Roadway Safety Management Program

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Arizona Motor Vehicle Crash Facts 2016 Highlights

azdot.gov/crashfacts

In 2016 in the state of Arizona, 126,845 motor vehicle crashes killed 962 people and left 56,636 people injured.

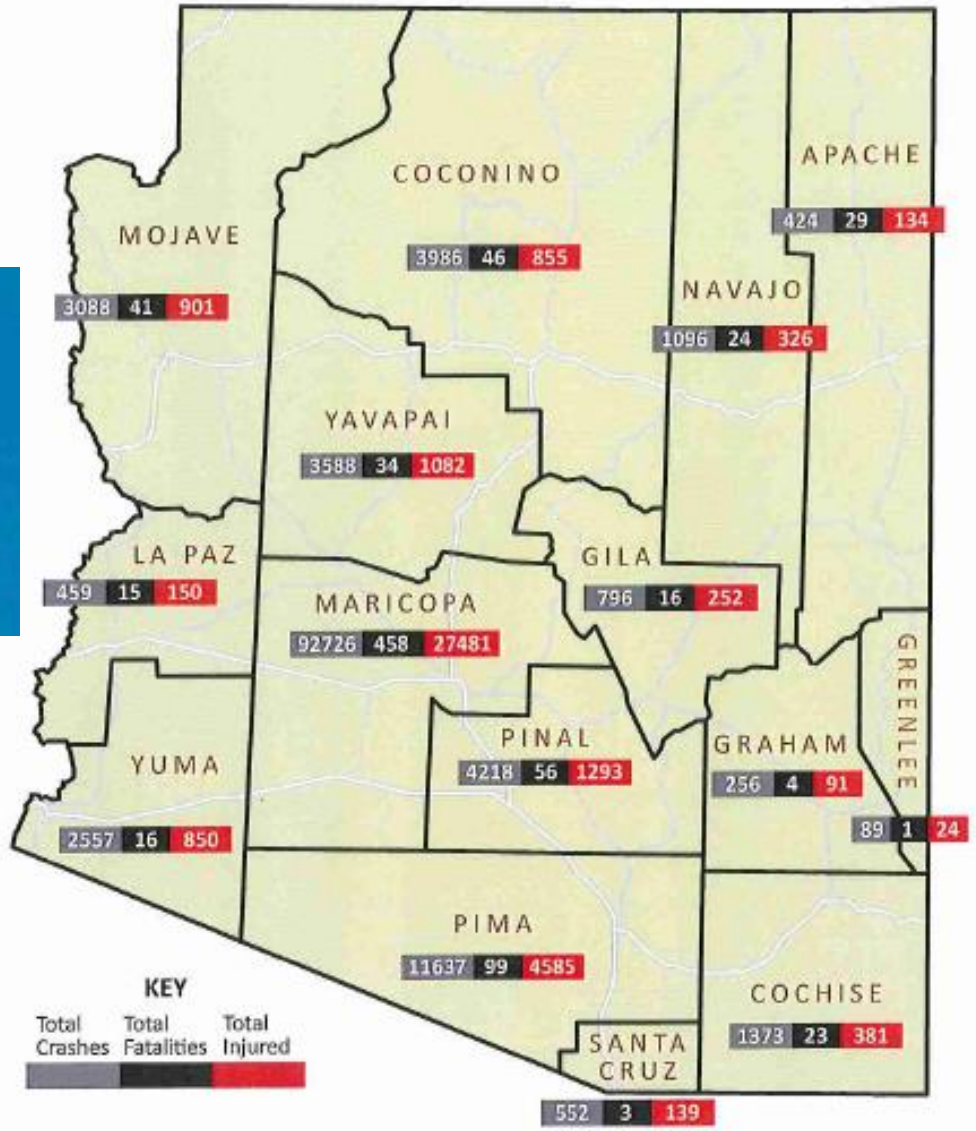
Some of the leading factors in traffic fatalities are:

- Speeding,
- Impairment
- Reckless driving
- Not wearing a seat belt
- Poor decisions made by drivers

2016 Arizona Crash Facts Summary

BREAKDOWN OF ALL CRASHES IN ARIZONA	
TOTAL	126,845
FATAL	865
INJURY	38,544
PROPERTY DAMAGE ONLY	87,436
URBAN	103,237
RURAL	23,608
ALCOHOL RELATED	4,923
PEDESTRIAN	1,637
PEDALCYCLE	1,476
MOTORCYCLE	3,104
SINGLE VEHICLE	20,036
MULTI-VEHICLE	106,809

Crashes occur on all kinds of roadways, from heavily-traveled freeways to back-country switchbacks. Of the 126,845 collisions in 2016, 30.3 percent happened on the state highway system, while 69.7 percent occurred on other roadways, such as city streets and county roads.



