DEPARTMENT OF TRANSPORTATION
Amarjeet S.Benipal
District 3 Director
703 B Street
MARYSVILLE, CA 95901–5556
PHONE (530) 741-4233
FAX (530) 741-4245
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

July 13, 2020

State Route 49 Safety Assessment Team
and Stakeholders

Dear Partners and State Route 49 Stakeholders,

Today Caltrans is announcing the release of the State Route (SR) 49 final Safety Assessment Report, which was initiated with our partner agencies based on a continuing pattern of severe collisions on the SR 49 corridor. Within a six-week period from December 2019 through January 2020 there were two fatal collisions on SR 49 that resulted in heightened concerns from multiple agencies and the public.

In February 2020 Caltrans and its partners conducted a safety assessment of SR 49 from Interstate 80 in Auburn to McKnight Way in Grass Valley. The safety assessment team was comprised of personnel from the following agencies: Caltrans District 3, Caltrans Headquarters, Federal Highway Administration (FHWA), Nevada County Transportation Commission (NCTC), Placer County Transportation Planning Agency (PCTPA), Nevada County, Placer County, City of Auburn, City of Grass Valley, City of Nevada City, California Highway Patrol (CHP), CAL FIRE and local fire districts.

The primary objectives of the SR 49 Safety Assessment Report were as follows:

1. Identify safety-related improvements that could be installed in the near term;

2. Identify enhancements that could be added to planned projects in the corridor;

3. Identify long-term projects to improve corridor safety.

Following the February audit, a draft Safety Assessment Report was prepared and circulated to safety audit team members and local agencies from Nevada and Placer Counties for comment. Feedback was incorporated into the report and Caltrans is now distributing the SR 49 Safety Assessment Report to safety audit team members, local political representatives and local stakeholders.

The SR 49 Safety Assessment Report will be released this summer to the public with virtual meetings held to present safety audit findings and receive input from constituents in both Nevada and Placer Counties.

Thank you to all who participated in the safety audit and in the preparation of the SR 49 Safety Assessment Report. The safety of the traveling public is our priority and we look forward to implementing these strategies with support from partner agencies, local elected representatives and the public.

Sincerely,

for AMARJEET S. BENIPAL
Caltrans District 3 Director

cc: Nevada County Transportation Commission
Placer County Transportation Planning Agency
Federal Highway Administration
Nevada County
Placer County
City of Auburn
City of Grass Valley
City of Nevada City
California Highway Patrol
CAL FIRE
Higgins Fire District
Assembly Member Megan Dahle
Senator Brian Dahle
Congressman Doug LaMalfa
Congressman Tom McClintock

State Route 49:
I-80 to McKnight Way
Safety Assessment Report

Prepared for:

Caltrans

July 2020

FEHR PEERS

Safety Assessment Report

State Route 49: I-80 to McKnight Way

03-PLA-49 PM 3.2/11.4
03-NEV-49 PM 0.0/13.7

EA 03-4H600
Project ID 03 1900 0004

July 2020

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1. Introduction

The State Route (SR) 49 Safety Audit Workshop was held on February 18, 19, and 20, 2020 at the Caltrans maintenance office in Rocklin and the Placer County Transportation Planning Agency in Auburn. The project area covers SR 49 from Interstate 80 (I-80) in Auburn to McKnight Way in Grass Valley.

1.1 Purpose

At the beginning of the workshop, Caltrans identified the primary objectives of the study as follows:

1. Identify safety-related improvements that could be installed within the very near term
2. Identify enhancements that could be added to planned projects in the corridor
3. Identify long term projects to improve corridor safety

1.2 Participants

This effort was a collaboration of several agencies: Caltrans (District 3), Federal Highway Administration (FHWA), California Highway Patrol (CHP), the Nevada County Transportation Commission (NCTC), the Placer County Transportation Planning Agency (PCTPA), Placer County Department of Public Works, the City of Auburn, and the Auburn City Fire Department.

The safety audit was the combined effort of 22 individuals representing the entities listed above. A complete list of the individuals is provided in Appendix A. Caltrans retained Fehr & Peers to evaluate crash data and facilitate the efforts of the participants.

1.3 Process

The final agenda for the safety audit workshop is provided in Appendix B. The morning of the first day was used to understand the nature of the issues, with a deep dive into the historical collision data. In the afternoon, the team conducted an in-person field review of the corridor with stops at six locations and discussed their observations. In the evening, a smaller group drove the corridor to observe conditions during darkness. On the second day, the team considered improvement ideas from their own experience, resource documents, and innovative efforts from elsewhere in the country. These ideas were discussed freely, with a bias towards including ideas that may potentially enhance safety, even if they may be difficult or expensive to implement. The final day was a review and refinement of the improvement strategies.

2. Corridor Description

The 22-mile SR 49 study corridor transitions from six-lane suburban street in Auburn to a four-lane rural highway in Placer County, to a rural two-lane highway in Nevada County, and to a four-lane freeway in Grass Valley. Given the variation along the route, the corridor was divided into the following four segments that have similar characteristics.

1. I-80 to Dry Creek Road – a four to six lane suburban arterial in Auburn and North Auburn
2. Dry Creek Road to Wolf Road/Combie Road – a four-lane rural highway with a continuous two-way left turn lane (striped median)
3. Wolf Road/Combie Road to Allison Ranch Road/La Barr Meadows Road – a two-lane highway with truck climbing lanes
4. Allison Ranch Road/La Barr Meadows Road to McKnight Way – a two-lane highway that transitions to a four-lane freeway at McKnight Way

The roadway characteristics are summarized in Table 1. A description of each segment is provided below.

Table 1: Corridor Description

Characteristic	Segment 1	Segment 2	Segment 3	Segment 4
Limits	I-80 to Dry Creek Road	Dry Creek Road to Wolf Road/Combie Road	Wolf Road/Combie Road to Allison Ranch Road/La Barr Meadows Road	Allison Ranch Road/ La Barr Meadows Road to McKnight Way
Post miles	PLA 3.21 to 7.43	PLA 7.43 to NEV 2.19	NEV 2.19 to R10.71	NEV R10.71 to R13.66
Length	4.2 miles	6.2 miles	8.5 miles	3.0 miles
AADT[1]	40,500	32,000	24,200	26,800
Adjacent land uses	Urbanized	Rural	Rural	Rural
Lanes	4 / 6	4	2	2
Posted speed	45 / 55 mph	65 mph	55 mph	55 mph
Traffic signals[2]	15	2	4	1
Median	TWLTL[3] / Raised	TWLTL	TWLTL / None	None
Shoulder width	4-8 feet	8 feet	2-8 feet	2-8 feet

Notes: 1. Highest average annual daily traffic (AADT) volume listed for the segment in the 2017 traffic volumes (https://dot.ca.gov/programs/traffic-operations/census/traffic-volumes/2017)
2. The number of signals includes boundary intersections.
3. TWLTL indicates a continuous two-way left-turn lane (striped median).
Source: Fehr & Peers (2020)

2.1 Segment 1

Segment 1 is from I-80 to Dry Creek Road in Placer County, post mile (PM) PLA 3.21 to 7.43. This segment is in an urbanized portion of Placer County. The portion south of Nevada Street/Marguerite Mine Road (PM PLA 4.55) is with the City of Auburn, and the portion to the north is in the unincorporated part of the County. Commercial and industrial parcels line the corridor including grocery stores, fast food restaurants, car dealerships, and big box retail outlets. Residential areas are mostly set back from the roadway except for the north end of the segment, where mobile home parks are located to the west. An elementary school and a hospital are located near Bell Road (PM 6.38) and Education Street (PM 6.54), and a middle school is located at Palm Avenue (PM 3.78).

Segment 1 has a posted speed of 45 miles per hour (mph) from I-80 to Locksley Lane (PM 6.96). North of Locksley Lane to Dry Creek Road, the posted speed is 55 mph based on an engineering and traffic survey conducted in 2017 that lowered the speed limit from the default speed limit of 65 mph as provided in CVC 22349. Including the I-80 ramp terminal intersections, Segment 1 has 15 traffic signals. Four travel lanes are provided from I-80 to Luther Road (PM 5.21). Luther Road to Bell Road has six lanes, and then the roadway narrows back to four lanes from Bell Road to Dry Creek Road. The most common median treatment is a two-way left-turn lane (striped median), which facilitates access to adjacent parcels. At some locations, a striped or raised median is used to prohibit left turns to and from driveways. A paved shoulder of varying width exists along the segment, but it is not formally designated as a Class II bicycle lane. Sidewalks primarily exist along recently improved parcels (for example, the shopping center on the southeast corner at Bell Road).

Figure 1 – Segment 1 North of Elm Avenue (PM PLA 3.47) and Segment 2 at Joeger Road (PM PLA R7.96)

2.2 Segment 2

Segment 2 is from Dry Creek Road in Placer County (PM PLA 7.43) to Wolf Road/Combie Road in Nevada County (PM NEV 2.19). The urbanized North Auburn area ends about a quarter mile north of Dry Creek Road. The rural land uses are primarily residential ranch homes and agricultural properties. Near the north end of the segment there are industrial and commercial parcels at Streeter Road (PM NEV 1.71) and Wolf Road/Combie Road.

Segment 2 has a posted speed of 55 mph from Dry Creek Road to Michael Lane (PM PLA R7.74, about 0.3 miles to the north) based on an engineering and traffic survey that lowered the speed limit from the default speed limit of 65 mph as provided in CVC 22349.. The rest of the segment is posted at 65 mph. Traffic signals exist only at the end points: Dry Creek Road and Wolf Road/Combie Road. The roadway generally has two lanes with a two-way left-turn lane (striped median) and an eight-foot shoulder in each direction. In the Nevada County portion, frontage roads are used to consolidate driveways.

2.3 Segment 3

Segment 3 is from Wolf Road/Combie Road to Allison Ranch Road/La Barr Meadows Road (PM NEV 2.20 to 10.56) in the rural portion of Nevada County. The adjacent land uses are primarily rural residential and agricultural parcels. A commercial area exists at Alta Sierra Drive (PM 9.22), and a few residential neighborhoods are located at the north end of the segment near Allison Ranch Road/La Barr Meadows Road.

Figure 2 – Segment 3 North of Alta Sierra Drive (PM 9.22) and Segment 4 at Golden Chain Motel (PM 11.62)

Segment 3 has a posted speed of 55 mph. Traffic signals are provided at Wolf Road/Combie Road, Lime Kiln Road (PM 7.17), Alta Sierra Drive, and Allison Ranch Road/La Barr Meadows Road. The four lanes at the southern end of the segment narrow to two lanes about one-half mile to the north. The highway widens to four lanes at the signals at Lime Kiln Road and Allison Ranch Road/La Barr Meadows Road. A northbound

truck climbing lane is provided from Auburn Road (PM 8.09) to Allison Ranch Road/La Barr Meadows Road. A turnout exists north of Running M Drive/Clivus Drive at PM 4.02. Left and right turn pockets are provided at various intersections to facilitate access. No left turn signs are posted at a few intersections in the southbound direction where there is one travel lane and no left turn pocket. Paved shoulder widths vary along this segment from 2 to 8 feet.

2.4 Segment 4

Segment 4 is from Allison Ranch Road/La Barr Meadows Road to McKnight Way (PM NEV 10.56 to R13.66). The segment starts in the south in a rural portion of Nevada County and enters the City of Grass Valley at the north end. The adjacent land uses are primarily rural residential with isolated commercial parcels near Wellswood Way (PM 11.69) and Crestview Drive (PM 12.89). A church is located in the middle of the segment, and mobile parks are located near and have access at Allison Ranch Road/La Barr Meadows Road. At the north end, commercial and industrial parcels adjoin the McKnight Way interchange.

Segment 4 has a posted speed of 55 mph that transitions to 60 mph north of McKnight Way. A traffic signal exists at Allison Ranch Road/La Barr Meadows Road, where the roadway has four lanes. The roadway transitions from four to two lanes about one-quarter mile north of Allison Ranch Road/La Barr Meadows Road. Left turn pockets are provided near Wellswood Way, Bethel Church Way (PM 11.90), Smith Road (PM 12.58), and Crestview Drive. The roadway then transitions to a four-lane freeway at about 0.4 miles south of the McKnight Way overcrossing. Paved shoulder widths vary along this segment from 2 to 8 feet.

3. Collision History

The findings from the evaluation of the collision history are summarized below. The presentation slides showing the collision and daily traffic volume history are provided in Appendix C.

3.1 Collisions

Collision history from the 10-year period from January 2010 through December 2019 was obtained from Caltrans' Traffic Accident Surveillance and Analysis System (TASAS). Table 2 lists the number of collisions and the number of persons killed and injured for each segment.

Table 2: Collisions and Persons Killed and Injured

Segment	Collisions				Persons	
	Total	Fatality	Injury	Fatality & Injury	Killed	Injured
1. I-80 to Dry Creek Rd (PM PLA 3.208 to 7.427)	1,266	11	433	444	12	648
2. Dry Creek Rd to Wolf Road/Combie Road (PM PLA 7.427 to NEV 2.194)	414	16	164	180	18	283
3. Wolf Road/Combie Road to Allison Ranch Road/ La Barr Meadows Road (PM NEV 2.194 to R10.710)	534	6	180	186	7	296
4. Allison Ranch Road/ La Barr Meadows Road to McKnight Way (PM NEV R10.710 to R13.663)	182	0	39	39	0	46
Total	2,396	33	816	849	37	1,273

Source: Caltrans TASAS for January 2010 to December 2019

Segment 1 had the highest number of collisions, more than half of all collisions in the study corridor. However, more fatality-related collisions occurred in Segment 2 (16) than in Segment 1 (11). In the 33 fatality-related collisions, 37 people were killed. In the 816 injury-related collisions, 1,273 people were injured.

3.2 Collision Rate

The collision rate is calculated by dividing the number of collisions by the traffic volume and the roadway length. Table 3 compares the actual collision rates to the average crash rates for similar facilities on a statewide basis in (see Appendix D for additional details). The first segment in the urbanized area of Auburn

and North Auburn has actual collision rates higher than the statewide averages for fatality, fatality and injury, and total collisions. All three actual rates are more than twice the average rate for similar facilities. The second segment has a fatality rate two-and-a-half times the statewide average, but the fatality and injury and total collision rates are lower than average. Collision rates for the northern segments are lower than the statewide averages.

Table 3: Collision Rate Comparison

Segment	Actual Collision Rate			Average Collision Rate		
	Fatality	Fatality & Injury	Total	Fatality	Fatality & Injury	Total
1. I-80 to Dry Creek Rd (PM PLA 3.208 to 7.427)	**0.020**	**0.81**	**2.32**	0.008	0.40	0.97
2. Dry Creek Rd to Wolf Road/Combie Road (PM PLA 7.427 to NEV 2.194)	**0.025**	0.27	0.62	0.010	0.30	0.78
3. Wolf Road/Combie Road to Allison Ranch Road/ La Barr Meadows Road (PM NEV 2.194 to R10.710)	0.008	0.25	0.73	0.017	0.37	0.91
4. Allison Ranch Road/ La Barr Meadows Road to McKnight Way[1] (PM NEV R10.710 to R13.663)	0.000	0.37	1.00	0.014	0.42	1.02

Notes: Collision rates are reported as collisions per million vehicle miles. Bold and underline font indicates an actual rate that is greater than the average rate.
1. Due to reporting limitations because the post mile changed at the boundary, the collision rates for this segment were only provided for a three-year period from January 2016 to December 2018.
Source: Caltrans TASAS for January 2010 to December 2019

3.3 Collision Trends

Figure 3 shows collisions by year for the study corridor. Reported collisions rose from 210 in 2010 to 244 in 2019, with a high of 305 collisions in 2016. The most property damage only (PDO) and injury collisions (116) occurred in 2016, and the most fatality collisions (5) occurred in 2017. The higher collisions in 2016 and 2017 correspond with an increase in average annual daily traffic (AADT) volume between 2014 and 2016, as reported by the census station at Lorenson Road (PM PLA R8.97).

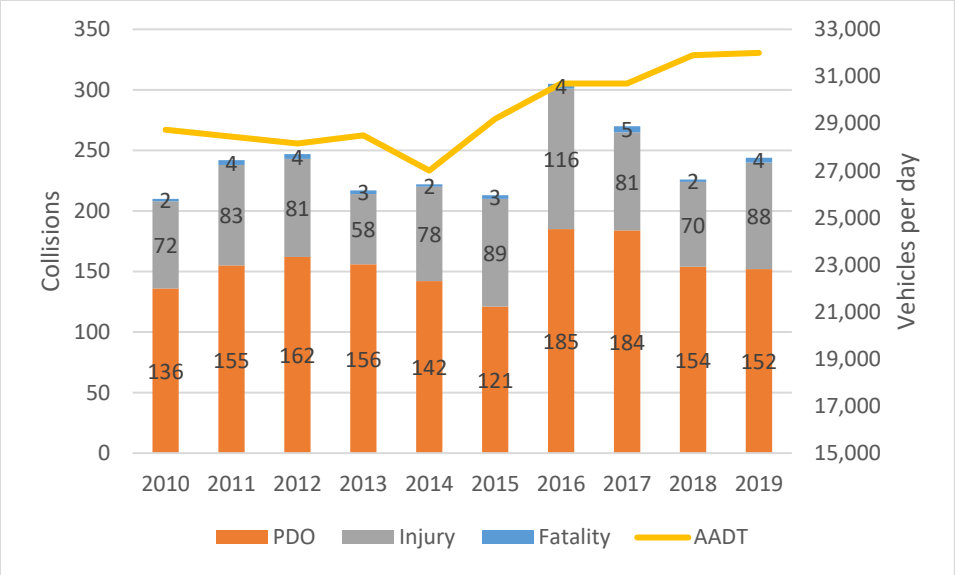


Figure 3 – Collisions by Year

The trend over time of other factors was reviewed. The percentage of severe (fatality and injury) collisions was found to vary around 30 to 40 percent. Collisions by side of the highway (that is, the direction of travel) were found to be evenly split. Intersection-related collisions were found to vary from 15 to 20 percent. These factors did not show a trend over time. These factors and the total collisions were reviewed by segment, and the results are provided in Appendix C.

3.4 Collisions by Time and Day

Figure 4 shows the percentage of collisions and daily volume (at Bell Road in 2011-2012) by month. The peak months for travel are late spring through summer (May to September). However, the peak months for collisions are October and November. These months correspond to peaks in recreational traffic for seasonal events and the onset of poor weather conditions. The urbanized Segment 1 has a relatively uniform distribution of collisions across the months, so the increased crashes in the fall months occurs in the rural segments.

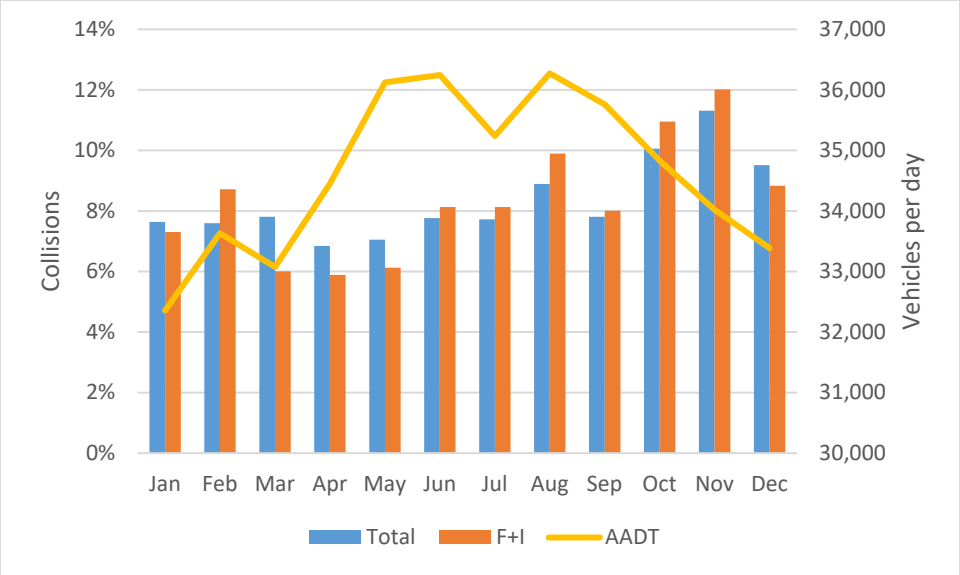


Figure 4 – Collisions by Month

Collisions are highest on weekdays (12 to 18 percent of all collisions) compared to weekend days (8 to 11 percent). This corresponds with daily traffic volumes that are higher on weekdays than weekends. This trend generally holds for the segments except for Segment 4 (Allison Ranch Road/La Barr Meadows Road to McKnight Way), which has a notable spike on Sundays (25 percent of fatality and injury collisions occurred on this day).

Figure 5 shows collisions and hourly volume by time of day from the count station at Bell Road (although older, the 2011-2012 time period provided the most complete year from the traffic census data).

