.1	4.2	35	6	6	6	53
SR 77	Catalina	86.0	87.5	1.5	35	2	6	0	43
SR 88 (N Apache Trail)	Apache Junction	196.2	198.0	1.8	33	6	6	0	45
US 60 (N Broad Street)	Globe	247.0.	253.0	6.0	34	0	3	6	43
US 60	Gold Canyon	201.5	203.0	1.5	32	6	6	0	44
SR 95	Parker	143.0	145.0	2.0	33	0	6	6	45
SR 387 (N Pinal Avenue)	Casa Grande	1.0	8.0	7.0	34	4	6	0	44
SR 84 (N Gila Bend Highway)	Casa Grande	176.0	177.6	1.6	35	4	6	0	45
SR 87 (Beeline Highway)	Payson	252.0	254.0	2.0	32	0	6	6	44
SR 260	Payson	252.0	253.0	1.0	32	0	4	6	42

Segment	Area	Beginning Milepost	Ending Milepost	Length (miles)	Initial Average Score	Sidewalk Connectivity Score	Crossing Opportunity Score	Pedestrian Attractors Score	Final Risk Assessment Score
SR 260	Heber	305.0	306.0	1.0	32	0	6	6	44
SR 77 (Apache Avenue)	Holbrook	387.6	389.0	1.4	33	2	6	0	41
US 70 (W Thatcher Boulevard)	Thatcher / Safford	336.0	342.0	6.0	35	0	6	6	47
US 191 (S 1st Avenue)	Safford	118.5	121.0	2.5	33	2	6	6	47
US 160 (Navajo Trail)	Tuba City	321.7	322.7	1.0	33	6	6	0	45
US 163	Kayenta	393.0	395.6	2.6	33	0	6	6	45

APPENDIX B – LOCATION AND COUNTERMEASURE SHEETS

Potential Countermeasures for US 160, High-Crash Segment 1

General Project Information

Primary Route/Street: US 160
City/Town Name: Tuba City
County: Apache
District: Northcentral
Begin Limit: MP 323.0
End Limit: MP 324.5
Segment Length: 1.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Navajo Indian Reservation (Tribal)
Google Map: https://goo.gl/maps/jGx4WzWjUev

Location Summary

The US 160 segment is located on the Navajo Nation outside of Tuba City. Four pedestrian crashes were reported; three resulted in pedestrian fatalities and one in a serious injury.
Programmed Projects: None
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Two-way, two-lane highway
AADT: 4,355 vehicles per day
Posted Speed Limit: 65 mph
Sidewalks: None
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 4 (3 involved alcohol, and 1 marked "Unknown")
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: None

Project Need

The reported pedestrian crashes along US 160 between MP 323 and MP 324.5 have occurred at night where there is currently no lighting. The crash types were predominately *Walking Along Roadway*. Small clusters of housing exist outside of Tuba City, which may lead to pedestrian use along US 160.

Project Purpose

Increase the visibility of potential pedestrians along US 160 and increase awareness of safer pedestrian travel through pedestrian safety education.

Potential Countermeasures — *Conceptual Cost*

Option 1: Pedestrian Warning Signs

Crashes are a result of alcohol involvement and not a site deficiency. Consider pedestrian warning signs for motorists (e.g., "pedestrians ahead" signs) with yellow flashers. Cost is minimal.

Option 2: Engineering Countermeasures

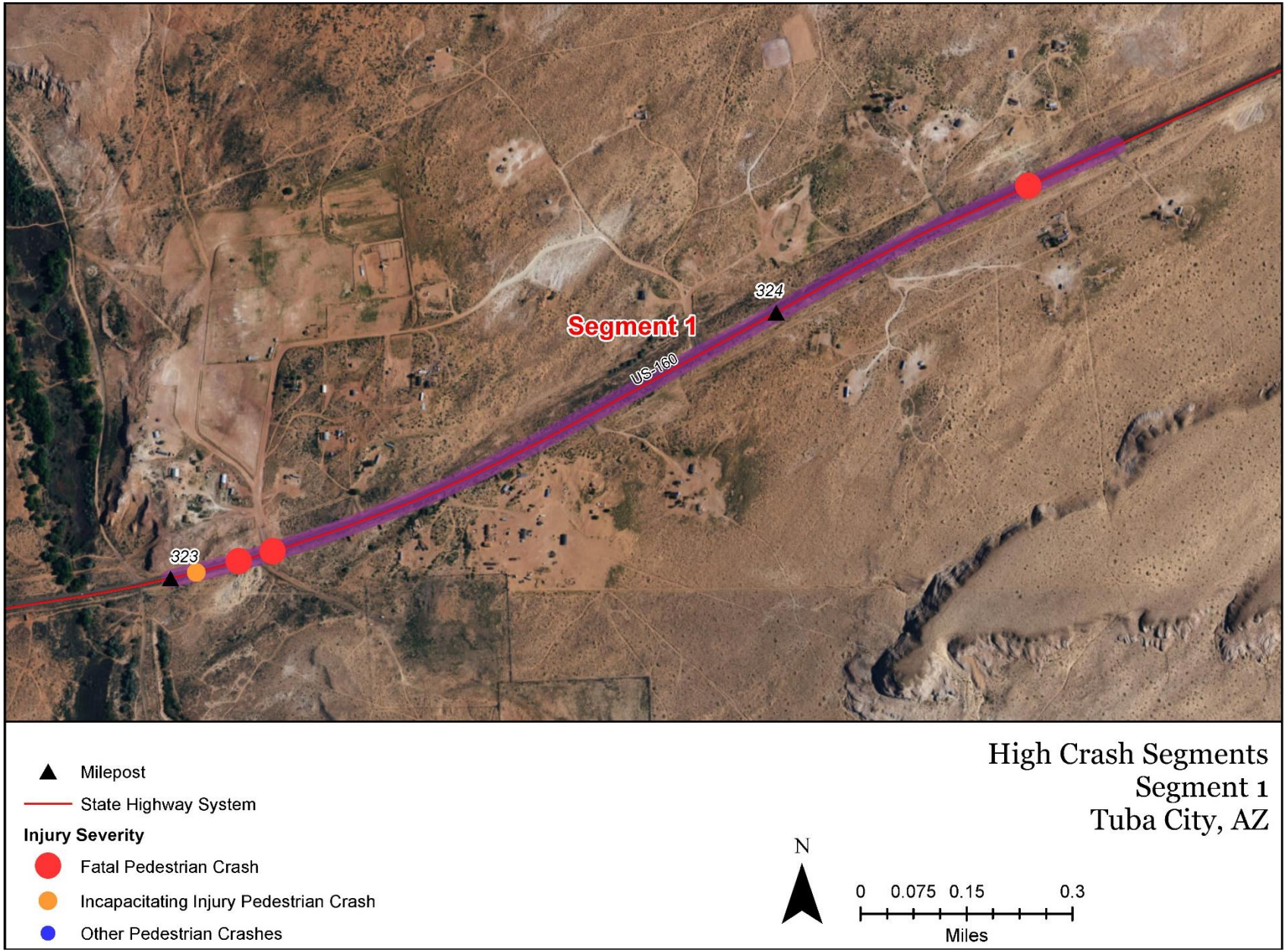
Provide Roadway Lighting **$535,040**

Extend the roadway lighting to outside of the Tuba City boundary where lighting currently exists (MP 322.4, northeast of Reservoir Road to MP 324.3).

Option 3: Pedestrian Education Campaign —

Provide ADOT pedestrian safety pamphlets to local businesses for distribution. Safety vests can be provided for pedestrians anticipated to walk during the night.

Estimated Planning Level Total Segment Conceptual Cost: $535,040


Segment 1
US-160
323
324
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 1
Tuba City, AZ
N
0 0.075 0.15 0.3
Miles

Potential Countermeasures for US 191, High-Crash Segment 2

General Project Information

Primary Route/Street: US 191
City/Town Name: Chinle
County: Apache
District: Northeast
Begin Limit: MP 448.0
End Limit: MP 449.0
Segment Length: 1 mile
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Navajo Indian Reservation
Google Map: https://goo.gl/maps/pAW41W6G4AP2

Location Summary

The US 191 segment is located on the Navajo Indian Reservation outside the City of Chinle. Three pedestrian crashes were reported, and all resulted in pedestrian fatalities.

Programmed Projects: None
Identified in 2009 PSAP: Partially
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Two-way, two-lane highway
AADT: 4,456 vehicles per day
Posted Speed Limit: 65 mph
Sidewalks: None
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 3 (1 involved alcohol/drugs, and the other 2 were "Unknown")
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: None

Project Need

The reported pedestrian crashes along US 191 between MP 448.0 and MP 449.0 have occurred during dark conditions. The crash types included *Pedestrian in Roadway*. Small clusters of housing exist north of Chinle, which may lead to pedestrian use along US 191 with limited paved shoulder width in between.

Project Purpose

Reduce the number of pedestrian crashes on US 191 by increasing the visibility of potential pedestrians and providing safe crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Widen Shoulders — **$594,000**

One of the common crash types included *Walking Along the Roadway.* The existing cross-section along US 160 includes 1' shoulder widths. At least 5' is recommended to provide adequate separation.

Provide Roadway Lighting — **$309,760**

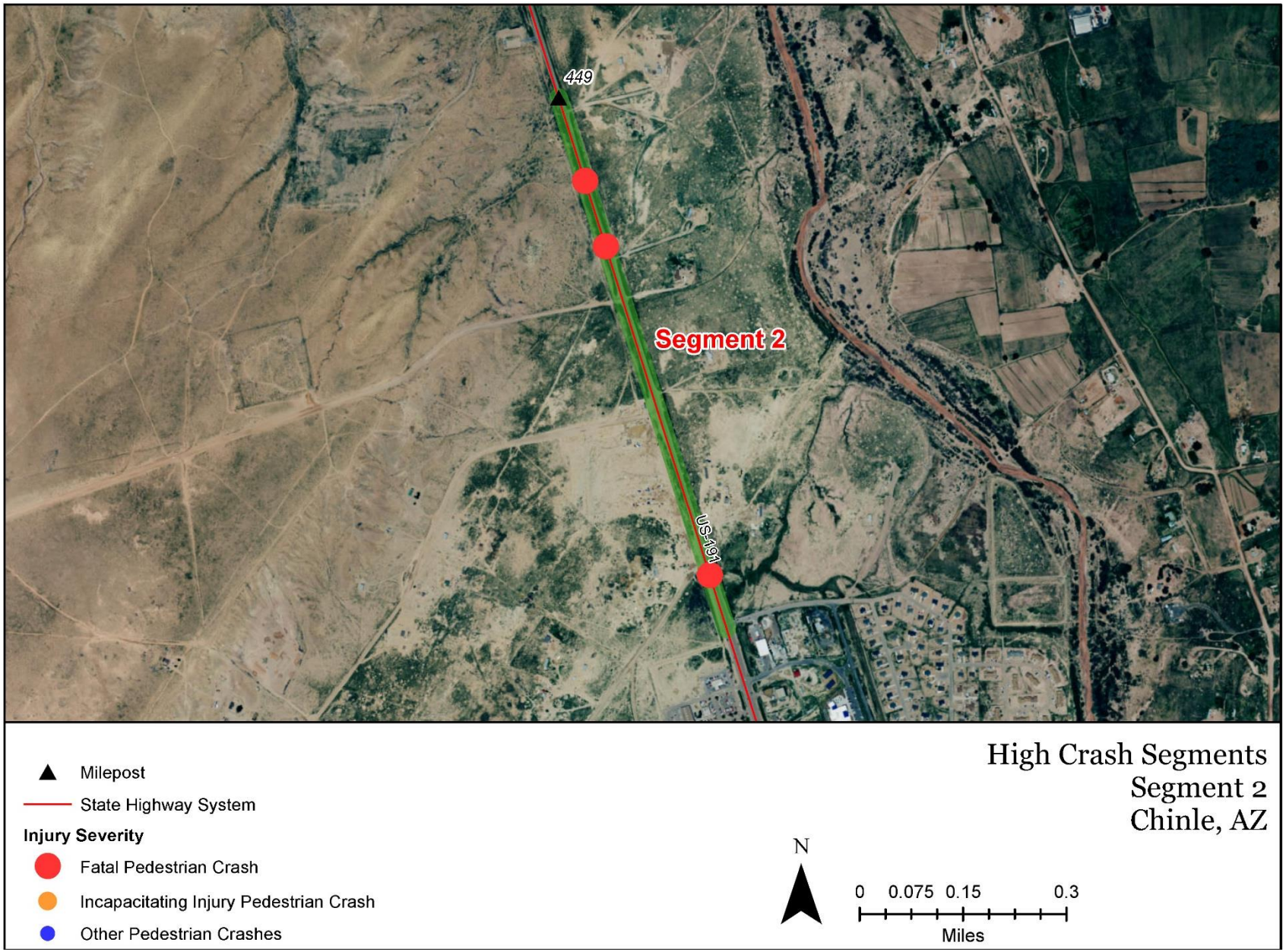
Extend the roadway lighting north of the Chinle city boundary from where there is existing lighting, MP 448.2 to MP 449.3.

Two motor vehicle crashes occurred during dark/not lighted conditions during the study period.

Option 2: Pedestrian Education Campaigns — —

Provide ADOT pedestrian safety pamphlets to local businesses for distribution. Safety vests can be provided for pedestrians anticipated to walk during the night.

Estimated Planning Level Total Segment Conceptual Cost: $903,760


449
Segment 2
US-191
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 2
Chinle, AZ
N
0 0.075 0.15 0.3
Miles

Potential Countermeasures for SR 68, High-Crash Segment 3

General Project Information

Primary Route/Street: SR 68
City/Town Name: Golden Valley
County: Mohave
District: Northwest
Begin Limit: MP 18.0
End Limit: MP 24.3
Segment Length: 6.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/WGzYF3XhMon

Location Summary

The SR 68 segment is in Golden Valley, northwest of Kingman. Seven pedestrian crashes were reported, with six resulting in fatal or incapacitating injuries (one fatality).
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Five-lane highway (TWLTL)
AADT: 9,080 vehicles per day
Posted Speed Limit: 55–65 mph
Sidewalks: None
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 7 (3 involved alcohol/drugs)
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The majority of reported pedestrian crashes along MP 18.0 - MP 24.3 have occurred during dark/night conditions. The majority of reported crash types include *Crossing Roadway – Vehicle Not Turning*. No pedestrian facilities exist along the high-speed facility. The SR 68 PA indicated that speeding is a common issue.

Project Purpose

Reduce the number of pedestrian crashes on SR 68 by increasing the visibility of potential pedestrians and providing safe crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Construct Raised Median — **$5,860,620**

No median exists east of Verde Road other than a TWLTL. The raised median would provide a pedestrian crossing refuge and increase overall safety for all transportation modes. This countermeasure was recommended in the 2016 SR 68 Golden Valley PA (MP 14.0 - MP 27.16). *Cost is based on the Final PA, which includes a raised median and roundabout at Bacobi.*

Provide Roadway Lighting — **$844,800**

Evaluate the need for lighting along the corridor between Bacobi Road to Verde Road (approximately 3 miles) to increase pedestrian visibility. *In addition to the pedestrian-motor vehicle crashes, 38 motor vehicle crashes occurred during dark/not lighted conditions during the study period.*

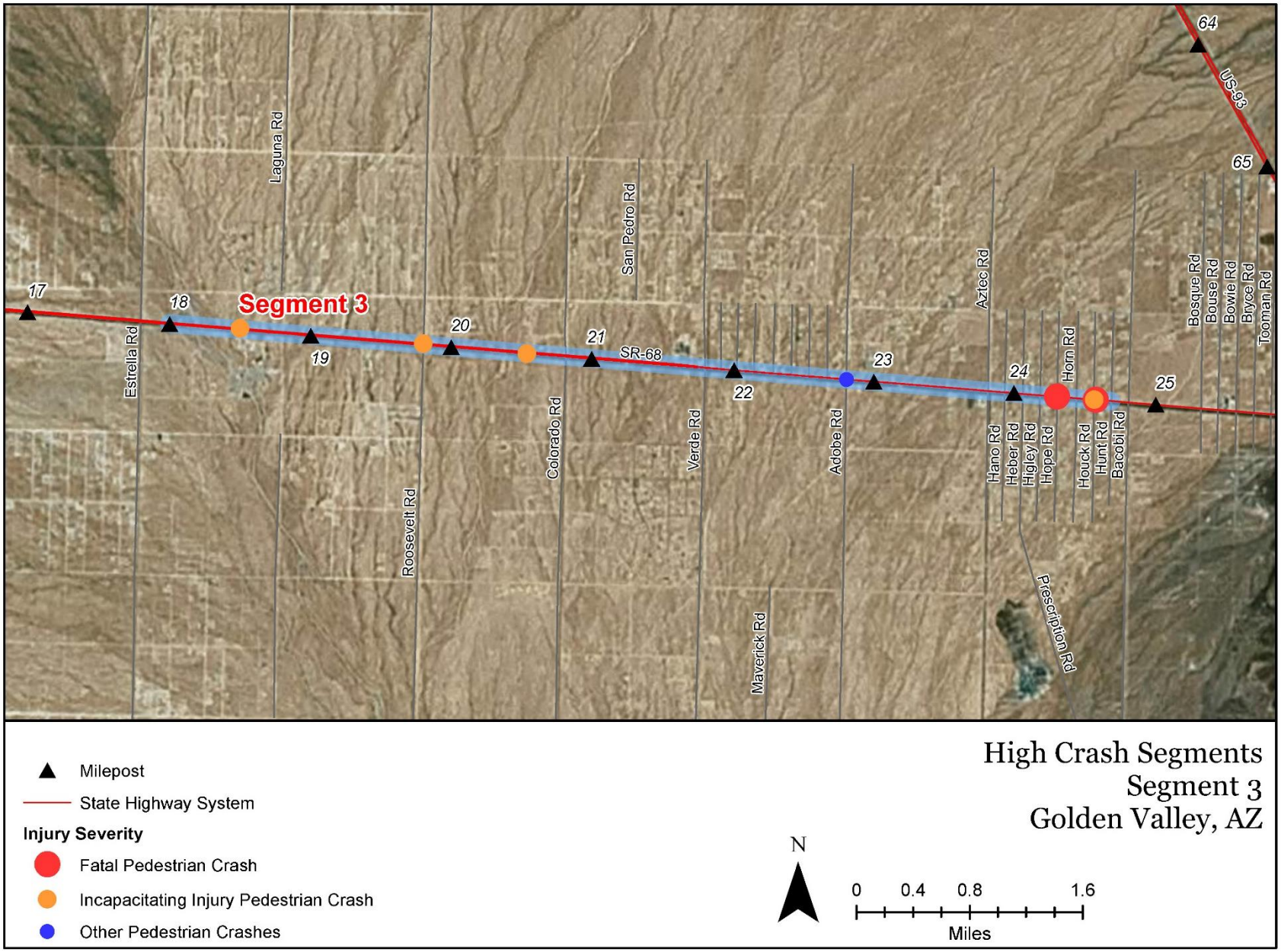
Pedestrian Crossing Improvements — **$173,959**

Provide designated crossing areas with appropriate crossing enhancements and warnings to motorist. The 2016 SR 68 Golden Valley PA recommended roundabouts, which can improve crossing opportunities and slow down traffic. Evaluate the need for a PHB with a raised median refuge or traffic signal between Aztec Road and Bacobi Road.

Option 2: Enforcement — —

Increase enforcement to target speeding along the corridor.

Estimated Planning Level Total Segment Conceptual Cost: $6,879,379


Segment 3
17
18
19
20
21
22
23
24
25
64
65
US-93
SR-68
Laguna Rd
Estrella Rd
Roosevelt Rd
San Pedro Rd
Colorado Rd
Verde Rd
Maverick Rd
Adobe Rd
Aztec Rd
Hano Rd
Heber Rd
Higley Rd
Hope Rd
Horn Rd
Houck Rd
Hunt Rd
Bacobi Rd
Prescription Rd
Bosque Rd
Bouse Rd
Bowie Rd
Bryce Rd
Tooman Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 3
Golden Valley, AZ
N
0
0.4
0.8
1.6
Miles

Potential Countermeasures for SR 68, High-Crash Segment 4

General Project Information

Primary Route/Street: SR 68
City/Town Name: Bullhead City
County: Mohave
District: Northwest
Begin Limit: MP 2.0
End Limit: MP 3.5
Segment Length: 1.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/os9N528wdpA2

Location Summary

The SR 68 segment is located northeast of Bullhead City. Three pedestrian crashes were reported, with two resulting in incapacitating or fatal injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash-/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Five-lane undivided/four-lane divided sections
AADT: 8,613 vehicles per day
Posted Speed Limit: 55 mph
Sidewalks: None
Lighting: Intersection lighting only
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 3 (all 3 involved alcohol/drugs)
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: Gas station

Project Need

The reported pedestrian crashes along MP 2.0 - MP 3.5 have occurred at night where there is a lack of roadway lighting. The reported crash type include *Crossing Roadway – Vehicle Not Turning*. No pedestrian facilities exist along the wide high-speed facility.

Project Purpose

Reduce the number of pedestrian crashes on SR 68 by increasing the visibility of potential pedestrians and providing safe crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Option 1: No Improvement

No improvements (e.g., result of crashes involving distraction or alcohol involvement and not a site deficiency).

Option 2: Engineering Countermeasures

Construct Raised Median **$472,247**

Construct a continuous raised median, providing a consistent SR 68 cross-section. There is currently an approximate 2,900' gap between two median divided section of the highway.

Pedestrian Crossing Improvements **N/A**

Evaluate the need for future pedestrian crossing improvements such as a traffic signal as the land north of the highway is developed.

Provide Roadway Lighting **$287,232**

Evaluate the need for lighting to increase visibility as this section becomes more developed and pedestrian traffic is more common.

In addition to the pedestrian crashes, eight motor vehicle crashes occurred during dark/not lighted conditions during the study period.

Estimated Planning Level Total Segment Conceptual Cost: $759,479


Segment 4
SR-68
2
3
Florence Ave
Sunridge Rd
Sunridge Ct
Sundrops Dr
Sundance Dr
Sharon Rd
Sunbeam Dr
Indian Head Dr
Landon Dr
Landon West Dr
Landon East Dr
Sunbonnet Dr
Sundial Dr
Sunflower Dr
Sunglow Dr
Sunlamp Dr
Indian Hill Dr
Warren Rd
Campbell Rd
Warren Ct
Sun River Rd
Mccormick Blvd
Yucca St
San Sabo Pl
Mercer
Milepost
State Highway System
Tribal Lands
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 4
Bullhead City, AZ
N
0
0.125
0.25
0.5
Miles

Potential Countermeasures for SR 95, High-Crash Segment 5

General Project Information

Primary Route/Street: SR 95
City/Town Name: Fort Mohave
County: Mohave
District: Northwest
Begin Limit: MP 237.4
End Limit: MP 239.2
Segment Length: 1.8 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/Z4BHv7CAyJm

Location Summary

The SR 95 segment is in Fort Mohave. Five pedestrian crashes were reported, with two resulting in incapacitating injuries and one with fatal injuries.
Programmed Projects: FY 2019 Modernization project; Teller Road to Aztec Road (PN: 095 MO 237 F0056 01D)
Identified in 2009 PSAP: No
Segment Type (High-Crash/High Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 27,700 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Fragmented
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 5 (1 involved alcohol/drugs)
Crosswalk: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial, medical, and schools

Project Need

The reported pedestrian crashes along MP 237.4 - MP 239.2 occurred during both daylight and night conditions with the majority being crossing related. The segment lacks a continuous sidewalk system, and signalized crossing opportunities are limited.

Project Purpose

Reduce the number of pedestrian crashes on SR 95 by increasing the visibility of potential pedestrians and providing safe crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted on SR 95 within the Fort Mohave area.

Construct a Raised Median — **--**

As programmed in the 2018–2022 ADOT Five Year Transportation Facilities Construction Program ($4,726,000). The project includes raised medians and a roundabout at Aztec Road.

Provide Roadway Lighting — **$1,013,760**

Provide continuous lighting along the corridor within the Fort Mohave area. Existing lighting currently exists at only at signalized intersections.

Eight motor vehicle crashes occurred during dark/not lighted conditions during the study period.

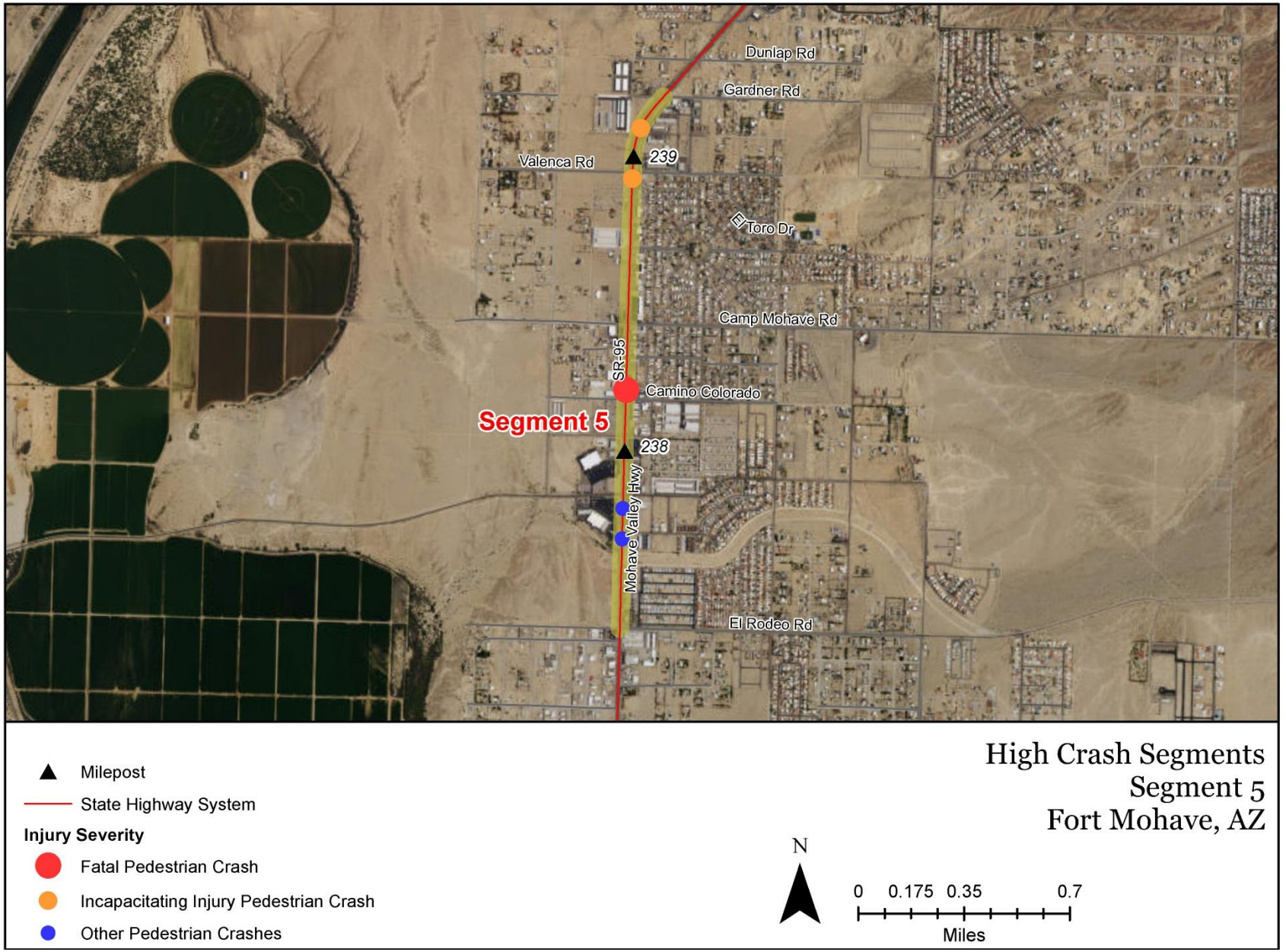
Install Sidewalks — **$2,681,035**

Provide sidewalks on both sides of SR 95 between Valencia Road to Courtney Place (approximately 1.9 miles). Local policy should be implemented to require new developments to provide sidewalk along frontage.

Enhance Mid-Block Crossing Opportunities — **$173,959**

Provide designated crossing areas with a PHB between the signalized intersections. Between Aztec Road and Camp Mohave Road may be a potential location.

Estimated Planning Level Total Segment Conceptual Cost: $3,888,754


Dunlap Rd
Gardner Rd
Valenca Rd
239
El Toro Dr
Camp Mohave Rd
SR-95
Camino Colorado
Segment 5
238
Mohave Valley Hwy
El Rodeo Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 5
Fort Mohave, AZ
N
0 0.175 0.35 0.7
Miles

Potential Countermeasures for SR 73, High-Crash Segment 6

General Project Information

Primary Route/Street: SR 73
City/Town Name: Whiteriver
County: Navajo
District: Southeast
Begin Limit: MP 339.0
End Limit: MP 341.0
Segment Length: 2.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: White Mountain Apache Tribe (Tribal)
Google Map: https://goo.gl/maps/NN7ktNeQwY92

Location Summary

The SR 73 segment is located in Whiteriver. Five pedestrian crashes were reported, with one resulting in incapacitating injuries and three with fatal injuries.
Programmed Projects: None
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 6,600 vehicles per day
Posted Speed Limit: 45–50 mph
Sidewalks: MP 339 - MP 340
Lighting: Segment and intersection
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 5 (all 5 involved alcohol/drugs)
Crosswalk: Striped only, at Fork Road and Elm Street
Other Pedestrian Attractors/Generators: Commercial, schools

Project Need

The majority of the reported pedestrian crashes along MP 339.0 - MP 341.0 occurred during dark/night conditions. The reported crash types include *Crossing Roadway – Vehicle Not Turning* and *Pedestrian in Roadway*.

Project Purpose

Reduce pedestrian crashes that involve pedestrian intoxication.

Potential Countermeasures — *Conceptual Cost*

An RSA was conducted that included this segment in 2011. The RSA should be reviewed for recommendations focused on pedestrian safety.

Option 1: No Improvement

No improvement (e.g., crashes result from distraction or alcohol involvement and not a site deficiency).

Option 2: Engineering Countermeasure

Roadway Reconfiguration **$140,822**

Evaluate the possibility to reduce the number of lanes on SR 73 through Whiteriver, as traffic volumes do not require the existing five-lane facility. The space could be utilized/reconfigured as a separated pedestrian pathway.

Option 3: Engineering Countermeasure

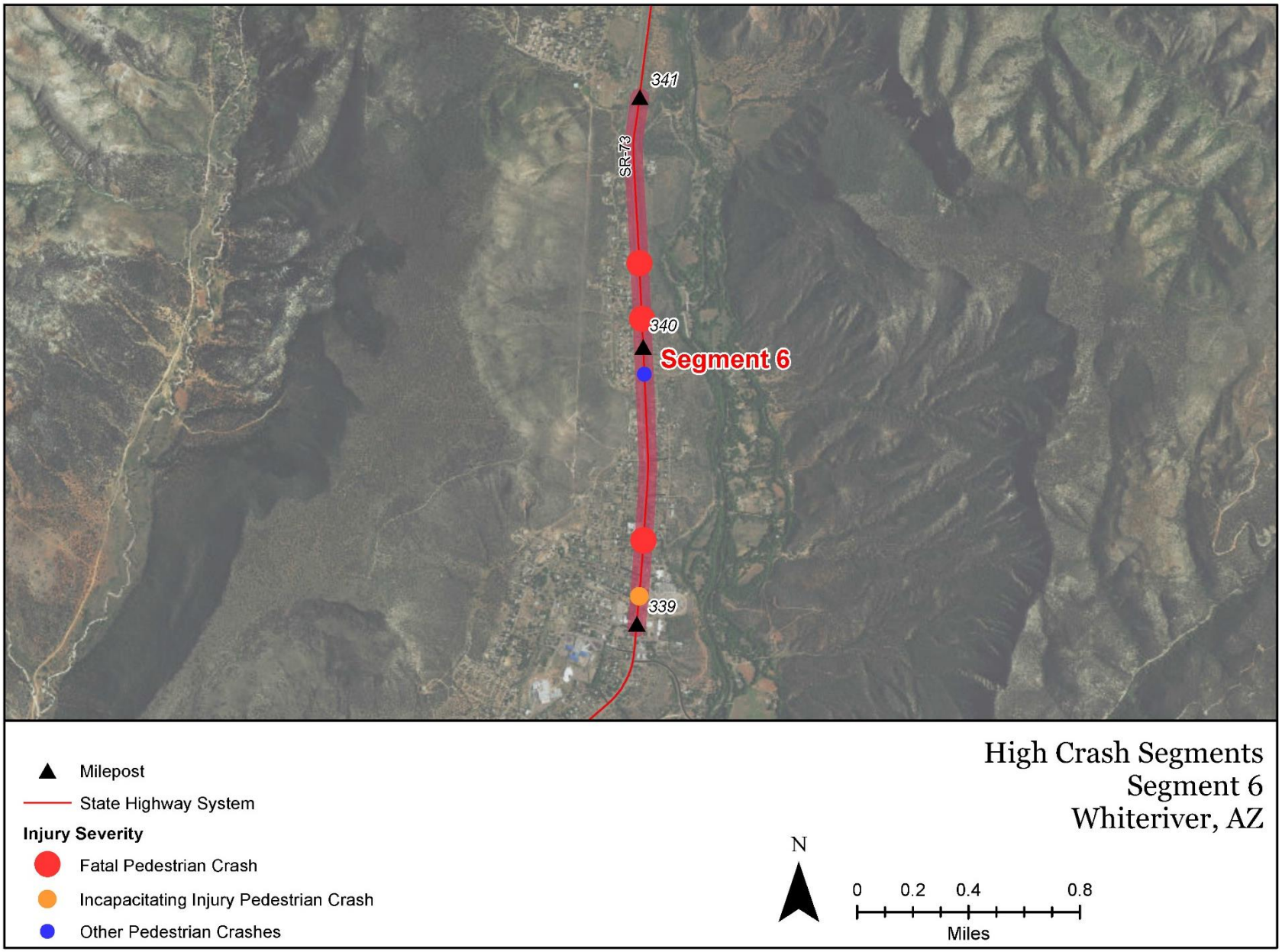
Construct a Raised Median **$2,862,102**

The raised median would provide a pedestrian crossing refuge and help to control access along the segment

Option 4: Pedestrian Education Campaign —

Provide ADOT pedestrian safety pamphlets to local businesses for distribution.

Estimated Planning Level Total Segment Conceptual Cost: **Option 2: $140,882**
Option 3: $2,862,102


341
SR-73
340
Segment 6
339
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 6
Whiteriver, AZ
N
0
0.2
0.4
0.8
Miles

Potential Countermeasures for SR 92, High-Crash Segment 7

General Project Information

Primary Route/Street: SR 92
City/Town Name: Sierra Vista
County: Cochise
District: Southcentral
Begin Limit: MP 321
End Limit: MP 326.7
Segment Length: 5.7 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/Y5J3woZsJBA2

Location Summary

The SR 92 segment is located northeast of Sierra Vista. Twelve pedestrian crashes were reported, with two resulting in incapacitating injuries and two with fatal injuries.
Programmed Projects: Intersection improvements at Foothills Boulevard; TRACS # H826501C
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane divided/undivided sections
AADT: 19,000–26,000 vehicles per day
Posted Speed Limit: 45–55 mph
Sidewalks: Paved path, north of Buffalo Soldier Trial
Lighting: At signalized locations
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 12 (5 involved alcohol/drugs)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial, churches, residential

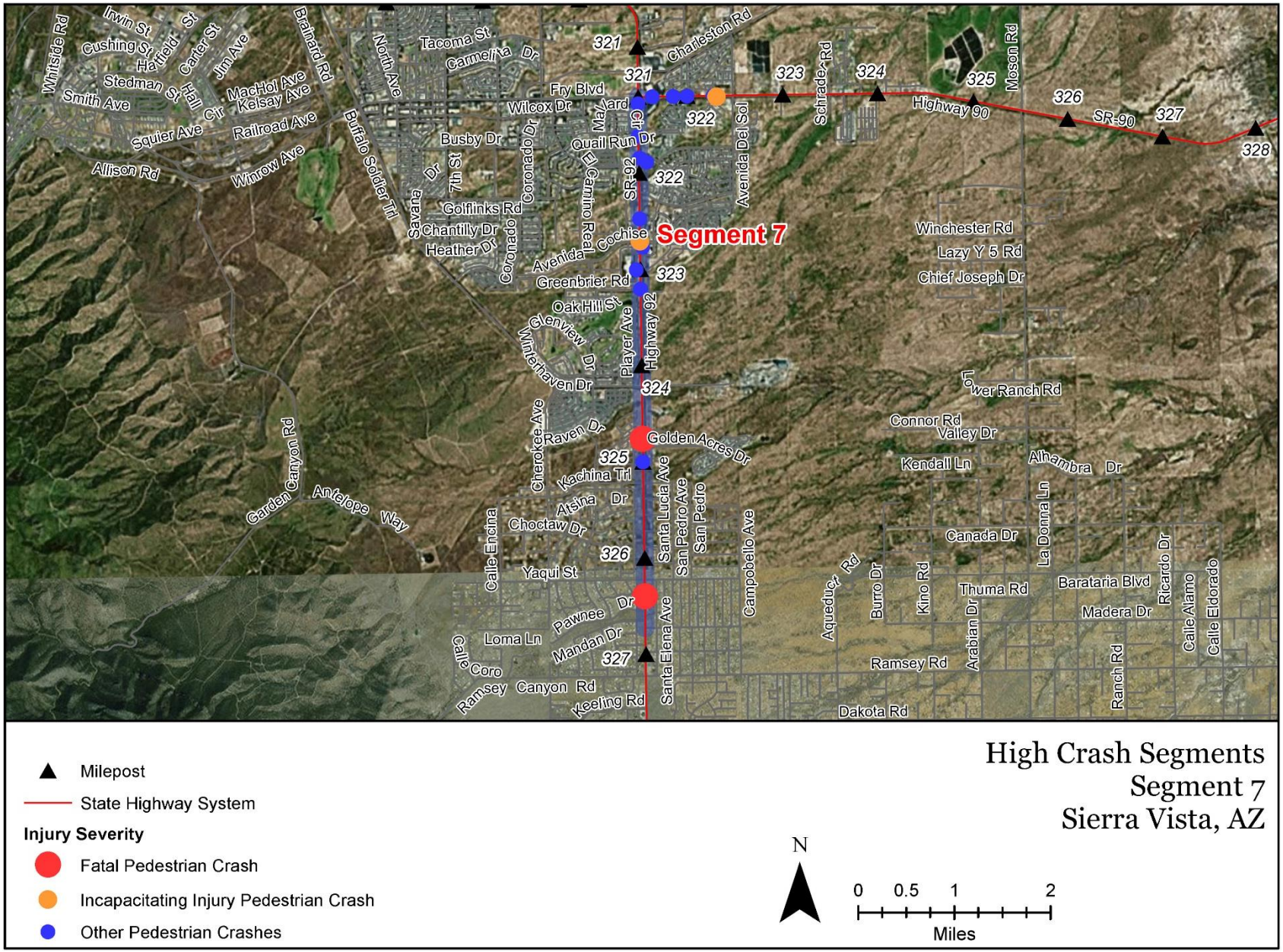
Project Need

Over half of the reported pedestrian crashes along MP 321.0 - MP 326.7 have occurred at night. The reported crash type is *Crossing Roadway – Vehicle Turning* on/near crosswalk areas at signalized and non-signalized intersections. Consistent application of sidewalks and raised median is needed.