Highlights and Historical Trends

Table 1 – 1

Arizona Crash Facts Summary and Comparison

Category	2015	2016	Percent Change
Total Crashes	116,774	126,845	8.62%
Total Fatalities	897	962	7.25%
Total Injuries	53,677	56,636	5.51%
Alcohol Related Fatalities	329	307	-6.69%
Alcohol Related Injuries	3,240	3,297	1.76%
Urban Fatalities	468	525	12.18%
Urban Injuries	43,495	46,106	6.00%
Rural Fatalities	429	437	1.86%
Rural Injuries	10,182	10,530	3.42%
MC Operator and Passenger Fatalities	134	144	7.46%
MC Operator and Passenger Injuries	2,518	2,593	2.98%
Pedestrians Fatalities	163	197	20.86%
Pedestrians Injuries	1,243	1,448	16.49%
Pedalcyclist Fatalities	28	31	10.71%
Pedalcyclist Injuries	1,277	1,350	5.72%
Millions of vehicle miles traveled (VMT)	65,045	65,606	0.86%
Fatalities per 100 million VMT	1.38	1.47	6.33%
Injuries per 100 million VMT	82.52	86.33	4.61%

Statewide Economic Loss Due to Motor Vehicle Crashes

Fatalities	$5,579,600,000
Incapacitating Injuries	$1,816,000,000
Non-Incapacitating Injuries	$1,714,720,000
Possible Injuries	$1,287,804,000
Property Damage Only	$349,744,000
TOTAL	**$10,747,868,000**

Table 1 – 4

Estimated Economic Loss by County

County	Cost of Traffic Crashes			
	Fatalities	Injuries	PDO	Total
Apache	$ 208,800,000	$ 26,056,000	$ 1,044,000	$ 235,900,000
Cochise	$ 150,800,000	$ 58,156,000	$ 3,876,000	$ 212,832,000
Coconino	$ 301,600,000	$ 120,638,000	$ 12,340,000	$ 434,578,000
Gila	$ 121,800,000	$ 40,880,000	$ 2,112,000	$ 164,792,000
Graham	$ 29,000,000	$ 13,084,000	$ 644,000	$ 42,728,000
Greenlee	$ 5,800,000	$ 4,268,000	$ 256,000	$ 10,324,000
La Paz	$ 104,400,000	$ 30,816,000	$ 1,176,000	$ 136,392,000
Maricopa	$ 2,807,200,000	$ 3,288,946,000	$ 259,148,000	$ 6,355,294,000
Mohave	$ 313,200,000	$ 151,344,000	$ 8,584,000	$ 473,128,000
Navajo	$ 168,200,000	$ 50,352,000	$ 2,984,000	$ 221,536,000
Pima	$ 655,400,000	$ 568,978,000	$ 27,812,000	$ 1,252,190,000
Pinal	$ 359,600,000	$ 182,038,000	$ 11,476,000	$ 553,114,000
Santa Cruz	$ 17,400,000	$ 19,046,000	$ 1,640,000	$ 38,086,000
Yavapai	$ 232,000,000	$ 166,916,000	$ 9,888,000	$ 408,804,000
Yuma	$ 104,400,000	$ 97,006,000	$ 6,764,000	$ 208,170,000
TOTALS	**$ 5,579,600,000**	**$ 4,818,524,000**	**$ 349,744,000**	**$ 10,747,868,000**