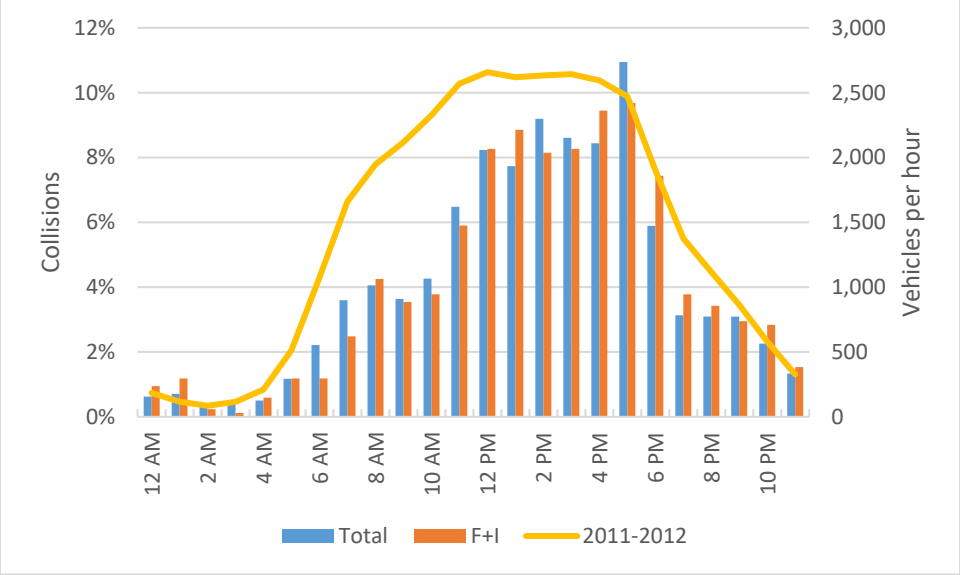


Figure 5 – Collisions by Time of Day

The highest hours for collisions are 11 AM to 6 PM. Although traffic volumes are relatively high during the morning hours, collisions are low. Segment 3 (Dry Creek Road to Wolf Road/Combie Road) is the only segment that has a higher percentage of collisions in the morning, from 7 to 9 AM. Segment 4 has a particularly concentrated number of collisions from 5 to 7 PM.

3.5 Collision Type

The most common collision type in the study corridor is a rear-end collision, which is about half (51 percent) of all collisions and of fatality and injury collisions. The next most common collision types are broadside, sideswipe, and hit object collisions. Table 4 lists the number, percentage, and rank of collisions types for total and fatality and injury collisions.

Table 4: Collision Type by Percentage

	Total Collisions			Fatality & Injury Collisions		
Collision Type	Total	Percentage	Rank	Total	Percentage	Rank
Head-On	84	4%	6	48	6%	5
Sideswipe	267	11%	3	49	6%	4
Rear End	1,220	51%	1	431	51%	1
Broadside	364	15%	2	177	21%	2
Hit Object	259	11%	4	68	8%	3
Overturn	40	2%	7	27	3%	7
Auto-Ped	32	1%	8	30	4%	6
Other	123	5%	5	16	2%	8
Not Stated	7	0%	9	3	0%	9

Source: Caltrans TASAS for January 2010 to December 2019

Figure 6 shows the share of collision types for each segment. For Segment 1, rear-end collisions are even more frequent (63 percent) than for the overall corridor (51 percent), and broadside collisions are the second most frequent type (16 percent) rather than sideswipe or hit object collisions. These collision types are associated with congestion (in the case of rear-end collisions) and cross traffic (in the case of broadside collisions), which are typically higher in urbanized areas. In the rural segments, hit object collisions are the second or third most frequent type. The "other" collision type is high in Segments 3 and 4 (12 to 13 percent).

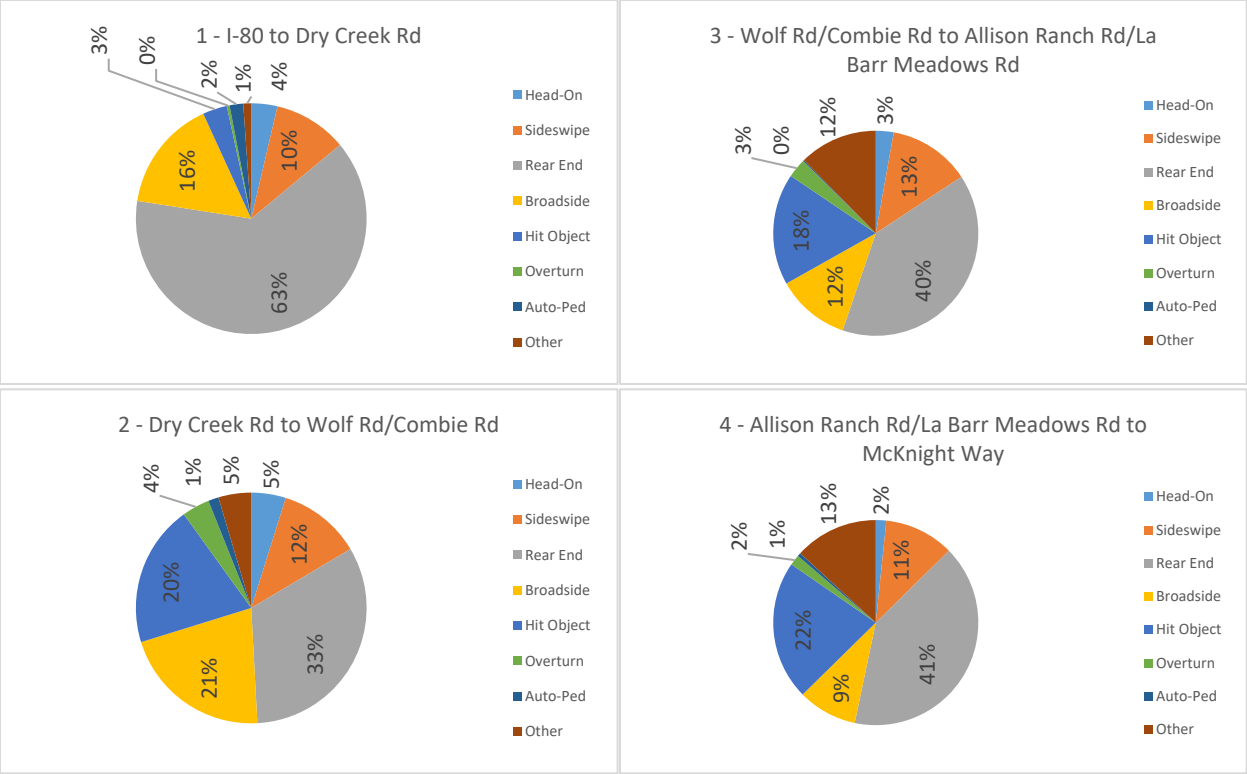


Figure 6 – Collision Type Percentage by Segment

3.6 Other Contextual Factors

The other contextual factors that were evaluated are the primary collision factor, weather, lighting, pavement condition, number of vehicles, and vehicle type. Here is a summary of the findings (see Appendix C for additional details).

- Speeding was the most frequent primary collision factor (43 percent), with failure to yield (15 percent) and other violation (15 percent) as the next most frequent factors.
- In the northern two segments, "other than driver" (17 to 18 percent) was the second most frequent factor. This category includes outside influences such as an animal in the roadway, a mechanical defect, roadway debris, and a medical event.
- Most collisions occurred during clear weather (75 percent). Rainy weather was 6 to 8 percent of collisions for all segments.
- Most collisions occurred during daylight (73 percent). Collisions in the dark were approximately split between those with streetlights (12 percent) and without streetlights (11 percent).

- Most collisions occurred on dry pavement (86 percent). Collisions on wet pavement varied from 11 to 18 percent with the highest percentage in Segment 3 (Wolf Road/Combie Road to Allison Ranch Road/La Barr Meadows Road).
- Overall, most collisions involved two vehicles (67 percent). Single vehicle collisions are more common in the three rural segments (30 to 33 percent) compared with the urban segment (6 percent).
- Most collisions involved passenger cars (72 percent). Trucks, motorcycles, and pedestrians are each 2 percent or lower. In Segments 2 and 3, animals are involved in collisions more frequently (4 and 7 percent, respectively) than for the corridor as a whole (2 percent).

Although it is listed as the most common primary collision factor, speeding in this context is not limited to traveling faster than the posted speed limit. CVC 22350 states that "no person shall drive a vehicle upon a highway at a speed greater than is reasonable or prudent having due regard for weather, visibility, the traffic on, and the surface and width of, the highway, and in no event at a speed which endangers the safety of persons or property." As a result, a California Highway Patrol (CHP) officer can cite a driver for speeding when traveling 45 mph in a 55-mph zone if the speed was not reasonable for the conditions at that time. Rear end collisions often have speeding as the primary collision factor since the following driver was traveling too fast to stop before the collision.

3.7 Collision Density

The spatial distribution of the 2010 to 2019 collisions from the TASAS database is shown in Figures 7 and 8 for total and fatal plus injury collisions, respectively. Fatal plus injury collisions are those collisions that involve at least one person injured or killed. Separate figures are provided for each segment.

For Segment 1, both total and fatal plus injury collisions are clustered around signalized intersections. The north legs at Bell Road (PM PLA 6.38) and Luther Road (PM 5.21) have the highest concentrations of collisions. Many of these are rear-end collisions may be related to drivers traveling at higher speeds encountering a queue at a signalized intersection. Palm Avenue (PM 3.78) has a high concentration of total collisions, but relatively fewer fatal plus injury collisions.

The only two signalized intersections in Segment 2, Dry Creek Road (PM PLA 7.43) and Wolf Road/Combie Road (PM NEV 2.19), have the highest concentration of collisions. Like Bell Road and Luther Road in Segment 1, the collisions are highest on the north leg of the Dry Creek Road intersection. Collisions at Wolf Road/Combie Road are centered on the intersection rather than on the north or south leg. Lone Star Road (PM PLA R10.28) is the only other high concentration of total collisions, but both Lone Star Road and Lorenson Road/Florence Lane (PM PLA R8.97) have a high concentration of fatal plus injury collisions.

For Segment 3, the four signalized intersections – Wolf Road/Combie Road, Lime Kiln Road (PM NEV 7.17), Alta Sierra Drive (PM 9.22), and Allison Ranch Road/La Barr Meadows Road (PM R10.71) – have the highest

concentrations of total collisions. For fatal plus injury collisions, hot spots occur at several locations including Round Valley Road (PM 8.43) and Pekolee Drive (PM 8.00).

Segment 4 has its highest concentration of total collisions at the signalized Allison Ranch Road/La Barr Meadows Road and the unsignalized Smith Road (PM NEV 12.58) intersections. One of the three hot spots in the fatal plus injury figure is the same as for total collisions (Allison Ranch Road/La Barr Meadows Road), but the other two are the Wellswood Way intersection (PM 11.69) and the McKnight Way (PM R13.66) ramps.

3.8 Fatal Collisions

The 10-year collision data (2010-2019) has 33 fatality-related collisions on the SR 49 study corridor (which resulted in 37 fatalities as shown in Table 2). Table 5 lists the fatal collisions by segment. The locations of the fatal collisions are shown on Figures 7 and 8.

Table 5: Fatal Collisions

Segment	Collisions	Comments
1. I-80 to Dry Creek Rd (PM PLA 3.25 to 7.42)	11	• 8 auto-pedestrian collisions • 2 at Atwood Road and 2 at Rock Creek Mobile Home Park driveway • 7 occurred in the last five years (2015-2019) • 9 occurred at night • 7 located in the southbound direction
2. Dry Creek Rd to Wolf Road/Combie Road (PM PLA 7.42 to NEV 2.20)	16	• 6 broadside collisions • 6 located within 0.5 miles of Dry Creek Road
3. Wolf Road/Combie Road to Allison Ranch Road/ La Barr Meadows Road (PM NEV 2.20 to 10.56)	6	• 2 each of head-on, broadside, and hit object • 3 located near Mother Lode Road/Oak Drive (near the southbound lane drop) • All located in the southbound direction
4. Allison Ranch Road/ La Barr Meadows Road to McKnight Way (PM NEV 10.56 to 13.66)	0	
Total	33	