Project Purpose

Reduce the number of pedestrian crashes on SR 92 by increasing the visibility of pedestrians along SR 92 and providing safe crossing opportunities.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA	***$20,000***
An RSA with an emphasis on pedestrian safety should be conducted on SR 92 within the Sierra Vista area.	
Provide Roadway Lighting	***$1,408,000***
Provide continuous lighting along the corridor to improve pedestrian visibility at night along segment. The lighting should extend from Fry Boulevard to East Camino Principal (approximately 5 miles), as the segment is getting fairly developed with high traffic volumes.	
Extend Paved Shared-Use Path	***$1,092,000***
Extend the existing shared-use path north of Buffalo Soldier Trail south to Glenn Road (approximately 0.97 mile) and on the side of SR 92 between Foothills Drive to Avenida Cochise (approximately 0.85 mile).	
Improve Signal Operations for Pedestrians	**$3,000**
Evaluate the existing operations at the signalized intersections. Consider LPI or right-turn on red restrictions at Avenida Cochise and Foothills Drive. Evaluate signal timing/phasing for pedestrians.	
Construct a Raised Median	**$2,718,997**
Provide consistent raised medians throughout the entire segment (approximately 1.9 miles), primarily south of Glenn Road.	
Enhance Mid-Block Crossing Opportunities	**$173,959**
Evaluate the need for a PHB or signalized pedestrian crossing on SR 92 between Foothills Drive and SR 90.	
Estimated Planning Level Total Segment Conceptual Cost:	**$5,415,956**


Segment 7
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 7
Sierra Vista, AZ
N
0 0.5 1 2
Miles

Potential Countermeasures for SR 86, High-Crash Segment 8

General Project Information

Primary Route/Street: SR 86 (Ajo Highway)
City/Town Name: Three Points
County: Pima
District: Southcentral
Begin Limit: MP 151.0
End Limit: MP 153.0
Segment Length: 2.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/6z7x5uKUBrv

Location Summary

The SR 86 segment is located southwest of Tucson. Three pedestrian crashes were reported, with two fatal crashes.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Three-lane highway (TWLTL)/two-lane segments
AADT: 7,200 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: None
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 3 (all 3 involved alcohol/drugs)
Crosswalks: None
Other Pedestrian Attractors/Generators: Some commercial

Project Need

The reported pedestrian crashes along MP 151 - MP 153.0 have occurred at night where there is a lack of roadway lighting. The reported crash type is *Walking Along Roadway*. No pedestrian facilities exist along the highway, but wide shoulders exist.

Project Purpose

Reduce the number of pedestrian crashes on SR 86 by increasing the visibility of pedestrians.

Potential Countermeasures — *Conceptual Cost*

Option 1: No Improvement

No improvement (e.g., crashes are a result of distraction or alcohol involvement and not a site deficiency).

Option 2: Engineering Countermeasure

Provide Roadway Lighting — **$506,880**

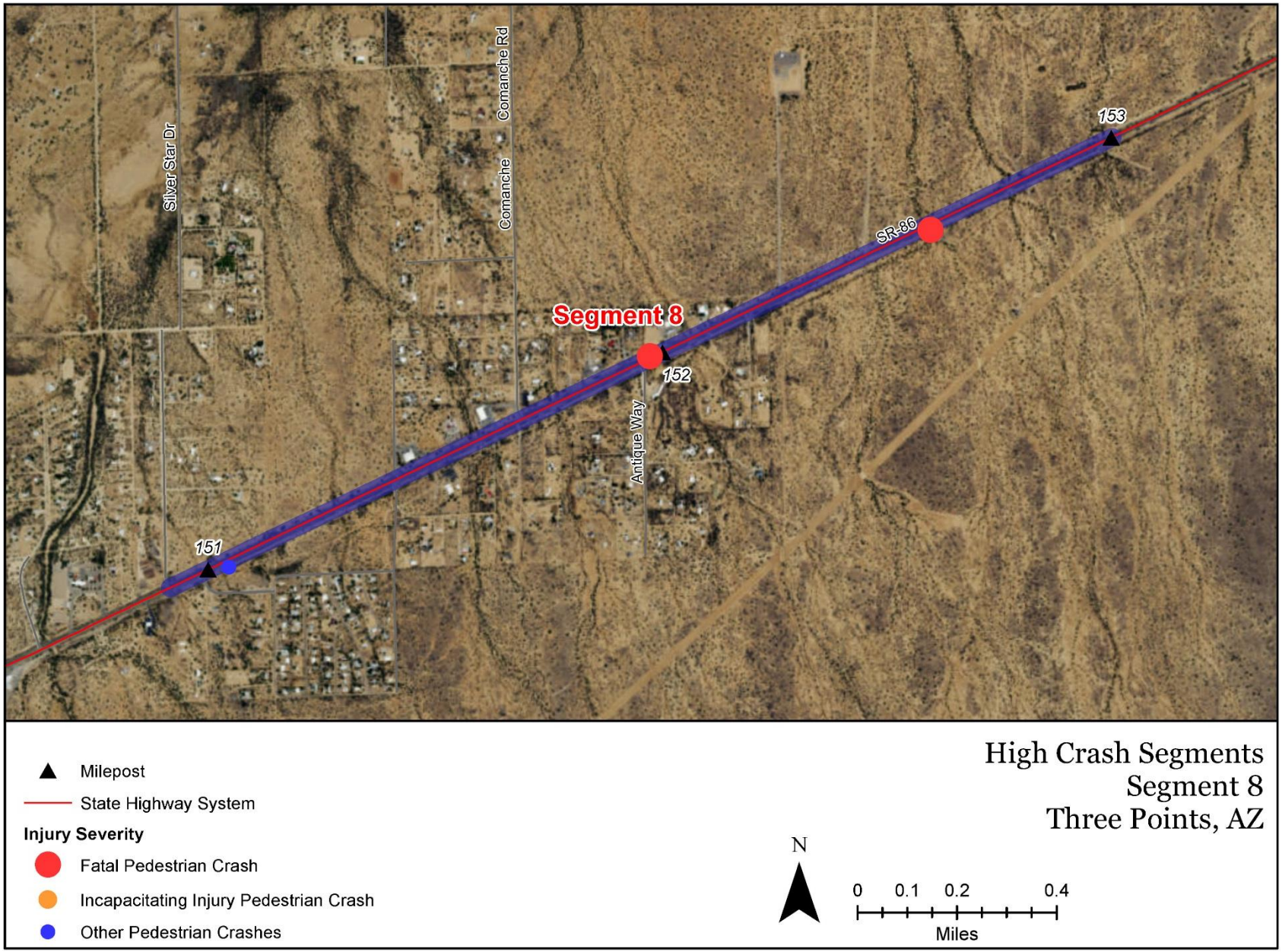
Install roadway lighting within the more developed area of the segment.

Five motor vehicle crashes occurred during dark/not lighted conditions during the study period.

Option 3: Pedestrian Education Campaign — —

Provide ADOT pedestrian safety pamphlets to local businesses for distribution.

Estimated Planning Level Total Segment Conceptual Cost: $506,880


Silver Star Dr
Comanche Rd
Comanche
Segment 8
151
152
153
SR-86
Antique Way
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 8
Three Points, AZ
N
0 0.1 0.2 0.4
Miles

Potential Countermeasures for SR 86, High-Crash Segment 9

General Project Information

Primary Route/Street: SR 86 (Ajo Way)
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 170.3
End Limit: MP 171.6
Segment Length: 1.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/Uf2MQekuHY52

Location Summary

The SR 86 segment is in southwest Tucson. Eleven pedestrian crashes were reported, with four resulting in incapacitating and one in fatal injuries. Another fatal pedestrian crash occurred on I-10 immediately north of SR 86.

Programmed Projects: Ajo Way Interchange Construction (in progress)
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 28,400–36,100 vehicles per day
Posted Speed Limit: 40–45 mph
Sidewalks: Yes (with buffer)
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 12 (3 involved alcohol/drugs)
Crosswalks: At signalized intersections, PHB at Freedom Drive (school crossing)
Other Pedestrian Attractors/Generators: Various commercial, school, and library

Project Need

The reported pedestrian crashes along MP 170.3 - MP 171.6 have occurred during both daylight and nighttime hours. The majority of the crashes involved the pedestrian crossing the roadway at both intersection and non-intersection locations. A number of the crashes occurred within proximity to a signalized crosswalk. Only one pedestrian was under age 18.

Project Purpose

Reduce the number of pedestrian crashes on SR 86, creating a more accommodating environment for pedestrians. Increase crosswalk use at the signalized intersections.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted within the defined SR 86 segment limits.

Enhance Signal Operations for Pedestrians — **$3,000**

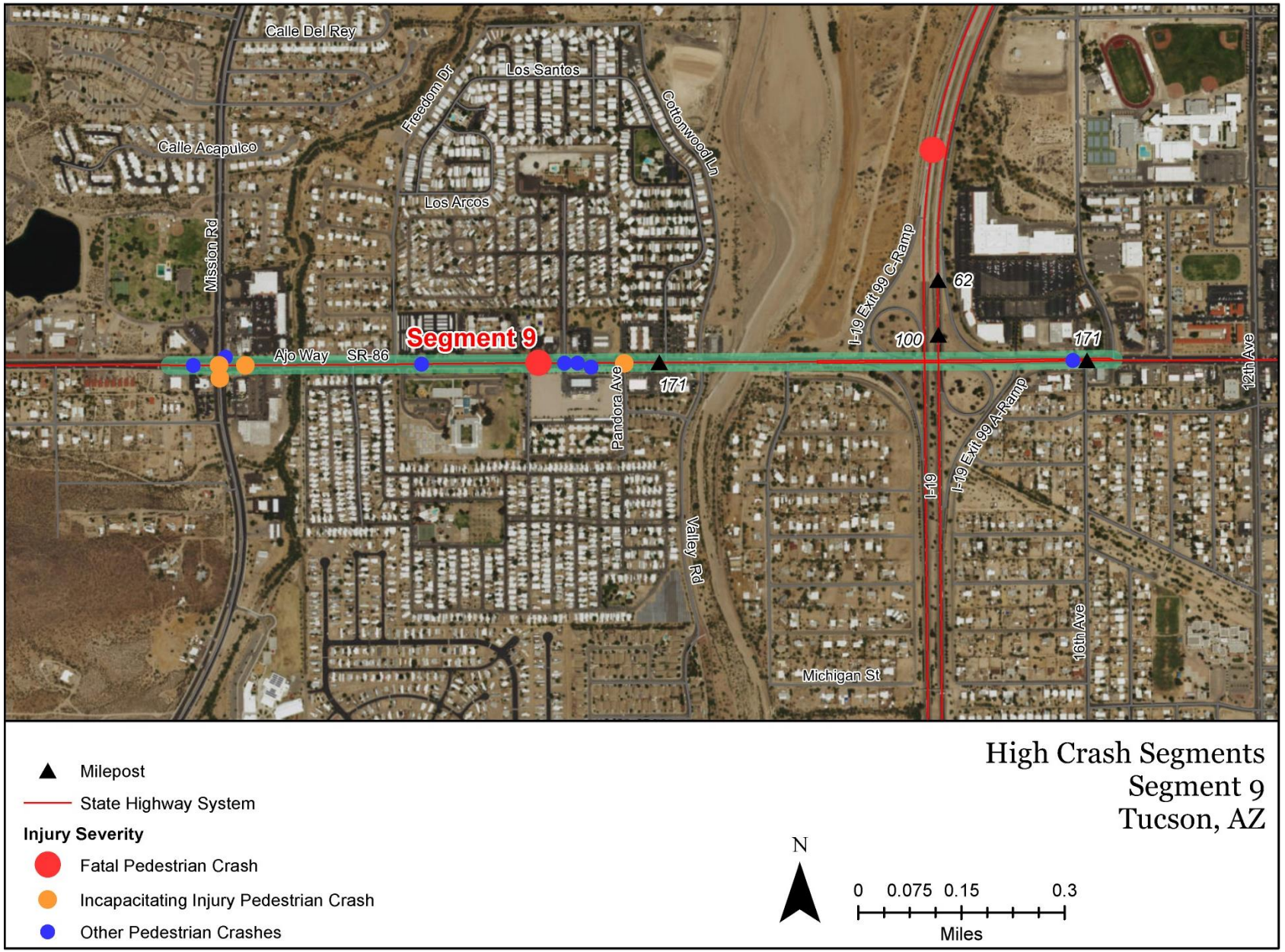
Evaluate the existing operations at the signalized intersections. Consider LPI or right-turn on red restrictions. Explore separating left-turns from pedestrian crossing movements.

Construct Raised Median — **$1,316,567**

The raised median would provide a pedestrian crossing refuge and increase overall safety for all transportation modes. This countermeasure was also recommended in the SR 86 – Kinney Road to Santa Cruz River PA (2016).

Nearly 200 motor vehicle crashes occurred along the segment during the study period.

Estimated Planning Level Total Segment Conceptual Cost: $1,339,567


Calle Del Rey
Freedom Dr
Los Santos
Cottonwood Ln
Calle Acapulco
Los Arcos
Mission Rd
Segment 9
Ajo Way
SR-86
171
Pandora Ave
Valley Rd
I-19 Exit 99 C-Ramp
62
100
171
I-19 Exit 99 A-Ramp
I-19
12th Ave
16th Ave
Michigan St
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 9
Tucson, AZ
N
0 0.075 0.15 0.3
Miles

Potential Countermeasures for SR 77, High-Crash Segment 10

General Project Information

Primary Route/Street: SR 77
City/Town Name: Unincorporated
County: Pima County
District: Southcentral
Begin Limit: MP 72.9
End Limit: MP 75.4
Segment Length: 2.48 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/CCTrFt14zU62

Location Summary

The SR 77 segment is located north of Tucson. Eighteen pedestrian crashes were reported, with five resulting in incapacitating injuries and two resulting in fatal injuries.

Programmed Projects: Construct New Sidewalk (River Road – Suffolk); TRACS # H724901C

Identified in 2009 PSAP: Yes

Segment Type (High-Crash/High-Risk): High-Crash

Area Type (Urban-Suburban/Rural): Urban-Suburban

Facility Type: Four-lane divided highway

AADT: 41,300–53,500 vehicles per day

Posted Speed Limit: 45–50 mph

Sidewalks: Some exists at intersections only

Lighting: At signalized intersections

Bus Stop Locations (within ¼ mile): Yes

Number of Pedestrian Crashes: 18 (1 involved alcohol/drugs)

Crosswalks: At signalized intersections; a signalized two-stage pedestrian crosswalk is to be constructed north of Rudasill Road.

Other Pedestrian Attractors/Generators: Commercial

Project Need

The majority of reported pedestrian crashes along MP 72.9 - MP 75.4 have occurred during daylight conditions with six occurring at night. The reported crash types include *Crossing Roadway – Vehicle Not Turning/Vehicle Turning*, *Dash/Dart-Out*, *Crossing Driveway or Alley*, and *Walking Along Roadway*. Crashes have occurred at signalized and unsignalized locations.

Project Purpose

Reduce both intersection and non-intersection related pedestrian crashes by increasing the visibility of pedestrians along SR 77 and providing safe crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

An RSA was conducted for MP 72.9 to 74.85 in October 2012. This RSA should be reviewed.

Provide Roadway Lighting **$698,368**

Construct lighting along the corridor segment to supplement the construction of the programmed sidewalks.

40 motor vehicle crashes occurred during dark/not lighted conditions during the study period.

Enhance Signal Operations for Pedestrians **$3,000**

Evaluate the existing operations at the signalized intersections. Consider LPI or right-turn on red restrictions at Orange Grove Road and Ina Road, or phasing changes to separate the pedestrian crossings and left-turn movements.

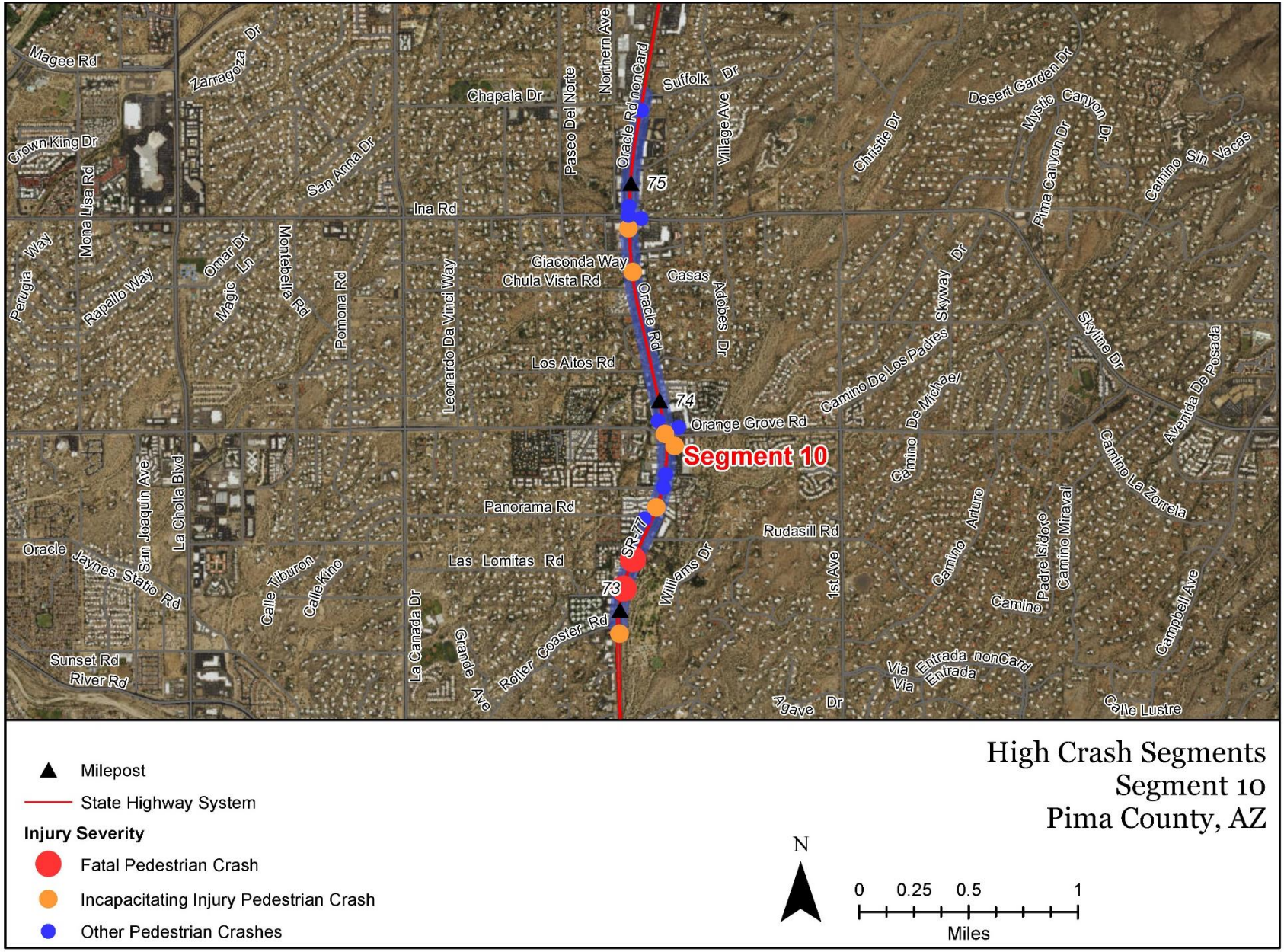
Pedestrian Crossing Improvements **$173,959**

Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB at locations south of Orange Grove Road.

Construct Sidewalks

As programmed in the 2016–2020 ADOT STIP ($1,540,000).

Estimated Planning Level Total Segment Conceptual Cost: $875,327


Magee Rd
Zarragoza Dr
Crown King Dr
Mona Lisa Rd
San Anna Dr
Chapala Dr
Paseo Del Norte
Northern Ave
Oracle Rd nonCard
Suffolk Dr
Village Ave
Christie Dr
Desert Garden Dr
Mystic Canyon Dr
Pima Canyon Dr
Camino Sin Vacas
75
Ina Rd
Perugia Way
Rapallo Way
Omar Dr
Magic Ln
Montebella Rd
Pomona Rd
Giaconda Way
Chula Vista Rd
Casas Adobes Dr
Oracle Rd
Leonardo Da Vinci Way
Skyway Dr
Skyline Dr
Los Altos Rd
74
Orange Grove Rd
Camino De Los Padres
Camino De Michael
Avenida De Posada
Segment 10
Camino La Zorrela
San Joaquin Ave
La Cholla Blvd
Oracle
Jaynes Station Rd
Panorama Rd
SR-77
Rudasill Rd
Las Lomitas Rd
Williams Dr
1st Ave
Camino Arturo
Camino Padre Isidoro
Camino Miraval
Calle Tiburon
Calle Kino
73
La Canada Dr
Grande Ave
Roller Coaster Rd
Campbell Ave
Sunset Rd
River Rd
Via Entrada nonCard
Via Entrada
Agave Dr
Calle Lustre
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 10
Pima County, AZ
N
0
0.25
0.5
1
Miles

Potential Countermeasures for SR 89A, High-Crash Segment 11A

General Project Information

Primary Route/Street: SR 89A (Milton Road)
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 402.15 (Forest Meadows)
End Limit: MP 403.20 (SR 40B)
Segment Length: 1.05 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/neuRmrAbGNy

Location Summary

This SR 89A segment is in Flagstaff. Twelve pedestrian crashes were reported, with two resulting in incapacitating injuries and one in fatal injuries.

Programmed Projects: Construct Right Turn Lane (MP 403); TRACS # H839901C

Identified in 2009 PSAP: Yes

Segment Type (High-Crash/High-Risk): High-Crash

Area Type (Urban-Suburban/Rural): Urban-Suburban

Facility Type: Five-lane highway (TWLTL)

AADT: 40,800 vehicles per day

Posted Speed Limit: 35 mph

Sidewalks: Yes

Lighting: Yes (intersection and segment lighting)

Bus Stop Locations (within ¼ mile): Yes

Number of Pedestrian Crashes: 12 (2 involved alcohol/drugs, 1 of which was a fatality)

Crosswalks: At signalized intersections

Other Pedestrian Attractors/Generators: University and various commercial

Project Need

The reported pedestrian crashes along the SR 89A segment occur during daylight and nighttime (lighted) conditions. The reported crash type included *Dash/Dart-Out* and *Crossing Roadway* both at intersections and mid-block locations. There is a need for additional crossing opportunities and a more pedestrian-friendly cross-section.

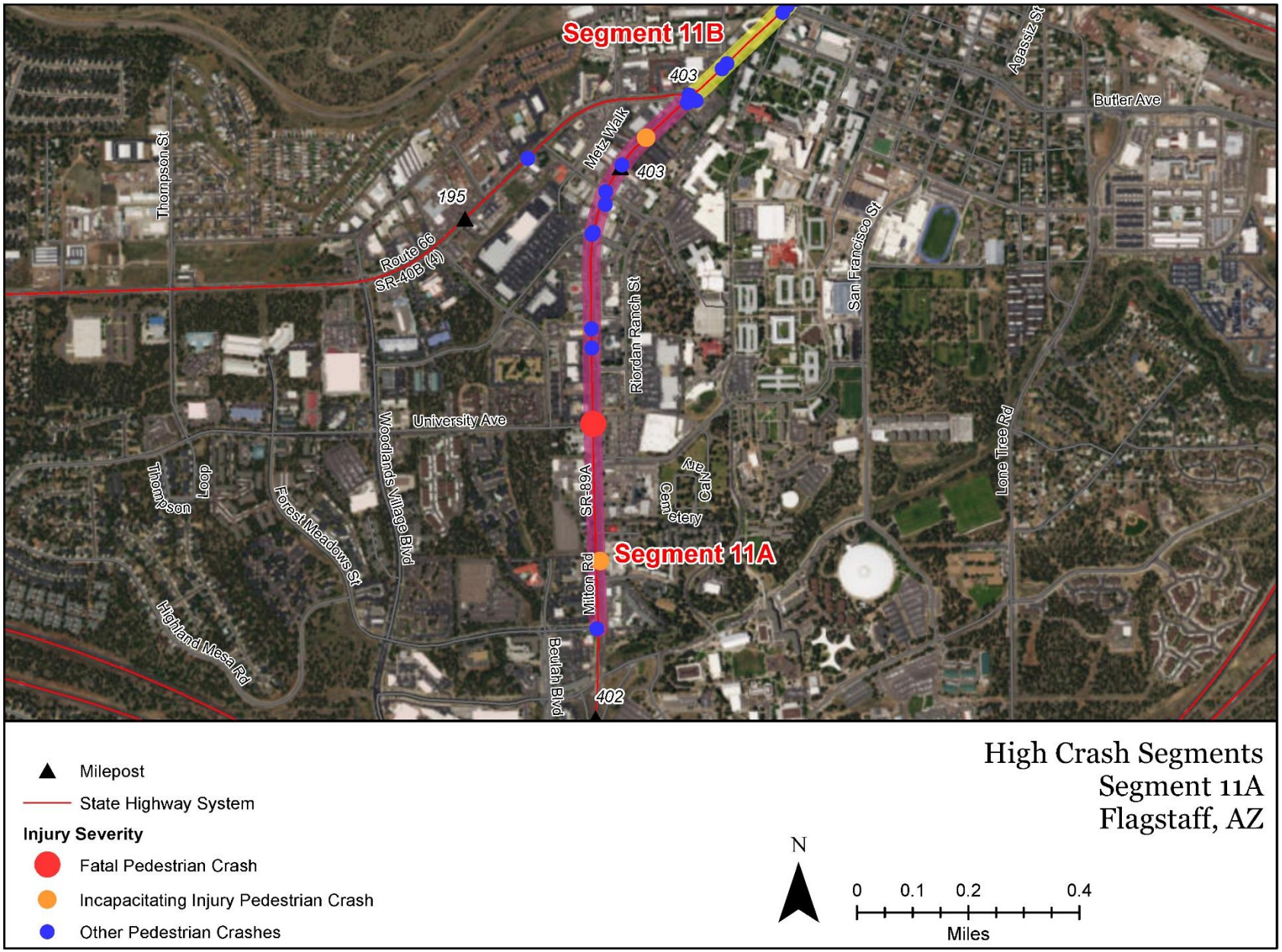
Project Purpose

Reduce both intersection and non-intersection related pedestrian crashes by providing safer crossing opportunities.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA An RSA with an emphasis on pedestrian safety should be conducted within the defined SR 89A segment limits.	**$20,000**
Construct Raised Median The raised median would provide a pedestrian crossing refuge and increase overall safety of all transportation modes.	**$1,502,604**
Enhance Mid-Block Crossing Opportunities Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB at locations between University Drive and Plaza Way.	**$173,959**
Enhance Signal Operations for Pedestrian Evaluate the existing operations at the signalized intersections. Consider LPI or right-turn on red restrictions or separating the left-turn movement from pedestrian crossings with a protected arrow (can be pedestrian activated with the use of a Flashing Yellow Arrow (FYA))	**$3,000**
Roadway Lighting Enhancement Evaluate the existing lighting conditions as part of the RSA to determine any deficiency in terms of pedestrian visibility and provide continuous lighting along corridor.	**—**
Conduct Access Management Study Evaluate the need to improve and consolidate the access drives along the highway to reduce pedestrian conflict.	**$20,000**

Nearly 300 motor vehicle crashes occurred during the study period.

Estimated Planning Level Total Segment Conceptual Cost: $1,719,563


Segment 11B
Segment 11A
403
403
195
402
Metz Walk
Route 66
SR-40B (4)
Thompson St
Riordan Ranch St
San Francisco St
Agassiz St
Butler Ave
University Ave
Woodlands Village Blvd
Forest Meadows St
Lone Tree Rd
SR-89A
Milton Rd
Beulah Blvd
Highland Mesa Rd
Cemetery
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 11A
Flagstaff, AZ
N
0 0.1 0.2 0.4
Miles

Potential Countermeasures for SR 40B, High-Crash Segment 11B

General Project Information

Primary Route/Street: 40B (Milton Road/Route 66)
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 195.48 (Intersection of Historic Route 66 / Milton Road)
End Limit: MP 196.5 (Elden Street)
Segment Length: 1.02 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/yKTHs7safUk

Location Summary

The SR 40B segment is in downtown Flagstaff. Fourteen pedestrian crashes were reported, with one resulting in incapacitating and two resulting in fatal injuries.

Programmed Projects: None

Identified in 2009 PSAP: Yes

Segment Type (High-Crash/High-Risk): High-Crash

Area Type (Urban-Suburban/Rural): Urban-Suburban

Facility Type: Five-lane highway (TWLTL)

AADT: 35,900 vehicles per day

Posted Speed Limit: 30 mph

Sidewalks: Yes

Lighting: Yes (intersection and segment lighting)

Bus Stop Locations (within ¼ mile): Yes

Number of Pedestrian Crashes: 14 (6 involved alcohol/drugs, including 2 fatal crashes)

Crosswalks: At signalized intersections

Other Pedestrian Attractors/Generators: Various commercial and Northern Arizona University

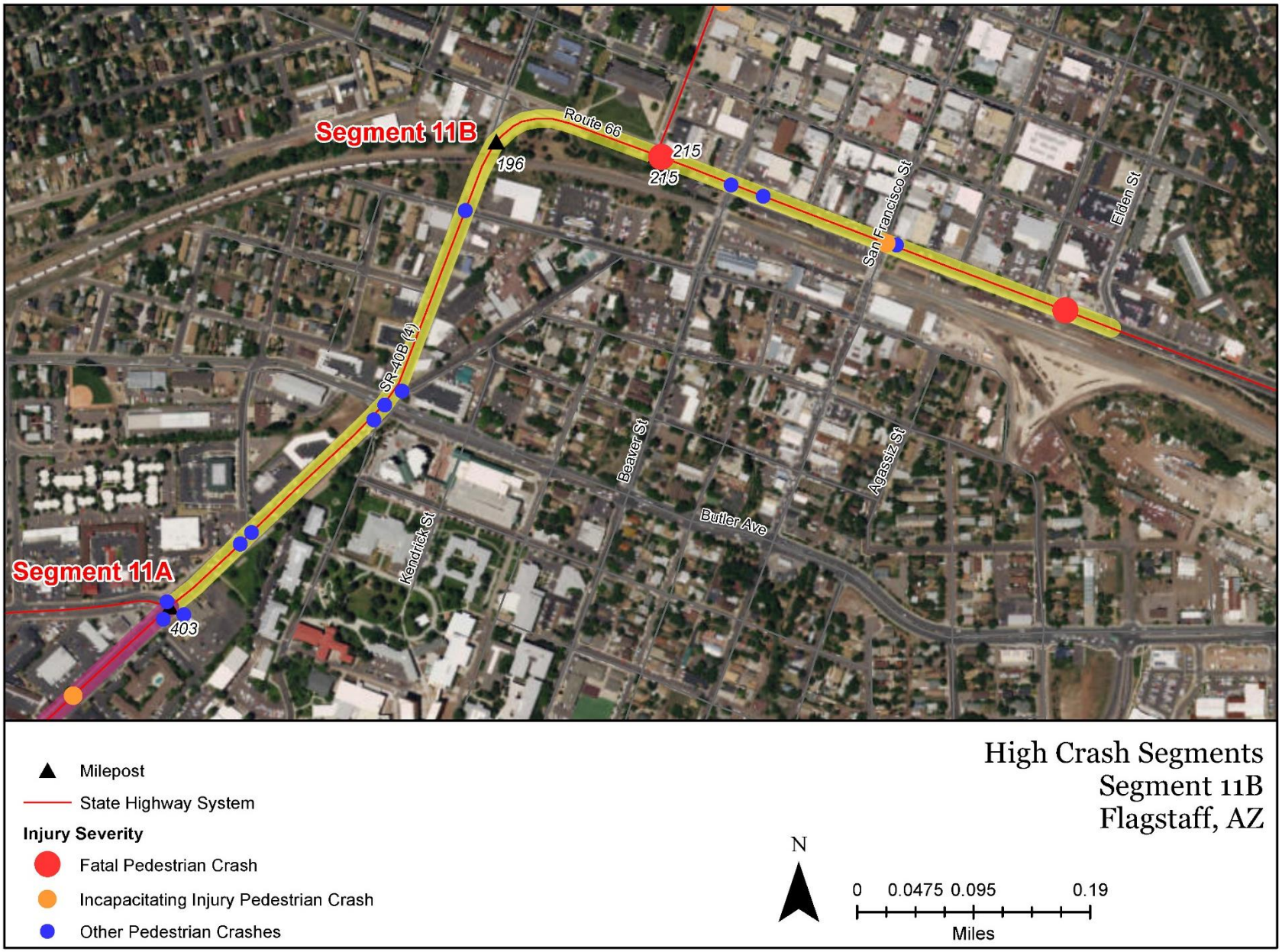
Project Need

The reported pedestrian crashes along the SR 40B have occurred during daylight and nighttime (lighted) conditions. The majority of the reported crashes involved *Crossing Roadway* and half occurred within the vicinity of a crosswalk area.

Project Purpose

Reduce pedestrian crossing related crashes along SR 40B by providing safer crossing opportunities and increase intersection crossing compliance.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA	**$20,000**
An RSA with an emphasis on pedestrian safety should be conducted.	
Option 1: Engineering Countermeasures	
Construct Raised Median	**$586,731**
Construct a raised median from SR 40B to north of Phoenix Avenue.	
Enhance Signal Operations for Pedestrians	**$3,000**
Evaluate the existing operations at the signalized intersections. Consider LPI, right-turn on red restrictions, or exclusive pedestrian phases for Beaver Street, Humphrey Street, and San Francisco Street to better accommodate the heavy pedestrian traffic.	
Over 100 motor vehicle crashes occurred during the study period.	
Option 2: Enforcement	—
Increase enforcement along the downtown area of SR 40B (Beaver Street to San Francisco Street) for pedestrians crossing improperly and motorists not yielding the right-of-way to pedestrians.	
Estimated Planning Level Total Segment Conceptual Cost:	**$609,731**


Segment 11B
Route 66
196
215
215
San Francisco St
Elden St
SR 40B (4)
Beaver St
Agassiz St
Butler Ave
Kendrick St
Segment 11A
403
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 11B
Flagstaff, AZ
N
0 0.0475 0.095 0.19
Miles

Potential Countermeasures for SR 40B, High-Crash Segment 12

General Project Information

Primary Route/Street: SR 40B
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 198.5 (Arrowhead Avenue)
End Limit: MP 199.5 (Park Drive)
Segment Length: 1.05 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/7WAwcTbqqxE2

Location Summary

The SR 40B segment is located east of downtown Flagstaff. Six pedestrian crashes were reported, with four resulting in incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 22,400 vehicles per day
Posted Speed Limit: 40 mph
Sidewalks: Yes; shared-use path along south side
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 6 (2 involved alcohol/drugs)
Crosswalks: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial (new development)

Project Need

The majority of the reported pedestrian crashes along MP 198.5 - MP 199.5 occurred at night where there is a lack of roadway lighting. The reported crash types vary and include both the pedestrian crossing and the pedestrian in roadway. Crossing opportunities are lacking.

Project Purpose

Reduce pedestrian crossing related crashes along SR 40B by improving pedestrian visibility and providing safer crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — ***$20,000***
An RSA with an emphasis on pedestrian safety should be conducted within the defined segment limits.

Construct Raised Median — **$1,502,604**
Construct a raised median from 1st Street to Park Drive. The raised median would provide a pedestrian crossing refuge and increase overall safety of all transportation modes.

Provide Roadway Lighting — **$295,680**
Evaluate the existing lighting conditions to determine any deficiency in terms of pedestrian visibility.

Enhance Mid-Block Crossing Opportunities — **$173,959**
Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB.

90 motor vehicle crashes occurred during the study period.

Estimated Planning Level Total Segment Conceptual Cost: $1,992,243


Segment 12
Jeffrey Loop
Rose Ave
Rose St
Colanthe Ave
Main St
King St
Joshua Ln
Patterson Blvd
Jamison Blvd
Burkhart Dr
Tindle Blvd
Alta Vista Dr
Lewis Dr
Park Dr
Loma Vista Dr
Fanning Dr
Lake Powell Blvd
Lakin Dr
Steves Blvd
6th Ave
5th Ave
3rd St
Route 66
Industrial Dr
Postal Blvd
199
200
200
Foxtail Dr
Fox Run Dr
Fox Run
Elk Run St
4th Ave
West St
Center St
East St
1st St
3rd Ave
2nd St
4th St
SR-40B (4)
Vickey Dr
Walgreens St
I-40
Soliere Ave
Brians Way
Fox Lair Dr
Bottle Brush Dr
Elk Run St
2nd Ave
Izabel St
1st Ave
Spruce Ave
I-40 Front
Whispering Pine Way
Maple Ave
Main St
Huntington Dr
Johnson Ave
Arrowhead Ave
East St
Deer Crossing Rd
Fox Lair Dr
Mallard Ln
Raintree Rd
Falcon Rd
Codburn Dr
Milepost
State Highway System
Tribal Lands
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 12
Flagstaff, AZ
N
0
0.125
0.25
0.5
Miles

Potential Countermeasures for US 60, High-Crash Segment 13

General Project Information

Primary Route/Street: US 60 (Grand Avenue)
City/Town Name: Surprise
County: Maricopa
District: Central
Begin Limit: MP 143.0
End Limit: MP 145.0
Segment Length: 2 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/gTSGMck477x

Location Summary

The US 60 segment is located in Surprise, northwest of Phoenix. Four pedestrian crashes were reported, each one resulting in incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 31,200 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Fragmented; none along north side
Lighting: Partial
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4 (2 involved alcohol/drugs)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial, school, and park. Railroad tracks run along north side, limiting legal crossings to traffic signals.