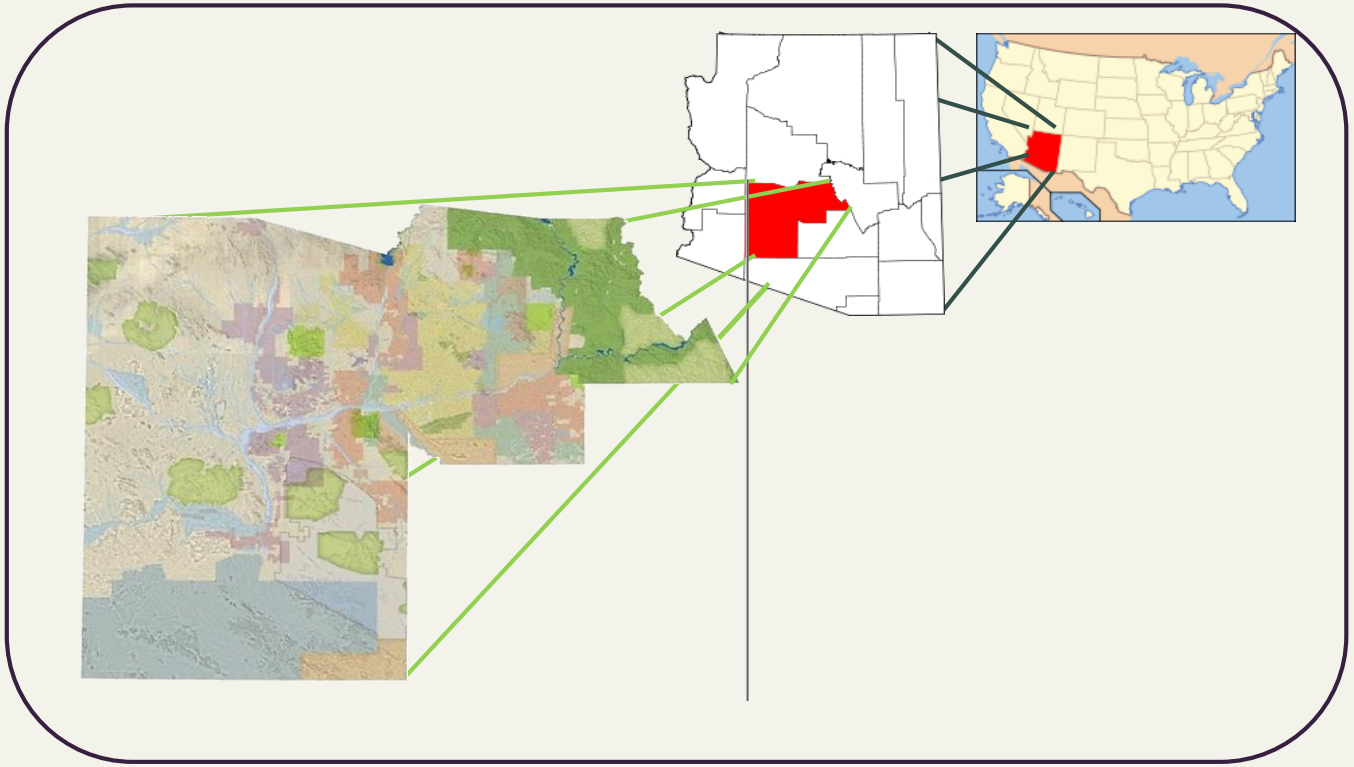
Average Economic Cost per Incident

1.	Fatality	$5,800,000
2.	Incapacitating Injury	$400,000
3.	Non-Incapacitating Injury	$80,000
4.	Possible Injury	$42,000
5.	Property Damage Only	$4,000

Source: www.cmfclearinghouse.org/resources_servlifecrashcostguide.cfm

- Approximately 9,230 Sq. MI.
- 4th largest County in US
- Population approx. 4 Million (More than 23 States)
- 24 cities and towns
- 5 Indian Communities

- 2,600 Ln Mile of paved county roads
- 814 Ln Mile of unpaved county roads
- 23 Miles (121,000 LF) of existing guardrail
- 160 signalized intersections
- 400 un-signalized intersections



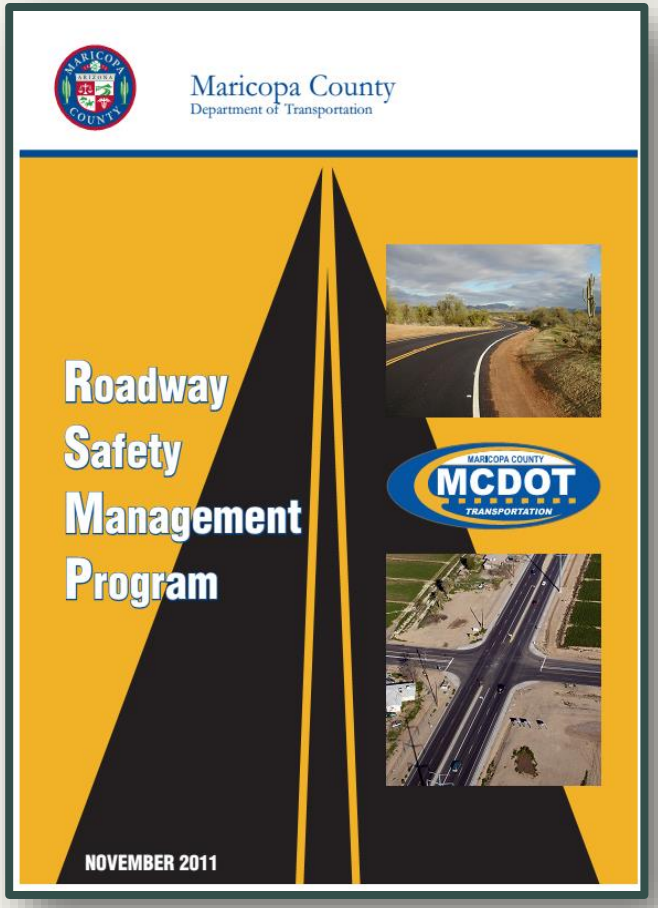
Maricopa County's 2011 – 2015 Strategic Plan Priorities

Safety goal:

"By 2015, Maricopa County will evaluate 100% of intersections and run off road fatal and serious injury crash locations within unincorporated County areas as identified in the MCDOT Roadway Safety Management Program, for implementation of appropriate safety improvements."