Source: Caltrans TASAS for January 2010 to December 2019

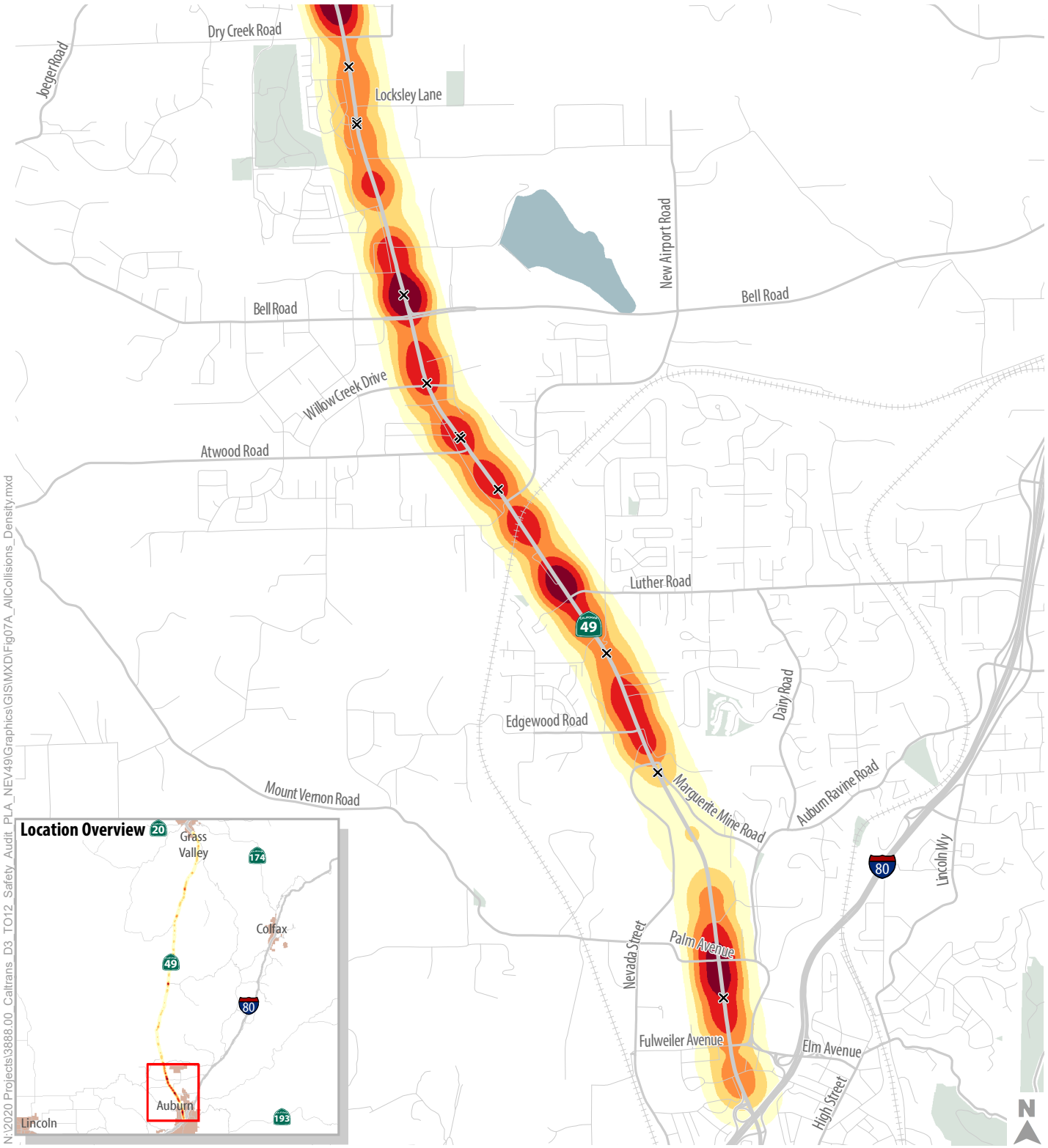


Figure 7A

Collision Density (All Collisions) - Segment 1

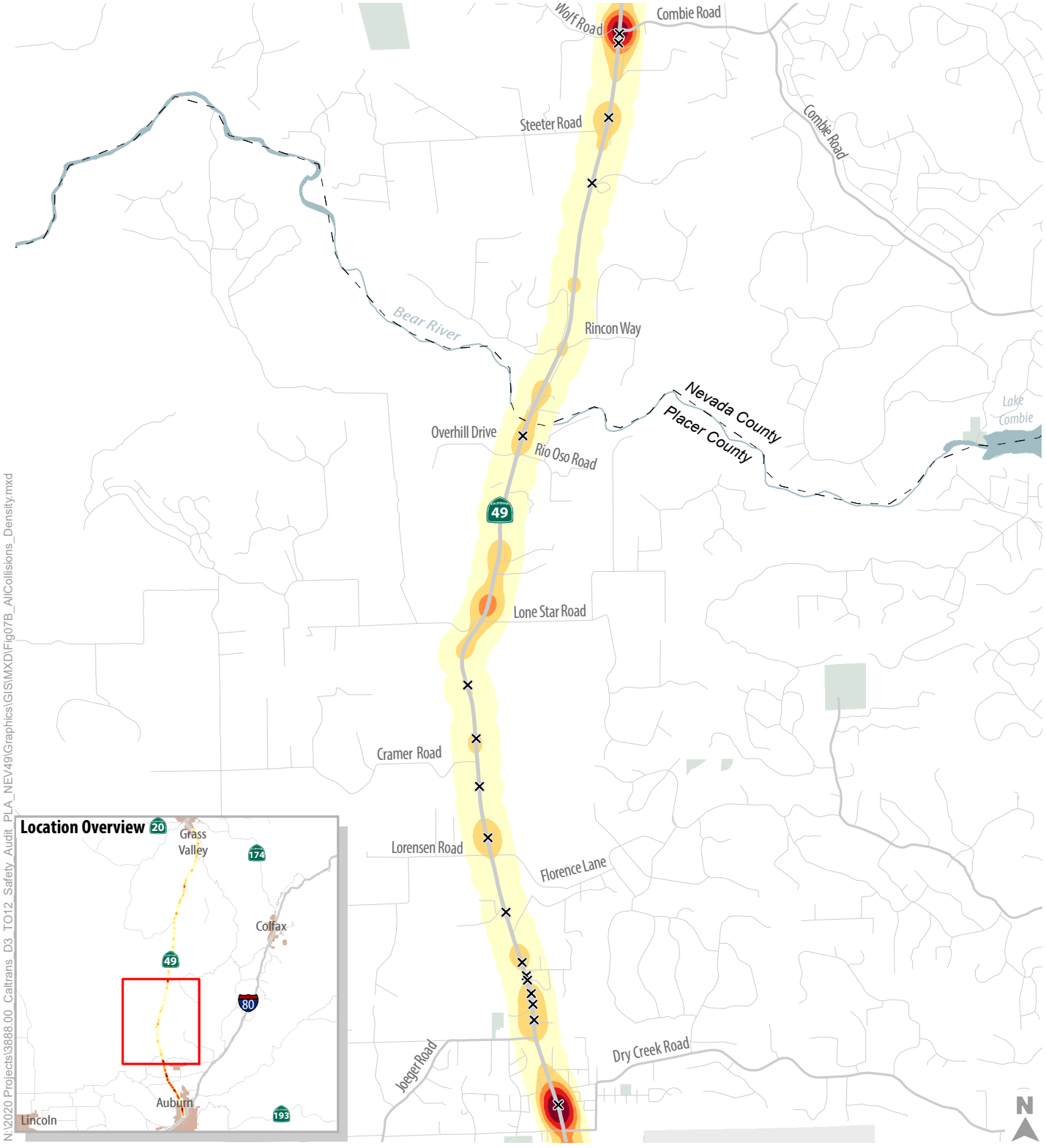


Figure 7B

Collision Density (All Collisions) - Segment 2

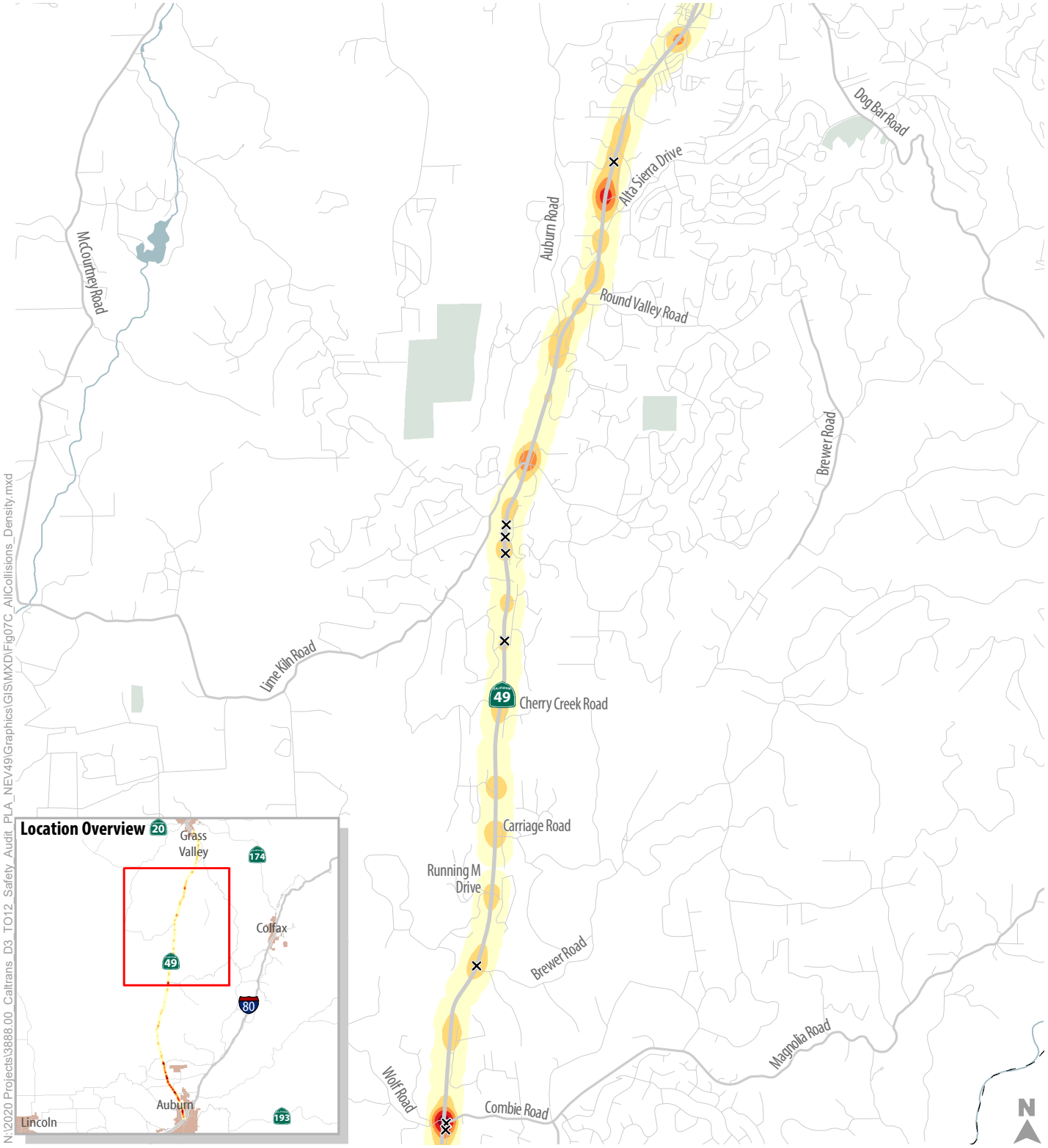


Figure 7C

Collision Density (All Collisions) - Segment 3

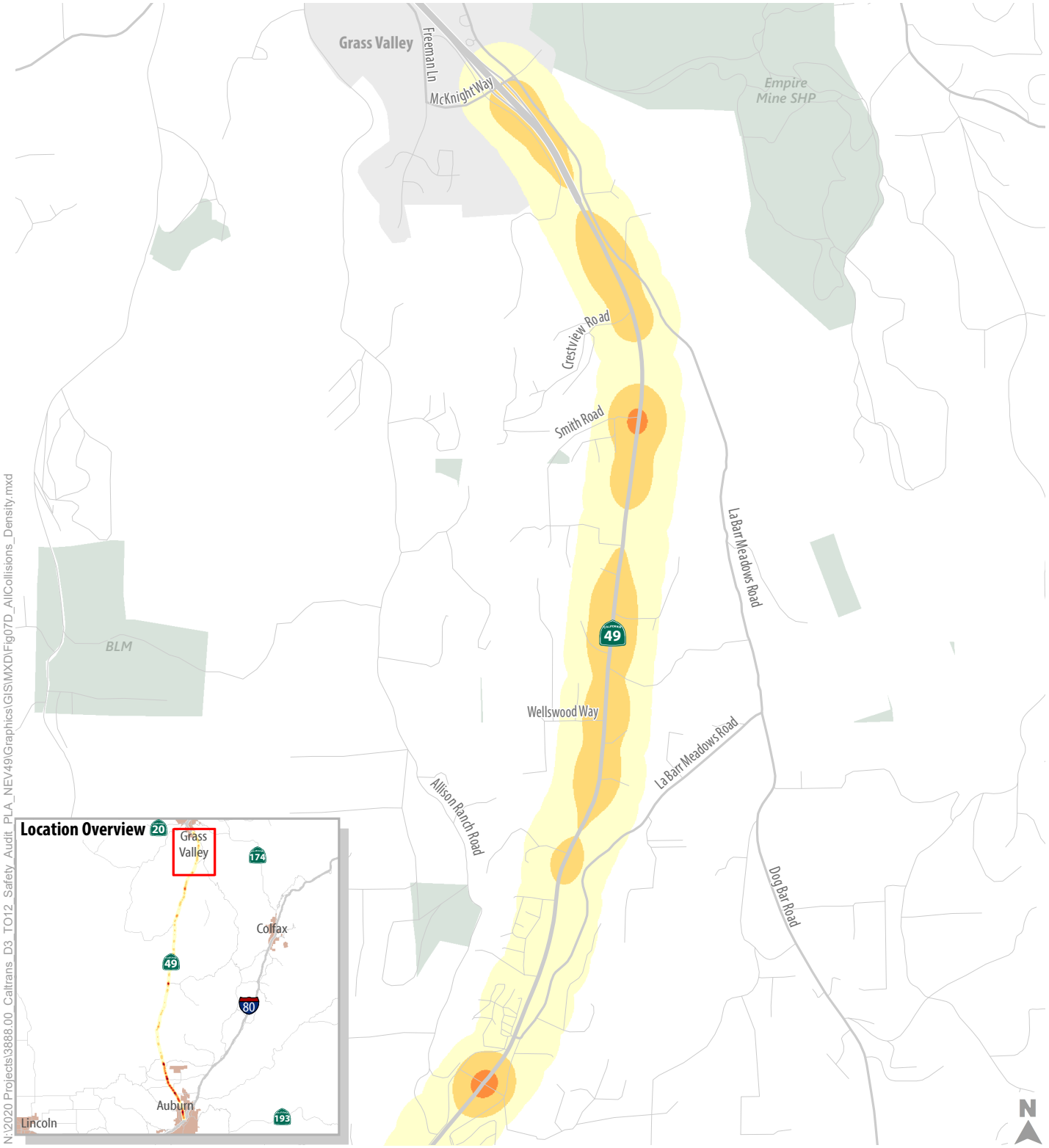


Figure 7D

Collision Density (All Collisions) - Segment 4

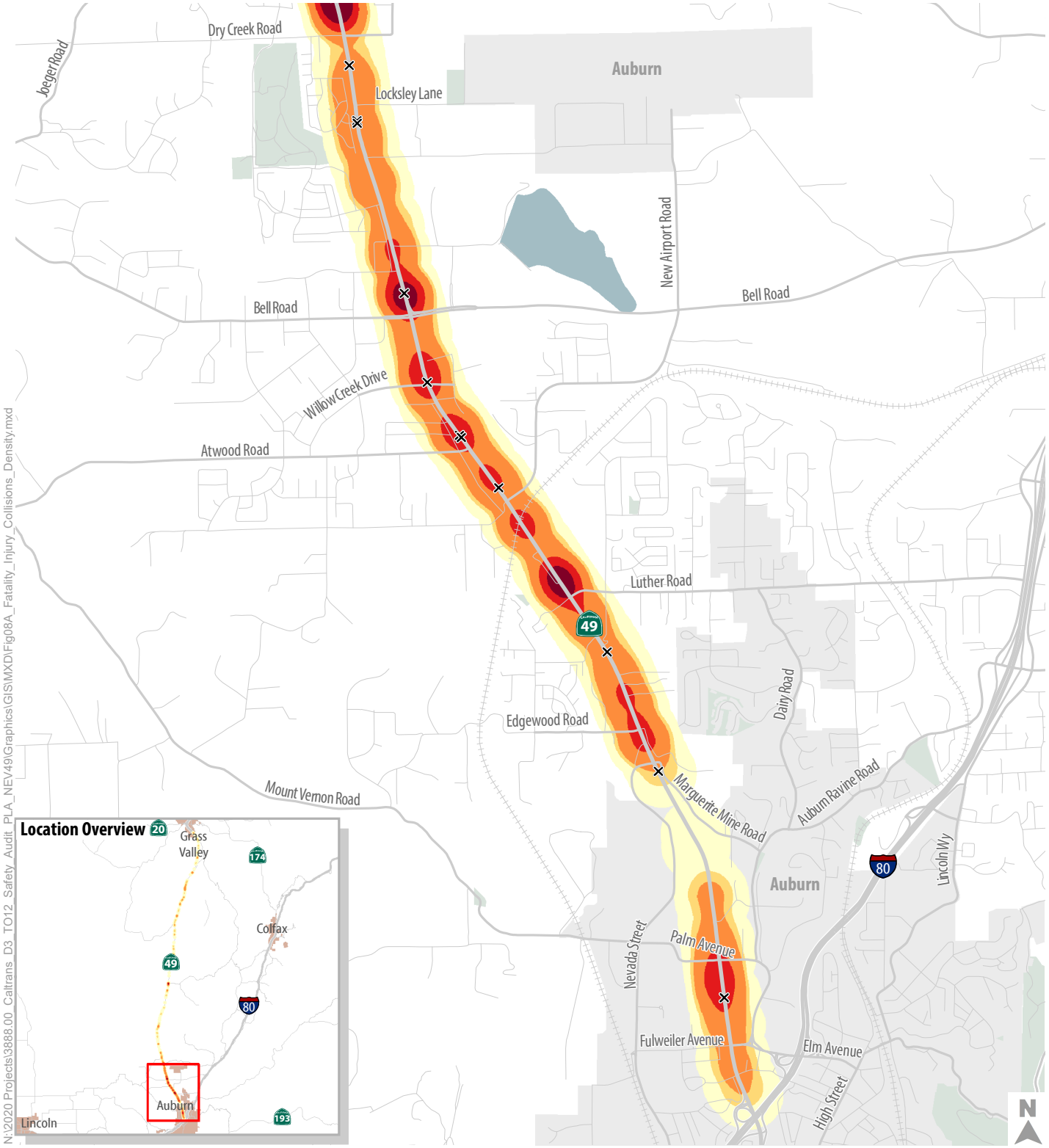


Figure 8A

Collision Density (Fatal and Injury Collisions) - Segment 1

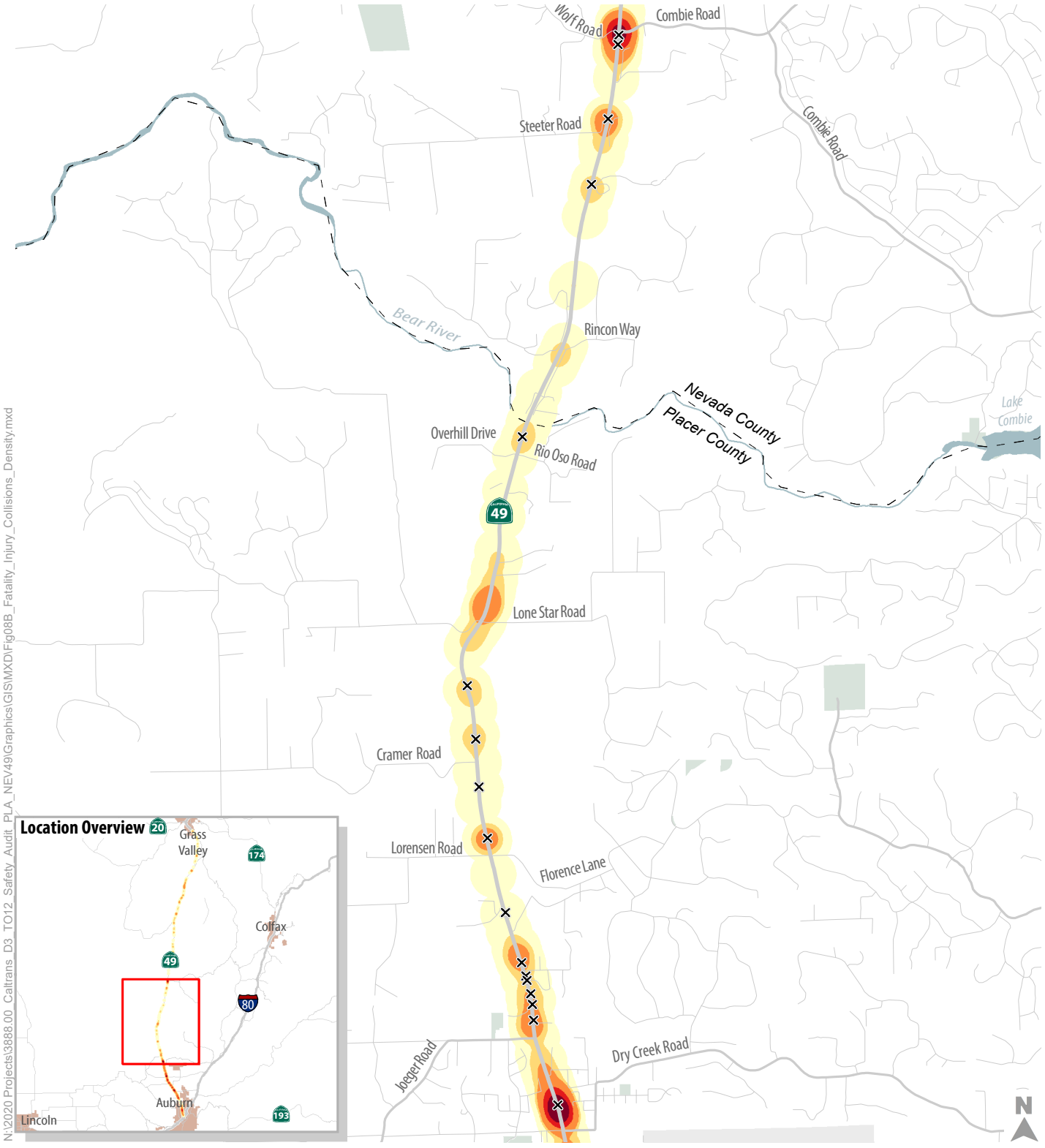


Figure 8B

Collision Density (Fatal and Injury Collisions) - Segment 2

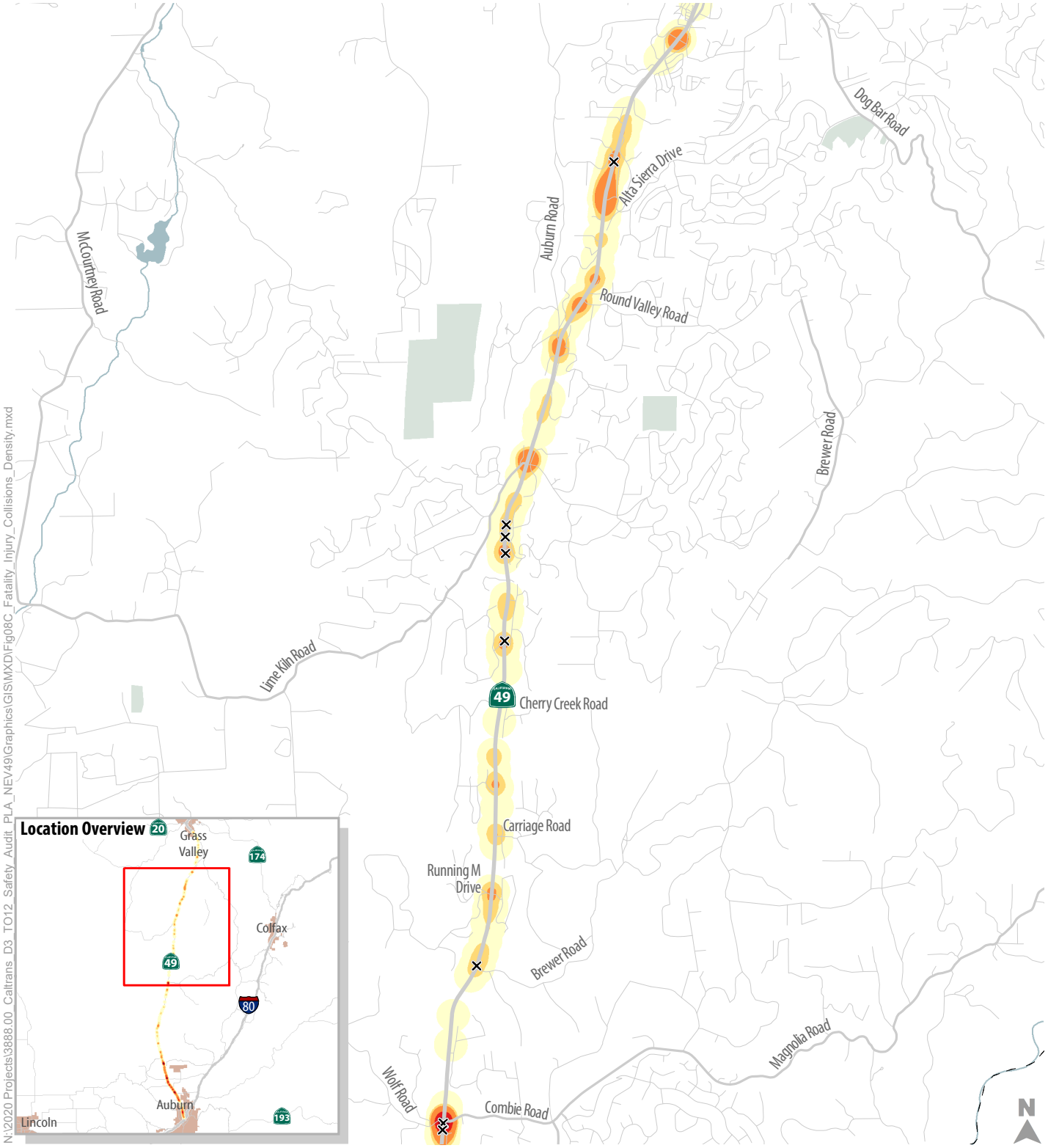


Figure 8C

Collision Density (Fatal and Injury Collisions) - Segment 3

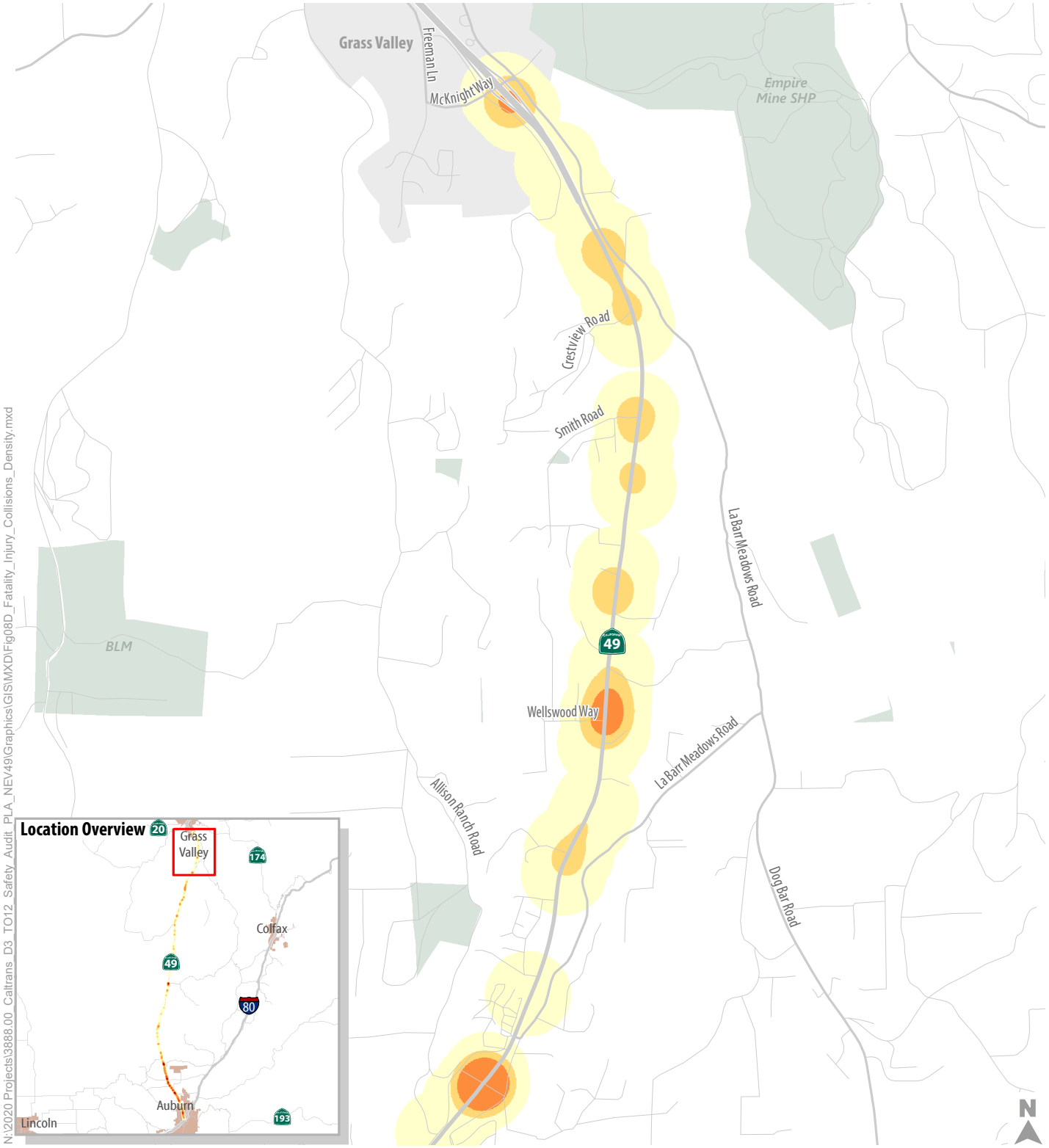


Figure 8D

Collision Density (Fatal and Injury Collisions) - Segment 4

4. Key Issues

The following issues were flagged by the team from their observations and/or the collision history.

