Yuma Metropolitan Planning Organization Strategic Transportation Safety Plan

May 2016

PREPARED BY:

PREPARED FOR:

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1 EXECUTIVE SUMMARY

With the YMPO region's growth, a Strategic Transportation Safety Plan (STSP) has become necessary to reduce fatal and injury crashes among all transportation modes in the region. Analysis of 10 years of crash data (2004-2013) for the region shows the City of Yuma had the highest number of crashes, while unincorporated Yuma County had the highest number of fatal crashes.

The incapacitating injury and fatal crash data were plotted spatially on a map to identify where these crashes are occurring, and how often. Interstate 8 had the highest number of fatal crashes in the region.

There are nine major collision types in the region: rear end, single vehicle, angle, sideswipe same direction, left turn, pedestrian, rear to side, bicyclist, and head on. The highest number of total crashes were rear end crashes, while the highest number of severe crashes were single vehicle crashes.

In order to determine the potential locations and risk for vulnerable user crashes (pedestrians and bicyclists), crash data, land use data, and socioeconomic data were used. The demographic data was processed through a Weighted-Overlay Analysis to identify at-risk block groups. The City of Yuma had the highest potential for non-motorized traffic incidents because of its large population. The City of San Luis also has a high potential for non-motorized traffic incidents due to the US 95 and high volume of pedestrians.

Existing traffic safety programs in the YMPO region include: Statewide Bicycle and Pedestrian Program, City of Yuma Bicycle Facilities Master Plan, YMPO Annual Traffic Counts and Maps, City of Yuma Transportation Master Plan, and the Safe Routes to School program.

The YMPO STSP vision is "No More Deaths, No More Injuries – Know More" and the STSP goal is "Reduce the number of fatalities and serious injuries in the region by 3% annually". The vision and goal were determined at a stakeholder workshop, and were inspired by the Federal Highway Administration's (FHWA) vision "Towards Zero Deaths" and Arizona's vision "Toward Zero Deaths by Reducing Crashes for a Safer Arizona".

Emphasis Areas for the YMPO region were based on the 12 emphasis areas reflected in the 2014 Arizona Strategic Highway Safety Plan (SHSP); these areas contribute the most to overall crashes and fatal crashes. They were narrowed down to 10 emphasis areas for the region, based on total number of crashes and total fatal crashes for each emphasis area. The 10 emphasis areas for the region are: 1) Distracted Driving, 2) Impaired Driving, 3) Speeding/Aggressive Driving, 4) Occupant Protection/Restraint, 5) Pedestrians, 6) Bicyclists, 7) Intersections, 8) Lane Departure, 9) Older Drivers, and 10) Young Drivers. Each emphasis area has related transportation safety strategies to employ to reduce fatal and serious injury crashes, as well as a goal by 2025.

The FHWA established five performance measures for the Highway Safety Improvement Program (HSIP): number of fatalities, rate of fatalities per 100 million VMT, number of serious injuries, rate of serious injuries per 100 million VMT, and number of combined non-motorized fatalities and serious injuries. These performance measures will be used to determine the effectiveness of the safety countermeasures.

Network screening was done to analyze intersections (unsignalized and signalized) and segments in the region and determine which intersections and segments could be potential priority locations for future safety projects. Using Priority Index (PI) ranking, which is based on frequency of crashes, crash rate, and severity of crashes, ranked lists of unsignalized intersections, signalized intersections, and segments were created. Corridors with multiple highly ranked intersections and segments were identified as corridors for potential safety projects.

Some potential traffic operations safety strategies include high-visibility crossings, mid-block crossings, median islands, road diet, roundabouts, separated bicycle lanes, and improved signage. In addition, the YMPO region would benefit from the development of a centralized crash database for all member agencies in order to keep accurate, timely, and thorough crash data.

The implementation plan for this STSP will follow the FHWA's implementation process model, which includes documenting objectives and performance measures, identifying required resources and action steps, integrating the STSP with other transportation safety plans, marketing the STSP, etc. The focus is on identifying steps to carry out the STSP, confirming roles and responsibilities of stakeholders, developing an evaluation strategy and schedule for implementation, and connecting funding resources to the appropriate safety strategy.

Through a benefit-cost (B/C) analysis of the HSIP corridors identified, a list of potential projects was created with specific improvements for each corridor. HSIP projects were developed for seven of the nine corridors; projects were not developed for the Somerton Avenue corridor (already addressed with another project) and the County 14th Street corridor (did not meet the minimum B/C ratio of 1.5).

2 INTRODUCTION

The purpose of this safety plan is to reduce the risk of death and serious injury to all transportation users in the YMPO region. The first phase of this project involved developing a work plan (including a public involvement plan), reviewing road system performance and available resources in the region, establishing a regional vision and goals for transportation safety, developing emphasis areas and performance measures, networking screening methodologies, developing a strategy to incorporate safety enhancements in projects, improving safety via traffic operations and ITS solutions, and monitoring and reporting on system performance and program effectiveness.

Phase II focused on the implementation plan and development of a benefit-cost analysis for each proposed project. The implementation plan included components as determined by the Federal Highway Administration (FHWA).

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3 Safety System Performance

3.1 Regional Safety Performance

The overall goal of this safety plan is to increase the safety system performance by addressing safety concerns in the entire YMPO region. Crash data from 2004-2013 was used in all analyses; all crash data was collected from the Arizona Department of Transportation's (ADOT) ALISS (Accident Location Identification and Surveillance System) database. This data originates from police reports from all over the state, which is then extracted and added to the ALISS database.

The crash data was used to perform analyses that focus on facilities in the YMPO region to find trends and issues in order to ultimately produce a list of potential safety projects that would improve the safety in the region.

3.1.1 All Users

Table 3.1 shows the percent of total crashes, incapacitating injury crashes and fatal crashes in the region, broken down by agency boundary based on the 10-year period from 2004 through 2013. Note that the percent shown represents the percentage of regional crashes occurring within that agency's boundaries. The City of Yuma has the highest percentage of total crashes and incapacitating injury crashes, which is likely due to the high population concentration and vehicle miles traveled (VMT) in that region. The county had the highest percentage of fatal crashes, which could be due to higher speeds on primarily rural roadways outside of the city limits. Table 3.2, Table 3.3, Table 3.4, and Table 3.5 show the crash data by month, day of the week, crash manner, and light conditions, respectively.

Based on Table 3.2, the highest number of crashes occurs in winter, while the lowest number of crashes occurs in summer; this is likely due to winter visitors to the region. From Table 3.3, weekdays have the highest crash frequencies, most likely due to higher roadway volumes. Table 3.4 shows the top collision manners based on total number of crashes. Rear end crashes are the most frequency type of crash, and single vehicle crashes are the most frequent fatal crash. Table 3.5 shows that while most crashes occur during the day, most fatal crashes occur at night.

Table 3.1: Crash Types by Agency

Agency	Total Crashes	% of Total Crashes	Incapacitating Injury Crashes	% of Incapacitating Injury Crashes	Fatal Crashes	% of Fatal Crashes
Yuma	19,225	67%	545	57%	74	32%
Yuma County	8,163	28%	391	41%	148	64%
San Luis	996	3%	8	0.8%	6	2.6%
Somerton	234	0.8%	6	0.6%	4	1.7%
Wellton	60	0.2%	4	0.4%	1	0.4%
TOTAL	**28,680**	**100%**	**954**	**100%**	**233**	**100%**

Table 3.2: Crashes by Year, Month

Year	January	February	March	April	May	June	July	August	September	October	November	December
2004	307	335	279	240	233	185	164	202	221	259	313	328
2005	335	347	333	257	224	188	187	213	208	244	283	348
2006	371	296	286	235	237	182	186	193	236	253	315	345
2007	332	337	345	247	235	204	194	225	191	219	297	295
2008	281	304	289	262	229	195	167	171	223	238	233	287
2009	257	290	299	243	228	192	191	176	172	207	244	277
2010	262	301	244	208	198	183	162	200	206	207	273	292
2011	293	295	285	221	188	173	154	198	172	184	244	278
2012	258	270	279	226	209	141	183	175	179	211	255	292
2013	248	274	261	192	171	144	139	150	172	190	235	261
% Total	**10%**	**11%**	**10%**	**8%**	**8%**	**6%**	**6%**	**7%**	**7%**	**8%**	**9%**	**10%**

Table 3.3: Crashes by Year, Day of the Week

Year	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2004	293	506	451	430	411	622	353
2005	309	506	448	436	469	566	433
2006	293	445	482	441	450	609	415
2007	292	471	478	418	457	594	411
2008	251	430	444	439	467	500	348
2009	258	401	426	408	420	512	351
2010	277	416	441	409	420	468	305
2011	263	425	404	374	402	484	333
2012	245	444	387	394	431	472	305
2013	176	383	342	347	376	466	347
% Total	**9%**	**15%**	**15%**	**14%**	**15%**	**18%**	**13%**

Table 3.4: Crash Type by Collision Manner

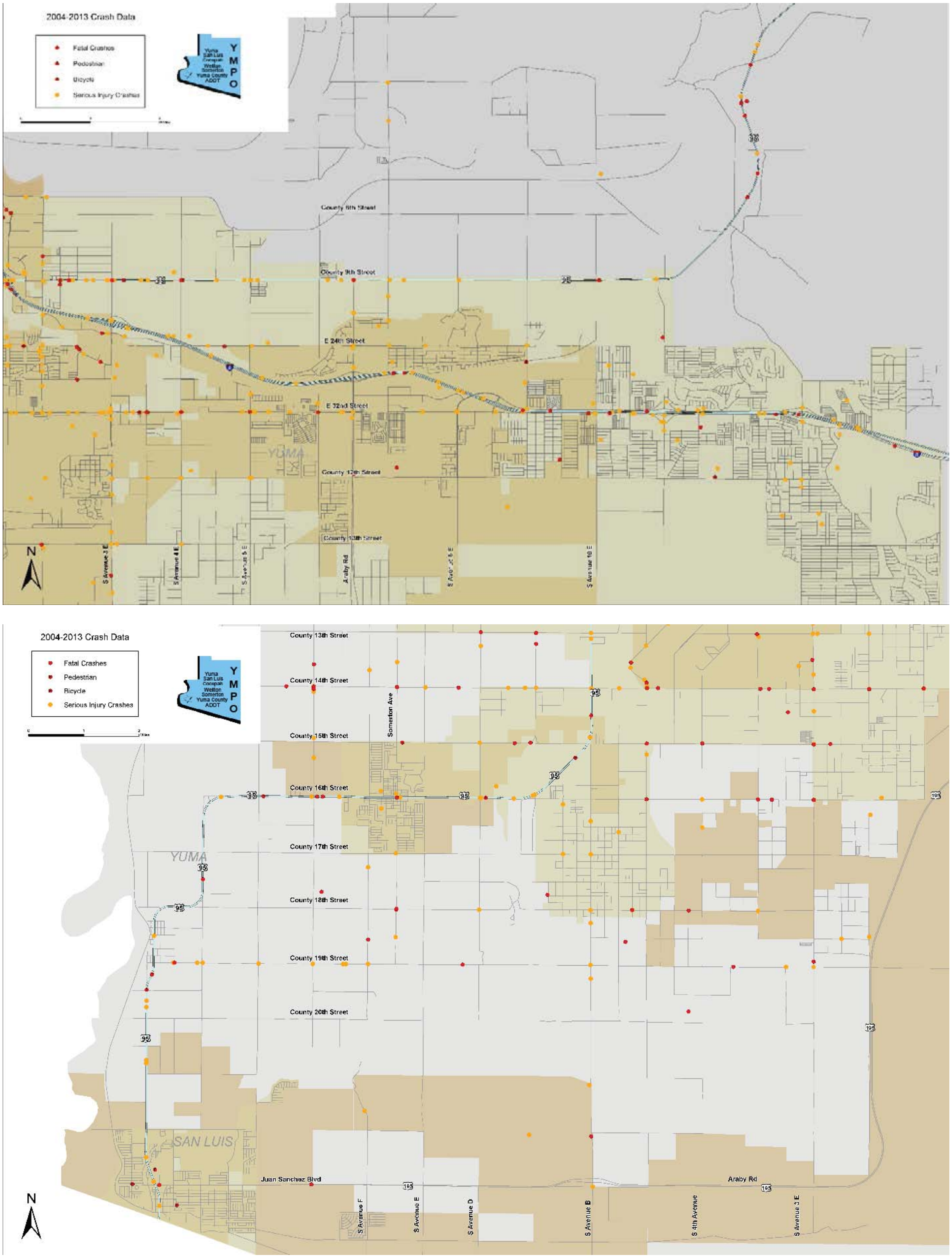
Collision Manner	Total Crashes	% of Total Crashes	Incapacitating Injury Crashes	% of Incapacitating Injury Crashes	Fatal Crashes	% of Fatal Crashes
Single Vehicle	5570	19%	309	32%	98	42%
Angle	5372	19%	200	21%	33	14%
Left Turn	2816	10%	109	11%	14	6%
Rear End	8841	31%	121	13%	10	4%
Head On	366	1%	37	4%	14	6%
Sideswipe Same Direction	2861	10%	26	3%	6	3%
Rear to Side	674	2%	1	0%	0	0%
Pedestrian	380	1%	75	8%	40	17%
Bicyclist	412	1%	39	4%	6	3%
TOTAL	**28,680**	**100%**	**954**	**100%**	**233**	**100%**

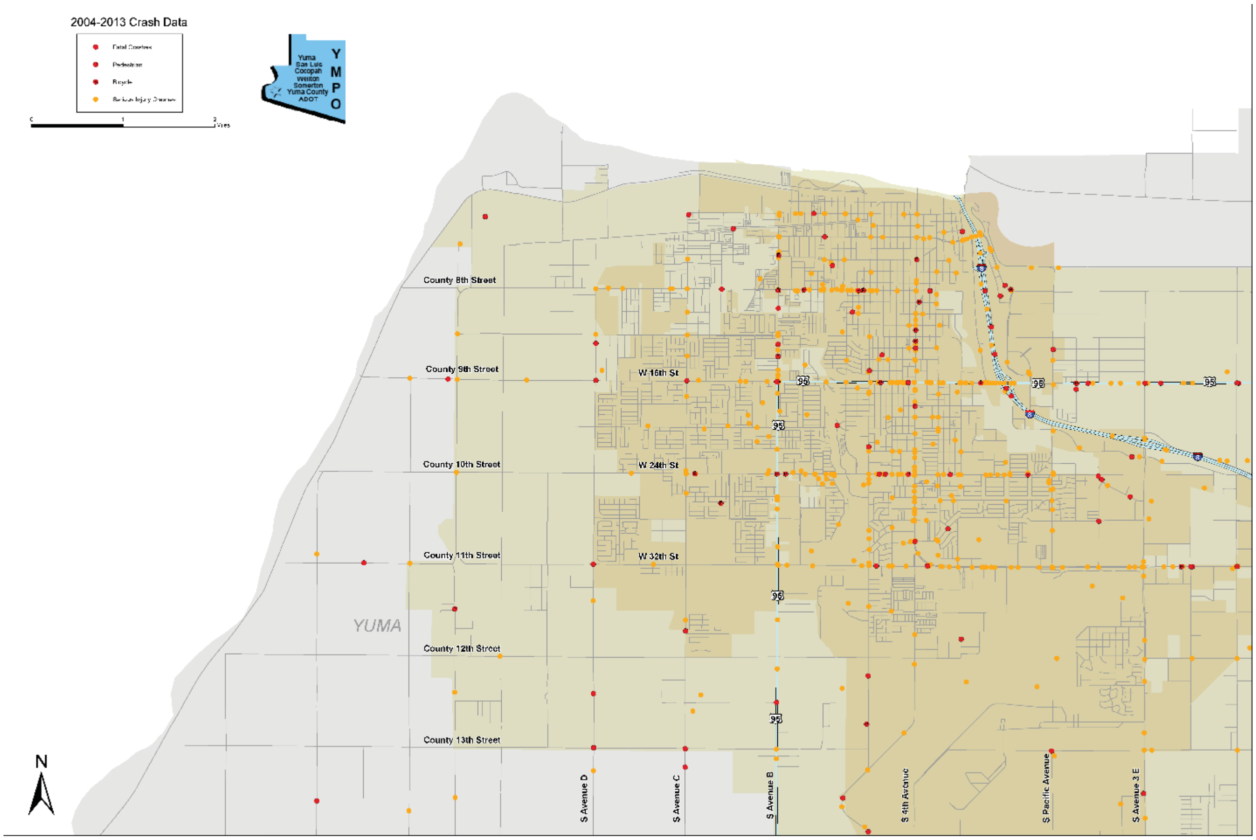
Table 3.5: Crashes by Light Condition

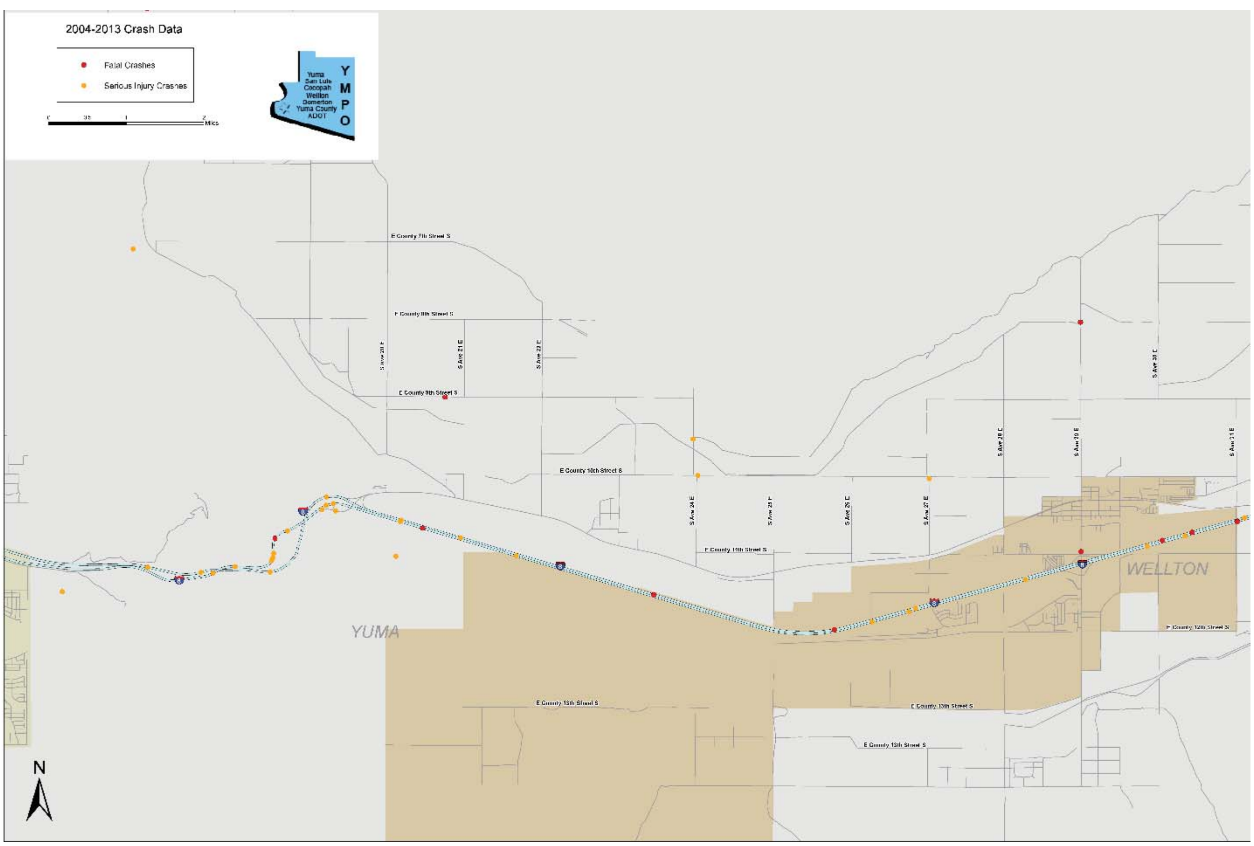
Light Condition	Total Crashes	% of Total Crashes	Fatal	% of Fatal Crashes
Daylight	20,555	72%	100	43%
Dark	6699	23%	106	45%
Dawn	991	3.5%	18	8%
Dusk	360	1.3%	8	3.4%
TOTAL	**28,680**	**100%**	**233**	**100%**

The incapacitating injury and fatal crashes for the most heavily populated areas in the region are shown in Figure 3.1; larger maps are included in Appendix E. This graphic shows the spatial depiction of these "severe" crashes, and distinguishes between vulnerable users (pedestrian and bicycle) and motor vehicle crashes. Roadway segments with high average daily traffic (ADT) volumes and intersections with high average daily entering volumes (ADEV) are typically more likely to have a higher crash frequency.

Figure 3.1: Geographic Distribution of Fatal and Incapacitating Injury Crashes




2004-2013 Crash Data
Fatal Crashes
Pedestrian
Bicycle
Serious Injury Crashes
0
1
2
Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
YMPO
County 8th Street
County 9th Street
County 10th Street
County 11th Street
County 12th Street
County 13th Street
W 16th St
W 24th St
W 32th St
YUMA
S Avenue D
S Avenue C
S Avenue B
S 4th Avenue
S Pacific Avenue
S Avenue 3 E
N


2004-2013 Crash Data
Fatal Crashes
Serious Injury Crashes
0
0.5
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Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
YMPO
YUMA
WELLTON
N

Table 3.6 shows the roads with the highest number of fatal crashes in the region. While traffic safety is determined by a number of different metrics, fatal crashes can provide a good starting point when determining locations within a region that require the most critical attention.

Table 3.6: Top Roads with Highest Frequency of Fatal Crashes

Street	# Fatal	% of Fatal Crashes
Interstate 8	44	19%
US 95	35	15%
State Business 8	13	5.6%
24th St/County 10th St	12	5.2%
County 14th St	11	4.7%
Avenue B	8	3.4%
Avenue A	6	2.6%
16th St/County 9th St	6	2.6%
Avenue 3 E	6	2.6%
County 15th St/Madison Ave	6	2.6%
Avenue D	5	2.1%
Somerton Ave	5	2.1%
32nd St/County 11th St	4	1.7%
Avenue C	4	1.7%
TOTAL	**233**	**100%**

Figure 3.2 shows the total number of crashes in the YMPO region for the major collision manner types. The bar chart shows the number of crashes of all severity levels for each collision manner with its axis on the left side. The line graph, corresponding to the axis on the right, shows the total number of severe crashes, which includes only incapacitating injury and fatal crashes. As seen in the figure, the highest number of total crashes for the study period were rear end crashes, while the highest number of severe crashes were single vehicle crashes.

Figure 3.2: Total and Severe Crashes by Collision Manner

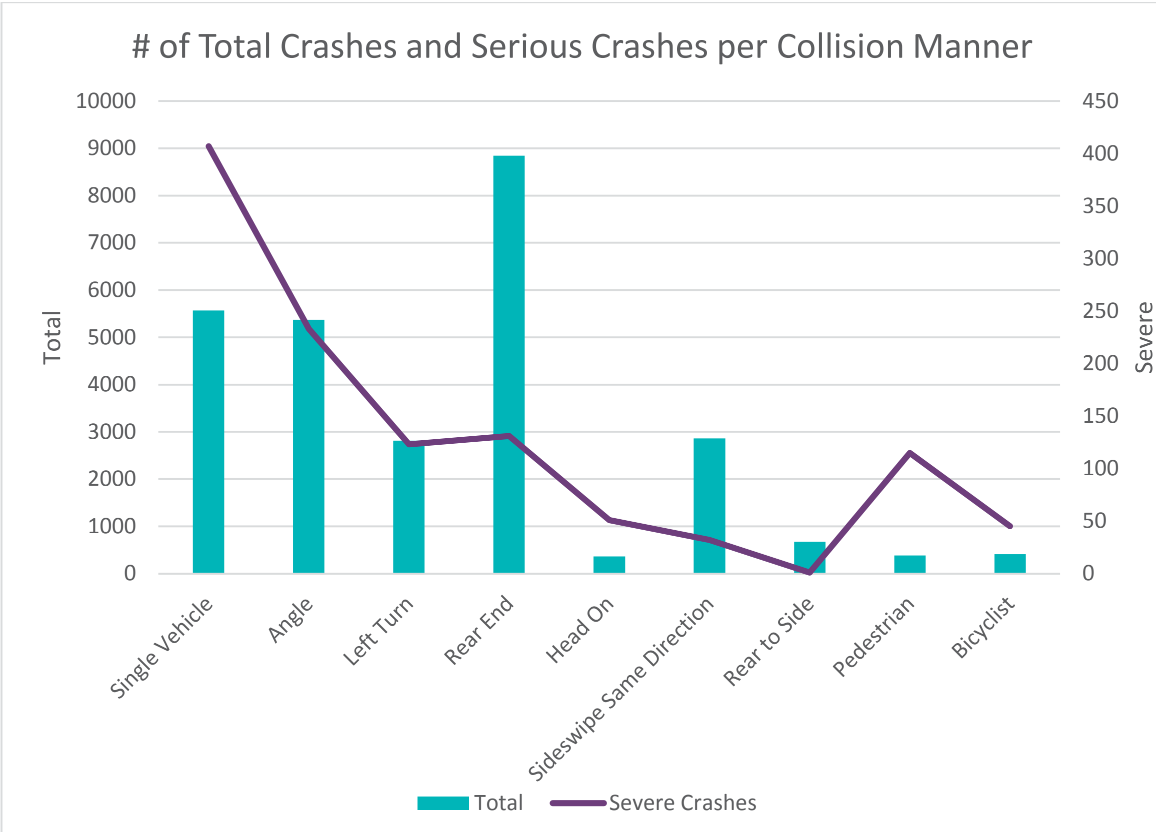


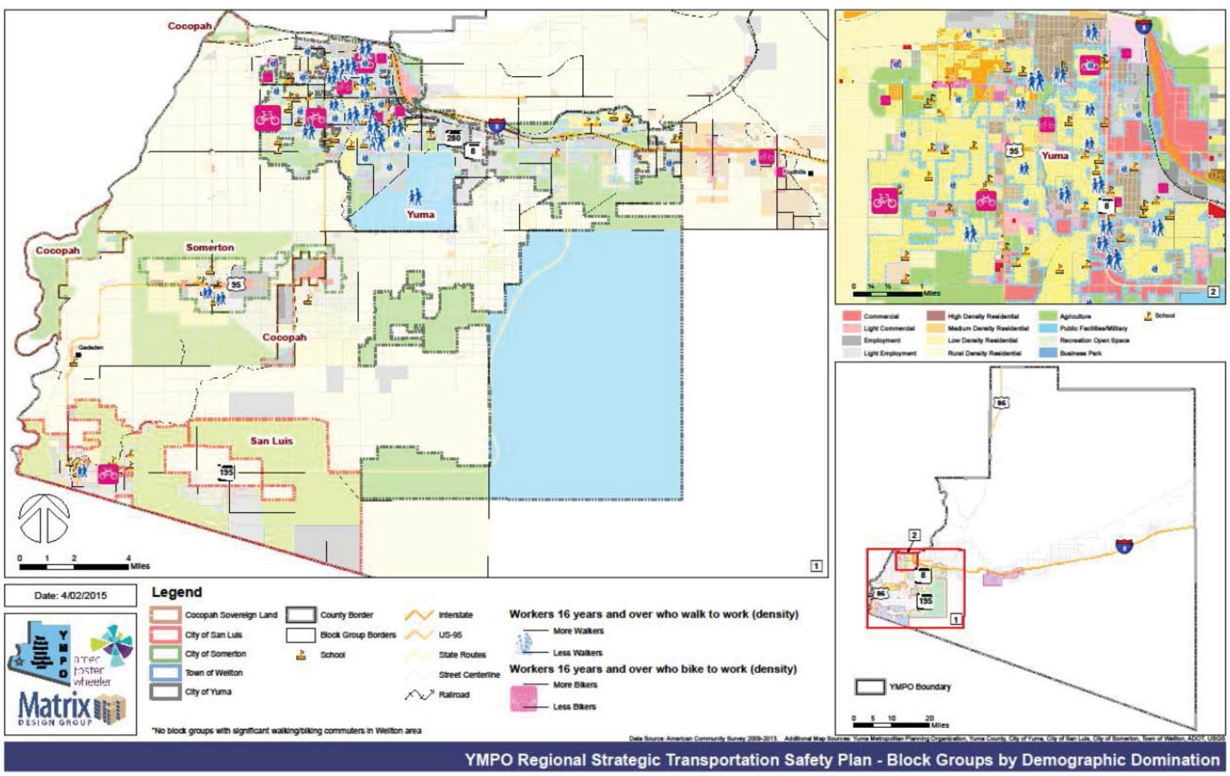
Figure 3.3 shows the top five violation types for crashes. Distracted driving accounts for approximately 30% of these violations. Distraction can include a number of factors, with cell phone usage being one of the most common offenses. A driver that is talking on a cell phone is four times more likely to be involved in a crash, and a driver that is texting on a cell phone is twenty-three times more likely to be involved in a crash[1]. 36% of incapacitating injury crashes and 54% of fatal crashes in the region involved lack of restraint (i.e. not wearing a seat belt). Research from the National Highway Traffic Safety Administration (NHTSA) shows that correctly wearing a seat belt will reduce fatal and moderate-critical injuries by 45% - 65%, based on the type of vehicle and location within the car. Child safety seats can reduce fatal injuries by 54% - 71% depending on the age of the child.

[1] "Distracted Driving Facts." (n.d.):n. pag. *The National Safety Council.* The National Safety Council. Web

Figure 3.3: Total Crashes by Violation Type

3.1.2 Non-Motorized Users

Figure 3.4: Biking and Walking Groups



Pedestrian and bike crashes are rare events but when they occur, they usually involve injury or death. In addition to analyzing crash data to determine the risk and potential locations of these vulnerable user crashes, land use and socioeconomic data were reviewed. This demographic data was collected from the 2009-2013 US Census and American Community Survey, which identifies block groups within residential areas.