Project Need

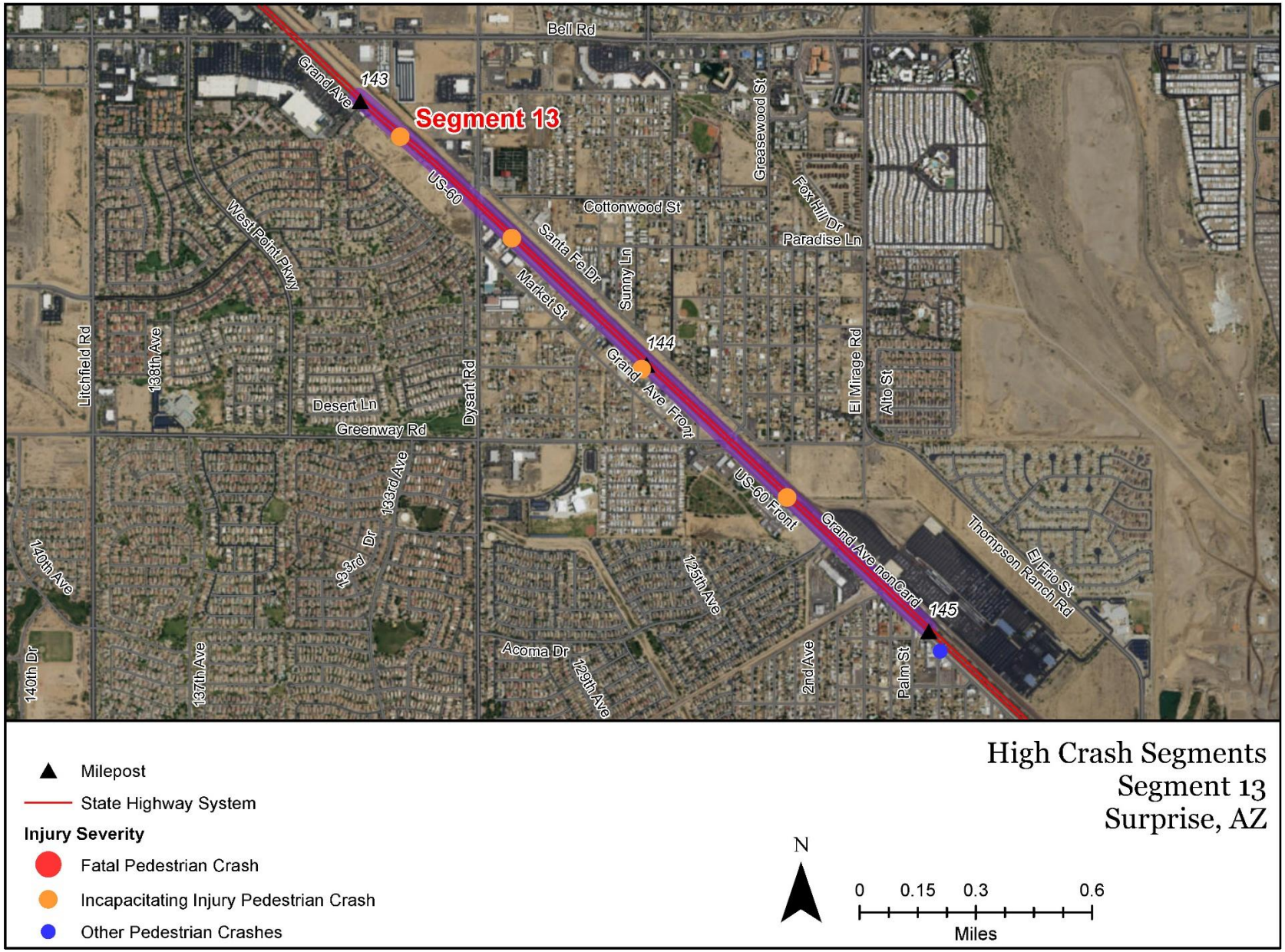
The reported pedestrian crashes along MP 143.0 - MP 145.0 during nighttime conditions. The majority of reported crashes involved pedestrians crossing US 60 at non-designated pedestrian crossings.

Project Purpose

Reduce pedestrian related crashes along US 60 by improving pedestrian visibility during nighttime conditions and encouraging pedestrians to cross at signalized crossings.

Potential Countermeasures	*Conceptual Cost*
Option 1: Engineering Countermeasures	
Conduct RSA	**$20,000**
An RSA with an emphasis on pedestrian safety should be conducted along US 60 segments to further evaluate safety issues.	
Install Barrier/Fencing	**$539,724**
Install fencing from south of Greenway Road to Dysart Road (approximately 0.95 mile) to restrict pedestrians from crossing the tracks and Grand Avenue at undesignated crossings, thus encouraging crossing only at signalized intersections.	
Roadway Lighting Enhancement	—
Evaluate the existing lighting conditions as part of the RSA to determine any deficiency in terms of pedestrian visibility and to provide continuous lighting along corridor.	
Option 2: Enforcement	—
Increase enforcement for pedestrians crossing improperly crossing (away from traffic signals).	

Estimated Planning Level Total Segment Conceptual Cost: $559,724


Bell Rd
Grand Ave
143
Segment 13
US-60
Greasewood St
Fox Hill Dr
Cottonwood St
Paradise Ln
West Point Pkwy
Santa Fe Dr
Sunny Ln
Market St
144
Grand Ave Front
Litchfield Rd
138th Ave
Desert Ln
Greenway Rd
Dysart Rd
El Mirage Rd
Alto St
133rd Ave
US-60 Front
Grand Ave nonCard
Thompson Ranch Rd
E Frio St
145
140th Ave
133rd Dr
125th Ave
140th Dr
137th Ave
Acoma Dr
129th Ave
2nd Ave
Palm St
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 13
Surprise, AZ
N
0
0.15
0.3
0.6
Miles

Potential Countermeasures for US 60, High-Crash Segment 14

General Project Information

Primary Route/Street: US 60
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: MP 158.5
End Limit: MP 159.5
Segment Length: 1.0 mile
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/fNF4VF1zEjP2

Location Summary

The US 60 segment is in Phoenix. Nine pedestrian crashes were reported, with two resulting in incapacitating injuries and four resulting in fatal injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 38,400 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Exist on one side (north)
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 9 (3 involved alcohol/drugs)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial, schools, and industrial land use; railroad tracks exist along south side of Grand Avenue behind strip industrial development.

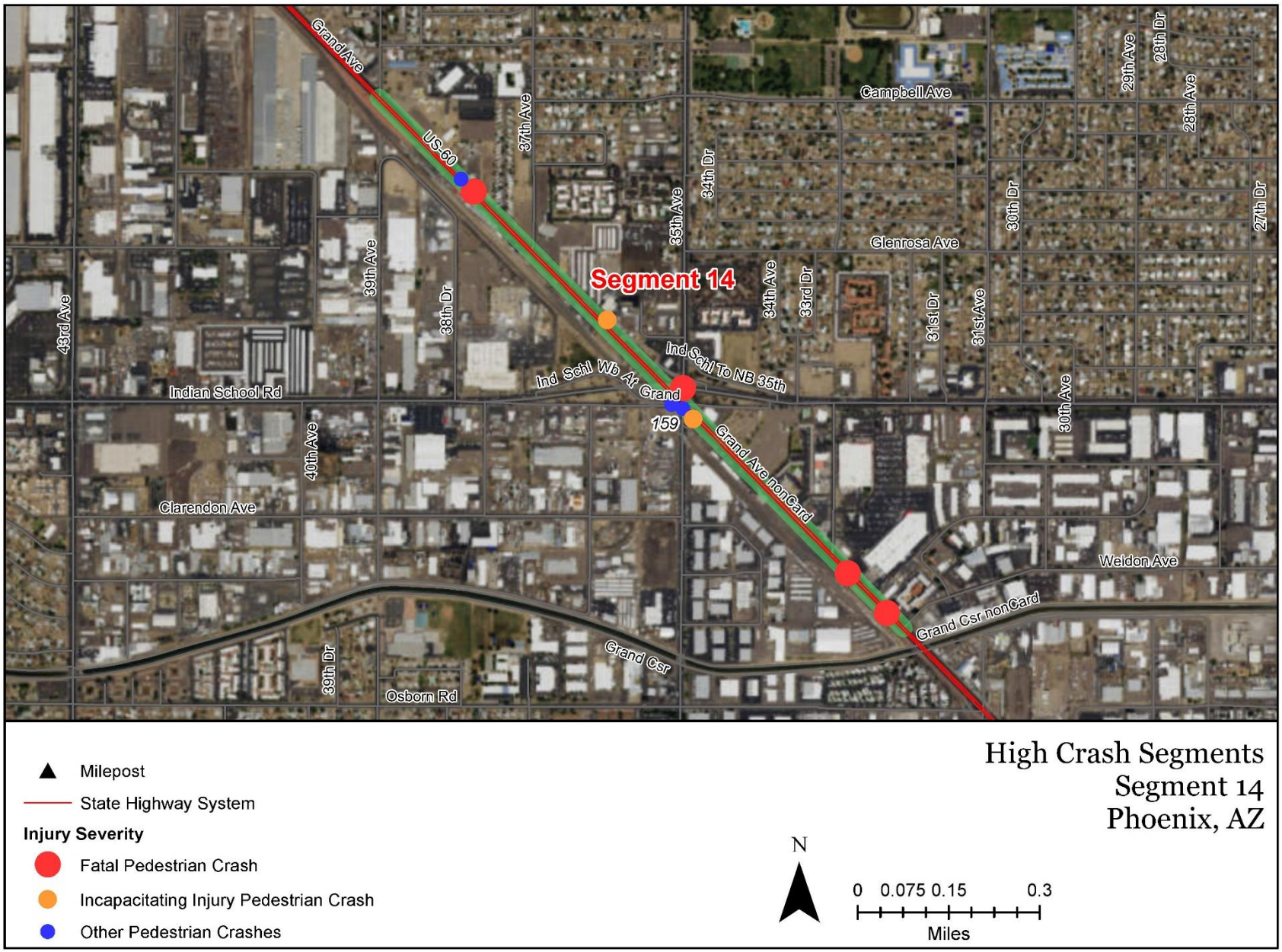
Project Need

The reported pedestrian crashes along US 60 from MP 158.5 - MP 159.5 have occurred during both daylight and nighttime conditions. A majority of the crashes were a result of pedestrians crossing at undesignated pedestrian crossing areas. Crash types include *Dash/Dart-Out, Crossing Roadway,* and *Pedestrian in Roadway*

Project Purpose

Reduce pedestrian related crashes along US 60 by improving pedestrian crossing opportunities.

Potential Countermeasures	***Conceptual Cost***
Conduct RSA	**$20,000**
An RSA with an emphasis on pedestrian safety should be conducted along US 60 segments to further evaluate safety issues.	
Intersection Improvements	**TBD**
The Indian School Road intersection should be evaluated to determine any necessary improvements to accommodate pedestrian crossing should be provided. City of Phoenix is working with ADOT, Arizona Corporation Commission, and BNSF to install railroad crossing upgrades including a pre-signal at this location and to relocate the gates to conform with modern standards and provide missing sidewalks.	
Enhance Midblock Crossing Opportunities	**$173,959**
Evaluate the need for additional pedestrian crossing opportunities on US 60 such as a two-stage pedestrian crossing or PHB. A Grand Canal crossing (PHB) should be explored for the shared use canal path on the south side of the canal.	
Roadway Lighting Enhancement	**—**
Evaluate existing lighting conditions as part of the RSA to determine any deficiency in terms of pedestrian visibility. Continuous double-sided lighting should be explored along this segment.	
Estimated Planning Level Total Segment Conceptual Cost:	**$193,959**


Grand Ave
US 60
37th Ave
35th Ave
34th Dr
Campbell Ave
29th Ave
28th Dr
28th Ave
27th Dr
30th Dr
Glenrosa Ave
Segment 14
34th Ave
33rd Dr
31st Dr
31st Ave
39th Ave
38th Dr
43rd Ave
Ind Schl To NB 35th
Ind Schl Wb At Grand
Indian School Rd
159
Grand Ave nonCard
30th Ave
40th Ave
Clarendon Ave
Weldon Ave
Grand Csr nonCard
Grand Csr
39th Dr
Osborn Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 14
Phoenix, AZ
N
0 0.075 0.15 0.3
Miles

Potential Countermeasures for US 70, High-Crash Segment 15

General Project Information

Primary Route/Street: US 70
City/Town Name: San Carlos
County: Gila
District: Southeast
Begin Limit: MP 257.0
End Limit: MP 259.0
Segment Length: 2 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: San Carlos Indian Reservation
Google Map: https://goo.gl/maps/1X8ntC9PMVz

Location Summary

The US 70 segment is located southeast of Globe. Three pedestrian crashes were reported, with all resulting in fatal injuries. The segment is adjacent to the Apache Gold Casino Resort.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Two-way, two-lane highway
AADT: 7,300 vehicles per day
Posted Speed Limit: 55–65 mph
Sidewalks: None
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 3 (3 involved alcohol)
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: Casino (the San Carlos Apache Airport is located on the south side of US 70).

Project Need

The reported pedestrian crashes along MP 257.0 - MP 259.0 occurred at night in locations without roadway lighting. The crashes were primarily a result of the pedestrian being on the roadway and also being under the influence of alcohol.
A RSA for MP 255.3 - MP 273 was completed in 2010. The document is avialable at http://www.aztribaltransportation.org/SCA/PDF/RSA_US70_Final.pdf.

Project Purpose

Reduce pedestrian related crashes by provided a separation between the pedestrian and vehicles along the high-speed roadway.

Potential Countermeasures — *Conceptual Cost*

Option 1: No Improvement

No improvement is recommended (e.g., result of crashes involving distraction or alcohol involvement and not a site deficiency).

Option 2: Engineering Countermeasures

Widen Shoulders **$1,620,000**

Increase width of the shoulders to provide adequate distance between the pedestrian and vehicles along the highway. Existing shoulders are approximately 1–2’ on average. Increase to 5’ wide.

Provide Roadway Lighting **$563,200**

Consider installing lighting at the casino driveway over US 70 (the only light at the entrance is over the driveway) to improve pedestrian visibility.

Option 3: Pedestrian Education Campaign —--

Provide pedestrian safety handouts regarding at the Apache Casino Gold Resort and other neighboring businesses.

The 2010 RSA identified that the Y-intersection located at MP 259.2, across from the saw mill, should be reconfigured to eliminate the skewed intersection.

Estimated Planning Level Total Segment Conceptual Cost: $2,183,200


257
Segment 15
US-70
258
259
Res 600
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 15
San Carlos, AZ
N
0
0.125
0.25
0.5
Miles

Potential Countermeasures for US 60X, High-Crash Segment 16

General Project Information

Primary Route/Street: US 60X, Apache Trail
City/Town Name: Apache Junction
County: Maricopa
District: Central
Begin Limit: MP 190 (83rd Place)
End Limit: MP 194 (Meridian Road)
Segment Length: 4 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/ZSMS7Fdbx522

Location Summary

The US 60X segment is in Apache Junction, east of Phoenix. Fifteen pedestrian crashes were reported, with four resulting in incapacitating injuries and five resulting in fatal injuries.
Programmed Projects: MPD0011-17
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 14,500 vehicles per day (per MAG 2015 ADT Map)
Posted Speed Limit: 45 mph
Sidewalks: None
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 15 (4 involved alcohol, all of which were fatal crashes)
Crosswalk Locations: At traffic signals
Other Pedestrian Attractors/Generators: Various commercial, residential, and schools

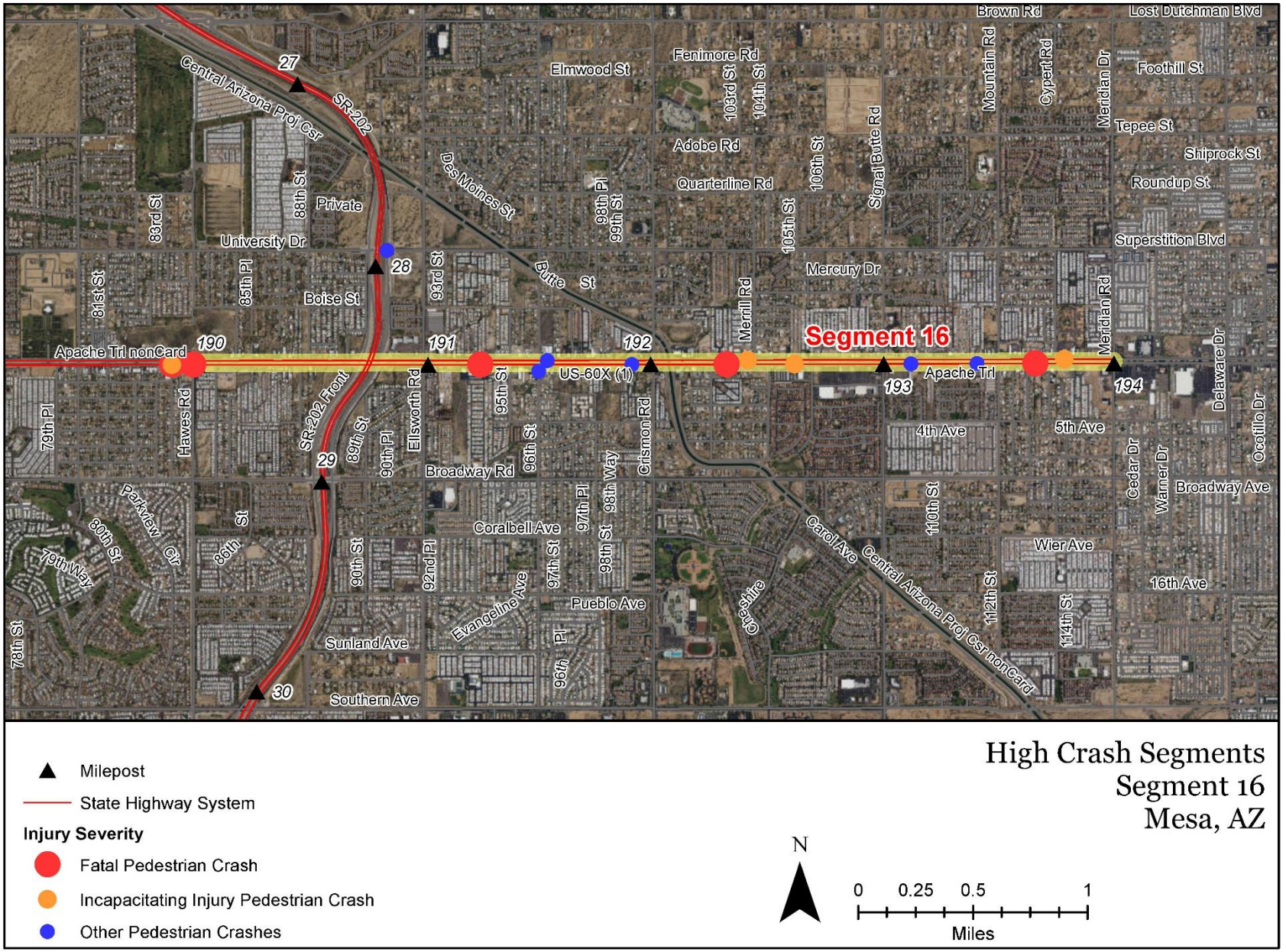
Project Need

The majority of pedestrian crashes along US 60X occurred in unlighted conditions. Various crash types were reported and included pedestrians crossing at non-intersections or walking along the roadway. No pedestrian facilities exist along the highway.

Project Purpose

Reduce pedestrian related crashes by increasing the quality of the pedestrian environment, which includes providing walkways along the road, improved pedestrian visibility at night, and improved pedestrian crossing opportunities.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA	**$20,000**
A RSA was conducted in 2014. ADOT is currently completing a PA for this segment. Additional investigation focused on pedestrian safety within this segment of US 60X may be required to further evaluate safety issues.	
Roadway Reconfiguration	**$281,644**
Implement a road diet (roadway reconfiguration) to reduce the number of lanes that a pedestrian must cross and convert a moving lane to another purpose (bike lanes, sidewalk). As shown in the MAG 2015 traffic volumes, the existing traffic volumes do not warrant a six-lane highway.	
Provide Roadway Lighting	**$985,600**
Improve the lighting along the segment between 104th Street and 83rd Place to increase the visibility of pedestrians. Continuous double-sided lighting would be desirable for the area.	
Enhance Midblock Crossing Opportunities	**$173,959**
Evaluate the need for additional pedestrian crossing opportunities on US 60X such as a two-stage pedestrian crossing or PHB.	
Install Sidewalks	**$4,213,055**
Construct continuous sidewalks or shared-use paths along both sides of US 60X to provide convenient pedestrian mobility. Sections include Silver Spur Ranch to Signal Butte and SR 202 to 104th Street. This may encourage crossing at signalized intersections.	
Estimated Planning Level Total Segment Conceptual Cost:	**$5,674,258**


Segment 16
Apache Trl nonCard
Apache Trl
US-60X (1)
Central Arizona Proj Csr
Central Arizona Proj Csr nonCard
SR-202
SR-202 Frnt
Brown Rd
Lost Dutchman Blvd
Elmwood St
Fenimore Rd
Adobe Rd
Quarterline Rd
Mercury Dr
Superstition Blvd
Foothill St
Tepee St
Shiprock St
Roundup St
Delaware Dr
Ocotillo Dr
Cedar Dr
Warner Dr
Broadway Ave
Wier Ave
16th Ave
5th Ave
4th Ave
Broadway Rd
Coralbell Ave
Pueblo Ave
Sunland Ave
Southern Ave
Carol Ave
Des Moines St
Butte St
University Dr
Boise St
Private
Merrill Rd
Signal Butte Rd
Mountain Rd
Cypert Rd
Meridian Dr
Meridian Rd
Ellsworth Rd
Crismon Rd
Hawes Rd
Parkview Cir
79th Way
Evangeline Ave
Cove Shire
27
28
29
30
190
191
192
193
194
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Segments
Segment 16
Mesa, AZ
N
0
0.25
0.5
1
Miles

Potential Countermeasures for Bethany Home Road at I-17, High-Crash Intersection 1

General Project Information

Interchange: Bethany Home Road at I-17
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/ZT7hjVyhDRy

Location Summary

The Single Point Urban Interchange (SPUI) Bethany Home Road TI at I-17 is in Phoenix. Five pedestrian crashes were reported. None involved serious injuries or fatal injuries.

Programmed Projects: None
Identified in 2009 PSAP: Yes
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
AADT: 40,700 vehicles per day per MAG 2015 ADT Map
Posted Speed Limit: 40 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 5 (1 involved alcohol)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

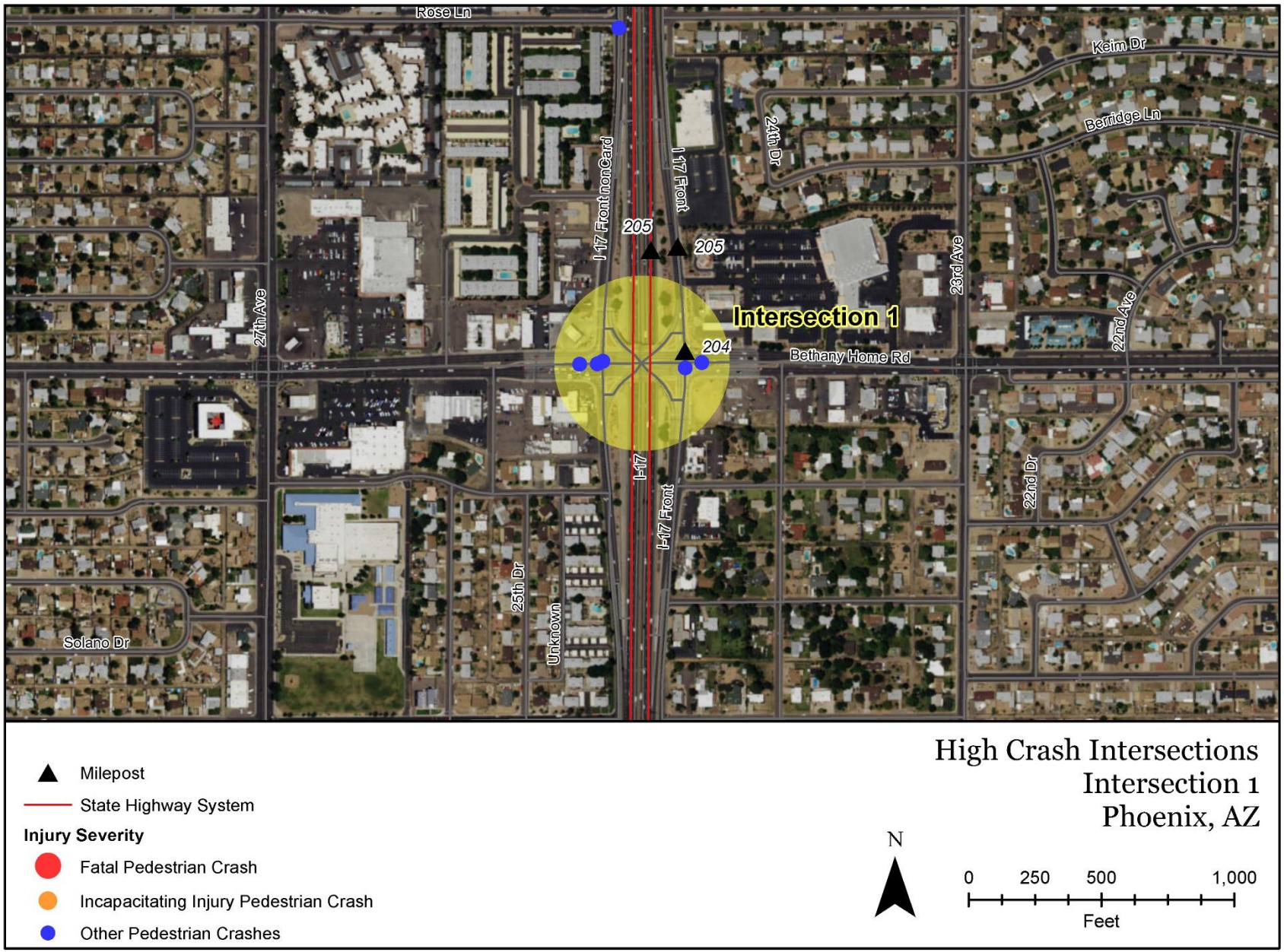
Project Need

The reported pedestrian crashes at the Bethany Home Road interchange occurred during both daylight and nighttime (lighted) conditions. The crash types involved pedestrians crossing where vehicles failed to yield the right-of-way.

Project Purpose

Reduce pedestrian crashes by increasing the pedestrian right-of-way compliance.

Potential Countermeasures	***Conceptual Cost***
Option 1: Engineering Countermeasures	
Conduct RSA	**$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High-Crash Intersection 4 and High-Crash Intersection 11 to further evaluate safety issues	
Enhance Signal Operations for Pedestrians	**$3,000**
Evaluate the existing operations at the interchange. Consider LPI with pushbutton operation, right-turn on red restrictions, or timing modifications to facilitate safe pedestrian travel.	
Enhance Roadway Lighting	—
Review the lighting as part of the RSA to ensure there is a street light above the crosswalks on all interchange approaches to supplement the existing lighting.	
Option 2: Enforcement	—
Increase enforcement at the interchange to target motorists not yielding the right-of-way to pedestrians.	
Estimated Planning Level Total Intersection Conceptual Cost:	**$23,000**


Rose Ln
Keim Dr
Berridge Ln
24th Dr
I 17 Front nonCard
I 17 Front
205
205
23rd Ave
22nd Ave
27th Ave
Intersection 1
204
Bethany Home Rd
I-17
I-17 Front
22nd Dr
25th Dr
Unknown
Solano Dr
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 1
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for SR 77/River Road, High-Crash Intersection 2

General Project Information

Intersection: SR 77/River Road
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 73.85
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/tKuvpKFWrAC2

Location Summary

The SR 77/River Road intersection is in northwest Tucson. Four pedestrian crashes were reported, with one resulting in an incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Six-lane divided (SR 77)
Minor Facility Type: Four-lane divided (River Road)
Major AADT: 43,000 vehicles per day
Minor AADT: 38,900 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the SR 77/River Road intersection occurred during both daylight and nighttime (lighted) conditions. The crash types involved pedestrians crossing, with two crashes occurring due to the pedestrian not using the crosswalk.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High Crash-Intersection 3 to further evaluate safety issues.

Option 1: Engineering Countermeasures

Reduce Curb Radii — **$41,440**
Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

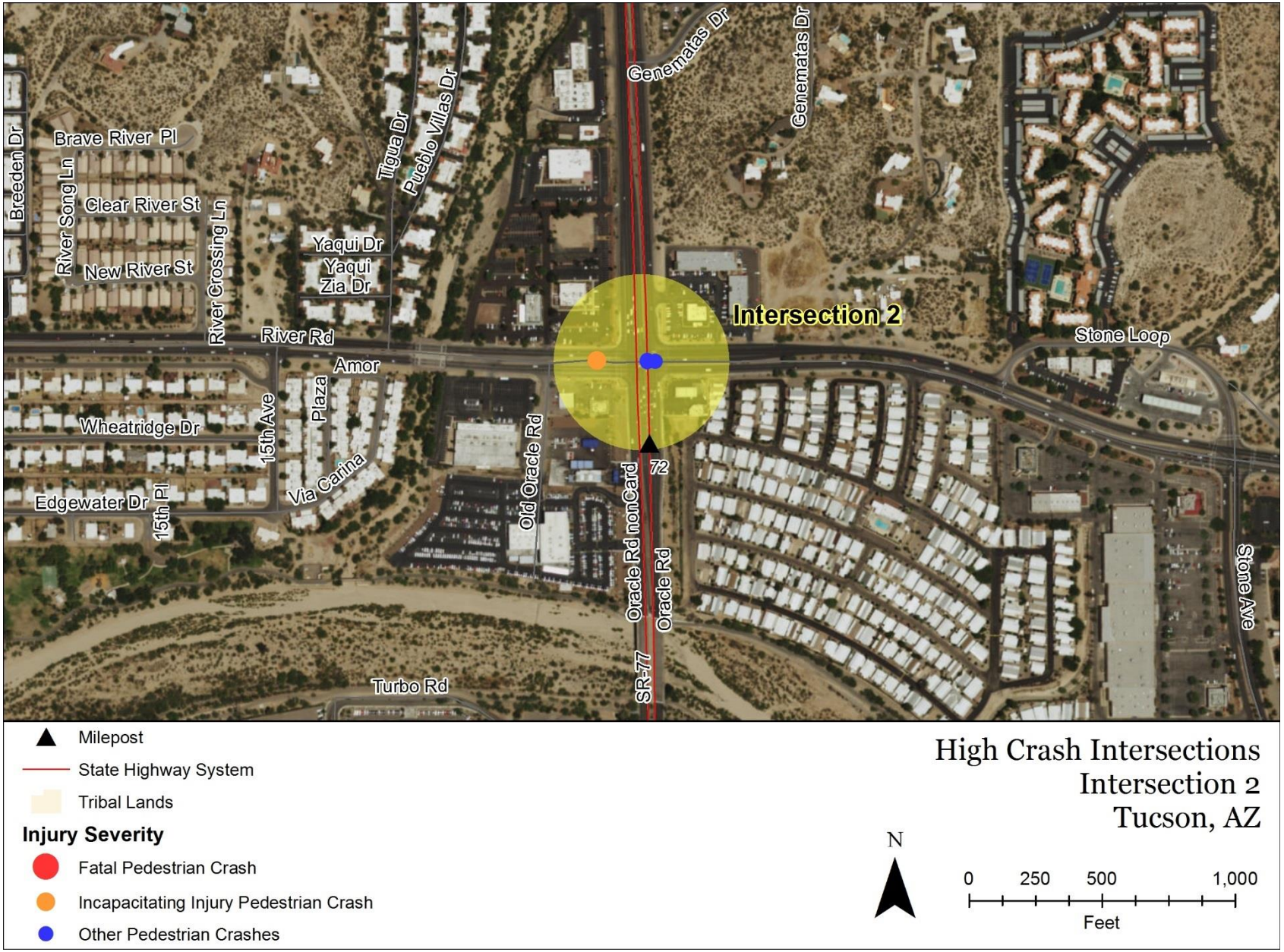
Enhance Roadway Lighting — **—**
Evaluate the intensity of light across all crosswalks as part of the RSA and improve where needed. Two street lights exist on all corners.

Enhance Signal Operations for Pedestrians — **$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions or separating left-turn movements from pedestrian crossings with a protected arrow using the FYA. Review pedestrian crossing/clearance times.

Option 2: Enforcement — **—**

Increase enforcement at the intersection to target motorists not yielding the right-of-way to pedestrians.

Estimated Planning Level Total Intersection Conceptual Cost: $64,440


Intersection 2
Brave River Pl
Breeden Dr
River Song Ln
Clear River St
New River St
River Crossing Ln
Tigua Dr
Pueblo Villas Dr
Yaqui Dr
Yaqui Zia Dr
River Rd
Amor
Plaza
15th Ave
Wheatridge Dr
Edgewater Dr
15th Pl
Via Carina
Old Oracle Rd
Oracle Rd nonCard
Oracle Rd
SR-77
72
Turbo Rd
Genematas Dr
Genematas Dr
Stone Loop
Stone Ave
Milepost
State Highway System
Tribal Lands
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 2
Tucson, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for SR 77/Ina Road, High-Crash Intersection 3

General Project Information

Intersection: SR 77/Ina Road
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 74.85
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/JGdrErTVkvL2

Location Summary

The SR 77/Ina Road intersection is located in northwest Tucson. Four pedestrian crashes were reported, with one resulting in an incapaciting injury. Two of the crashes occurred approximately 250 feet away from the intersection (one to the north and one to the south).

Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Six-lane divided (SR 77)
Minor Facility Type: Four-lane divided (Ina Road)
Major AADT: 53,500 vehicles per day
Minor AADT: 40,000 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the SR 77/Ina Road intersection occurred during daylight conditions with one occurring during the night. The crash types involved pedestrians crossing where the motorists were primarily at fault. Two of the crashes involved pedestrians crossing away from the intersection.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High-Crash Intersection 2 to further evaluate safety issues.

Option 1: Engineering Countermeasures

Reduce Curb Radii — **$20,720**

Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

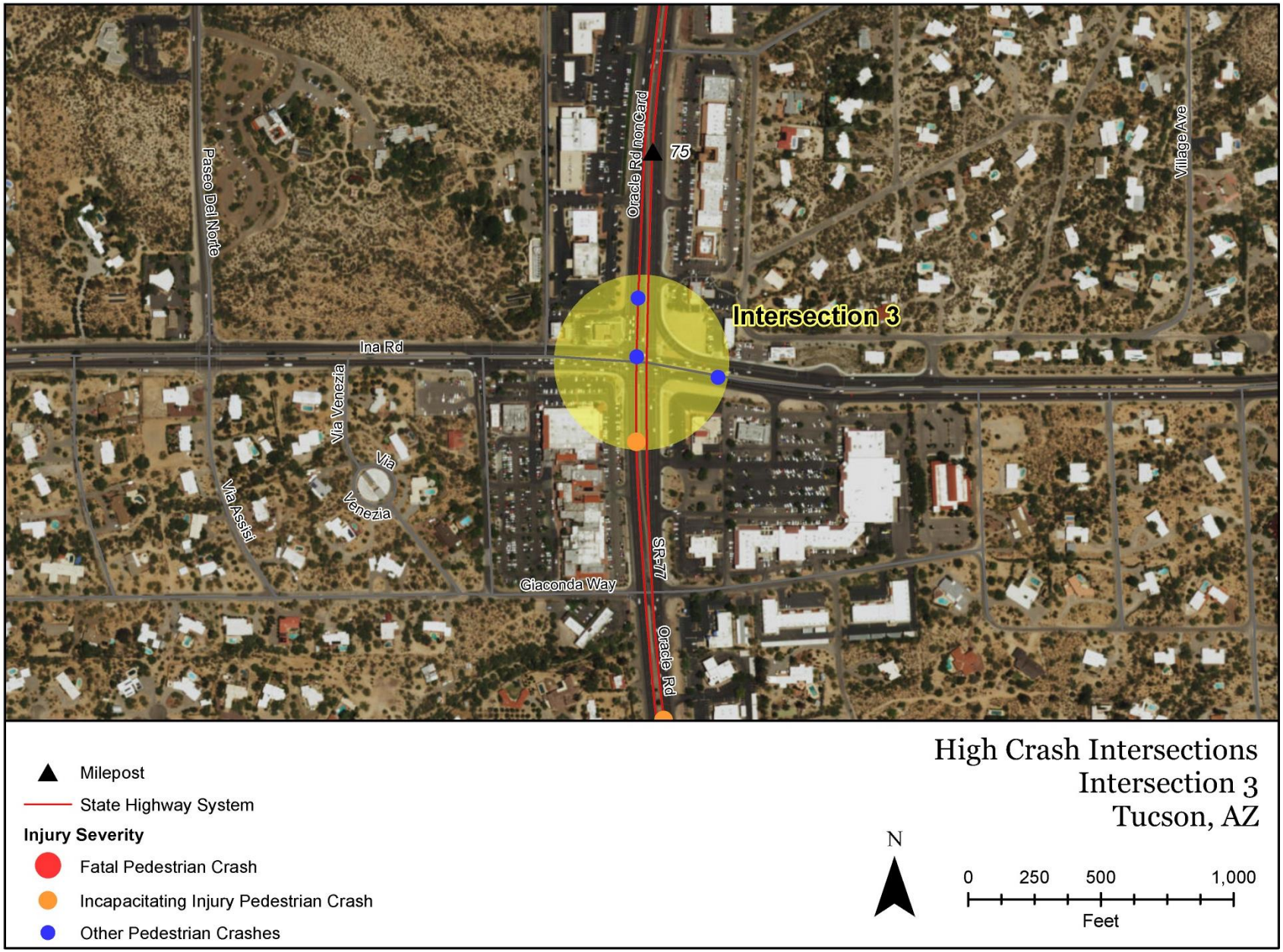
Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions (no right-turn on red already exists for westbound Ina Road).

Option 2: Enforcement — —

Increase enforcement at the intersection to target motorists not yielding the right-of-way to pedestrians.

Estimated Planning Level Total Intersection Conceptual Cost: $43,720


Paseo Del Norte
Oracle Rd nonCard
75
Village Ave
Intersection 3
Ina Rd
Via Venezia
Via
Via Assisi
Venezia
SR-77
Giaconda Way
Oracle Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 3
Tucson, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for Northern Avenue at I-17, High-Crash Intersection 4

General Project Information

Interchange: Northern Avenue at I-17
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/NpLPXdjCdBD2

Location Summary

The SPUI Northern Avenue TI at I-17 is in Phoenix. Three pedestrian crashes were reported, including one fatality
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Seven-lane divided roadway
AADT: 36,600 vehicles per day (Northern Avenue)
Posted Speed Limit: 40 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 3 (2 involved alcohol/drugs)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the Northern Avenue interchange occurred during both daylight and nighttime (lighted) conditions. The crash types involved pedestrians crossing the roadway.

Project Purpose

Reduce pedestrian crashes by increasing the pedestrian crossing compliance at the signalized intersections.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High-Crash Intersection 1 to further evaluate safety issues.

Option 1: Engineering Countermeasures

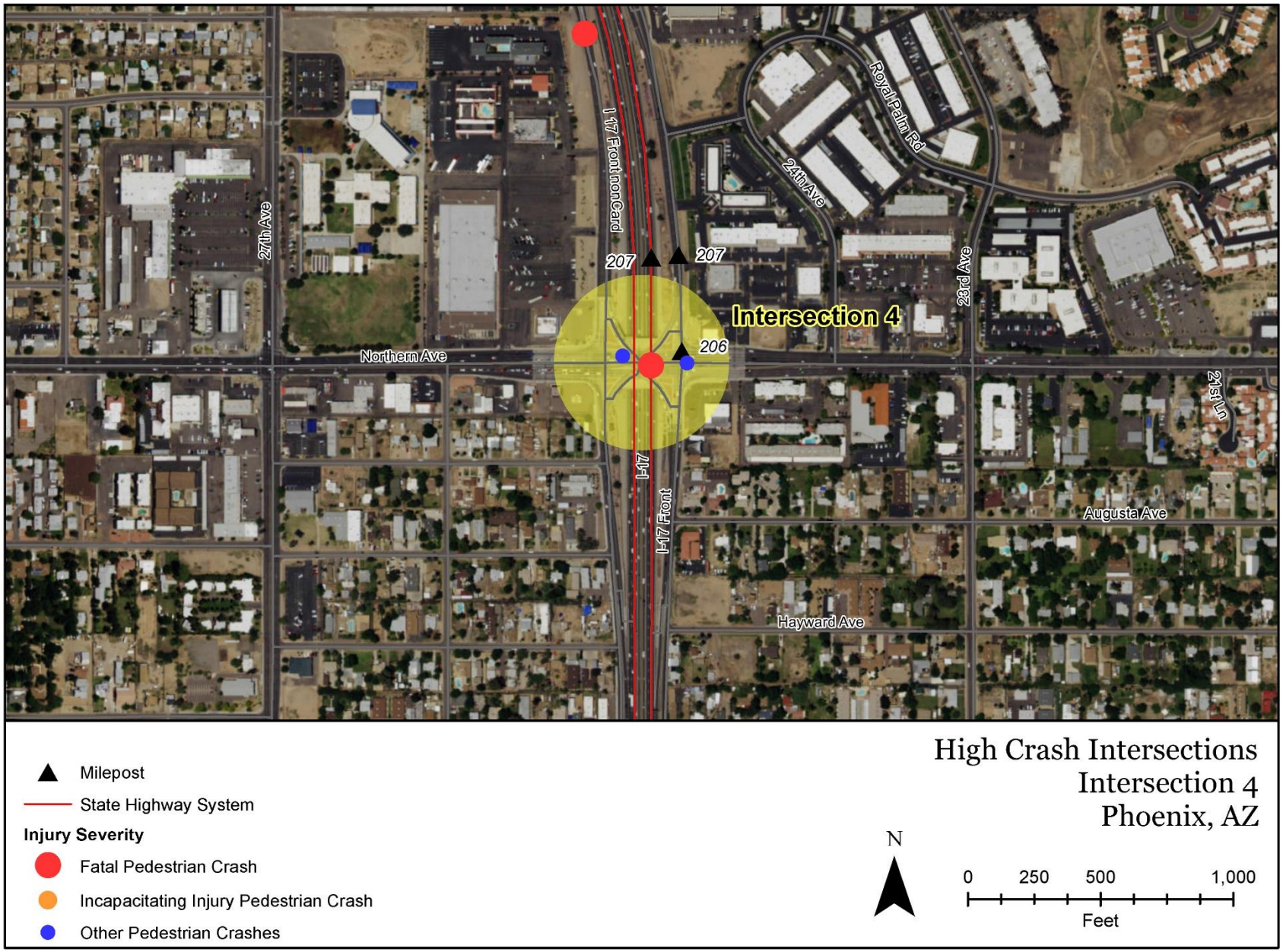
Reduce Curb Radii — **$41,440**
Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

Enhance Signal Operations for Pedestrians — **$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.