Corridor

- More collisions occur during the fall, possibly related to the slippery pavement during the first rain event after the dry summer months, increased traffic volumes at the start of the school year, the change from daylight savings to standard time, and seasonal animal migration.
- More collisions occur on weekdays than on weekends.
- More collisions occur during the PM hours (noon to midnight) than the AM hours (midnight to noon).

Segment 1

- Auto-ped collisions are high (24 total, 8 out of 11 fatality collisions).
- Congestion-related collisions are high: 63 percent are rear-end collisions, which are usually congestion-related, and an additional 26 percent are broadsides and sideswipes, which may be congestion-related.
- Collision rates are higher than statewide average for total and severe collisions.
- Making left turns from unsignalized side streets requires driver patience, especially during peak periods.
- Drivers have difficulty entering the roadway at unsignalized intersections due to few and inconsistent gaps in traffic, especially during peak periods.
- There is a lack of lighting between intersections.

Segment 2

- Fatality rate is higher than statewide average, but other collision rates are lower.
- Drivers have difficulty entering the roadway at unsignalized intersections due to limited sight distance at some intersections and driver inability to accurately judge available gaps in traffic to make a safe turning movement.
- Lone Star Road intersection has limited sight distance in the northbound direction due to existing terrain.
- Southbound congestion at Dry Creek Road contributes to collisions.

Segment 3

- Southbound congestion at Wolf Road/Combie Road and Alta Sierra Drive contributes to collisions.
- Some portions of the roadway have a restricted clear recovery zone and narrow shoulders.
- Drivers have difficulty entering the roadway at unsignalized intersections due to limited sight distance at some intersections and driver inability to accurately judge available gaps in traffic to make a safe turning movement.
- SR 49 has variability in roadway width and design features due to frontage improvements associated with land development and spot improvements with agency-funded projects.
- There is a lack of passing opportunities 3.7 miles northbound and 4 miles southbound between about Cameo Drive and Mother Lode Road/Oak Drive.
- Collision history shows higher concentrations at lane drop merge areas.

Segment 4

- Collision history shows higher concentrations at lane drop merge areas.
- Drivers have difficulty entering the roadway at unsignalized intersections due to limited sight distance at some intersections and driver inability to accurately judge available gaps in traffic to make a safe turning movement.

5. Improvement History

This chapter lists previous projects on the corridor, the existing safety enhancements, and planned improvements.

5.1 Previous Improvements

Over the last ten years (2010 to 2019), Caltrans has constructed the following projects on the study corridor (see Appendix F for details). The cost and completion year of each project is provided.

- Installed shoulder and centerline rumble strips and six-inch striping from south of Michael Lane to the Bear River Bridge ($1.4 million, 2019)
- Extended northbound passing lane from Combie Road to Brewer Road ($1.4 million, 2010)
- Constructed right turn pocket at Brewer Road ($0.5 million, 2015)
- Constructed right turn pockets and shoulders at Carriage Road and Ladybird Drive ($2.2 million, 2014)
- Constructed northbound right turn lane and shoulder at Holcomb Drive/Cherry Creek Road ($0.8 million, 2014)
- Improved roadway curve superelevation near Mother Lode Road ($0.6 million, 2018)
- Installed emergency vehicle signal preemption at Wolf Road/Combie Road, Lime Kiln Road, and Alta Sierra Drive ($0.1 million, 2018)
- Widened SR 49 to five lanes from north of Alta Sierra Drive to south of Wellswood Way, constructed frontage roads, and installed a traffi signal at La Barr Meadows Road/Allison Ranch Road ($28.9 million, 2014)
- Constructed southbound right turn pocket at Smith Road ($0.5 million, 2016)
- Installed guardrail and rumble strips in Nevada County at various locations ($4.9 million, 2015)

5.2 Existing Safety Features

The following is a list of safety treatments that have been implemented on the corridor, some of which were installed under the previous projects listed above.

- Centerline and edge line rumble strips have been installed in the rural areas (Segments 2, 3, & 4). This is the FHWA Proven Safety Countermeasure for Longitudinal Rumble Strips and Stripes.

- Oversize speed limit signs have been posted in Segment 2.
- Overhead flashing beacons for signal ahead warning exist on southbound at Dry Creek Road, northbound and southbound at Wolf Road/Combie Road, and southbound at Allison Ranch Road/La Barr Meadows Road.
- Roadside flashing beacons for signal ahead warning exist on southbound SR 49 at Palm Avenue, northbound and southbound at Lime Kiln Road and Alta Sierra Drive, and northbound at Allison Ranch Road/La Barr Meadows Road.
- Mandatory headlight use signs are in place for Segments 2, 3, and 4. Associated safety corridor signs are in place, but the safety corridor designation has expired.

Figure 9 – Edge Line Rumble Strip and Overhead Flashing Beacon

5.3 Recent Actions

Caltrans has taken the following actions in this corridor approximately within the last year:

- In Nevada County, SR 49 has been restriped to have six-inch pavement markings (Segments 2, 3, and 4).
- In Placer County, center line rumble strips and six-inch edge line pavement markings were installed in Segment 2 (EA 4H030).

The pavement is currently (as of March 2020) being rehabilitated from I-80 to Dry Creek Road (EA 2F340). As part of this project, six-inch enhanced wet night visibility striping will be installed, and new signs will be installed with Type XI sheeting (both are standard). New signals will be installed at Locksley Lane and Shale Ridge Road. A sidewalk will be constructed in on at least one side of the roadway from Nevada Street to Palm Avenue. The paved shoulder will be widened to eight feet within the project limits, and the shoulder will be striped as a Class II bicycle lane.

5.4 Approved and Funded Projects

Caltrans is already planning to take the following actions:

- Install four radar speed feedback signs (Segments 2 and 3, EA 3H340):
  - Northbound near Florence Lane (PM PLA 9.2)
  - Southbound south of Streeter Road (PM NEV 1.6)
  - Northbound north of Wolf Road/Combie Road (PM NEV 2.8)
  - Southbound south of Pekolee Drive (PM NEV 7.9)
- Install safety lighting at Brewer Road and a second flashing beacon for signal ahead warning for northbound and southbound at Alta Sierra Drive (Segment 3, EA 3H340)
- Install a northbound acceleration lane at Wolf Road/Combie Road (Segment 3, EA 3H640)
- Construct a two-way left turn lane and 8-foot shoulders between Round Valley Road and Quail Creek Drive (Segment 3, EA 3H650)

A PCTPA-led and state-funded project along SR 49 from I-80 to Dry Creek Road (Segment 1) will add nearly three miles of sidewalk to at least one side of the roadway for the project limits. Placer County Health and Human Services is leading an associated Safe Routes to Schools project for six nearby schools.

Two development-driven projects are planned for the corridor. In Nevada County, the existing intersection at Woodridge Court (PM 1.9) will be updated. In Placer County, a northbound lane will be constructed from Education Street to Quartz Drive along the frontage of the Auburn Creekside Center.

The above projects are planned to start in 2020, 2021, or 2022.

5.5 Planned Projects

In Segment 2, Caltrans has identified and is currently developing a project (EA 4H600) to install concrete median barrier between Lorenson Road/Florence Lane and Lone Star Road. The median barrier would address a cross median collision pattern that qualifies for funding under the Highway Safety Improvement Program. All intersections and driveways between the two end intersections would be restricted to right-in and right-out movements. To accommodate the U-turns and to slow traffic, multi-lane roundabouts would be installed at the end points. The project incorporates two FHWA Proven Safety Countermeasures, Median Barrier and Roundabouts.

A project in Segment 4 proposes to widen SR 49 between Allison Ranch Road/La Barr Meadows Road and McKnight Way (EA 4E170). Three alternatives are under consideration. The first would provide two northbound lanes, one southbound lane, and median two-way left-turn lane. The second would add a

second southbound lane. The last alternative would install a median barrier, construct frontage roads to consolidate driveways, and install roundabouts or signals at Wellswood Way and Smith Road to accommodate U-turns and local street access. Funding for construction of this project has not yet been identified.

6. Potential Safety Enhancements

Caltrans asked the team to identify potential safety enhancements that could be installed in both the near term and long term. In the first section below, the team identified the near term (within two years) potential actions for consideration by Caltrans. The next section lists potential longer-term actions (two to ten years), and the final section describes the ultimate vision for the facility that would help to address safety concerns. These lists are the result of team brainstorming, and each suggestion will require further engineering review for potential efficacy and cost considerations. The lists below are numbered for convenience but do not imply priority.

6.1 Near Term Treatments

This section describes potential safety enhancements that could be implemented within the next two years on the SR 49 corridor.

Education, Encouragement, Enforcement, and Evaluation

The following countermeasures apply to the entire corridor and focus on non-engineering solutions.

1. Create an organized media campaign that could include a dedicated web page, videos, targeted Facebook campaigns, and "pop-up" activities at public gatherings (such as the county fair).
2. Institute a regular (quarterly or semi-annual) gathering of safety-related staff from multiple entities to share information and coordinate programs and messaging. Potential participants would include Caltrans, City and County public works, City and County fire departments and other first responders, cities, bicycle advocates, schools, CHP, hospitals, County public health, tourism industry, and agricultural industry.
3. At public workshops for upcoming construction projects, provide corridor safety messaging.
4. Investigate renewing the "safety corridor" designation.
5. Conduct outreach activities regarding safety plans with citizens groups (Citizens for 49 Safety and Fix49), business groups, and the general public, such as senior centers, schools, and churches.
6. Partner with CHP and fire departments on outreach events (for example, Coffee with a Cop).
7. Support a grant application for added CHP enforcement in the fall (to address the first rain of the season, time change, and other seasonal effects on collisions).
8. Develop a structured evaluation program to annually review performance data to determine trends and the need for additional countermeasures. The performance data should include speeds, collisions, and feedback from key user groups.

9. For outreach events, prepare driver education materials with input from CHP, Office of Traffic Safety, and DMV on determining a safe gap when turning on and off the highway.

Engineering

The following potential safety enhancements are physical improvements to the roadway. These elements are summarized in Table 6.

1. Enhance signs by enlarging and/or upgrading the Type XI retroreflective sheeting to enhance visibility. In particular, review deer crossing signs in Segments 2, 3, and 4 and no left turn signs in Segment 3.
2. Install signal ahead warning sign, potentially with a flashing beacon, for the northbound approach to New Airport Road in Segment 1. The jog in the roadway at the railroad overcrossing may obscure the adjacent downstream traffic signal.
3. Reduce excessive foliage growth that may be restricting sight distance at curves and intersections in Segments 2, 3, and 4.
4. Upgrade existing crosswalk striping at all locations to the ladder pattern with longitudinal markings and raised pavement markers on the leading edge to increase the conspicuity of crossings.
5. Add crosswalk markings at Lime Kiln Road (Segment 3), and refresh crosswalk markings at I-80 Westbound Ramps/Sawyer Street (Segment 1).
6. Provide advanced stop bars for downhill approaches at traffic signals in Segments 1, 2, and 3 to encourage drivers to not encroach into crosswalks.
7. Optimize and coordinate traffic signals in Segment 1 to better manage vehicle flow, speed, and travel time.
8. Install a speed zone ahead sign for the southbound direction near Joeger Road to warn of the speed limit reduction north of Dry Creek Road.
9. Upgrade all longitudinal striping to current Caltrans standard of six-inch Enhanced Wet Night Visibility Thermoplastic throughout the corridor to increase visibility of lane lines.
10. Add retroreflective strips to signs posts in Segments 2, 3, and 4 to improve visibility of signs and the edge of pavement.
11. Install retroreflective back plates at traffic signals to improve visibility of traffic signals especially during a power outage. This is a FHWA Proven Safety Countermeasure.
12. Install or refresh reflectors on cut and fill slopes, guard rail, and concrete barrier in Segments 3 and 4.

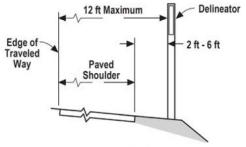
13. Install enhanced wet night visibility pavement markings in Segments 2, 3, and 4. This is an element of the FHWA Proven Safety Countermeasure for Enhanced Delineation and Friction for Horizontal Curves.

14. Install or refresh centerline pavement markers in Segments 2, 3, and 4. Add markers to the nose of right turn lane gore points. Install white/red pavement markers for lane striping on multi-lane roadways.

15. Install guide signs on southbound SR 49 to direct travelers to use Bell Road and Elm Avenue as alternate routes to I-80. Similarly, install guide signs on I-80 to direct travelers to use Bell Road as an alternate route to SR 49.

Table 6: Near Term Treatments – Physical Countermeasures

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
1. Install enhanced signs		N/A	X	X	X
2. Install signal ahead warning		Northbound at New Airport Rd	N/A	N/A	N/A
3. Reduce foliage growth in clear recovery zone		N/A	N/A	X	X
4. Upgrade existing crosswalk striping (ladder)		X	X	X	X
5. Add/refresh crosswalk markings		I-80 Westbound Ramps/Sawyer St	N/A	Lime Kiln Rd	N/A
6. Add advanced stop bar for downhill approaches at signals		X	X	X	N/A

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
7. Optimize/coordinate signals		X	N/A	N/A	N/A
8. Install speed zone ahead sign		N/A	Southbound at Joeger Rd	N/A	N/A
9. Upgrade to 6-inch striping		X	X	X	X
10. Add retroreflective strips to signposts		N/A	X	X	X
11. Install retro reflective back plates		X	X	X	X
12. Install/refresh reflectors on slopes and barriers		N/A	N/A	X	X

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
13. Install enhanced wet night visibility pavement markings		N/A[1]	X	X	X
14. Install or refresh pavement markers		N/A[1]	X	X	X
15. Install guide signing		Southbound SR 49 at Bell Rd and Elm Ave, Eastbound I-80 at SR 49	N/A	N/A	N/A

Notes: "X" indicates that the treatment applies to the entire segment, and "N/A" indicates that the treatment does not apply to the segment.
1. New pavement markings and markers will be installed as part of the current roadway rehabilitation project in Segment 1.
Source: Fehr & Peers (2020)

6.2 Long Term Treatments

The following potential safety enhancements are expected to take longer to implement, more than 2 years up to as many as 10 years.

Education, Encouragement, Enforcement, and Evaluation

1. Develop corridor wide messaging regarding safety and plans for countermeasures for use with the changeable message signs. For example, a safety campaign can be conducted to warn drivers of slippery pavement conditions in the fall when the first rainfall is likely to occur.
2. Coordinate on the development of a driver education program with CHP, Office of Traffic Safety, and DMV that includes a virtual reality element on gap acceptance for turning on and off the highway.
3. Support the development of sub-area evacuation plans for communities along the corridor (Lake of the Pines, Alta Sierra, etc.) so that evacuations are coordinated to keep the highway flowing.
4. Support the development of a corridor operations plan for an evacuation event for coordination among Caltrans, CHP, fire departments, county sheriff, emergency services, etc.
5. Develop safety messages to be displayed on changeable message signs (CMS) to be used on the corridor.

Engineering

The following potential safety enhancements are physical improvements to the roadway. These elements are summarized in Table 7.

1. Conduct a speed zone study for Segment 1. Investigate reducing the posted speed between Dry Creek Road and Bell Road after the installation of the new traffic signals at Shale Ridge Road and Locksley Lane. Reducing the posted speed in Segment 1 may be justified due to the high occurrence of auto-pedestrian collisions.
2. Construct eight-foot shoulders to provide a paved recovery zone and to facilitate right turns on and off the highway. While the planned Round Valley Road to Quail Creek Drive widening project will provide this for a portion of Segment 3, other locations in Segments 3 and 4 would benefit from shoulder widening.
3. Investigate installing raised medians at selected locations in Segment 1 to reduce conflict points at unsignalized intersections and for driveways near signalized intersections (for example, Rock Creek Mobile Home Park driveway).

4. Widen side street approaches to eliminate split-phase signal operations at five intersections in Segment 1. This will allow more time for the SR 49 approaches so that congestion-related collisions may be reduced.

5. Investigate adding crosswalks to the fourth leg at signalized intersections in Segments 1, 2, and 3, where feasible, to reduce pedestrian delay and pedestrians crossing outside of crosswalks.

6. Investigate adding right turn pockets at unsignalized intersections throughout the corridor to reduce the potential for right turn queues affecting through vehicles. This is an element of the FHWA Proven Safety Countermeasure for Left and Right Turn Lanes at Two-Way Stop-Controller Intersections.

7. Construct intersection improvements at selected locations to reduce congestion-related collisions.

    a. In Segment 1, widen the southbound approach at I-80 Westbound Ramps to provide more southbound right turn capacity so that the queues for vehicles heading to westbound I-80 is reduced.

    b. In Segment 2, consider improvements at Wolf Road/Combie Road including a displaced left turn intersection (also known as a continuous flow intersection).

    c. In Segment 3, widen the southbound approach at Alta Sierra Drive or modify the traffic signal so that the southbound through movement does not stop (similar to the operation of Hazel Avenue/US 50 Eastbound Ramps in Rancho Cordova).

8. Upgrade the eight-inch signal heads at Lime Kiln Road (Segment 3) to twelve inches. Review traffic signals and flashing beacons throughout the corridor to upgrade to twelve-inch heads if appropriate.

9. Install extinguishable message signs to warn drivers of long queues at signalized intersections. Recommended locations for the signs are the southbound approaches to Palm Avenue (Segment 1), Dry Creek Road (Segment 2), and Wolf Road/Combie Road and Alta Sierra Drive (Segment 3).

10. Install Intelligent Transportation System elements in the corridor to inform traffic managers and to provide better traveler information.

    a. Install changeable message signs to notify travelers of road conditions and anticipated travel times. Potential locations on SR 49 are southbound at Bell Road (Segment 1), northbound at Dry Creek Road (Segment 1), and southbound near McKnight Way (Segment 4). Another potential location is on eastbound I-80 west of SR 49 to provide travel time information to Grass Valley via SR 49 and Bell Road.

    b. Install closed-circuit television cameras at major intersections (traffic signals, roundabouts, etc.) to provide monitoring for traffic operations and incident response.

c. Install weather monitoring stations (RWIS) so that drivers can be warned of weather conditions via the changeable message signs.

11. Investigate if longitudinal pedestrian-scale street lighting in Segment 1 meets warrants, safety guidance, or HSIP program requirements. If so, work to program projects to install lighting to improve the visibility of pedestrians at night.

12. Investigate vehicle/animal collision patterns to determine feasible locations to construct wildlife fencing and undercrossings in Segments 2, 3, and 4 to reduce vehicle conflicts with wildlife.

13. Consolidate and/or remove driveways to reduce conflict points with highway traffic. In Segment 1, driveways could be consolidated in the portion from Nevada Street to Luther Road. In Segment 4, driveways near Crestview Drive could be closed since parcel access is available via the parallel La Barr Meadows Road. This is the FHWA Proven Safety Countermeasure for Corridor Access Management.

14. Install high friction pavement on the approaches to signalized intersections to reduce rear-end collisions. Potential treatment locations are the downhill southbound approaches at Palm Avenue (Segment 1), Atwood Drive (Segment 1), Wolf Road/Combie Road (Segment 3), and Alta Sierra Drive (Segment 4).

15. Evaluate the existing alignment for opportunities to straighten horizontal and flatten vertical curves and to widen clear recovery zones. For example, the railroad overpass south of New Airport Road in Segment 1 causes a jog in the roadway alignment that may contribute to vehicle collisions. Wider clear recovery zones and flattened slopes adjacent to the roadway may improve sight distance on curves in Segments 3 and 4. Widening the clear recovery zone is an element of the FHWA Proven Safety Countermeasure for Roadside Design Improvements at Curves.

16. Identify and implement vehicle pullout areas for CHP to stage their vehicles for enforcement in Segments 3 and 4 where shoulders are less than eight feet wide and driveways are infrequent.

17. Investigate if safety lighting at unsignalized intersections and lane drop merge areas in Segments 3 and 4 meets required warrants or HSIP program requirements. Potential locations are Pingree Road, Bethel Church Way, and south of McKnight Way.