The demographic data was processed through a Weighted Overlay Analysis to identify at-risk block groups, incorporating generators and attractors. Public generators and attractors are the destinations to or from which residents commonly walk or drive. Generators have been defined as housing facilities, examples of which are identified below:

- Single-family housing communities
- Apartments
- Hotels
- Group homes

Attractors are generally defined as non-residential destinations. Some examples of those are:

- Schools
- Parks
- Community Facilities
- Work Places
- Transit Stops
- Commercial Destinations

The larger a site's pedestrian and vehicular traffic generation and attraction, the higher the potential for pedestrian crashes. Both factors complement each other in that, without one, there most likely would not be the other. Although these generators and attractors are not inducers of public activity, they show the locations where pedestrian and vehicular traffic is most likely to occur.

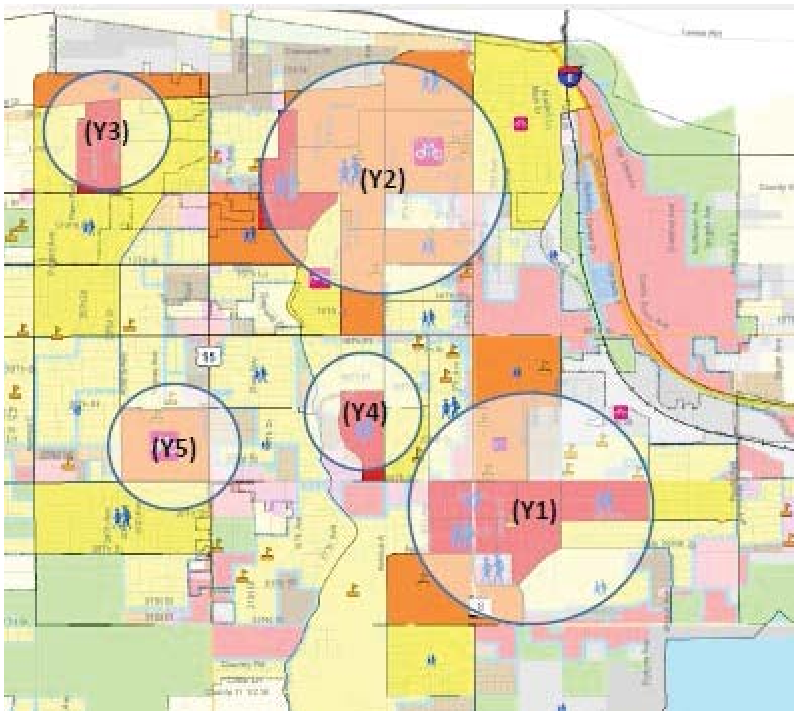
The Weighted Overlay Analysis provided distinct block groups that can be considered potentially 'At-Risk' for motorized/non-motorized incidents. At-Risk block groups were classified as either: Moderate Risk (indicated in yellow), Intermediate Risk (indicated in orange), and High Risk (indicated in red). The highest At-Risk areas were located in the City of Yuma, City of Somerton, City of San Luis, and the County's Fortuna Foothills area. These areas have the highest potential for non-motorized transportation incidents.

The remaining jurisdictions within the YMPO constitute a very small portion of the overall transportation system in the region. These areas include the Town of Wellton, the Cocopah Indian Tribe Reservation, and unincorporated Yuma County. When conducting the "at-risk" GIS weighted overlay analysis, these areas did not identify any significant transportation safety concerns for pedestrians and bicyclists. This does not prove that there are no potential transportation risks within these areas, but for the sake of this portion of the report, further analysis cannot be justifiably conducted.

3.1.2.1 *City of Yuma*

The City of Yuma area has the most significant potential for non-motorized traffic incidents within the YMPO region because it has, by far, the largest population. Figure 3.5 below shows areas within the City of Yuma that present high or moderate risk to non-motorized traffic.

Figure 3.5: City of Yuma At-Risk Areas



The most significant At-Risk area within the City of Yuma is the Y1 area, which is centered on the intersection of 26th Street and Arizona Avenue. It is the largest, densest area of concern identified by the Weighted Overlay Analysis. It contains miles of uninterrupted commercial attractors ranging from grocery stores to churches, and is surrounded by well-established residential generators, each with their own schools and other attractors. There is a high concentration of mobile home parks to the east of 4th Avenue, and a large concentration of schools within a mile of 24th Street. Within a mile west of here lies the Yuma Regional Medical Center, which may be the reason for the high concentration of disabled persons within these block groups.

The Y2 area is located in the northeast part of the City of Yuma. It is characterized by older style streets composed of denser shorter blocks that lend themselves well to walking and biking. There is a cluster of schools near the intersection of 5th Street and 4th Avenue, and denser commercial uses all along 4th Avenue as well as 8th Street that provide heavy pedestrian attractors. Many of the block groups in this area have high densities of No-Vehicle Households with some spikes in Poverty and Disabled densities. Several of the block groups also are high in walking commuters. The Colorado River and some adjoining parks lie just to the north, meaning this area may attract tourists as well.

Area Y3, centered on Vaughn Avenue and 8th Street and outside of the City of Yuma, consists of one high-risk block group surrounded by moderate risk block groups that are high in poverty. There are schools within walking distance to the east, south, and west of this area, with mixed-use zoned attractors along

8th Street running through the middle of the area. This area may be at risk of being underserved by the public transportation network.

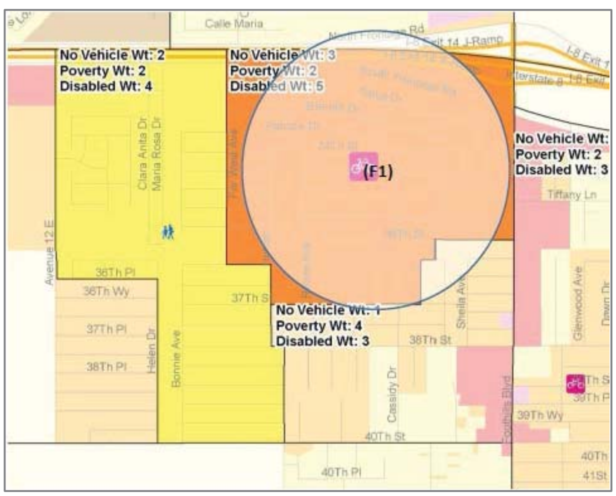
Area Y4 is a block group northwest of 24th Street and Avenue A. It is notable for falling in the highest density brackets for all three of our indicators, which is likely explained by the fact that the block group is composed mostly of apartment buildings. There is a school half a mile to the east, and there are mixed commercial uses to the west, south, and east, which likely provide job sites for the moderate density of walking commuters who live in this block group. Just across the street to the south is the Yuma Regional Medical Center, which may provide services to the high concentration of disabled people who live here as well as to the block groups to the east in area Y1.

Area Y5 is bounded by 20th Street and 24th Street and Avenue B and 29th Avenue. This area includes an elementary school, middle school, park, convenience store, and multiple apartments and houses.

3.1.2.2 *Fortuna Foothills*

Fortuna Foothills is unincorporated county land with significant population density, but does not have as high activity as other communities of similar population density in the YMPO region. The zoning is low in employment areas, but high in commercial and residential zones, which imply that it is a true suburb of the City of Yuma; many residents of this area may be commuting into the City of Yuma for retail and medical needs or work on a daily basis.

Figure 3.6: Fortuna Foothills At-Risk Areas



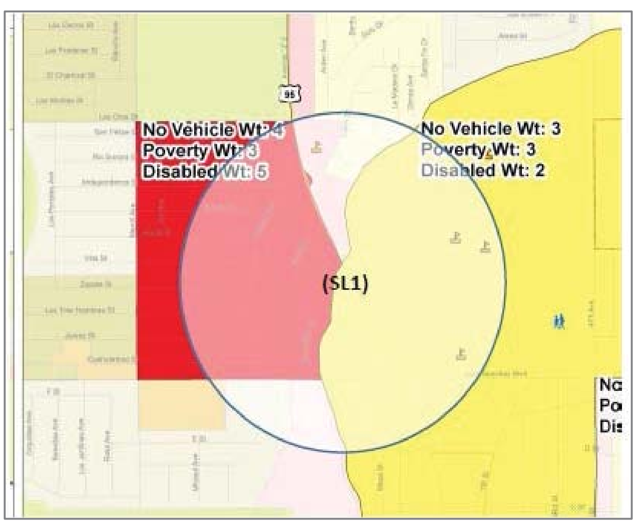
This focus area is unlike other focus areas in both the composition and location of generators in comparison to attractors in the area. For this area, special attention needs to be placed on the factors outside the focus area. In this case, the commercial zoning directly west of the focus area is likely to be the contributing factor to area F1's potential for non-motorized traffic incidents. As there is not much commercial zoning within the immediate focus area, it can be assumed that those walking or biking are doing so to the commercial destinations outside the focus area. This area is composed nearly entirely of small lots, mobile home parks, and RV parks, with many of the small lot homes also having RVs parked on the premises, based on aerial views. Therefore, the high disability status density may be coming from older residents that are either year-round retirees, or winter residents. Supporting this analysis is the fact that there are no nearby schools acting as attractors. There is a distinct lack of active open space in this region and attractors are tailored to automobile traffic, so pedestrian accidents in this area may be low.

3.1.2.3 *City of San Luis*

Located in the southwestern portion of the study area, the City of San Luis has population characteristics strongly tied to the southern international boundary it shares with Mexico. US 95 runs through San Luis to an international border crossing into Mexico and its biggest shopping centers lie within a couple of miles of that crossing. This route will be the greatest driving factor of San Luis's transportation system.

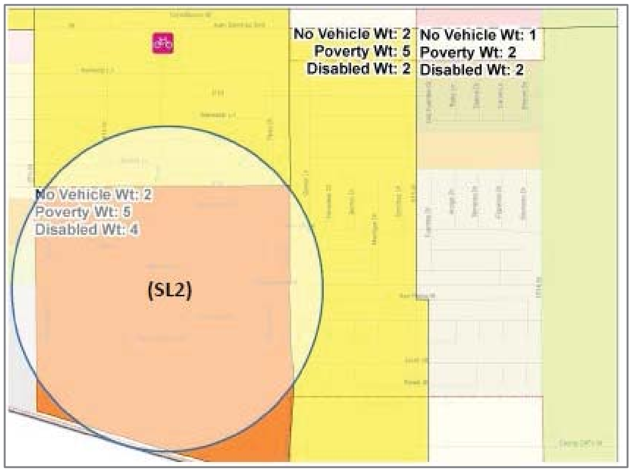
US 95 turns into Main Street halfway through area SL1, shown in Figure 3.7, and a mile or so south of the focus area it crosses into Mexico, providing the only entrance to the U.S.-Mexico border in the City of San Luis; about 3,000 bikes per day cross the international border. That alone makes this road a key focus area for high activity and potential crashes. Within a mile to the north is a regional commercial center, and within a mile to the southeast is a retail strip that likely provides a major attractor to these block groups. Another key factor of the City's transportation safety is the 'at-risk' block groups' relation to nearby schools. Within area SL1, there are five schools, two moderate-to-high at-risk block groups, and at least some residents identifying that they walk to work. Separating the intermediate to high-density residential zoning and the cluster of schools is US 95. This would indicate that a large portion of people walking to school have to cross US 95 to get to and from their destination. Combined with the other areas of high activity surrounding the highway, this sets up the highest potential for traffic incidents in the City of San Luis.

Figure 3.7: City of San Luis At-Risk Area 1



The SL2 area in San Luis, shown in Figure 3.8, is located between 6th Street and 8th Street, south of B Street. It is served by two schools within a mile to the north across Juan Sanchez Boulevard. There is a commercial center approximately a mile to the northeast, and a retail strip is within two miles to the northwest of SL2. The highest risk for this area is poverty. While there is a relatively low density of no-vehicle households, residents in this area may be more likely to save gas money by walking to complete shopping errands, increasing pedestrian crash risk. There are a number of parks within the residential neighborhoods, so people may be slightly less likely to leave the neighborhood for recreational purposes.

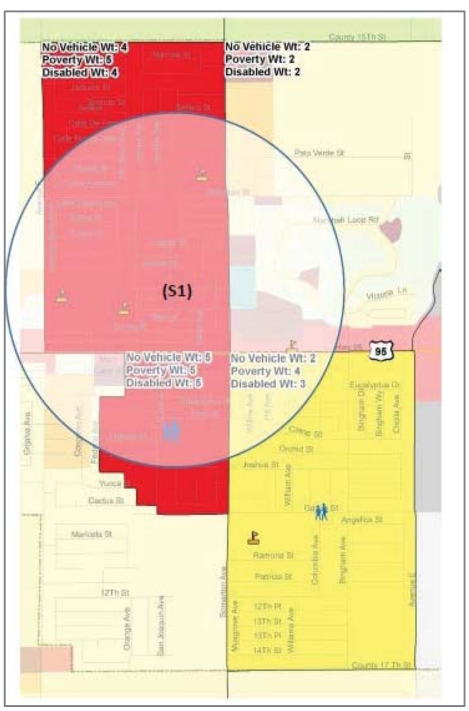
Figure 3.8: City of San Luis At-Risk Area 2



3.1.2.4 *City of Somerton*

Located in-between the City of Yuma and the City of San Luis, the City of Somerton, Figure 3.9, is not very large in area compared to the other jurisdictions but still presents significant transportation concerns. The 'at-risk' weighted overlay map indicates intermediate to high levels of at-risk block groups branching off of the intersection of US 95 and Somerton Avenue. There are five schools within one mile of the highway, and two block groups south of US 95 with high concentrations of residents identifying walking as their primary mode of transportation to work. Like many small towns, Somerton has turned the highway route passing through town into a main street, with small commercial businesses and on-street parking lining the route. The proximity of the at-risk zones to the main street suggests that residents may walk to work, which could increase the risk for pedestrian crashes in their daily walking commute.

Figure 3.9: City of Somerton At-Risk Area



3.1.2.5 *Non-Motorized Recommendations*

Given some of the concentrated areas of pedestrian activity in the region, the YMPO may want to consider a long-range pedestrian plan for improving non-motorized traffic safety in the at-risk areas. At a minimum, areas noted as at-risk should be reviewed more closely to determine issues that may exist and potential mitigation measures to improve safety and prevent incidents.

The City of Yuma Y1 area may benefit from a neighborhood shuttle that loops to the hospital complex at 24th Street and Avenue A.

Adding more finished trails along canals, or extra bus routes may help separate pedestrian traffic from vehicle traffic in the Y2 area. This region has interesting characteristics and may lend itself well to long-term branding efforts by the City as a historic neighborhood or tourism hub. Efforts to encourage public buy-in into transportation redevelopment projects might be helped by encouraging scenic trails or establishing a river related watercourse district similar to efforts in Tempe or the El Rio Corridor west of Phoenix.

The Y4 area could potentially support a neighborhood circulator bus route.

The Foothills Region may need extra bus routes connecting it to employment, shopping, and hospital areas in the City of Yuma.

The higher density of disabled retirees may mean the F1 area could be suited for a fire station or a clinic with a full time ambulance stationed on site. Traffic signals in the area may need to have emergency signal preemption installed. The long distance to the nearest schools may mean the area requires extra school bus routes.

3.2 Traffic Safety Programs

The following section contains a list of programs and other resources pertaining to traffic safety in the region. These programs address safety needs for motorized and non-motorized users. The list is intended to be a resource to allow collaboration among the various agencies across the region regarding safety strategies.

Statewide Bicycle and Pedestrian Program

The Arizona Department of Transportation (ADOT) runs a website dedicated to providing bicycling and walking information. This includes maps, safety tips, organizations/programs, commuting information, walking and biking to school resources, as well as the Statewide Bicycle and Pedestrian Plan of 2003 (with 2013 update). More information can be found at the ADOT Bicycle and Pedestrian Program webpage.

City of Yuma Bicycle Facilities Master Plan

The City of Yuma adopted a Bicycle Facilities Master Plan in 2009 that provides an overview of existing bicycle facilities, goals for implementing the Master Plan, and design standards for future bicycle facilities. Overall, the goal of the master plan is to improve bike safety and convenience for the City. More information can be found at the City of Yuma Bicycle Facilities Master Plan webpage.

YMPO Annual Traffic Counts and Maps

The Yuma Metropolitan Planning Organization (YMPO) collects annual traffic counts for most of the major roads and highways in the region, which can be downloaded as a spreadsheet, or viewed spatially on a map. More information can be found at the YMPO Traffic Counts webpage.

City of Yuma Transportation Master Plan

The City of Yuma adopted the Transportation Master Plan in 2014, which focuses on developing a multimodal transportation system for the City of Yuma. To accomplish this, the Master Plan included an extensive study of current socioeconomic characteristics, roadway network characteristics and deficiencies (highway, local), transit services, bicycle facilities, pedestrian facilities, truck routes, railroad, and airport traffic.

Within the Transportation Master Plan, there are specific plans for roadway, transit, bicycle, and pedestrian systems. The roadway system plan includes improvement projects for intersections and roadways in addition to roadway network alternatives. The bicycle system plan builds on the 2009 City of Yuma Bicycle Facilities Master Plan with additional guidance on long-term plans for the bike routes, bike lanes, shared use paths, and shared use trails throughout the city. The pedestrian system plan focuses on correcting ADA and travel consistency (e.g. intersections, crosswalks, cross distances) deficiencies. Solutions include additional sidewalk, improved lighting, mid-block crossings, reducing curb return radii, and enhanced pedestrian visibility.

Another goal of the Transportation Master Plan is outlining the potential for implementing the Federal Highway Administration's (FHWA) Complete Streets policies to create a multimodal transportation system that accommodates everyone. More information can be found at the City of Yuma Transportation Master Plan webpage.

Safe Routes to School

YMPO has received funding from the nationwide Safe Routes to School Program (SRTS) to promote walking and biking to school through increased safety, health, and environmental initiatives and projects. More information can be found at the ADOT Safe Routes to School Program webpage.

3.3 Funding Resources

The Highway Safety Improvement Program (HSIP) is a core federal aid program administered by the FHWA. The goal of the program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The program states, "A highway safety improvement project is any strategy, activity, or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem." Candidate projects submitted by local agencies for HSIP funding can address spot locations or systemic treatments. Potential projects are prioritized based on Benefit/Cost ratio, potential crash reduction for fatal and incapacitating injury crashes, and connection with the state's SHSP emphasis areas.

Previously, the federal act that established HSIP funding designated a set-aside amount for High-Risk Rural Roads (HRRRs). That set-aside has since been eliminated and replaced with a Special Rule that requires States with an increase in fatality rates on rural roads to obligate a specified amount of HSIP funds on HRRRs. The use of HRRR related HSIP funding would become an option for the YMPO if Arizona as a whole was found to have an increase in fatalities on rural roads over the most recent two years. The 2009 amount for Arizona was 1.8 million dollars.

Currently, local agencies can use HSIP applications to pursue both the YMPO and the ADOT statewide HSIP apportionments to develop safety projects. Arizona HSIP funds are approximately $40,000,000 each year and the YMPO allocation is approximately $490,000 per year. Beginning in fiscal year 2019, these sub-allocations to COGs and MPOs will be eliminated, and all agencies will compete for the statewide pot of HSIP funds. This is a primary reason for the development of this regional STSP: to position the YMPO member agencies to better compete for the statewide HSIP funds by identifying and justifying worthy safety projects through a data-driven process.

Local rural agencies are typically at a disadvantage when applying for HSIP funding due to their smaller population. There are various strategies that these agencies can use in order to raise their chances of receiving some of the statewide funding. Typically, it is most effective for small governments to look at systemic improvements or combinations of multiple spot locations to demonstrate enough safety need based on the FHWA criteria. Local agencies can look at crash data on a more regional level and partner with adjacent agencies to develop larger projects.

The Transportation Alternatives Program (TAP) provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; and safe routes to school projects. MPO's and local governments submit applications for projects that compete against projects across the state.

The Governor's Office of Highway Safety administers National Highway Traffic Safety Administration funding based on submitted safety projects. Typical projects include law enforcement activities such as targeted DUI checkpoints and improvements to crash data collection.

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 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 for highway construction, improvements, and other transportation related expenses. In Fiscal Year (FY) 2015, Yuma County received a total of 9.7 million dollars of HURF funds.

4 Regional Vision and Goal

The Federal Highway Administration (FHWA) has adopted the vision "Towards Zero Deaths" with the goal of zero fatalities across the nation's highway system. In its 2014 Strategic Highway Safety Plan (SHSP), the state of Arizona has adopted this vision to be "Toward Zero Deaths by Reducing Crashes for a Safer Arizona", with a goal to reduce fatalities and serious injuries by 3-7% in the five years following 2013 (the base year).

4.1 YMPO Region Vision and Goal

The study team conducted two 3-hour stakeholder workshops in support of the YMPO Regional Strategic Transportation Safety Plan (SHSP). The workshops were attended by 40 participants, including members of the YMPO Technical Advisory Committee (TAC), as well as professionals from other engineering, planning, management, law enforcement, public safety, education, and community agencies in the YMPO region. Stakeholder participants developed the following:

The safety vision for the YMPO region is,

> "No More Deaths, No More Injuries – Know More"

The regional goal for traffic safety is,

> "Reduce the number of fatalities and serious injuries in the region by 3% annually"

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5 EMPHASIS AREAS AND PERFORMANCE MEASURES

In the 2014 Arizona SHSP, 12 emphasis areas were chosen to improve road and highway safety, with five "top focus" emphasis areas considered to be top priority due to the high contribution to fatalities and serious injuries statewide. The five top focus emphasis areas are: 1) Speeding and Aggressive Driving, 2) Impaired Driving (alcohol, drugs, medication, illness, fatigue, and physical impairment), 3) Occupant Protection (seat belts, child safety seats, and helmets), 4) Motorcycles, and 5) Distracted Driving. The remainder of the 12 emphasis areas are: 6) Roadways Infrastructure and Operations (Lane/Roadway Departure, Intersections/Railroad Crossings), 7) Age Related (Young – Under 25, Older – Over 64), 8) Heavy Vehicles/Buses/Transit, 9) Non-Motorized Users (Pedestrians, Bicyclists), 10) Natural Risks (Weather, Animals), 11) Traffic Incident Management, and 12) Interjurisdictional.

Using these statewide emphasis areas as a framework to identify potential emphasis areas for the YMPO region, crash data was analyzed for each emphasis area in the Arizona SHSP. From the analysis, emphasis areas that contributed significantly to the total number of crashes or fatal crashes, or were comparable to the statewide fatal crashes were considered as an emphasis area for the region. Table 5.1 shows the emphasis areas chosen for the YMPO region, along with the total number of crashes, total related crash percentage, total number of fatal crashes, and total related fatal crashes attributed to each area. For instance, Distracted Driving contributed to 34% of all crashes and 24% of all fatal crashes in the region.

5.1 EMPHASIS AREAS AND GOALS

Table 5.1: YMPO Region Emphasis Areas

				% Fatal Crashes	
Emphasis Area	**Total # of Crashes**	**YMPO % Total Related**	**# Fatal Crashes**	**YMPO region**	**Statewide**
Distracted Driving	9,870	34%	55	24%	15%
Impaired Driving	2,741	10%	87	37%	34%
Speeding/Aggressive Driving	7,194	25%	85	36%	38%
Occupant Protection/Restraint	4,512	16%	122	52%	49%
Pedestrians	380	1%	40	17%	15%
Bicyclists	412	1%	6	3%	2%
Intersections	14,568	51%	63	27%	23%
Lane Departure	8,371	29%	117	50%	53%
Older Drivers	5,764	20%	25	11%	15%
Young Drivers	8,658	30%	40	17%	30%
Totals	**28,680**		**233**		

5.1.1 Distracted Driving

According to the National Highway Traffic Safety Administration (NHTSA), more than nine people are killed and more than 1,153 people are injured every day in the United States in crashes that involve a distracted driver. Many extraneous activities can divert drivers' attention from their most crucial task of keeping their eyes on the road and controlling their vehicles. Of these, cell phone use and texting are garnering the most attention across the country.

Distracted Driving was chosen based on two factors: total percent of crashes in the region, and total fatal crashes in the region. Distracted Driving contributed to 34% of all crashes in the region, and 24% of all fatal crashes, which is significantly higher than the statewide 15% of fatal crashes.

GOAL: Reduce distracted driving-related fatalities and serious injuries by 30% by 2025

5.1.2 Impaired Driving

In 2012, NHTSA reported that more than 10,000 people died in alcohol-impaired driving crashes nationwide - one every 51 minutes. Impaired driving refers to drivers under the influence of alcohol, drugs, fatigue, illness, or medications. Although fatal and serious injury crashes involving a driver under the influence of drugs and medication are on the rise, alcohol remains the most prevalent problem. Impaired driving crashes are more likely to be very severe and represent a far larger proportion of fatalities than that of less severe crashes. In the YMPO region, 37% of all fatal crashes involved impaired driving.

While Impaired Driving only contributed to 10% of all crashes in the region, at 37% of fatal crashes it surpassed the 34% of statewide fatal crashes.

GOAL: Reduce impaired driving-related fatalities and serious injuries by 25% by 2025.

5.1.3 Speeding/Aggressive Driving

Speeding and aggressive driving was cited as a crash contributor in a large portion of crashes related to driver behavior in the YMPO region. These behaviors increase the frequency and severity of collisions, particularly the severity of collisions involving pedestrians and bicyclists. Nationally, NHTSA estimates the economic cost to society of speeding-related crashes to be $40.4 billion per year. Most speeding-involved fatalities occur as single-vehicle collisions.

About 25% of all crashes in the region were attributed to Speeding and Aggressive Driving, and 36% of fatal crashes were attributed to Speeding and Aggressive Driving - this is similar to the statewide statistic of 38% of all fatal crashes.

GOAL: Reduce speeding/aggressive driving-related fatalities and serious injuries by 25% by 2025.

5.1.4 Occupant Protection/Restraint

The NHTSA estimates that using seat belts, child safety seats, and helmets saves thousands of lives each year. Unfortunately, statistics also show that one in five Americans fail to wear a seat belt regularly when driving or riding in a motor vehicle. In the YMPO region, 52% of fatalities reported lack of occupant restraint usage. Wearing seat belts, properly installing and using child safety seats, and wearing helmets reduce the severity of crashes and save lives.

Occupant Protection/Restraint is another emphasis area that was chosen based on the high percentage of fatal crashes (52%), compared to 49% of statewide fatal crashes.

GOAL: Reduce fatalities and serious injuries related to lack of occupant protection/restraint by 25% by 2025.

5.1.5 Pedestrians

Pedestrians are considered vulnerable road users – those who are at the most risk of injury or death when struck by a vehicle. People on foot experience drastically different travel conditions, environmental stimuli, exposure, and risks compared to vehicle drivers. Many of the severe pedestrian-involved crashes take place when the motorist turns and does not look for the pedestrian. Elderly, disabled, and child/school pedestrians represent a subgroup that warrants special attention.

According to NHTSA, 4,743 pedestrians were killed in the United States in 2012. In the YMPO region, pedestrians were involved in 1.3% of all crashes, but comprised 17% of all fatal crashes compared to 15% statewide. Moreover, a high percentage of these crashes occurred during dark and low light conditions (83%).

GOAL: Reduce the number of pedestrian fatalities and serious injuries by 50% by 2025.

5.1.6 Bicyclists

Bicyclists are also considered vulnerable road users. According to FHWA, 677 bicyclists were killed and 48,000 injured in traffic crashes in 2011.

Of all fatal crashes in the YMPO region, 3% involved bicyclists compared to 2% for the state, and 83% of bicyclist-involved fatal crashes occurred during dark and low light conditions. Many of the severe bicyclist-involved crashes occur when the motorist turns and does not look for the bicyclist.

GOAL: Reduce the number of bicyclist fatalities and serious injuries by 50% by 2025.

5.1.7 Lane/Roadway Departure

Lane and roadway departure crashes accounted for 53% of all fatalities and 34% of all serious injuries in Arizona during the years 2005 to 2012. These types of crashes often take place on rural highways at high speeds, and therefore can be very severe. Run-off-road crashes accounted for 43% of the fatal crashes in the YMPO region, with over half of these occurring at night, dawn, or dusk. In fact, 55% of all fatal crashes in the YMPO region occurred at night, dawn, or dusk.

GOAL: Reduce the number of fatalities and serious injuries related to lane departure by 50% by 2025.

5.1.8 Intersections

Nearly 45% of all crashes in Arizona occurred at an intersection. Such crashes comprise approximately 23% of all fatal crashes in Arizona.

Crashes at intersections contribute the most to the total crash count with 51% of all crashes occurring at intersections in the YMPO region. Additionally, about 27% of all fatal crashes in the region are attributed to Intersections, above the statewide rate of 23%.

GOAL: Reduce the number of fatalities and serious injuries related to intersections by 50% by 2025.

5.1.9 Older Drivers (over 64 years old)

According to NHTSA, in 2012, there were 5,560 older adults (65 and older) killed and 214,000 injured in motor vehicle traffic crashes across the country. Nationally, older adults made up 9 percent of all people injured in traffic crashes, but 17% of all traffic fatalities. The 65-and-older group is the fastest-growing population group in Arizona. Older drivers in the YMPO region were involved in 5,764 collisions, second only to drivers aged 24 and younger.

Older Drivers were involved in 20% of serious crashes in the region, and 11% of fatal crashes compared to the statewide crash percentage of 15%.

GOAL: Reduce the number of fatalities and serious injuries involving drivers over the age of 65 by 50% by 2025.

5.1.10 Young Drivers (under 25 years old)

Statewide, young drivers (age 24 and under) are involved in a greater number of fatal and serious injury crashes than any other age group -- more than a third of all these crashes. Young drivers have less on-the-road experience and are involved disproportionately in risky driving behaviors. In the YMPO region, drivers under the age of 25 make up an estimated 11% of licensed drivers, but they were responsible for approximately 30% of all crashes. 17% of fatal crashes in the region involved Young Drivers, compared to 30% statewide.

GOAL: Reduce the number of fatalities and injuries involving drivers 24 years and younger by 30% by 2025.