Option 2: Enforcement — —

Increase enforcement at the interchange to target pedestrians improperly crossing.

Estimated Planning Level Total Intersection Conceptual Cost: $64,440


I-17 Frontnon Card
I-17
I-17 Front
27th Ave
24th Ave
Royal Palm Rd
23rd Ave
21st Ln
Northern Ave
Augusta Ave
Hayward Ave
207
207
206
Intersection 4
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 4
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for 67th Avenue at I-10, High-Crash Intersection 5

General Project Information

Interchange: 67th Avenue at I-10
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/jtmvKra7mGL2

Location Summary

The 67th Avenue TI at I-10 is in west Phoenix. Three pedestrian crashes were reported, with one resulting in an incapacitating injury
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
AADT: 26,500 vehicles per day (67th Avenue)
Posted Speed Limit: 40 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 3
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial and industrial, including large truck stops south of I-10

Project Need

The reported pedestrian crashes at the Northern Avenue interchange occurred during daylight and nighttime (lighted) conditions. The crash types involved pedestrians crossing the roadway.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection to further evaluate safety issues.

Option 1: Engineering Countermeasures

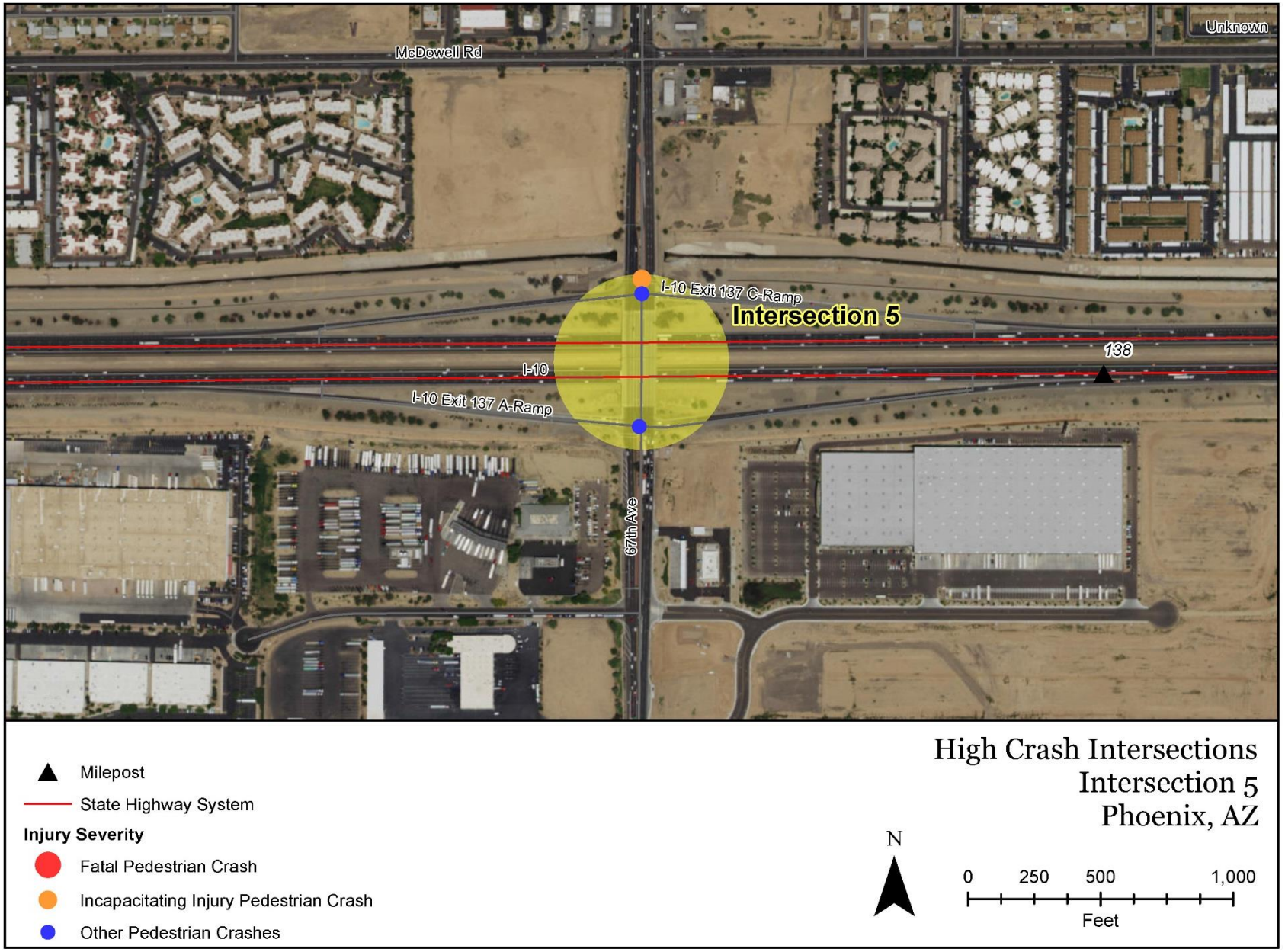
Enhance Signal Operations for Pedestrians — **$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.

Enhance Intersection Lighting — **—**
Evaluate TI to ensure there is a light over every crosswalk as part of the RSA.

Option 2: Enforcement — **—**

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Intersection Conceptual Cost: $23,000


McDowell Rd
Unknown
I-10 Exit 137 C-Ramp
Intersection 5
138
I-10
I-10 Exit 137 A-Ramp
67th Ave
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 5
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for Dysart Road at I-10, High-Crash Intersection 6

General Project Information

Interchange: Dysart Road at I-10
City/Town Name: Avondale/Goodyear
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/1reeTmJ7T8T2

Location Summary

The Dysart Road TI at I-10 is located on the border of Avondale and Goodyear, west of Phoenix. Four pedestrian crashes were reported, with one resulting in an incapacitating injury and one resulting in a fatality. The fatal crash occurred on the I-10 mainline west of the TI.

Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
AADT: 36,900 vehicles per day (Dysart Road) – per 2015 MAG ADT Map
Posted Speed Limit: 40 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the Dysart Road interchange occurred during daylight conditions. The crash types involved pedestrians crossing the roadway with a majority of the motorists failing to yield the right-of-way.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted at the intersection to further evaluate safety issues.

Option 1: Engineering Countermeasures

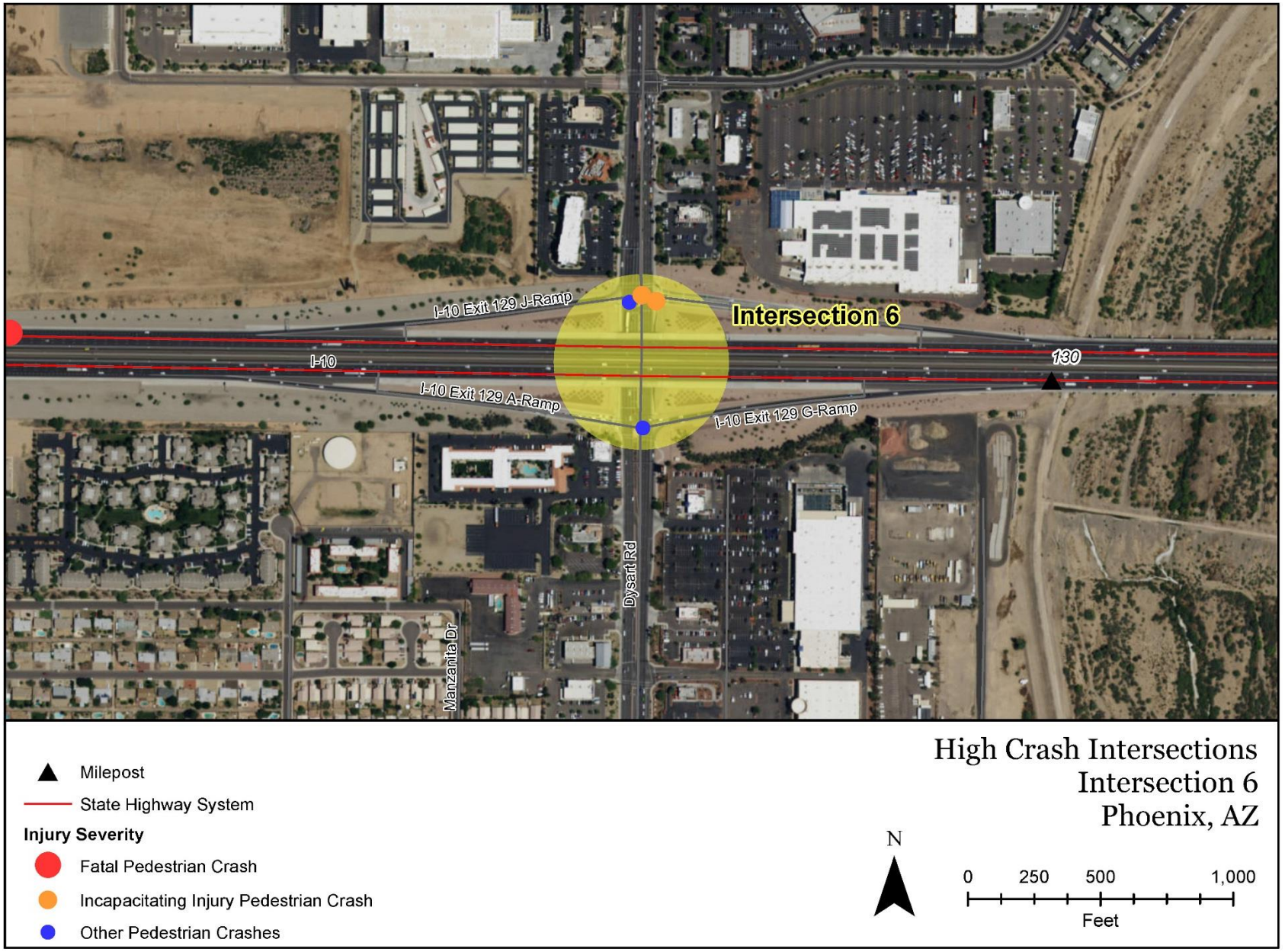
Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Intersection Conceptual Cost: $23,000


Intersection 6
I-10 Exit 129 J-Ramp
I-10
I-10 Exit 129 A-Ramp
I-10 Exit 129 G-Ramp
130
Dysart Rd
Manzanita Dr
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 6
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for SR 95/Joy Lane High-Crash Intersection 7

General Project Information

Intersection: SR 95/Joy Lane
City/Town Name: Fort Mohave
County: Mohave
District: Northwest
Begin Limit: MP 236.45
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/PboTwddaB6U2

Location Summary

The SR 95/Joy Lane intersection is in Fort Mohave. Three pedestrian crashes were reported, with one resulting in an incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Rural
Major Facility Type: Five-lane with TWLTL (SR 77)
Minor Facility Type: Two-lane road (Joy Lane)
Major AADT: 14,200 vehicles per day
Minor AADT: N/A
Posted Speed Limit: 45 mph
Sidewalks: No (ADA ramps)
Lighting: Yes
Bus Stop Locations (within ¼ mile): No
Number of Pedestrian Crashes: 3
Crosswalks: Yes (on two of the three legs)
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the SR 95/Joy Lane intersection occurred during both daylight and nighttime conditions. The crash types involved pedestrians crossing the intersection where the motorists were primarily at fault due to distraction and failure to yield the right-of-way.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted at the intersection to further evaluate safety issues.

Option 1: Engineering Countermeasures

Reduce Curb Radii — **$20,720**

Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

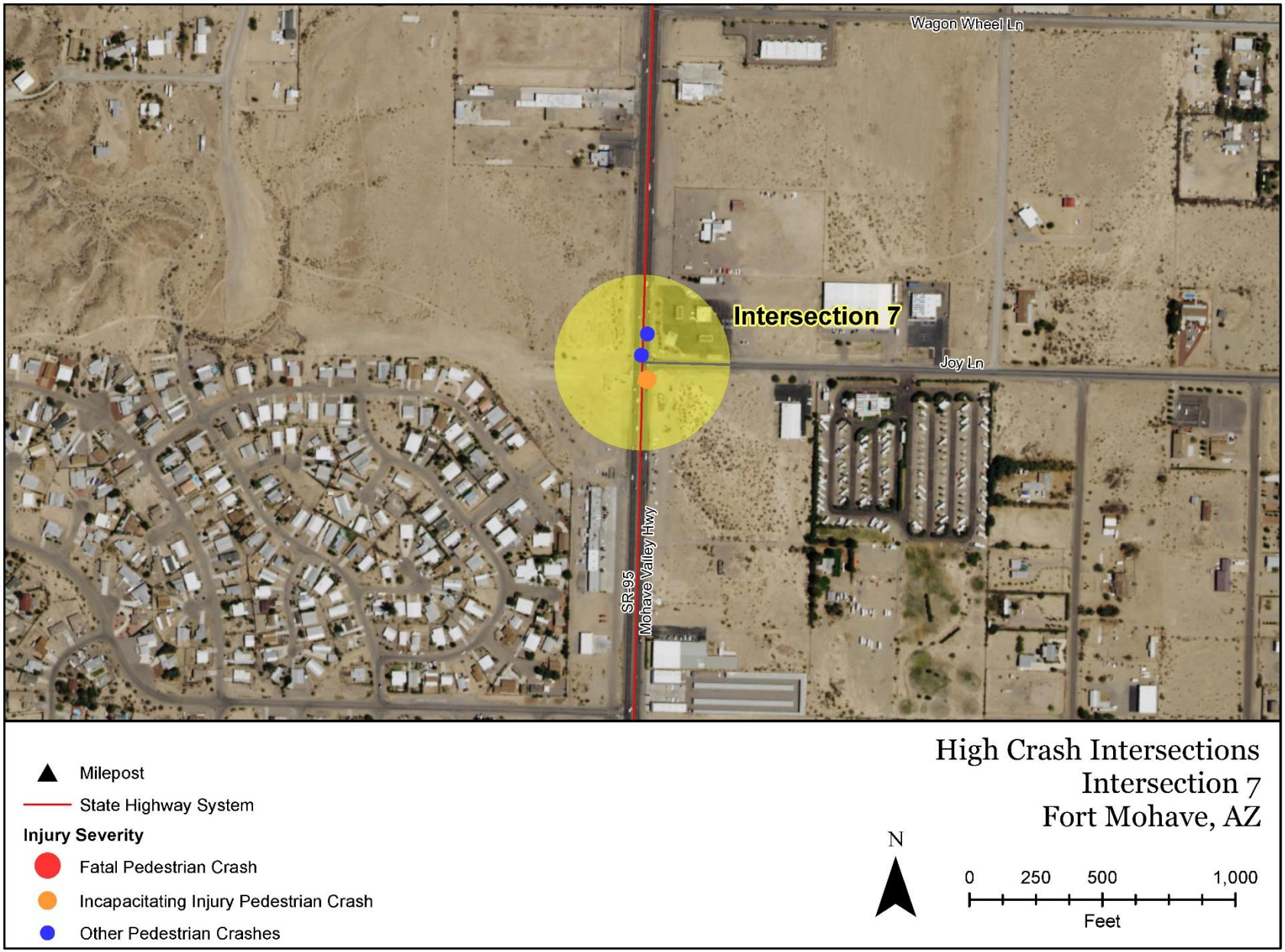
Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions. Consider separating left-turn movements and pedestrian crossings with protected arrow and FYA operation.

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Intersection Conceptual Cost: $43,720


Wagon Wheel Ln
Intersection 7
Joy Ln
SR-95
Mohave Valley Hwy
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 7
Fort Mohave, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for SR 40B/Milton Road High-Crash Intersection 8

General Project Information

Intersection: SR 40B/Milton Road
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 236.45
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/qXboANULMp62

Location Summary

SR 40B/Milton Road is a signal-controlled intersection in Flagstaff, with the fourth leg being a private driveway. Three pedestrian crashes were reported. None involved serious injuries or fatalities. Note that this location is at the end points of High-Crash Segments 11A and 11B.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Five-lane with TWLTL
Minor Facility Type: Five-lane with TWLTL
Major AADT: 36,000 vehicles per day
Minor AADT: 21,200 vehicles per day
Posted Speed Limit: 30 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 3 (1 involved alcohol)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial and university

Project Need

The reported pedestrian crashes at the SR 40B/Milton Road intersection occurred during both daylight and nighttime conditions. The crash types involved pedestrians crossing the intersection.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High-Crash Intersection 9 to further evaluate safety issues.

Option 1: Engineering Countermeasures

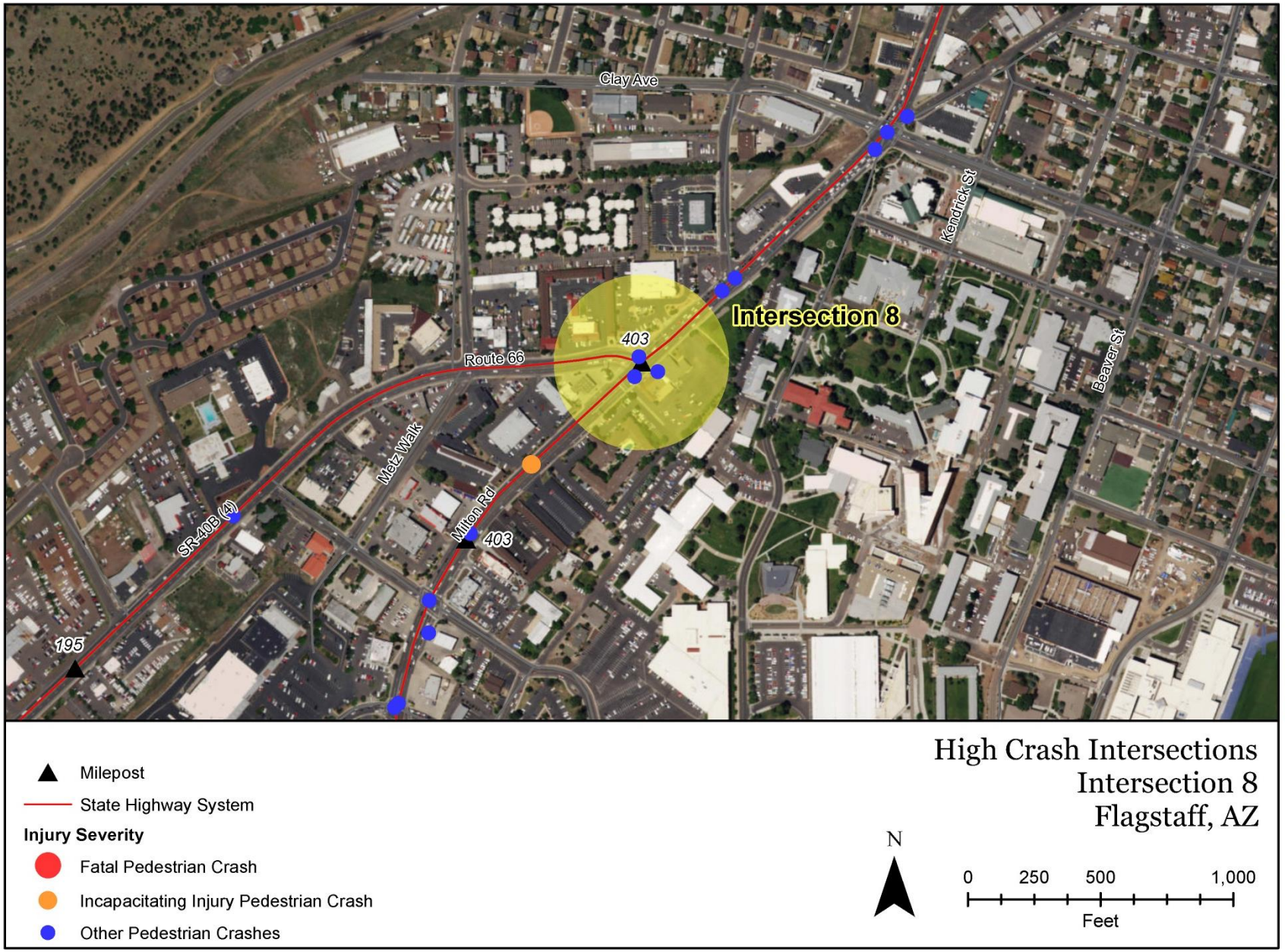
Reduce Curb Radii — **$20,720**
Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

Enhance Signal Operations for Pedestrians — **$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions, or consider protected left-turn arrow to separate left-turn movements from pedestrian crossings (with pedestrian actuation and FYA).

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Intersection Conceptual Cost: $64,440


Clay Ave
Kendrick St
Intersection 8
403
Route 66
Beaver St
Metz Walk
Milton Rd
403
SR-40B (4)
195
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 8
Flagstaff, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for US 180/Birch Avenue High-Crash Intersection 9

General Project Information

Intersection: US 180/Birch Avenue
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 215.6
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/MqDwJRs8qJ82

Location Summary

The US 180/Birch Avenue intersection is in Flagstaff. Three pedestrian crashes were reported, with one resulting in incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Three-lane with TWLTL
Minor Facility Type: One-way, two-lane roadway on east leg and two-way roadway on west leg
Major AADT: 14,300 vehicles per day
Minor AADT: N/A
Posted Speed Limit: 25 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 3
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial, CBD, park, school, and library

Project Need

The reported pedestrian crashes at the US 180/Birch Avenue intersection occurred during both daylight and nighttime conditions. The crashes were a result of the motorists' failure to yield the right-of-way to pedestrians and one crash due to inatention/distraction.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted at the intersection in conjunction with High-Crash Intersection 8 to further evaluate safety issues.

Option 1: Engineering Countermeasures

Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the intersection. Consider LPI or right-turn on red restrictions, or separating left-turn movements from pedestrian crossings with protected arrow and FYA.

Enhance Lighting — **—**

Evaluate to ensure there is adequate light over every crosswalk with the RSA.

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Intersection Conceptual Cost: $23,000


Intersection 9
Cherry Ave
Sitgreaves St
Birch Ave
Aspen Ave
Santa Fe Ave
Phoenix Ave
Humphreys St
US-180 (1)
US-180
Dale Ave
Elm Ave
Beaver St
San Francisco St
Leroux St
Agassiz St
Elden St
196
SR-40B (4)
215
Route 66
215
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 9
Flagstaff, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for US 95/B Street High-Crash Intersection 10

General Project Information

Intersection: US 95/B Street
City/Town Name: San Luis
County: Yuma
District: Southwest
Begin Limit: MP 0.15
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/MJKVEsPdPFF2

Location Summary

The US 95/B Street intersection is in San Luis at a two-way STOP-controlled intersection. Five pedestrian crashes were reported, with two resulting in incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Five-lane with TWLTL
Minor Facility Type: Two-way, two-lane roadway
Major AADT: 23,800 vehicles per day
Minor AADT: N/A
Posted Speed Limit: 25 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 5 (none involved alcohol)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial, San Luis II Arizona-Mexico border crossing

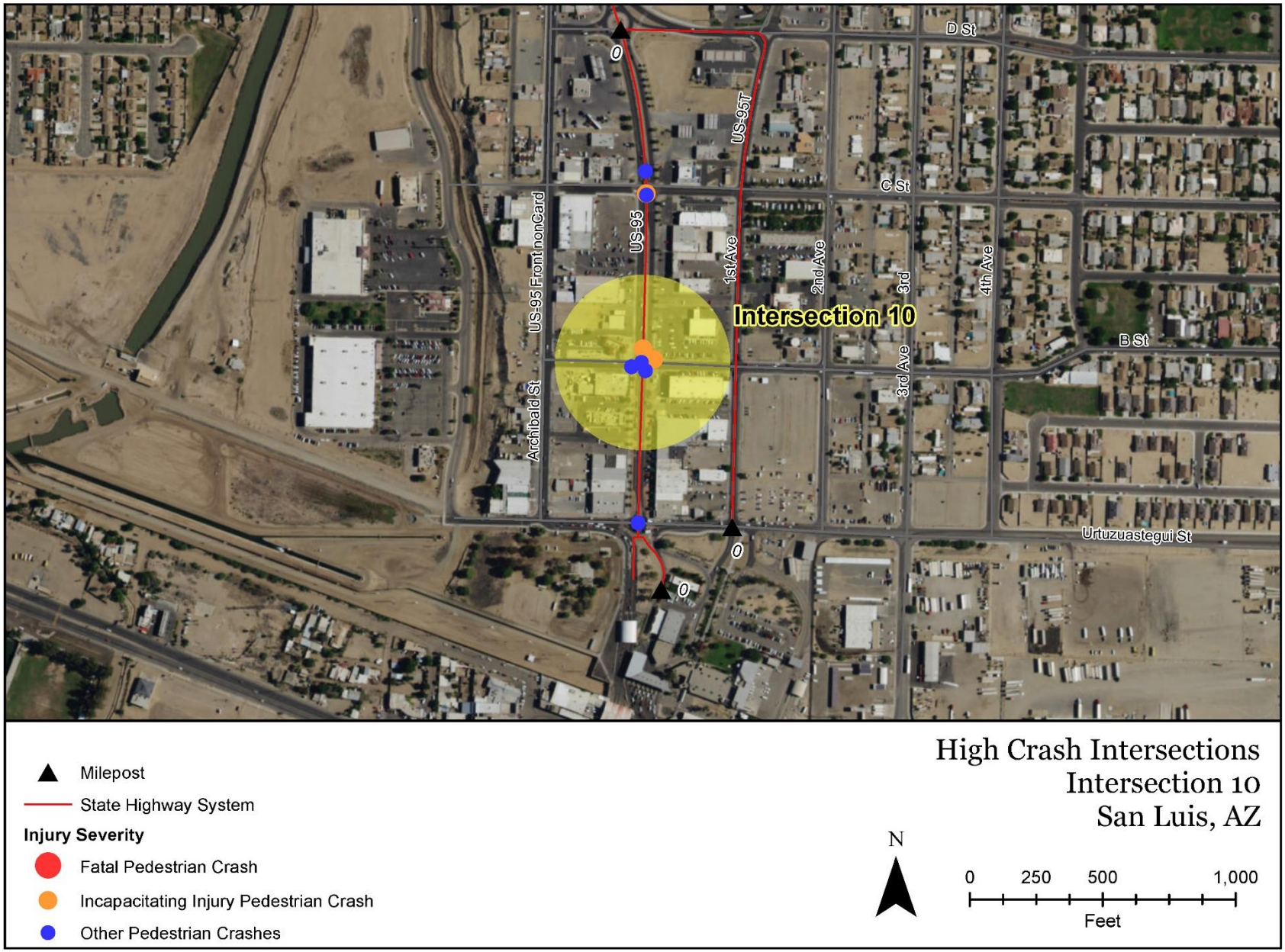
Project Need

The reported pedestrian crashes at the US 95/B Street STOP-controlled intersection (side street stops for US 95) occurred during both daylight and nighttime conditions. The crashes were a result of the motorists' failure to yield the right-of-way to pedestrians and one crash due to inattention/distraction.

Project Purpose

Reduce pedestrian crashes by increasing motorist right-of-way compliance to pedestrians.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA	**$20,000**
An RSA with an emphasis on pedestrian safety should be conducted at the intersection to further evaluate safety issues	
Option 1: Engineering Countermeasures	
Enhance Pedestrian Crossing	**$173,959**
Evaluate the need for a PHB, traffic signal, or four-way STOP control at the intersection.	
Option 2: Enforcement	**—**
Increase enforcement for motorists failing to yield the right-of way at the intersection.	
Estimated Planning Level Total Intersection Conceptual Cost:	**$193,959**


D St
C St
B St
Urtuzuastegui St
US-95T
US-95
US-95 Front nonCard
Archibald St
1st Ave
2nd Ave
3rd
3rd Ave
4th Ave
Intersection 10
0
0
0
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 10
San Luis, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for Glendale Avenue at I-17, High-Crash Intersection 11

General Project Information

Interchange: Glendale Avenue at I-17
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: MP 205
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/SWTpy4bHvBQ2

Location Summary

The SPUI Glendale Avenue TI at I-17 is in Phoenix. Four pedestrian crashes were reported, with one crash resulting in an incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
AADT: 45,900 vehicles per day (Glendale Avenue) – per MAG 2015 Traffic Count Map)
Posted Speed Limit: 40 mph
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4 (none involved alcohol)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the Glendale Avenue interchange occurred during daylight conditions. The crash types involved pedestrians crossing the roadway with a mix of motorists failing to yield the right-of-way and pedestrians not using the crosswalk or disregarding the traffic signal.

Project Purpose

Reduce pedestrian crashes by increasing both motorist and pedestrian compliance.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

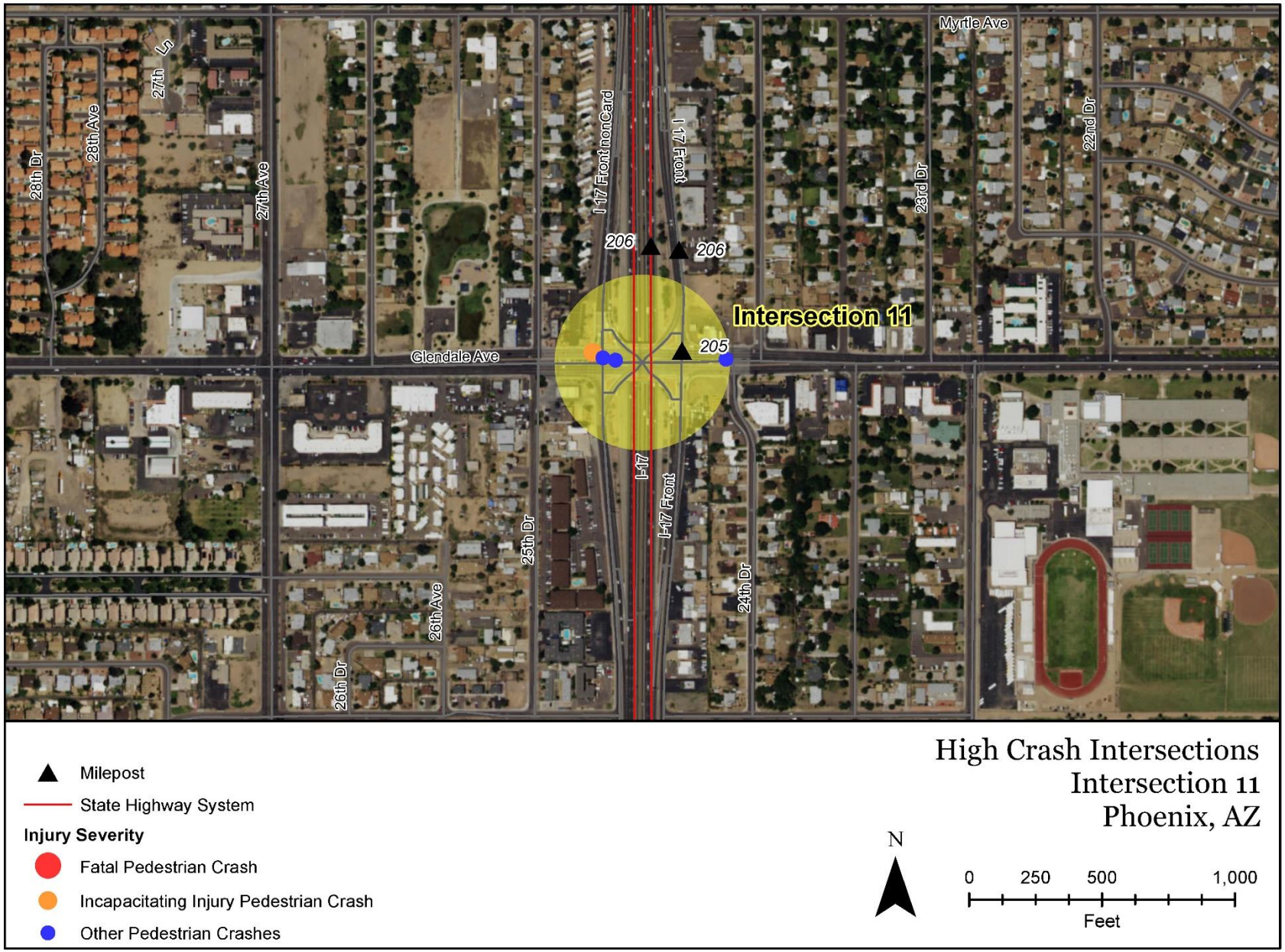
Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions. Review cycle lengths and wait times for pedestrian crossings.

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection and for pedestrians crossing improperly.

Estimated Planning Level Total Intersection Conceptual Cost: $3,000


Myrtle Ave
27th Ln
28th Dr
28th Ave
27th Ave
I 17 Front nonCard
I 17 Front
23rd Dr
22nd Dr
206
206
Intersection 11
205
Glendale Ave
I-17
I-17 Front
25th Dr
24th Dr
26th Ave
26th Dr
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 11
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for Indian School Road at I-17, High-Crash Intersection 12

General Project Information

Interchange: Indian School Road at I-17
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: MP 202
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/555SsUaJoo42

Location Summary

The Indian School Road TI at I-17 is in Phoenix. Four pedestrian crashes were reported, with one crash resulting in an incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Eight-lane divided roadway
AADT: 51,056 vehicles per day (Indian School Road)
Posted Speed Limit: 35 mph for Indian School Road and 40 mph for I-17 frontage roads
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4 (1 involved alcohol)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

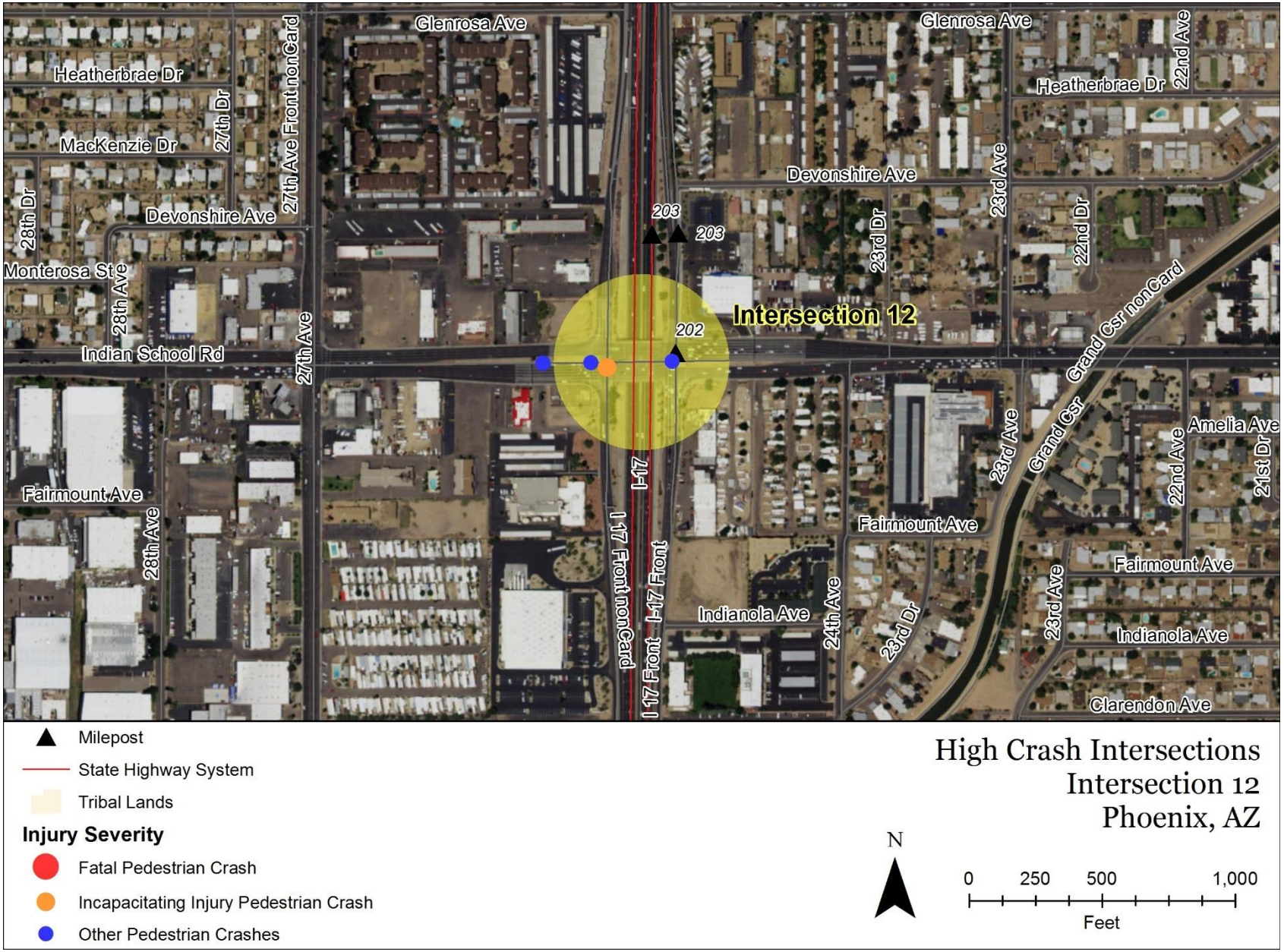
Project Need

The reported pedestrian crashes at the Indian School Road interchange occurred during both daylight and nighttime (lighted) conditions. The crash types involved pedestrians crossing the roadway where pedestrians were did not use the crosswalk or disregarded the traffic signal.

Project Purpose

Reduce pedestrian crashes by increasing pedestrian intersection crossing compliance.