18. Extend the merge areas away from the traffic signal at Lime Kiln Road in the northbound direction (Segment 3) and away from the McKnight Way on-ramp in the southbound direction (Segment 4).

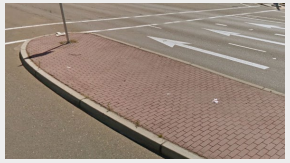
19. Install curve warning signs and chevrons in accordance with the current requirements in the California Manual on Uniform Traffic Control Devices. This is an element of the FHWA Proven Safety Countermeasure for Enhanced Delineation and Friction for Horizontal Curves.

20. Widen two-lane highway segments to provide a center two-way left-turn lane to facilitate left turns to and from the highway and to provide a median recovery zone for errant drivers. This is an

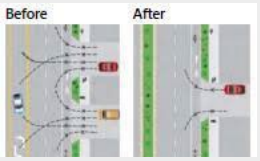
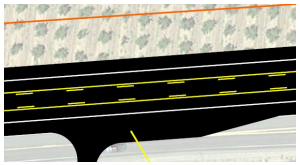
element of the FHWA Proven Safety Countermeasure for Left and Right Turn Lanes at Two-Way Stop-Controller Intersections.

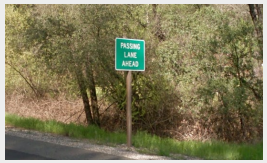
21. Construct passing lanes in both directions in Segment 3 to improve driver comfort and increase available gaps for side street approaches. The location should be approximately midway between Cameo Drive and Mother Lode Road/Oak Drive.

Table 7: Long Term Treatments – Physical Countermeasures

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
1. Conduct speed zone study		X	N/A	N/A	N/A
2. Construct 8-foot shoulders		N/A[1]	N/A[2]	X	X
3. Install raised median		X [Example: Elm Ave to Palm Ave]	N/A	N/A	N/A
4. Widen side street approach to eliminate split phasing		X [Example: Palm Ave]	N/A	N/A	N/A
5. Add crosswalk to 4th leg		X [Example: Palm Ave]	X	X	
6. Add right turn lane		X [Example: Middle School Drwy]	X	X	X

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
7. Improve intersection		Widen southbound approach at I-80 Westbound Ramps	Expand Wolf Rd/ Combie Rd	Widen southbound or modify signal at Alta Sierra Dr	N/A
8. Upgrade signals to 12-inch heads		N/A	N/A	Lime Kiln Rd	N/A
9. Install queue/slow traffic warning signs		Southbound at Palm Ave	Southbound at Dry Creek Rd	Southbound at Wolf Rd/Combie Rd	Southbound at Alta Sierra Dr
10. Install Intelligent Transportation System elements		X	X	X	X
11. Investigate longitudinal lighting for pedestrians		X	N/A	N/A	N/A
12. Determine potential for wildlife fencing and undercrossings		N/A	X	X	X

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
13. Consolidate or remove driveways		Nevada St to Luther Rd	N/A	N/A	Near Crestview Dr
14. Place high friction pavement		Southbound at Palm Ave and Atwood Dr	N/A	Southbound at Wolf Rd/Combie Rd	Southbound at Alta Sierra Dr
15. Realign roadway and widen clear recovery zone		X	X	X	X
16. Identify and construct enforcement pullouts		N/A	N/A	X	X
17. Install safety lighting at intersections and merges		N/A	N/A	X [Example: Pingree Rd]	X [Example: Southbound after McKnight Way]
18. Extend merge area		N/A	N/A	Northbound north of Lime Kiln Rd	Southbound south of McKnight Way

Countermeasure	Image	Segment 1	Segment 2	Segment 3	Segment 4
19. Install chevrons/curve warning signs		N/A	N/A	X	X
20. Construct two-way left-turn lane		N/A	N/A	X	X
21. Construct passing lanes		N/A	N/A	X	N/A

Notes: "X" indicates that the treatment applies to the entire segment, and "N/A" indicates that the treatment does not apply to the segment.
1. 8-foot shoulders will be constructed in Segment 1 as part of the current roadway rehabilitation project.
2. 8-foot shoulders exist in Segment 2.

Source: Fehr & Peers (2020)

6.3 Proven Safety Countermeasures

The FHWA promotes twenty proven safety countermeasures that address roadway departure, intersection, bicycle, and pedestrian crashes. The safety audit team reviewed this list when developing suggestions for safety treatments for the SR 49 corridor. Table 8 lists the FHWA countermeasures and notes which of the near term and long term potential safety treatments relate to the countermeasure.

Table 8: FHWA Proven Safety Countermeasures

Countermeasure	Potential Treatment[1]	
	Near Term	Long Term
Backplates with Retroreflective Borders	11	N/A
Corridor Access Management	N/A	14
Dedicated Left- and Right-Turn Lanes at Intersections	N/A	6, 21
Enhanced Delineation and Friction for Horizontal Curves	13	N/A
Leading Pedestrian Interval	N/A	N/A
Local Road Safety Plan	N/A	N/A
Longitudinal Rumble Strips and Stripes on Two-Lane Roads	-[2]	N/A
Median Barrier	-[3]	N/A
Medians and Pedestrian Crossing Islands in Urban and Suburban Areas	N/A	N/A
Pedestrian Hybrid Beacon	N/A	N/A
Reduced Left-Turn Conflict Intersections	N/A	N/A
Road Diet	N/A	N/A
Road Safety Audit	-[4]	N/A
Roadside Design Improvement at Curves	N/A	16, 20
Roundabouts	-[3]	N/A
Safety Edge$_{SM}$	N/A	N/A
Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections	N/A	N/A
USLIMTS2	N/A	N/A
Walkways	-[5]	N/A
Yellow Change Intervals	N/A	N/A

Notes: 1. The listed number refers to the potential treatments described in Sections 6.1 and 6.2.
2. Longitudinal rumble strips exist on SR 49 in Segments 2, 3, and 4 (see Section 5.2).
3. Median barrier and roundabouts would be installed as part of a planned project in Segment 2 (see Section 5.5).
4. This report is a product of a road safety audit.
5. Sidewalks will be installed as part of an approved and funded project in Segment 1 (see Section 5.4).
"N/A" indicates that the countermeasure does not have an associated near term or long term potential treatment.

Source: FHWA, Fehr & Peers (2020)

6.4 Vision for Ultimate Facility

Table 9 lists the ultimate concept facility for each segment in the SR 49 study area as recommended by the safety audit team. The urban segment from I-80 to Dry Creek Road would have six lanes and function as a suburban arterial street. A raised median would be used to limit conflicts from side streets, and pedestrian and bicycle facilities would be included. The rural segment from Dry Creek Road to Wolf Road/Combie Road would remain four lanes, but a median barrier would be installed to limit cross-median collisions. At intersections, control would be provided by a traffic signal or roundabout. For Segments 3 and 4 in Nevada County, the goal would be to provide more consistency by providing at least a three-lane cross-section with passing lanes. A center two-way left turn lane would accommodate turning traffic from side streets. The ultimate configuration would be a five-lane cross-section to provide continuous passing opportunities. Median barrier would be installed where needed to limit cross-median collisions.

Table 9: Vision for Ultimate Facility

Segment	Configuration
1. I-80 to Dry Creek Rd	6 lanes with raised median
2. Dry Creek Rd to Wolf Road/Combie Road	4 lanes with median barrier and signals/roundabouts at intersections
3. Wolf Road/Combie Road to Allison Ranch Road/ La Barr Meadows Road	Interim – 3 lanes (TWLTL) with passing lanes Ultimate – 5 lanes (TWLTL) with signals/roundabouts at intersections and median barrier, as needed
4. Allison Ranch Road/ La Barr Meadows Road to McKnight Way	

Source: Fehr & Peers (2020)

7. References

- FHWA Proven Safety Countermeasures, (https://safety.fhwa.dot.gov/provencountermeasures/)
- Human Factors Guidelines for Road Systems, NCHRP Report 600 (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_600second.pdf)
- Local Roadway Safety, A Manual for California's Local Road Owners, June 2018 (https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/hsip/2018/ca-lrsm-20180410final.pdf)
- State Route 49 Corridor Improvement Project Transportation Analysis Report, November 2019
- Unsignalized Intersection Improvement Guide (http://toolkits.ite.org/uiig/)
- WSDOT Design Manual, Chapter 1040 Illumination (http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/1040.pdf)

Appendix A

Workshop Attendance List

SR 49 Safety Audit Workshop Attendance List

Name	Agency	Email	Phone	Feb. 18	Feb. 19	Feb. 20
Tom Conley	Auburn Fire	tconley@auburn.ca.gov		x		
Ed Yarbrough	Caltrans District 3	ed.yarbrough@dot.ca.gov	530-741-5722	x	x	x
Martin Clark	Caltrans District 3	martin.clark@dot.ca.gov	530-682-6333	x	x	x
Eric Souza	Caltrans District 3	eric.souza@dot.ca.gov	916-718-7822	x	x	
Gilbert Mohtes-Chan	Caltrans District 3	gilbert.mohtes-chan@dot.ca.gov	530-741-4571	x	x	x
Fernando Rivera	Caltrans District 3	fernando.rivera@dot.ca.gov		x		
Brian Alconcel	Caltrans District 3	brian.alconcel@dot.ca.gov	530-741-5710	x	x	x
Sheila Ennes	Caltrans District 3	sheila.ennes@dot.ca.gov		x		x
Gurleen Boparai	Caltrans District 3	gurleen.boparai@dot.ca.gov				x
Abdelrahman Beshair	Caltrans Headquarters	abdelrahman.beshair@dot.ca.gov	916-654-3748	x	x	x
Tom Schriber	Caltrans Headquarters	tom.schriber@dot.ca.gov	916-654-7138	x		
Captain Scott Parker	CHP	scottparker@chp.ca.gov	530-477-4900		x	
Lt. George Steffenson	CHP	Gsteffenson@chp.ca.gov	408-848-2324	x		x
CJ Bratcher	CHP	cbratcher@chp.ca.gov	530-477-4900	x	x	x
David Martinez	CHP	dmartinez@chp.ca.gov	916-663-3344		x	
Mengil Deane	City of Auburn	mdeane@auburn.ca.gov	530-823-4211 ext. 145	x	x	x
David Stanek	Fehr & Peers	d.stanek@fehrandpeers.com	916-262-7390	x	x	x
Steve Brown	Fehr & Peers	s.brown@fehrandpeers.com	949-308-6321	x	x	x
Sadie Sabol	Fehr & Peers	s.sabol@fehrandpeers.com	916-262-7417	x	x	x
Ken Kochevar	FHWA	ken.kochevar@dot.gov	906-498-5853	x	x	
Mike Woodman	NCTC	mwoodman@nccn.net	916-412-8139	x	x	
Dan Landon	NCTC	dlandon@nccn.net	530-265-3202			x
Aaron Hoyt	PCTPA	ahoyt@pctpa.net	530-823-4032	x	x	
Stephanie Holloway	Placer County	shollow@placer.ca.gov	530-745-7551	x		
Phil Vassion	Placer County	pvassion@placer.ca.gov	530-745-7581		x	

Appendix B

Workshop Agenda

SR 49 Safety Audit Workshop
Agenda

Tuesday Feb 18, 2020

8:00-9:30 AM **Background**

- Introductions
- Purpose and goals of safety audit
- Handouts
- History
- Recent actions
- Agency interests

9:30-10:30 AM **Data Review**

- Data sources
- Raw data
- DTAR findings (volumes, forecasts, performance)
- Initial collision findings (time of day, weather, type, etc.)
- Additional data desired

11:00-11:15 AM **Break**

11:15-12:00 PM **Geometric Conditions**

- Basic horizontal and vertical features
- Sub-standard conditions
- Past or current geometric proposals
- Maintenance protocols/history

Dates:

Feb 18, 2020, 8am-8pm

Feb 19, 2020, 8am-8pm

Feb 20, 2020, 8am-5pm

Feb 21, 2020, if needed

Locations:

Tuesday 8 AM – 12 PM

2520 Warren Drive
Suite A
Rocklin, CA 95677
Construction Field Office Conference Room

Tuesday 1 PM – Friday

299 Nevada St
Auburn, CA 95603
Placer County Transportation Planning Agency

12:00-1:00 PM **Lunch Break**

1:00-3:00 PM **Field Visit – I-80 to Wolf Rd/Combie Rd (off-peak)**

3:00-5:00 PM **Treatment Brainstorming**

- Menu of possibilities
- Initial review (CMFs, applicability to issues)
- Discussion of pros/cons, timing, negative externalities

Note: Proposed times are flexible

5:00-6:00 PM **Break**

6:00-8:00 PM **Field Visit – I-80 to Wolf Rd/Combie Rd (when dark)**

Wednesday Feb 19, 2020

8:00-10:00 AM **Screening of Initial Ideas**

- Not applicable or sufficiently effective
- More study/analysis needed
- Existing applications to learn from

10:00-10:45 AM **Staging/Phasing of Treatments**

- Sequencing of promising ideas
- Highest priorities based upon cost/benefit

10:45-11:00 AM **Break**

11:00-12:00 PM **Long-Term Conditions**

- Median barrier/roundabouts, signals proposal (merits/concerns)
- Other options?

12:00-1:00 PM **Lunch Break**

1:00-3:30 PM **Field Visit – Wolf Rd/Combie Rd to McKnight Way (off-peak)**

3:30-5:00 PM **Treatment Brainstorming**

- Menu of possibilities
- Initial review (CMFs, applicability to issues)
- Discussion of pros/cons, timing, negative externalities

5:00-6:00 PM **Break**

6:00-8:00 PM **Field Visit – Wolf Rd/Combie Rd to McKnight Way (when dark)**

Note: Proposed times are flexible

Thursday Feb 20, 2020

8:00-10:00 AM **Screening of Initial Ideas**

- Not applicable or sufficiently effective
- More study/analysis needed
- Existing applications to learn from

10:00-10:45 AM **Staging/Phasing of Treatments**

- Sequencing of promising ideas
- Highest priorities based upon cost/benefit

10:45-11:00 AM **Break**

11:00-12:00 PM **Long-Term Conditions**

- Shoulder widening, two-way left-turn lane (3-Lane and 5-lane conversions) with before/after data
- Other options?

12:00-1:00 PM **Lunch Break**

1:00-2:00 PM **Long-Term Conditions (continued)**

2:00-2:15 PM **Break**

2:15-5:00 PM **Next Steps**

- Key actions and responsibilities
- Schedule
- Deliverables
- Communication plan
- Subsequent meetings/calls

Friday, February 21, 2020

Hold for additional activities as-needed

Note: Proposed times are flexible

Appendix C

Workshop Presentation Slides

SR 49 Safety Audit Workshop

February 18, 2020

1

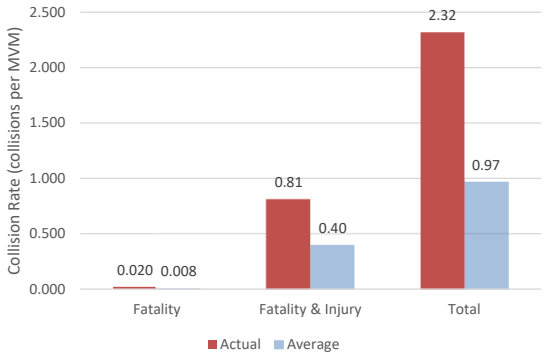
COLLISION RATE

2

SR 49 SAFETY AUDIT

COLLISION RATE

SEGMENT 1 – I-80 TO DRY CREEK RD



Fatality rate is more than twice statewide average

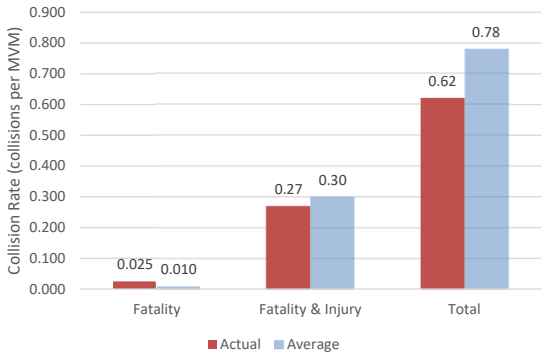
- 2010-2019
- Fatality & Injury rate is about double the average rate
- Total rate is more than double

3

SR 49 SAFETY AUDIT

COLLISION RATE

SEGMENT 2 – DRY CREEK RD TO WOLF RD/COMBIE RD



Fatality rate is 2.5 times higher than statewide average

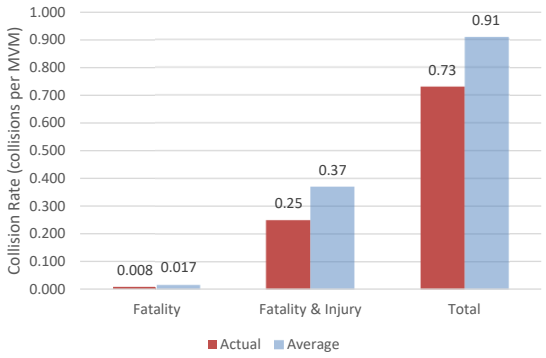
- 2010-2019
- Fatality & Injury rate is 90% of average
- Total rate is 79% of average

4

SR 49 SAFETY AUDIT

COLLISION RATE

SEGMENT 3 – WOLF RD/COMBIE RD TO LA BARR MEADOWS RD



Fatality rate is less than statewide average

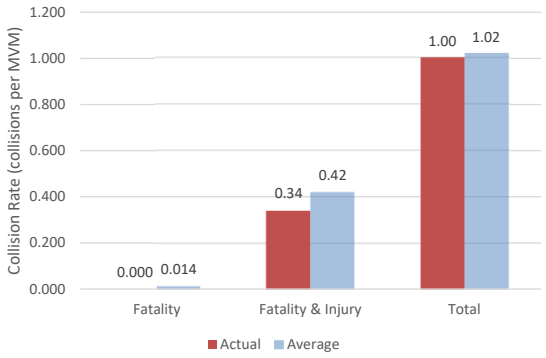
- 2010-2019
- Fatality & Injury and Total rates are lower than statewide averages

5

SR 49 SAFETY AUDIT

COLLISION RATE

SEGMENT 4 – LA BARR MEADOWS RD TO MCKNIGHT WAY



Fatality rate is less than statewide average

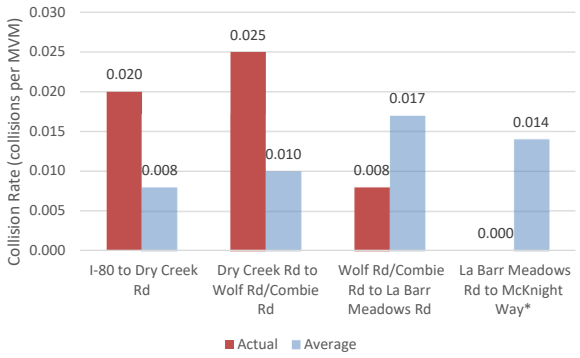
- 2016-2018
- Fatality & Injury is 81% of average
- Total rate is about the same as statewide average

6

SR 49 SAFETY AUDIT

COLLISION RATE

FATALITY RATE COMPARISON



- Segments 1 & 2 have rates higher than statewide average
- Segments 3 & 4 are lower than average

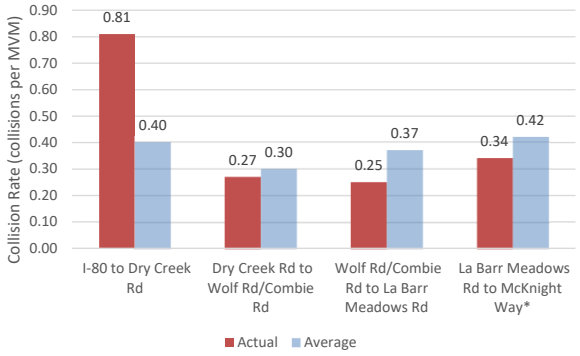
Fatality rates are highest in the four-lane segments

7

SR 49 SAFETY AUDIT

COLLISION RATE

FATALITY & INJURY RATE COMPARISON



- Segment 1 has a rate higher than statewide average
- Segments 2-4 are lower than average

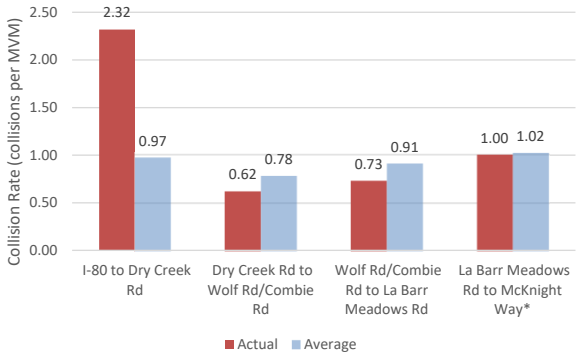
Fatality & Injury rate is highest in the urbanized segment

8

SR 49 SAFETY AUDIT

COLLISION RATE

TOTAL RATE COMPARISON



- Segment 1 has a rate higher than statewide average
- Segments 2-4 are lower than average