5.2 Performance Measures

Performance measures provide a means for tracking the effectiveness of deployed safety countermeasures. The FHWA recently established the following five performance measures specifically focused on HSIP funding:

- Number of fatalities
- Rate of fatalities per 100 million VMT
- Number of serious injuries
- Rate of serious injuries per 100 million VMT
- Number of combined non-motorized fatalities and non-motorized serious injuries

These measures can be monitored for the overall region, for each of the Emphasis Areas, and/or for each of the other safety improvement areas (contributing factors which are non-emphasis areas). Performance measures may also be monitored by member jurisdictions. The FHWA recommends a 5-year rolling average for crash monitoring.

Output performance measures examples include number of:

- High-visibility enforcement campaigns
- Public Service Announcements
- Cost spent on safety projects
- Intersections with improved pavement markings
- Center line miles with cable median barrier, rumble strips

Performance measures for outcome evaluation typically include total fatalities and serious injuries, fatalities and serious injuries by emphasis area, and observed behavior, e.g. annual safety belt observations. They need to be carefully selected, with consideration given to:

- Ease and cost of data collection
- Appropriateness and meaningfulness
- Select measures that fit strategies
- Misleading performance measures, i.e. pedestrian fatalities per population does not account for pedestrian or traffic volumes, or the impact of visitors

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6 Transportation Safety Strategies

Several potential strategies to improve the safety performance of the Emphasis Areas are listed below. The list is not comprehensive, but is provided as a toolbox of ideas that project owners may draw from when considering safety improvements. Engineering, education, and enforcement strategies are provided, and in some cases, include programs and policies which have already been implemented in the region.

6.1 Distracted Driving

- Engineering
  - Annually install a minimum of 10 lane-miles of centerline and bicycle-friendly shoulder rumble strips (provide gaps for bike entry/exit) on roadways that are indicated as high-volume/high-risk based on network screening methodologies in Section 7
- Education
  - Initiate two new (or strengthen two existing) distracted driving school and distracted driving public education campaigns by 2018
    - Increase the budgets 2% annually through 2025
  - Engage at least one secondary or post-secondary educational institution in AT&T's "It Can Wait" program/app by 2018
    - Sustain involvement at this level or above through 2025
  - Promote distracted driving resources, videos, and pledges to the public and charter high schools and local colleges and universities by 2017
    - Sustain involvement at this level or above through 2025
- Enforcement
  - Adopt local ordinances that prohibit the use of cell phones and mobile devices while driving
  - Annually conduct at least 3 high-visibility distracted driving enforcement campaigns, beginning in 2017
  - Increase the number of distracted driving encounters between law enforcement and motorists (violation stops, educational contacts) by 2% per year

6.2 Impaired Driving

- Education
  - Initiate two new (or strengthen two existing) impaired driving education campaigns by 2018
    - Increase the budget 2% annually through 2025
  - Work with fire departments, other public health and safety agencies, and educational institutions to conduct 2 mock crashes/events per year
  - Increase the budget of the "Know Your Limit" program by 2% each year
  - Continue to support programs that provide alternatives to driving while impaired, such as free taxi services, designated drivers, and complimentary shuttles provided by bar/liquor establishment owners
    - Increase program budget 2% per year

- Enforcement
  - Initiate two new (or strengthen two existing) DUI/impaired driving enforcement campaigns by 2018
    - Increase the budget 2% annually through 2025

6.3 Speeding/Aggressive Driving

- Engineering
  - Purchase and strategically deploy Speed Monitoring Awareness Radar Trailers (SMART) at locations with high frequency/risk of speeding behavior by 2017
  - Begin installing solar powered speed feedback signs as appropriate (e.g. locations where speed limits are reduced, high pedestrian/bicyclist/school activity, etc.) by 2018
  - Evaluate and implement engineering measures to reduce speed on specific corridors with excessive speeding
- Education
  - Engage area public and charter high schools and school districts by 2018
  - Launch NHTSA's "5 To Drive" campaign in at least one area school
    - Sustain the effort annually through 2025
- Enforcement
  - Initiate two new (or strengthen two existing) speed enforcement campaigns by 2018
    - Increase the budget 2% annually
  - Increase officer or staff stops/contacts with drivers regarding speeding 2% per year
  - Use automated speed enforcement cameras as appropriate

6.4 Occupant Protection/Restraint

- Education
  - Initiate two new (or strengthen two existing) on-going occupant protection education campaigns by 2018
    - Increase the budget 2% annually
  - Increase the number of contacts with the public, including high-risk groups, by 50% over existing levels
    - Increase awareness of seat belt/restraint use by 2025
  - Annually conduct 3 seat belt education events to children
  - Provide 3 community-wide child protection seat distribution programs coupled with high-profile inspection events/clinics utilizing certified child protection seat technicians
  - Train law-enforcement personnel to check for proper child restraint use during all motorist encounters

- Enforcement
    - Increase the number of stops or contacts regarding occupant protection/restraint, including high-risk groups, by 50% over existing levels by 2025
    - Initiate two new (or strengthen two existing) on-going occupant protection enforcement campaigns by 2018
        - Increase the budget 2% annually through 2025
    - Annually conduct 2 high-visibility, saturated seat-belt enforcement campaigns (i.e. Click It or Ticket) similar to DPS's Seat Belt 500

6.5 Vulnerable Users – Pedestrians

- Engineering
    - Conduct an analysis of sidewalk infrastructure every 3 to 5 years to determine gaps and other deficiencies
    - Create a corresponding GIS layer or map and an accompanying remediation plan by 2017
        - Annually update both
    - Have each community in the YMPO create an ADA Transition Plan by 2018
    - Annually install at least one of the following pedestrian countermeasures, facilities, or American with Disabilities Act (ADA) improvements in each YMPO member community:
        - High-visibility crosswalks
        - High-visibility crosswalks in school zones
        - Countdown pedestrian signals
        - Sidewalks or walkways
        - Paved shoulders
        - ADA curb ramps
        - Pedestrian Hybrid Beacons (PHBs, "HAWKs")
        - Rectangular Rapid Flash Beacons (RRFBs)
        - Roadway lighting or pedestrian-scale lighting
    - Fund the installation of pedestrian/safety facilities such that the budget matches the percent that pedestrians are represented in regional crash statistics (e.g. 13% pedestrian fatalities = 13% of budget) by 2018
    - Appoint a team by 2017 to investigate adopting a "Complete Streets" policy by 2018 in at least one community in the YMPO region
    - Annually conduct speed studies on 5 pedestrian high-risk roadway segments in the YMPO region
        - Based on the study results, consider implementing the following:
            - Lower posted speed limit
            - Leading Pedestrian Interval (LPI) phasing
            - Protected-only left turn phasing
            - Restricted right turn on red (RTOR)

- Education
    - Provide education focused on pedestrian awareness, safety, and laws/rights
    - Initiate two new (or strengthen two existing) campaigns or trainings for each of the following audiences by 2018: pedestrians, drivers, and law enforcement officers
        - Increase the budgets 2% annually through 2025
    - Beginning in fiscal year 2019, annually seek Transportation Alternatives Program (TAP) funding from ADOT for use in Safe Routes to School (SRTS) projects, programs, and studies
- Enforcement
    - Annually increase pedestrian and motorist stops or contacts aimed at pedestrian safety by 2%, beginning in 2017
    - Conduct targeted motorist-focused, pedestrian enforcement ("stings") at 3 locations per year that have been identified as high risk for pedestrian crashes
    - Work with local public and charter schools and districts to efficiently increase school-zone speed enforcement efforts, beginning in 2017
    - Regularly conduct pedestrian volume counts to help assess safety risk, beginning in 2017
    - Annually conduct 5 Walking Site Assessments (WSAs) and/or Hybrid WSA-Road Safety Audits (Hybrid WSA-RSAs) of sites (e.g. schools, public facilities, retail, etc.), roadway corridors, and/or intersections that are identified as high risk for pedestrians, or otherwise exhibit higher pedestrian volumes
        - Gather data and observational evidence needed to address safety deficiencies, and to inform/recommend the installation of pedestrian/ADA facilities

6.6 Vulnerable Users – Bicyclists

- Engineering
    - Appoint a team by 2017 to investigate providing safe roadway facilities for parallel travel to arterial roads (e.g. bike boulevards) on existing low-stress routes by 2019
    - Annually install at least one of the following bicycle countermeasures in each YMPO member community:
        - Road diets
        - Narrower vehicle travel lanes
        - Wider shoulders
        - Safety Edge roadway treatment
        - Bicycle lanes
        - Shared lane markings
        - Bicycle boulevards
    - Devote additional funding for the installation of bicycle facilities such that the revised budget matches the percent that bicyclists are represented in regional crash statistics (e.g. 13% bicyclist fatalities = 13% of budget) by 2017

- Education
    - Provide education focused on bicyclist awareness, safety, and laws/rights
    - Initiate two new (or strengthen two existing) campaigns or training by 2018 for each of the following audiences: bicyclists, drivers, and law enforcement officers
        - Increase the budgets 2% annually through 2025
    - Increase the use of bicycle helmets by all bicyclists by advocating to town, city, county, and tribal elected officials to enact a bicycle helmet ordinance by 2019
    - Seek federal grants to pay for a bicycle helmet program (similar to a child safety seat program)
- Enforcement
    - Annually increase bicyclist and motorist stops or contacts aimed at bicyclist safety by 2%, beginning in 2017
- Evaluation
    - Beginning in 2017, regularly collect bicycle volume counts to help assess safety risk. Annually conduct Bicycling Site Assessments (BSAs) and/or Hybrid BDS/Road Safety Audits (Hybrid BSA-RSAs) at 2 specific sites (e.g. schools, retail, public facilities, etc.), roadway corridors, and/or intersections that are identified as high priority based on crash data and/or high bicycle volumes
        - Gather data and observational evidence needed to address safety deficiencies, and to inform/recommend the installation of bicycle/ADA facilities.

6.7 Lane/Roadway Departure

- Engineering
    - Reduce run-off-road crashes by annually installing at least one of the following countermeasures/treatments on 10 lane-miles of high-volume/high-risk (based on network screening methodologies) roadway:
        - Bicycle-friendly rumble strips (provide gaps for bike entry/exit)
        - Raised pavement markers
        - Curve warning signs and chevrons
        - Wider shoulders
        - Flexible delineators
        - Safety Edge roadway treatment
        - Roadway lighting
        - Curb and gutter
- Enforcement
    - Increase the number of hours officers spend on special enforcement details focusing on speed and red light running by 3% per year
    - Initiate two new (or strengthen two existing) nighttime speeding enforcement campaigns on high risk roadways by 2018
        - Increase the budget 2% annually through 2025

6.8 Intersections

- Engineering
    - To reduce conflicts and crash severity, require alternative intersection consideration in the project assessment phase (e.g. roundabouts, indirect left turns, etc.) by 2020
    - By 2018, update signal timing on a regular schedule and implement adaptive signal control and centralized control to improve intersection operations and safety
    - Adopt consistent signal timing practices (e.g. left-turn phasing, clearance intervals, etc.) in metro areas by 2018 to eliminate driver confusion
    - Increase coordination between state and local signals by 2018 to improve operations and reduce driver frustration
    - Consider adding dilemma-zone detection at intersections with a high frequency of speed-related crashes by 2020
- Education
    - By 2018, create radio and/or television public service announcements on red light running and air them 4 times per year
- Enforcement
    - Focus on speed and red light running enforcement

6.9 Older Drivers

- Engineering
    - By 2018, integrate the FHWA Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians into design standards and policies
- Education
    - Provide education and outreach on the value and availability of AARP's online, safe-driving "refresher" course for older drivers, Smart Driver, by 2017
        - Increase the number of older drivers who complete the course by 5% per year
    - Expand alternative transportation options for older drivers
    - By 2017, make resources on older driver physical, behavioral, and enforcement issues available to law enforcement officers and recommend biennial training
    - Encourage doctors, healthcare providers, law enforcement officers, and first responders to report older drivers who may have compromised their driving ability to the MVD
        - Create reporting protocol by 2017 and initiate by 2018
    - Educate and encourage the public to report a family member who may be at risk due to reduced driving skills and abilities to the MVD
        - Create reporting protocol by 2017 and initiate by 2018
    - Increase training for doctors and healthcare providers about medical assessment testing of their patients who are older drivers
        - Develop this training by 2017 and initiate by 2018

6.10 Young Drivers

- Education
  - By 2017, increase the availability of information and skills/safety training for young drivers
  - Investigate at least one of the following:
    - Requiring private or school-based driver education for young drivers in order to obtain their license
    - Requiring a parent/guardian component of mandatory driver education
    - Increasing the number of young drivers who participate in any private or school-based driver education courses by 2% per year
    - Offer classes, assemblies, or other forms of education on bicycle, pedestrian, and/or motorcycle safety and award credit for attendance
    - Incorporate driver education into School Resource Officer (SRO) lesson plans
  - Beginning in 2017, annually host mock crashes for high school students to capture their attention and maximize “shock factor”
- Enforcement
  - By 2019, all agencies will adopt local ordinances that prohibit the use of cell phones and mobile devices by younger drivers while driving
  - Conduct 2 targeted enforcement campaigns per year at high schools, community college, and/or universities

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7 Network Screening and Safety Needs Prioritization

Network screening of a roadway system is the data-driven analysis of the intersections and segments within the system. The process utilizes spatial analysis of crash data and is performed in order to determine high priority locations that may require safety improvements. Crashes are spatially attributed to individual intersections and segments in order to facilitate network analysis.

The goal of network screening is to develop a list of specific sites, for example, signalized intersections, that are ranked by priority. Priority is typically developed from crash frequency, rate, and severity, but other crash factors can be incorporated into the analysis as appropriate. This priority list is then used to plan and implement safety projects at individual locations or at the system-wide level. The list can also serve as a resource for local governments when applying for state or federal traffic safety funding.

7.1 Network Screening Methodology

The Safety Management System (SMS) program utilized by Pima County is an excellent tool for screening network crashes, and it provides the framework for the YMPO network screening analysis. The SMS program was developed by Pima County to prioritize intersections and segments in the unincorporated Pima County road network using available network data and crash data from the previous three years. The network data required for the SMS program is average daily entering volume for intersections, average daily traffic volume for segments and roadway length. The number and severity of crashes that occurred at each intersection is required for the intersection analysis. For the segment analysis the number and frequency of crashes that occurred along the segment and at intermediate intersections is required.

Pima County creates prioritization lists for each of the following facility types: unsignalized intersections with four or more crashes over the 3-year period, signalized intersections, roadway segments with less than or equal to 10,000 vehicles per day, and segments with more than 10,000 vehicles per day. The priority ranking is based on crash frequency, crash rate, and severity index. The value and rank of each are calculated for each location. Crash rate is expressed as crashes per million entering vehicles or crashes per million vehicle miles for intersections and segments, respectively. The Severity Index (SI) was developed by the National Safety Council and is calculated using the following formula:

$$SI = \frac{5.8(N_k + N_a) + 2(N_b + N_c) + N_{pd}}{T}$$

Where:

N_k=Number of fatal crashes
N_a=Number of incapacitating injury crashes
N_b=Number of non-incapacitating crashes
N_c=Number of possible injury crashes
N_{pd}=Number of property damage only crashes
T=Number of total crashes

The rank of each variable is combined, using equal weighting for each variable, to develop a priority index (PI) ranking. The priority index is then ranked to obtain the final priority list for each facility type.

7.1.1 Intersection Priority Index Rating

The intersection analysis was performed using ten years of crash data from 2004-2013. The goal of the analysis was to rank intersections regionally and locally based on traffic safety criteria. The resulting lists are intended to provide local agencies with a guideline in determining locations that may require a closer examination for safety improvements. Intersections were classified based on whether or not a signal is present. Individual priority ranking lists were developed for signalized and unsignalized intersections. Traffic counts were assigned to intersections using the ADOT and YMPO Transportation Data Management System databases. The signalized intersection priority ranking with the top 20 locations is shown in Table 7.1. Top intersections were first determined using the PI ranking. Other factors were then considered including existing conditions, recent improvements, and already programmed improvement plans for each location. As seen in Table 7.1, all of the top signalized intersections lie within the City of Yuma boundary. This is due to the high population and resulting high AADT, relative to the surrounding agencies.

Table 7.2 lists the top 20 unsignalized intersections in the region; all fall within the City of Yuma or unincorporated Yuma County.

The numbers 1 through 5 for severity represent the level of severity of a crash: 1 is No Injury or Property Damage Only, 2 is Possible Injury, 3 is Non-incapacitating Injury, 4 is Incapacitating Injury, and 5 is Fatal.

Table 7.1: Top 20 Signalized Intersections, Region

Intersection	Agency	ADEV	Severity 1	Severity 2	Severity 3	Severity 4	Severity 5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
S Ave B & W 16th St	City of Yuma	41166.5	243	66	40	10	2	361	71	2.40	69	1.45	38	178	1
S Ave B & W 24th St	City of Yuma	37867.5	152	56	37	5	1	251	67	1.82	64	1.49	46	177	2
E 16th St & S Arizona Ave	City of Yuma	40554	131	53	23	5	0	212	65	1.43	57	1.47	42	164	3
E 24th St & S Arizona Ave	City of Yuma	24110.5	119	46	20	3	0	188	61	2.14	67	1.43	35	163	4
W 8th St & S 4th Ave	City of Yuma	31796.5	80	37	27	3	0	147	57	1.27	52	1.53	53	162	5
US HWY 95 & Fortuna Rd	ADOT	24633	75	29	17	4	0	125	53	1.39	55	1.52	52	160	6
S 4th Ave & W 24th St	City of Yuma	50393	205	75	25	5	0	310	70	1.69	62	1.40	25	157	7
W Catalina Dr & S 4th Ave	City of Yuma	32380	67	27	27	4	1	126	54	1.07	45	1.62	57	156	8
W 24th St & S Ave A	City of Yuma	34369.5	180	58	28	2	0	268	68	2.14	68	1.36	20	156	8
E 32nd St & W 32nd St (W Cty 11th St)	City of Yuma	18975	69	31	14	2	0	116	51	1.67	61	1.47	41	153	10
S 4th Ave Extension & W 32nd St (W Cty 11th St)	City of Yuma	17345.5	66	18	8	4	1	97	44	1.53	59	1.52	49	152	11
E 16th St & S 1st Ave	City of Yuma	37722.5	136	57	18	2	0	213	66	1.55	60	1.40	24	150	12
W 16th St & S Ave C	City of Yuma	20071.5	55	20	12	3	1	91	42	1.24	51	1.56	56	149	13
S Ave B & W 8th St	City of Yuma	15653	114	21	19	2	1	157	60	2.75	70	1.35	19	149	13
W 16th St & S 4th Ave	City of Yuma	55186.5	178	78	29	1	0	286	69	1.42	56	1.39	23	148	15
E 24th St & S Pacific Ave	City of Yuma	51849.5	112	43	29	4	0	188	61	0.99	40	1.49	45	146	16
W 16th St & S Ave A	City of Yuma	35783	125	46	25	1	0	197	64	1.51	58	1.38	22	144	17
S Ave 8 E & E 32nd St	City of Yuma	10135	21	8	10	4	0	43	26	1.16	49	1.87	68	143	18
E 32nd St & S Pacific Ave	City of Yuma	38209.5	99	39	13	3	0	154	59	1.10	47	1.43	37	143	18
S Ave 5 E & E 32nd St	City of Yuma	23690	27	24	11	6	1	69	37	0.80	33	1.99	71	141	20

Table 7.2: Top 20 Unsignalized Intersections

Intersection	Agency	ADEV	Severity 1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
S Ave B & W County 19th St	Yuma County	9407.5	19	10	8	4	0	41	41	1.19	38	1.91	36	115	1
32nd St & S Ave D	City of Yuma	6770	19	6	5	2	1	33	38	1.34	41	1.77	33	112	2
S Ave 4 E & E County 13th St	Yuma County	3372.5	12	6	5	2	0	25	30	2.03	43	1.82	35	108	3
S Ave 5 E & E 40th St	City of Yuma	1440.5	9	3	7	2	0	21	25	3.99	45	1.93	37	107	4
S Gila St & Harold C Giss Pkwy	City of Yuma	9177	48	12	6	2	0	68	44	2.03	42	1.41	16	102	5
S Ave C & 12th St	City of Yuma	13138	21	9	7	2	0	39	40	0.81	32	1.66	28	100	6
W County 14th St & Somerton Ave	Yuma County	7257	15	5	4	1	1	26	31	0.98	37	1.72	29	97	7
W 16th St & S Ave D	Yuma County	8766	19	4	3	1	1	28	34	0.88	34	1.59	27	95	8
S Ave 4 E & E County 14th St	Yuma County	9146	10	6	3	2	1	22	27	0.66	25	2.06	39	91	9
Harold C Giss Pkwy & S Madison Ave	City of Yuma	21326.5	82	10	4	0	0	96	45	1.23	39	1.15	6	90	10
S Ave C & W County 14th St	Yuma County	9481.5	16	1	9	1	0	27	33	0.78	30	1.55	24	87	11
S Ave 4 E & E 40th St	City of Yuma	6346	9	2	2	3	0	16	16	0.69	27	2.15	43	86	12
E 40th St & S Ave 3 E	City of Yuma	10799	21	5	4	1	0	31	36	0.79	31	1.45	19	86	12
Harold C Giss Pkwy & S 1st Ave	City of Yuma	13358	35	6	2	0	0	43	42	0.88	35	1.19	9	86	12
S Ave A & W Airport Loop	City of Yuma	15812.25	9	6	5	3	0	23	28	0.40	16	2.10	41	85	15
W 16th St & S 8th Ave East	City of Yuma	30706	32	10	8	2	0	52	43	0.46	19	1.53	23	85	15
N Frontage Rd & S Ave 9 E	City of Yuma	10180	19	6	2	1	0	28	34	0.75	29	1.46	20	83	17
48th St & S Ave 3 E	City of Yuma	11294	15	4	6	1	0	26	31	0.63	24	1.57	26	81	18
S Ave 36 E & Old Hwy 80	Yuma County	1452.5	10	3	4	0	0	17	18	3.21	44	1.41	17	79	19
W 40th St & S Ave C	City of Yuma	6197.5	12	4	4	0	0	20	24	0.88	36	1.40	15	75	20

A priority ranking table was also developed for all non-interstate segments in the YMPO region, as shown in Table 7.3. All 20 of these top ranked segments fell within unincorporated Yuma County or the City of Yuma. This ranking provided a starting point for the selection of priority corridors in the region, which were selected to aid in the acquisition of federal traffic safety funding (HSIP). This analysis is discussed in Section 11.

Table 7.3: Top 20 Segments, Region

Segment	Volume	Agency	Length (mi)	Severity 1	2	3	4	5	Freq (C/Mi)	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
MAIN ST (HWY 95), 2ND AVE TO 3RD AVE	8794	Yuma County	0.09	2	1	1	1	0	58.22	159	181.38	150	2.36	152	461	1
AVE G, CO 14TH ST TO CO 15TH ST	639	Yuma County	1.00	11	1	9	3	2	26.08	134	1118.24	166	2.31	148	448	2
AVE B, CO 18 1/2 ST TO CO 19TH ST	6739	Yuma County	0.51	15	8	5	3	0	60.93	161	247.71	160	1.88	117	438	5
7TH AVE, AVE I 1/2 TO COLLEGE ST	2385	Yuma County	0.26	2	0	1	1	1	19.25	113	221.13	157	3.12	167	437	6
CO 19TH ST, AVE G TO AVE H	5814	Yuma County	0.99	6	3	12	5	0	26.32	135	124.05	143	2.50	156	434	7
HWY 95, FROM THE FARM RD TO MADONNA RD	7610	Yuma County	0.41	2	3	1	2	0	19.40	114	69.85	124	2.70	165	403	10
CO 19TH ST, SOMERTON AVE TO AVE F	7066	Yuma County	0.50	11	1	3	2	0	33.83	148	131.16	145	1.80	106	399	12
AVE G, CO 13TH ST TO CO 14TH ST	639	Yuma County	1.00	8	2	5	1	1	17.02	103	729.53	164	1.98	128	395	13
AVE 36 E, HWY 80 TO I-8	632	Yuma County	0.09	5	2	2	0	0	94.84	166	4111.18	167	1.44	53	386	16
CO 19TH ST, AVE A 1/2 TO AVE B	2815	Yuma County	0.51	4	1	3	1	0	17.74	107	172.69	149	1.98	129	385	17
SOMERTON AVE, CO 13TH ST TO CO 14TH ST	3828	Yuma County	0.98	11	5	4	2	0	22.45	124	160.70	148	1.85	111	383	18
CO 16TH ST (HWY 95), AVE G TO VALLEY VISTA APTS	9239	Yuma County	0.26	3	0	1	1	0	19.17	112	56.85	117	2.16	143	372	22

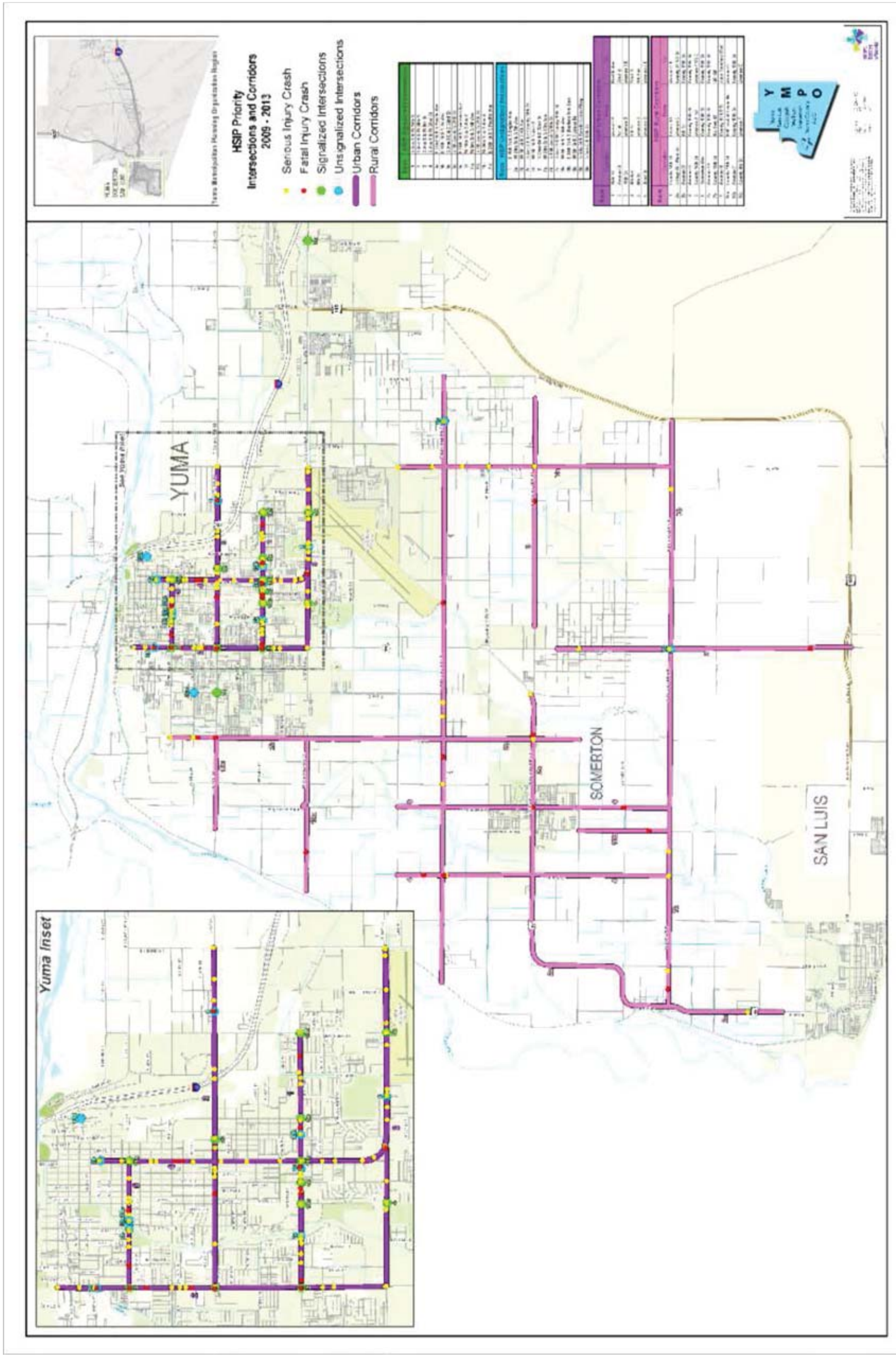
MAIN ST (HWY 95), CO 19TH ST TO CO 19 ½ St	13305	Yuma County	0.46	7	1	1	1	1	24.12	127	49.66	109	2.05	132	368	23
HWY 95 (S AVE J), CO 20 1/2 ST TO CO. 21ST ST	13305	Yuma County	0.50	1	4	3	2	0	19.85	117	40.87	87	2.66	164	368	23
W CO 19TH ST, AVE I TO AVE I 1/2	4033	Yuma County	0.49	2	1	2	1	0	12.20	83	82.91	130	2.30	147	360	26
CO 19TH ST, AVE H TO AVE I	4033	Yuma County	1.02	18	5	5	1	0	28.51	141	193.69	155	1.51	59	355	27
AVE 40 E, OHIO AVE TO HWY 80	532	Yuma County	0.04	8	0	2	0	0	245.04	168	12619.12	168	1.20	17	353	28
HWY 80, AVE 40 E TO 1ST PL	921	Yuma County	0.19	4	1	1	0	0	32.05	146	953.39	165	1.33	39	350	31
CO 14TH ST, SOMERTON AVE TO AVE F	5365	Yuma County	0.41	6	0	1	0	1	19.73	115	100.76	136	1.73	97	348	32
CO 19TH ST, AVE F TO AVE G	7066	Yuma County	0.99	11	2	4	2	0	19.17	111	74.34	126	1.82	109	346	33

7.1.2 HSIP Corridor Analysis

The goal of network screening and spatial analysis was to determine locations that would benefit from a safety improvement. HSIP federal funding is a critical source for local governments to use to install and upgrade traffic safety countermeasures and strategies. An unfortunate circumstance for many local governments is that HSIP funding is not allocated evenly across the state, which means that agencies with smaller populations, lower AADT, and typically fewer crashes must compete with larger agencies to receive this funding.