Potential Countermeasures	*Conceptual Cost*
Option 1: Engineering Countermeasures	
Reduce Curb Radii	**$41,440**
Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility. As there are four lanes in each direction, it may be possible to address some of the large radii at this TI.	
Enhance Signal Operations for Pedestrians	**$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.	
Evaluate Lighting for Pedestrians	—
Review nighttime lighting at interchange crosswalks	
Option 2: Enforcement	—
Increase enforcement for pedestrians crossing improperly and motorists' failure to yield on right-turns.	
Estimated Planning Level Total Intersection Conceptual Cost:	**$44,440**


Glenrosa Ave
Heatherbrae Dr
MacKenzie Dr
Devonshire Ave
Monterosa St
Indian School Rd
Fairmount Ave
Indianola Ave
Clarendon Ave
Amelia Ave
27th Dr
27th Ave Front nonCard
28th Dr
28th Ave
27th Ave
22nd Ave
23rd Ave
23rd Dr
22nd Dr
21st Dr
24th Ave
Grand Csr nonCard
Grand Csr
I-17
I-17 Front nonCard
I-17 Front
203
202
Intersection 12
Milepost
State Highway System
Tribal Lands
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 12
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for Thomas Road at I-17, High-Crash Intersection 13

General Project Information

Interchange: Thomas Road at I-17
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: MP 201
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/Vr1k1XU1N5J2

Location Summary

The Thomas Road TI at I-17 is in Phoenix. Six pedestrian crashes were reported with one crash resulting in an incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
AADT: 37,400 vehicles per day (Thomas Road) per MAG 2015 traffic volume map
Posted Speed Limit: 35 mph for Thomas Road and 40 mph for the I-17 frontage roads
Sidewalks: Yes
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 6 (1 involved alcohol and 1 involved a physical impairment)
Crosswalks: Yes
Other Pedestrian Attractors/Generators: Various commercial

Project Need

The reported pedestrian crashes at the Thomas Road interchange occurred during daylight with one during dark/lighted conditions. The crash types involved pedestrians crossing the roadway with a mix of the motorist failing to yield the right-of-way and pedestrians not using the crosswalk or disregarding the traffic signal.

Project Purpose

Reduce pedestrian crashes by increasing pedestrian intersection crossing compliance.

Potential Countermeasures	*Conceptual Cost*
Option 1: Engineering Countermeasures	
Reduce Curb Radii	**$20,720**
Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility; the radii at the NW corner in particular may be reduced.	
Enhance Signal Operations for Pedestrians	**$3,000**
Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.	
Evaluate Lighting	—
Review nighttime lighting to assure all crosswalks are well lit.	
Option 2: Enforcement	—
Increase enforcement for motorists failing to yield the right-of way at the intersection and for pedestrians crossing improperly.	

Estimated Planning Level Total Intersection Conceptual Cost: $23,720


US-60 Exit 160 J-Ramp
160
US-60 Exit 160 C-Ramp
US-60 Exit 160 A-Ramp
US-60
Earll Dr
Avalon Dr
Avalon Dr
Campus Dr
23rd Dr
Avalon Dr
Pinchot Ave
26th Dr
25th Dr
27th Ave
Catalina Dr
24th Ave
Catalina Dr
202
202
Verde Ln
Grand Ave
Intersection 13
201
21st Dr
23rd Ave
160
160
Thomas Rd
26th Ave
US-60X Exit 160 G-Ramp
US-60 Exit 160 G-Ramp
I-17
I 17 Front nonCard
I-17 Front
Dr
Edgemont Ave
22nd
Windsor Ave
27th Ave
US-60X
24th Dr
28th Ave
Grand Ave nonCard
I 17 Front
201
Cambridge Ave
24th Ave
22nd Ave
Cambridge Ave
Virginia Ave
Milepost
State Highway System
Tribal Lands
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Crash Intersections
Intersection 13
Phoenix, AZ
N
0
250
500
1,000
Feet

Potential Countermeasures for SR 95, High-Risk Segment 1

General Project Information

Primary Route/Street: SR 95
City/Town Name: Bullhead City
County: Mohave
District: Northwest
Begin Limit: MP 244
End Limit: MP 246
Segment Length: 2.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/CPF5NDy6hYw

Location Summary

This US 95 segment is in the central business district of Bullhead City. Eight pedestrian crashes were reported, and one resulted in incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway with TWLTL
AADT: 26,200 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Yes
Lighting: Yes, on both sides (for majority of corridor)
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 8 (none involved alcohol)
Crosswalks: At signalized intersections
Other Pedestrian Attractors/Generators: Commercial, high school, and nearby residential

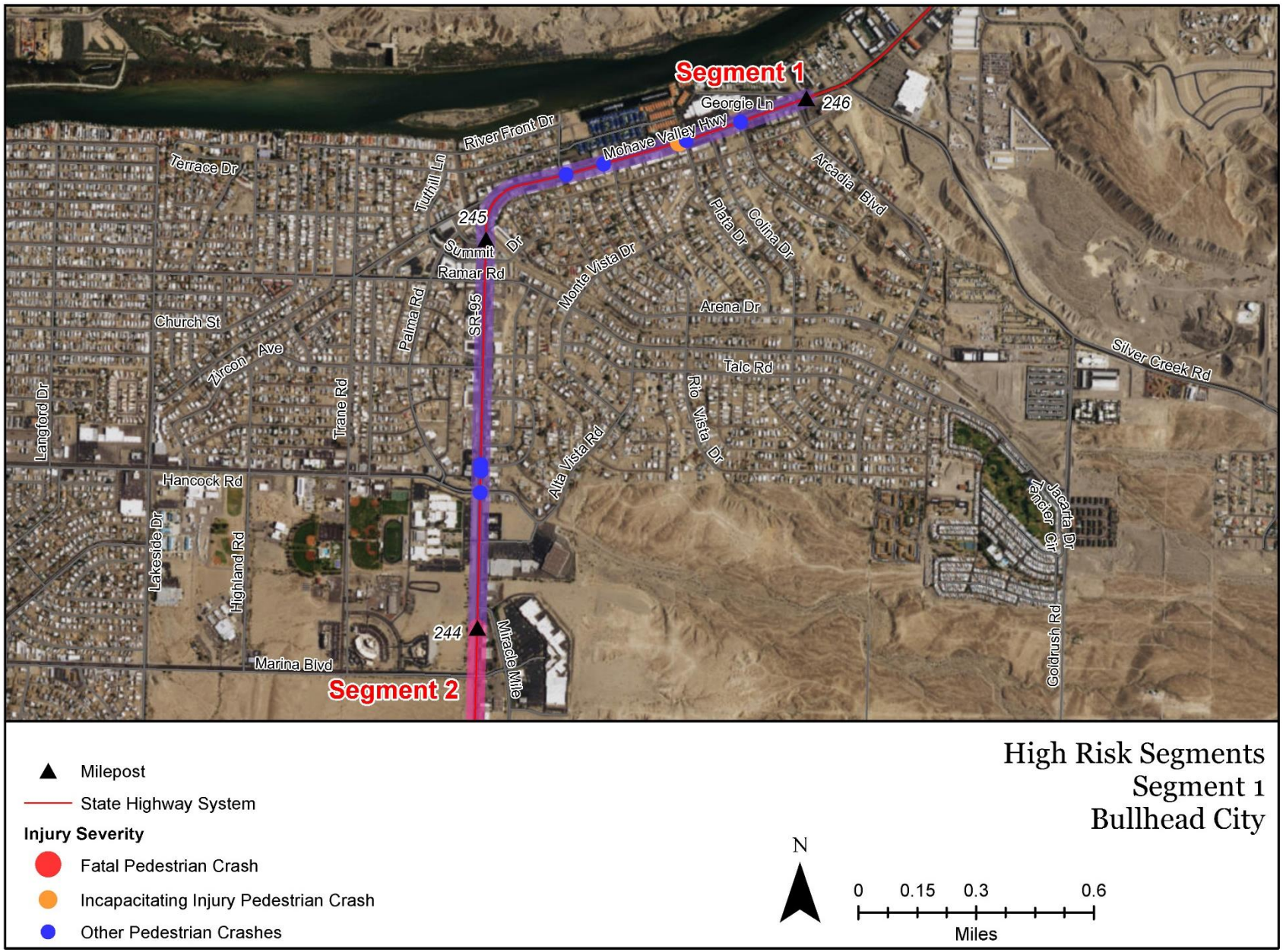
Project Need

A majority of the reported pedestrian crashes along MP 244 - MP 246 have occurred at unsignalized intersections. The reported crash types include *Crossing Roadway – Vehicle Turning/Vehicle Not Turning*. This segment has few crossing opportunities. This segment has a vertical and horizontal curve. Sidewalks exist along both sides of the road. Commercial development along the road has direct access to SR 95 resulting in multiple closely-spaced driveways.

Project Purpose

Reduce potential for pedestrian crashes by providing safe crossing opportunities across SR 95.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA	**$20,000**
An RSA was completed for MP 242 to MP 250, October 20-22, 2008. Recommendations should be reviewed and updated with an emphasis on pedestrian safety.	
Option 1: Engineering Countermeasures	
Pedestrian Crossing Improvements	**$173,959**
Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB at locations between the signalized intersections of Hancock Road and Ramar Road.	
Reduce Curb Radii	**$414,400**
Reduce the curb radii at pedestrian crossings where feasible to improve pedestrian mobility and increase pedestrian visibility.	
Construct a Raised Median	**$3,434,522**
Construct a raised median from Rancho Colorado Boulevard to Miracle Mile (approximately 2.4 miles). The raised median would provide a pedestrian crossing refuge and help to control access along the segment.	
Evaluate Lighting	**—**
Review nighttime lighting as part of the RSA to ensure all sidewalks and crosswalks are well lit.	
Option 2: Enforcement	**—**
Based on the existing crash characteristics, increase enforcement for motorists failing to yield the right-of way at the intersections.	
Estimated Planning Level Total Segment Conceptual Cost:	**$4,042,881**


Segment 1
Georgie Ln
246
River Front Dr
Mohave Valley Hwy
Terrace Dr
Tuthill Ln
245
Summit Dr
Ramar Rd
Monte Vista Dr
Plata Dr
Colina Dr
Arcadia Blvd
Arena Dr
Church St
Zircon Ave
Palma Rd
SR-95
Talc Rd
Silver Creek Rd
Langford Dr
Trane Rd
Rio Vista Dr
Alta Vista Rd
Hancock Rd
Jacarta Dr
Tander Cir
Lakeside Dr
Highland Rd
244
Miracle Mile
Goldrush Rd
Marina Blvd
Segment 2
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 1
Bullhead City
N
0
0.15
0.3
0.6
Miles

Potential Countermeasures for SR 95, High-Risk Segment 2

General Project Information

Primary Route/Street: SR 95
City/Town Name: Bullhead City
County: Mohave
District: Northwest
Begin Limit: MP 241.5
End Limit: MP 244.0
Segment Length: 2.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/ATE9bo2gYTN2

Location Summary

This SR 95 segment is in Bullhead City. Three pedestrian crashes were reported, and two resulted in incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway with TWLTL
AADT: 26,500 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Yes, on east side and most of west side
Lighting: One side of the highway
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 4 (1 involved alcohol, driver)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Big Box Store, commercial, church, and residential

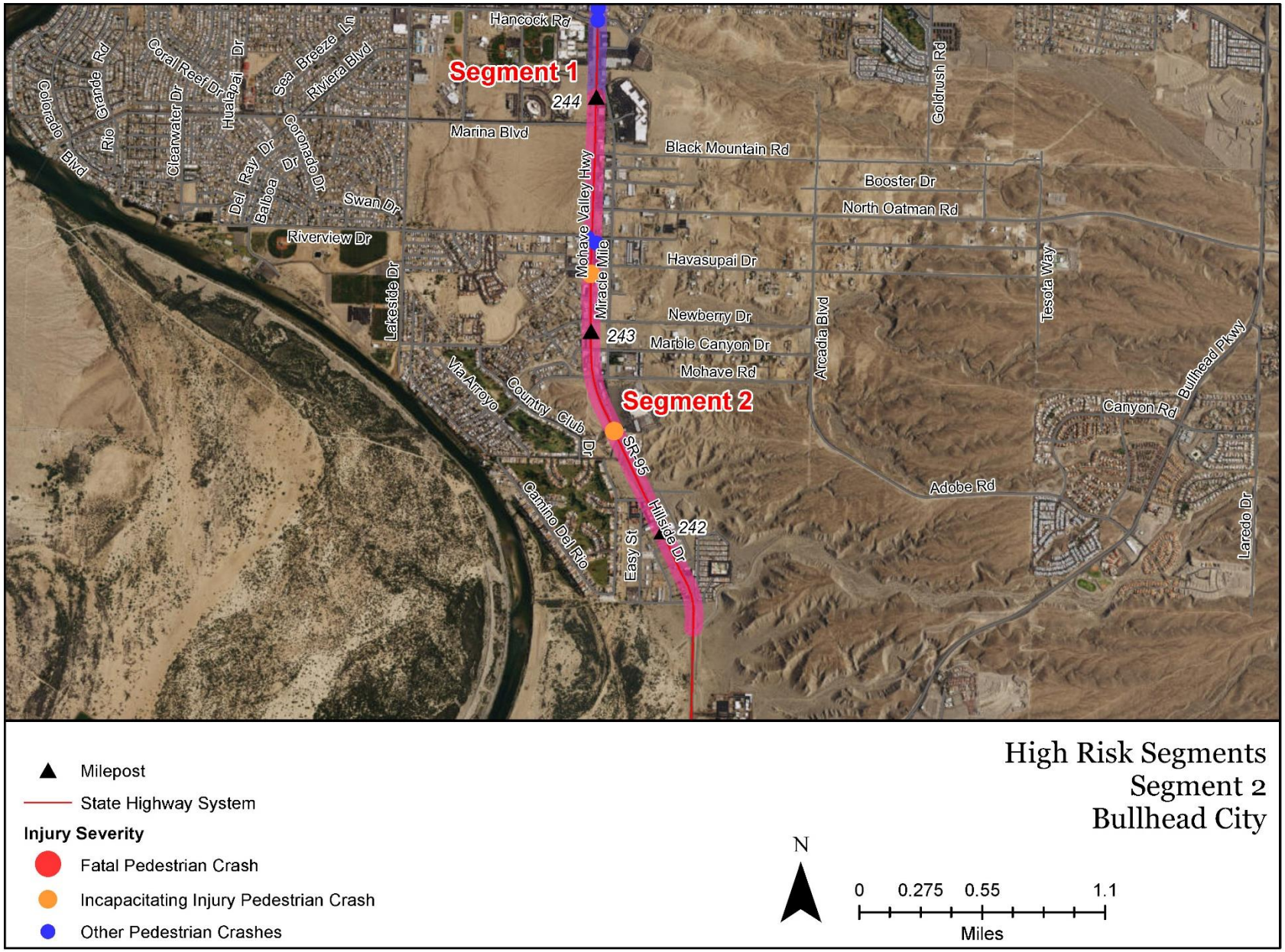
Project Need

The majority of the reported pedestrian crashes along MP 244 - MP 246 have occurred at unsignalized intersections at nighttime. The reported crash types include *Crossing Roadway – Vehicle Turning/Vehicle Not Turning*. This segment has few crossing opportunities and high speeds. Sidewalks exist along the east side of the road and along developed portions of the west side. Long blocks of undeveloped land do not have sidewalk on the west side of the road.

Project Purpose

Reduce potential for pedestrian crashes by creating a more accommodating environment for pedestrians and providing safe crossing opportunities across SR 95.

Potential Countermeasures	*Conceptual Cost*
Option 1: Engineering Countermeasures	
Conduct RSA	**$20,000**
An RSA was completed for MP 242 to MP 250, October 20-22, 2008. Recommendations should be reviewed and updated with an emphasis on pedestrian safety.	
Construct Raised Median	**$3,577,627**
Construct a raised median throughout the high-risk segment at the developed locations between MP 241.5 - MP 244.	
Conduct Access Management Study	**$20,000**
Improve and consolidate the access drives along the high-risk segment to reduce pedestrian conflicts.	
Enhance Mid-Block Crossing Opportunities	**$173,959**
Evaluate the need for a PHB located between Mohave Drive and Riverview Drive. Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB at locations along the segment.	
Reduce Curb Radii	**$124,320**
Improve the curb radii at the signalized pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.	
Option 2: Enforcement	**—**
Based on the existing crash characteristics, increase enforcement for motorists failing to yield the right-of way at the intersections.	
Estimated Planning Level Total Segment Conceptual Cost:	**$3,915,907**


Segment 1
Segment 2
Hancock Rd
244
Marina Blvd
Black Mountain Rd
Booster Dr
North Oatman Rd
Havasupai Dr
Newberry Dr
243
Marble Canyon Dr
Mohave Rd
242
Adobe Rd
Canyon Rd
Mohave Valley Hwy
Miracle Mile
Lakeside Dr
Riverview Dr
Swan Dr
Del Ray Dr
Balboa Dr
Coronado Dr
Cleanwater Dr
Coral Reef Dr
Hualapai Dr
Sea Breeze Ln
Riviera Blvd
Rio Grande Rd
Colorado Blvd
Goldrush Rd
Arcadia Blvd
Tesota Way
Bullhead Pkwy
Laredo Dr
Via Arroyo
Country Club Dr
SR-95
Hillside Dr
Easy St
Camino Del Rio
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 2
Bullhead City
N
0
0.275
0.55
1.1
Miles

Potential Countermeasures for SR 95, High-Risk Segment 3

General Project Information

Primary Route/Street: SR 95
City/Town Name: Fort Mohave
County: Mohave
District: Northwest
Begin Limit: MP 235.5
End Limit: MP 237.4
Segment Length: 1.9 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/JPj1JdNjAEF2

Location Summary

The SR 95 segment is located in Fot Mohave. Two crashes were reported, with both resulting in no injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 27,700 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Fragmented
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 2 (1 involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial

Project Need

Similar to the high-pedestrian-crash location Segment 5, the reported crashes along MP 235.5 - MP 239.5 occurred during both daylight and nighttime conditions. Most of the crashes occurred at intersections and were primarily observed to be the fault of the pedestrian.

Project Purpose

Reduce the number of pedestrian crashes on SR 95 by increasing pedestrian visibility to motorist.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

Construct Raised Median — **$2,718,997**
Construct a raised median throughout the high-risk segment at the developed locations between MP 235.5 - MP 237.4.

Add Segment Lighting — **$535,040**
Evaluate the need for increased roadway lighting along the segment MP 235 - MP 237.5.

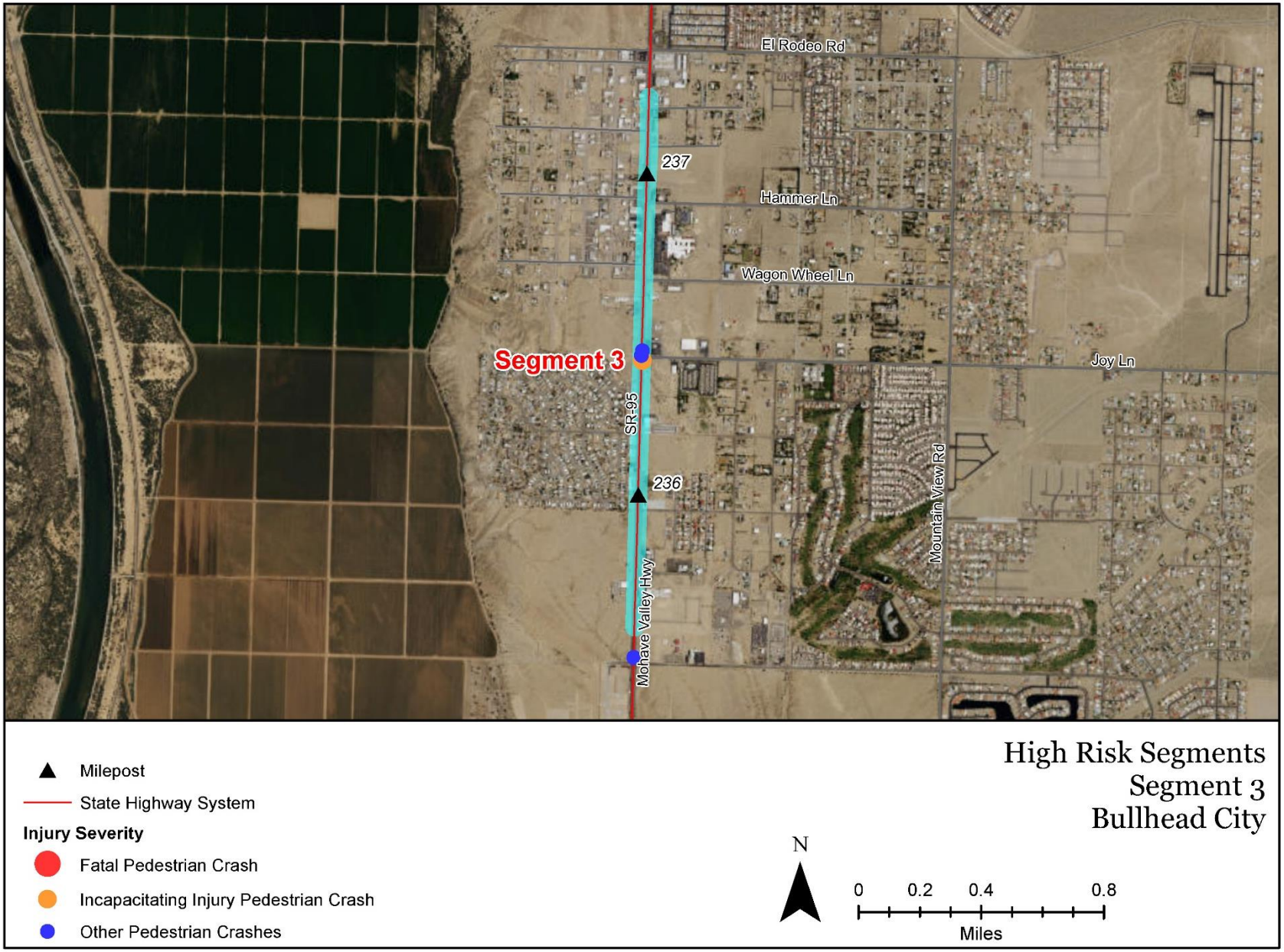
Install Sidewalks — **$4,694,900**
Provide sidewalks on both sides of MP 235.5 - MP 237.4. Require new developments to construct sidewalk along frontage.

Option 2: Education/Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection and for pedestrians crossing improperly. Implement a pedestrian safety campaign to include local businesses provided with ADOT pedestrian safety pamphlets.

54 motor vehicle crashes occurred during the study period.

Estimated Planning Level Total Segment Conceptual Cost: $7,968,937


El Rodeo Rd
237
Hammer Ln
Wagon Wheel Ln
Segment 3
Joy Ln
SR-95
236
Mountain View Rd
Mohave Valley Hwy
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 3
Bullhead City
N
0
0.2
0.4
0.8
Miles

Potential Countermeasures for SR 95, High-Risk Segment 4

General Project Information

Primary Route/Street: SR 95
City/Town Name: Mohave Valley
County: Mohave
District: Northwest
Begin Limit: MP 229.4
End Limit: MP 230.5
Segment Length: 1.1 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Tribal and private
Google Map: https://goo.gl/maps/7TCtZJj4Ntk

Location Summary

This segment is in Mohave Valley adjacent to Spirit Mountain Casino. There have been zero reported pedestrian crashes. This segment was identified as a potential high-risk segment. No pedestrian crashes were reported, but this segment has similar characteristics to other high-crash locations.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Five-lane highway with TWLTL
AADT: 11,500 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: No
Lighting: No
Bus Stop Locations (within ¼ mile): No
Number of Pedestrian Crashes: 0
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: Casino, residential, commercial, and school

Project Need

Further evaluation of this segment should be performed at the SR 95/Willow Drive.
There have been no reported crashes along this segment. Residential exists on the east side of the road. A casino and other commercial exist on the west side of the road. There is a worn dirt path parallel to the highway on the east side of the road.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues. ADOT should work closely with Tribal members to determine actual crash statistics on this segment.

Option 1: Engineering Countermeasures

Install Sidewalks **$988,400**
Provide sidewalks on both sides of SR 95 from Cottonwood Lane to Commercial Street (0.4 mile).

Improve Signal Operations for Pedestrians ***$3,000***
Evaluate the existing SR 95/Willow Drive traffic signal for improvements to enhance pedestrian crossing safety, especially during peak school periods. This can include signage to restrict right-turn on red when children are present.

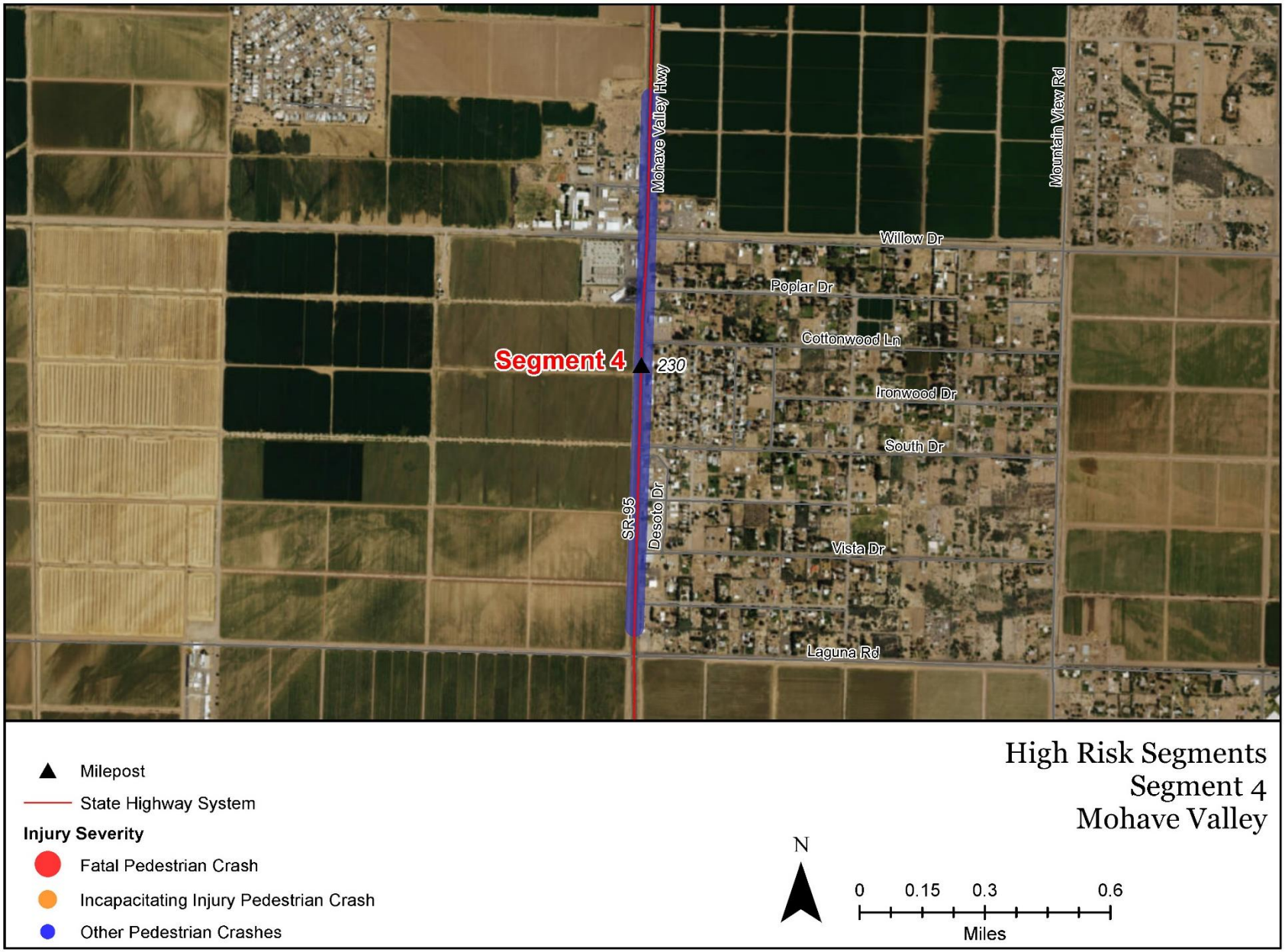
Enhance Mid-Block Crossing Opportunities **$173,959**
Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB adjacent to the casino.

Provide Intersection Lighting **$48,000**
Provide lighting at major intersections and access points and future crosswalks.

Option 2: Engineering Countermeasures

Provide Paved Shared-Use Path **$618,000**
Provide an offset paved shared-use path on the east side of the highway along the entire segment with accessible connections to existing and future crosswalks.

Estimated Planning Level Total Segment Conceptual Cost: $1,851,359


Mohave Valley Hwy
Mountain View Rd
Willow Dr
Poplar Dr
Cottonwood Ln
Segment 4
230
Ironwood Dr
South Dr
SR-95
Desoto Dr
Vista Dr
Laguna Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 4
Mohave Valley
N
0
0.15
0.3
0.6
Miles

Potential Countermeasures for SR 347, High-Risk Segment 5

General Project Information

Primary Route/Street: SR 347
City/Town Name: Maricopa
County: Maricopa
District: Central
Begin Limit: MP 171.4
End Limit: MP 175.4
Segment Length: 4.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/oRstp1Vgq8P2

Location Summary

The SR 95 segment is located in Maricopa and is idenified as a high-risk location. Two crashes have been reported, with one resulting in incapaciting injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Four-lane divided, five-lane (TWLTL)
AADT: 43,400 vehicles per day
Posted Speed Limit: 35 mph
Sidewalks: Various locations
Lighting: Various locations
Bus Stop Locations (within ¼ mile):
Number of Pedestrian Crashes: 2
Crosswalk Locations: At signalized locations
Other Pedestrian Attractors/Generators: Various commercial, schools, and parks

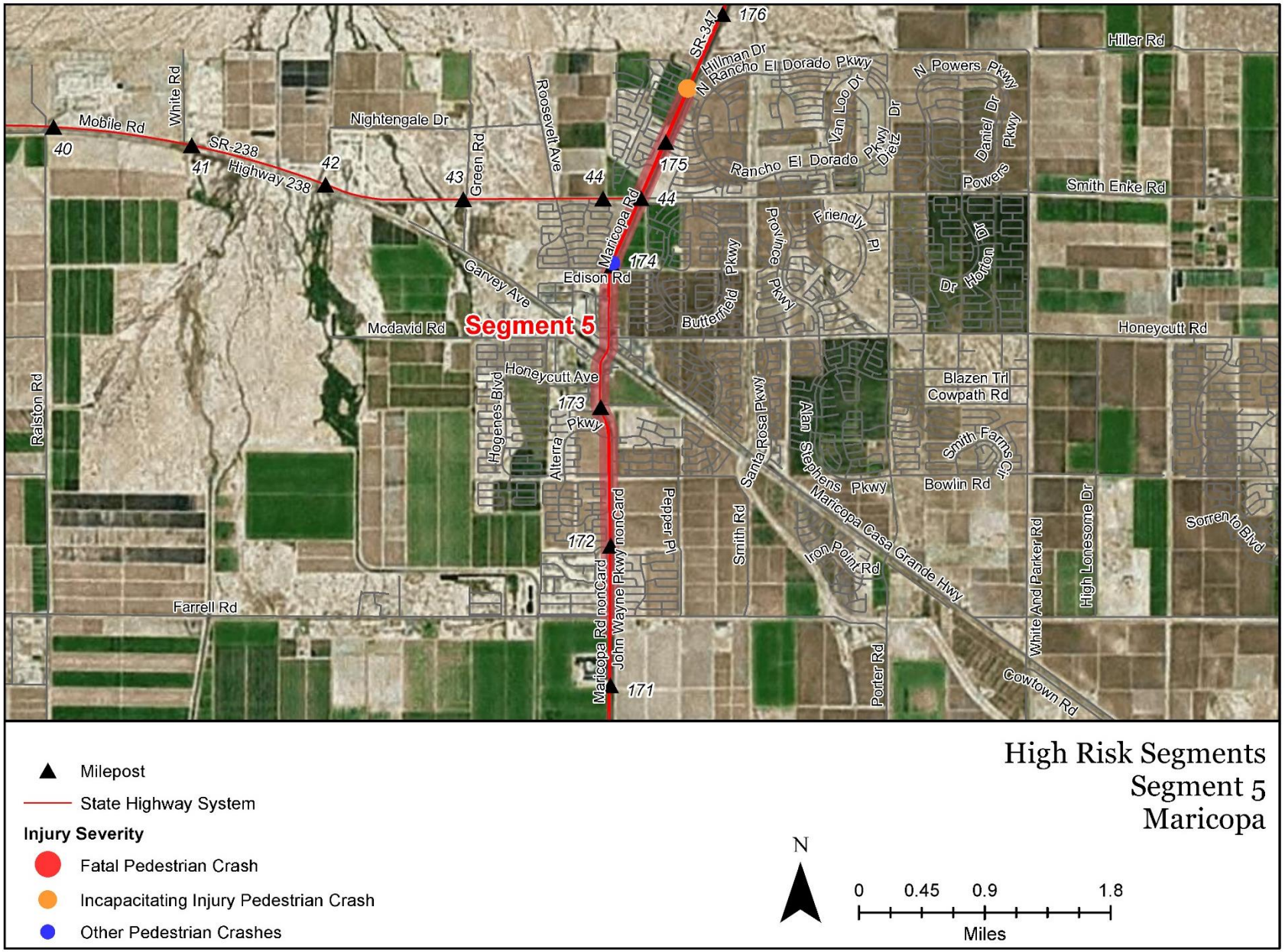
Project Need

This location has the potential pedestrian safety issues of other five-lane divided, high-speed highways in urban-suburban areas with a lack of continuous pedestrian facilities along the highway and limited signalized crossing opportunities. The area has large tracts of residential development.

Project Purpose

Reduce potential for pedestrian crashes by creating a more accommodating environment for pedestrians and providing safe crossing opportunities across SR 347.

Potential Countermeasures	*Conceptual Cost*
Conduct RSA An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.	**$20,000**
Improve Signal Operations for Pedestrians Evaluate the existing operations at the interchange. Consider LPI or right-turn on red restrictions.	**$3,000**
Enhance Midblock Crossing Opportunities Evaluate the need for additional pedestrian crossing opportunities on SR 347. A recommended location for a PHB would be at the intersection of Alterra Parkway/MLK Jr. Boulevard for residential access to Copper Sky Park.	**$173,959**
Install Sidewalks Construct continuous sidewalks or shared use paths along both sides of SR 347 to provide convenient pedestrian mobility. Require new developments to construct sidewalk along the frontage.	**$2,841,650**
Reduce Curb Radii Improve the curb radii at the signalized pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.	**$82,880**
Construct Raised Median Construct a raised median between MP 172.90 - MP 173.80 to have a consistent cross-section through the Maricopa area.	**$1,287,946**
50 vehicle crashes occurred during the study period.	
Estimated Planning Level Total Segment Conceptual Cost:	**$4,409,435**


Segment 5
Mobile Rd
White Rd
SR-238
Highway 238
Nightengale Dr
Green Rd
Roosevelt Ave
Maricopa Rd
Garvey Ave
Edison Rd
Mcdavid Rd
Honeycutt Ave
Honeycutt Rd
Ralston Rd
Hogenes Blvd
Alterra Pkwy
Farrell Rd
Maricopa Rd
nonCard
John Wayne Pkwy
nonCard
Pepper Pl
Smith Rd
Santa Rosa Pkwy
Alan Stephens Pkwy
Maricopa Casa Grande Hwy
Iron Point Rd
Bowlin Rd
Blazen Trl
Cowpath Rd
Smith Farms Cir
Porter Rd
Cowtown Rd
White And Parker Rd
High Lonesome Dr
Sorrento Blvd
Hillman Dr
N Rancho El Dorado Pkwy
Rancho El Dorado Pkwy
Van Loo Dr
Dr
Diez
N Powers Pkwy
Daniel Dr
Powers
Smith Enke Rd
Hiller Rd
Friendly Pl
Province Pkwy
Butterfield Pkwy
Dr Horton
40
41
42
43
44
44
175
176
174
173
172
171
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 5
Maricopa
N
0
0.45
0.9
1.8
Miles

Potential Countermeasures for US 60, High-Risk Segment 6

General Project Information

Primary Route/Street: US 60
City/Town Name: Phoenix/Glendale
County: Maricopa
District: Central
Begin Limit: MP 156.5
End Limit: MP 158.5
Segment Length: 2 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/6RofBePrfaL2

Location Summary

The US 60 segment is identified as a high-risk location. Two crashes were reported with no injuries.
Programmed Projects: Left Turn Bay Extension (MP 356); TRACS Fxxxx01D
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 44,700 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: One side of the highway
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 2
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial and industrial

Project Need

Identified as a high-risk location. Sidewalk currently exists along the north side of US 60 and crossing should be discouraged as railroad operations exist along the south side of the highway.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors (High-Crash Segment 14) on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

RSAs with an emphasis on pedestrian safety should be conducted along the segment and at the intersection of US 60/Bethany Home Road and 43rd Avenue/Camelback Road to further evaluate potential safety issues.

Option 1: Engineering Countermeasures

Enhance Signal Operations for Pedestrians — **$9,000**

Evaluate the existing operations at the intersections of US 60/Bethany Home Road and 43rd Avenue/Camelback Road. Consider LPI or right-turn on red restrictions or separating left-turn movements from pedestrian crossings with a protected arrow using the FYA. Review pedestrian crossing/clearance times.

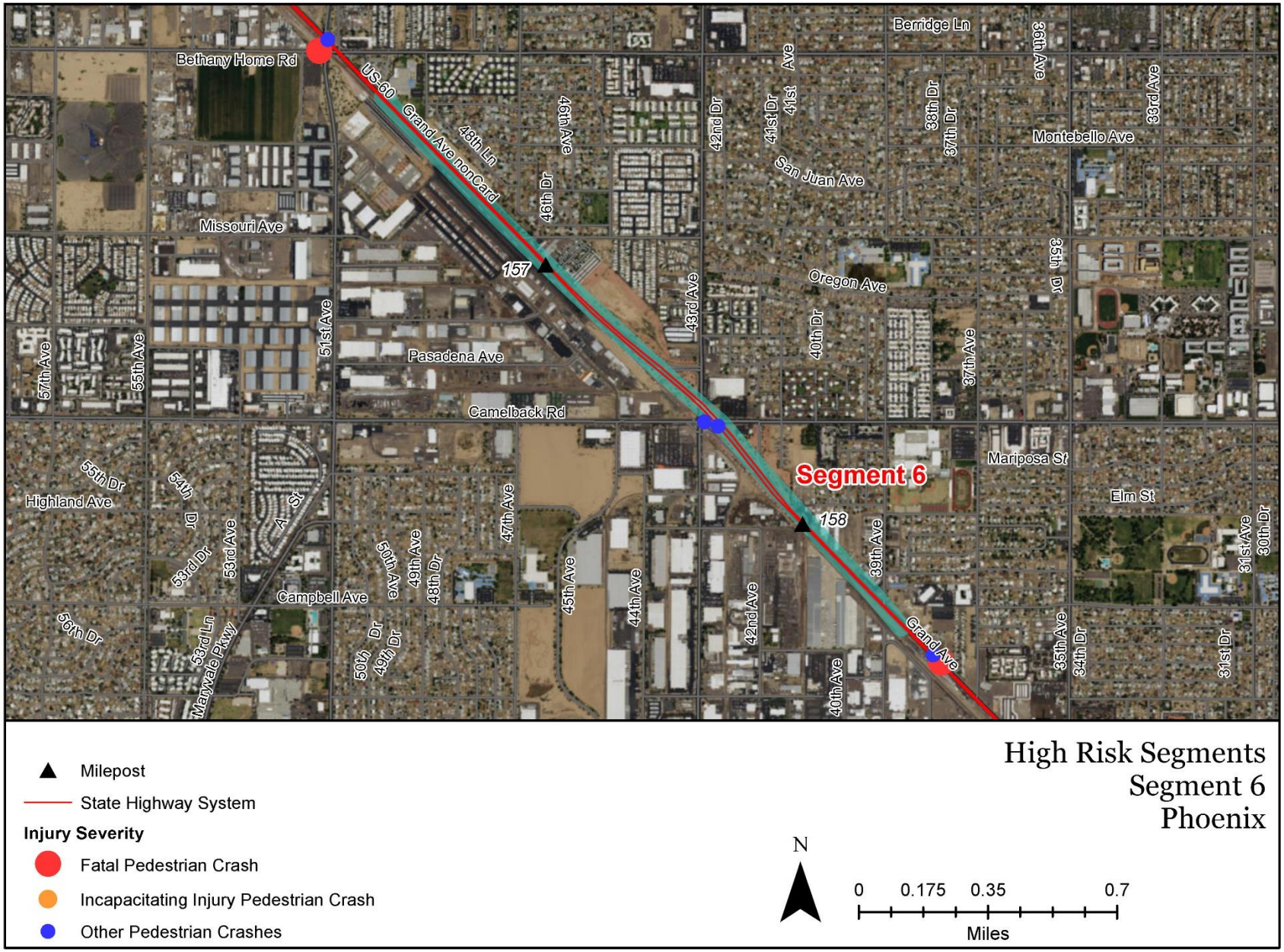
Evaluate Lighting — **—--**

Review nighttime lighting as part of the RSA to ensure all sidewalks and crosswalks are well lit.