MCDOT Roadway Safety Management Program

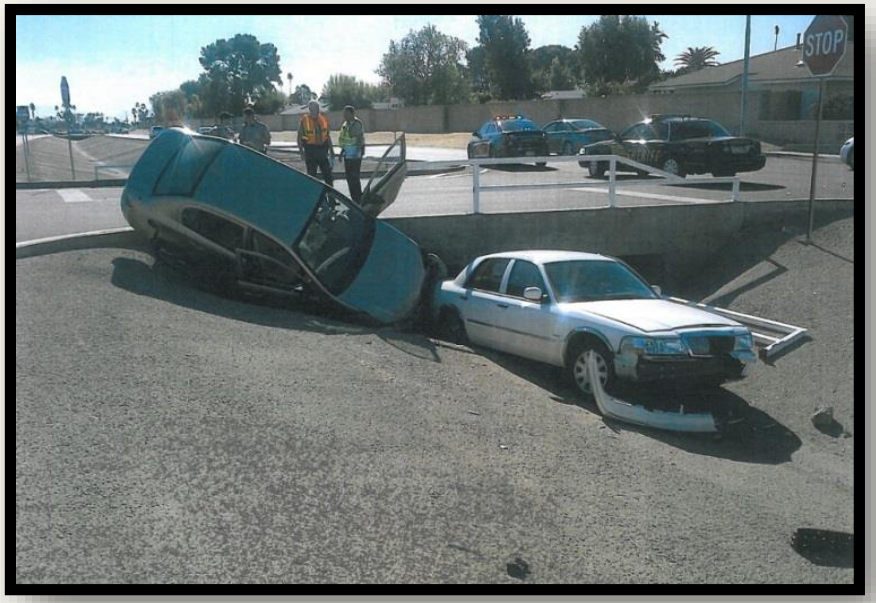
MCDOT TSM division issued the Road Safety Management Program in November 2011. The program will complement the traditional approach based on MUTCD National Standards, which provide guidelines for the implementation of changes when a certain number of crashes occur or crash warrant is met. This Systematic Approach Concept will supplement the traditional approach whereby intersection and run-off-the-road locations not meeting the minimum crash warrant criteria of the MUTCD, will be evaluated for improvements.



Program Focus

This program will focus on two types of crashes:

- Intersections
- Run-off-the-road



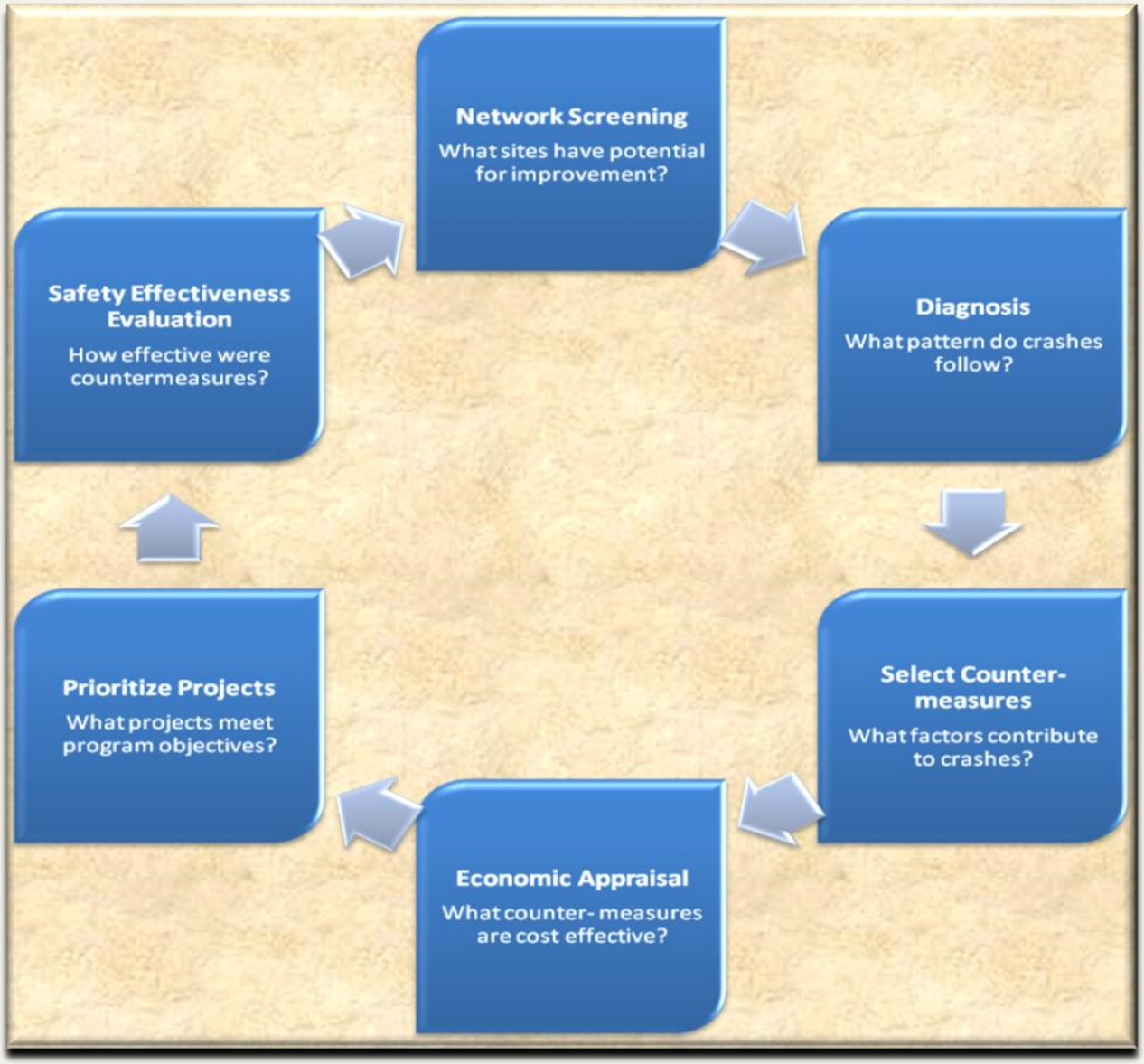
Planning/Programming

Systemic needs are identified subject to analysis of ranked traffic fatalities and serious/incapacitating injuries (Class 4) crash locations.
The ranking is based on:

- crash history (last three years),
- average daily traffic (ADT) &
- total number of all crash categories for intersections and ROR crash locations.

The following process is adopted by MCDOT :

- Collect and maintain data
- Diagnose, analyze & identify hazardous locations
- Establish priorities
- Conduct engineering studies
- Select countermeasures
- Implement projects
- Evaluate (before & after studies)


Network Screening
What sites have potential for improvement?
Diagnosis
What pattern do crashes follow?
Select Counter-measures
What factors contribute to crashes?
Economic Appraisal
What counter- measures are cost effective?
Prioritize Projects
What projects meet program objectives?
Safety Effectiveness Evaluation
How effective were countermeasures?

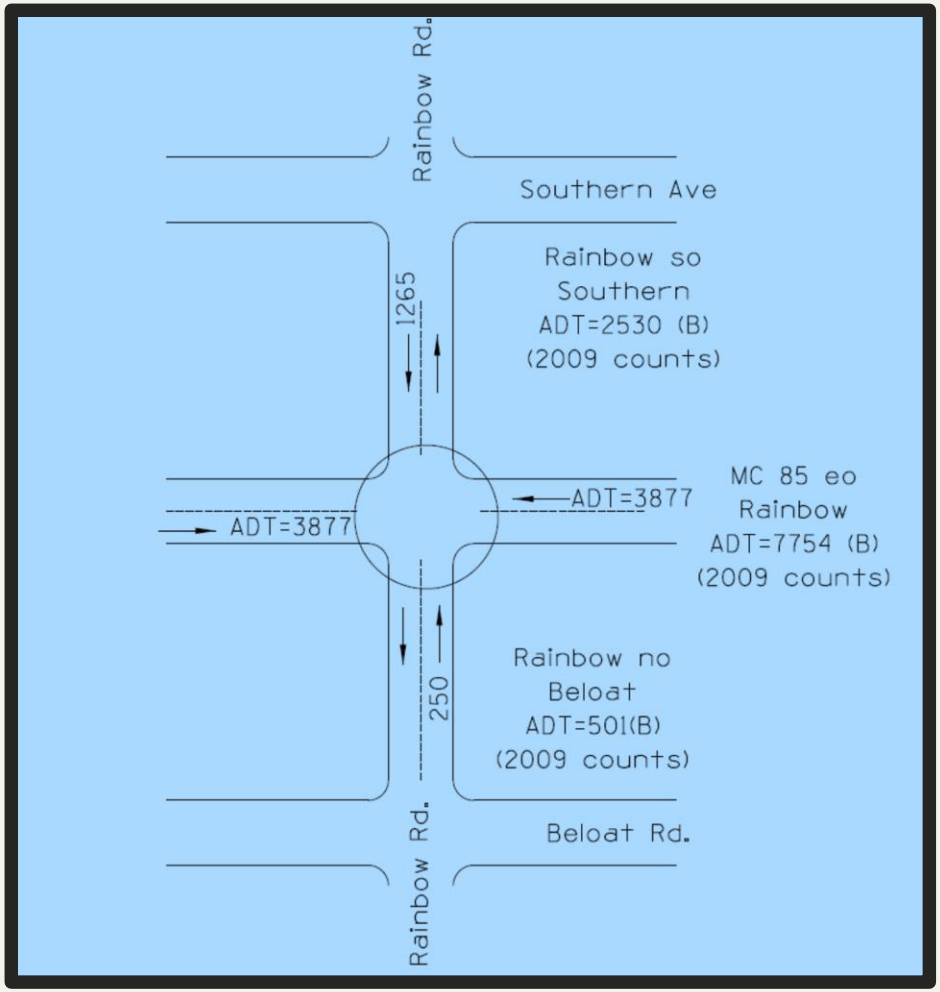
Criteria for Selecting Locations for Evaluation:

- Crash Data
  - Severity (Fatal & Incapacitation crashes)
  - Total number of crashes (all types)
- Average Daily Traffic (ADT)

Intersection and Run-Off-The-Road Ranking Form

	1	2	3	4	5	6	7	8	9
	Intersection or Run-Off-The-Road Location	Total # of Fatalities/ Injury 4	Rank (Fatalities/ Injury 4) High to Low	Total # of Crashes	Rank (Total # of Crashes) High to Low	ADT	Rank (ADT) Low to High	Ranking Score (Low to High)	Overall Ranking (Low to High)
1	A	6	4	50	3	10,000	3	10	4
2	B	10	2	26	4	25,000	5	11	5
3	C	11	1	20	5	6,000	2	8	2
4	D	5	5	100	1	3,000	1	7	1
5	E	8	3	66	2	20,000	4	9	3

ADT Calcs. for intersection



Safety Improvements Countermeasures as recommended by RSMP

Countermeasures used by Maricopa County DOT for application at Run Of Road (ROR) locations include but not limited to the following items:

- ✓ **Installation of oversized warning signs, Lane traverse rumble strips.**
- ✓ **Pavement marking & striping (center & edge line).**
- ✓ **Speed feedback Signs.**
- ✓ **Adding /upgrading delineators and raised pavement marker (RPM).**
- ✓ **Evaluate & upgrade existing safety barriers/guardrail (length of need distance)**
- ✓ **Remove, relocate or protect roadside hazards (clear zone distance)**
- ✓ **Horizontal & vertical sight distance improvement.**
- ✓ **Improving roadway geometric conditions in general. (implement proper reverse curves, super elevation, and friction coefficient etc.) .**
- ✓ **Increase no. of lanes.**
- ✓ **High friction surface treatment application(HFST).**

Safety Improvements Countermeasures as recommended by RSMP

Countermeasures used by Maricopa County DOT for application at *Intersections* include but not limited to the following items:

Non Signalized Intersection

- ✓ **Double up (left & right) oversize stop signs.**
- ✓ **Convert from 2 way to 4 way stop control.**
- ✓ **Installation of oversized advanced warning signs, flashing solar powered LED beacons, lane traverse rumble strips, and STOP on advance intersection warning signs.**
- ✓ **Pavement marking & striping (stop bar, center & edge line)**
- ✓ **Evaluate/ Install intersection lighting(transition to LED)**
- ✓ **Adding /upgrading delineators and raised pavement marker (RPM)**
- ✓ **Evaluate & upgrade existing safety barriers/guardrail**
- ✓ **Remove, relocate or protect roadside hazards**
- ✓ **Horizontal & vertical Sight distance improvement**
- ✓ **Improving roadway geometric conditions in general**

Safety Improvements Countermeasures as recommended by RSMP

Countermeasures used by Maricopa County DOT for application at *Intersections* include but not limited to the following items:

Signalized Intersection

1- Signal Operations

- **Add all-red clearance interval (from 0 to 2 second)**
- **Add exclusive pedestrian phasing**
- **Convert exclusive leading protected to exclusive lagging protected**
- **Convert permissive or permissive/protected to protected only left-turn phasing.**
- **Increase yellow change interval**

2- Signal Hardware

- **Add yellow retro-reflective sheeting to signal back plates**
- **Convert signal from pedestal-mounted to mast arm**
- **Improve visibility of signal heads (increase signal lens size, install new backboards)**
- **And/or install additional one signal head per lane**

Funding

An implementation program will be defined based on the estimated cost for the recommended countermeasures and how improvements will be funded.