To improve the odds of receiving federal funds, high priority intersections and segments from the network screening analysis were combined to highlight 12 rural and 6 urban corridors in the region. The corridors were selected based on the number of crashes on relevant segments and intersections, especially fatal and incapacitating injury crashes. TAC members reviewed the corridors and provided input on existing conditions, safety concerns, and suggestions for alternative or additional corridors. Figure 7.1 shows the HSIP corridors for the region.

Figure 7.1: HSIP Corridors in YMPO Region



7.2 SPATIAL ANALYSIS

ADOT crash data was used to perform a spatial analysis for intersections and segments. The crashes were attributed to these facility types using the latitude and longitude points in the crash database, coupled with spatial analysis tools using ArcGIS.

7.2.1 Intersections and Segments

Intersections were created using the network layer provided by YMPO. Road segments were intersected in GIS and named using a semi-automated software. Signalized intersections were provided by each member agency and were verified using web-based mapping software, while unsignalized intersections were located using GIS. Both urban and rural signalized and urban unsignalized intersections were analyzed. Crashes were defined as intersection-related if they fell within 250 feet of a signalized intersection or 125 feet of an unsignalized intersection. Crashes were attributed to rural segments if they fell within 100 feet of that segment, excluding signalized intersection crashes. In more densely populated areas, some manual effort was used to attribute crashes to the correct segment based on spatial location and the “On Road” field in the ADOT crash data due to some overlapping segment buffers.

8 INCORPORATING SAFETY IN THE REGIONAL TRANSPORTATION PLAN AND INFRASTRUCTURE PROJECTS

Safety is often viewed as an "extra" or "add-on" or even a nuisance to incorporate into a project, when in fact it should be mainstreamed and explicitly considered on every project.

Traffic safety programs, projects, and policies included in the Regional Transportation Plan (RTP) have a higher likelihood of being implemented. The following should be considered for inclusion in the YMPO RTP 2018 – 2041, which is currently being developed:

- Develop evaluation criteria to explicitly consider safety in project programming
    - Give higher priority to projects that address STSP Emphasis Areas
    - Give higher priority to locations experiencing fatal and serious injury crashes
- Include systematic safety improvements in projects, e.g. rumble strips, shoulders, bike lanes, sidewalks, lighting
- Conduct Road Safety Assessments (RSA) during:
    - Project design stage
    - Evaluation of high priority locations

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9 TRAFFIC OPERATIONS SAFETY STRATEGIES

9.1 IMPROVEMENTS FOR SAFETY PROJECT DEVELOPMENT

9.1.1 Safer sidewalks

According to FHWA's Designing Sidewalks and Trails for Access, "In new construction, the commitment to create sidewalk corridors that meet the needs of people with disabilities should be made during the planning stages of the development process. For example, if sufficient right-of-way is not allocated to the sidewalk corridor during the planning process, it is harder for designers to construct curb ramps with level landings. When access improvements are made to existing sidewalk corridors, designers should prioritize needs with available resources and try to make the most significant changes possible with the funds available."

Depending on the context of a specific roadway project and of the community, a sidewalk could be essential to the overall success of the roadway. According to a study by the UNC Highway Safety Research Center conducted for FHWA, the likelihood of a site with a paved sidewalk being a crash site is 88.2% lower than a site without a sidewalk after accounting for traffic volumes and speed limits [McMahon et al., 2002]. Other studies have shown that the lack of sidewalks is the second largest barrier that prevents people (especially school age children) from walking to destinations. As Arizona continues to urbanize, it will be increasingly important to encourage the safe mobility of non-motorized roadway users along and across state highways and local streets.

9.1.2 High-visibility crosswalks

A marked crosswalk can benefit pedestrians by directing them to cross at locations where appropriate traffic control, including traffic signals or school crossing guards, either currently exists or can be provided. However, marked pedestrian crosswalks themselves do not slow traffic or reduce pedestrian crashes. It may be beneficial to install high-visibility crosswalks at signalized intersections or locations where crosswalks are typically marked, at key crossings in neighborhoods with designated school walking routes and at uncontrolled crossings. Several types of crosswalk marking patterns can be used; recommended types are shown in Figure 9.1.

Figure 9.1: High-visibility Crosswalk Marking Patterns

9.1.3 Median islands / pedestrian refuges

There are several types of medians and pedestrian crossing islands, and if designed and applied appropriately, they improve the safety benefits to both pedestrians and vehicles in the following ways[2]:

- May reduce pedestrian crashes by 46% and motor vehicle crashes by up to 39%
- May decrease delays (by greater than 30%) for motorists
- Allow pedestrians a safe place to stop at the mid-point of the roadway before crossing the remaining distance
- Enhance the visibility of pedestrian crossings, particularly at unsignalized crossing points
- Can reduce the speed of vehicles approaching pedestrian crossings
- Can be used for vehicle access management
- Provide space for supplemental signage on multi-lane roadways

Raised medians (or refuge areas) should be considered in curbed sections of multi-lane roadways in urban and suburban areas, particularly in areas where there are mixtures of significant pedestrian and vehicle traffic (more than 12,000 ADT) and intermediate or high travel speeds. Medians/refuge islands should be at least 4 feet wide (preferably 8 feet wide to accommodate pedestrian comfort and safety) and of adequate length to allow the anticipated number of pedestrians to stand and wait for gaps in traffic before crossing the second half of the street. (From FHWA Proven Countermeasures, FHWA-SA-12-001)

9.1.4 Pedestrian Hybrid Beacon (HAWK)

The pedestrian hybrid beacon (PHB), also known as a "HAWK" (**H**igh-intensity **A**ctivated cross**w**al**k**) is a pedestrian-activated warning device located on the roadside or on mast arms over midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until the pedestrian desires to cross the street. At this point, the pedestrian will push an easy to reach button that activates the beacon. After displaying brief flashing and steady yellow intervals, the device displays a steady red indication to drivers and a "WALK" indication to pedestrians, allowing them to cross a major roadway while traffic is stopped. After the pedestrian phase ends, the "WALK" indication changes to a flashing orange hand to notify pedestrians that their clearance time is ending. The hybrid beacon displays alternating flashing red lights to drivers while pedestrians finish their crossings before once again going dark at the conclusion of the cycle.

Installation of the pedestrian hybrid beacon has been shown to provide the following safety benefits:

- Up to a 69% reduction in pedestrian crashes
- Up to a 29% reduction in total roadway crashes

Pedestrian hybrid beacons should only be used in conjunction with a marked crosswalk. Transit and school locations may be good places to consider using the pedestrian hybrid beacon.

9.1.5 Rectangular Rapid Flash Beacon (RRFB)

RRFBs are user-actuated amber LEDs that supplement warning signs at unsignalized intersections or mid-block crosswalks. Pedestrians can activate them manually by a push button or passively by a pedestrian

[2] "Medians and Pedestrian Crossing Islands in Urban and Suburban Areas." *Proven Safety Countermeasures.* Federal Highway Administration, 15 Oct. 2014. Web. 20 Apr. 2016.

detection system. RRFBs use an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs may be installed on either two-lane or multi-lane roadways.

9.1.6 Leading Pedestrian Interval

A Leading Pedestrian Interval (LPI) is a pedestrian safety strategy that involves changing the timing of the 'walk' signal. LPI typically gives pedestrians a 3- to 7-second head start when entering an intersection before the corresponding green signal in the same direction of travel. During the LPI, the traffic signal displays red/stop for vehicles travelling in the same direction as the crossing pedestrians, and also delays any right- and left-turn movements across the pedestrians' path.

LPIs enhance the visibility of pedestrians in the intersection and reinforce their right-of-way over turning vehicles, especially in locations with a history of conflict. LPIs have been shown to reduce pedestrian-vehicle collisions as much as 60% at treated intersections.

9.1.7 Access management

According to the FHWA Office of Operations, Access Management is the proactive management of vehicular access points to land parcels adjacent to all manner of roadways. Studies show that implementing Access Management provides three major benefits to transportation systems: increased roadway capacity, reduced crashes, and shortened travel time for motorists. Good Access Management also is an important part of maintaining mobility and safety for other roadway users, such as pedestrians and bicyclists. Access Management techniques include access spacing, driveway spacing, safe turning lanes, median treatments, and right-of-way management.

Micro-scale considerations include the number and spacing of driveways from parking lots and other retail and commercial establishments onto residential/pedestrian-frequented streets. There needs to be a balance between retail/commercial vehicular access and the number of vehicular conflict points that can potentially endanger pedestrians and cyclists.

9.1.8 Road Diet (Roadway reconfiguration, "Rightsizing")

A road diet or roadway reconfiguration involves converting an undivided 4-lane roadway to enhance safety, mobility, and access for all road users; a common solution is changing a 4-lane roadway to a 3-lane roadway with 2 through lanes and a center two-way left turn lane[3]. Midblock locations tend to experience higher travel speeds, contributing to increased injury and fatality rates. When appropriately applied, road diets have generated benefits to users of all modes of transportation, including bicyclists, pedestrians, and motorists.

The resulting benefits include reduced vehicle speeds, improved mobility and access, reduced collisions and injuries, and improved livability and quality of life. The benefits to pedestrians include reduced crossing distance and fewer midblock crossing locations, which account for more than 70% of pedestrian fatalities.

Roadways with an ADT of 20,000 or less may be good candidates for a road diet and should be evaluated for feasibility.

[3] "Road Diets (Roadway Reconfiguration)." *Safety.* Federal Highway Administration, 23. Mar. 2016. Web.

9.1.9 Crosswalk lighting

According to the Federal Highway Administration, nighttime fatal accident rates in unlit areas are approximately three times higher than daytime rates, suggesting that visibility is a crucial risk factor[4]. In a recent study by the Transportation Group at the Lighting Research Center (LRC)[5], bollards, which are short vertical posts containing linear light sources inside, addressed the need to contrast pedestrians from their surroundings in a way that traditional pole-mounted luminaires did not achieve. According to the study, the bollards were judged as being likely to increase pedestrian safety. The study also suggested adding flashing LEDs on the bollard, which would be activated with push-button controls or motion sensors, for additional safety.

9.1.10 Roundabouts

These circular intersections use the physical geometry of the intersection to slow vehicle speeds. Roundabouts have demonstrated substantial safety and operational benefits compared to most other intersection forms and controls, with especially significant reductions in fatal and injury crashes. The Highway Safety Manual (HSM) indicates that by converting from two-way stop control to a roundabout a location can experience an 82% reduction in severe crashes and a 44% reduction in overall crashes; converting from a signalized intersection to a roundabout a location can experience a 78% reduction in severe crashes and a 48% reduction in overall crashes.

Roundabouts can be an effective tool for managing speed, creating a transition area that moves traffic from a high-speed to a low-speed environment, and as a gateway into an urban area. Proper site selection, channelization, and design features are essential for making roundabouts accessible to all users.

Roundabouts should be considered as an alternative for intersections on federally funded highway projects that involve new construction or reconstruction. Roundabouts should also be considered when rehabilitating existing intersections that have been identified as needing major safety or operational improvements. According to the FHWA Proven Countermeasures, roundabouts have also proven to be effective at freeway interchange ramp terminals and at rural high-speed intersections.

9.1.11 Bicyclists

9.1.11.1 *Colored Pavement for Bicycle Lanes*

The design of the experimental green colored pavement is not proprietary and can be used by any jurisdiction that requests and obtains interim approval from the FHWA to use green colored pavement.

Agencies across the United States are showing an increased interest in using colored pavement specifically for bicycle facilities, and many of them have submitted requests to the FHWA to experiment with colored pavement. During the past 10 years, the FHWA has approved experiments with green colored pavement for a variety of state and local government agencies.

[4] "Driving After Dark." *Public Roads.* Federal Highway Administration, n.d. Web.
[5] "Bollard Luminaries Create Pedestrian Crosswalk Safety in an Economic Model." *Transportation Lighting & Safety.* Lighting Research Center, n.d. Web.

9.1.11.2 *Buffered Bicycle Lanes*

Buffered bike lanes (also known as 'protected' bike lanes) are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

Typical Applications for buffered bicycle lanes include:

- Anywhere a standard bike lane is being considered
- On streets with high travel speeds, high travel volumes and/or high amounts of truck traffic
- On streets with extra lanes or extra lane width

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

9.1.11.3 *Separated Bicycle Lanes ("Cycle Tracks")*

Cycle tracks are separated bicycle facilities that run alongside a roadway. Unlike bike lanes, cycle tracks typically are separated from automobile traffic by a physical barrier, such as parked cars, bollards, a landscaped buffer, or a curb. Cycle tracks may be one- or two-way, and run with or against traffic. They may be at grade or at the level of the sidewalk.

9.1.11.4 *Bike Boxes*

Bike boxes are intended to improve awareness and visibility of bicyclists, allow cyclists to queue safely for a left turn, and to help prevent dangerous "right- hook" crashes. Cyclists are able to make a safe left turn in busy traffic by lining up in front of vehicles that are stopped (or will stop) behind the expanded crosswalk. Without the benefit of the bike box, the bicyclist may not be able to find a gap in the left-turning traffic.

9.1.11.5 *Shared Lane Markings ("Sharrows")*

According to an FHWA study entitled Evaluation of Shared Lane Markings (Publication No. FHWA-HRT-10-041), shared lane markings (also referred to as sharrows) help convey to motorists and bicyclists that they must share the roads on which they are operating. The purpose of the markings is to create improved conditions for bicyclists by clarifying where they are expected to ride and to remind motorists to expect bicyclists on the road.

In the absence of bicycle lanes, motorists often neglect to safely share travel lanes with bicyclists, which can compel bicyclists to ride closer to parked motor vehicles. Such a scenario can result in a dooring crash, which occurs when a vehicle door opens as the bicyclist passes. In addition, when bicyclists stay to the far right in narrow travel lanes, passing motorists often track too closely to the bicyclists.

9.1.11.6 *'Share The Road' signs*

The "Share The Road" combination sign consists of the W11-1 bicycle crossing warning sign and W16-1 "SHARE THE ROAD" plaque. Following are options/substitutions for the Share the Road sign as approved by the Manual on Uniform Traffic Control Devices (MUTCD):

- Section 9B.06 BICYCLES MAY USE FULL LANE Sign (R4-11)
    - The R4-11 sign may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.
- Section 9B.07 BICYCLE WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3cP)

- Section 9B.10 NO PARKING BIKE LANE Signs (R7-9, R7-9a)
  - The BIKE USE PED SIGNAL (R9-5) sign may be used where the crossing of a street by bicyclists is controlled by pedestrian signal indications.

9.1.12 Rural Road Initiatives

Rural road safety is a major concern nationwide since a majority of all highway fatalities occur on rural roads. According to the FHWA, rural roads account for approximately 40% of the vehicle miles traveled in the U.S., but almost 57% of fatalities. Additionally, 19,259 people were killed in rural crashes in 2009 and the fatality rate for rural crashes is more than twice the fatality rate in urban crashes. Typical safety projects on rural roads include installing shoulders, rumble strips, delineation, and warning signs.

10 Road Safety Performance Reporting

Safety has become a key metric for infrastructure improvements and other engineering projects. Implementation of an effective road safety performance reporting and monitoring program is key for ensuring that the data used to track traffic safety is accurate and available to all agencies.

10.1 Central Crash Database

Traffic safety engineering relies on accurate, timely, and thorough crash data. YMPO would benefit from the development of a centralized crash database for all member agencies. Ideally, the crash data would be obtained and stored under the direction of YMPO. The data would be sent annually to each member agency for review, and any edits would be directed back to YMPO for inclusion in the central database.

The ADOT crash database is typically 6 months behind in crash data (i.e. a crash occurring today will be entered into the database 6 months later). A regional database can provide more timely information. The database can be used for annual summaries of crashes by severity, driver violation, etc. to monitor the effectiveness of regional safety programs and projects.

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11 IMPLEMENTATION PLAN 2016-2025

Network screening provided the priority crash locations to be addressed. The implementation plan is the next phase of the process and focuses on how to correct the identified crash issues from both a funding and engineering approach.

11.1 IMPLEMENTING AN EFFECTIVE STSP

An effective strategic transportation safety plan is feasible, living, and regularly updated and embraced by safety stakeholders. A usable implementation plan for the region will:

- Identify large-scale steps to address carrying out the STSP and roles and responsibilities of stakeholders including FHWA, ADOT, YMPO, and other agencies
- Develop an evaluation strategy and a preliminary schedule for implementation of safety strategies
- Connect potential federal, state, regional, and local funding resources (HSIP, HURF, NHTSA/GOHS grants, TAP) to the appropriate safety strategy

Figure 11.1: STSP Implementation Process Model, FHWA

Figure 11.1 highlights FHWA's eight elements of a STSP Implementation Process Model. These elements and the following components are key factors in the Implementation Plan:

- Document measureable objectives and performance measures for each emphasis area
- Determine the data requirements for each performance measure
- Identify the required resources and action steps for implementing each countermeasure
- Identify a process to track countermeasure and action step implementation
- Integrate the STSP with other transportation safety plans
- Market STSP through branding, news events, web sites, and newsletters

- Monitor and track regularly the extent to which emphasis area strategies are being implemented
- Monitor and track regularly the extent to which emphasis area goals and objectives are being met

Sections 5 and 6 give detailed goals and strategies for implementing the STSP and for measuring the success of the STSP. Recommendations to encourage stakeholder support and participation in implementing the plan include:

- Form a STSP Champions Working Group of key safety stakeholders to identify issues affecting the implementation of the plan, celebrate successes, and identify emerging safety issues and discuss new safety strategies will help ensure the STSP is continually employed in the region
- Host an annual Regional Traffic Safety Conference to promote traffic safety for all stakeholders
- Form a fatal crash investigation team of engineering, law enforcement, and risk management to analyze fatal crashes in the region
- Update the STSP on a regular cycle, e.g. every 3 to 5 years

Beginning in 2018, MPOs must report on the following performance measures to FHWA:

- Number of fatalities
- Number of serious injuries
- Rate of fatalities per 100 million VMT
- Rate of serious injuries per 100 million VMT
- Number of combined non-motorized fatalities and non-motorized serious injuries

Figures 11.2, 11.3, and 11.4 provide 5-year rolling average crash graphs for the most recent crash data to provide an example of how these performance measures can be utilized.

Figure 11.2: YMPO Fatalities Frequency

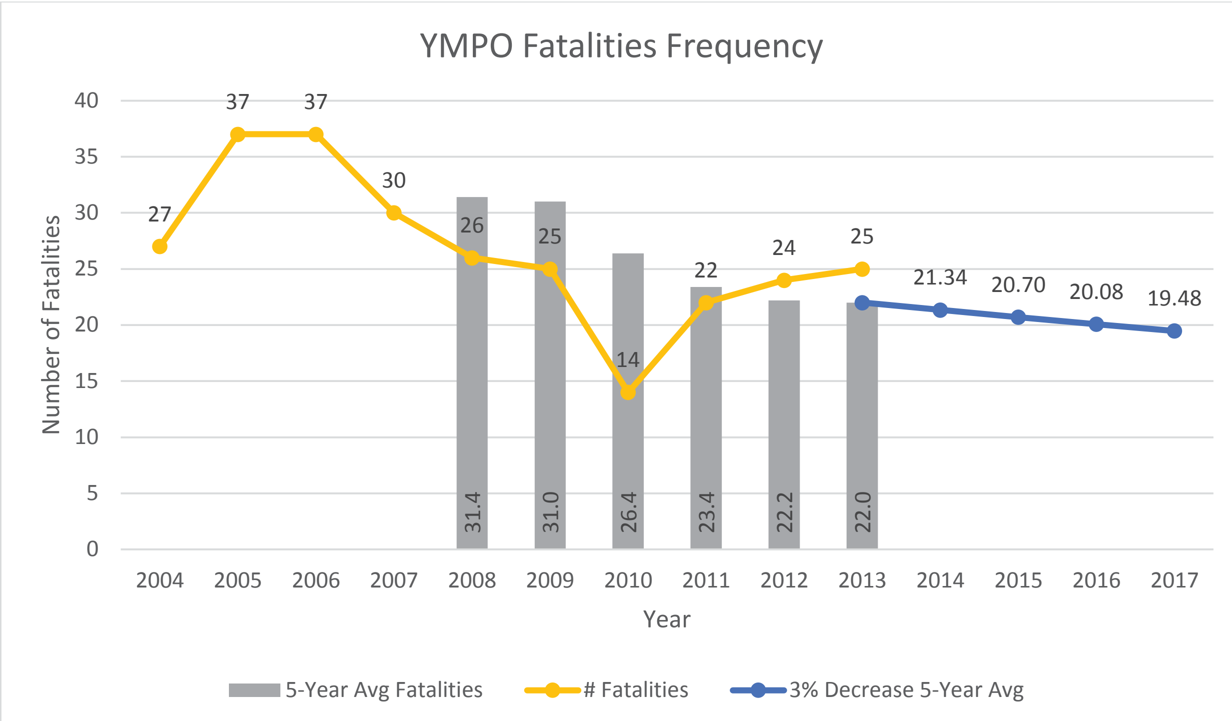


Figure 11.3: YMPO Serious Injuries Frequency

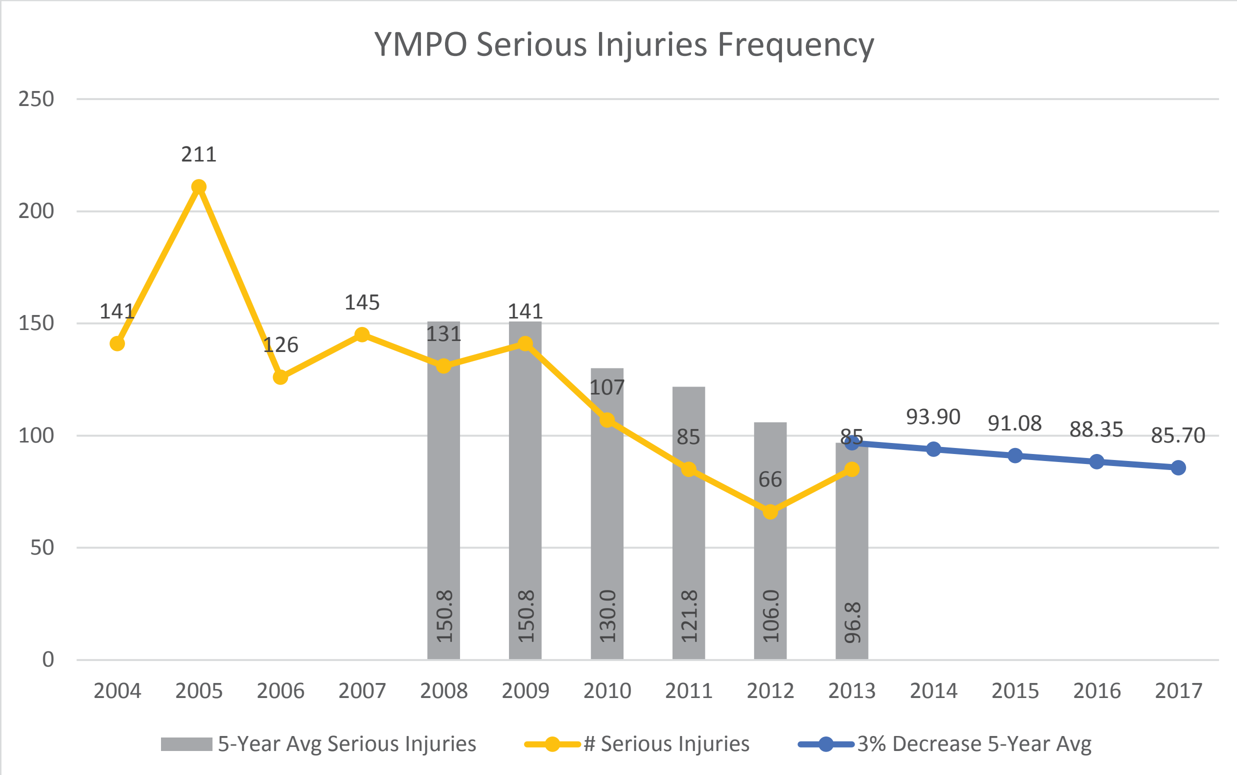
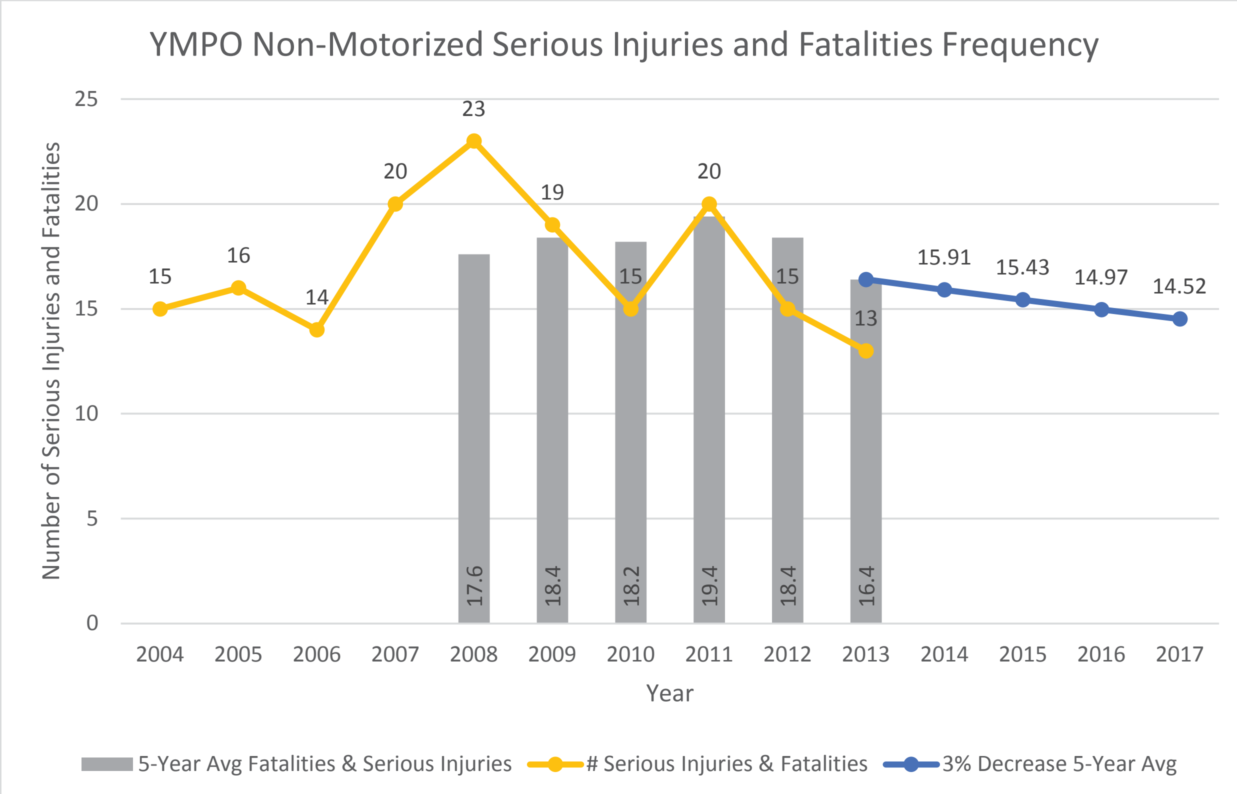


Figure 11.4: YMPO Non-Motorized Serious Injuries & Fatalities Frequency



11.2 Benefit Cost Analysis

The HSIP corridor analysis identified the top corridors that would likely qualify for an HSIP funding project; the YMPO Technical Advisory Committee approved them. Crashes in each corridor were reviewed, with emphasis given to fatal and serious injury crashes along the corridors shown in Table 11.1. The top three most common collision types for each corridor are noted in the table. A detailed review of the corridors characteristics was done and any noted pattern was determined through a review of crash data from 2010-2014. The data from 2010-2014 was used since the HSIP application requires the most recent 5 years of crash data. It should be noted that for County 14th St, no specific pattern could be determined that would benefit from improvements that will provide a B/C ratio at or exceeding 1.5, the minimum B/C ration for receiving HSIP eligibility. Since a safety project has already been programmed for Somerton Avenue, that corridor was eliminated as a top priority location.

Table 11.1: Top Accident Type for HSIP Selected Corridors

		Most Common Collision Manner		
#	Corridor	1st	2nd	3rd
1	W 8th St, S Ave B to S 4th Ave	Rear-end	Angle	Left-turn
2	4th Ave, 1st St to 14th St	Rear-end	Angle	Left-turn
3	16th St, Pacific Ave to Ave 3E	Rear-end	Angle	Left-turn
4	24th St, S Ave B to Pacific Ave	Rear-end	Left-turn	Angle
5	S Ave B, 1st St to 32nd St	Rear-end	Left-turn	Angle
6	County 14th St, US 95 to Ave D	Rear-end	Single-Vehicle	Left-turn
7	Ave 3E, County 19th St to 32nd St	Rear-end	Left-turn	Angle
8	County 19th St, Avenue B to US 95	Single-Vehicle	Rear-end	Angle
9	Somerton Ave, County 13th St to County 19th St	Rear-end	Angle	Left-turn

Table 11.2 is a summary of the proposed priority projects. Detailed HSIP application summaries can be found in Appendix B and planning level cost estimates can be found in Appendix C. The CMF Clearinghouse website[6] was used to determine appropriate countermeasures and a detailed description of each is provided in Appendix D.