Option 2: Education/Enforcement — **—**

Increase enforcement for motorists failing to yield the right-of way at the intersection and for pedestrians crossing improperly. Implement a pedestrian safety campaign to include local businesses provided ADOT pedestrian safety pamphlets. Safety vests can be provided for pedestrians anticipated to walk during the night. Crossing should be discouraged at undesignated locations (e.g., segments where the railroad tracks are directly adjacent to the highway).

Estimated Planning Level Total Segment Conceptual Cost: $29,000


Bethany Home Rd
US-60
Grand Ave nonCard
48th Ln
46th Ave
46th Dr
Missouri Ave
157
51st Ave
57th Ave
55th Ave
Pasadena Ave
Camelback Rd
43rd Ave
42nd Dr
41st Dr
41st Ave
Berridge Ln
38th Ave
38th Dr
37th Dr
33rd Ave
Montebello Ave
San Juan Ave
Oregon Ave
36th Dr
40th Dr
37th Ave
Mariposa St
Elm St
Segment 6
158
55th Dr
Highland Ave
54th Dr
53rd Dr
53rd Ave
A St
47th Ave
50th Ave
49th Ave
48th Dr
45th Ave
44th Ave
39th Ave
42nd Ave
Campbell Ave
56th Dr
53rd Ln
Maryvale Pkwy
50th Dr
49th Dr
40th Ave
Grand Ave
35th Ave
34th Dr
31st Dr
31st Ave
30th Dr
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 6
Phoenix
N
0
0.175
0.35
0.7
Miles

Potential Countermeasures for US 60, High-Risk Segment 7

General Project Information

Primary Route/Street: US 60
City/Town Name: Glendale
County: Maricopa
District: Central
Begin Limit: MP 152.0
End Limit: MP 155.6
Segment Length: 2.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/GjoqxaAhRTT2

Location Summary

The SR 95 segment is located in the Phoenix/Glendale area. The facility has similar high-risk characteristics as High-Crash Segment 14. Two pedestrian crashes were reported, with one resulting in a fatality.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane highway
AADT: 39,200 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: One side of the highway
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 2 (1 involved alcohol)
Crosswalk Locations: At signalized intersection
Other Pedestrian Attractors/Generators: Various commercial

Project Need

This location has the same potential pedestrian safety issues as other six-lane divided highways in urban-suburban areas with a lack of continuous pedestrian facilities along the highway and signalized crossing opportunities. Some areas within the segment have barriers to restrict pedestrian access.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA was conducted in 2015 – Grand Avenue (US 60) at West Myrtle Avenue. The recommendations should be reviewed and updated, if necessary, to include pedestrian safety countermeasures. Additional investigation may be required.

Option 1: Engineering Countermeasures

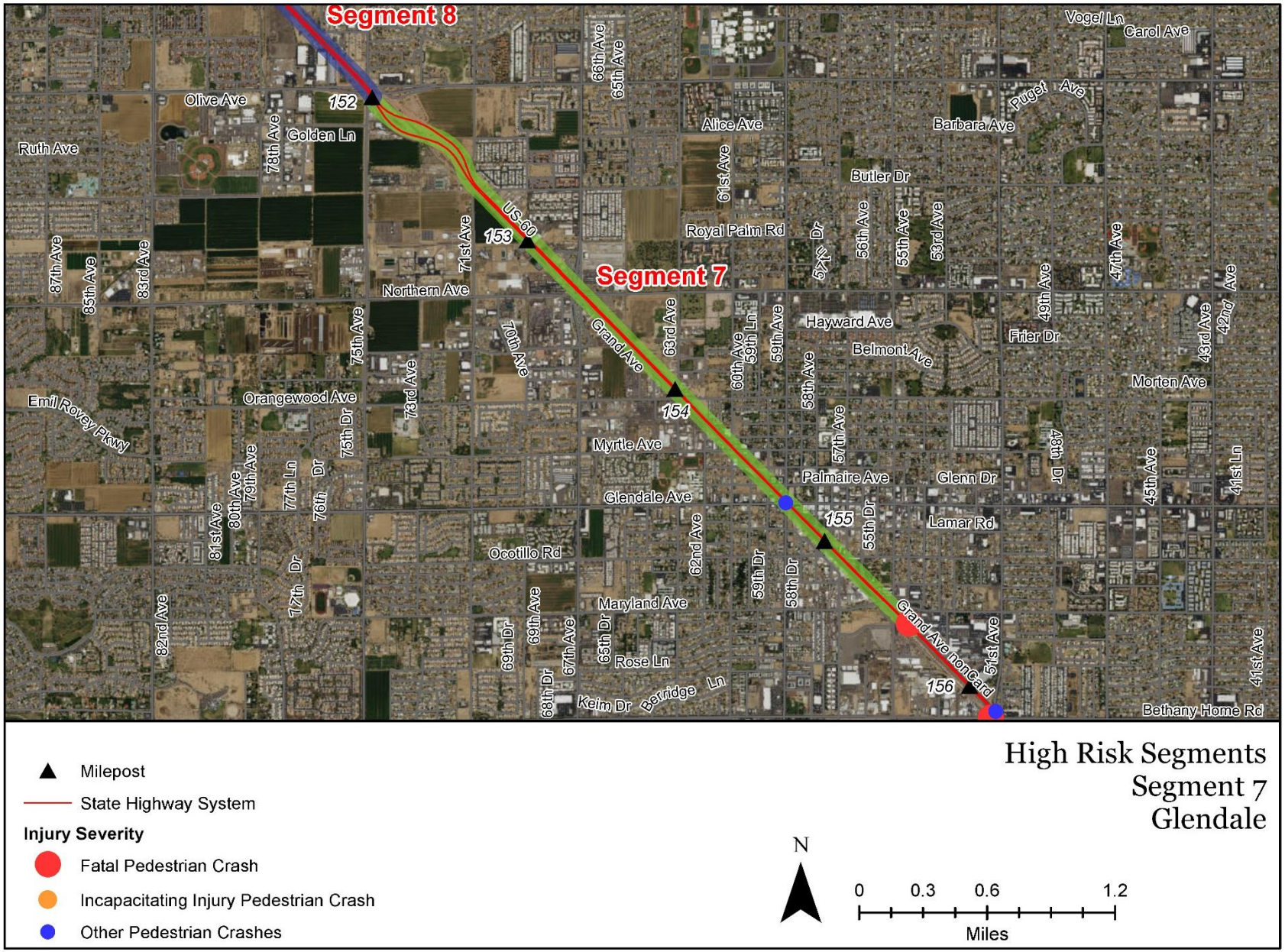
Improve Signal Operations for Pedestrians — **$6,000**

Evaluate the existing operations at the intersection of 59th Avenue/Glendale and 55th Avenue/US 60. Consider LPI or right-turn on red restrictions or separating left-turn movements from pedestrian crossings with a protected arrow using the FYA. Review pedestrian crossing/clearance times.

Install Barrier/Fencing — **$153,395**

Evaluate the need for barriers or fencing along the railroad tracks and identify gaps to discourage pedestrians from crossing the tracks at undesignated crossings and encourage crossing at signalized intersections.

Estimated Planning Level Total Segment Conceptual Cost: $179,395


Segment 8
Segment 7
152
153
154
155
156
US-60
Grand Ave
Grand Ave nonCard
Olive Ave
Golden Ln
Ruth Ave
Northern Ave
Orangewood Ave
Emil Rovey Pkwy
Myrtle Ave
Glendale Ave
Ocotillo Rd
Maryland Ave
Rose Ln
Keim Dr
Bethany Home Rd
Alice Ave
Barbara Ave
Butler Dr
Royal Palm Rd
Hayward Ave
Belmont Ave
Frier Dr
Morten Ave
Palmaire Ave
Glenn Dr
Lamar Rd
Vogel Ln
Carol Ave
Puget Ave
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 7
Glendale
N
0
0.3
0.6
1.2
Miles

Potential Countermeasures for US 60, High-Risk Segment 8

General Project Information

Primary Route/Street: US 60
City/Town Name: Peoria
County: Maricopa
District: Central
Begin Limit: MP 149.0
End Limit: MP 152.0
Segment Length: 4.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/sBtGoRXEgQE2

Location Summary

The US 60 segment is located in Peoria and has been identified as a high risk location. The segment has one reported pedestrian related crash.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane highway
AADT: 30,000 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Fragmented
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 1
Crosswalk Locations: At signalized locations
Other Pedestrian Attractors/Generators: Various commercial

Project Need

This location has the same potential pedestrian safety issues as other six-lane divided highways in urban-suburban areas with a lack of continuous pedestrian facilities along the highway and signalized crossing opportunities.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

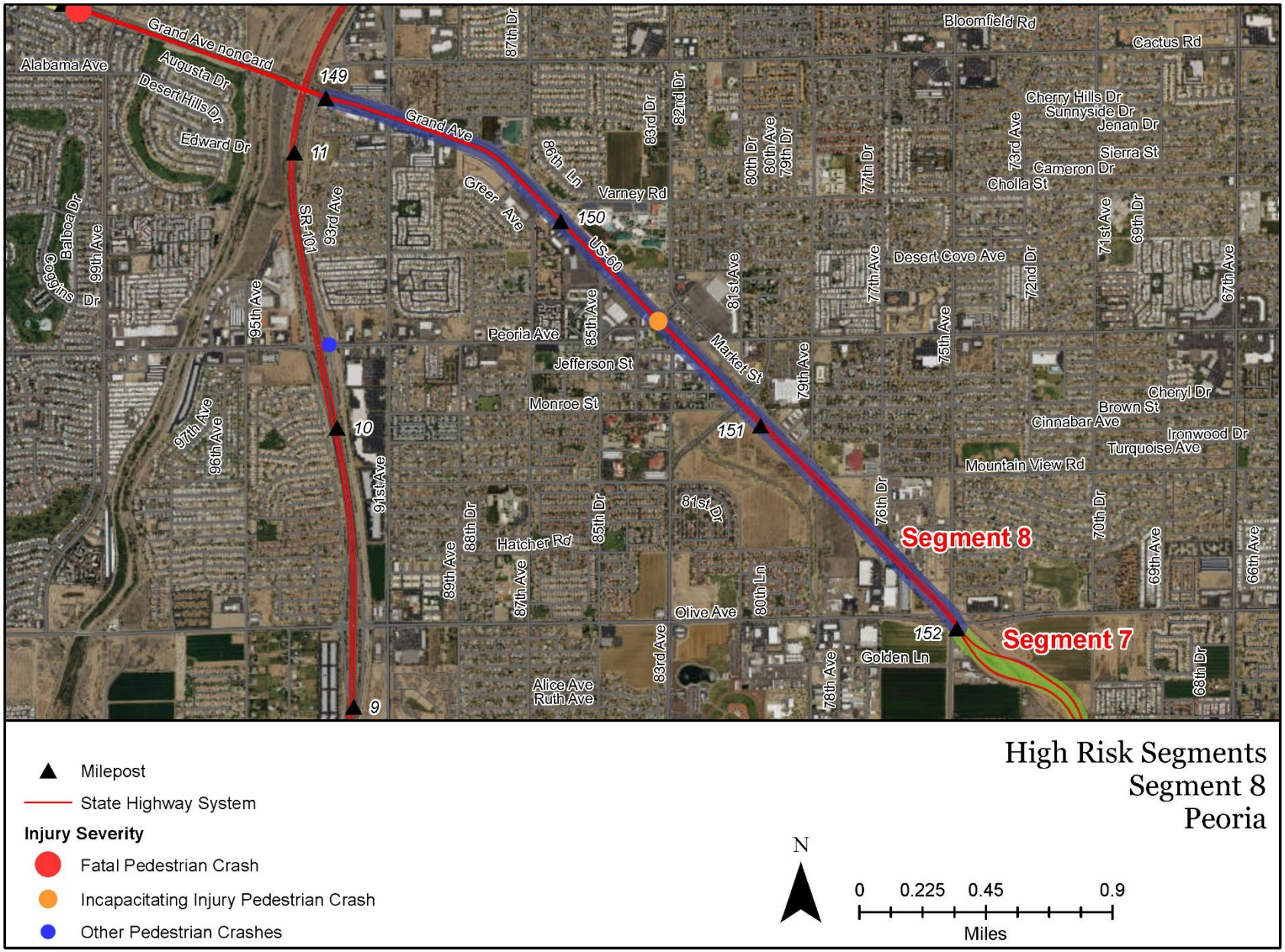
An RSA in the vicinity of the Peoria Town Center and focused on pedestrian safety should be conducted to further evaluate potential safety issues.

Option 1: Engineering Countermeasures

Install Barrier/Fencing — ***$340,878***

Evaluate the need for barriers or fencing along the railroad tracks east of Cotton Crossing (approximately 0.6 mile) and identify gaps to discourage pedestrians from crossing the tracks at undesignated crossings and encourage crossing at signalized intersections.

Estimated Planning Level Total Segment Conceptual Cost: $360,878


Grand Ave nonCard
Alabama Ave
Augusta Dr
Desert Hills Dr
Edward Dr
149
Grand Ave
11
SR-101
93rd Ave
Greer Ave
86th Ln
Varney Rd
150
US-60
Peoria Ave
Jefferson St
Monroe St
Market St
10
151
Segment 8
Segment 7
152
Olive Ave
Golden Ln
Alice Ave
Ruth Ave
Hatcher Rd
9
Bloomfield Rd
Cactus Rd
Cherry Hills Dr
Sunnyside Dr
Jenan Dr
Sierra St
Cameron Dr
Cholla St
Desert Cove Ave
Cheryl Dr
Brown St
Cinnabar Ave
Ironwood Dr
Turquoise Ave
Mountain View Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 8
Peoria
N
0
0.225
0.45
0.9
Miles

Potential Countermeasures for US 60, High-Risk Segment 9

General Project Information

Primary Route/Street: US 60
City/Town Name: Sun City
County: Maricopa
District: Central
Begin Limit: MP 146.3
End Limit: MP 148.0
Segment Length: 1.7 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/jy5PPMfFDmt

Location Summary

The US 60 segment is located in Sun City, northwest of Phoenix, and has been identified as a high-risk segment. Five crashes have been reported, with two resulting in fatal and incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 28,700 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Fragmented, south side of US 60
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 5 (3 involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: None

Project Need

This location has the same potential pedestrian safety issues as other six-lane divided highways in urban-suburban areas with a lack of pedestrian facilities along the highway and midblock crossing opportunities. The reported crashes occurred at signalized intersections.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate potential safety issues.

Option 1: Engineering Countermeasures

Install Sidewalks **$1,667,925**

Evaluate the need for continuous sidewalks along the south side of US 60. This may encourage pedestrians to cross at the signalized intersections. Note that the existence of the railroad may not justify the installation of a sidewalk on the north side. Approximately 1.35 miles of new sidewalk is recommended.

Enhance Signal Operations for Pedestrians **$9,000**

Evaluate the existing signal operations at 103rd Avenue, 107th Avenue, and 111th Avenue. Provide pedestrian crossings where sidewalk continues past the intersection. Review pedestrian crossing/clearance times.

Provide Roadway Lighting **$450,560**

Evaluate the need to install roadway lighting along the US 60. This improvement would benefit both pedestrian and vehicle traffic.

28 vehicle crashes occurred during dark/not lighted conditions during the five-year period.

Estimated Planning Level Total Segment Conceptual Cost: $2,147,485


Segment 10
146
Segment 9
Buccaneer Dr
Del Webb Blvd
Thunderbird Blvd
Bolivar Dr
Cedar Dr
Grand Ave nonCard
Grand Ave
147
US-60
111th Dr
113th Ave
111th Ave
106th Ave
103rd Ave
Royal Oak Rd
Coggins Dr
107th Ave
Santa Fe Dr
148
Balboa Dr
115th Ave
Augusta Dr
Pebble Beach Dr
Saint Andrew Dr
Cherry Hills Dr
Hacienda Dr
Thunderbird Rd
Alabama Ave
99th Ave
Lakeforest Dr
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 9
Sun City
N
0 0.1 0.2 0.4
Miles

Potential Countermeasures for US 60, High-Risk Segment 10

General Project Information

Primary Route/Street: US 60
City/Town Name: Surprise
County: Maricopa
District: Central
Begin Limit: MP 145.0
End Limit: MP 146.3
Segment Length: 1.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/S4YDCU5qbDA2

Location Summary

The US 60 segment is located in Surprise. A total of seven crashes were reported, with four resulting in incapacitating injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 31,200 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: Along south side of frontage road, south of US 60
Lighting: Yes
Bus Stop Locations (within ¼ mile):
Number of Pedestrian Crashes: 7 (3 involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial, grocery store, and schools

Project Need

This high-risk segment has similar characteristics to the identified high-pedestrian-crash location on US 60, Segment 13. Most the crashes occurred during nighttime (lighted) conditions. Pedestrians were considered at fault for most of the crashes. Railroad tracks run parallel to the highway on the north side.

Project Purpose

Evaluate and identify any potential deficiencies along the facility as this high-risk segment relates to similar corridors on the SHS. Measures should be considered to encourage pedestrian use of the Grand Avenue frontage road rather than US 60.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate potential safety issues.

Install Barrier/Fencing — **$738,570**

Evaluate the need for a barrier or fencing to restrict and discourage pedestrians from crossing the tracks at undesignated crossings and encourage crossing at signalized intersections.

Option 2: Enforcement/Pedestrian Education Campaign — —

Provide education and outreach for pedestrians to discourage use of US 60. Increase enforcement along US 60 to discourage pedestrian crossing at undesignated areas.

Estimated Planning Level Total Segment Conceptual Cost: $758,570


Bell Rd
143
144
145
146
147
Litchfield Rd
West Point Pkwy
Cottonwood St
Santa Fe Dr
US-60 Front
Market St
Paradise Ln
Greasewood St
Fox Hill Dr
El Mirage Rd
114th Ave
Palmeras Dr
Granada Dr
Loma Blanca Dr
Hutton Dr
Pineaire Dr
Wedgewood Dr
Brookside Dr
Del Webb Blvd
Sunland Dr
Meade Dr
White Mountain Rd
Tropicana Cir
Saratoga Cir
Greenway Rd
Desert Ln
142nd Ave
137th Ave
133rd Dr
133rd Ave
US-60
Acoma Dr
Thompson Ranch Rd
Grand Ave nonCard
Grand Ave Front
Palm St
2nd Ave
1st Ave
129th Ave
Ventura St
Poppy St
Luna St
El Frio St
B St
A St
Camelot Cir
Roundelay
El Capitan Cir
Cameo Dr
141st Ave
140th Dr
Waddell Rd
Thunderbird Rd
Segment 10
Segment 9
124th Ave
Alto St
111th Ave
Grand Ave
Thunderbird Blvd
Dysart Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 10
Surprise
N
0
0.25
0.5
1
Miles

Potential Countermeasures for SR 69, High-Risk Segment 11

General Project Information

Primary Route/Street: SR 69
City/Town Name: Prescott Valley
County: Yavapai
District: Northcentral
Begin Limit: MP 286.5
End Limit: MP 289.7
Segment Length: 3.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/5PMip8j5DbB2

Location Summary

The SR 69 segment is located in Prescott Valley. Three crashes were reported, with two resulting in incapacitating injuries
Programmed Projects: Construct Raised Curb Median (MP 284 – MP 288); TRACS # F006101C
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane highway (TWLTL)
AADT: 33,700 vehicles per day
Posted Speed Limit: 45 mph
Sidewalks: North of SR 69
Lighting: At signalized intersection
Bus Stop Locations (within ¼ mile):
Number of Pedestrian Crashes: 3
Crosswalk Locations: At signalized intersection
Other Pedestrian Attractors/Generators: Various commercial

Project Need

This high-risk segment is surrounded by various commercial facilities that may encourage pedestrian crossing. Signalized crossings existing with an average spacing of ¼ mile.

Project Purpose

Evaluate and identify and potential deficiencies of the facility as this high-risk segment relates to similar corridors on the SHS.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

Option 1: Engineering Countermeasures

Install Sidewalk — **$4,077,150**

Construct continuous sidewalk or shared use path along the south side of SR 69 to provide convenient pedestrian mobility.

Construct Raised Median — **--**

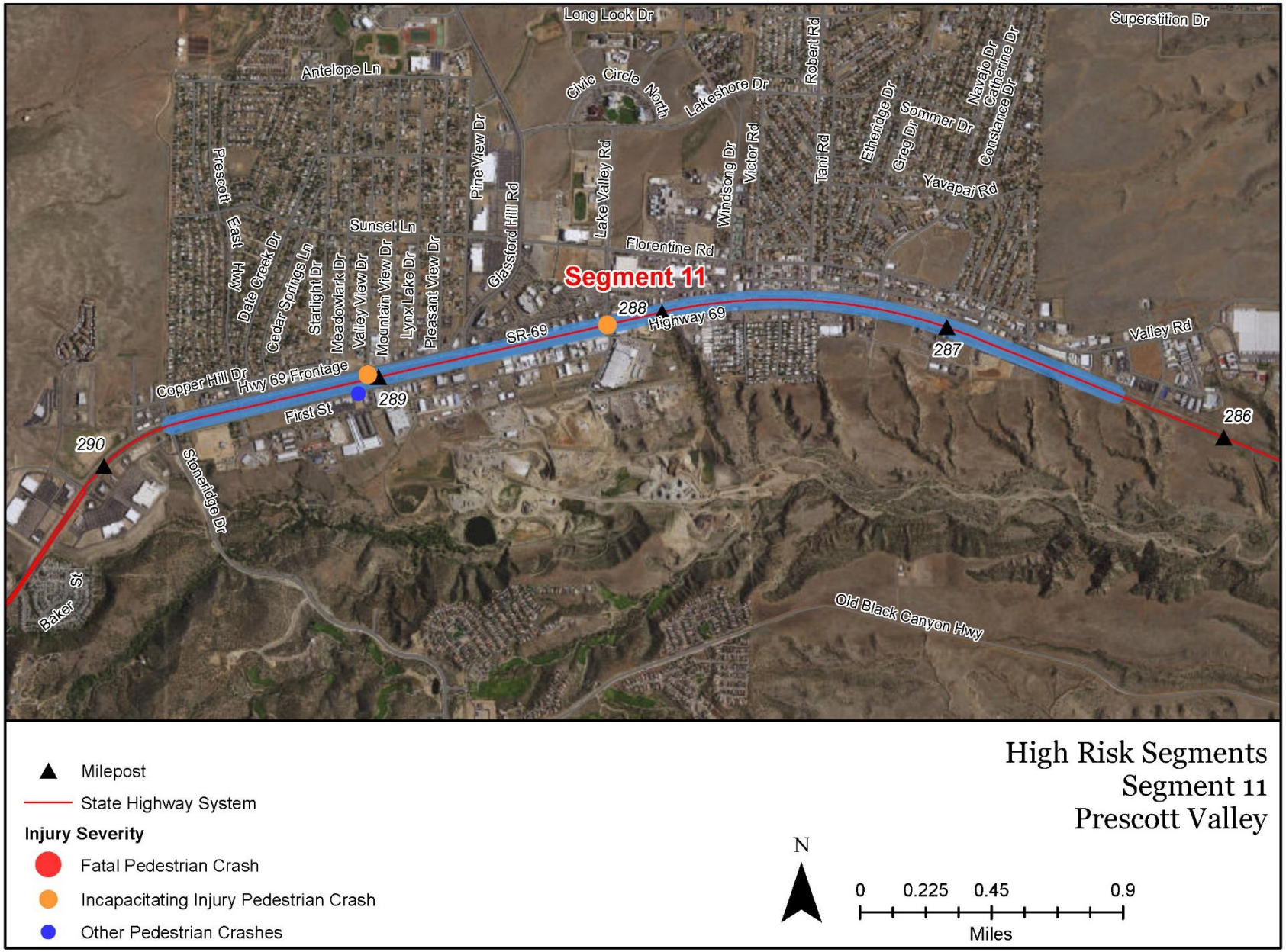
As programmed in the 2018–2022 ADOT Five Year Transportation Facilities Construction Program ($2,500,000).

Reduce Curb Radii — **$41,440**

Improve the curb radii at pedestrian crossings to improve pedestrian mobility and increase pedestrian visibility.

Over 257 vehicle crashes occurred during the five-year study period.

Estimated Planning Level Total Segment Conceptual Cost: $4,138,590


Long Look Dr
Superstition Dr
Antelope Ln
Civic Circle North
Lakeshore Dr
Robert Rd
Navajo Dr
Catherine Dr
Etheridge Dr
Sommer Dr
Greg Dr
Constance Dr
Yavapai Rd
Prescott
East Hwy
Date Creek Dr
Cedar Springs Ln
Starlight Dr
Meadowlark Dr
Valley View Dr
Mountain View Dr
Lynx Lake Dr
Pleasant View Dr
Sunset Ln
Pine View Dr
Glassford Hill Rd
Lake Valley Rd
Windsong Dr
Victor Rd
Tari Rd
Florentine Rd
Segment 11
288
Highway 69
SR-69
287
Valley Rd
286
Copper Hill Dr
Hwy 69 Frontage
First St
289
290
Stoneridge Dr
Baker St
Old Black Canyon Hwy
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 11
Prescott Valley
N
0
0.225
0.45
0.9
Miles

Potential Countermeasures for US 191/SR 80, High-Risk Segment 12

General Project Information

Primary Route/Street: US 191/SR 80
City/Town Name: Douglas
County: Cochise
District: Southcentral
Begin Limit: MP 365.5
End Limit: MP 366.1
Segment Length: 0.6 mile
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/aQBAUQJgnHD2

Location Summary

The US 191 segment is located in Douglas. One pedestrian crash has been reported on this segment that resulted in a incapacitating injury.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban
Facility Type: Five-lane (TWLTL)
AADT: 2,600 vehicles per day
Posted Speed Limit: 45–65 mph
Sidewalks: Yes
Lighting: None
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 1
Crosswalk Locations: None
Other Pedestrian Attractors/Generators: Minor Commercial

Project Need

This high-risk segment is a low volume five-lane highway with a speed limit transition from 65 mph to 45 mph.

Project Purpose

Reduce the potential for pedestrian crashes by lowering the speeds within the developed area of the segment.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — ***$20,000***

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

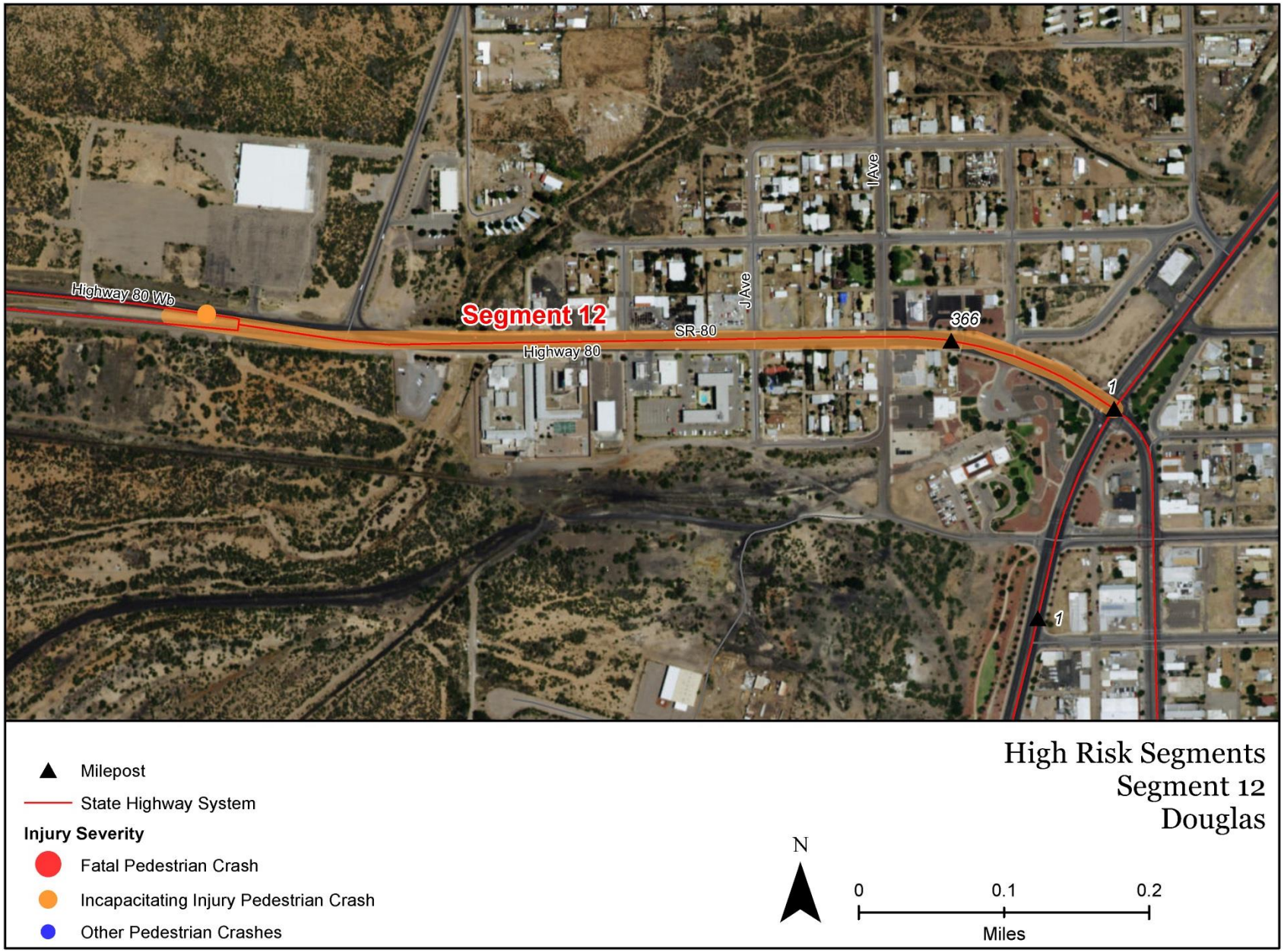
Option 1: Roadway Reconfiguration — ***$42,246***

Evaluate the need for a road diet (roadway reconfiguration) project for US 191 within the developed area as the facility is under-utilized in terms of traffic volumes.

Option 2: Construct Raised Median — ***$858,631***

The raised median would provide a pedestrian crossing refuge and increase overall safety of all transportation modes.

Estimated Planning Level Total Segment Conceptual Cost: **Option 1: $62,246**
Option 2: $878,631


Highway 80 Wb
Segment 12
SR-80
Highway 80
I Ave
J Ave
366
1
1
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 12
Douglas
N
0
0.1
0.2
Miles

Potential Countermeasures for SR 90, High-Risk Segment 13

General Project Information

Primary Route/Street: SR 90
City/Town Name: Sierra Vista
County: Cochise
District: Southcentral
Begin Limit: MP 320.0
End Limit: MP 323.8
Segment Length: 3.8 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/KeH2ARHjngv

Location Summary

The SR 90 segment is located in Sierra Vista. Five crashes were reported, with one involving incapaciting injuries.
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Four-lane divided; five-lane with TWLTL
AADT: 14,000 vehicles per day
Posted Speed Limit: 45–55 mph
Sidewalks: Yes
Lighting: At intersections and various segments
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 5 (3 involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial

Project Need

This high-risk segment has similar characteristics as the identified high pedestrian crash segment on SR 92, Segment 7. Three of the five crashes were intersection related and occurred during dark conditions. Alcohol may have been a factor in three of the crashes.

Project Purpose

Reduce the number of pedestrian crashes on SR 90 by educating pedestrians to discourage walking while intoxicated.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Conduct RSA **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

Install Lighting **$340,736**

Evaluate the need for lighting along SR 90 from MP 321 south to the SR 90 Bypass / SR 90 and east of South Avenue Del Sol along SR 90.

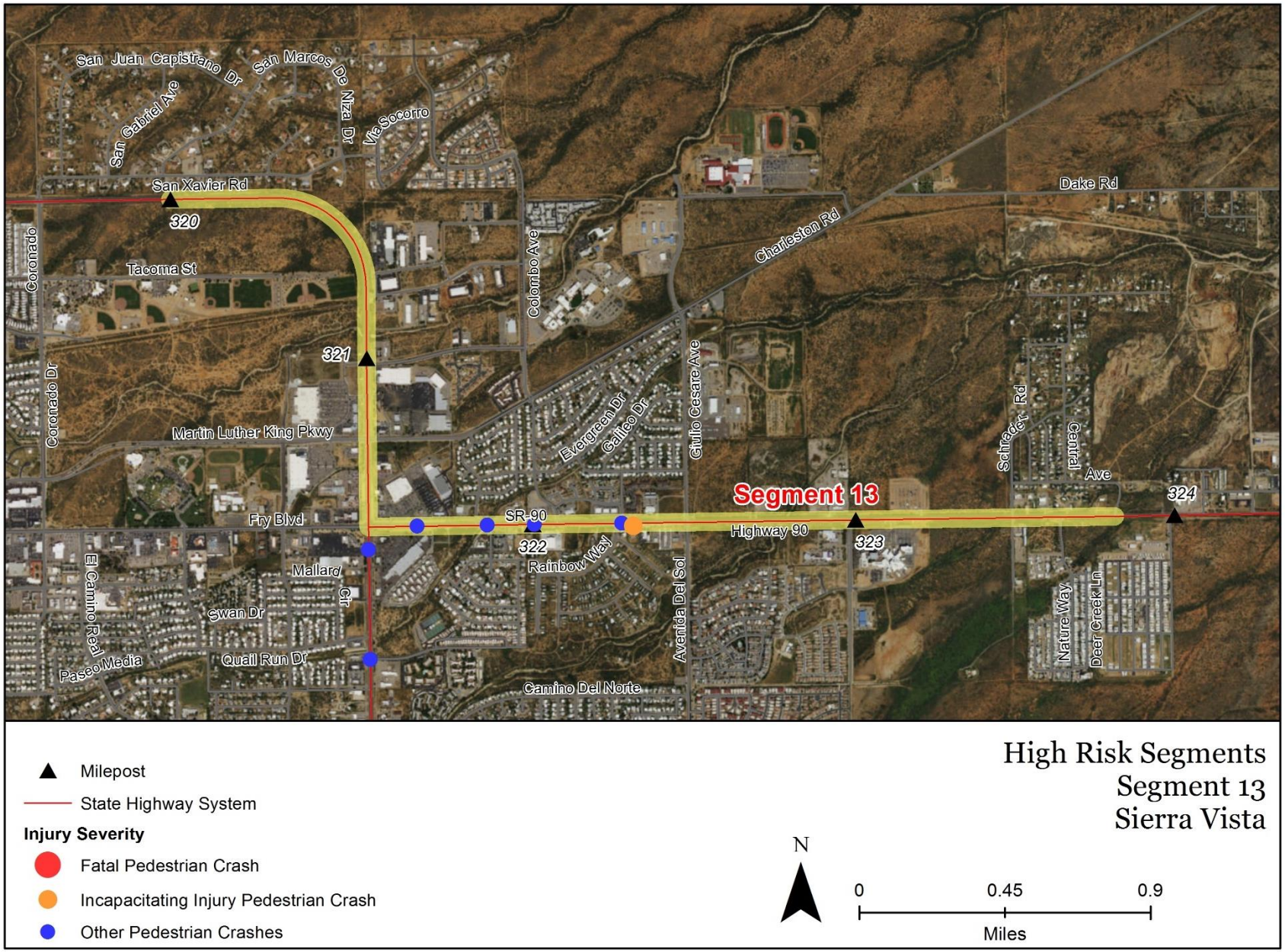
11 vehicle crashes occurred during dark/not lighted conditions during the five-year study period.

Construct Raised Median **$2,575,892**

A raised median along MP 321.2 - MP 323 would provide a pedestrian crossing refuge and increase overall safety of all transportation modes.

Six vehicle crashes occurred during the five-year study period.

Estimated Planning Level Total Segment Conceptual Cost: $2,936,628


San Juan Capistrano Dr
San Marcos De Niza Dr
San Gabriel Ave
Via Socorro
San Xavier Rd
320
Tacoma St
Coronado
Coronado Dr
321
Martin Luther King Pkwy
Colombo Ave
Charleston Rd
Dake Rd
Evergreen Dr
Galileo Dr
Giulio Cesare Ave
Schrader Rd
Central Ave
Segment 13
324
Fry Blvd
SR-90
322
Highway 90
323
Rainbow Way
Mallard Ct
Swan Dr
Quail Run Dr
El Camino Real
Paseo Media
Avenida Del Sol
Camino Del Norte
Nature Way
Deer Creek Ln
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 13
Sierra Vista
N
0
0.45
0.9
Miles

Potential Countermeasures for SR 86, High-Risk Segment 14

General Project Information

Primary Route/Street: SR 86
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 169.7
End Limit: MP 170.3
Segment Length: 0.6 mile
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/ce1rmHLmSR32

Location Summary

The SR 86 high-risk segment is located in Tucson and is similar to High-Crash Segment 9.
Programmed Projects: Ajo Way Interchange Construction (in progress)
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
AADT: 28,400–36,100 vehicles per day
Posted Speed Limit: 40–45 mph
Sidewalks: Yes (with buffer)
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 0
Crosswalk Locations: At signalized intersections, PHB at Freedom Drive
Other Pedestrian Attractors/Generators: Park

Project Need

This high-risk segment is adjacent to a high-crash segment (HC Segment 9, MP 170.3 - MP 171.6) with crashes reported during both daylight and nighttime hours.

Project Purpose

Reduce the number of pedestrian crashes on SR 86 by creating a more accommodating environment for pedestrians. Increase crosswalk use at the signalized intersections.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted within the defined SR 86 segment limits.