Total rate is highest in the urbanized segment

9

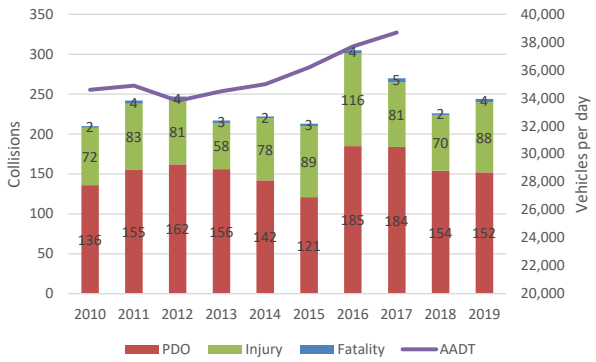
COLLISION TRENDS

10

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY YEAR



Collisions highest in 2016 & 2017

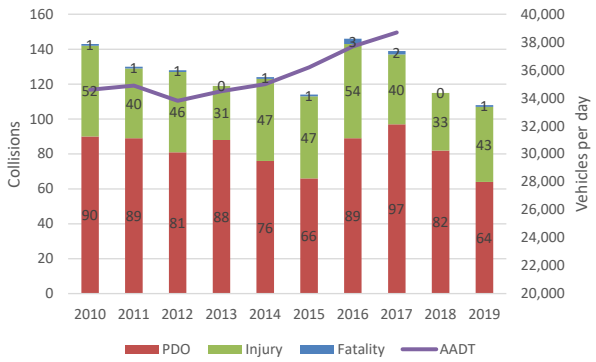
- Reported collisions rose from 210 in 2010 to 244 in 2019, with a notable spike of 305 in 2016
- F+I collisions highest in last 3 years
- Highest year for fatality collisions was 5 in 2017

11

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY YEAR: I-80 TO DRY CREEK RD



Collisions trending lower since 2016

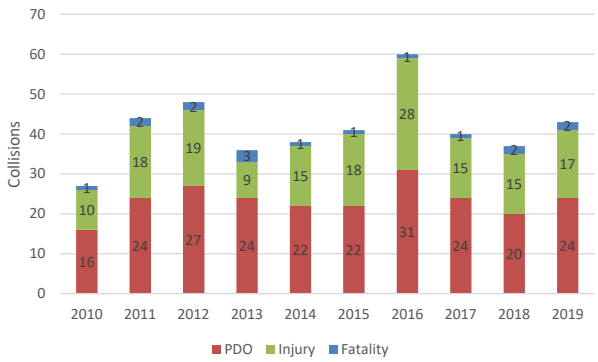
- Reported collisions dropped from 143 in 2010 to 108 in 2019, with a high of 146 in 2016
- Highest year for fatality collisions was 3 in 2016

12

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY YEAR: DRY CREEK RD TO WOLF RD/COMBIE RD



- Reported collisions rose from 27 in 2010 to 43 in 2019, with a high of 60 in 2016
- Highest year for fatality collisions was 3 in 2013

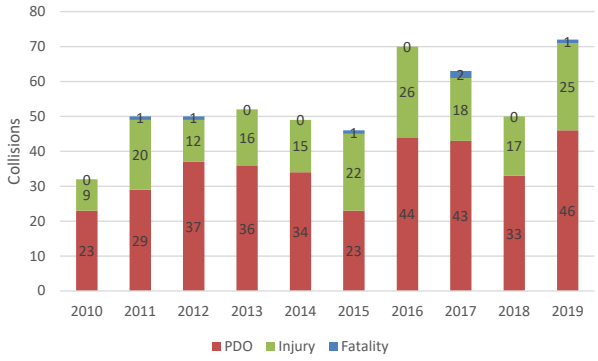
Averaging about 40 per year since 2017

13

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY YEAR: WOLF RD/COMBIE RD TO LA BARR MEADOWS RD



- Reported collisions rose from 32 in 2010 to 72 in 2019
- Highest year for fatality collisions was 2 in 2017

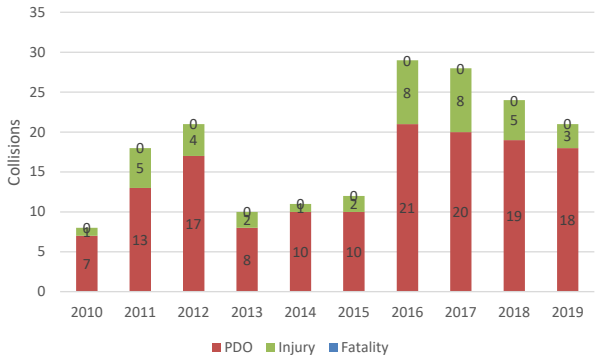
Collisions highest over last 4 years

14

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY YEAR: LA BARR MEADOWS RD TO MCKNIGHT WAY



Collisions highest in last 4 years

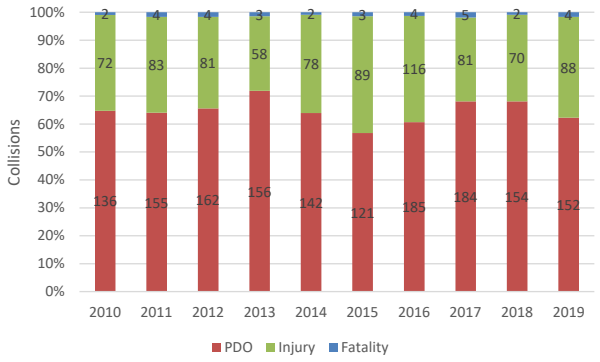
- Reported collisions rose from 8 in 2010 to 21 in 2019, with a high of 29 in 2016
- No fatalities in last 10 years

15

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISION SEVERITY AS A PERCENTAGE



30 to 40% of all collisions involve a fatality or injury

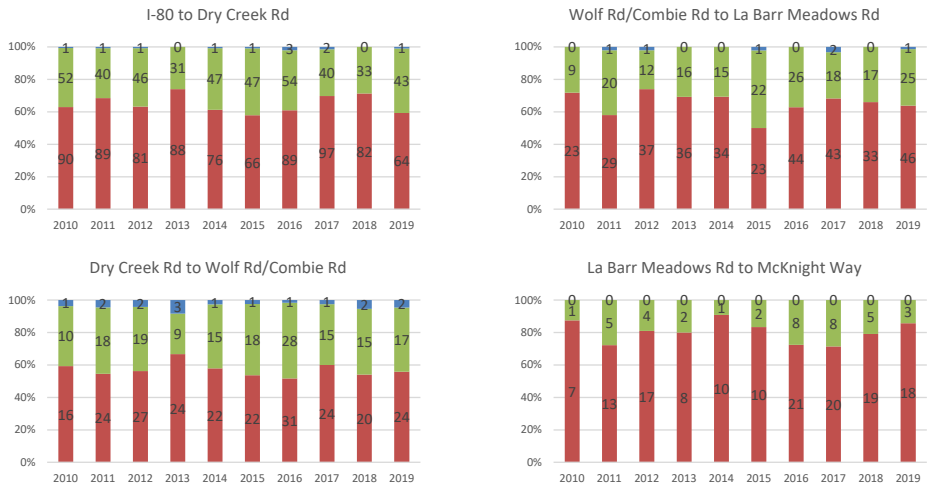
- Average is 3.3 fatality collisions per year
- PDO collisions are typically 60 to 70%

16

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISION SEVERITY AS A PERCENTAGE

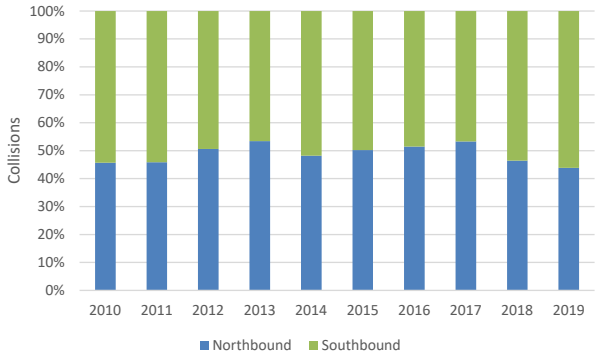


17

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY SIDE OF HIGHWAY



- Relatively evenly split by direction

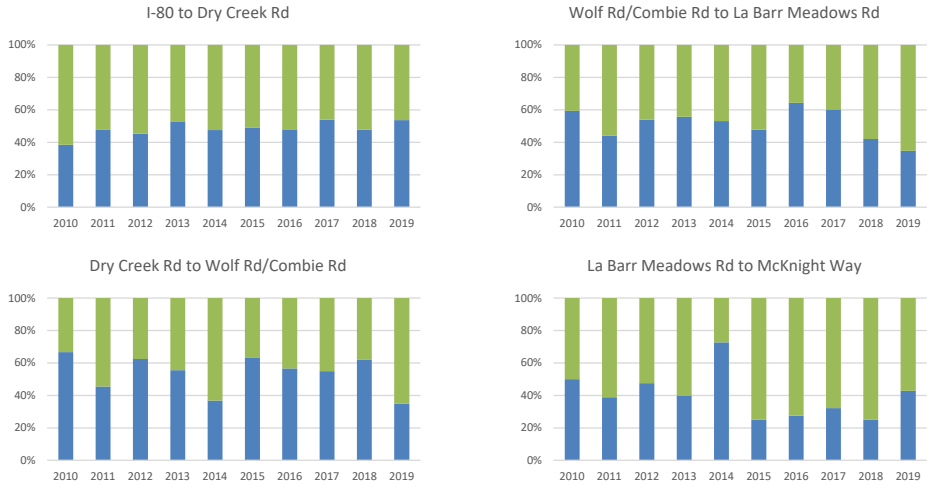
Collisions slightly more likely in southbound direction

18

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY SIDE OF HIGHWAY

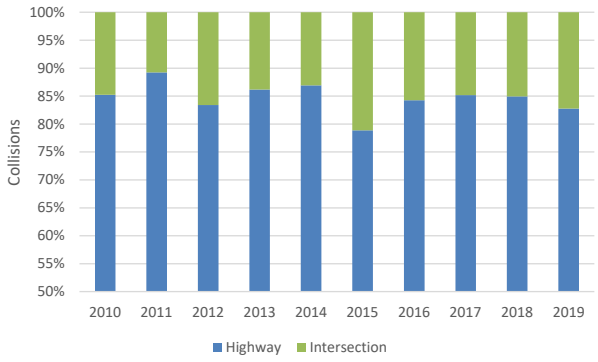


19

SR 49 SAFETY AUDIT

COLLISION TRENDS

COLLISIONS BY FACILITY TYPE



- Intersection-related collisions are 15 to 20%
- Highest was 48 intersection collisions in 2016

Most collisions occur on highways segments, not at intersections

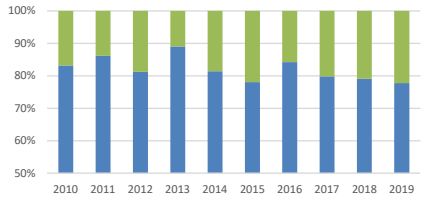
20

SR 49 SAFETY AUDIT

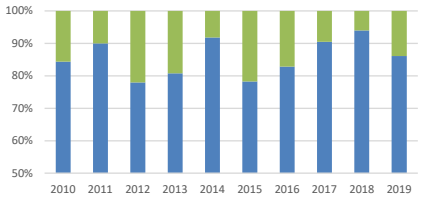
COLLISION TRENDS

COLLISIONS BY FACILITY TYPE

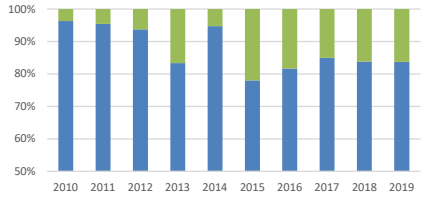
I-80 to Dry Creek Rd



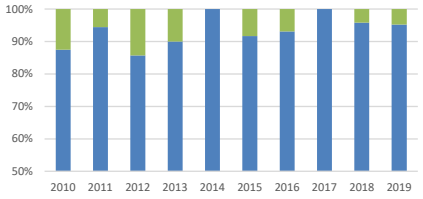
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



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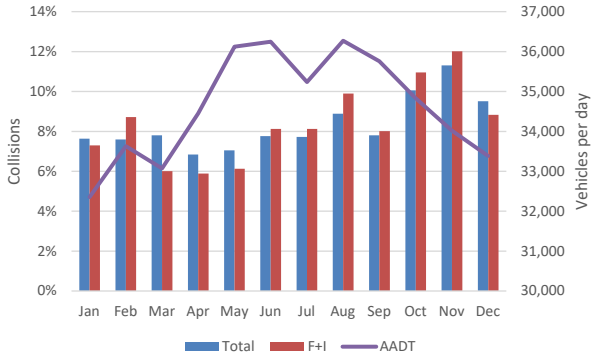
TIME/DAY FACTORS

22

SR 49 SAFETY AUDIT

TIME/DAY FACTORS

COLLISIONS BY MONTH



Collisions are most frequent in Fall

- November is the peak month for collisions
- Peak months correspond to recreational peak and poor weather

2011-2012 VOLUME DATA AT BELL ROAD

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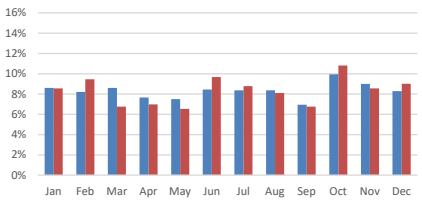
SR 49 SAFETY AUDIT

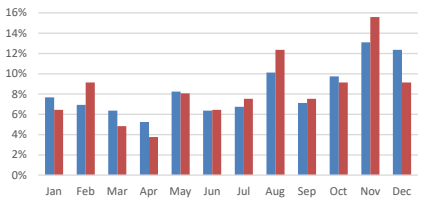
TIME/DAY FACTORS

COLLISIONS BY MONTH

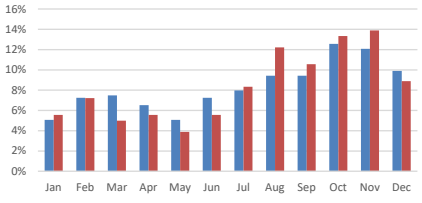
I-80 to Dry Creek Rd



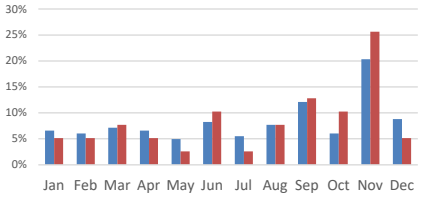
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



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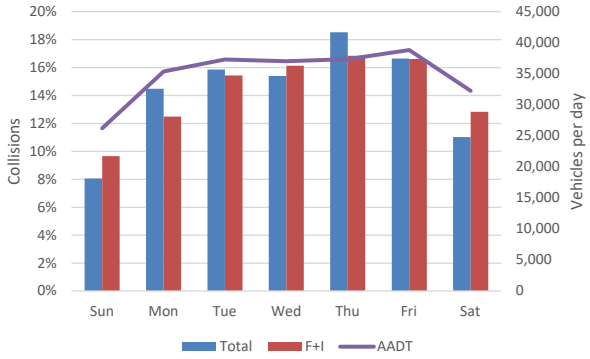
SR 49 SAFETY AUDIT

TIME/DAY FACTORS

COLLISIONS BY DAY OF WEEK



- More collisions occur on Wednesday, Thursday, and Friday
- Fewest collisions on Sunday

Collisions are most frequent on weekdays

2012 VOLUME DATA AT BELL ROAD

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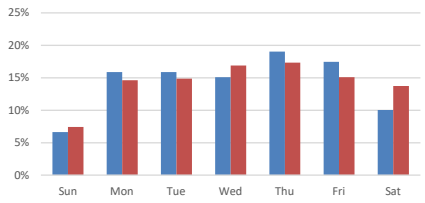
SR 49 SAFETY AUDIT

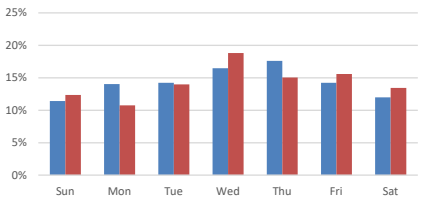
TIME/DAY FACTORS

COLLISIONS BY DAY OF WEEK

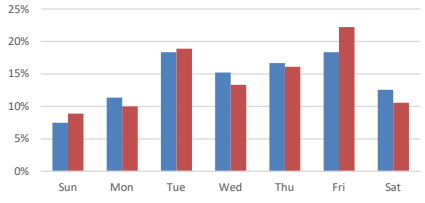
I-80 to Dry Creek Rd



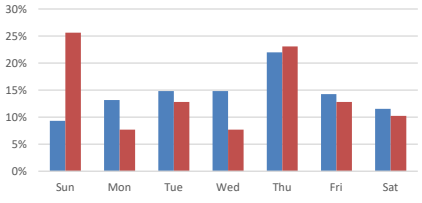
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



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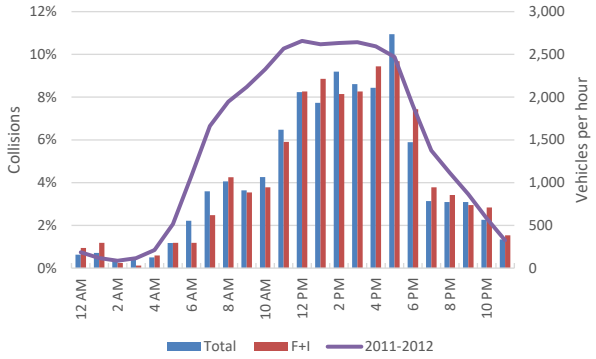
SR 49 SAFETY AUDIT

TIME/DAY FACTORS

COLLISIONS BY TIME OF DAY



Collisions most often occur in the afternoon (12 to 7 PM)

- Collisions occur most often from 1 to 6 PM
- F+I peak at 5-6 PM
- Collisions are low during the AM despite high volumes

2011-2012 VOLUME DATA AT BELL ROAD

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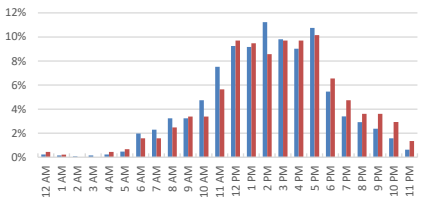
SR 49 SAFETY AUDIT

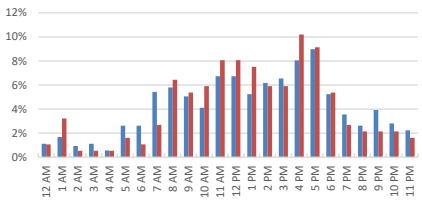
TIME/DAY FACTORS

COLLISIONS BY TIME OF DAY

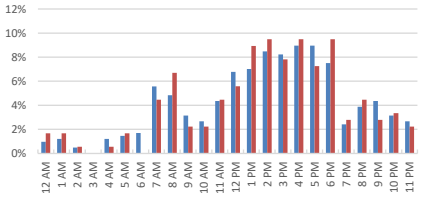
I-80 to Dry Creek Rd



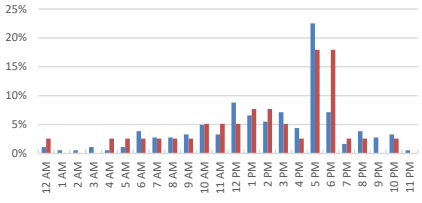
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



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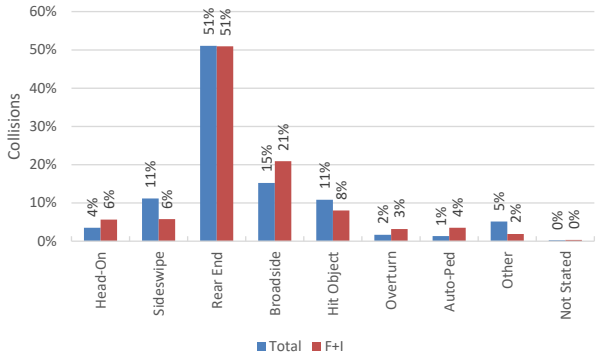
CONTEXTUAL FACTORS

29

SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY TYPE



- Broadside is second most common type
- Sideswipe and Hit Object are tied for third most common

Rear End is the most common collision type

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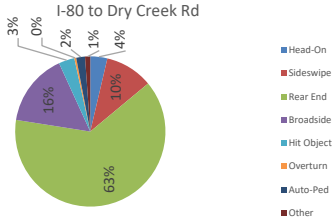
SR 49 SAFETY AUDIT

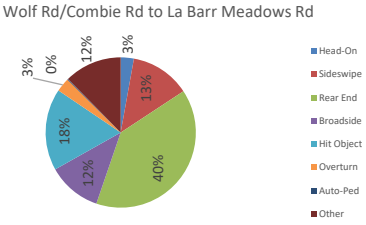
CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY TYPE