[6] Website: http://www.cmfclearinghouse.org/

Table 11.2: Project Matrix

Corridor #	Location	Improvement	CRF	Service Life	Total Cost	Annual Benefit	Annual Cost	B/C
1	8th St & Magnolia	WB LT to Protect/Perm	16%	10	$20,375	$25,600	$3,136	8.1
1	8th St & 21st Ave	HAWK signal	69%	10	$161,762	$855,600	$24,207	35.3
1	8th St, Ave B to 4th Ave	LED lighting***	69%/ 28%	15	$96,232	$867,600	$12,243	70.8
2	4th Ave & 5th St	HAWK signal	69%	10	$161,812	$855,600	$24,215	35.3
2	4th Ave & 13th St	Pork chop Medians	44%	10	$113,390	$510,400	$16,998	30
2	4th Ave, 1st St to 14th St	LED lighting***	69%/ 28%	15	$97,576	$2,468,400	$12,400	199
3	16th St & Engler Ave	Traffic signal	44%	10	$484,791	$545,600	$82,248	6.6
3	16th St & Alamo Dr	Raised median	44%	20	$89,573	$545,600	$9,223	59.1
3	16th St, Pacific to Ave 3E	Improve lighting w/ LED***	69%/ 28%	15	$83,760	$1,623,200	$10,786	150.4
4	24th St & Arizona	Extend & widen EB LT lane	28%	20	$1,806,783	$369,600	$184,125	2
4	24th St, 7th Ave to 5th Ave	600' raised median, widen road	44%	20	$363,650	$70,400	$37,139	1.8
4	24th St, Ave B to Pacific Ave	LED lighting***	69%/ 28%	15	$149,616	$4,114,000	$18,480	222.6
5	Ave B, 12th St to 24th St	3 intersections to protected N/S	99%	10	$46,320	$316,800	$7,403	42.7
5	Ave B, 12th St to 24th St	3 intersections to FYA N/S	37%	10	$50,496	$116,800	$8,025	14.5
5	Ave B, 1st St to 32nd St	LED lighting***	69%/ 28%	15	$209,088	$3,291,200	$25,428	129.4
6	Co. 14th St	No Project Identified						
7	Ave 3E, Co. 12 to Co. 19	7 mi of ctr rumble strips	45%	10	$192,625	$72,000	$28,807	2.4
8	Co. 19th St, Ave F 3/4 to Ave I 3/4	Rumble strips, Ave G flasher stop	33% 16%	**6	$233,477	$117,200	$50,605	2.3
9	Somerton Ave	No Project Identified						

** = Used least of two CRF Service Lives
***= See notes on B/C calculations for limitations

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12 Appendix A: Regional Crash Table

12.1 Crash Tables, Yuma County

Table 12.1: Top Signalized Intersections, Yuma County

		Severity												
Intersection	**ADEV**	**1**	**2**	**3**	**4**	**5**	**Freq**	**Freq Rank**	**Rate**	**Rate Rank**	**SI**	**SI Rank**	**PI**	**PI Rank**
Ave 5 E & Co 14th St	14319	30	8	11	2	1	52	32	0.99	41	1.64	58	131	26
Ave 3 E & Hwy 95	30701	37	4	7	6	1	55	33	0.49	24	1.81	67	124	31
Ave 3 E & E 32nd St	35399	112	18	17	3	0	150	58	1.16	48	1.33	16	122	32
Ave 3 E & Co 15th St	10154	17	2	3	3	1	26	15	0.70	30	1.93	69	114	39
40th St & Foothills Blvd	17715	22	5	10	1	0	38	23	0.59	27	1.52	51	101	47
Ave C & 8th St	16458	36	7	11	1	0	55	33	0.92	35	1.41	31	99	48
Co 14th St & Hwy 95	24993	18	3	8	3	0	32	18	0.35	13	1.79	64	95	49
Co 15th St & Hwy 95	28583	22	6	10	0	0	38	23	0.36	15	1.42	34	72	56
Co 19th St & Hwy 95	13435	17	1	4	0	0	22	11	0.45	20	1.23	6	37	64
Co 16th St & Ave G	15263	10	2	2	0	0	14	7	0.25	8	1.29	13	28	66
40th St & Fortuna Road	19660	9	0	4	0	0	13	6	0.18	6	1.31	14	26	67
Co 23rd St & Ave F	12166	0	0	0	0	0	0	1	0.00	1	0.00	1	3	70

Table 12.2: Top 20 Unsignalized Intersections, Yuma County

		Severity												
Intersection	ADEV	1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI
S Ave B & W County 19th St	9408	19	10	8	4	0	41	41	1.19	38	1.91	36	115
S Ave 4 E & E 48th St	3373	12	6	5	2	0	25	30	2.03	43	1.82	35	108
W County 14th St & Somerton Ave	7257	15	5	4	1	1	26	31	0.98	37	1.72	29	97
W 16th St & S Ave D	8766	19	4	3	1	1	28	34	0.88	34	1.59	27	95
S Ave 4 E & E County 14th St	9146	10	6	3	2	1	22	27	0.66	25	2.06	39	91
S Ave C & W County 14th St	9482	16	1	9	1	0	27	33	0.78	30	1.55	24	87
S Ave 36 E & Old Hwy 80	1453	10	3	4	0	0	17	18	3.21	44	1.41	17	79
W County 14th St & S Ave G	3816	4	1	3	1	1	10	1	0.72	28	2.36	44	73
S Somerton Ave & W Co 9th St	5377	3	2	4	1	0	10	1	0.51	21	2.08	40	62
S Ave G & Co 19th St S	7446	4	0	3	3	0	10	1	0.37	14	2.74	45	60
S Ave 40 E & Old Hwy 80	3159	13	0	2	0	0	15	14	1.30	40	1.13	5	59
W 24th St & S Somerton Ave	10167	7	2	3	1	0	13	8	0.35	13	1.75	32	53
County 15th St & Avenue A	21167	13	3	2	0	1	19	22	0.25	8	1.52	22	52
S Somerton Ave & W Co 11th St	11099	11	0	2	0	0	13	8	0.32	12	1.15	7	27

Table 12.3: Top 20 Segments, Yuma County

			Severity												
Segment	Volume	Length (mi)	1	2	3	4	5	Freq (C/Mi)	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
MAIN ST (HWY 95), 2ND AVE TO 3RD AVE	8794	0.09	2	1	1	1	0	58.22	159	181.38	150	2.36	152	461	1
AVE G, CO 14TH ST S TO CO 15TH ST	639	1.00	11	1	9	3	2	26.08	134	1118.24	166	2.31	148	448	2
AVE B, CO 18 1/2 ST TO CO 19TH ST	6739	0.51	15	8	5	3	0	60.93	161	247.71	160	1.88	117	438	5
7TH AVE, AVE I 1/2 TO	2385	0.26	2	0	1	1	1	19.25	113	221.13	157	3.12	167	437	6

Segment	Volume	Length (mi)	Severity 1	2	3	4	5	Freq (C/Mi)	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
COLLEGE ST															
CO 19TH ST, AVE G TO AVE H	5814	0.99	6	3	12	5	0	26.32	135	124.05	143	2.50	156	434	7
HWY 95, FROM THE FARM RD TO MADONNA RD	7610	0.41	2	3	1	2	0	19.40	114	69.85	124	2.70	165	403	10
CO 19TH ST, SOMERTON AVE TO AVE F	7066	0.50	11	1	3	2	0	33.83	148	131.16	145	1.80	106	399	12
AVE G, 1 CO 13TH ST TO CO 14TH ST	639	1.00	8	2	5	1	1	17.02	103	729.53	164	1.98	128	395	13
AVE 36 E, HWY 80 TO I-8	632	0.09	5	2	2	0	0	94.84	166	4111.18	167	1.44	53	386	16
CO 19TH ST, AVE A 1/2 TO AVE B	2815	0.51	4	1	3	1	0	17.74	107	172.69	149	1.98	129	385	17
SOMERTON AVE, CO 13TH ST TO CO 14TH ST	3828	0.98	11	5	4	2	0	22.45	124	160.70	148	1.85	111	383	18
CO. 16TH ST, AVE G TO VALLEY VISTA APTS	9239	0.26	3	0	1	1	0	19.17	112	56.85	117	2.16	143	372	22
MAIN ST, CO 19TH ST TO CO 19 ½ ST	13305	0.46	7	1	1	1	1	24.12	127	49.66	109	2.05	132	368	23
S AVE J, CO 20 1/2 ST TO CO 21ST ST	13305	0.50	1	4	3	2	0	19.85	117	40.87	87	2.66	164	368	23
CO 19TH ST, AVE I TO AVE I 1/2	4033	0.49	2	1	2	1	0	12.20	83	82.91	130	2.30	147	360	26
CO 19TH ST, AVE H TO AVE I	4033	1.02	18	5	5	1	0	28.51	141	193.69	155	1.51	59	355	27
AVE 40 E, OHIO AVE TO HWY 80	532	0.04	8	0	2	0	0	245.04	168	12619.12	168	1.20	17	353	28

Segment	Volume	Length (mi)	Severity 1	2	3	4	5	Freq (C/Mi)	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
E HWY 80, AVE 40 E TO 1ST PL	921	0.19	4	1	1	0	0	32.05	146	953.39	165	1.33	39	350	31
CO 14TH ST, SOMERTON AVE TO AVE F	5365	0.41	6	0	1	0	1	19.73	115	100.76	136	1.73	97	348	32
CO 19TH ST, AVE F TO AVE G	7066	0.99	11	2	4	2.00	0	19.17	111	74.34	126	1.82	109	346	33

12.2 Crash Tables, City of Yuma

Table 12.4: Top 20 Signalized Intersections, City of Yuma

		Severity												
Intersection	**ADEV**	**1**	**2**	**3**	**4**	**5**	**Freq**	**Freq Rank**	**Rate**	**Rate Rank**	**SI**	**SI Rank**	**PI**	**PI Rank**
S Ave B & W 16th St	41167	243	66	40	10	2	361	71	2.40	69	1.45	38	178	1
S Ave B & W 24th St	37868	152	56	37	5	1	251	67	1.82	64	1.49	46	177	2
E 16th St & S Arizona Ave	40554	131	53	23	5	0	212	65	1.43	57	1.47	42	164	3
E 24th St & S Arizona Ave	24111	119	46	20	3	0	188	61	2.14	67	1.43	35	163	4
W 8th St & S 4th Ave	31797	80	37	27	3	0	147	57	1.27	52	1.53	53	162	5
S 4th Ave & W 24th St	50393	205	75	25	5	0	310	70	1.69	62	1.40	25	157	7
W Catalina Dr & S 4th Ave	32380	67	27	27	4	1	126	54	1.07	45	1.62	57	156	8
W 24th St & S Ave A	34370	180	58	28	2	0	268	68	2.14	68	1.36	20	156	8
E 32nd St & W 32nd St	18975	69	31	14	2	0	116	51	1.67	61	1.47	41	153	10
S 4th Ave Extension & W 32nd St	17346	66	18	8	4	1	97	44	1.53	59	1.52	49	152	11
E 16th St & S 1st Ave	37723	136	57	18	2	0	213	66	1.55	60	1.40	24	150	12
W 16th St & S Ave C	20072	55	20	12	3	1	91	42	1.24	51	1.56	56	149	13
S Ave B & W 8th St	15653	114	21	19	2	1	157	60	2.75	70	1.35	19	149	13
W 16th St & S 4th Ave	55187	178	78	29	1	0	286	69	1.42	56	1.39	23	148	15
E 24th St & S Pacific Ave	51850	112	43	29	4	0	188	61	0.99	40	1.49	45	146	16
W 16th St & S Ave A	35783	125	46	25	1	0	197	64	1.51	58	1.38	22	144	17
S Ave 8 E & E 32nd St	10135	21	8	10	4	0	43	26	1.16	49	1.87	68	143	18
E 32nd St & S Pacific Ave	38210	99	39	13	3	0	154	59	1.10	47	1.43	37	143	18
S Ave 5 E & E 32nd St	23690	27	24	11	6	1	69	37	0.80	33	1.99	71	141	20
W 12th St & S Ave B	22368	38	27	13	3	0	81	40	0.99	39	1.67	60	139	21

Table 12.5: Top 20 Unsignalized Intersections, City of Yuma

		Severity												
Intersection	ADEV	1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
32nd St & Ave D	6770	19	6	5	2	1	33	38	1.34	41	1.77	33	112	2
Ave 5 E & E 40th St	1441	9	3	7	2	0	21	25	3.99	45	1.93	37	107	4
S Gila St & Harold C Giss Pkwy	9177	48	12	6	2	0	68	44	2.03	42	1.41	16	102	5
S Ave C & 12th St	13138	21	9	7	2	0	39	40	0.81	32	1.66	28	100	6
Harold C Giss Pkwy & S Madison Ave	21327	82	10	4	0	0	96	45	1.23	39	1.15	6	90	10
S Ave 4 E & E 40th St	6346	9	2	2	3	0	16	16	0.69	27	2.15	43	86	12
E 40th St & S Ave 3 E	10799	21	5	4	1	0	31	36	0.79	31	1.45	19	86	12
Harold C Giss Pkwy & S 1st Ave	13358	35	6	2	0	0	43	42	0.88	35	1.19	9	86	12
S Ave A & W Airport Loop	15812	9	6	5	3	0	23	28	0.40	16	2.10	41	85	15
W 16th St & S 8th Ave East	30706	32	10	8	2	0	52	43	0.46	19	1.53	23	85	15
N Frontage Rd & S Ave 9 E	10180	19	6	2	1	0	28	34	0.75	29	1.46	20	83	17
48th St & S Ave 3E	11294	15	4	6	1	0	26	31	0.63	24	1.57	26	81	18
W 40th St & S Ave C	6198	12	4	4	0	0	20	24	0.88	36	1.40	15	75	20
S Ave B & W 1st St	19930	9	5	2	3	0	19	22	0.26	9	2.13	42	73	21
S Ave 10 E & S Frontage Rd	7988	11	1	2	2	0	16	16	0.55	22	1.79	34	72	23
W Catalina Dr & S 8th Ave	23025	18	10	3	0	0	31	36	0.37	15	1.42	18	69	24
W 1st St & S Ave A	15497	8	6	2	1	0	17	18	0.30	10	1.75	31	59	28
E 24th St & S Ave 9 E	4848	9	1	1	1	0	12	6	0.68	26	1.57	25	57	30
W 12th St & S Ave A	13195	8	1	5	1	0	15	14	0.31	11	1.72	30	55	31
Co 16th St & S Ave 3 E	15543	7	3	1	1	1	13	8	0.23	7	2.05	38	53	33

Table 12.6: Top Segments, City of Yuma

Segment	Volume	Length (mi)	Severity 1	2	3	4	5	Freq (C/Mi)	Frequency Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
S AVENUE 3 E, CO 17TH ST TO CO 17 1/4	7096	0.25	2	1	2	0	0	19.98	120	77.13	129	1.60	72	321	41
S AVENUE 3 E, CO 17 3/4 TO CO 18TH	7096	0.25	5	0	0	0	0	19.96	119	77.08	128	1.00	1	248	89
S SR 195 HWY, CO 14TH ST TO AVE A	8000	1.37	2	0	4	0	0	4.37	7	14.96	27	1.67	82	116	153
S AVENUE 3 E, CO 16TH ST TO CO 17TH ST	7096	0.87	5	0	1	0	0	6.87	31	26.53	57	1.17	13	101	159

12.3 Crash Tables, City of Somerton

Table 12.7: Top Signalized Intersections, City of Somerton

Intersection	ADEV	Severity 1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
W County 16th St & S Ave D	34037	12	5	5	3	0	25	12	0.20	7	1.98	70	89	50
W Main St & S Somerton Ave	18216	15	0	1	0	1	17	9	0.26	9	1.34	17	35	65

Table 12.8: Top Unsignalized Intersections, City of Somerton

Intersection	Agency	ADEV	Severity 1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
S Ave B & W County 16th St	City of Somerton	8894	13	4	1	0	0	18	21	0.55	23	1.28	10	54	32
W County 15th St & S Ave B	City of Somerton	11293	14	2	1	0	0	17	18	0.41	17	1.18	8	43	37

Table 12.9: Top Segments, City of Somerton

Segment	Volume	Length (mi)	Severity 1	2	3	4	5	Freq	Freq (C/Mi)	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
CO 16TH ST, CANAL TO AVE G	8400	0.50	2	0	1	1	2	6	11.99	81	39.11	81	3.57	168	330	36
AVE G, FARM ROAD TO CO 16TH ST	593	1.00	6	0	1	1	0	8	8.03	47	371.06	162	1.73	97	306	52

12.4 Crash Tables, City of San Luis

Table 12.10: Top Signalized Intersections, City of San Luis

Intersection	ADEV	Severity 1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
Juan Sanchez Blvd and 8th Avenue (Ave H1/2)	17361	15	9	1	0	0	25	12	0.39	16	1.40	25	53	60
US HWY 95 and Juan Sanchez Blvd. (County 23rd Street)	31818	45	2	3	0	0	50	30	0.43	19	1.10	3	52	61
US HWY 95 (Main St) and County 22nd Street	21778	17	7	1	0	0	25	12	0.31	11	1.32	15	38	63
Archibald St. and Urtuzuastegui St.	20206	7	1	0	0	0	8	4	0.11	3	1.13	5	12	69

Table 12.11: Top Unsignalized Intersections, City of San Luis

		Severity												
Intersection	**ADEV**	**1**	**2**	**3**	**4**	**5**	**Freq**	**Freq Rank**	**Rate**	**Rate Rank**	**SI**	**SI Rank**	**PI**	**PI Rank**
D St & Main St	23497	35	3	0	0	0	38	39	0.44	18	1.08	3	60	26
Juan Sanchez Blvd. (County 23rd Street) & 10th Ave	3517	11	0	0	0	0	11	5	0.86	33	1.00	1	39	38
Main St & Urtuzuastegui St	39511	22	1	0	0	0	23	28	0.16	6	1.04	2	36	40
Juan Sanchez Blvd. (County 23rd Street) & 6th Ave	34727	10	3	1	0	0	14	12	0.11	2	1.29	11	25	43
4th Ave & Juan Sanchez Blvd. (County 23rd Street)	19959	9	1	0	0	0	10	1	0.14	4	1.10	4	9	45

Table 12.12: Top Segments, City of San Luis

			Severity												
Segment	**Volume**	**Length (mi)**	**1**	**2**	**3**	**4**	**5**	**Freq (C/Mi)**	**Freq Rank**	**Rate**	**Rate Rank**	**SI**	**SI Rank**	**PI**	**PI Rank**
S HWY 95, CO 21ST ST TO CO 21 1/2 ST	14597	0.50	2	2	1	0	0	9.90	65	18.59	35	1.60	72	172	132

12.5 CRASH TABLES, ADOT

Table 12.13: Top Signalized Intersections, ADOT

		Severity												
Intersection	ADEV	1	2	3	4	5	Freq	Freq Rank	Rate	Rate Rank	SI	SI Rank	PI	PI Rank
US HWY 95 & Fortuna Rd	24633	75	29	17	4	0	125	53	1.39	55	1.52	52	160	6
E Frontage Rd & S Ave 11 E	26595	155	21	15	2	0	193	63	1.99	66	1.24	7	136	24
E 32nd St & State Rte 195 / Araby Rd	39349.5	67	27	18	2	0	114	50	0.79	32	1.48	44	126	30
S Ave 11 E & N Frontage Rd	16568.5	85	10	12	1	0	108	48	1.79	63	1.25	9	120	35
US Hwy 95 & S Araby Rd	19001	18	6	5	1	2	32	18	0.46	21	1.79	64	103	44
S Ave 13 E & S Frontage Rd	22104	26	8	4	1	0	39	25	0.48	22	1.43	36	83	52
Fortuna Rd & Hwy 95	12200	12	3	2	1	0	18	10	0.40	17	1.54	54	81	53
S Ave 3 E & Gila Ridge Rd	36421	82	8	2	0	0	92	43	0.69	29	1.11	4	76	55
Foothills Blvd & North Frontage Rd	12009	11	1	2	1	0	15	8	0.34	12	1.52	50	70	57
S Ave 7 E & US Hwy 95	24928.5	23	2	6	1	0	32	18	0.35	14	1.40	25	57	58
S Araby Rd & E Gila Ridge Rd	23799	28	4	5	0	0	37	22	0.43	18	1.24	8	48	62
N SR 195 & E County 14th St	12972	6	2	0	0	0	8	4	0.17	5	1.25	10	19	68
E SR 195 & S Ave E	7970	0	0	0	0	0	0	1	0.00	1	0.00	1	3	70

13 APPENDIX B: HSIP APPLICATION SUMMARIES

Required for all HSIP Applications

Agency:	City of Yuma/YMPO	**Title of Project:**	8th Street and Magnolia Make WB LT Protected/Permissive

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.00**		0.00	$5,800,000	$0
Incapacitating Injury	**0.40**	**16%**	0.06	$400,000	$25,600
				Total Annual Benefits	$25,600

Costs

Total Project Cost	$20,375
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$3,036
Annual Maintenance Cost	$100.00
Total Annual Costs	$3,136

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$25,600	$3,136	8.1

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Project involves changing construction and phasing change to WB LT Lane so that it is Protected/ Permissive rather than Permissive

Required for all HSIP Applications

Agency:	City of Yuma/YMPO	**Title of Project:**	8th Street and 21st Avenue HAWK

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**69%**	0.14	$5,800,000	$800,400
Incapacitating Injury	**0.20**	**69%**	0.14	$400,000	$55,200
				Total Annual Benefits	$855,600

Costs

Total Project Cost	$161,762
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$24,107
Annual Maintenance Cost	$100.00
Total Annual Costs	$24,207

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$855,600	$24,207	35.3

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*This involves installing a Pedestrian "HAWK" signal at 21st Avenue. This location is a school crossing.

Required for all HSIP Applications

Agency:	City of Yuma/YMPO	**Title of Project:**	4th Avenue and 5th Street Pedestrian HAWK

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**69%**	0.14	$5,800,000	$800,400
Incapacitating Injury	**0.20**	**69%**	0.14	$400,000	$55,200
				Total Annual Benefits	$855,600

Costs

Total Project Cost	$ 161,812
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$24,115
Annual Maintenance Cost	$100.00
Total Annual Costs	$24,215

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$855,600	$24,215	35.3

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

Required for all HSIP Applications

Agency:	Yuma Co/YMPO	Title of Project:	Pork Chop Medians at 13th Street and 4th Avenue

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	0.20	44%	0.09	$5,800,000	$510,400
Incapacitating Injury	0.00	44%	0.00	$400,000	$0
				Total Annual Benefits	$510,400

Costs

Total Project Cost	$113,390
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$16,898
Annual Maintenance Cost	$100.00
Total Annual Costs	$16,998

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$510,400	$16,998	30.0

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*A "pork-chop" or RT in and RT out only median at 13th Street approaches at the 4th Avenue intersection

Required for all HSIP Applications

Agency:	City/County/YMPO	**Title of Project:**	16th Street/Engler Traffic Signal

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**44%**	0.09	$5,800,000	$510,400
Incapacitating Injury	**0.20**	**44%**	0.09	$400,000	$35,200
				Total Annual Benefits	$545,600

Costs

Total Project Cost	$484,791
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$72,248
Annual Maintenance Cost	$10,000.00
Total Annual Costs	$82,248

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$545,600	$82,248	6.6

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

Note: Before Implementation, a warrant Study should be conducted.
*One Fatal and One Incapacitating Injury at this location

Required for all HSIP Applications

Agency:	Yuma Co/YMPO	**Title of Project:**	Raised Median at 16th Street and Alamo Drive

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**44%**	0.09	$5,800,000	$510,400
Incapacitating Injury	**0.20**	**44%**	0.09	$400,000	$35,200
				Total Annual Benefits	$545,600

Costs

Total Project Cost	$89,573
Project Life (years)	20
Interest Rate (%)	8%
Capital Recovery Factor	0.1019
Annual Construction Cost	$9,123
Annual Maintenance Cost	$100.00
Total Annual Costs	$9,223

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$545,600	$9,223	59.1

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Project entails installing 200' of raised median to prevent left turn conflicts at Alamo Drive
*Another option, least costly and with potentially the same benefits would be to install right-in, right-out porkchop at Alamo North Leg
*One Fatal and One Serious injury occur here

Required for all HSIP Applications

Agency:	City of Yuma/YMPO	Title of Project:	24th Street and Arizona LT Lane at West Leg

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**28%**	0.06	$5,800,000	$324,800
Incapacitating Injury	**0.40**	**28%**	0.11	$400,000	$44,800
				Total Annual Benefits	$369,600

Costs

Total Project Cost	$ 1,806,783
Project Life (years)	20
Interest Rate (%)	8%
Capital Recovery Factor	0.1019
Annual Construction Cost	$184,025
Annual Maintenance Cost	$100.00
Total Annual Costs	$184,125

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$369,600	$184,125	2.0

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Given the inadequate Condition of the EB LT turn lane and preceding lane of continuous TWLTL, the proper addition of a LT lane was considered as an addition on one major (EB) approach
*1 Fatal and 2 serious injury rear end accidents occurred over a 5 year period. All EB, all intersection related and in turn lane or inside lane.
*The widening was shifted northerly to avoid interaction with WAPA powerlines on the south side

Required for all HSIP Applications

Agency:	COY/YMPO	Title of Project:	24th Street from 7th Ave to 5th Ave Median Installation

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	0.00	44%	0.00	$5,800,000	$0
Incapacitating Injury	0.40	44%	0.18	$400,000	$70,400
				Total Annual Benefits	$70,400

Costs

Total Project Cost	$ 363,650.00
Project Life (years)	20
Interest Rate (%)	8%
Capital Recovery Factor	0.1019
Annual Construction Cost	$37,039
Annual Maintenance Cost	$100.00
Total Annual Costs	$37,139

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$70,400.0	$37,138.6	1.8

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists <u>Only</u> at Tabs 17 - 19 preferred.**

*A raised Median around 600 feet in length will restrict left turn and angle accident conflicts from side streets. Therefore a raised median from about 5th Avenue to 7th Avenue will be installed.

Required for all HSIP Applications

Agency:	City of Yuma	**Title of Project:**	Convert 3 Avenue B Locations to Protected, North&South Approaches

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.00**	**0%**	0.00	$5,800,000	$0
Incapacitating Injury	**0.80**	**99%**	0.79	$400,000	$316,800
				Total Annual Benefits	$316,800

Costs

Total Project Cost	$46,320
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$6,903
Annual Maintenance Cost	$500.00
Total Annual Costs	$7,403

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$316,800	$7,403	42.7

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Locations are 12th Street, 16th Street and 24th Street
*All locations would have two legs converted (North and South Approaches) and includes two faces per approach
*All locations had accidents on North and South Approaches

Required for all HSIP Applications

Agency:	City of Yuma	**Title of Project:**	Convert 3 Avenue B Locations to FYA Turns, North&South Approaches

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.00**	**0%**	0.00	$5,800,000	$0
Incapacitating Injury	**0.80**	**37%**	0.29	$400,000	$116,800
				Total Annual Benefits	$116,800

Costs

Total Project Cost	$50,496
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$7,525
Annual Maintenance Cost	$500.00
Total Annual Costs	$8,025

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$116,800	$8,025	14.5

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Locations are 12th Street, 16th Street and 24th Street
*All locations would have two legs converted (North and South Approaches) to Flashing Yellow Arrow and includes two faces per approach
*All locations had accidents on North and South Approaches

Required for all HSIP Applications

Agency:	City of Yuma	**Title of Project:**	Avenue B Lighting Improvements

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.80**	**69%**	0.55	$5,800,000	$3,201,600
Incapacitating Injury	**0.80**	**28%**	0.22	$400,000	$89,600
				Total Annual Benefits	$3,291,200

Costs

Total Project Cost	$208,752
Project Life (years)	15
Interest Rate (%)	8%
Capital Recovery Factor	0.1168
Annual Construction Cost	$24,388
Annual Maintenance Cost	$1,000.00
Total Annual Costs	$25,388

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$3,291,200	$25,388	129.6

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Replacement of all existing HPS or other similar Luminairs along Avenue B from 32nd Street to 1st Street
*Used 4 star star Serious injury and 3 star Fatal from same study for CMF Reduction
*Study indicated "No Prior Condition". No study for replacing existing luminaires with improved LEDs currently exist

Required for all HSIP Applications

Agency:	City of Yuma	**Title of Project:**	Avenue B Bike Lanes

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.00**	**35%**	0.00	$5,800,000	$0
Incapacitating Injury	**0.20**	**35%**	0.07	$400,000	$28,000
				Total Annual Benefits	$28,000

Costs

Total Project Cost	$101,079
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$15,064
Annual Maintenance Cost	$1,000.00
Total Annual Costs	$16,064

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$28,000	$16,064	1.7

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Provide Lane Reduction from 12th Street to 1st Street on Avenue B to create two 4 ft bike lanes.
*65% (11/17) of the bike accidents occur on this corridor for the range identified.
*One Fatal and one severe occur in the range identified over 5 year period. However Fatal was NOT counted because bike was travelling on 8th Street and not Avenue B.
*For the 60 cross section (not counting gutter pan) reduce ouside lanes to 11 feet; inside lanes and two-way center turn lane, provide 10 ft lane.