Funding Sources Include:

a. **Short term countermeasures can be immediately addressed with available funding *(MCDOT yearly TIP budget includes about 3% allowance for safety related projects)***

b. **Long term countermeasures included in major improvement projects will be programmed into MCDOT's *Transportation Improvement Program (TIP)***

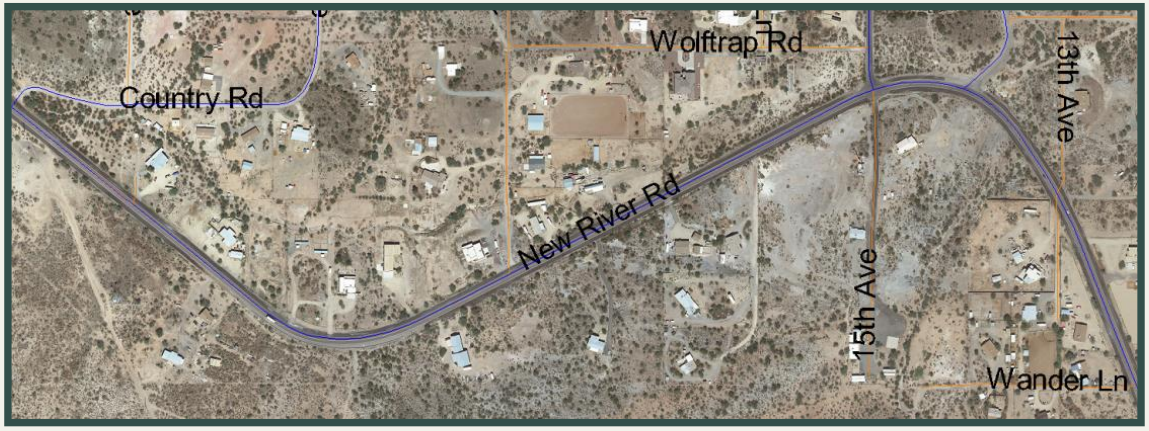
c. **Some projects may be eligible for future state *Highway Safety Improvement Program funding (HSIP)***

d. **Roadside Barrier installation, upgrading and repair can be done using MCDOT Operations and Maintenance Division funding and utilizing *Job Order Contracting services (JOC)***

Projects Implementation & Evaluation

Location 1: New River Road (S-Curve)

- Rural Minor Arterial
- Two Lane Roadway
- Posted speed = 45mph
- ADT =1920 VPD(Both) 2013



Safety Issues:

1. 7 crashes from 2009 to 2011
2. 4 ROR crashes
3. 1 fatality, 3 class 3 injury, & 3 PD

Countermeasures Implemented:

- Upgrade chevrons, signs, one direction large arrow
- Refresh Striping & Replace or add RPM's (Centerlines & EP)
- Speed feedback device @ two locations both directions.

Completion date: January 2012

Results:

MCDOT crash data records show that between 4/1/2012 and 12/31/16 there was
4 PD,1 INJ2 & 1 INJ3.
4 ROR ,with various causes(speed and other)
3 darkness,3 daylight

	Before	After
Avg. Speed	46.4	38.11
85th Percentile Speed	53.3	48.84
Vehicle Percentage @ Speed above 51MPH	9.50%	5.28%

85th percentile speed(Operating Speed) as referenced in 2011 AASHTO Green Book & 2009 MUTCD

Criteria defined as:

The speed limit is commonly set at or below the 85th percentile operating speed (being the speed which no more than 15% of traffic is exceeding)