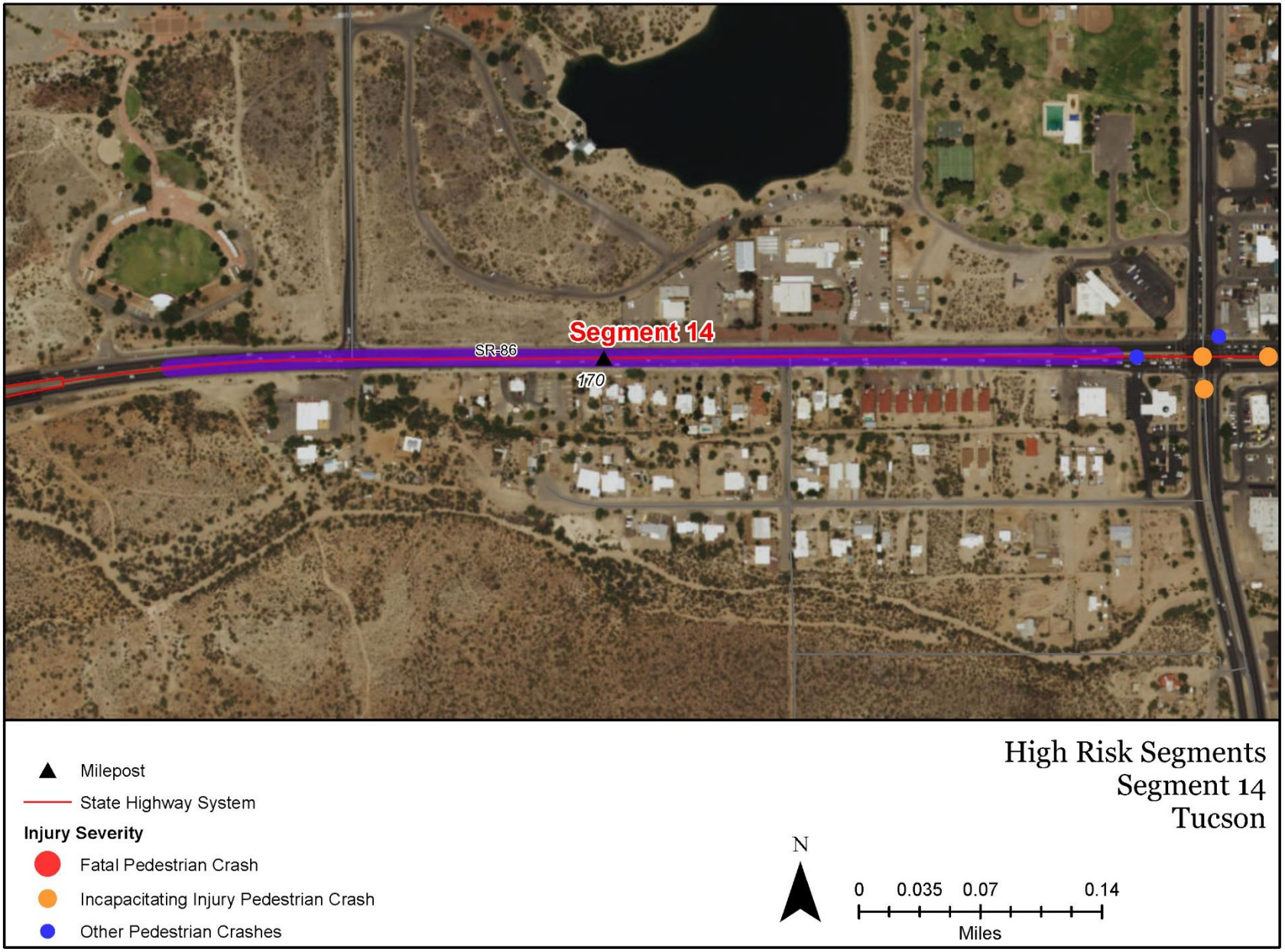
Option 1: Engineering Countermeasures

Construct Raised Median — **$2,003,471**

The raised median would provide a pedestrian crossing refuge and increase overall safety for all transportation modes. This countermeasure was also recommended in the SR 86 – Kinney Road to Santa Cruz River Study (2016).

58 vehicle crashes occurred during the five-year study period.

Estimated Planning Level Total Segment Conceptual Cost: $2,023,471


Segment 14
SR-86
170
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 14
Tucson
N
0
0.035
0.07
0.14
Miles

Potential Countermeasures for SR 77, High-Risk Segment 15

General Project Information

Primary Route/Street: SR 77
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 69.5
End Limit: MP 72.0
Segment Length: 1.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/dcppyBuWLEs

Location Summary

The SR 77 segment is located in Tucson. Fourteen pedestrian crashes were reported, with two resulting in incapacitating injuries
Programmed Projects: None
Identified in 2009 PSAP: No
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided
AADT: 43,400–46,200 vehicles per day
Posted Speed Limit: 40 mph
Sidewalks: Yes, except no connection to southwest corner of Oracle/Miracle Mile
Lighting: Yes
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 14 (1 involved alcohol)
Crosswalks: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial and residential, schools, and cemetery

Project Need

This high-risk segment has similar characteristics and needs as the identified High-Crash Segment 10. Pedestrian crashes have occurred at both signalized and unsignalized locations. All the crashes occurred during daylight conditions.

Project Purpose

Reduce both intersection and non-intersection related pedestrian crashes by increasing the visibility of pedestrians along SR 77 and providing safe crossing opportunities at existing signalized crossings.

Potential Countermeasures — *Conceptual Cost*

Option 1: Engineering Countermeasures

Conduct RSA — **$20,000**

An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

Enhance Signal Operations for Pedestrians — **$3,000**

Evaluate the existing operations at the signalized intersections. Consider LPI or right-turn on red restriction at all signalized intersections within the high-risk segment.

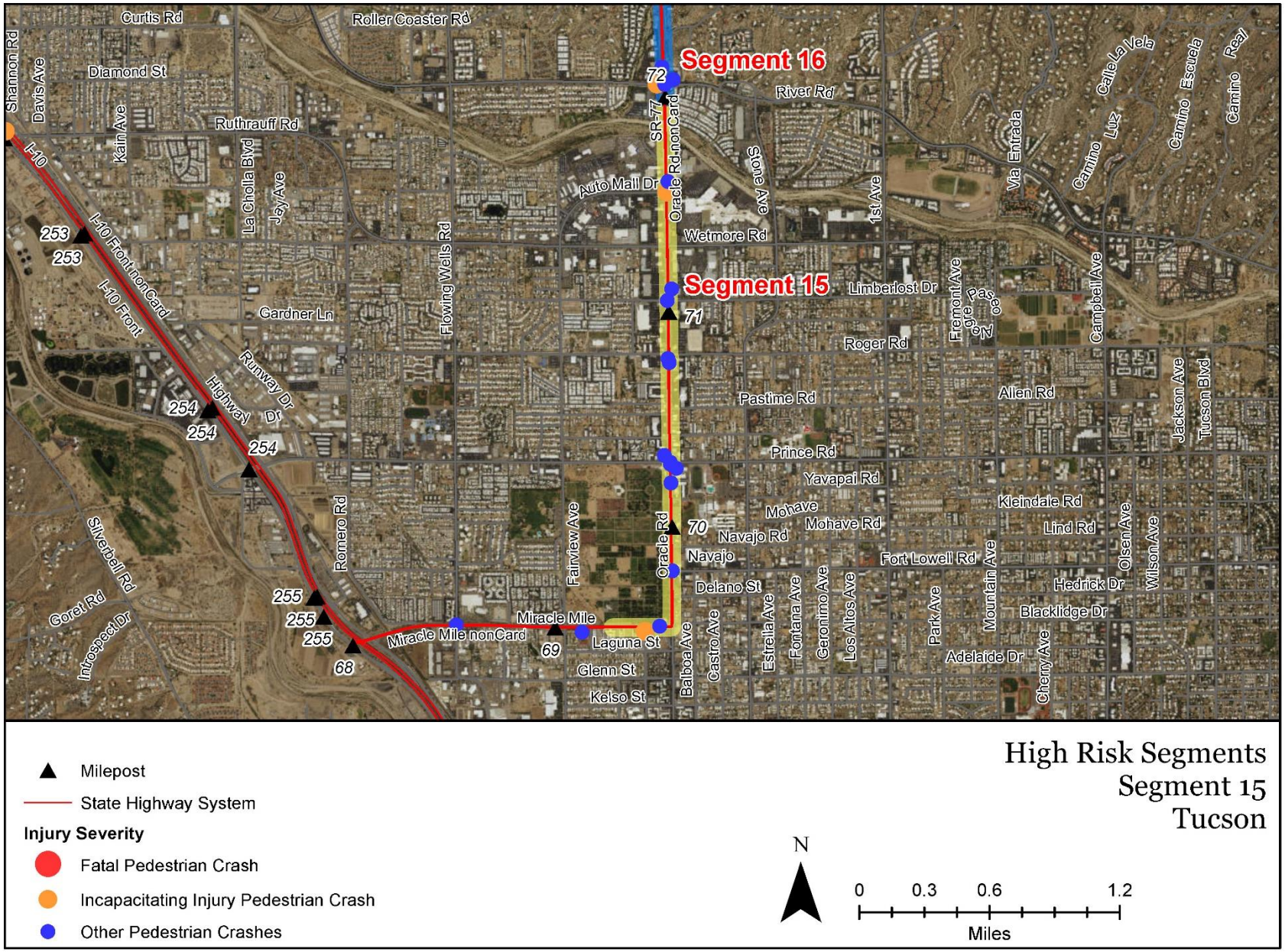
Enhance Midblock Crossing Opportunities — **$173,959**

Evaluate the need for additional pedestrian crossing opportunities such as a two-stage pedestrian crossing or PHB.

Option 2: Enforcement — --

Increase enforcement for distracted motorists and failure to yield the right-of-way at the intersection for pedestrians.

Estimated Planning Level Total Segment Conceptual Cost: $196,959


Segment 16
Segment 15
Curtis Rd
Roller Coaster Rd
Shannon Rd
Davis Ave
Diamond St
Kain Ave
Ruthrauff Rd
La Cholla Blvd
Jay Ave
Flowing Wells Rd
Auto Mall Dr
Oracle Rd nonCard
SR-77
Sioux Ave
1st Ave
River Rd
Via Entrada
Camino Luz
Calle La Vela
Camino Escuela
Camino Real
Wetmore Rd
Limberlost Dr
Fremont Ave
Campbell Ave
Jackson Ave
Tucson Blvd
Roger Rd
Pastime Rd
Allen Rd
Prince Rd
Yavapai Rd
Kleindale Rd
Lind Rd
Olsen Ave
Wilson Ave
Mohave
Mohave Rd
Navajo Rd
Navajo
Fort Lowell Rd
Hedrick Dr
Blacklidge Dr
Adelaide Dr
Cherry Ave
Mountain Ave
Park Ave
Los Altos Ave
Geronimo Ave
Fontana Ave
Estrella Ave
Castro Ave
Balboa Ave
Oracle Rd
Fairview Ave
Delano St
Laguna St
Glenn St
Kelso St
Miracle Mile
Miracle Mile nonCard
Romero Rd
Silverbell Rd
Corel Rd
Introspect Dr
Gardner Ln
Runway Dr
Highway Dr
I-10
I-10 Front nonCard
I-10 Front
253
254
255
68
69
70
71
72
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 15
Tucson
N
0
0.3
0.6
1.2
Miles

Potential Countermeasures for SR 77, High-Risk Segment 16

General Project Information

Primary Route/Street: SR 77
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 72.92 (Roller Coaster Road)
End Limit: MP 75.40 (Suffolk Road)
Segment Length: 2.48 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/fEN11nWLU6L2

Location Summary

This location overlaps with High-Crash Segment 10. The SR 77 segment is located in Tucson. 14 crashes were reported at this high-risk location, with nine resulting in severe injuries.
Programmed Projects: Construct New Sidewalk (River Road – Suffolk); TRACS # H724901C
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided
AADT: 41,300–53,500 vehicles per day
Posted Speed Limit: 45–50 mph
Sidewalks: Yes
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 14 (1 involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial

Project Need

Pedestrian crashes have occurred at both signalized and unsignalized locations. All the crashes occurred during daylight conditions.

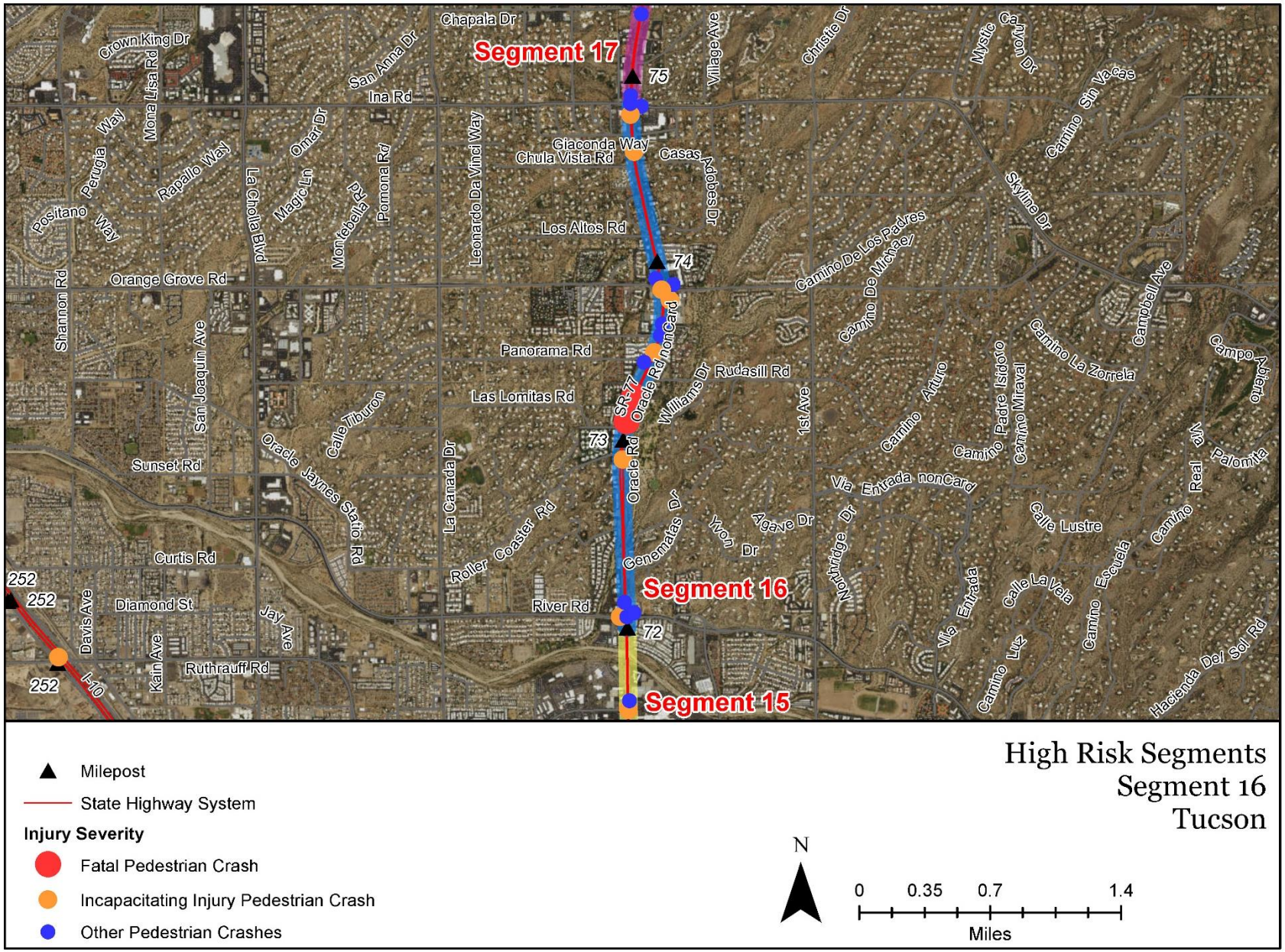
Project Purpose

This location overlaps with High-Crash Segment 10.

Potential Countermeasures *Conceptual Cost*

This location overlaps with High-Crash Segment 10. Refer to Segment 10 for recommendations.

Estimated Planning Level Total Segment Conceptual Cost: —


Segment 17
Segment 16
Segment 15
75
74
73
72
252
Chapala Dr
Crown King Dr
Mona Lisa Rd
San Anna Dr
Ina Rd
Perugia Way
Rapallo Way
Omar Dr
La Cholla Blvd
Magic Ln
Montebella Dr
Pomona Rd
Leonardo Da Vinci Way
Giaconda Way
Chula Vista Rd
Casas Adobes Dr
Village Ave
Christie Dr
Mystic Canyon Dr
Camino Sin Vacas
Skyline Dr
Positano Way
Los Altos Rd
Camino De Los Padres
Camino De Michael
Campbell Ave
Orange Grove Rd
Shannon Rd
San Joaquin Ave
Panorama Rd
Oracle Rd nonCard
Williams Dr
Rudasill Rd
Las Lomitas Rd
SR-77
Oracle Rd
1st Ave
Camino Arturo
Camino Padre Isidoro
Camino Miraval
Camino La Zorrela
Campo Abierto
Sunset Rd
Calle Tiburon
Oracle Jaynes Station Rd
La Canada Dr
Via Entrada nonCard
Camino Real
Via Palomita
Curtis Rd
Roller Coaster Rd
Genematas Dr
Yvon Dr
Agave Dr
Northridge Dr
Calle Lustre
Diamond St
River Rd
Davis Ave
Jay Ave
Kain Ave
Ruthrauff Rd
I-10
Calle La Vela
Camino Escuela
Vía Entrada
Camino Luz
Hacienda Del Sol Rd
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 16
Tucson
N
0
0.35
0.7
1.4
Miles

Potential Countermeasures for SR 77, High-Risk Segment 17

General Project Information

Primary Route/Street: SR 77
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 75.0
End Limit: MP 79.1
Segment Length: 4.1 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/DSCtae3KKMG2

Location Summary

The SR 77 segment is located in Tucson and overlaps with the High-Crash Segment 10. Four crashes were reported at this high risk location, with one resulting in an incapacitating injury.
Programmed Projects: Construct New Sidewalk (River Road – Suffolk); TRACS # H724901C
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided
AADT: 41,300–53,500 vehicles per day
Posted Speed Limit: 45–50 mph
Sidewalks: No
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): Yes
Number of Pedestrian Crashes: 4 (1 driver involved alcohol)
Crosswalk Locations: At signalized intersections
Other Pedestrian Attractors/Generators: Various commercial

Project Need

This high-risk segment has similar characteristics and needs as the identified High-Crash Segment 10. Pedestrian crashes have occurred at both signalized and unsignalized locations. All the crashes occurred during daylight conditions.

Project Purpose

Reduce both intersection and non-intersection related pedestrian crashes by increasing the visibility of pedestrians along SR 77 and providing safer crossing opportunities.

Potential Countermeasures — *Conceptual Cost*

Conduct RSA — **$20,000**
An RSA with an emphasis on pedestrian safety should be conducted along the high-risk segment to further evaluate safety issues.

Option 1: Engineering

Install Roadway Lighting — **$1,126,400**
Construct lighting along the corridor segment to supplement the construction of the programmed sidewalks.

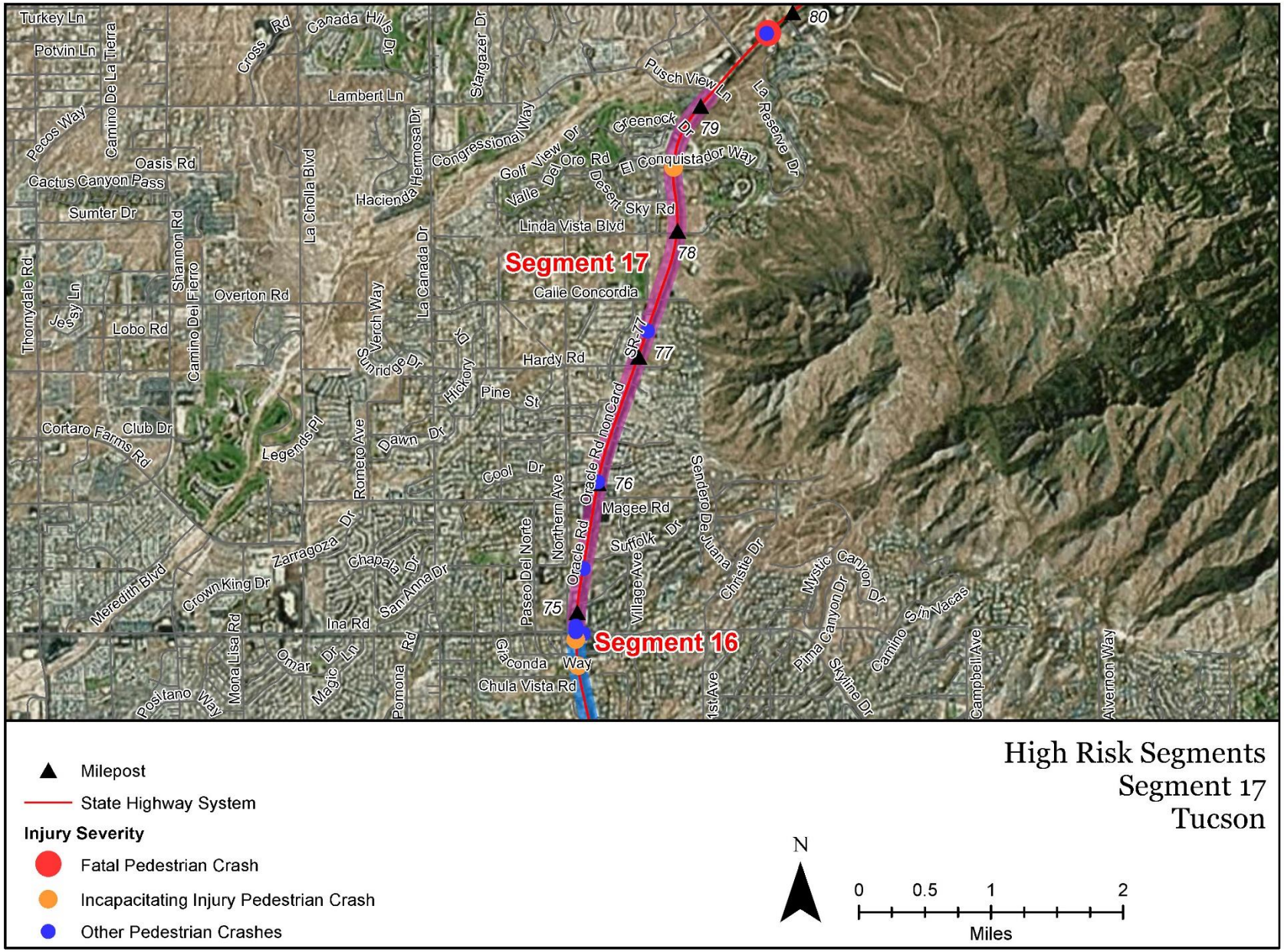
57 vehicle crashes occurred during dark-not lighted conditions during the five-year study period.

Install Sidewalks — —
AS PROGRAMMED. Evaluate the need to extend sidewalks up to MP 79.1.

Option 2: Enforcement — —

Increase enforcement for motorists failing to yield the right-of way at the intersection.

Estimated Planning Level Total Segment Conceptual Cost: $1,146,400


Segment 17
Segment 16
80
79
78
77
76
75
Milepost
State Highway System
Injury Severity
Fatal Pedestrian Crash
Incapacitating Injury Pedestrian Crash
Other Pedestrian Crashes
High Risk Segments
Segment 17
Tucson
N
0
0.5
1
2
Miles

Potential Countermeasures for US 60X, High-Risk Segment 18

General Project Information

Primary Route/Street: US 60X, Apache Trail
City/Town Name: Apache Junction
County: Maricopa
District: Central
Begin Limit: MP 189 (Sossaman Road)
End Limit: MP 194 (Meridian Road)
Segment Length: 4 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://goo.gl/maps/ZSMS7Fdbx522

Location Summary

The US 60X segment is in Apache Junction, east of Phoenix. 16 pedestrian crashes were reported, with four resulting in incapacitating injuries and five resulting in fatal injuries.
Programmed Projects: MPD0011-17
Identified in 2009 PSAP: Yes
Segment Type (High-Crash/High-Risk): High-Risk
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway
AADT: 14,500 vehicles per day (per MAG 2015 ADT Map)
Posted Speed Limit: 45 mph
Sidewalks: None
Lighting: At signalized intersections
Bus Stop Locations (within ¼ mile): None
Number of Pedestrian Crashes: 16 (4 involved alcohol; all were fatal crashes)
Crosswalk Locations: At traffic signals
Other Pedestrian Attractors/Generators: Various commercial, residential, and schools

Project Need

The majority of pedestrian crashes along US 60X occurred during dark/not lighted conditions. Various crash types were reported and included the pedestrian crossing at non-intersections or walking along the roadway. No pedestrian facilities exist along the highway.

Project Purpose

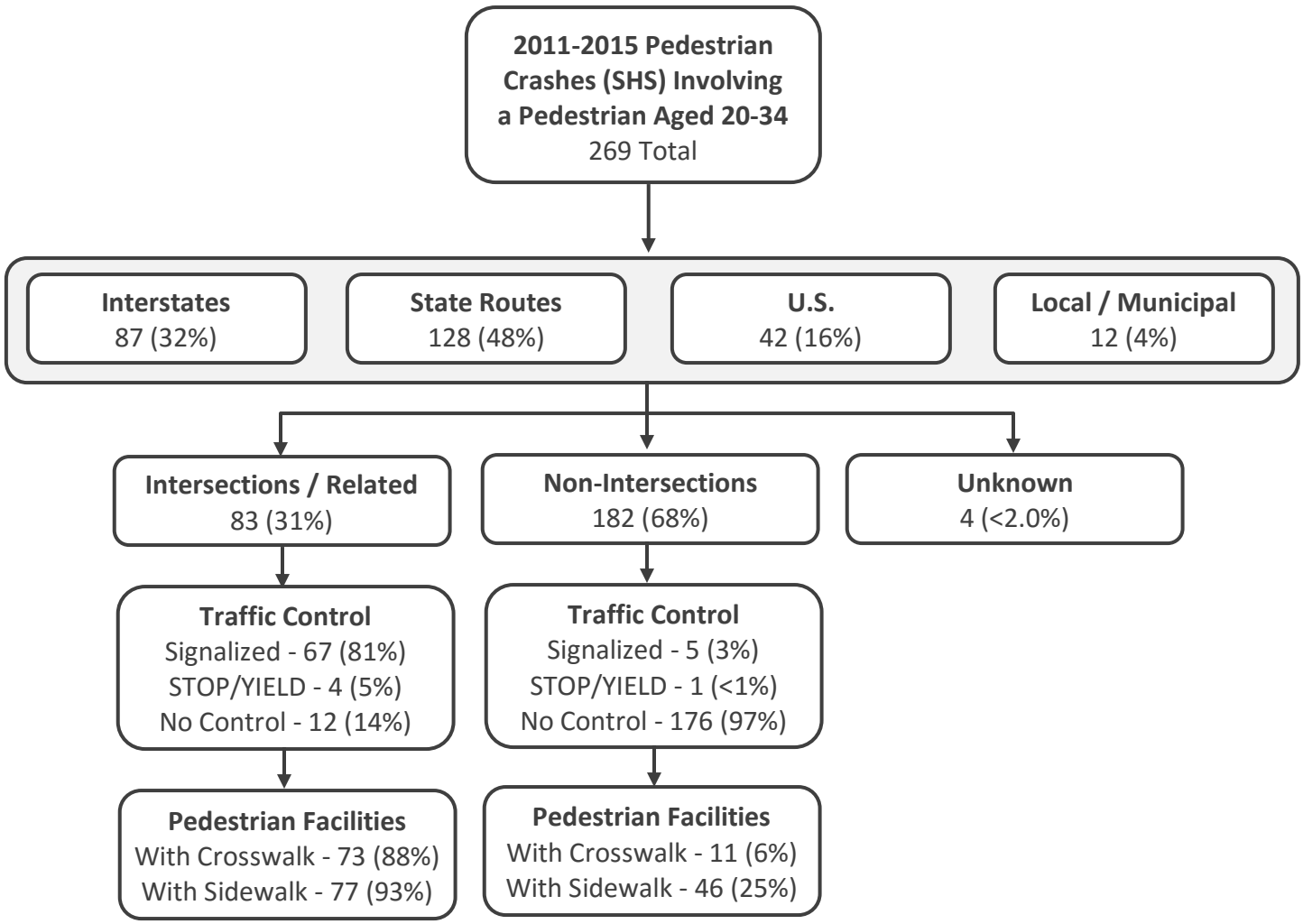
This location overlaps with High-Crash Segment 16 from MP 190 to MP 194. Refer to High-Crash Segment 16 recommendations. Countermeasures apply to MP 189 - MP 190.

Potential Countermeasures	*Conceptual Cost*
Roadway Reconfiguration	**$70,411**
Implement a road diet (roadway reconfiguration) to reduce the number of lanes that a pedestrian must cross and convert a moving lane to another purpose (bike lanes, sidewalk). As shown in the MAG 2015 traffic volumes, the existing traffic volumes do not warrant a six-lane highway.	
Provide Roadway Lighting	**$281,600**
Improve the lighting along the segment between MP 189 - MP 190. Place lighting to increase the visibility of pedestrians. Continuous double-sided lighting would be desirable for the area.	
Enhance Midblock Crossing Opportunities	**$173,959**
Evaluate the need for additional pedestrian crossing opportunities on US 60X such as a two-stage pedestrian crossing or PHB.	
Install Sidewalks	**$2,471,000**
Construct additional sidewalk along both sides of US 60X from MP 189 - MP 190 to provide convenient pedestrian mobility.	
Estimated Planning Level Total Segment Conceptual Cost:	**$2,996,970**

APPENDIX C – PEDESTRIAN CRASH ANALYSIS FOR AGE GROUP 20-34

Highway Characteristics Summary for Crashes on the SHS for Pedestrians Age 20-34

It was noted that 40 percent of the pedestrian crashes on the SHS involved pedestrians in the age group of 20 to 34. While exposure data does not exist to identify the percent of the pedestrian population walking along and crossing the SHS this age group represents, the disproportionate size of this age group represented a sizable target for educational safety messages. A separate analysis was desired to help identify the types, characteristics and location of the crashes in this age group. It appears that a higher percentage of pedestrian crashes in this demographic occur midblock instead of at intersections. For those pedestrians in this age group that were involved in a crash at intersections, a higher percentage were struck at signal-controlled intersections compared to STOP-sign controlled or uncontrolled intersections, and a slightly greater amount of these locations had marked crosswalks as shown in the figure below. Other crash analyses of this age demographic on the SHS are also provided below.



Crash Type (PBCAT Group ID) Description	Total Crashes	% of Total	% Urban	% Rural	% K+A
Crossing Roadway / Vehicle Turning (790)					
The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.	**52**	19%	90%	10%	10%
Crossing Roadway / Vehicle Not Turning (750)					
The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.	**40**	15%	95%	5%	68%
Unusual Circumstances (100) – Disabled Vehicle					
The crash involved a pedestrian and a disabled vehicle (including assisting emergency/tow truck personnel), an emergency vehicle, driverless vehicle or the pedestrian was hit while trying to remove something from the freeway (i.e., debris, pet, etc.)	**31**	12%	84%	16%	58%
Unusual Circumstances (100) – Intentionally Struck					
Modified definition: Crashes where the pedestrian was struck intentionally, was clinging to a vehicle, or was struck as the result of other unusual circumstances. Examples include: clinging to vehicle, vehicle hit sign structure, which then struck the pedestrian, police pursuit/evading police, motor vehicle loss of control, crash occurring as a result of a dispute/argument, assault by vehicle.	**7**	3%	43%	57%	57%
Dash / Dart-Out (740)					
The pedestrian walked or ran into the roadway at an intersection or midblock location and was struck by a vehicle. The motorist's view of the pedestrian may have been blocked until an instant before the impact.	**26**	10%	65%	35%	62%
Walking Along Roadway (400)					
The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.	**31**	12%	55%	45%	48%
Pedestrian in Roadway / Circumstances Unknown (600)					
The pedestrian was standing, walking, or lying in the road right-of-way at an intersection or midblock location but the circumstances are unknown.	**34**	13%	53%	47%	76%
Other / Unknown / Insufficient Details (990)					
The circumstances do not clearly fit any of the situations described or are unknown.	**18**	7%	44%	56%	78%
Crossing Expressway (910)					
The pedestrian was struck by a motor vehicle while crossing an expressway or expressway ramp.	**14**	5%	79%	21%	79%
Crossing Driveway or Alley (460)					
The pedestrian was standing or walking near the roadway edge, on a sidewalk, in a driveway or alley, or in a parking lot, when struck by a vehicle.	**4**	1%	75%	25%	25%
Working or Playing in Roadway (310)					
The pedestrian was struck when playing or working in the roadway, which includes highway workers who were struck within a work zone.	**5**	2%	60%	40%	20%
Backing Vehicle (200)					
A pedestrian was struck by a backing vehicle on a street, in a driveway, on a sidewalk, in a parking lot, or at another location.	**3**	1%	67%	33%	0%
Unique Midblock (350)					
A pedestrian was struck while crossing the road to/from a mailbox, newspaper box, ice-cream truck, similar unique/temporary destinations, or while getting into or out of a stopped vehicle.	**2**	< 1.0%	50%	50%	0%
Bus-Related (340)					
A pedestrian was struck by a vehicle while: crossing in front of a public bus stopped at a bus stop; going to or from a school bus stop; or going to or from, or waiting near a public bus stop.	**1**	< 1.0%	100%	< 1.0%	0%
Multiple Threat / Trapped (720)					
The pedestrian entered the roadway in front of stopped or slowed traffic and was struck by a multiple-threat vehicle in an adjacent lane after becoming trapped in the middle of the roadway.	**1**	< 1.0%	100%	< 1.0%	0%

Total Crashes with Ped 20-34	269

Hour	
0	14
1	11
2	10
3	9
4	7
5	6
6	8
7	2
8	5
9	5
10	4
11	5
12	8
13	4
14	8
15	9
16	14
17	17
18	23
19	20
20	33
21	24
22	14
23	9
Total	**269**

Age	
20	18
21	21
22	30
23	16
24	17
25	15
26	18
27	24
28	13
29	20
30	20
31	19
32	15
33	11
34	12
Grand Total	**269**

Influence A	
Drugs	14
Alcohol	74
Not Impaired	132
Unknown	49
Grand Total	**269**

Influence 2	
Impared	88
Not Impaired	132
Unknown	49
Grand Total	**269**

Injury Severity			
	Total	Urban	Rural
Fatal (K)	61	36	25
Incapacitating (A)	77	55	22
None (O)	11	8	3
Non-Incapacitating (B)	79	60	19
Possible (C)	37	33	4
Unknown	4	4	0
Grand Total	**269**	**196**	**73**

Roadway Configuration			
	Total	Urban	Rural
1-Way Trafficway	41	39	2
2-Way, Divided, Positive Median Barrier	88	74	14
2-Way, Divided, Unprotected (Painted >4 Feet) Median	38	19	19
2-Way, Undivided (no median)	51	20	31
2-Way, Undivided, w/LT Lane	51	44	7
Grand Total	**269**	**196**	**73**

Traffic Control	
No Controls	189
Person (i.e. law enforcement)	2
Signal	73
STOP Sign	4
YIELD Sign	1
Grand Total	**269**

Marked Crosswalk Presence	
No	184
Yes	85
Grand Total	**269**

Weather Condition	
Clear	218
Cloudy	24
Rain	13
Snow	1
Unknown	13
Grand Total	**269**

Road Surface Conditions	
Dry	234
Ice/Frost	1
Snow	1
Unknown	18
Water (Standing, Moving)	1
Wet	14
Grand Total	**269**

Lighting Condition	
Dark-Lighted	86
Dark-Not Lighted	75
Dark-Unknown Lighting	10
Dawn	4
Daylight	85
Dusk	9
Grand Total	**269**

Roadway Type	
Interstate	87
Local / Municipal	12
State Route	128
US Highway	42
Grand Total	**269**

Pedestrian Position Description	
Crosswalk area	64
Other / Unknown	19
Paved Shoulder / Bike Lane / Parking Lane	39
Sidewalk / Shared Use Path / Driveway Crossing	9
Travel Lane	137
Unpaved Right-of-Way	1
Grand Total	**269**

Crash Group Description	
Backing Vehicle	3
Bus-Related	1
Crossing Driveway or Alley	4
Crossing Expressway	14
Crossing Roadway - Vehicle Not Turning	40
Crossing Roadway - Vehicle Turning	52
Dash / Dart-Out	26
Multiple Threat / Trapped	1
Other / Unknown - Insufficient Details	18
Pedestrian in Roadway - Circumstances Unknown	34
Unique Midblock	2
Unusual Circumstances	38
Walking Along Roadway	31
Working or Playing in Roadway	5
Grand Total	**269**

APPENDIX D – ADOT HSIP BENEFIT-COST RATIO (BCR) ANALYSIS

HSIP BCR Summary

The Benefit-Cost Ratio (BCR) was estimated using the application framework from the Arizona Highway Safety Improvement Program Manual, May 2015 (Revised February 2017), *Appendix A – HSIP Project Application Process and Worksheets*. The calculated annual benefit includes only fatal (K) and serious injury (A) crashes. A summary is provided below for both High-Crash and High-Risk Segments. The following pages provide the individual segment worksheets calculations.