Required for all HSIP Applications

Agency:	Yuma County	**Title of Project:**	Avenue 3E Rumble Strips from County 12 1/2 to Co. 16 1/2 Street

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.00**	**0%**	0.00	$5,800,000	$0
Incapacitating Injury	**0.40**	**45%**	0.18	$400,000	$72,000
				Total Annual Benefits	$72,000

Costs

Total Project Cost	$128,688
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$19,178
Annual Maintenance Cost	$100.00
Total Annual Costs	$19,278

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$72,000	$19,278	3.7

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists <u>Only</u> at Tabs 17 - 19 preferred.**

*1 Single Vehicle, 2 Head-On
*Involves approx. 4 Miles of Rumble Strips (Center)

Required for all HSIP Applications

Agency:	Yuma County/YMPO	Title of Project:	County 19th Street Rumble and Avenue G Flasher

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**9%**	0.02	$5,800,000	$104,400
Incapacitating Injury	**0.20**	**16%**	0.03	$400,000	$12,800
				Total Annual Benefits	$117,200

Costs

Total Project Cost	$155,080
Project Life (years)	6
Interest Rate (%)	8%
Capital Recovery Factor	0.2163
Annual Construction Cost	$33,546
Annual Maintenance Cost	$100.00
Total Annual Costs	$33,646

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$117,200	$33,646	3.4

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Install Rumble Strips C/L for 4.25 miles of County 19th Roadway
*Improve w/ Flashing Beacon at Stop One side at Avenue G. Affects an Serious Injury
*Project Life is the least of the roadside vs. signage improvement

Required for all HSIP Applications

Agency:	Yuma County	**Title of Project:**	Somerton Avenue Rumble Strips From Co 19th to Co 17th

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CMF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**9%**	0.02	$5,800,000	$104,400
Incapacitating Injury	**0.00**	**9%**	0.00	$400,000	$0
				Total Annual Benefits	$104,400

Costs

Total Project Cost	$76,570
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$11,411
Annual Maintenance Cost	$1,000.00
Total Annual Costs	$12,411

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$104,400	$12,411	8.4

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 17 - 19 preferred.**

*Install Rumble Strips on C/L for three miles of County 19th Roadway

14 APPENDIX C: HSIP – PLANNING LEVEL COST ESTIMATES

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	YMPO		**Name of Project:**	8th Street &Magnolia	Spot Improvement with Non-HSIP construction included				
				HSIP Project Cost Estimate Worksheet					
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:	Design & Programming		1	$5,000.00	$ 5,000.00	$ 4,715.00	$ 285.00	$ -	$ 5,000.00
ROW Acquisition:					$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 2,000.00	$ 2,000.00	$ 1,886.00	$ 114.00	$ -	$ 2,000.00
Design Sub-Total					**$ 17,000.00**	**$ 16,031.00**	**$ 969.00**	**$ -**	**$ 17,000.00**
Construction:	Heads	EA	2	$ 500.00	$ 1,000.00	$ 943.00	$ 57.00	$ -	$ 1,000.00
Construction:	Conductor	LS	1	$ 1,000.00	$ 1,000.00	$ 943.00	$ 57.00	$ -	$ 1,000.00
Construction:	Loop Detectors	EA	1	$ 250.00	$ 250.00	$ 235.75	$ 14.25	$ -	$ 250.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 2,250.00	$ 2,121.75	$ 128.25	$ -	$ 2,250.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 2,250.00	$ 2,121.75	$ 128.25	$ -	$ 2,250.00
Traffic Control:			10.00%		$ 225.00	$ 212.18	$ 12.83	$ -	$ 225.00
Mobilization:			10.00%		$ 225.00	$ 212.18	$ 12.83	$ -	$ 225.00
Construction Sub-Total					$ 2,700.00	$ 2,546.10	$ 153.90	$ -	$ 2,700.00
Construction Admin :			14.00%		$ 378.00	$ 356.45	$ 21.55	$ -	$ 378.00
Contingencies :			5.00%		$ 135.00	$ 127.31	$ 7.70	$ -	$ 135.01
Post Design:			1.00%		$ 27.00	$ 25.46	$ 1.54	$ -	$ 27.00
Communications:			5.00%		$ 135.00	$ 127.31	$ 7.70	$ -	$ 135.01
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 675.00	$ 636.53	$ 38.49	$ -	$ 675.02
Post Const Sub-Total					**$ 3,375.00**	**$ 3,182.63**	**$ 192.39**	**$ -**	**$ 3,375.02**
TOTAL REQUEST					**$ 20,375.00**	**$ 19,213.63**	**$ 1,161.39**	**$ -**	**$ 20,375.02**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City/YMPO		**Name of Project:**	8th Street HAWK	Spot Improvement with Non-HSIP construction included

HSIP Project Cost Estimate Worksheet

Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	5.70%	0.00%	
Design:			1	$11,103.26	$ 11,103.26	$ 10,470.38	$ 632.89	$ -	$ 11,103.27
ROW Acquisition:					$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:			1	$ 15,000.00	$ 15,000.00	$ 14,145.00	$ 855.00	$ -	$ 15,000.00
Design Sub-Total					**$ 46,103.26**	**$ 43,475.38**	**$ 2,627.89**	**$ -**	**$ 46,103.27**
Construction:	HAWK Assembly	EA	1	$ 75,000.00	$ 75,000.00	$ 70,725.00	$ 4,275.00	$ -	$ 75,000.00
Construction:	Cross Walk	LF	512	$ 0.50	$ 256.00	$ 241.41	$ 14.59	$ -	$ 256.00
Construction:	Sidewalk Ramp	EA	2	$ 250.00	$ 500.00	$ 471.50	$ 28.50	$ -	$ 500.00
Construction:	Signing	EA	4	$ 150.00	$ 600.00	$ 565.80	$ 34.20	$ -	$ 600.00
Construction:	Yield Bar	EA	30	$ 25.00	$ 750.00	$ 707.25	$ 42.75	$ -	$ 750.00
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 77,106.00	$ 72,710.96	$ 4,395.04	$ -	$ 77,106.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 77,106.00	$ 72,710.96	$ 4,395.04	$ -	$ 77,106.00
Traffic Control:			**10.00%**		$ 7,710.60	$ 7,271.10	$ 439.50	$ -	$ 7,710.60
Mobilization:			**10.00%**		$ 7,710.60	$ 7,271.10	$ 439.50	$ -	$ 7,710.60
Construction Sub-Total					$ 92,527.20	$ 87,253.15	$ 5,274.05	$ -	$ 92,527.20
Construction Admin :			**14.00%**		$ 12,953.81	$ 12,215.44	$ 738.37	$ -	$ 12,953.81
Contingencies :			**5.00%**		$ 4,626.36	$ 4,362.66	$ 263.70	$ -	$ 4,626.36
Post Design:			**1.00%**		$ 925.27	$ 872.53	$ 52.74	$ -	$ 925.27
Communications:			**5.00%**		$ 4,626.36	$ 4,362.66	$ 263.70	$ -	$ 4,626.36
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 23,131.80	$ 21,813.29	$ 1,318.51	$ -	$ 23,131.80
Post Const Sub-Total					**$ 115,659.00**	**$ 109,066.44**	**$ 6,592.56**	**$ -**	**$ 115,659.00**
TOTAL REQUEST					**$ 161,762.27**	**$ 152,541.82**	**$ 9,220.45**	**$ -**	**$ 161,762.27**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	COY/YMPO		**Name of Project:**	4th Avenue HAWK	Spot Improvement with Non-HSIP construction included				
				HSIP Project Cost Estimate Worksheet					
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	5.70%	0.00%	
Design:			1	$11,107.58	$ 11,107.58	$ 10,474.45	$ 633.13	$ -	$ 11,107.58
ROW Acquisition:					$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:			1	$ 15,000.00	$ 15,000.00	$ 14,145.00	$ 855.00	$ -	$ 15,000.00
Design Sub-Total					**$ 46,107.58**	**$ 43,479.45**	**$ 2,628.13**	**$ -**	**$ 46,107.58**
Construction:	HAWK Assembly	EA	1	$ 75,000.00	$ 75,000.00	$ 70,725.00	$ 4,275.00	$ -	$ 75,000.00
Construction:	Cross Walk	LF	572	$ 0.50	$ 286.00	$ 269.70	$ 16.30	$ -	$ 286.00
Construction:	Sidewalk Ramp	EA	2	$ 250.00	$ 500.00	$ 471.50	$ 28.50	$ -	$ 500.00
Construction:	Signing	EA	4	$ 150.00	$ 600.00	$ 565.80	$ 34.20	$ -	$ 600.00
Construction:	Yield Bar	EA	30	$ 25.00	$ 750.00	$ 707.25	$ 42.75	$ -	$ 750.00
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 77,136.00	$ 72,739.25	$ 4,396.75	$ -	$ 77,136.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 77,136.00	$ 72,739.25	$ 4,396.75	$ -	$ 77,136.00
Traffic Control:			10.00%		$ 7,713.60	$ 7,273.93	$ 439.68	$ -	$ 7,713.60
Mobilization:			10.00%		$ 7,713.60	$ 7,273.93	$ 439.68	$ -	$ 7,713.60
Construction Sub-Total					$ 92,563.20	$ 87,287.10	$ 5,276.10	$ -	$ 92,563.20
Construction Admin :			14.00%		$ 12,958.85	$ 12,220.20	$ 738.65	$ -	$ 12,958.85
Contingencies :			5.00%		$ 4,628.16	$ 4,364.35	$ 263.81	$ -	$ 4,628.16
Post Design:			1.00%		$ 925.63	$ 872.87	$ 52.76	$ -	$ 925.63
Communications:			5.00%		$ 4,628.16	$ 4,364.35	$ 263.81	$ -	$ 4,628.16
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 23,140.80	$ 21,821.77	$ 1,319.03	$ -	$ 23,140.80
Post Const Sub-Total					**$ 115,704.00**	**$ 109,108.87**	**$ 6,595.13**	**$ -**	**$ 115,704.00**
TOTAL REQUEST					**$ 161,811.59**	**$ 152,588.32**	**$ 9,223.26**	**$ -**	**$ 161,811.58**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City/YMPO		**Name of Project:**	4th Ave at 13th Street	Spot Improvement with Non-HSIP construction included				
HSIP Project Cost Estimate Worksheet									
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:			1	$15,000.00	$ 15,000.00	$ 14,145.00	$ 855.00	$ -	$ 15,000.00
ROW Acquisition:	Four 25' Chamfers	SF	1252	$ 10.00	$ 12,520.00	$ 11,806.36	$ 713.64	$ -	$ 12,520.00
Environmental Clearance			1	$ 15,000.00	$ 15,000.00	$ 14,145.00	$ 855.00	$ -	$ 15,000.00
ADOT Admin Costs:			1	$ 5,200.00	$ 5,200.00	$ 4,903.60	$ 296.40	$ -	$ 5,200.00
Design Sub-Total					**$ 47,720.00**	**$ 44,999.96**	**$ 2,720.04**	**$ -**	**$ 47,720.00**
Construction:	Sawcut and Curb	LF	740	$ 17.00	$ 12,580.00	$ 11,862.94	$ 717.06	$ -	$ 12,580.00
Construction:	Median Paving	SF	4,000	$ 5.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Construction:	Truncated Domes	EA	8	$ 250.00	$ 2,000.00	$ 1,886.00	$ 114.00	$ -	$ 2,000.00
Construction:	Signing	EA	8	$ 150.00	$ 1,200.00	$ 1,131.60	$ 68.40	$ -	$ 1,200.00
Construction:	AC Replacement	SY	70	$ 50.00	$ 3,500.00	$ 3,300.50	$ 199.50	$ -	$ 3,500.00
Construction:	Sidewalk/25' radaii corners	SF	900	$ 5.00	$ 4,500.00	$ 4,243.50	$ 256.50	$ -	$ 4,500.00
HSIP Eligible Sub-Total					$ 43,780.00	$ 41,284.54	$ 2,495.46	$ -	$ 43,780.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 43,780.00	$ 41,284.54	$ 2,495.46	$ -	$ 43,780.00
Traffic Control:			10.00%		$ 4,378.00	$ 4,128.45	$ 249.55	$ -	$ 4,378.00
Mobilization:			10.00%		$ 4,378.00	$ 4,128.45	$ 249.55	$ -	$ 4,378.00
Construction Sub-Total					$ 52,536.00	$ 49,541.45	$ 2,994.55	$ -	$ 52,536.00
Construction Admin :			14.00%		$ 7,355.04	$ 6,935.80	$ 419.24	$ -	$ 7,355.04
Contingencies :			5.00%		$ 2,626.80	$ 2,477.07	$ 149.73	$ -	$ 2,626.80
Post Design:			1.00%		$ 525.36	$ 495.41	$ 29.95	$ -	$ 525.36
Communications:			5.00%		$ 2,626.80	$ 2,477.07	$ 149.73	$ -	$ 2,626.80
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 13,134.00	$ 12,385.35	$ 748.65	$ -	$ 13,134.00
Post Const Sub-Total					**$ 65,670.00**	**$ 61,926.80**	**$ 3,743.20**	**$ -**	**$ 65,670.00**
TOTAL REQUEST					**$ 113,390.00**	**$ 106,926.76**	**$ 6,463.24**	**$ -**	**$ 113,390.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	Yuma Co/YMPO		**Name of Project:**	16th @ Engler Improvements	Spot Improvement with Non-HSIP construction included				
				HSIP Project Cost Estimate Worksheet					
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 6.74%	**TOTAL COST**
Design:		LS	1	$32,283.60	$ 32,283.60	$ 30,443.43	$ 1,840.17	$ 2,175.60	$ 34,459.20
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance		LS	1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ 1,347.81	$ 21,347.81
ADOT Admin Costs:		LS	1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 72,283.60**	**$ 68,163.43**	**$ 4,120.17**	**$ 3,523.41**	**$ 75,807.01**
Construction:	Traffic Signal: Complete	EA	1	$ 250,000.00	$ 250,000.00	$ 235,750.00	$ 14,250.00	$ -	$ 250,000.00
Construction:	Pavement Marking	LF	1800	$ 0.50	$ 900.00	$ 848.70	$ 51.30	$ -	$ 900.00
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
Construction:				$ -	$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 250,900.00	$ 236,598.70	$ 14,301.30	$ -	$ 250,900.00
Construction:	Curb and Gutter	LF	314	$ 15.00	$ 4,710.00			$ 4,710.00	$ 4,710.00
Construction:	Sidewalk	SF	1884	$ 5.00	$ 9,420.00			$ 9,420.00	$ 9,420.00
Consturction:	Sidewalk Ramp	EA	4	$ 1,000.00	$ 4,000.00			$ 4,000.00	$ 4,000.00
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ 18,130.00			$ 18,130.00	$ 18,130.00
Construction Sub-Total					$ 269,030.00	$ 236,598.70	$ 14,301.30	$ 18,130.00	$ 269,030.00
Traffic Control:			10.00%		$ 26,903.00	$ 23,659.87	$ 1,430.13	$ 1,813.00	$ 26,903.00
Mobilization:			10.00%		$ 26,903.00	$ 23,659.87	$ 1,430.13	$ 1,813.00	$ 26,903.00
Construction Sub-Total					$ 322,836.00	$ 283,918.44	$ 17,161.56	$ 21,756.00	$ 322,836.00
Construction Admin :			14.00%		$ 45,197.04	$ 42,620.81	$ 2,576.23	$ 3,045.84	$ 48,242.88
Contingencies :			5.00%		$ 16,141.80	$ 15,221.72	$ 920.08	$ 1,087.80	$ 17,229.60
Post Design:			1.00%		$ 3,228.36	$ 3,044.34	$ 184.02	$ 217.56	$ 3,445.92
Communications:			5.00%		$ 16,141.80	$ 15,221.72	$ 920.08	$ 1,087.80	$ 17,229.60
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 80,709.00	$ 76,108.59	$ 4,600.41	$ 5,439.00	$ 86,148.00
Post Const Sub-Total					**$ 403,545.00**	**$ 360,027.03**	**$ 21,761.97**	**$ 27,195.00**	**$ 408,984.00**
TOTAL REQUEST					**$ 484,791.01**	**$ 428,190.46**	**$ 25,882.14**	**$ 30,718.41**	**$ 484,791.01**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	YMPO		**Name of Project:**	16th @ Alamo Option A	Spot Improvement with Non-HSIP construction included				
				HSIP Project Cost Estimate Worksheet					
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:		LS	1	$3,117.60	$ 3,117.60	$ 2,939.90	$ 177.70	$ -	$ 3,117.60
ROW Acquisition:					$ -	$ -	$ -	$ -	$ -
Environmental Clearance		LS	1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:		LS	1	$ 8,000.00	$ 8,000.00	$ 7,544.00	$ 456.00	$ -	$ 8,000.00
Design Sub-Total					**$ 31,117.60**	**$ 29,343.90**	**$ 1,773.70**	**$ -**	**$ 31,117.60**
Construction:	Sawcut	LF	400	$ 2.00	$ 800.00	$ 754.40	$ 45.60	$ -	$ 800.00
Construction:	Curb	LF	438	$ 15.00	$ 6,570.00	$ 6,195.51	$ 374.49	$ -	$ 6,570.00
Construction:	Median Paving	SF	4,400	$ 5.00	$ 22,000.00	$ 20,746.00	$ 1,254.00	$ -	$ 22,000.00
Construction:	Signing	EA	4	$ 150.00	$ 600.00	$ 565.80	$ 34.20	$ -	$ 600.00
Construction:	AC Replacement	SY	90	$ 100.00	$ 9,000.00	$ 8,487.00	$ 513.00	$ -	$ 9,000.00
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 38,970.00	$ 36,748.71	$ 2,221.29	$ -	$ 38,970.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 38,970.00	$ 36,748.71	$ 2,221.29	$ -	$ 38,970.00
Traffic Control:			10.00%		$ 3,897.00	$ 3,674.87	$ 222.13	$ -	$ 3,897.00
Mobilization:			10.00%		$ 3,897.00	$ 3,674.87	$ 222.13	$ -	$ 3,897.00
Construction Sub-Total					$ 46,764.00	$ 44,098.45	$ 2,665.55	$ -	$ 46,764.00
Construction Admin :			14.00%		$ 6,546.96	$ 6,173.78	$ 373.18	$ -	$ 6,546.96
Contingencies :			5.00%		$ 2,338.20	$ 2,204.92	$ 133.28	$ -	$ 2,338.20
Post Design:			1.00%		$ 467.64	$ 440.98	$ 26.66	$ -	$ 467.64
Communications:			5.00%		$ 2,338.20	$ 2,204.92	$ 133.28	$ -	$ 2,338.20
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 11,691.00	$ 11,024.60	$ 666.40	$ -	$ 11,691.00
Post Const Sub-Total					**$ 58,455.00**	**$ 55,123.05**	**$ 3,331.95**	**$ -**	**$ 58,455.00**
TOTAL REQUEST					**$ 89,572.60**	**$ 84,466.95**	**$ 5,105.65**	**$ -**	**$ 89,572.60**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	COY/YMPO		**Name of Project:**	**24th and AZ West Leg**	Spot Improvement with Non-HSIP construction included				
					HSIP Project Cost Estimate Worksheet				
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	5.70%	0.00%	
Design:	At 12%		1	$133,732.80	$ 133,732.80	$ 126,110.03	$ 7,622.77	$ -	$ 133,732.80
ROW Acquisition:	25000 SF Property	SF	25000	$ 10.00	$ 250,000.00	$ 235,750.00	$ 14,250.00	$ -	$ 250,000.00
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 413,732.80**	**$ 390,150.97**	**$ 23,582.77**	**$ -**	**$ 413,732.80**
Construction:	Purchase & Remove Bldgs	SF	7400	$ 100.00	$ 740,000.00	$ 697,820.00	$ 42,180.00	$ -	$ 740,000.00
Construction:	Base Course Prep	SY	5400	$ 3.00	$ 16,200.00	$ 15,276.60	$ 923.40	$ -	$ 16,200.00
Construction:	Paving	SY	3,400	$ 50.00	$ 170,000.00	$ 160,310.00	$ 9,690.00	$ -	$ 170,000.00
Construction:	Pavement Marking	LF	2,000	$ 0.50	$ 1,000.00	$ 943.00	$ 57.00	$ -	$ 1,000.00
Construction:	Signage	EA	10	$ 150.00	$ 1,500.00	$ 1,414.50	$ 85.50	$ -	$ 1,500.00
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total			0		$ 928,700.00	$ 875,764.10	$ 52,935.90	$ -	$ 928,700.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 928,700.00	$ 875,764.10	$ 52,935.90	$ -	$ 928,700.00
Traffic Control:			**10.00%**		$ 92,870.00	$ 87,576.41	$ 5,293.59	$ -	$ 92,870.00
Mobilization:			**10.00%**		$ 92,870.00	$ 87,576.41	$ 5,293.59	$ -	$ 92,870.00
Construction Sub-Total					$ 1,114,440.00	$ 1,050,916.92	$ 63,523.08	$ -	$ 1,114,440.00
Construction Admin :			**14.00%**		$ 156,021.60	$ 147,128.37	$ 8,893.23	$ -	$ 156,021.60
Contingencies :			**5.00%**		$ 55,722.00	$ 52,545.85	$ 3,176.15	$ -	$ 55,722.00
Post Design:			**1.00%**		$ 11,144.40	$ 10,509.17	$ 635.23	$ -	$ 11,144.40
Communications:			**5.00%**		$ 55,722.00	$ 52,545.85	$ 3,176.15	$ -	$ 55,722.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 278,610.00	$ 262,729.24	$ 15,880.76	$ -	$ 278,610.00
Post Const Sub-Total					**$ 1,393,050.00**	**$ 1,313,646.16**	**$ 79,403.84**	**$ -**	**$ 1,393,050.00**
TOTAL REQUEST					**$ 1,806,782.80**	**$ 1,703,797.13**	**$ 102,986.61**	**$ -**	**$ 1,806,782.80**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	COY/YMPO		Name of Project:	24th Median, 4th to 8th St	Spot Improvement with Non-HSIP construction included				
HSIP Project Cost Estimate Worksheet									
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	5.70%	0.00%	
Design:	At 12%		1	$29,000.00	$ 29,000.00	$ 27,347.00	$ 1,653.00	$ -	$ 29,000.00
ROW Acquisition:	None				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 59,000.00**	**$ 55,637.94**	**$ 3,363.00**	**$ -**	**$ 59,000.00**
Construction:	Sawcut	LF	1200	$ 2.00	$ 2,400.00	$ 2,263.20	$ 136.80	$ -	$ 2,400.00
Construction:	Curb	LF	1200	$ 15.00	$ 18,000.00	$ 16,974.00	$ 1,026.00	$ -	$ 18,000.00
Construction:	Median Paving/Prep	SF	2,400	$ 15.00	$ 36,000.00	$ 33,948.00	$ 2,052.00	$ -	$ 36,000.00
Construction:	Signing	EA	6	$ 400.00	$ 2,400.00	$ 2,263.20	$ 136.80	$ -	$ 2,400.00
Construction:	AC Replacement	SY	2400	$ 50.00	$ 120,000.00	$ 113,160.00	$ 6,840.00	$ -	$ 120,000.00
Construction:	Striping	LF	600	$ 0.50	$ 300.00	$ 282.90	$ 17.10	$ -	$ 300.00
Construction:	Sidewalk	SF	4800	$ 5.00	$ 24,000.00	$ 22,632.00	$ 1,368.00	$ -	$ 24,000.00
HSIP Eligible Sub-Total					$ 203,100.00	$ 191,523.30	$ 11,576.70	$ -	$ 203,100.00
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 203,100.00	$ 191,523.30	$ 11,576.70	$ -	$ 203,100.00
Traffic Control:			**10.00%**		$ 20,310.00	$ 19,152.33	$ 1,157.67	$ -	$ 20,310.00
Mobilization:			**10.00%**		$ 20,310.00	$ 19,152.33	$ 1,157.67	$ -	$ 20,310.00
Construction Sub-Total					$ 243,720.00	$ 229,827.96	$ 13,892.04	$ -	$ 243,720.00
Construction Admin :			**14.00%**		$ 34,120.80	$ 32,175.91	$ 1,944.89	$ -	$ 34,120.80
Contingencies :			**5.00%**		$ 12,186.00	$ 11,491.40	$ 694.60	$ -	$ 12,186.00
Post Design:			**1.00%**		$ 2,437.20	$ 2,298.28	$ 138.92	$ -	$ 2,437.20
Communications:			**5.00%**		$ 12,186.00	$ 11,491.40	$ 694.60	$ -	$ 12,186.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 60,930.00	$ 57,456.99	$ 3,473.01	$ -	$ 60,930.00
Post Const Sub-Total					**$ 304,650.00**	**$ 287,284.95**	**$ 17,365.05**	**$ -**	**$ 304,650.00**
TOTAL REQUEST					**$ 363,650.00**	**$ 342,922.89**	**$ 20,728.05**	**$ -**	**$ 363,650.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City of Yuma/YMPO		**Name of Project:**	Protected Signal	Spot Improvement with Non-HSIP construction included				
					HSIP Project Cost Estimate Worksheet				
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	5.70%	0.00%	
Design:	At 20%		1	$4,320.00	$ 4,320.00	$ 4,073.76	$ 246.24	$ -	$ 4,320.00
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 5,000.00	$ 5,000.00	$ 4,715.00	$ 285.00	$ -	$ 5,000.00
Design Sub-Total					**$ 19,320.00**	**$ 18,218.76**	**$ 1,101.24**	**$ -**	**$ 19,320.00**
Construction:	Demolition	EA.	3	$ 500.00	$ 1,500.00	$ 1,414.50	$ 85.50	$ -	$ 1,500.00
Construction:	Head, Type R	EA.	12	$ 1,000.00	$ 12,000.00	$ 11,316.00	$ 684.00	$ -	$ 12,000.00
Construction: Mast Arm	Wiring	EA.	6	$ 250.00	$ 1,500.00	$ 1,414.50	$ 85.50	$ -	$ 1,500.00
Construction:	Programming/Testing	LS	3	$ 1,000.00	$ 3,000.00	$ 2,829.00	$ 171.00	$ -	$ 3,000.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 18,000.00	$ 16,974.00	$ 1,026.00	$ -	$ 18,000.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 18,000.00	$ 16,974.00	$ 1,026.00	$ -	$ 18,000.00
Traffic Control:			10.00%		$ 1,800.00	$ 1,697.40	$ 102.60	$ -	$ 1,800.00
Mobilization:			10.00%		$ 1,800.00	$ 1,697.40	$ 102.60	$ -	$ 1,800.00
Construction Sub-Total					$ 21,600.00	$ 20,368.80	$ 1,231.20	$ -	$ 21,600.00
Construction Admin :			14.00%		$ 3,024.00	$ 2,851.63	$ 172.37	$ -	$ 3,024.00
Contingencies :			5.00%		$ 1,080.00	$ 1,018.44	$ 61.56	$ -	$ 1,080.00
Post Design:			1.00%		$ 216.00	$ 203.69	$ 12.31	$ -	$ 216.00
Communications:			5.00%		$ 1,080.00	$ 1,018.44	$ 61.56	$ -	$ 1,080.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 5,400.00	$ 5,092.20	$ 307.80	$ -	$ 5,400.00
Post Const Sub-Total					**$ 27,000.00**	**$ 25,461.00**	**$ 1,539.00**	**$ -**	**$ 27,000.00**
TOTAL REQUEST					**$ 46,320.00**	**$ 43,679.76**	**$ 2,640.24**	**$ -**	**$ 46,320.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City of Yuma/YMPO		**Name of Project:**	FYA Signal Coversion	Spot Improvement with Non-HSIP construction included				
HSIP Project Cost Estimate Worksheet									
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:	At 20%		1	$4,896.00	$ 4,896.00	$ 4,616.93	$ 279.07	$ -	$ 4,896.00
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 5,000.00	$ 5,000.00	$ 4,715.00	$ 285.00	$ -	$ 5,000.00
Design Sub-Total					**$ 19,896.00**	**$ 18,761.93**	**$ 1,134.07**	**$ -**	**$ 19,896.00**
Construction:	Demolition	EA.	3	$ 500.00	$ 1,500.00	$ 1,414.50	$ 85.50	$ -	$ 1,500.00
Construction:	Head, Type G, Modified	EA.	12	$ 1,200.00	$ 14,400.00	$ 13,579.20	$ 820.80	$ -	$ 14,400.00
Construction: Mast Arm	Wiring	EA.	6	$ 250.00	$ 1,500.00	$ 1,414.50	$ 85.50	$ -	$ 1,500.00
Construction:	Programming/Testing	LS	3	$ 1,000.00	$ 3,000.00	$ 2,829.00	$ 171.00	$ -	$ 3,000.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 20,400.00	$ 19,237.20	$ 1,162.80	$ -	$ 20,400.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 20,400.00	$ 19,237.20	$ 1,162.80	$ -	$ 20,400.00
Traffic Control:			10.00%		$ 2,040.00	$ 1,923.72	$ 116.28	$ -	$ 2,040.00
Mobilization:			10.00%		$ 2,040.00	$ 1,923.72	$ 116.28	$ -	$ 2,040.00
Construction Sub-Total					$ 24,480.00	$ 23,084.64	$ 1,395.36	$ -	$ 24,480.00
Construction Admin :			14.00%		$ 3,427.20	$ 3,231.85	$ 195.35	$ -	$ 3,427.20
Contingencies :			5.00%		$ 1,224.00	$ 1,154.23	$ 69.77	$ -	$ 1,224.00
Post Design:			1.00%		$ 244.80	$ 230.85	$ 13.95	$ -	$ 244.80
Communications:			5.00%		$ 1,224.00	$ 1,154.23	$ 69.77	$ -	$ 1,224.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 6,120.00	$ 5,771.16	$ 348.84	$ -	$ 6,120.00
Post Const Sub-Total					**$ 30,600.00**	**$ 28,855.80**	**$ 1,744.20**	**$ -**	**$ 30,600.00**
TOTAL REQUEST					**$ 50,496.00**	**$ 47,617.73**	**$ 2,878.27**	**$ -**	**$ 50,496.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City of Yuma		**Name of Project:**	Avenue B Lighting	Spot Improvement with Non-HSIP construction included