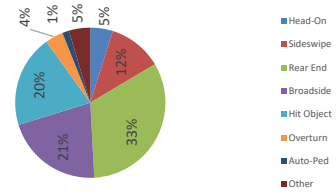
I-80 to Dry Creek Rd



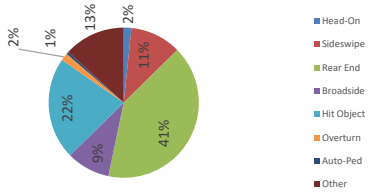
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES "NOT STATED" (7)

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SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY TYPE

Segment	Most Common	2nd Most	3rd Most
I-80 to McKnight Way	Rear End (51%)	Broadside (15%)	Sideswipe & Hit Object (11%)
1. I-80 to Dry Creek	Rear End (63%)	Broadside (16%)	Sideswipe (10%)
2. Dry Creek to Wolf Rd/Combie Rd	Rear End (33%)	Broadside (21%)	Hit Object (20%)
3. Wolf Rd/Combie Rd to La Barr Meadows Rd	Rear End (40%)	Hit Object (18%)	Sideswipe (13%)
4. La Barr Meadows Rd to McKnight Way	Rear End (41%)	Hit Object (22%)	Other (13%)

Broadside is more frequent in urbanized areas and Hit Object is more frequent in rural areas

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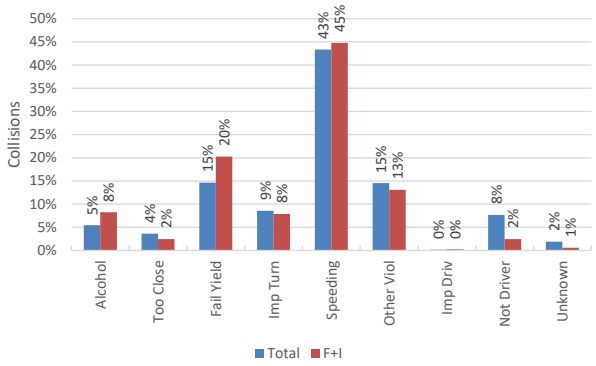
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY PRIMARY COLLISION FACTOR



Speeding is the most common primary collision factor

- Failure to Yield and Other Violation (15%) are the second most common factors
- 8% of F+I collisions involve alcohol

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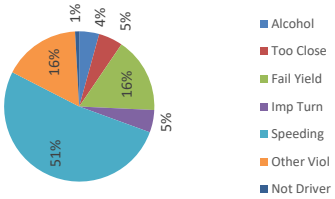
SR 49 SAFETY AUDIT

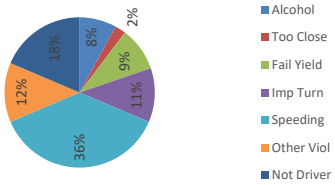
CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY PRIMARY COLLISION FACTOR

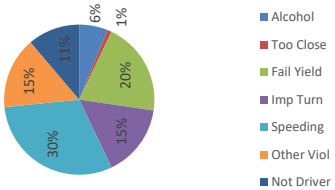
I-80 to Dry Creek Rd



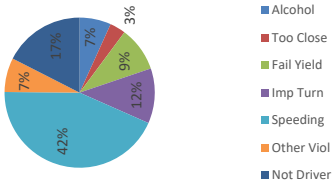
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES IMPROPER DRIVING (4), UNKNOWN (46), AND NOT STATED (1)

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SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY PRIMARY COLLISION FACTOR

Segment	Most Common	2nd Most	3rd Most
I-80 to McKnight Way	Speeding (43%)	Failure to Yield & Other Violation (15%)	
1. I-80 to Dry Creek	Speeding (51%)	Failure to Yield & Other Violation (15%)	
2. Dry Creek to Wolf Rd/Combie Rd	Speeding (30%)	Failure to Yield (20%)	Improper Turn & Other Violation (15%)
3. Wolf Rd/Combie Rd to La Barr Meadows Rd	Speeding (36%)	Not Driver (18%)	Other Violation (12%)
4. La Barr Meadows Rd to McKnight Way	Speeding (42%)	Not Driver (17%)	Improper Turn (12%)

Failure to Yield is more frequent in urbanized areas and Other than Driver is more frequent in rural areas

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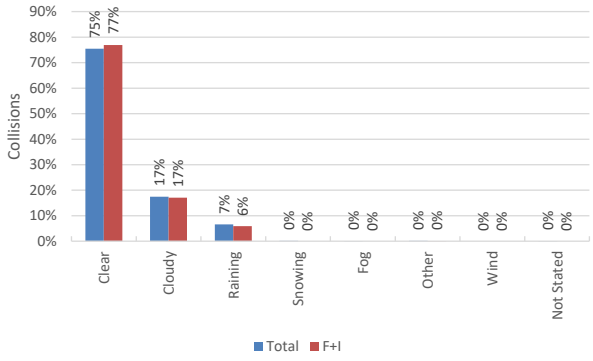
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY WEATHER



- 7% of collisions occurred in rain

Most collisions occur during clear weather

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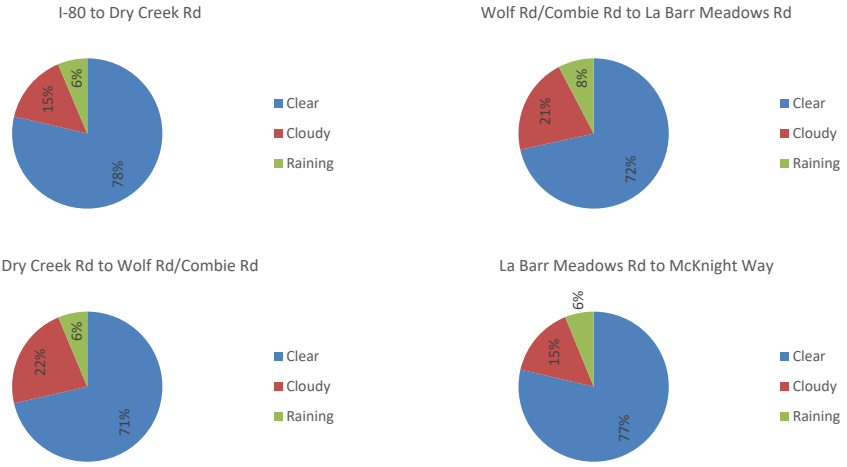
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY WEATHER



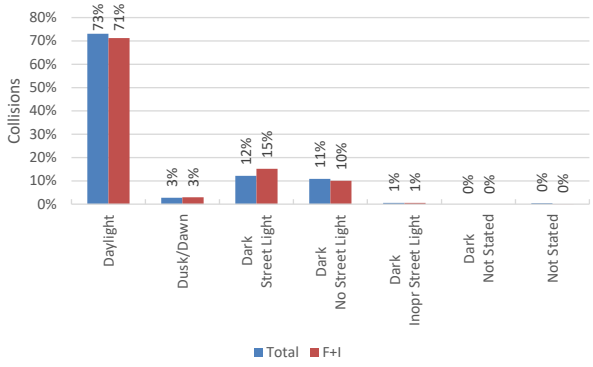
NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES SNOWING (3). FOG (2), OTHER (4), AND NOT STATED (2)

37

SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY LIGHTING



- Most collisions occur during daylight
- Dusk/dawn collisions were 3%

23% of collisions occurred in dark, unlit areas

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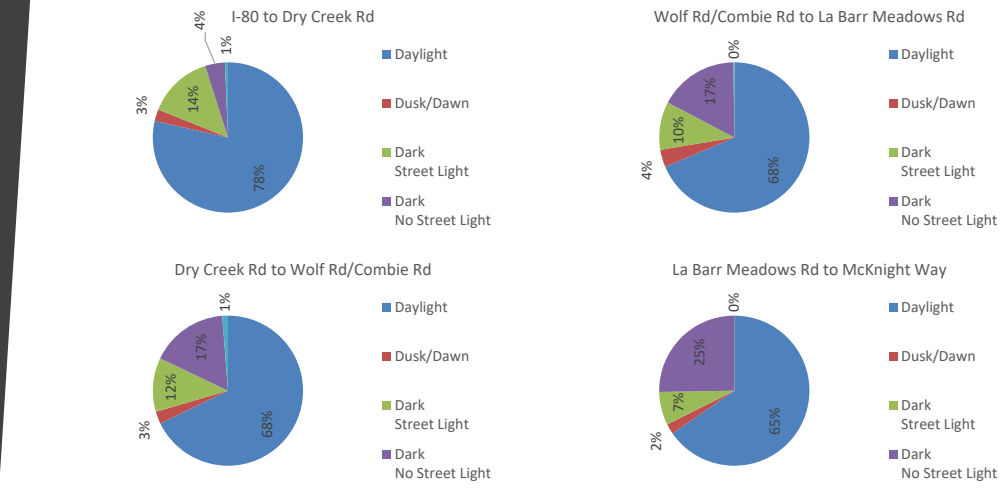
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY LIGHTING



NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES DARK INOPR STREET LIGHT (14) AND NOT STATED (11)

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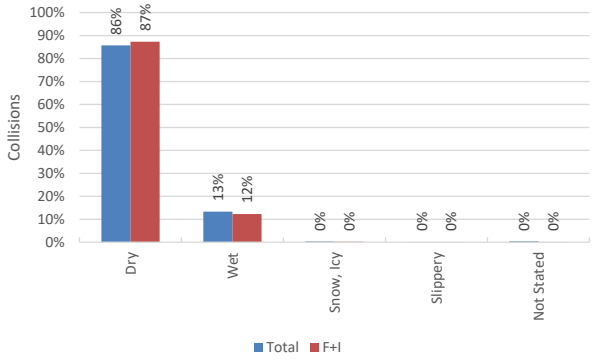
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY ROAD SURFACE



- Most collisions occur when pavement is dry

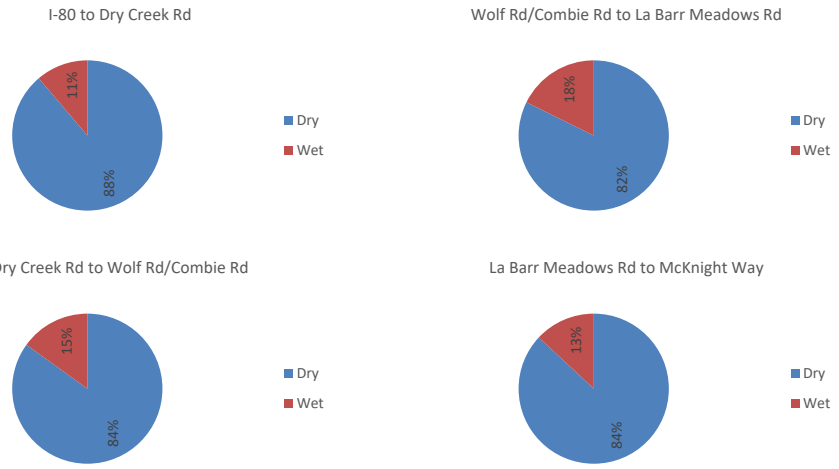
13% of collisions occurred on wet pavement

40

SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY ROAD SURFACE



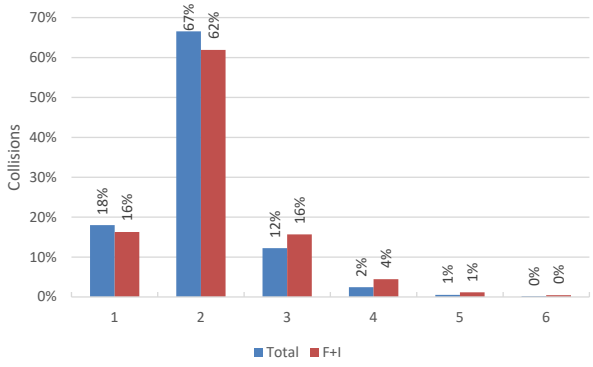
NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES SNOW, ICY (9), SLIPPERY (2), AND NOT STATED (11)

41

SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY NUMBER OF MOTOR VEHICLES



- Three-vehicle collisions are nearly as common as one-vehicle collisions

Most collisions involve two vehicles

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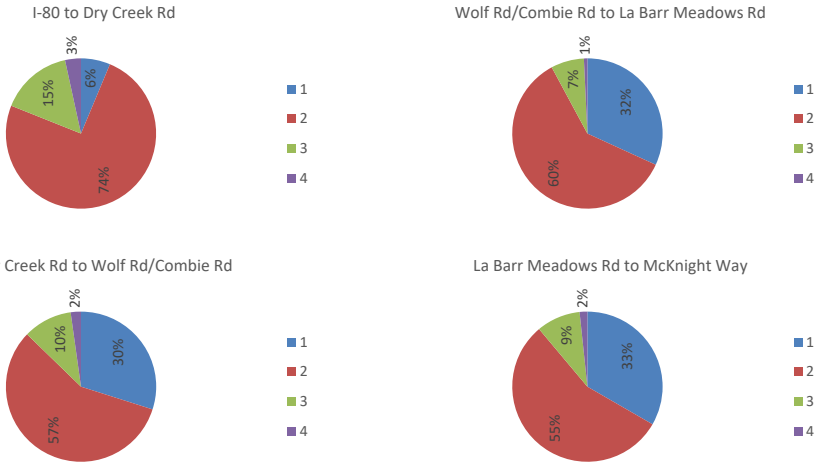
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY NUMBER OF MOTOR VEHICLES



NOTE: 2,396 TOTAL COLLISIONS, EXCLUDES 0 VEHICLES (1), 5 VEHICLES (13), AND 6 VEHICLES (5)

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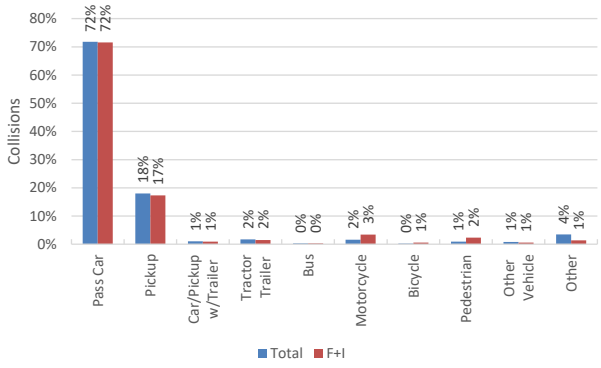
SR 49 SAFETY AUDIT

CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY VEHICLE TYPE (PARTY)



- Heavy trucks involved in 2% of collisions
- Bicycle and pedestrian collisions are 3%

Most collisions involve passenger cars or pickup trucks

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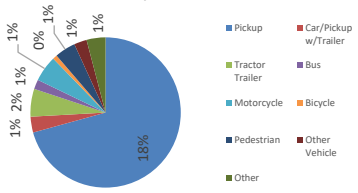
SR 49 SAFETY AUDIT

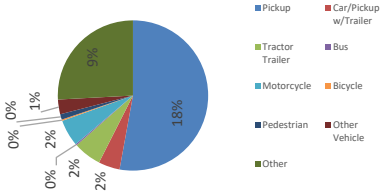
CONTEXTUAL TRENDS

SHARE OF COLLISIONS BY VEHICLE TYPE (PARTY) – EXCLUDING PASSENGER CAR

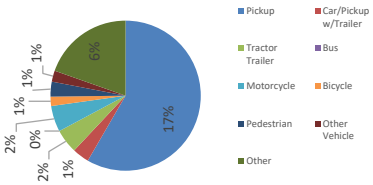
I-80 to Dry Creek Rd



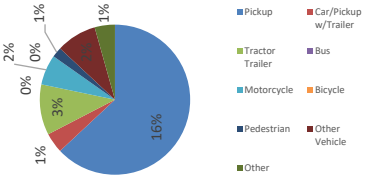
Wolf Rd/Combie Rd to La Barr Meadows Rd



Dry Creek Rd to Wolf Rd/Combie Rd



La Barr Meadows Rd to McKnight Way



NOTE: 4,883 TOTAL INVOLVED VEHICLES, EXCLUDES PASSENGER CAR/STATION WAGON (3,505)

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TREATMENT BRAINSTORMING

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SR 49 SAFETY AUDIT

THE FIVE E'S

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SR 49 SAFETY AUDIT

EDUCATION

Can public outreach change behavior?

- What is the message?
- Who is the audience?

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SR 49 SAFETY AUDIT

ENFORCEMENT

California Highway Patrol

- Infrastructure gaps?
- Availability?
- Priority?

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SR 49 SAFETY AUDIT

ENCOURAGEMENT

- Safety Corridor
- Speed Feedback Signs

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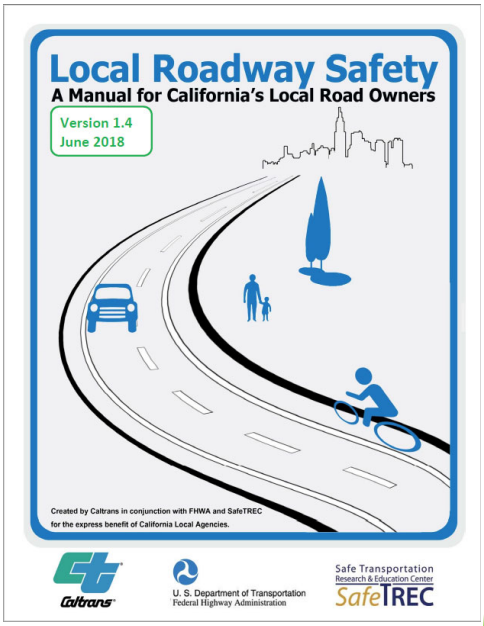
SR 49 SAFETY AUDIT

ENGINEERING

Local Roadway Safety Manual

- Signalized Intersection
- Non-Signalized Intersection
- Roadways



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SR 49 SAFETY AUDIT

COUNTERMEASURES FOR SIGNALIZED INTERSECTIONS

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity
S1	Lighting	Add intersection lighting (S.I.)	Night	40%	20	100%	Medium
S2	Signal Mod.	Improve signal hardware: lenses, back-plates, mounting, size, and number	All	15%	10	100%	Very High
S3	Signal Mod.	Improve signal timing (coordination, phases, red, yellow, or operation)	All	15%	10	50%	Very High
S4	Signal Mod.	Provide Advanced Dilemma Zone Detection for high speed approaches	All	40%	10	100%	High
S5	Signal Mod.	Install emergency vehicle pre-emption systems	EV	70%	10	100%	High
S6	Signal Mod.	Provide protected left turn phase (left turn lane already exists)	All	30%	20	100%	High
S7	Signal Mod.	Convert signal to mast arm (from pedestal-mounted)	All	30%	20	100%	Medium
S8	Operation/ Warning	Install raised pavement markers and striping (Through Intersection)	All	10%	10	100%	Very High
S9	Operation/ Warning	Install flashing beacons as advance warning (S.I.)	All	30%	10	100%	Medium
S10	Operation/ Warning	Install cameras to detect red-light running	N/A	N/A	N/A	N/A	N/A
S11	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	Medium
S12	Geometric Mod.	Install raised median on approaches (S.I.)	All	25%	20	90%	Medium
S13	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns & u-turns (S.I.)	All	50%	20	90%	Medium
S14	Geometric Mod.	Install right-turn lane (S.I.)	N/A	N/A	N/A	N/A	N/A
S15	Geometric Mod.	Install left-turn lane (signal has no left-turn phase - before and after)	N/A	N/A	N/A	N/A	N/A
S16	Geometric Mod.	Install left-turn lane (signal has a left-turn phase - before and after)	N/A	N/A	N/A	N/A	N/A
S17	Geometric Mod.	Install left-turn lane and add turn phase (signal has no left-turn lane or phase before)	All	55%	20	90%	Low
S18	Geometric Mod.	Convert intersection to roundabout (from signal)	All	Varies	20	100%	Low
S19	Ped and Bike	Install pedestrian countdown signal heads	P & B	25%	20	100%	Very High
S20	Ped and Bike	Install pedestrian crossing (S.I.)	P & B	25%	20	100%	High
S21	Ped and Bike	Install advance stop bar before crosswalk (Bicycle Box)	P & B	15%	10	100%	Very High
S22	Ped and Bike	Install pedestrian overpass/underpass	N/A	N/A	N/A	N/A	N/A
S23	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low