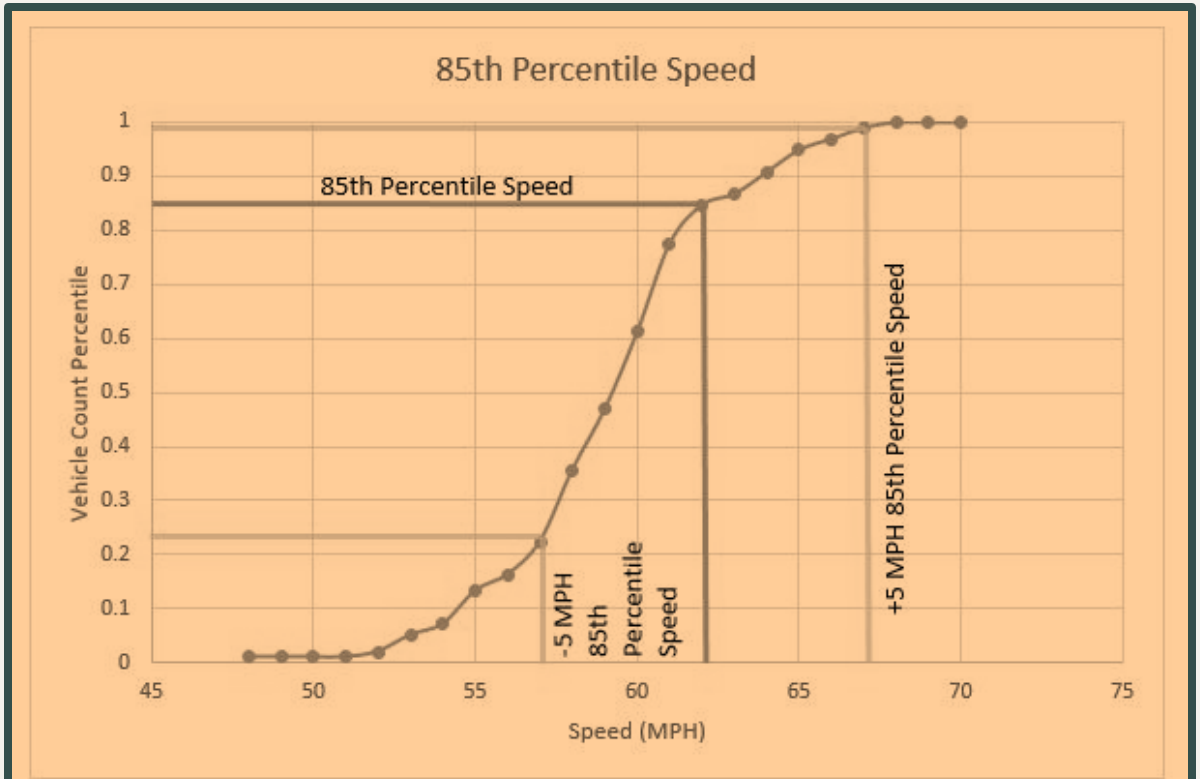


Figure 1: 85th Percentile Speed Graph

Site 2: Glendale Ave. and Reems Rd.

- Principal arterial
- Two way curved intersection
- Direction of traffic N/S & E/W
- East & South leg not a through street
- Posted @ 45mph in both directions
- ADT =766 VPD (Both) 2013

Safety Issues:

1. 18 crashes from 2008 to 2010
2. 15 ROR crashes
3. 17 crashes occurred in darkness
4. 1 fatality, 2 class 3 injuries , 3 class 2 injury & 11 PD

Glendale Ave. and Reems Rd.

- **Countermeasures Implemented**
  - Upgrade chevrons (W1-8 - 30”x36”).
  - Install oversized turn signs(48”x48”) combined with advisory speed (10mph) 36”x36” both sides on both approaches
  - Install oversized one direction large arrow (96”x48”)
  - Restriping /adding RPM’s (Centerlines & EP)
  - Install transverse rumble strip on both approaches
  - Installation of two street lights at the inside of the curve
- **Implementation completed September 2011**
- **Results:**
  MCDOT crash data records show that between 10/1/2011 and 12/31/16 there was 5 PD, all ROR & all in darkness

Site 3: Mckellips Rd. at Crismon

- Principal arterial
- Two way curved intersection.
- Direction of traffic N/S & E/W.
- East & North leg not a through street.
- Posted @ 45mph for Crismon & 50 mph for McKellips Ave.
- ADT =2173 VPD (Both) 2013

Safety Issues:

1. 6 crashes from 2008 to 2011
2. 6 ROR crashes
3. 1 class 3 injury & 5 PD

McKellips Rd. at Crismon Rd

- **Countermeasures Implemented**
  - **Upgrade chevrons (W1-8 - 30”x36”).**
  - **Replace turn signs with advisory speed (10mph) with new signs & relocate according to MUTCD**
  - **Remove & reinstall one direction large arrow (oversized 96”x48”)**
  - **Restriping / replacing or adding RPM’s (Centerlines & EP)**
  - **Replace existing rumble strips with transverse rumble bar**
- **Implementation completed June 2011**
- **Results: There was 2 ROR PD crashes that occurred to date since the implementations took place (2013)**

As Transportation/Safety Engineers will do our best to improve the road conditions and try to make a difference

But, drivers hold the key to reducing crashes. Choose to make smart decisions behind the wheel, making roads safer for everyone.

Thank You

Questions?

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