HSIP Project Cost Estimate Worksheet

Project Cost Estimate:	Description:	Unit	Quantity:	Unit Cost:	Total Cost:	HSIP:	Local Match:	Other Amt:	TOTAL COST
						94.30%	5.70%	0.00%	
Design:	At 15%		1	$19,152.00	$ 19,152.00	$ 18,060.34	$ 1,091.66	$ -	$ 19,152.00
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 49,152.00**	**$ 46,350.34**	**$ 2,801.66**	**$ -**	**$ 49,152.00**
Construction:	LED Head for ex. Light Pole	EA.	45	$ 600.00	$ 27,000.00	$ 25,461.00	$ 1,539.00	$ -	$ 27,000.00
Construction:	LED Head for ex. Power Pole	EA.	57	$ 600.00	$ 34,200.00	$ 32,250.60	$ 1,949.40	$ -	$ 34,200.00
Construction:	LED Head for ex. Traffic Signal	EA.	31	$ 600.00	$ 18,600.00	$ 17,539.80	$ 1,060.20	$ -	$ 18,600.00
Construction:	Remove Existing Head	EA.	133	$ 200.00	$ 26,600.00	$ 25,083.80	$ 1,516.20	$ -	$ 26,600.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 106,400.00	$ 100,335.20	$ 6,064.80	$ -	$ 106,400.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 106,400.00	$ 100,335.20	$ 6,064.80	$ -	$ 106,400.00
Traffic Control:			10.00%		$ 10,640.00	$ 10,033.52	$ 606.48	$ -	$ 10,640.00
Mobilization:			10.00%		$ 10,640.00	$ 10,033.52	$ 606.48	$ -	$ 10,640.00
Construction Sub-Total					$ 127,680.00	$ 120,402.24	$ 7,277.76	$ -	$ 127,680.00
Construction Admin :			14.00%		$ 17,875.20	$ 16,856.31	$ 1,018.89	$ -	$ 17,875.20
Contingencies :			5.00%		$ 6,384.00	$ 6,020.11	$ 363.89	$ -	$ 6,384.00
Post Design:			1.00%		$ 1,276.80	$ 1,204.02	$ 72.78	$ -	$ 1,276.80
Communications:			5.00%		$ 6,384.00	$ 6,020.11	$ 363.89	$ -	$ 6,384.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 31,920.00	$ 30,100.55	$ 1,819.45	$ -	$ 31,920.00
Post Const Sub-Total					**$ 159,600.00**	**$ 150,502.79**	**$ 9,097.21**	**$ -**	**$ 159,600.00**
TOTAL REQUEST					**$ 208,752.00**	**$ 196,853.13**	**$ 11,898.87**	**$ -**	**$ 208,752.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City of Yuma/County		**Name of Project:**	Avenue B Bike Lanes	Spot Improvement with Non-HSIP construction included				
					HSIP Project Cost Estimate Worksheet				
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:	At 20%		1	$9,804.00	$ 9,804.00	$ 9,245.17	$ 558.83	$ -	$ 9,804.00
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 10,000.00	$ 10,000.00	$ 9,430.00	$ 570.00	$ -	$ 10,000.00
ADOT Admin Costs:			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 39,804.00**	**$ 37,535.17**	**$ 2,268.83**	**$ -**	**$ 39,804.00**
Construction:	Pavement Marking	LF	28200	$ 0.50	$ 14,100.00	$ 13,296.30	$ 803.70	$ -	$ 14,100.00
Construction:	Remove Pavement Marking	LF	42300	$ 0.50	$ 21,150.00	$ 19,944.45	$ 1,205.55	$ -	$ 21,150.00
Construction:	Bike Signage	EA.	14	$ 400.00	$ 5,600.00	$ 5,280.80	$ 319.20	$ -	$ 5,600.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 40,850.00	$ 38,521.55	$ 2,328.45	$ -	$ 40,850.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 40,850.00	$ 38,521.55	$ 2,328.45	$ -	$ 40,850.00
Traffic Control:			10.00%		$ 4,085.00	$ 3,852.16	$ 232.85	$ -	$ 4,085.00
Mobilization:			10.00%		$ 4,085.00	$ 3,852.16	$ 232.85	$ -	$ 4,085.00
Construction Sub-Total					$ 49,020.00	$ 46,225.86	$ 2,794.14	$ -	$ 49,020.00
Construction Admin :			14.00%		$ 6,862.80	$ 6,471.62	$ 391.18	$ -	$ 6,862.80
Contingencies :			5.00%		$ 2,451.00	$ 2,311.29	$ 139.71	$ -	$ 2,451.00
Post Design:			1.00%		$ 490.20	$ 462.26	$ 27.94	$ -	$ 490.20
Communications:			5.00%		$ 2,451.00	$ 2,311.29	$ 139.71	$ -	$ 2,451.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 12,255.00	$ 11,556.46	$ 698.54	$ -	$ 12,255.00
Post Const Sub-Total					**$ 61,275.00**	**$ 57,782.32**	**$ 3,492.68**	**$ -**	**$ 61,275.00**
TOTAL REQUEST					**$ 101,079.00**	**$ 95,317.49**	**$ 5,761.51**	**$ -**	**$ 101,079.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	Yuma Co./YMPO		Name of Project:	Avenue 3E Rumble	Spot Improvement with Non-HSIP construction included				
HSIP Project Cost Estimate Worksheet									
Project Cost Estimate:	Description:	Unit	Quantity:	Unit Cost:	Total Cost:	HSIP: 94.30%	Local Match: 5.70%	Other Amt: 0.00%	TOTAL COST
Design:	At 15%	LS	1	$8,062.50	$ 8,062.50	$ 7,602.94	$ 459.56	$ -	$ 8,062.50
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance		LS	1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:		LS	1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 48,062.50**	**$ 45,322.94**	**$ 2,739.56**	**$ -**	**$ 48,062.50**
Construction:	Rumble Strip CL	LF	21,500	$ 2.00	$ 43,000.00	$ 40,549.00	$ 2,451.00	$ -	$ 43,000.00
Construction:	Pavement Marking	LF	21,500	$ 0.50	$ 10,750.00	$ 10,137.25	$ 612.75	$ -	$ 10,750.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 53,750.00	$ 50,686.25	$ 3,063.75	$ -	$ 53,750.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 53,750.00	$ 50,686.25	$ 3,063.75	$ -	$ 53,750.00
Traffic Control:			10.00%		$ 5,375.00	$ 5,068.63	$ 306.38	$ -	$ 5,375.00
Mobilization:			10.00%		$ 5,375.00	$ 5,068.63	$ 306.38	$ -	$ 5,375.00
Construction Sub-Total					$ 64,500.00	$ 60,823.50	$ 3,676.50	$ -	$ 64,500.00
Construction Admin :			14.00%		$ 9,030.00	$ 8,515.29	$ 514.71	$ -	$ 9,030.00
Contingencies :			5.00%		$ 3,225.00	$ 3,041.18	$ 183.83	$ -	$ 3,225.01
Post Design:			1.00%		$ 645.00	$ 608.24	$ 36.77	$ -	$ 645.01
Communications:			5.00%		$ 3,225.00	$ 3,041.18	$ 183.83	$ -	$ 3,225.01
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 16,125.00	$ 15,205.89	$ 919.14	$ -	$ 16,125.03
Post Const Sub-Total					**$ 80,625.00**	**$ 76,029.39**	**$ 4,595.64**	**$ -**	**$ 80,625.03**
TOTAL REQUEST					**$ 128,687.50**	**$ 121,352.33**	**$ 7,335.20**	**$ -**	**$ 128,687.53**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	Yuma County		**Name of Project:**	County 19th St Improvements	Spot Improvement with Non-HSIP construction included				
HSIP Project Cost Estimate Worksheet									
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:**	**Local Match:**	**Other Amt:**	**TOTAL COST**
						94.30%	**5.70%**	**0.00%**	
Design:	At 15%		1	$12,330.00	$ 12,330.00	$ 11,627.19	$ 702.81	$ -	$ 12,330.00
ROW Acquisition:					$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
Design Sub-Total					**$ 52,330.00**	**$ 49,347.19**	**$ 2,982.81**	**$ -**	**$ 52,330.00**
Construction:	Rumble Strip, Ctr	LF	22440	$ 2.00	$ 44,880.00	$ 42,321.84	$ 2,558.16	$ -	$ 44,880.00
Construction:	Pavement Marking	LF	22440	$ 0.50	$ 11,220.00	$ 10,580.46	$ 639.54	$ -	$ 11,220.00
Construction:	New Stop Sign	EA	1	$ 400.00	$ 400.00	$ 377.20	$ 22.80	$ -	$ 400.00
Construction:	Head/Flasher/Fnd	EA	1	$ 4,000.00	$ 4,000.00	$ 3,772.00	$ 228.00	$ -	$ 4,000.00
Construction:	Electrical Service	EA	1	$ 8,000.00	$ 8,000.00	$ 7,544.00	$ 456.00	$ -	$ 8,000.00
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 68,500.00	$ 64,595.50	$ 3,904.50	$ -	$ 68,500.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 68,500.00	$ 64,595.50	$ 3,904.50	$ -	$ 68,500.00
Traffic Control:			**10.00%**		$ 6,850.00	$ 6,459.55	$ 390.45	$ -	$ 6,850.00
Mobilization:			**10.00%**		$ 6,850.00	$ 6,459.55	$ 390.45	$ -	$ 6,850.00
Construction Sub-Total					$ 82,200.00	$ 77,514.60	$ 4,685.40	$ -	$ 82,200.00
Construction Admin :			**14.00%**		$ 11,508.00	$ 10,852.04	$ 655.96	$ -	$ 11,508.00
Contingencies :			**5.00%**		$ 4,110.00	$ 3,875.73	$ 234.27	$ -	$ 4,110.00
Post Design:			**1.00%**		$ 822.00	$ 775.15	$ 46.85	$ -	$ 822.00
Communications:			**5.00%**		$ 4,110.00	$ 3,875.73	$ 234.27	$ -	$ 4,110.00
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 20,550.00	$ 19,378.65	$ 1,171.35	$ -	$ 20,550.00
Post Const Sub-Total					**$ 102,750.00**	**$ 96,893.25**	**$ 5,856.75**	**$ -**	**$ 102,750.00**
TOTAL REQUEST					**$ 155,080.00**	**$ 146,240.44**	**$ 8,839.56**	**$ -**	**$ 155,080.00**

Comments:

ADOT LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	Yuma Co/YMPO		**Name of Project:**	Somerton Avenue	Spot Improvement with Non-HSIP construction included				
					HSIP Project Cost Estimate Worksheet				
Project Cost Estimate:	**Description:**	**Unit**	**Quantity:**	**Unit Cost:**	**Total Cost:**	**HSIP:** 94.30%	**Local Match:** 5.70%	**Other Amt:** 0.00%	**TOTAL COST**
Design:	At 12%		1	$11,460.96	$ 11,460.96	$ 10,807.69	$ 653.27	$ -	$ 11,460.96
ROW Acquisition:	N/A				$ -	$ -	$ -	$ -	$ -
Environmental Clearance			1	$ 20,000.00	$ 20,000.00	$ 18,860.00	$ 1,140.00	$ -	$ 20,000.00
ADOT Admin Costs:			1	$ 12,000.00	$ 12,000.00	$ 11,316.00	$ 684.00	$ -	$ 12,000.00
Design Sub-Total					**$ 43,460.96**	**$ 40,983.69**	**$ 2,477.27**	**$ -**	**$ 43,460.96**
Construction:	Rumble Strip, Ctr & Edge	LF	31836	$ 2.00	$ 63,672.00	$ 60,042.70	$ 3,629.30	$ -	$ 63,672.00
Construction:	Pavement Marking	LF	31836	$ 0.50	$ 15,918.00	$ 15,010.67	$ 907.33	$ -	$ 15,918.00
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
Construction:					$ -	$ -	$ -	$ -	$ -
HSIP Eligible Sub-Total					$ 79,590.00	$ 75,053.37	$ 4,536.63	$ -	$ 79,590.00
Construction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Consturction:					$ -			$ -	$ -
Construction:					$ -			$ -	$ -
Non-HSIP Eligible Sub-Total					$ -			$ -	$ -
Construction Sub-Total					$ 79,590.00	$ 75,053.37	$ 4,536.63	$ -	$ 79,590.00
Traffic Control:			10.00%		$ 7,959.00	$ 7,505.34	$ 453.66	$ -	$ 7,959.00
Mobilization:			10.00%		$ 7,959.00	$ 7,505.34	$ 453.66	$ -	$ 7,959.00
Construction Sub-Total					$ 95,508.00	$ 90,064.04	$ 5,443.96	$ -	$ 95,508.00
Construction Admin :			14.00%		$ 13,371.12	$ 12,608.97	$ 762.15	$ -	$ 13,371.12
Contingencies :			5.00%		$ 4,775.40	$ 4,503.20	$ 272.20	$ -	$ 4,775.40
Post Design:			1.00%		$ 955.08	$ 900.64	$ 54.44	$ -	$ 955.08
Communications:			5.00%		$ 4,775.40	$ 4,503.20	$ 272.20	$ -	$ 4,775.40
					$ -	$ -	$ -	$ -	$ -
Post Sub-Total					$ 23,877.00	$ 22,516.01	$ 1,360.99	$ -	$ 23,877.00
Post Const Sub-Total					**$ 119,385.00**	**$ 112,580.05**	**$ 6,804.95**	**$ -**	**$ 119,385.00**
TOTAL REQUEST					**$ 162,845.96**	**$ 153,563.74**	**$ 9,282.22**	**$ -**	**$ 162,845.96**

Comments:

15 APPENDIX D: HSIP – COUNTERMEASURES AND DESCRIPTIONS

CMF / CRF Details

CMF ID: 4578

Change left-turn phase from permissive to protected/permissive or permissive/protected phasing on one or more approaches

Description: Change from permissive to protected/permissive or permissive/protected phasing on one or more approaches at urban signalized intersection

Prior Condition: Permitted phasing

Category: Intersection traffic control

Study: *Highway Safety Manual, 1st Edition*, Various, 2010

Star Quality Rating:	★★★★★

Crash Modification Factor (CMF)

Value:	0.84
Adjusted Standard Error:	
Unadjusted Standard Error:	0.02

Crash Reduction Factor (CRF)

Value:	16 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	2

Applicability

Crash Type:	Left turn
Crash Severity:	Fatal,Serious injury,Minor injury
Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Urban
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Signalized
Major Road Traffic Volume:	Minimum of 3000 to Maximum of 77000 Annual Average Daily Traffic (AADT)
Minor Road Traffic Volume:	Minimum of 1 to Maximum of 45500 Annual Average Daily Traffic (AADT)

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	Yes
Date Added to Clearinghouse:	
Comments:	

CRASH MODIFICATION FACTORS CLEARINGHOUSE

CMF / CRF Details

CMF ID: 2911

Installation of a High intensity Activated crossWalK (HAWK) pedestrian-activated beacon at an intersection

Description: Installation of a High intensity Activated crossWalK (HAWK) pedestrian-activated beacon at an intersection

Prior Condition: Minor-road stop-controlled intersection

Category: Pedestrians

Study: *Safety Effectiveness of the HAWK Pedestrian Crossing Treatment*, Fitzpatrick, K., and Park, E.S., 2010

Star Quality Rating:	★★★★☆ [View score details]
	Crash Modification Factor (CMF)
Value:	0.712
Adjusted Standard Error:	
Unadjusted Standard Error:	0.065
	Crash Reduction Factor (CRF)
Value:	29 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	6.5

Applicability

Crash Type:	All
Crash Severity:	All
Roadway Types:	Not Specified
Number of Lanes:	4 to 6
Road Division Type:	All
Speed Limit:	30 to 40 mph
Area Type:	Urban and suburban
Traffic Volume:	
Time of Day:	All
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	3-leg,4-leg
Traffic Control:	Other
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	2002 to 2008
Municipality:	Tucson
State:	AZ
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	Site-years
Before Sample Size Used:	63 Site-years
After Sample Size Used:	55 Site-years

Other Details

Included in Highway Safety Manual?	No

CMF / CRF Details

CMF ID: 3035

Install raised median

Description:

Prior Condition: no raised median

Category: Access management

Study: *Analyzing Raised Median Safety Impacts Using Bayesian Methods*, Schultz et al., 2011

Star Quality Rating:	★★★★☆ [View score details]

Crash Modification Factor (CMF)

Value:	0.56
Adjusted Standard Error:	
Unadjusted Standard Error:	

Crash Reduction Factor (CRF)

Value:	44 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	

Applicability

Crash Type:	All
Crash Severity:	Fatal,Serious injury

Roadway Types:	Not Specified
Number of Lanes:	
Road Division Type:	Divided by Median
Speed Limit:	
Area Type:	
Traffic Volume:	Minimum of 10000 to Maximum of 55000 Average Daily Traffic (ADT)
Time of Day:	All
If countermeasure is intersection-based	
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	1998 to 2008
Municipality:	
State:	UT
Country:	USA
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	Site-years
Before Sample Size Used:	32 Site-years
After Sample Size Used:	28 Site-years

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	
Comments:	

CMF / CRF Details

CMF ID: 325

Install a traffic signal

Description:

Prior Condition: Stop controlled

Category: Intersection traffic control

Study: *Accident Modification Factors for Traffic Engineering and ITS Improvements*, Harkey et al., 2008

Star Quality Rating:	

Crash Modification Factor (CMF)

Value:	0.56
Adjusted Standard Error:	0.03
Unadjusted Standard Error:	

Crash Reduction Factor (CRF)

Value:	44 *(This value indicates a* ***decrease*** *in crashes)*
Adjusted Standard Error:	3
Unadjusted Standard Error:	

Applicability

Crash Type:	All
Crash Severity:	All

Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Rural
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	3-leg,4-leg
Traffic Control:	Stop-controlled
Major Road Traffic Volume:	Minimum of 3261 to Maximum of 29926 Annual Average Daily Traffic (AADT)
Minor Road Traffic Volume:	Minimum of 101 to Maximum of 10300 Annual Average Daily Traffic (AADT)

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	Yes. HSM lists this CMF in **bold** font to indicate that it has the highest reliability since it has an adjusted standard error of 0.1 or less.
Date Added to Clearinghouse:	
Comments:	Countermeasure name has been slightly modified for consistency across Clearinghouse

CMF / CRF Details

CMF ID: 267

Provide a left-turn lane on one major-road approach

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Intersection geometry

Study: *Safety Effectiveness of Intersection Left- and Right-Turn Lanes*, Harwood et al., 2002

Star Quality Rating:	★★★★☆

Crash Modification Factor (CMF)

Value:	0.72
Adjusted Standard Error:	0.06
Unadjusted Standard Error:	0.05

Crash Reduction Factor (CRF)

Value:	28 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	6
Unadjusted Standard Error:	5

Applicability

Crash Type:	All
Crash Severity:	Fatal,Serious Injury,Minor Injury

Roadway Types:	Not Specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Urban
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Signalized
Major Road Traffic Volume:	Minimum of 4600 to Maximum of 40300 Average Daily Traffic (ADT)
Minor Road Traffic Volume:	Minimum of 100 to Maximum of 13700 Average Daily Traffic (ADT)

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	Yes. HSM lists this CMF in **bold** font to indicate that it has the highest reliability since it has an adjusted standard error of 0.1 or less.
Date Added to Clearinghouse:	
Comments:	Countermeasure name changed to match HSM

CMF / CRF Details

CMF ID: 3350

Install centerline rumble strips

Description:

Prior Condition: No centerline rumble strips

Category: Roadway

Study: ***NCHRP Report 641: Guidance for the Design and Application of Shoulder and Centerline Rumble Strips*, Torbic et al., 2009**

Star Quality Rating:	[View score details]

Crash Modification Factor (CMF)

Value:	0.91
Adjusted Standard Error:	
Unadjusted Standard Error:	0.035

Crash Reduction Factor (CRF)

Value:	9 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	3.5

Applicability

Crash Type:	All

Crash Severity:	Fatal,Serious injury,Minor injury
Roadway Types:	Not Specified
Number of Lanes:	2
Road Division Type:	Undivided
Speed Limit:	
Area Type:	Rural
Traffic Volume:	Minimum of 574 to Maximum of 20784 Average Daily Traffic (ADT)
Time of Day:	All
	If countermeasure is intersection-based
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	1997 to 2006
Municipality:	
State:	MN, PA, WA
Country:	U.S.A.
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	Crashes
Before Sample Size Used:	1733 Crashes
After Sample Size Used:	920 Crashes

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	

CMF / CRF Details

CMF ID: 3360

Install centerline rumble strips

Description:

Prior Condition: No centerline rumble strips

Category: Roadway

Study: ***NCHRP Report 641: Guidance for the Design and Application of Shoulder and Centerline Rumble Strips*, Torbic et al., 2009**

Star Quality Rating:	★★★★★ [View score details]

Crash Modification Factor (CMF)

Value:	0.55
Adjusted Standard Error:	
Unadjusted Standard Error:	0.064

Crash Reduction Factor (CRF)

Value:	45 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	6.4

Applicability

Crash Type:	Head on,Sideswipe

Crash Severity:	Fatal,Serious injury,Minor injury
Roadway Types:	Not Specified
Number of Lanes:	2
Road Division Type:	Undivided
Speed Limit:	
Area Type:	Rural
Traffic Volume:	Minimum of 574 to Maximum of 20784 Average Daily Traffic (ADT)
Time of Day:	All
	If countermeasure is intersection-based
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	1997 to 2006
Municipality:	
State:	MN, PA, WA
Country:	U.S.A.
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	Crashes
Before Sample Size Used:	300 Crashes
After Sample Size Used:	96 Crashes

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	

CMF / CRF Details

CMF ID: 450

Provide flashing beacons at stop controlled intersections

Description:

Prior Condition: ***No Prior Condition(s)***

Category: **Intersection traffic control**

Study: ***Safety Evaluation of Flashing Beacons at Stop Controlled Intersections*, Srinivasan et al., 2008**

Star Quality Rating:	★★★★☆
	Crash Modification Factor (CMF)
Value:	0.84
Adjusted Standard Error:	0.06
Unadjusted Standard Error:	0.05
	Crash Reduction Factor (CRF)
Value:	16 *(This value indicates a* ***decrease*** *in crashes)*
Adjusted Standard Error:	6
Unadjusted Standard Error:	5
	Applicability
Crash Type:	Angle
Crash Severity:	All

Roadway Types:	Not Specified
Number of Lanes:	2
Road Division Type:	
Speed Limit:	
Area Type:	Rural
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Stop-controlled
Major Road Traffic Volume:	Minimum of 250 to Maximum of 42520 Average Daily Traffic (ADT)
Minor Road Traffic Volume:	Minimum of 90 to Maximum of 13270 Average Daily Traffic (ADT)

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	Yes. HSM lists this CMF in **bold** font to indicate that it has the highest reliability since it has an adjusted standard error of 0.1 or less.
Date Added to Clearinghouse:	
Comments:	Countermeasure name changed from "flashing beacons at four leg stop controlled intersections on two lane roads; standard and actuated beacons" to match HSM

CMF / CRF Details

CMF ID: 339

Change from permitted-protected to protected on major approach

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Intersection traffic control

Study: *Safety Effects of Left-Turn Phasing Schemes at High-Speed Intersections*, Davis and Aul, 2007

Star Quality Rating:	★★★★★

Crash Modification Factor (CMF)

Value:	0.01
Adjusted Standard Error:	0.02
Unadjusted Standard Error:	0.01

Crash Reduction Factor (CRF)

Value:	99 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	2
Unadjusted Standard Error:	1

Applicability

Crash Type:	Angle
Crash Severity:	All

Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Urban
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	Not specified
Traffic Control:	Signalized
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	
Comments:	

Export PDF

[View the Full Study Details]

CMF / CRF Details

CMF ID: 4177

Changing left turn phasing from protected-permissive to flashing yellow arrow (FYA)

Description: CMFs are calculated the intersection level and not the treated approach(es) level.

Prior Condition: All treated approaches had protected-permissive left turn

Category: Intersection traffic control

Study: ***Evaluation of Safety Strategies at Signalized Intersections*****, Srinivasan, et al., 2011**

Image: ***View the countermeasure image.***

Star Quality Rating:	[View score details]

Crash Modification Factor (CMF)

Value:	0.806
Adjusted Standard Error:	
Unadjusted Standard Error:	0.146

Crash Reduction Factor (CRF)

Value:	19.4 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	14.6

Applicability

Crash Type:	Left turn
Crash Severity:	All
Roadway Types:	Not Specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Urban
Traffic Volume:	
Time of Day:	Not specified
If countermeasure is intersection-based	
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Signalized
Major Road Traffic Volume:	Minimum of 8260 to Maximum of 43000 Annual Average Daily Traffic (AADT)
Minor Road Traffic Volume:	Minimum of 600 to Maximum of 13745 Annual Average Daily Traffic (AADT)

Development Details

Date Range of Data Used:	
Municipality:	
State:	NC, OR, WA
Country:	USA
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	Crashes
Before Sample Size Used:	134 Crashes
After Sample Size Used:	47 Crashes

Other Details

Included in Highway Safety Manual?	No

CRASH MODIFICATION FACTORS CLEARINGHOUSE

CMF / CRF Details

CMF ID: 191

Provide highway lighting

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Highway lighting

Study: ***Handbook of Road Safety Measures*, Elvik, R. and Vaa, T., 2004**

Star Quality Rating:	3 of 5 stars

Crash Modification Factor (CMF)

Value:	0.31
Adjusted Standard Error:	0.36
Unadjusted Standard Error:	

Crash Reduction Factor (CRF)

Value:	69 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	36
Unadjusted Standard Error:	

Applicability

Crash Type:	All
Crash Severity:	Fatal

Roadway Types:	All
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	All
Traffic Volume:	Minimum of All to Maximum of All
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Meta-analysis
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	
Comments:	

Export PDF

[View the Full Study Details]

CMF / CRF Details

CMF ID: 192

Provide highway lighting

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Highway lighting

Study: *Handbook of Road Safety Measures*, Elvik, R. and Vaa, T., 2004

Star Quality Rating:	★★★★☆

Crash Modification Factor (CMF)

Value:	0.72
Adjusted Standard Error:	0.06
Unadjusted Standard Error:	

Crash Reduction Factor (CRF)

Value:	28 *(This value indicates a* ***decrease*** *in crashes)*
Adjusted Standard Error:	6
Unadjusted Standard Error:	

Applicability

Crash Type:	Nighttime
Crash Severity:	Serious Injury,Minor Injury

Roadway Types:	All
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	All
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Meta-analysis
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	Yes. HSM lists this CMF in **bold** font to indicate that it has the highest reliability since it has an adjusted standard error of 0.1 or less.
Date Added to Clearinghouse:	
Comments:	

CMF / CRF Details

CMF ID: 1719

Provide bike lanes

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Bicyclists

Study: ***Signalized Intersections: Informational Guide*, Rodegerdts et al., 2004**

Star Quality Rating:	[View score details]
	Crash Modification Factor (CMF)
Value:	0.65
Adjusted Standard Error:	
Unadjusted Standard Error:	0.2
	Crash Reduction Factor (CRF)
Value:	35 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	20.3
	Applicability
Crash Type:	Vehicle/bicycle
Crash Severity:	Fatal,Serious injury,Minor injury

Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	
Traffic Volume:	
Time of Day:	
	If countermeasure is intersection-based
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

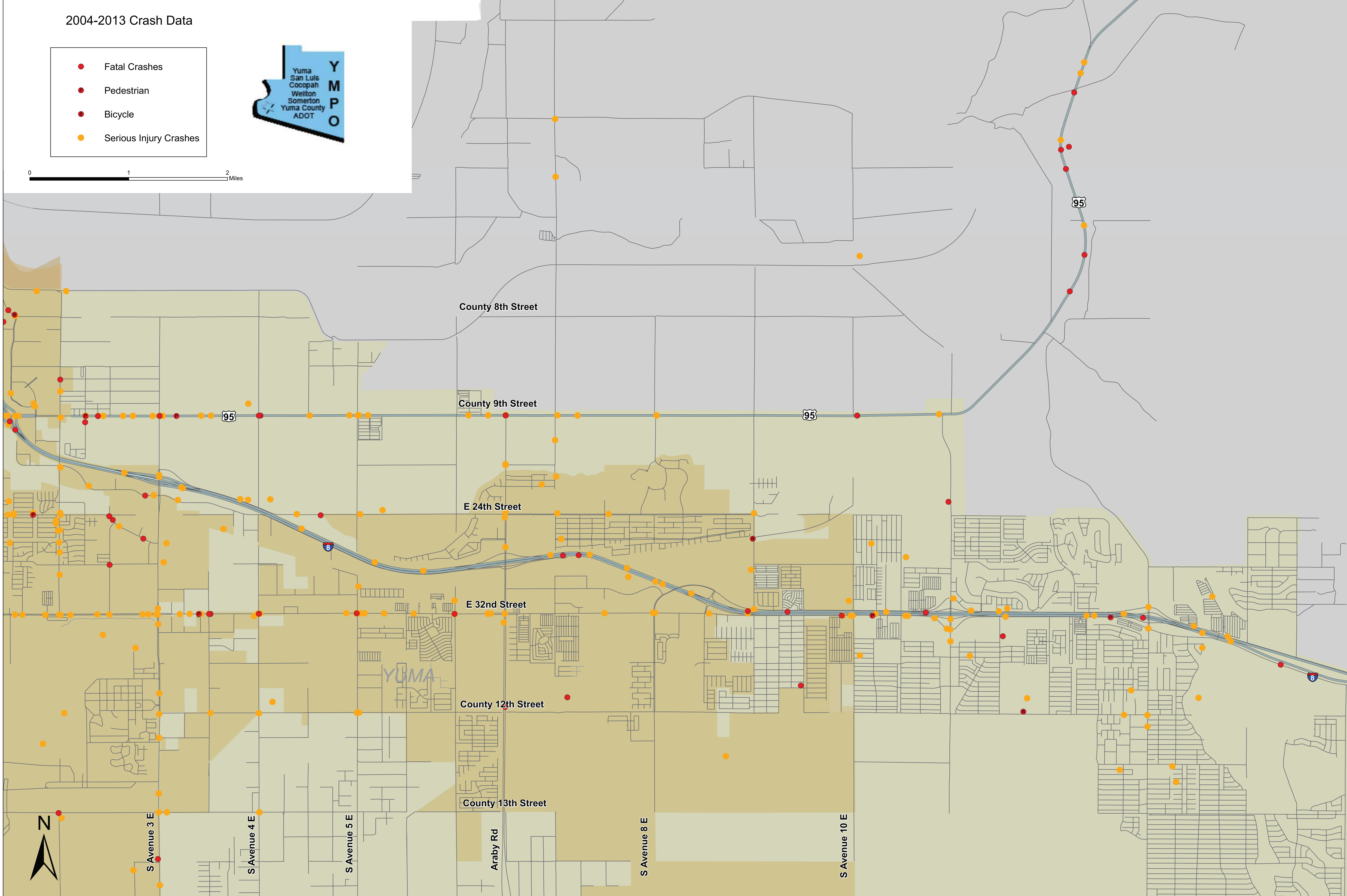
Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Simple before/after
Sample Size Used:	Crashes
Before Sample Size Used:	26 Crashes
After Sample Size Used:	11 Crashes