Red countermeasures are not eligible in the Cycle 9 HSIP call for projects

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SR 49 SAFETY AUDIT

COUNTERMEASURES FOR NON-SIGNALIZED INTERSECTIONS

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity
NS1	Lighting	Add intersection lighting (NS.I.)	Night	40%	20	100%	Medium
NS2	Control	Convert to all-way STOP control (from 2-way or Yield control)	All	50%	10	100%	High
NS3	Control	Install signals	All	25%	20	100%	Low
NS4A	Control	Convert intersection to roundabout (from all way stop)	All	Varies	20	100%	Low
NS4B	Control	Convert intersection to roundabout (from stop or yield control on minor road)	All	Varies	20	100%	Low
NS5	Operation/ Warning	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	All	15%	10	100%	Very High
NS6	Operation/ Warning	Upgrade intersection pavement markings (NS.I.)	All	25%	10	100%	Very High
NS7	Operation/ Warning	Install Flashing Beacons at Stop-Controlled Intersections	All	15%	10	100%	High
NS8	Operation/ Warning	Install flashing beacons as advance warning (NS.I.)	All	30%	10	100%	High
NS9	Operation/ Warning	Install transverse rumble strips on approaches	All	20%	10	90%	High
NS10	Operation/ Warning	Improve sight distance to intersection (Clear Sight Triangles)	All	20%	10	90%	High
NS11	Geometric Mod.	Install splitter-islands on the minor road approaches	All	40%	20	90%	Medium
NS12	Geometric Mod.	Install raised median on approaches (NS.I.)	All	25%	20	90%	Medium
NS13	Geometric Mod.	Create directional median openings to allow (and restrict) left-turns and u-turns (NS.I.)	All	50%	20	90%	Medium
NS14	Geometric Mod.	Install right-turn lane (NS.I.)	All	20%	20	90%	Low
NS15	Geometric Mod.	Install left-turn lane (where no left-turn lane exists)	All	35%	20	90%	Low
NS16	Ped and Bike	Install raised medians / refuge islands (NS.I.)	P & B	45%	20	90%	Medium
NS17	Ped and Bike	Install pedestrian crossing at uncontrolled locations (new signs and markings only)	P & B	25%	10	100%	High
NS18	Ped and Bike	Install pedestrian crossing at uncontrolled locations (with enhanced safety features)	P & B	35%	20	100%	Medium
NS19	Ped and Bike	Install pedestrian signal or HAWK	P & B	55%	20	100%	Low
NS20	Operation/ Warning	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	Medium

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SR 49 SAFETY AUDIT

COUNTERMEASURES FOR ROADWAYS

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity
R1	Lighting	Add segment lighting	Night	35%	20	100%	Medium
R2	Remove/ Shield Obstacles	Remove or relocate fixed objects outside of Clear Recovery Zone	All	35%	20	90%	High
R3	Remove/ Shield Obstacles	Install Median Barrier	All	25%	20	100%	Medium
R4	Remove/ Shield Obstacles	Install Guardrail	All	25%	20	100%	High
R5	Remove/ Shield Obstacles	Install impact attenuators	All	25%	10	100%	High
R6	Remove/ Shield Obstacles	Flatten side slopes	All	30%	20	90%	Medium
R7	Remove/ Shield Obstacles	Flatten side slopes and remove guardrail	All	40%	20	90%	Medium
R8	Remove/ Shield Obstacles	Upgrade bridge railing	N/A	N/A	N/A	N/A	N/A
R9	Geometric Mod.	Install raised median	All	25%	20	90%	Medium
R10	Geometric Mod.	Install median (flush)	All	15%	20	90%	Medium
R11	Geometric Mod.	Install acceleration/ deceleration lanes	All	25%	20	90%	Low
R12	Geometric Mod.	Install climbing lane (where large difference between car and truck speed)	N/A	N/A	N/A	N/A	Low
R13	Geometric Mod.	Widen lane (initially less than 10 ft)	All	25%	20	90%	Medium
R14	Geometric Mod.	Add two-way left-turn lane (without reducing travel lanes)	All	30%	20	90%	Medium
R15	Geometric Mod.	Road Diet (Reduce travel lanes from 4 to 3 and add a two way left-turn and bike lanes)	All	30%	20	90%	Medium
R16	Geometric Mod.	Widen shoulder (paved)	All	30%	20	90%	Medium
R17	Geometric Mod.	Widen shoulder (unpaved)	All	20%	20	90%	Medium
R18	Geometric Mod.	Pave existing shoulder	All	15%	20	90%	Medium
R19	Geometric Mod.	Improve horizontal alignment (flatten curves)	All	50%	20	90%	Low
R20	Geometric Mod.	Flatten crest vertical curve	All	25%	20	90%	Low
R21	Geometric Mod.	Improve horizontal and vertical alignments	All	60%	20	90%	Low
R22	Geometric Mod.	Improve curve superelevation	All	45%	20	90%	Medium
R23	Geometric Mod.	Convert from two-way to one-way traffic	All	35%	20	90%	Medium
R24	Geometric Mod.	Improve pavement friction (High Friction Surface Treatments)	All	40%	10	100%	High

Red countermeasures are not eligible in the Cycle 9 HSIP call for projects

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SR 49 SAFETY AUDIT

COUNTERMEASURES FOR ROADWAYS (CONTINUED)

No.	Type	Countermeasure Name	Crash Type	CRF	Expected Life (Years)	Federal Funding Eligibility	Systemic Approach Opportunity
R25	Geometric Mod.	Provide Tapered Edge for Pavement Edge Drop-off	N/A	N/A	N/A	N/A	N/A
R26	Operation/ Warning	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	All	15%	10	100%	Very High
R27	Operation/ Warning	Install chevron signs on horizontal curves	All	40%	10	100%	Very High
R28	Operation/ Warning	Install curve advance warning signs	All	25%	10	100%	Very High
R29	Operation/ Warning	Install curve advance warning signs (flashing beacon)	All	30%	10	100%	High
R30	Operation/ Warning	Install dynamic/variable speed warning signs	All	30%	10	100%	High
R31	Operation/ Warning	Install delineators, reflectors and/or object markers	All	15%	10	100%	Very High
R32	Operation/ Warning	Install edge-lines and centerlines	All	25%	10	100%	Very High
R33	Operation/ Warning	Install no-passing line	All	45%	10	100%	Very High
R34	Operation/ Warning	Install centerline rumble strips/stripes	All	20%	10	100%	High
R35	Operation/ Warning	Install edgeline rumble strips/stripes	All	15%	10	100%	High
R36	Ped and Bike	Install bike lanes	P & B	35%	20	90%	High
R37	Ped and Bike	Install sidewalk/pathway (to avoid walking along roadway)	P & B	80%	20	90%	Medium
R38	Ped & Bike	Install pedestrian crossing (with enhanced safety features)	P & B	30%	10	90%	Medium
R39	Ped and Bike	Install raised pedestrian crossing	P & B	35%	10	90%	Medium
R40	Animal	Install animal fencing	Animal	80%	20	90%	Medium
R41	Truck	Install truck escape ramp	N/A	N/A	N/A	N/A	N/A
R42	Geometric Mod.	Install pedestrian median fencing on approaches	P & B	35%	20	90%	Low

Red countermeasures are not eligible in the Cycle 9 HSIP call for projects

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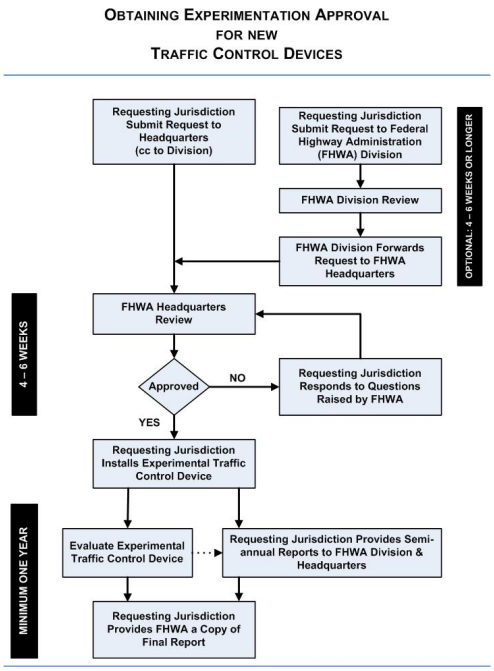
SR 49 SAFETY AUDIT

EVALUATION

- Cameras / Data Collection
- Corridor Safety Evaluation
- Pilot Programs
- New Technology



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Appendix D

TASAS Table B Summary

OTM22130

Table B - Selective Accident Rate Calculation

Report Parameters-

Event ID: 4195215

Request Name: Pla 49

Ref Date: 02/13/2020

Request- & Line	LOC	DIR	LSC	Route/Location	Begin Date	End Date	Rate Type	Out Seq	Override Rates			Override ADT		Req. Type	Com- bine?	Excl Ramp?
									Rate	Inj%	Fat%	Main	Cross			
1 3	H	T	I	03 PLA 049 003.208 - 03 PLA 049 007.427	01-JAN-10	31-JAN-20	N	L						N	N	Y

Event Log:

Job id is : 138721 Accidents Table B Request Pla 49 Submitted by T3JHUANG
03 PLA 049 3.208 - 03 PLA 049 7.427 01/01/2010 TO 01/31/2020

Location Description	Rate Group (RUS)	No. of Accidents / Significance Tot	Fat	Inj	F+I	Multi Veh	Wet	Dark	Pers Kld Inj	ADT Main X-St	Total **MV+** or **MVM**	Accident Rates Actual Fat	Actual F+I	Average Tot	Average Fat	Average F+I	Average Tot
03 PLA 049 003.208 - 03 PLA 049 007.426	**4.219 MI** H	1275	11	436	447	1195	143	276	12	35.5	550.87	0.020	.81	2.32	0.008	.40	.97
0001-0003 2010-01-01 2020-01-31 *121 mo.*	NA	**H99**	**H97**	**H99**	**H99**		**H99**	**H99**	653								

Accident Rates expressed as: **# of accidents / Million vehicle miles**

+ denotes that **Million Vehicles** (MV) used in accident rates instead (for intersections and ramps).

For Ramps RUS only considers R(Rural) U(Urban)

OTM22130

Table B - Selective Accident Rate Calculation

Report Parameters-

Event ID: 4195216

Request Name: Pla 49

Ref Date: 02/13/2020

Request- & Line	LOC	DIR	LSC	Route/Location	Begin Date	End Date	Rate Type	Out Seq	Override Rates			Override ADT		Req. Type	Com- bine?	Excl Ramp?
									Rate	Inj%	Fat%	Main	Cross			
1 4	H	T	I	03 PLA 049 007.427 - 03 PLA 049 011.373	01-JAN-10	31-JAN-20	N	L						N	Y	Y
1 5	H	T	I	03 NEV 049 000.000 - 03 NEV 049 002.194	01-JAN-10	31-JAN-20	N	L						N	Y	Y

Event Log:

Job id is : 138722 Accidents Table B Request Pla 49 Submitted by T3JHUANG
03 PLA 049 7.427 - 03 PLA 049 11.373 01/01/2010 TO 01/31/2020
03 NEV 049 0 - 03 NEV 049 2.194 01/01/2010 TO 01/31/2020

California Department of Transportation
Table B - Selective Accident Rate Calculation

Location Description	Rate Group (RUS)	No. of Accidents / Significance							Pers Kld Inj	ADT Main X-St	Total **MV+** or **MVM**	Accident Rates Actual		Accident Rates Average			
		Tot	Fat	Inj	F+I	Multi Veh	Wet	Dark				Fat	F+I	Tot	Fat	F+I	Tot
Combined	**6.140 MI** H	417	17	165	182	294	62	134	19	29.9	676.62	0.025	.27	.62	0.010	.30	.78
0001- 2010-01-01 2020-01-31 *121 mo.*	NA		**H99**						286								

Accident Rates expressed as: **# of accidents / Million vehicle miles**

+ denotes that **Million Vehicles** (MV) used in accident rates instead (for intersections and ramps).

For Ramps RUS only considers R(Rural) U(Urban)

OTM22130

Table B - Selective Accident Rate Calculation

Report Parameters-

Event ID: 4195217

Request Name: Nev 49

Ref Date: 02/13/2020

Request- & Line	LOC	DIR	LSC	Route/Location	Begin Date	End Date	Rate Type	Out Seq	Override Rates			Override ADT		Req. Type	Com- bine?	Excl Ramp?
									Rate	Inj%	Fat%	Main	Cross			
1	17	H	T	I 03 NEV 049 002.194 - 03 NEV 049 R010.710	01-JAN-10	31-JAN-20	N	L						N	N	Y

Event Log:

Job id is : 138723 Accidents Table B Request Nev 49 Submitted by T3JHUANG
03 NEV 049 2.194 - 03 NEV 049 R 10.71 01/01/2010 TO 01/31/2020

Location Description	Rate Group (RUS)	No. of Accidents / Significance Tot	Fat	Inj	F+I	Multi Veh	Wet	Dark	Pers Kld Inj	ADT Main X-St	Total **MV+** or **MVM**	Accident Rates Actual Fat	Actual F+I	Average Tot	Average Fat	Average F+I	Average Tot
03 NEV 049 002.194 - 03 NEV 049 R010.709	**8.516 MI** H	536	6	180	186	365	96	169	7	23.3	732.17	0.008	.25	.73	0.017	.37	.91
0001-0017 2014-03-24 2020-01-31	*NA mo.* NA								296								

Accident Rates expressed as: **# of accidents / Million vehicle miles**

+ denotes that **Million Vehicles** (MV) used in accident rates instead (for intersections and ramps).

For Ramps RUS only considers R(Rural) U(Urban)

OTM22130

Table B - Selective Accident Rate Calculation

Report Parameters-

Event ID: 4126550

Request Name: NEV 49

Ref Date: 06/14/2019

Request- & Line	LOC	DIR	LSC	Route/Location	Begin Date	End Date	Rate Type	Out Seq	Override Rates			Override ADT		Req. Type	Com- bine?	Excl Ramp?
									Rate	Inj%	Fat%	Main	Cross			
1	11	H	T	I 03 NEV 049 011.100 - 03 NEV 049 R013.300	01-JAN-16	31-DEC-18	N	L						N	N	Y

Event Log:

Job id is : 96508 Accidents Table B Request NEV 49 Submitted by T3DCHAMB
03 NEV 049 11.1 - 03 NEV 049 R 13.3 01/01/2016 TO 12/31/2018

Location Description	Rate Group (RUS)	No. of Accidents / Significance Tot	Fat	Inj	F+I	Multi Veh	Wet	Dark	Pers Kld Inj	ADT Main X-St	Total **MV+** or **MVM**	Accident Rates Actual Fat	Actual F+I	Average Tot	Average Fat	Average F+I	Average Tot
03 NEV 049 011.100 - 03 NEV 049 R013.299	**2.200 MI** H	62	0	21	21	42	5	19	0	25.8	62.21	0.000	.34	1.00	0.014	.42	1.02
0001-0011 2016-01-01 2018-12-31 *36 mo.*	S								33								

Accident Rates expressed as: **# of accidents / Million vehicle miles**

+ denotes that **Million Vehicles** (MV) used in accident rates instead (for intersections and ramps).

For Ramps RUS only considers R(Rural) U(Urban)

Appendix E

FHWA Proven Safety Countermeasures

U.S. Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives
http://safety.fhwa.dot.gov

Making Our Roads Safer

ONE COUNTERMEASURE AT A TIME

The FHWA has identified and is promoting widespread use of a set of 20 Proven Safety Countermeasures that can offer significant, measurable impacts as part of any agency's data-driven, systemic approach to improving safety. These strategies are designed to enhance safety on all kinds of roads—from rural to urban, from high-volume freeways to less traveled two-lane State and county roads, from signalized crossings to horizontal curves, and everything in between. Each countermeasure addresses **intersections, roadway departures, or pedestrian/bicyclist facilities**—along with crosscutting strategies that address all three safety focus areas.

Which Proven Safety Countermeasures Will You Use?

➔ For more information on this and other FHWA Proven Safety Countermeasures, please visit **https://safety.fhwa.dot.gov/provencountermeasures**.

Proven Safety Countermeasures

ROADWAY DEPARTURE


1. EnhancedDelineation and Friction for Horizontal Curves


2. Longitudinal Rumble Strips and Stripes


3. SafetyEdge$_{sm}$


4. Roadside Design Improvements at Curves


5. Median Barriers

INTERSECTIONS


6. Backplates with Retroreflective Borders


7. Corridor Access Management


8. Left-and Right-Turn Lanes at Two-Way Stop-Controlled Intersections


9. Reduced Left-Turn Conflict Intersections


10. Roundabouts


11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections


12. Yellow Change Intervals

PEDESTRIANS/BICYCLES


13. Leading Pedestrian Intervals


14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas


15. Pedestrian Hybrid Beacons


16. Road Diets/Reconfigurations


17. Walkways

CROSSCUTTING


18. Local Road Safety Plans


19. Road Safety Audits

20. Uslimits2

➔For more information on these countermeasures and other FHWA Proven Safety Countermeasures, please visit **https://safety.fhwa.dot.gov/provencountermeasures**.

U.S. Department of Transportation
Federal Highway Administration

FHWA-SA-18-068

Appendix F

Highway 49 PLA/NEV Corridor Improvement

HIGHWAY 49 PLA/NEV CORRIDOR IMPROVEMENT

FUTURE INVESTMENT PROJECTS

STIP PROJECTS

2 **Nev 49, PM 11.1/13.3: Corridor Improvement**
Costs - $50 - $120 million
Widen to 4 lane and 8 ft shoulders continuous two way left turn lane
La Barr Meadows to McKnight Way
Begin Construction Winter 2024

SHOPP PROJECTS

7 **Nev 49, 8.3/8.7: Intersection Improvements**
Costs - $4.2 million
Left turn pockets and 8-foot shoulders from Round Valley Rd to Quail Creek Rd
Begin Construction Fall 2020

17 **Pla 49, PM 8.7/10.6: Safety Improvements**
Cost - $26.3 million
Two roundabouts and median barrier from Lorenson Rd to Lone Star Rd
Begin Construction Spring 2022

LOCAL PROJECTS

19 **Pla 49, PM 3.1/7.5: Sidewalk Gap Closure (ATP)**
Cost - $19.1 million
Construct sidewalks, curb ramps and pedestrian bridge from I-80 to Dry Creek Rd
Begin Construction Winter 2021

Investments Completed or In Construction

1 **Nev 49, PM 0.0/14.4: Safety Improvements**
Costs - $4.9 million
Midwest Guardrail and Rumble strips at various intersections and locations
Construction Completed 10/2015

3 **Nev 49, PM 12.6: Roadway Widening**
Cost - $.5 million
Add right turn pocket at Smith Rd
Construction Completed 10/2016

4 **Nev 49, PM 9.7/11.2: Roadway Widening**
Cost – $28.9 million
Widened to 4 lanes from Alta Sierra Drive to Wellswood Way
Construction Completed 04/2014

5 **Nev 49, PM 2.0/9.4: Traffic Signal Improvements**
Cost - $.1 million
Installed traffic signal pre-emptive devices at Wolf/Combie, Lime Kiln, and Alta Sierra intersections
Construction Completed 05/2018

6 **Nev/Pla 49, Nev 8.9/Pla 9.2: Safety Improvements**
Cost - $.2 million
Radar Feedback signs, lighting, Safety beacons and loop detectors at Florence Ln, Wolf/Combie, Brewer Rd, Pekolee Dr, and Alta Sierra Construction
Construction Completed 11/2020

8 **Nev 49, PM 7.3/8.0: Roadway Widening**
Cost - $4.9 million
Widen to 4 lanes and added shoulders from Lime Kiln Road to Pekolee Dr
Construction Completed 10/2006

9 **Nev 49, PM 6.3/6.7: Roadway Improvement**
Cost - $.6 million
Correct roadway curve superelevation near Mother Lode Rd
Construction Completed 08/2018

10 **Nev 49, PM 5.6/6.0: Roadway Widening**
Cost - $.8 million
Northbound right turn lane and 8-foot wide paved shoulder at Holcomb/Cherry Creek Road
Construction Completed 12/2014

11 **Nev 49, PM 4.3/4.8: Intersection Improvements**
Cost – $2.2 million
Right turn pockets and shoulder widening at Carriage Rd and Ladybird Dr
Construction Completed 10/2014

12 **Nev 49, PM 3.4: Intersection Improvements**
Cost – $.5 million
Right turn pocket at Brewer Rd
Construction Completed 09/2015

13 **Nev 49, PM 2.4/3.0: Operational Improvement**
Cost - $1.4 million
Extend northbound passing lane Combie Rd to Brewer Rd
Construction Completed 07/2010

14 **Nev 49, PM 2.0/2.5: Intersection Improvements**
Costs - $4.3 million
NB and SB accelerations lanes. Wolf Rd/Combie Rd intersection
Begin Construction Summer 2020

16 **Pla 49, PM 7.7/11.4: Safety Improvements**
Cost - $1.4 million
Shoulder and/or centerline. Rumble strips and 6 inch striping
South of Michael Ln to Bear River Br
Construction Completed 10/2019

18 **Pla 49, 3.1/7.5: Rehab and Widening**
Cost - $43.1 million
Roadway pavement, left turn pockets, sidewalks and bike lane from I-80 to Dry Creek Rd
Construction to be Completed Summer 2021

21 **Pla 49, PM 3.5/6.1: Roadway Widening**
Cost - $17 million (STIP)
Turn pockets, TWLTL, sidewalk. Fulweiler Ave to Willow Creek Ave
Construction Completed 12/2008

LOCAL PROJECTS

15 **Nev 49, PM 1.9/1.9: Intersection Improvement**
Cost - $.6 million
Update existing intersection at Woodridge Ct
Construction to be Completed Fall 2021

20 **Pla 49, PM 6.5/6.7: Auburn Creekside Center**
Cost - $1.45 million
Construct a northbound lane from Education St to Quartz Dr
Construction to be Completed Fall 2021

Caltrans