High-Crash Segments

Project	Route	From MP	To MP	Annual Benefit	Annual Cost	Benefit-Cost Ratio
H-C Segment 1	U.S. 160	323	324.5	$ 3,634,400.00	$ 46,441.00	78.3
H-C Segment 2	US 191	448	449	$ 1,890,800.00	$ 68,704.77	27.5
H-C Segment 3	SR 68	18	24.3	$ 2,389,600.00	$ 506,826.00	4.7
H-C Segment 4	SR 68	2	3.5	$ 328,400.00	$ 58,178.00	5.6
H-C Segment 5	SR 95	237.4	239.2	$ 451,600.00	$ 297,649.00	1.5
H-C Segment 6	SR 73	339	341	$ 56,800.00	$ 9,913.87	5.7
H-C Segment 7	SR 92	321	326.7	$ 1,227,600.00	$ 411,779.00	3.0
H-C Segment 8	SR 86 (Ajo Way)	151	153	$ 533,600.00	$ 43,997.00	12.1
H-C Segment 9	SR 86	170.3	171.6	$ 1,050,000.00	$ 93,047.00	11.3
H-C Segment 10	SR 77	72.9	75.4	$ 736,800.00	$ 81,889.00	9.0
H-C Segment 11A	SR 89A	402.15	403.2	$ 176,000.00	$ 127,054.00	1.4
H-C Segment 11B	40B	403.2	196.5	$ 196,000.00	$ 41,666.00	4.7
H-C Segment 12	SR 40B	198.5	199.5	$ 1,089,200.00	$ 152,358.00	7.1
H-C Segment 13	US 60	143	145	***CMF not available for improvement***		
H-C Segment 14	US 60	158.5	159.5	$ 522,000.00	$ 20,910.00	25.0
H-C Segment 15	US 70	257	259	$ 870,000.00	$ 162,934.00	5.3
H-C Segment 16	US 60X	190	194	$ 2,886,800.00	$ 422,887.00	6.8

High-Risk Segments

Project	Route	From MP	To MP	Annual Benefit	Annual Cost	Benefit-Cost Ratio
H-R Segment 1	SR 95	244	246	$ 480,000.00	$ 291,874.00	1.6
H-R Segment 2	SR 95	241.5	244	$ 1,980,000.00	$ 281,527.00	7.0
H-R Segment 3	SR 95	235.5	237.4	$ 1,230,000.00	$ 582,080.00	2.1
H-R Segment 4	SR 95	229.4	230.5	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 5	SR 347	171.4	175.4	$ 513,257.00	$ 297,649.00	1.7
H-R Segment 6	US 60	156.5	158.5	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 7	US 60	152	155.6	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 8	US 60	149	152	***CMF not available for improvement***		
H-R Segment 9	US 60	146.3	148	$ 529,200.00	$ 169,149.00	3.1
H-R Segment 10	US 60	145	146.3	***CMF not available for improvement***		
H-R Segment 11	SR 69	286.5	289.7	$ 0.00	$ 289,949.00	0.0
H-R Segment 12	US 191 / SR 80	365.5	366.1	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 13	SR 90	320	323	$ 60,000.00	$ 169,149.00	0.4
H-R Segment 14	SR 86	169.7	170.3	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 15	SR 77	69.5	72	$ 36,000.00	$ 20,910	1.7
H-R Segment 16	SR 77	72.9	75.4	***Overlaps with High-Crash Segment 10***		
H-R Segment 17	SR 77	75.0	79.1	***Identified as a high-risk location; the proposed countermeasure does not correct crashes reported.***		
H-R Segment 18	US 60X	189	194	***Overlaps with High-Crash Segment 16***		

HSIP BCR Worksheet

H-C Segment 1

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 1	**Date**	7/9/2017		
Route	U.S. 160	**From MP**	323	**To MP**	324.5
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting		

BENEFITS						
	Crash Types	**Annual Average**	**Crash Reduction Factor**	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.8	0.23	0.616	$ 5,800,000.00	$ 3,572,800.00
	Incapacitating (A)	0.2	0.23	0.154	$ 400,000.00	$ 61,600.00
	Non-Incapacitating (B)	0	0.23	0	$ 80,000.00	$ -
	Possible Injury	0.2	0.23	0.154	$ 42,000.00	$ 6,468.00
	PDO	0.2	0.23	0.154	$ 4,000.00	$ 616.00
	Unknown	0	0.23	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 3,634,400.00

COSTS	
Total Construction Cost	$ 535,040.00
Project Life (Years)	15
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 46,441.00
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 46,441.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 3,634,400.00	$ 46,441.00	78.3

H-C Segment 2

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 2	**Date**	7/9/2017		
Route	US 191	**From MP**	448	**To MP**	449
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting/Widen Shoulders		

BENEFITS						
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.8	0.23	0.184	$ 5,800,000.00	$ 1,067,200.00
	Incapacitating (A)	0	0.23	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0	0.23	0	$ 80,000.00	$ -
	Possible Injury	0	0.23	0	$ 42,000.00	$ -
	PDO	0.2	0.23	0.154	$ 4,000.00	$ 616.00
	Unknown	0	0.23	0	$ 4,000.00	$ -
Widen Shoulders	**Fatal (K)**	0.2	0.71	0.142	$ 5,800,000.00	$ 823,600.00
	Incapacitating (A)	0	0.71	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0	0.71	0	$ 80,000.00	
	Possible Injury	0	0.71	0	$ 42,000.00	$ -
	PDO	0.4	0.71	0.116	$ 4,000.00	$ 464.00
	Unknown	0	0.71	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 1,890,800.00

COSTS	
Total Construction Cost	$ 903,760.00
Project Life (Years)	15 (Lighting), 20 (Shoulders)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 00704 (Shoulders)
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 68,704.77
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 68,704.77

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 1,890,800.00	$ 68,704.77	27.5

H-C Segment 3

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 3	**Date**	7/9/2017		
Route	SR 68	**From MP**	18	**To MP**	24.3
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting/Raised Median/Pedestrian Hybrid Beacon		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.4	0.23	0.092	$ 5,800,000.00	$ 533,600.00
	Incapacitating (A)	1.0	0.23	0.77	$ 400,000.00	$ 308,000.00
	Non-Incapacitating (B)	1.6	0.23	1.232	$ 80,000.00	$ 98,560.00
	Possible Injury	1	0.23	0.77	$ 42,000.00	$ 32,340.00
	PDO	4.6	0.23	3.542	$ 4,000.00	$ 14,168.00
	Unknown	0	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.2	0.25	0.15	$ 5,800,000.00	$ 870,000.00
	Incapacitating (A)	0.4	0.25	0.3	$ 400,000.00	$ 120,000.00
	Non-Incapacitating (B)	0.2	0.25	0.15	$ 80,000.00	$ 12,000.00
	Possible Injury	0	0.25	0	$ 42,000.00	$ -
	PDO	0	0.25	0	$ 4,000.00	$ -
	Unknown	0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.2	0.55	0.09	$ 5,800,000.00	$ 522,000.00
	Incapacitating (A)	0.2	0.55	0.09	$ 400,000.00	$ 36,000.00
	Non-Incapacitating (B)	0.2	0.55	0.09	$ 80,000.00	$ 7,200.00
	Possible Injury	0	0.55	0	$ 42,000.00	$ -
	PDO	0	0.55	0	$ 4,000.00	$ -
	Unknown	0	0.55	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 2,389,600.00

COSTS	
Total Construction Cost	$ 6,879,379.00
Project Life (Years)	15 (Lighting), 20 (Median), 10 (PHB)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 00704 (Median), 0.1202
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 68,704.77
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 506,826.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 2,389,600.00	$ 506,826.00	4.7

H-C Segment 4

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 4	**Date**	7/9/2017		
	Route	SR 68	**From MP**	2	**To MP**	3.5
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting/Raised Median		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.20	0.23	0.046	$ 5,800,000.00	$ 266,800.00
	Incapacitating (A)	0.20	0.23	0.154	$ 400,000.00	$ 61,600.00
	Non-Incapacitating (B)	0.00	0.23	0	$ 80,000.00	$ -
	Possible Injury	0.20	0.23	0.154	$ 42,000.00	$ 6,468.00
	PDO	1.40	0.23	1.078	$ 4,000.00	$ 4,312.00
	Unknown	0.00	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.00	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.00	0.25	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.20	0.25	0.15	$ 80,000.00	$ 12,000.00
	Possible Injury	0.00	0.25	0	$ 42,000.00	$ -
	PDO	0.00	0.25	0	$ 4,000.00	$ -
	Unknown	0.00	0.25	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 328,400.00
	COSTS					
	Total Construction Cost			$		759,479.00
	Project Life (Years)					15 (Lighting), 20 (Median)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0868 (Lighting), 00704 (Median)
	Annual Const. Cost = CRF x Total Const. Cost (A)			$		58,178.00
	Annual Maintenance Cost Difference (B)			$		-
	Total Annual Cost: (A + B)			$		58,178.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 328,400.00		$ 58,178.00		5.6	

H-C Segment 5

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 5	**Date**	7/9/2017		
	Route	SR 95	**From MP**	237.4	**To MP**	239.2
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.2	0.23	0.046	$ 5,800,000.00	$ 266,800.00
	Incapacitating (A)	0.6	0.23	0.462	$ 400,000.00	$ 184,800.00
	Non-Incapacitating (B)	0.2	0.23	0.154	$ 80,000.00	$ 12,320.00
	Possible Injury	0.2	0.23	0.154	$ 42,000.00	$ 6,468.00
	PDO	0.6	0.23	0.462	$ 4,000.00	$ 1,848.00
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 451,600.00
	COSTS					
	Total Construction Cost			$		3,888,754.00
	Project Life (Years)					15 (Lighting), 10 (PHB)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0868 (Lighting), 0.1202 (PHB)
	Annual Const. Cost = CRF x Total Const. Cost (A)			$		297,649.00
	Annual Maintenance Cost Difference (B)			$		-
	Total Annual Cost: (A + B)			$		297,649.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 451,600.00		$ 297,649.00		1.5	

H-C Segment 6

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 6	**Date**	7/9/2017		
Route	SR 73	**From MP**	339	**To MP**	341
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Road Diet (Roadway Reconfiguration)		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Road Diet (Roadway Reconfiguration)	**Fatal (K)**	0.0	0.29	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.29	0.142	$ 400,000.00	$ 56,800.00
	Non-Incapacitating (B)	0.2	0.29	0.142	$ 80,000.00	$ 11,360.00
	Possible Injury	0.0	0.29	0	$ 42,000.00	$ -
	PDO	0.0	0.29	0	$ 4,000.00	$ -
	Unknown	0.0	0.29	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 56,800.00

COSTS	
Total Construction Cost	$ 140,822.00
Project Life (Years)	20
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0704
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 9,913.87
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 9,913.87

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 56,800.00	$ 9,913.87	5.7

H-C Segment 7

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 7	**Date**	7/9/2017		
Route	SR 92	**From MP**	321	**To MP**	326.7
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting, Raised Median, Pedestrian Hybrid Beacon, Leading Pedestrian Interval		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.4	0.23	0.092	$ 5,800,000.00	$ 533,600.00
	Incapacitating (A)	0.0	0.23	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.6	0.23	0.462	$ 80,000.00	$ 36,960.00
	Possible Injury	0.0	0.23	0	$ 42,000.00	$ -
	PDO	0.0	0.23	0	$ 4,000.00	$ -
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.0	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.25	0.15	$ 400,000.00	$ 60,000.00
	Non-Incapacitating (B)	0.6	0.25	0.45	$ 80,000.00	$ 36,000.00
	Possible Injury	0.2	0.25	0.15	$ 42,000.00	$ 6,300.00
	PDO	0.0	0.25	0	$ 4,000.00	$ -
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.2	0.55	0.09	$ 5,800,000.00	$ 522,000.00
	Incapacitating (A)	0.2	0.55	0.09	$ 400,000.00	$ 36,000.00
	Non-Incapacitating (B)	0.6	0.55	0.27	$ 80,000.00	$ 21,600.00
	Possible Injury	0.2	0.55	0.09	$ 42,000.00	$ 3,780.00
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
LPI	**Fatal (K)**	0.0	0.05	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.05	0.19	$ 400,000.00	$ 76,000.00
	Non-Incapacitating (B)	0.2	0.05	0.19	$ 80,000.00	$ 15,200.00
	Possible Injury	0.2	0.05	0.19	$ 42,000.00	$ 7,980.00
	PDO	0.0	0.05	0	$ 4,000.00	$ -
	Unknown	0.0	0.05	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 1,227,600.00

COSTS	
Total Construction Cost	$ 5,415,956.00
Project Life (Years)	15 (Lighting), 20 (Median), 10 (PHB, LPI)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 00704 (Median), 0.1202 (PHB and LPI)
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 411,779.00
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 411,779.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 1,227,600.00	$ 411,779.00	3.0

H-C Segment 8

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 8	**Date**	7/9/2017		
Route	SR 86 (Ajo Way)	**From MP**	151	**To MP**	153
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Roadway Lighting		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.4	0.23	0.092	$ 5,800,000.00	$ 533,600.00
	Incapacitating (A)	0.0	0.23	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.4	0.23	0.308	$ 80,000.00	$ 24,640.00
	Possible Injury	0.0	0.23	0	$ 42,000.00	$ -
	PDO	0.8	0.23	0.616	$ 4,000.00	$ 2,464.00
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 533,600.00

COSTS	
Total Construction Cost	$ 506,880.00
Project Life (Years)	15
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 43,997.00
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 43,997.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 533,600.00	$ 43,997.00	12.1

H-C Segment 9

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 9	**Date**	7/9/2017		
Route	SR 86	**From MP**	170.3	**To MP**	171.6
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Raised Median	**Fatal (K)**	0.2	0.25	0.15	$ 5,800,000.00	$ 870,000.00
	Incapacitating (A)	0.6	0.25	0.45	$ 400,000.00	$ 180,000.00
	Non-Incapacitating (B)	0.0	0.25	0	$ 80,000.00	$ -
	Possible Injury	0.4	0.25	0.3	$ 42,000.00	$ 12,600.00
	PDO	0.2	0.25	0.15	$ 4,000.00	$ 600.00
	Unknown	0.2	0.25	0.15	$ 4,000.00	$ 600.00
				Total Annual Benefit (K + A)		$ 1,050,000.00

COSTS	
Total Construction Cost	$ 1,339,567.00
Project Life (Years)	20
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0704
Annual Const. Cost = CRF x Total Const. Cost (A)	$ 93,047.00
Annual Maintenance Cost Difference (B)	$ -
Total Annual Cost: (A + B)	$ 93,047.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 1,050,000.00	$ 93,047.00	11.3

H-C Segment 10

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 10	**Date**	7/9/2017		
Route	SR 77	**From MP**	72.9	**To MP**	75.4
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Roadway Lighting, PHB		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.4	0.23	0.092	$ 5,800,000.00	$ 533,600.00
	Incapacitating (A)	0.4	0.23	0.308	$ 400,000.00	$ 123,200.00
	Non-Incapacitating (B)	0.0	0.23	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.23	0	$ 42,000.00	$ -
	PDO	0.0	0.23	0	$ 4,000.00	$ -
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.00	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.00	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.00	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.00	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
LPI	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.00	0.2	$ 400,000.00	$ 80,000.00
	Non-Incapacitating (B)	0.0	0.00	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 736,800.00

COSTS	
Total Construction Cost	$ 875,327.00
Project Life (Years)	15 (Lighting), 10 (PHB)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 0.1202 (PHB)
Annual Const. Cost	$ 81,889.00
Annual Maintenance Cost Difference	$ -
Total Annual Cost:	$ 81,889.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 736,800.00	$ 81,889.00	9.0

H-C Segment 11A

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 11A	**Date**	7/9/2017		
Route	SR 89A	**From MP**	402.15	**To MP**	403.2
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Roadway Lighting, PHB		

	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.00	0.2	$ 400,000.00	$ 80,000.00
	Non-Incapacitating (B)	0.2	0.00	0.2	$ 80,000.00	$ 16,000.00
	Possible Injury	0.2	0.00	0.2	$ 42,000.00	$ 8,400.00
	PDO	1.0	0.00	1	$ 4,000.00	$ 4,000.00
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.0	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.25	0.15	$ 400,000.00	$ 60,000.00
	Non-Incapacitating (B)	0.2	0.25	0.15	$ 80,000.00	$ 12,000.00
	Possible Injury	0.6	0.25	0.45	$ 42,000.00	$ 18,900.00
	PDO	0.2	0.25	0.15	$ 4,000.00	$ 600.00
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.55	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.55	0.09	$ 400,000.00	$ 36,000.00
	Non-Incapacitating (B)	0.2	0.55	0.09	$ 80,000.00	$ 7,200.00
	Possible Injury	0.6	0.55	0.27	$ 42,000.00	$ 11,340.00
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
LPI	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.00	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.00	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 176,000.00

COSTS	
Total Construction Cost	$ 1,719,562.55
Project Life (Years)	15 (Lighting), 20 (Median), 10 (PHB, LPI)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 00704 (Median), 0.1202 (PHB and LPI)
Annual Const. Cost	$ 127,054.00
Annual Maintenance Cost Difference	$ -
Total Annual Cost:	$ 127,054.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 176,000.00	$ 127,054.00	1.4

H-C Segment 11B

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 11B	**Date**	7/9/2017		
	Route	40B	**From MP**	195.48	**To MP**	196.5
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median, Signal Enhancements		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Raised Median	**Fatal (K)**	0.0	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.4	0.25	0.3	$ 400,000.00	$ 120,000.00
	Non-Incapacitating (B)	0.2	0.25	0.15	$ 80,000.00	$ 12,000.00
	Possible Injury	0.4	0.25	0.3	$ 42,000.00	$ 12,600.00
	PDO	0.2	0.25	0.15	$ 4,000.00	$ 600.00
	Unknown	0.2	0.25	0.15	$ 4,000.00	$ 600.00
LPI	**Fatal (K)**	0.0	0.05	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.05	0.19	$ 400,000.00	$ 76,000.00
	Non-Incapacitating (B)	0.0	0.05	0	$ 80,000.00	$ -
	Possible Injury	0.4	0.05	0.38	$ 42,000.00	$ 15,960.00
	PDO	0.2	0.05	0.19	$ 4,000.00	$ 760.00
	Unknown	0.0	0.05	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 196,000.00
	COSTS					
	Total Construction Cost			$		609,731.00
	Project Life (Years)					20 (Median), 10 (LPI)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0704, , 0.1202 (LPI)
	Annual Const. Cost			$		41,666.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		41,666.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 196,000.00		$ 41,666.00		4.7	

H-C Segment 12

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 12	**Date**	7/9/2017		
	Route	SR 40B	**From MP**	198.5	**To MP**	199.5
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median, Roadway Lighting, PHB		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.0	0.23	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.4	0.23	0.308	$ 400,000.00	$ 123,200.00
	Non-Incapacitating (B)	0.0	0.23	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.23	0	$ 42,000.00	$ -
	PDO	0.0	0.23	0	$ 4,000.00	$ -
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.2	0.25	0.15	$ 5,800,000.00	$ 870,000.00
	Incapacitating (A)	0.2	0.25	0.15	$ 400,000.00	$ 60,000.00
	Non-Incapacitating (B)	1.4	0.25	1.05	$ 80,000.00	$ 84,000.00
	Possible Injury	3.6	0.25	2.7	$ 42,000.00	$ 113,400.00
	PDO	12.8	0.25	9.6	$ 4,000.00	$ 38,400.00
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.55	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.55	0.09	$ 400,000.00	$ 36,000.00
	Non-Incapacitating (B)	0.0	0.55	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.55	0	$ 42,000.00	$ -
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 1,089,200.00
	COSTS					
	Total Construction Cost			$		1,992,243.00
	Project Life (Years)					15 (Lighting), 20 (Median), 10 (PHB)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0868 (Lighting), 0.0704 (Median), 0.1202 (PHB)
	Annual Const. Cost			$		152,358.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		152,358.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 1,089,200.00		$ 152,358.00		7.1	

H-C Segment 13

A CMF is not available for Barrier / Fencing improvements.

H-C Segment 14

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 14	**Date**	7/9/2017		
	Route	US 60	**From MP**	158.5	**To MP**	159.5
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; PHB		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
PHB	**Fatal (K)**	0.2	0.55	0.09	$ 5,800,000.00	$ 522,000.00
	Incapacitating (A)	0.0	0.55	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.2	0.55	0.09	$ 80,000.00	$ 7,200.00
	Possible Injury	0.0	0.55	0	$ 42,000.00	$ -
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 522,000.00
	COSTS					
	Total Construction Cost			$		193,959.00
	Project Life (Years)					10 (PHB)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.1202
	Annual Const. Cost			$		20,910.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		20,910.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 522,000.00		$ 20,910.00		25.0	

H-C Segment 15

	BENEFITS/COST WORKSHEET					
	Project Number	H-C Segment 15	**Date**	7/9/2017		
	Route	US 70	**From MP**	257	**To MP**	259
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Widen Shoulders, Roadway Lighting		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.4	0.23	0.092	$ 5,800,000.00	$ 533,600.00
	Incapacitating (A)	0.0	0.23	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.23	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.23	0	$ 42,000.00	$ -
	PDO	0.0	0.23	0	$ 4,000.00	$ -
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Widen Shoulders	**Fatal (K)**	0.2	0.71	0.058	$ 5,800,000.00	$ 336,400.00
	Incapacitating (A)	0.0	0.71	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.71	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.71	0	$ 42,000.00	$ -
	PDO	0.0	0.71	0	$ 4,000.00	$ -
	Unknown	0.0	0.71	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 870,000.00
	COSTS					
	Total Construction Cost			$		2,183,200.00
	Project Life (Years)					15 (Lighting), 20 (Shoulders)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0868 (Lighting), 0.0704 (Shoulders)
	Annual Const. Cost			$		162,934.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		162,934.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 870,000.00		$ 162,934.00		5.3	

H-C Segment 16

BENEFITS/COST WORKSHEET					
Project Number	H-C Segment 16	**Date**	7/9/2017		
Route	US 60X	**From MP**	190	**To MP**	194
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Roadway Lighting, Road Diet (Roadway Reconfiguration), PHB, Sidewalk		

BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	1.0	0.23	0.23	$ 5,800,000.00	$ 1,334,000.00
	Incapacitating (A)	0.4	0.23	0.308	$ 400,000.00	$ 123,200.00
	Non-Incapacitating (B)	0.4	0.23	0.308	$ 80,000.00	$ 24,640.00
	Possible Injury	1.2	0.23	0.924	$ 42,000.00	$ 38,808.00
	PDO	3.8	0.23	2.926	$ 4,000.00	$ 11,704.00
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Road Diet (Roadway Reconfiguration)	**Fatal (K)**	0.0	0.29	0	$ 5,800,000.00	$ -
	Incapacitating (A)	3.8	0.29	2.698	$ 400,000.00	$ 1,079,200.00
	Non-Incapacitating (B)	0.4	0.29	0.284	$ 80,000.00	$ 22,720.00
	Possible Injury	0.0	0.29	0	$ 42,000.00	$ -
	PDO	0.0	0.29	0	$ 4,000.00	$ -
	Unknown	0.0	0.29	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.55	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.4	0.55	0.18	$ 400,000.00	$ 72,000.00
	Non-Incapacitating (B)	0.4	0.55	0.18	$ 80,000.00	$ 14,400.00
	Possible Injury	0.0	0.55	0	$ 42,000.00	$ -
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
Sidewalk	**Fatal (K)**	0.4	0.88	0.048	$ 5,800,000.00	$ 278,400.00
	Incapacitating (A)	0.0	0.88	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.88	0	$ 80,000.00	$ -
	Possible Injury	0.2	0.88	0.024	$ 42,000.00	$ 1,008.00
	PDO	0.2	0.88	0.024	$ 4,000.00	$ 96.00
	Unknown	0.0	0.88	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 2,886,800.00

COSTS	
Total Construction Cost	$ 5,674,258.00
Project Life (Years)	20 (Road Diet, Sidewalk), 15 (Lighting), 10 (PHB)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0868 (Lighting), 0.0704 (Road Diet, Sidewalk), 0.1202 (PHB)
Annual Const. Cost	$ 422,887.00
Annual Maintenance Cost Difference	$ -
Total Annual Cost:	$ 422,887.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 2,886,800.00	$ 422,887.00	6.8

H-R Segment 1

BENEFITS/COST WORKSHEET					
Project Number	H-R Segment 1	**Date**	7/9/2017		
Route	SR 95	**From MP**	244	**To MP**	246
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median, PHB		

BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Raised Median	**Fatal (K)**	0.0	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	1.6	0.25	1.2	$ 400,000.00	$ 480,000.00
	Non-Incapacitating (B)	5.6	0.25	4.2	$ 80,000.00	$ 336,000.00
	Possible Injury	0.2	0.25	0.15	$ 42,000.00	$ 6,300.00
	PDO	0.4	0.25	0.3	$ 4,000.00	$ 1,200.00
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.00	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.4	0.00	0.4	$ 80,000.00	$ 32,000.00
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 480,000.00

COSTS	
Total Construction Cost	$ 4,042,881.00
Project Life (Years)	20 (Raised Median), 10 (PHB)
Interest Rate (%)	3.5
Capital Recovery Factor (CRF)	0.0704 (Raised Median), 0.1202 (PHB)
Annual Const. Cost	$ 291,874.00
Annual Maintenance Cost Difference	$ -
Total Annual Cost:	$ 291,874.00

BENEFITS/COSTS		
Annual Benefit	**Annual Cost**	**Benfit/Cost Ratio**
$ 480,000.00	$ 291,874.00	1.6

H-R Segment 2

BENEFITS/COST WORKSHEET					
Project Number	H-R Segment 2	**Date**	7/9/2017		
Route	SR 95	**From MP**	241.5	**To MP**	244
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median, PHB		
BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Raised Median	**Fatal (K)**	0.4	0.25	0.3	$ 5,800,000.00	$ 1,740,000.00
	Incapacitating (A)	0.8	0.25	0.6	$ 400,000.00	$ 240,000.00
	Non-Incapacitating (B)	6.0	0.25	4.5	$ 80,000.00	$ 360,000.00
	Possible Injury	0.0	0.25	0	$ 42,000.00	$ -
	PDO	0.0	0.25	0	$ 4,000.00	$ -
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.55	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.55	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.2	0.55	0.09	$ 80,000.00	$ 7,200.00
	Possible Injury	0.2	0.55	0.09	$ 42,000.00	$ 3,780.00
	PDO	0.0	0.55	0	$ 4,000.00	$ -
	Unknown	0.0	0.55	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 1,980,000.00
COSTS					
Total Construction Cost				$	3,915,907.00
Project Life (Years)					20 (Raised Median), 10 (PHB)
Interest Rate (%)					3.5
Capital Recovery Factor (CRF)					0.0704 (Median), 0.1202 (PHB)
Annual Const. Cost				$	281,527.00
Annual Maintenance Cost Difference				$	-
Total Annual Cost:				$	281,527.00
BENEFITS/COSTS					
Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
$ 1,980,000.00		$ 281,527.00		7.0	

H-R Segment 3

BENEFITS/COST WORKSHEET					
Project Number	H-R Segment 3	**Date**	7/9/2017		
Route	SR 95	**From MP**	235.5	**To MP**	237.4
Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Raised Median, Lighting, Sidewalks		
BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.0	0.23	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.23	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.2	0.23	0.154	$ 80,000.00	$ 12,320.00
	Possible Injury	0.6	0.23	0.462	$ 42,000.00	$ 19,404.00
	PDO	0.4	0.23	0.308	$ 4,000.00	$ 1,232.00
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.2	0.25	0.15	$ 5,800,000.00	$ 870,000.00
	Incapacitating (A)	1.2	0.25	0.9	$ 400,000.00	$ 360,000.00
	Non-Incapacitating (B)	2.4	0.25	1.8	$ 80,000.00	$ 144,000.00
	Possible Injury	0.2	0.25	0.15	$ 42,000.00	$ 6,300.00
	PDO	0.0	0.25	0	$ 4,000.00	$ -
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
Sidewalk	**Fatal (K)**	0.0	0.88	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.88	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.88	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.88	0	$ 42,000.00	$ -
	PDO	0.0	0.88	0	$ 4,000.00	$ -
	Unknown	0.0	0.88	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 1,230,000.00
COSTS					
Total Construction Cost				$	7,968,936.00
Project Life (Years)					20 (Raised Median, Sidwalks), 15 (Lighting)
Interest Rate (%)					3.5
Capital Recovery Factor (CRF)					0.0868 (Lighting), 0.0704 (Median, Sidewalk)
Annual Const. Cost				$	582,080.00
Annual Maintenance Cost Difference				$	-
Total Annual Cost:				$	582,080.00
BENEFITS/COSTS					
Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
$ 1,230,000.00		$ 582,080.00		2.1	

H-R Segment 4

This segment was identified as a high-risk location; however, there have not been any reported crashes on this segment. As such, a benefit-cost ratio is not able to be calculated.

H-R Segment 5

	BENEFITS/COST WORKSHEET					
	Project Number	H-R Segment 5	**Date**	7/9/2017		
	Route	SR 347	**From MP**	171.4	**To MP**	175.4
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; PHB, Sidewalks, Raised Medians		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Raised Median	**Fatal (K)**	0.2	0.25	0.15	$ 5,800,000.00	$ 870,000.00
	Incapacitating (A)	0.0	0.25	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.8	0.25	0.6	$ 80,000.00	$ 48,000.00
	Possible Injury	1.8	0.25	1.35	$ 42,000.00	$ 56,700.00
	PDO	7.6	0.25	5.7	$ 4,000.00	$ 22,800.00
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
PHB	**Fatal (K)**	0.0	0.00	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.00	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.00	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.00	0	$ 42,000.00	$ -
	PDO	0.0	0.00	0	$ 4,000.00	$ -
	Unknown	0.0	0.00	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 997,500.00
	COSTS					
	Total Construction Cost			$		4,409,435.00
	Project Life (Years)					20 (Raised Medians, Sidewalks), 10 (PHB)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0704 (Raised Median, Sidewalks), 0.1202 (PHB)
	Annual Const. Cost			$		317,829.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		317,829.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 997,500.00		$ 317,829.00		3.1	

H-R Segment 6

This segment was identified as a high-risk location; however, there have only been two non-injury crashes reported. As such, a benefit-cost ratio for the proposed countermeasure is not able to be calculated.

H-R Segment 7

This segment was identified as a high-risk location; there has been one fatality on this segment. However, a CMF is not available for the recommended improvements (RSA, and Barrier/Fencing). As such, a benefit-cost ratio for the proposed countermeasure is not able to be calculated.

H-R Segment 8

A is CMF not available for Barrier/Fencing improvements. As such, a benefit-cost ratio for the proposed countermeasure is not able to be calculated.

H-R Segment 9

	BENEFITS/COST WORKSHEET					
	Project Number	H-R Segment 9	**Date**	7/9/2017		
	Route	US 60	**From MP**	146.3	**To MP**	148.0
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Sidewalk, Lighting, LPI		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.2	0.23	0.046	$ 5,800,000.00	$ 266,800.00
	Incapacitating (A)	0.4	0.23	0.308	$ 400,000.00	$ 123,200.00
	Non-Incapacitating (B)	0.8	0.23	0.616	$ 80,000.00	$ 49,280.00
	Possible Injury	0.8	0.23	0.616	$ 42,000.00	$ 25,872.00
	PDO	3.0	0.23	2.31	$ 4,000.00	$ 9,240.00
	Unknown	0.0	0.23	0	$ 4,000.00	$ -
LPI	**Fatal (K)**	0.0	0.05	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.05	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.05	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.05	0	$ 42,000.00	$ -
	PDO	0.2	0.05	0.19	$ 4,000.00	$ 760.00
	Unknown	0.2	0.05	0.19	$ 4,000.00	$ 760.00
Sidewalk	**Fatal (K)**	0.2	0.88	0.024	$ 5,800,000.00	$ 139,200.00
	Incapacitating (A)	0.0	0.88	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.88	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.88	0	$ 42,000.00	$ -
	PDO	0.0	0.88	0	$ 4,000.00	$ -
	Unknown	0.0	0.88	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 529,200.00
	COSTS					
	Total Construction Cost			$		2,147,485.00
	Project Life (Years)					20 (Sidewalks), 15 (Lighting), 10 (LPI)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0704 (Sidewalks), 0.0868 (Lighting), 0.1202 (LPI)
	Annual Const. Cost			$		169,149.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		169,149.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 529,200.00		$ 169,149.00		3.1	

H-R Segment 10

This segment was identified as a high-risk location; there have been seven reported pedestrian crashes on this segment, with four resulting in injuries. However, a CMF is not available for the recommended improvements (RSA, and Barrier/Fencing, and Enforcement/Pedestrian Education Campaign). As such, a benefit-cost ratio for the proposed countermeasure is not able to be calculated.

H-R Segment 11

This segment was identified as a high-risk location; there were three reported pedestrian crashes on this segment that included the crash type dash/dart-out and crossing the roadway. The recommended countermeasure (sidewalk) are designed to address risks associated with a 6-lane roadway, as opposed to mitigating characteristics associated with the pedestrian crashes that occurred on this segment. As such, a benefit-cost ratio was not calculated

H-R Segment 12

This segment was identified as a high-risk location; there was one reported pedestrian crash on this segment that included the pedestrian walking along the roadway at a section with a raised median. The recommended countermeasures (RSA, Road Diet (Roadway Reconfiguration), Construct Raised Median) are designed to address risks associated with a 5-lane roadway, as opposed to mitigating characteristics associated with the single pedestrian crash that occurred on this segment. As such, a benefit-cost ratio was not calculated.

H-R Segment 13

	BENEFITS/COST WORKSHEET					
	Project Number	H-R Segment 13	**Date**	7/9/2017		
	Route	SR 90	**From MP**	320	**To MP**	323.0
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; Lighting, Raised Median		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
Lighting	**Fatal (K)**	0.0	0.29	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.0	0.29	0	$ 400,000.00	$ -
	Non-Incapacitating (B)	0.0	0.29	0	$ 80,000.00	$ -
	Possible Injury	0.0	0.29	0	$ 42,000.00	$ -
	PDO	0.0	0.29	0	$ 4,000.00	$ -
	Unknown	0.0	0.29	0	$ 4,000.00	$ -
Raised Median	**Fatal (K)**	0.0	0.25	0	$ 5,800,000.00	$ -
	Incapacitating (A)	0.2	0.25	0.15	$ 400,000.00	$ 60,000.00
	Non-Incapacitating (B)	1.6	0.25	1.2	$ 80,000.00	$ 96,000.00
	Possible Injury	2.6	0.25	1.95	$ 42,000.00	$ 81,900.00
	PDO	9.2	0.25	6.9	$ 4,000.00	$ 27,600.00
	Unknown	0.0	0.25	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 60,000.00
	COSTS					
	Total Construction Cost			$		2,147,485.00
	Project Life (Years)					15 (Lighting), 20 (Raised Median)
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.0868 (Lighting), 0.0704 (Raised Median)
	Annual Const. Cost			$		169,149.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		169,149.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 60,000.00		$ 169,149.00		0.4	

H-R Segment 14

This segment was identified as a high-risk location. However, there were no reported pedestrian crashes. As such, a benefit-cost ratio for the proposed countermeasure is not able to be calculated.

H-R Segment 15

	BENEFITS/COST WORKSHEET					
	Project Number	H-R Segment 15	**Date**	7/9/2017		
	Route	SR 77	**From MP**	69.5	**To MP**	72.0
	Alternative Of		**Type of Improvement**	Pedestrian Safety Improvement; PHB		
	BENEFITS					
	Crash Types	**Annual Average**	**Crash Reduction Factor***	**Total Reduction**	**Unit Cost ($)**	**Annual Benefit**
PHB	**Fatal (K)**	0.0	0.55	0	$ 5,800,000.00	$ -
PHB	**Incapacitating (A)**	0.2	0.55	0.09	$ 400,000.00	$ 36,000.00
PHB	**Non-Incapacitating (B)**	0.8	0.55	0.36	$ 80,000.00	$ 28,800.00
PHB	**Possible Injury**	0.2	0.55	0.09	$ 42,000.00	$ 3,780.00
PHB	**PDO**	0.2	0.55	0.09	$ 4,000.00	$ 360.00
PHB	**Unknown**	0.0	0.55	0	$ 4,000.00	$ -
				Total Annual Benefit (F + A)		$ 36,000.00
	COSTS					
	Total Construction Cost			$		196,959.00
	Project Life (Years)					10
	Interest Rate (%)					3.5
	Capital Recovery Factor (CRF)					0.1202
	Annual Const. Cost			$		21,270.00
	Annual Maintenance Cost Difference			$		-
	Total Annual Cost:			$		21,270.00
	BENEFITS/COSTS					
	Annual Benefit		**Annual Cost**		**Benfit/Cost Ratio**	
	$ 36,000.00		$ 21,270.00		1.7	

H-R Segment 16

This segment overlaps with High-Crash Segment 10

H-R Segment 17

This segment was identified as a high-risk location; there were four reported pedestrian crashes on this segment that occurred during daylight conditions. The recommended countermeasure, roadway lighting, is designed to address risks associated with a 5-lane roadway, as opposed to mitigating characteristics associated with the single pedestrian crashes that occurred on this segment. As such, a benefit-cost ratio was not calculated.

H-R Segment 18

This segment overlaps with High-Crash Segment 16

APPENDIX E – PSAP PROJECT RANKING

Ranking	Project Description	Improvements	Estimated Total Project Cost	Benefit-Cost Ratio (Pedestrian Crashes)
1	Project 3: SR 73 Pedestrian Safety Improvement, MP 339.0 - 341.0	Road Diet (Roadway Reconfiguration)	$140,822	30.1
2	Project 5: US 191/SR 80 Roadway Reconfiguration, MP 365.5 – 366.1	Road Diet (Roadway Reconfiguration)	$62,247	25.1
3	Project 6: US 191 Highway Lighting and Shoulder Improvement, MP 448.0 - 449.0	Widen shoulders and provide roadway lighting	$903,760	19.7
4	Project 10: US 160 Roadway Lighting Improvements, MP 323.0 - 324.5	Provide roadway lighting	$535,040	11.0
5	Project 2: Flagstaff Area Pedestrian Safety Improvement, SR 89A / SR 40B	Conduct a RSA and evaluate access management. Provide raised median, PHB, and signal operation enhancements	$2,329,294	8.9
6	Project 15: SR 86 Highway Lighting Enhancement, MP 151.0 - 153.0	Provide roadway lighting	$506,880	8.7
7	Project 4: SR 86 Pedestrian Improvement Project, MP 170. 3 - 171.6	Conduct a RSA and consider constructing a raised median and enhance signal operations	$1,339,567	5.5
8	Project 8: SR 40B, Pedestrian Safety Improvements, MP 198.45 - 195.5	Conduct a RSA and consider providing a raised median, a PHB, and roadway lighting	$1,992,242	4.9
9	Project 18: SR 92 Pedestrian Safety Improvements, MP 321.0 - 326.7	Conduct RSA, provide roadway lighting, shared-use path, improve signal operations, construct raised median and PHB	$5,415,956	4.7
10	Project 17: SR 77 Pedestrian Safety Improvements	Provide roadway lighting, enhance signal operations and improve pedestrian crossing with a PHB	$2,021,727	4.2
11	Project 12: SR 90 Pedestrian Safety Improvements, MP 320.0 - 323.8	Conduct an RSA and provide roadway lighting and a raised median.	$2,888,756	4.1
12	Project 16: US 60X Pedestrian Safety Improvements, MP 190.0 - 194.0	Conduct an RSA and consider a road diet (roadway reconfiguration). Provide roadway lighting, sidewalks, and a PHB	$8,671,228	3.3
13	Project 9: SR 68 Pedestrian Safety Improvements, Golden Valley - Bullhead City Area	Improve pedestrian crossing with PHB, raised median, and roadway lighting	$7,638,858	2.8
14	Project 1: SR 95 Pedestrian Safety Improvement, MP 237. 4 - 239.2	Roadway lighting, PHB, and sidewalks	$3,888,754	1.7
15	Project 20: US 70 Pedestrian Safety Improvements, MP 257.0 - 259.0	Widen shoulders and provide roadway lighting	$2,183,200	1.6
16	Project 19: US 60 Pedestrian Safety Improvements	Conduct an RSA and evaluate existing lighting conditions. Provide roadway lighting, sidewalks and PHB	$2,731,322	1.6
17	Project 7: SR 95 Pedestrian Safety Improvements, Fort Mohave and Bullhead City Area	Conduct RSA, evaluation of lighting and access management. Provide sidewalk, raised median, PHB, and curb radii improvements	$9,810,147	1.1
18	Project 14: SR 95 Pedestrian Safety Improvements	Conduct an RSA and provide a raised median, roadway lighting, and sidewalks	$7,968,937	0.4
19	Project 13: SR 347 Pedestrian Safety Improvements, MP 171.4 - 175.4	Conduct an RSA and provide a raised median, a PHB and improve signal operations for pedestrians	$4,409,435	0.2

Ranking	Project Description	Improvements	Estimated Total Project Cost	Benefit-Cost Ratio (Pedestrian Crashes)
20	Project 21: US 60 Pedestrian Safety Improvements	Conduct an RSA, install fencing/barrier where there are gaps along the railroad tracks, enhance signal operations for pedestrians	$1,497,689	0.0
21	Project 11: SR 69 Pedestrian Safety Improvements, 286.5 - 289.7	Conduct an RSA and consider providing sidewalk	$4,138,590	0.0
22	Project 22: SR 86 Pedestrian Safety Improvements	Conduct a RSA and construct a raised median and enhance signal operations for pedestrians	$2,023,471	0.0
23	Project 23: SR 77 Pedestrian Safety Improvements	Evaluate the need for additional pedestrian crossing opportunities such as a PHB or two-stage pedestrian crossing	$196,959	0.0