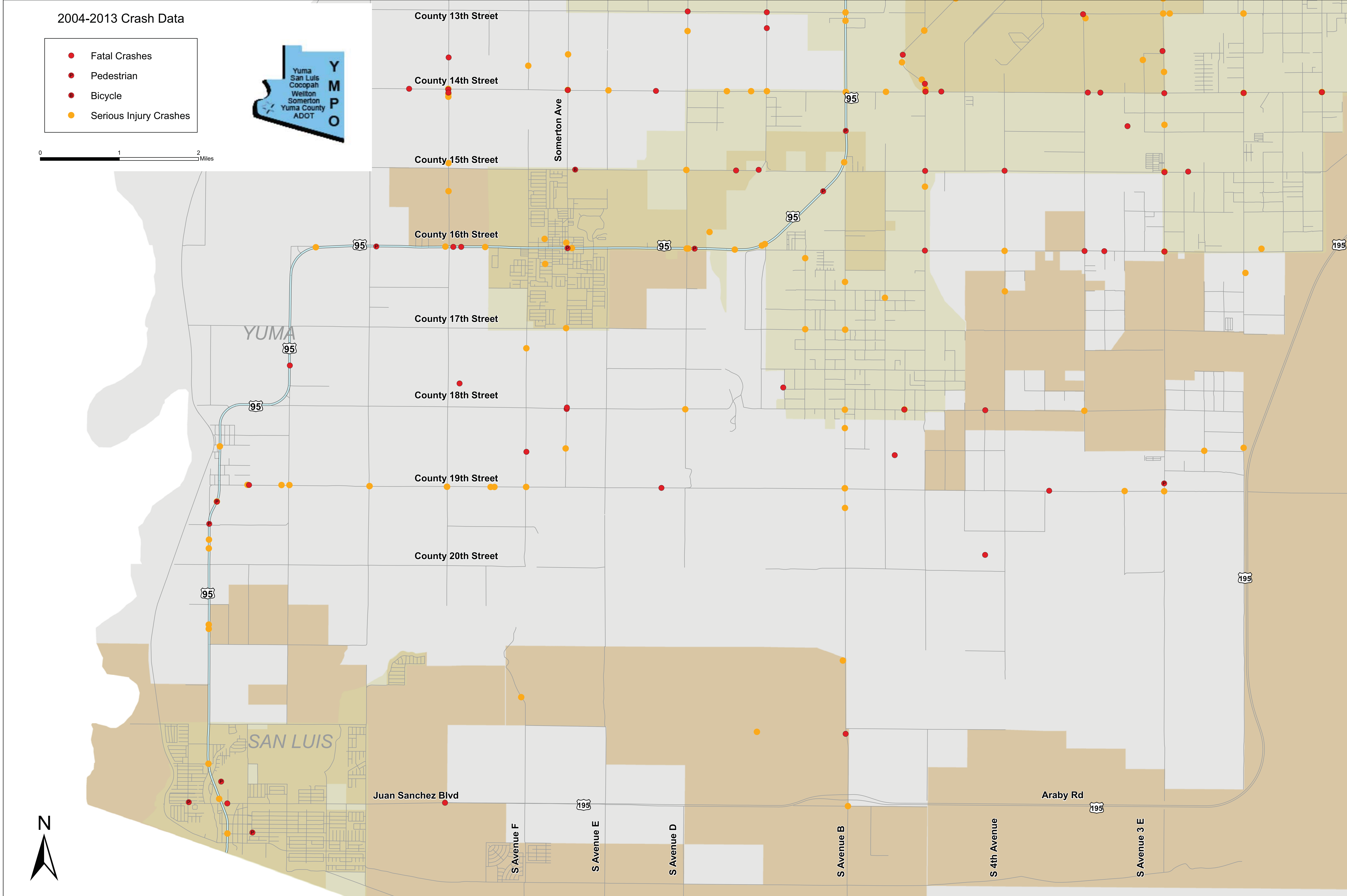
Other Details

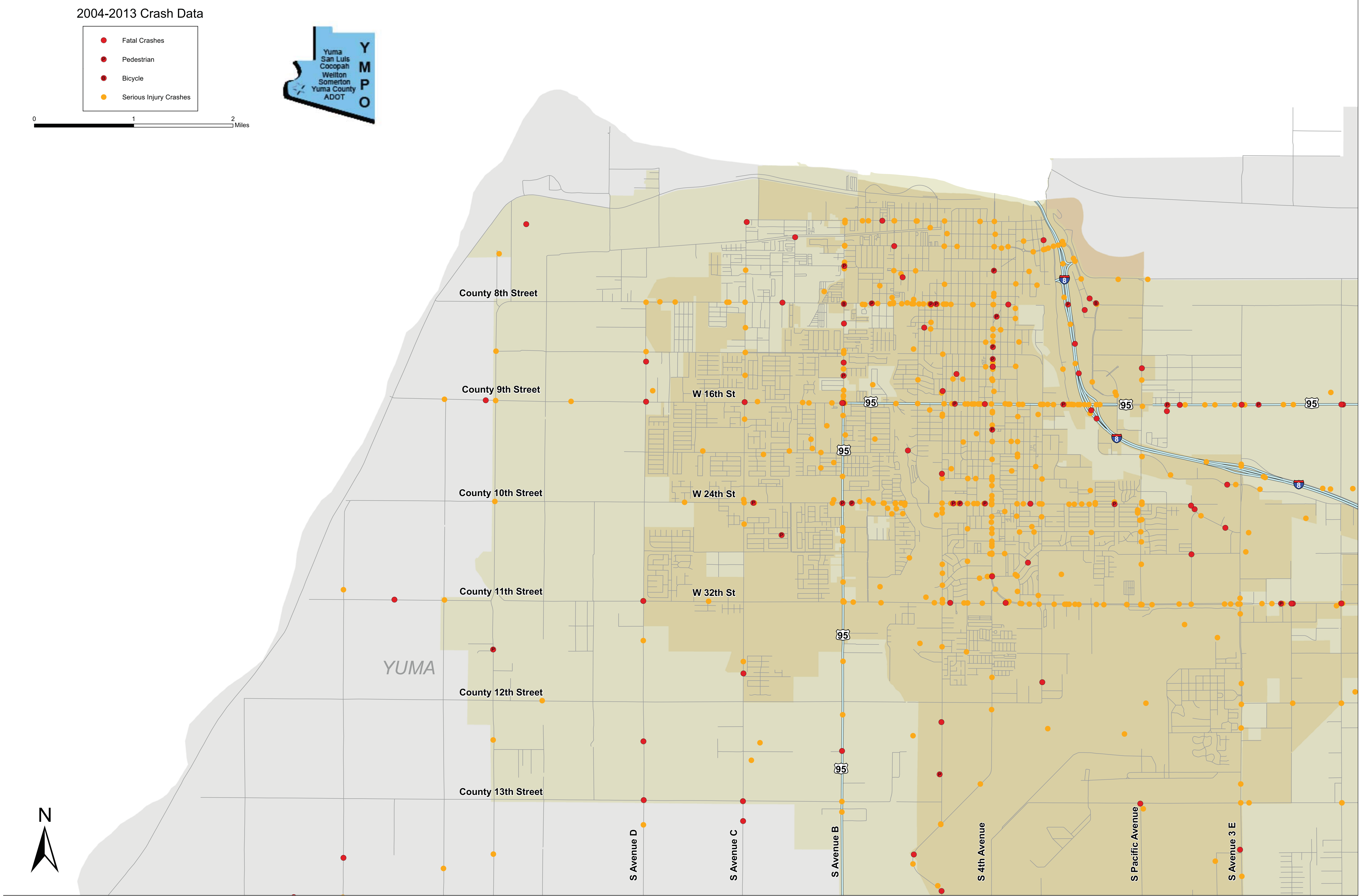
Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	
Comments:	

16 APPENDIX E: 11X17 MAPS

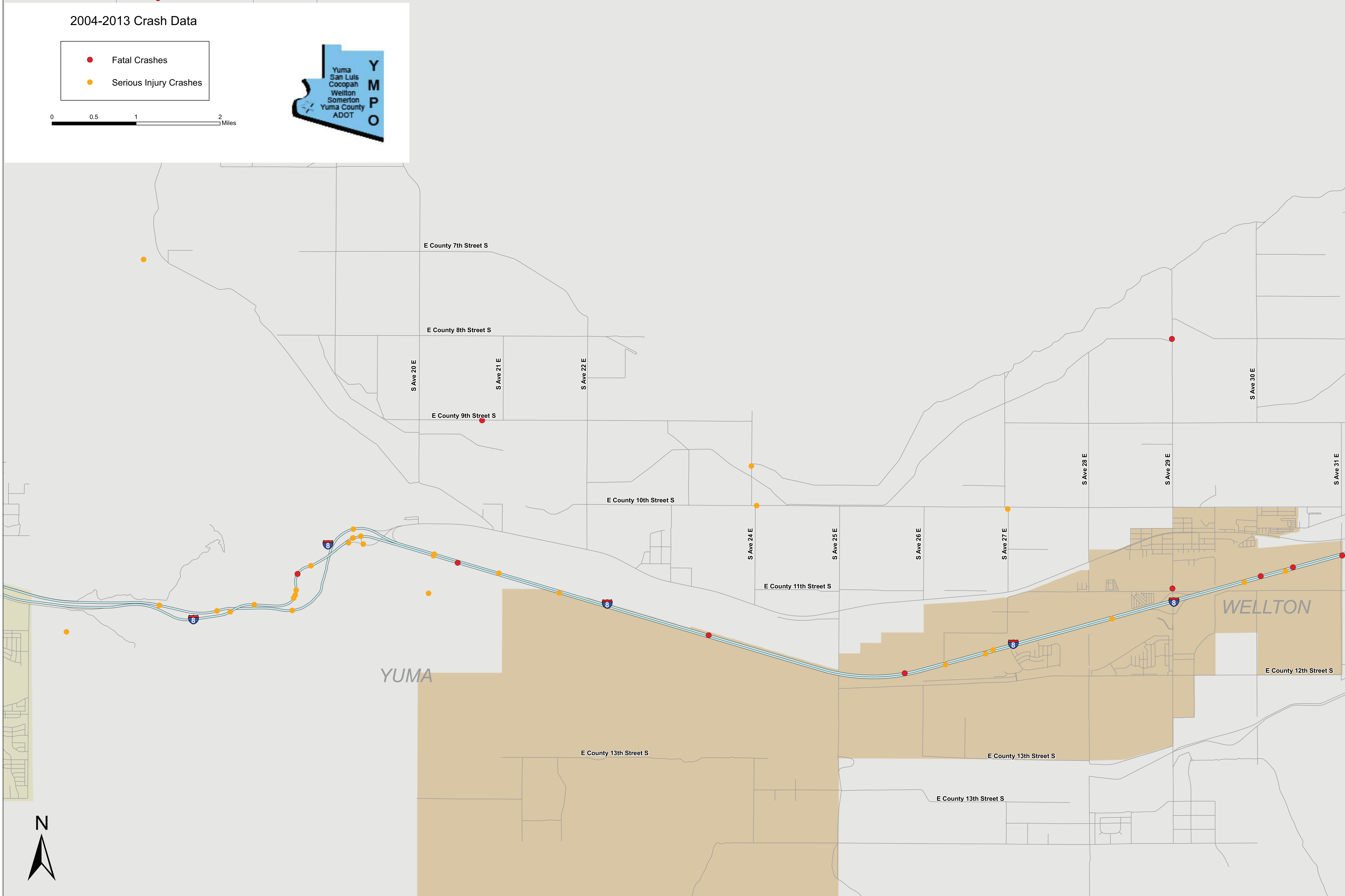


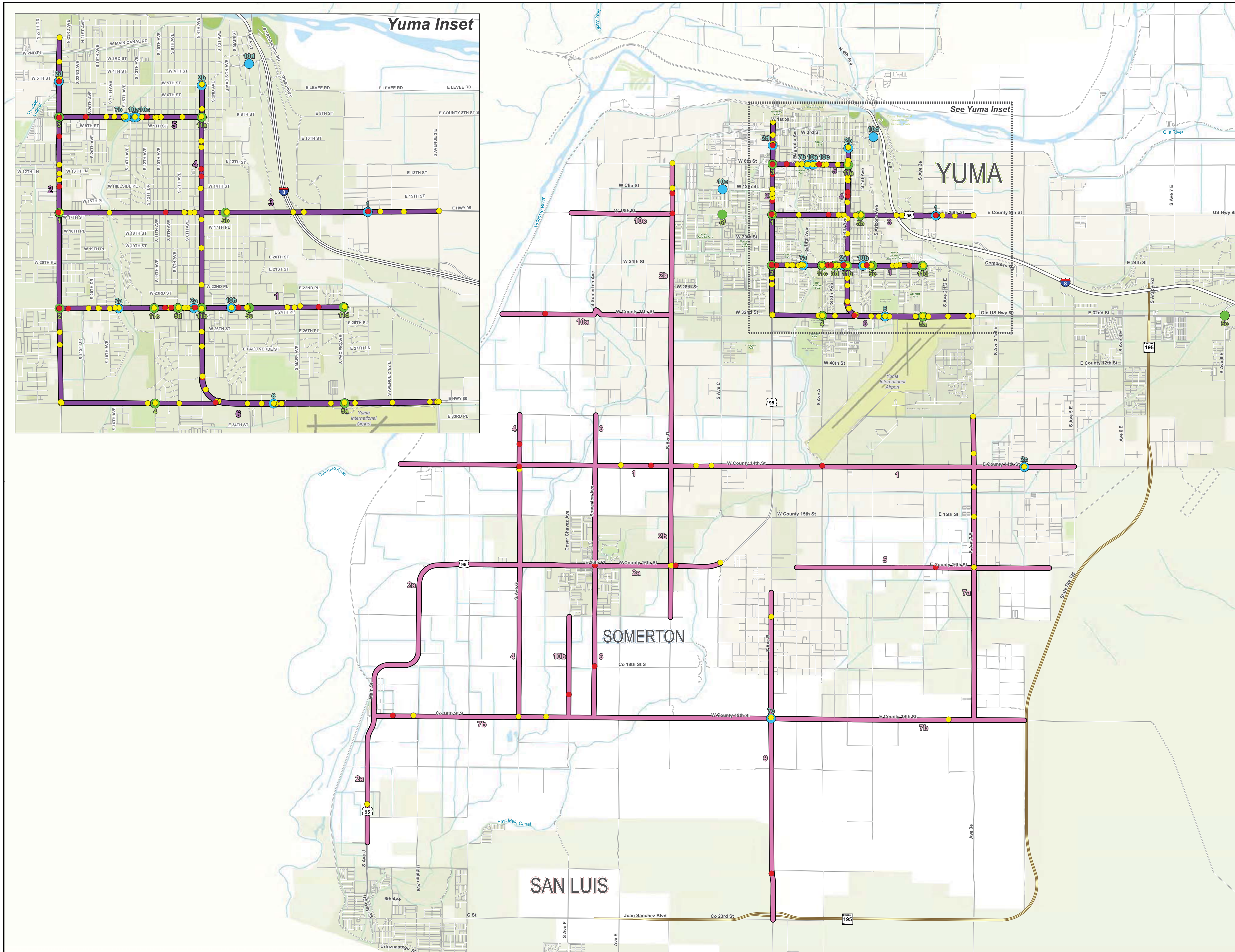
2004-2013 Crash Data
Fatal Crashes
Pedestrian
Bicycle
Serious Injury Crashes
0
1
2
Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
YMPO
N
County 8th Street
County 9th Street
E 24th Street
E 32nd Street
County 12th Street
County 13th Street
YUMA
95
8
S Avenue 3 E
S Avenue 4 E
S Avenue 5 E
Araby Rd
S Avenue 8 E
S Avenue 10 E


2004-2013 Crash Data
Fatal Crashes
Pedestrian
Bicycle
Serious Injury Crashes
0
1
2
Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
YMPO
County 13th Street
County 14th Street
County 15th Street
County 16th Street
County 17th Street
County 18th Street
County 19th Street
County 20th Street
Somerton Ave
YUMA
SAN LUIS
Juan Sanchez Blvd
Araby Rd
S Avenue F
S Avenue E
S Avenue D
S Avenue B
S 4th Avenue
S Avenue 3 E
95
195
N



2004-2013 Crash Data
Fatal Crashes
Pedestrian
Bicycle
Serious Injury Crashes
0
1
2
Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
YMPO
County 8th Street
County 9th Street
County 10th Street
County 11th Street
County 12th Street
County 13th Street
W 16th St
W 24th St
W 32th St
YUMA
S Avenue D
S Avenue C
S Avenue B
S 4th Avenue
S Pacific Avenue
S Avenue 3 E
N


2004-2013 Crash Data
Fatal Crashes
Serious Injury Crashes
0 0.5 1 2
Miles
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT
Y M P O
E County 7th Street S
E County 8th Street S
S Ave 20 E
S Ave 21 E
S Ave 22 E
E County 9th Street S
E County 10th Street S
S Ave 24 E
S Ave 25 E
S Ave 26 E
S Ave 27 E
S Ave 28 E
S Ave 29 E
S Ave 30 E
S Ave 31 E
E County 11th Street S
8
YUMA
WELLTON
E County 12th Street S
E County 13th Street S
E County 13th Street S
E County 13th Street S
N



HSIP Priority Intersections and Corridors 2009 - 2013

- Serious Injury Crash
- Fatal Injury Crash
- Signalized Intersections
- Unsignalized Intersections
- Urban Corridors
- Rural Corridors

Rank	HSIP Signalized Intersections
1	S Ave B & W 16th St
2	S Ave B & W 24th St
3	S Ave B & W 8th St
4	S Ave A & W 32nd St
5a	E 32nd St & S Pacific Ave
5b	E 16th St & S 1st Ave
5c	S Ave 8 E & E 32nd St
5d	S 8th Ave & W 24th St
5e	E 24th St & S Arizona Ave
5f	W 16th St & S Ave C
11a	W 8th St & S 4th Ave
11b	S 4th Ave & W 24th St
11c	W 24th St & S Ave A
11d	E 24th St & S Pacific Ave

Rank	HSIP Unsignalized Intersections
1	E 16th St & S Engler Ave
2a	W 24th St & S 5th Ave
2b	W 5th St & S 4th Ave
2c	S Ave 4 E & E County 14th St
2d	W 5th St & S Ave B
6	S Crest Dr & E 32nd St
7a	W 24th St & S 17th Ave
7b	S 15th Ave & W 8th St
7c	S Ave B & W County 19th St
10a	W 8th St & S 14th Ave
10b	E 24th St & S Madison Ave East
10c	W 8th St & S Arena Dr
10d	S Gila St & Harold C Giss Pkwy
10e	S Ave C & 12th St

Rank	HSIP Urban Corridors		
	Corridor	From	To
1	24th St	Avenue B	Pacific Ave
2	Avenue B	1st St	32nd St
3	16th St	Avenue B	Avenue 3 E
4	4th Ave	5th St	32nd St
5	8th St	Avenue B	4th Ave
6	32nd St	Avenue B	Avenue 3 E

Rank	HSIP Rural Corridors		
	Corridor	From	To
1	County 14th St	Levee Rd	Avenue 5 E
2a	S Hwy 95 / Main St	Avenue C	County 21 1/2 St
2b	Avenue D	8th St	County 17th St
4	Avenue G	County 13th St	County 19th St
5	County 16th St	Avenue A 1/2	Avenue 4 1/2 E
6	Somerton Ave	County 13th St	County 19th St
7a	Avenue 3 E	County 13th St	County 19th St
7b	County 19th St	US Hwy 95	SR 195
9	Avenue B	County 16 1/2 St	Juan Sanchez Blvd
10a	County 11th St	600' east of Levee Rd	Avenue D
10b	Avenue F	County 17th St	County 19th St
10c	County 9th St	Avenue F	Avenue D

YMPO
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT

Job No.	37-2014-5011
PM:	MB
Date:	12/8/2015
Scale:	N/A

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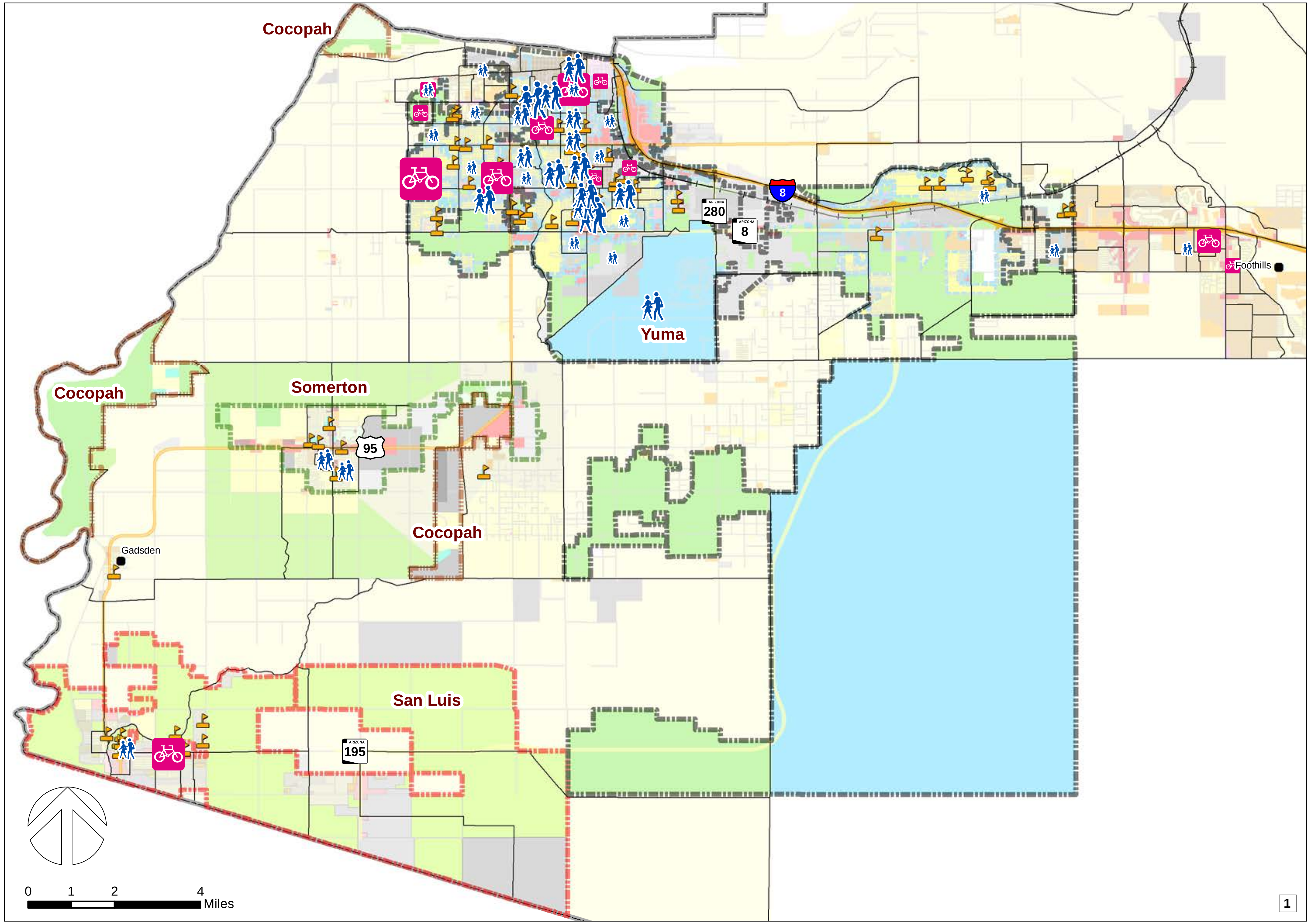
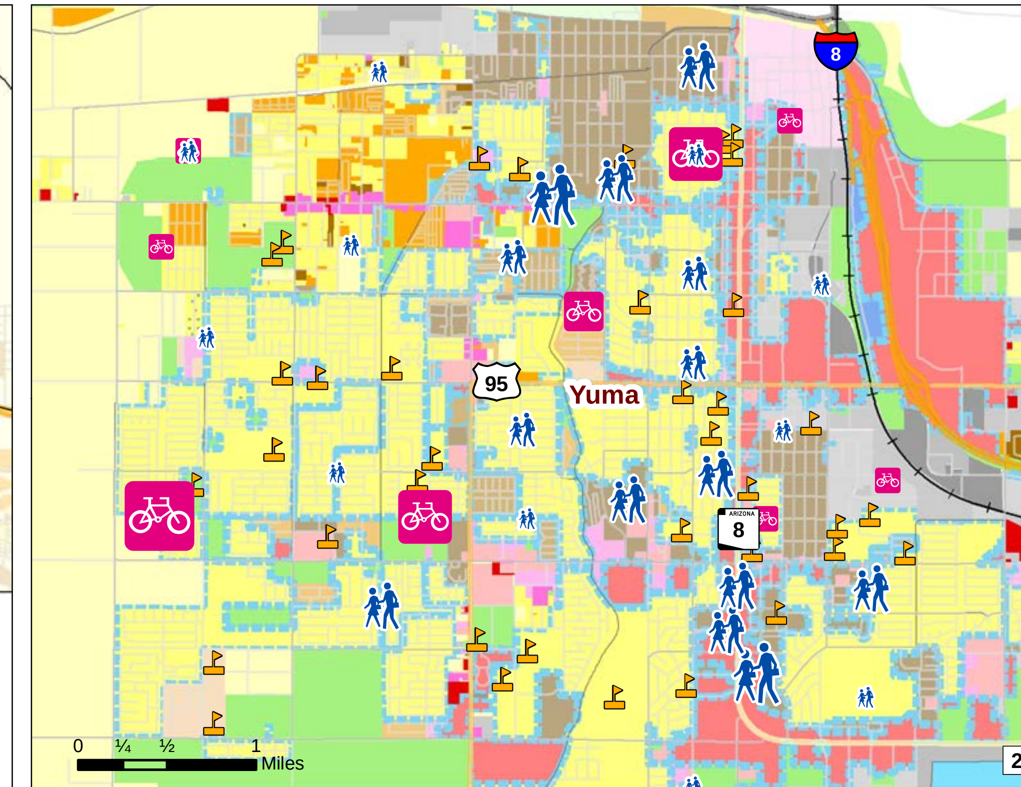
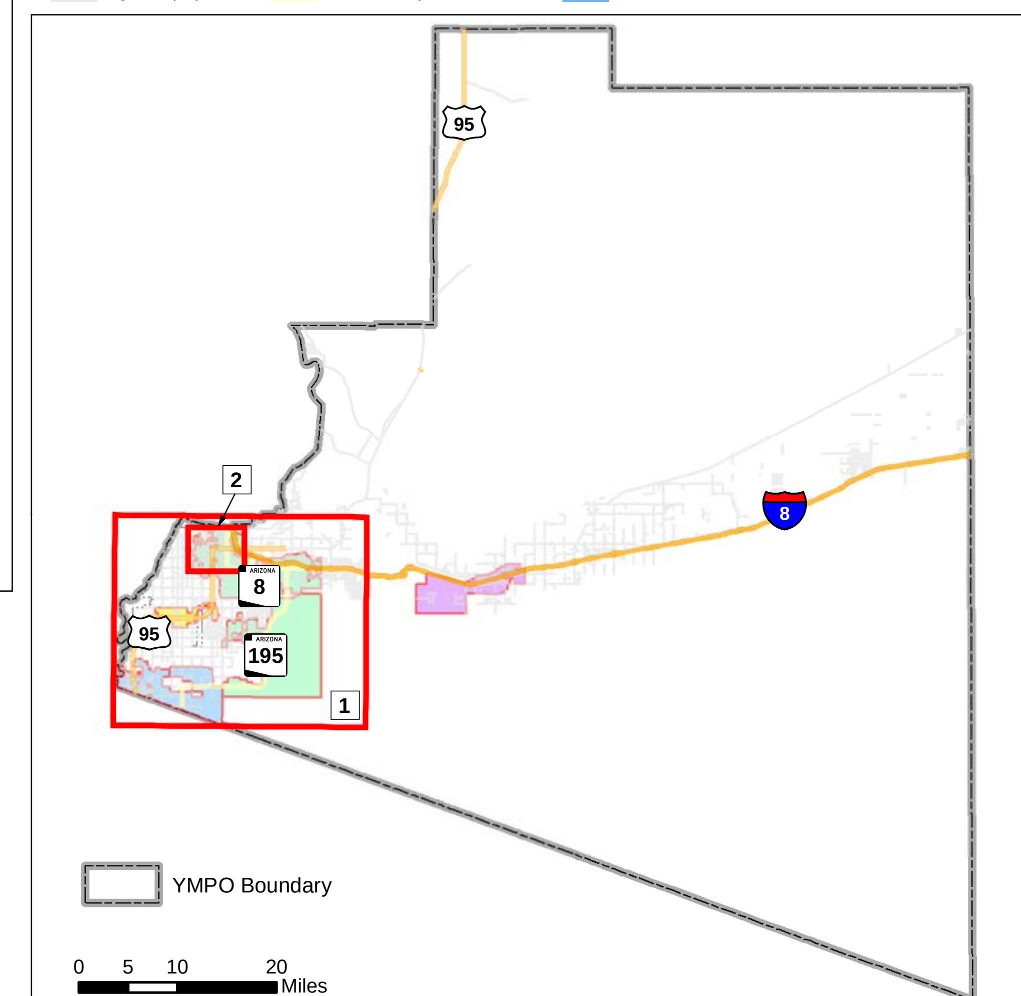




Commercial
Light Commercial
Employment
Light Employment
High Density Residential
Medium Density Residential
Low Density Residential
Rural Density Residential
Agriculture
Public Facilities/Military
Recreation Open Space
Business Park
School



Date: 4/02/2015

YMPO
Yuma
San Luis
Cocopah
Wellton
Somerton
Yuma County
ADOT

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Matrix DESIGN GROUP

Legend

Cocopah Sovereign Land
City of San Luis
City of Somerton
Town of Wellton
City of Yuma
County Border
Block Group Borders
School
Interstate
US-95
State Routes
Street Centerline
Railroad

Workers 16 years and over who walk to work (density)

More Walkers
Less Walkers

Workers 16 years and over who bike to work (density)

More Bikers
Less Bikers

*No block groups with significant walking/biking commuters in Wellton area

Data Source: American Community Survey 2009-2013. Additional Map Sources: Yuma Metropolitan Planning Organization, Yuma County, City of Yuma, City of San Luis, City of Somerton, Town of Wellton, ADOT, USGS

YMPO Regional Strategic Transportation Safety Plan - Block Groups by Demographic Domination