Technical Memorandum #2

TO:	Francisco Olmedo Naomi Robles Imperial County Public Works
FROM:	Darryl DePencier, AICP, GISP, RSP$_{2B,}$ Kimley-Horn Kyle McGowan, AICP, Kimley-Horn
PROJECT:	Imperial County Local Roadway Safety Plan (LRSP)
DATE:	December 27, 2023
SUBJECT:	Technical Memorandum #2 – Countywide Safety Background and Trends

This memorandum summarizes the collision data collected as part of the Local Roadway Safety Plan (LRSP) development process. It outlines the analysis methods and provides statistical summaries of the outcomes. This process differs from the analysis performed in the 2020 Systemic Safety Analysis Report (SSAR) through the involvement of local leadership that represents the 5 E's of traffic safety. The 5 E's of traffic safety include Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies. This information will lead to the identification of locations of interest where site visits will be conducted. Ultimately, this information will be used to identify systemic countermeasures that will be included in the LRSP. Imperial County does not have jurisdiction on State Highway facilities within the County and is not responsible for improvements to these facilities. The Local Roadway Safety Plan focuses on roadways that the County owns and maintains.

1 ANALYSIS DATA

1.1 ROADWAY NETWORK

The Caltrans California Road System (CRS) GIS database was used to build the base roadway network used for this analysis. Traffic volumes and signal locations were provided by the County (from the SSAR) and were included in the analysis network. Intersections and roadway segments were divided into control and classification categories so that each set could have its own crash rates and be evaluated against similar facilities. Most of the County maintained centerline miles are located within the Imperial Valley south of the Salton Sea. **Figure 1** illustrates Imperial County's roadway network and intersections as classified for this study. This classification designated each corridor as either a Prime Arterial, Minor Arterial, Major Collector, Minor Collector, or Local Street to compare the functional design.

1.2 INTERSECTION

The collision analysis requires each intersection to be classified by type: Signalized or Unsignalized. Signalized intersections are heavily concentrated along State Route 111 (SR 111) as well as the area between El Centro and Calexico. This report includes State Route data. It

should be noted within this report that the County will show data on state routes as reference but will not include improvements on state routes as projects require coordination with Caltrans that may be fiscally burdensome and be temporally prolonged, which jeopardizes the County's ability to meet funding milestones. The safety analysis compares intersection safety performance to locations with similar control types. This information is also displayed in **Figure 1**.

1.3 COUNT DATA

Vehicular count data is used as part of the analysis process to evaluate the impact of traffic and understand the natural hierarchy of the roadway network. Count data utilized for this project was pulled from the 2020 Systemic Safety Analysis Report (SSAR). For locations without volume or count data, reasonable assumptions were made based on classification types. The traffic volume information allowed the team to assess locations for risk to a given roadway user as well as reviewing locations with the highest number of collisions.

1.4 COLLISION DATA

Collision data was collected from Crossroads Software for the period from January 1, 2016, through December 31, 2021. Six years of data are utilized instead of the standard three years to provide more history to evaluate trends or patterns. Analysis of the collision data is the first step in understanding the specific and systemic challenges faced throughout the County. Analyzing the five years of data provided insight on the following collision trends and patterns. The locations of fatal and severe injury collisions are displayed in **Figure 2.**

Figure 1: Functional Classification & Signalized Intersections

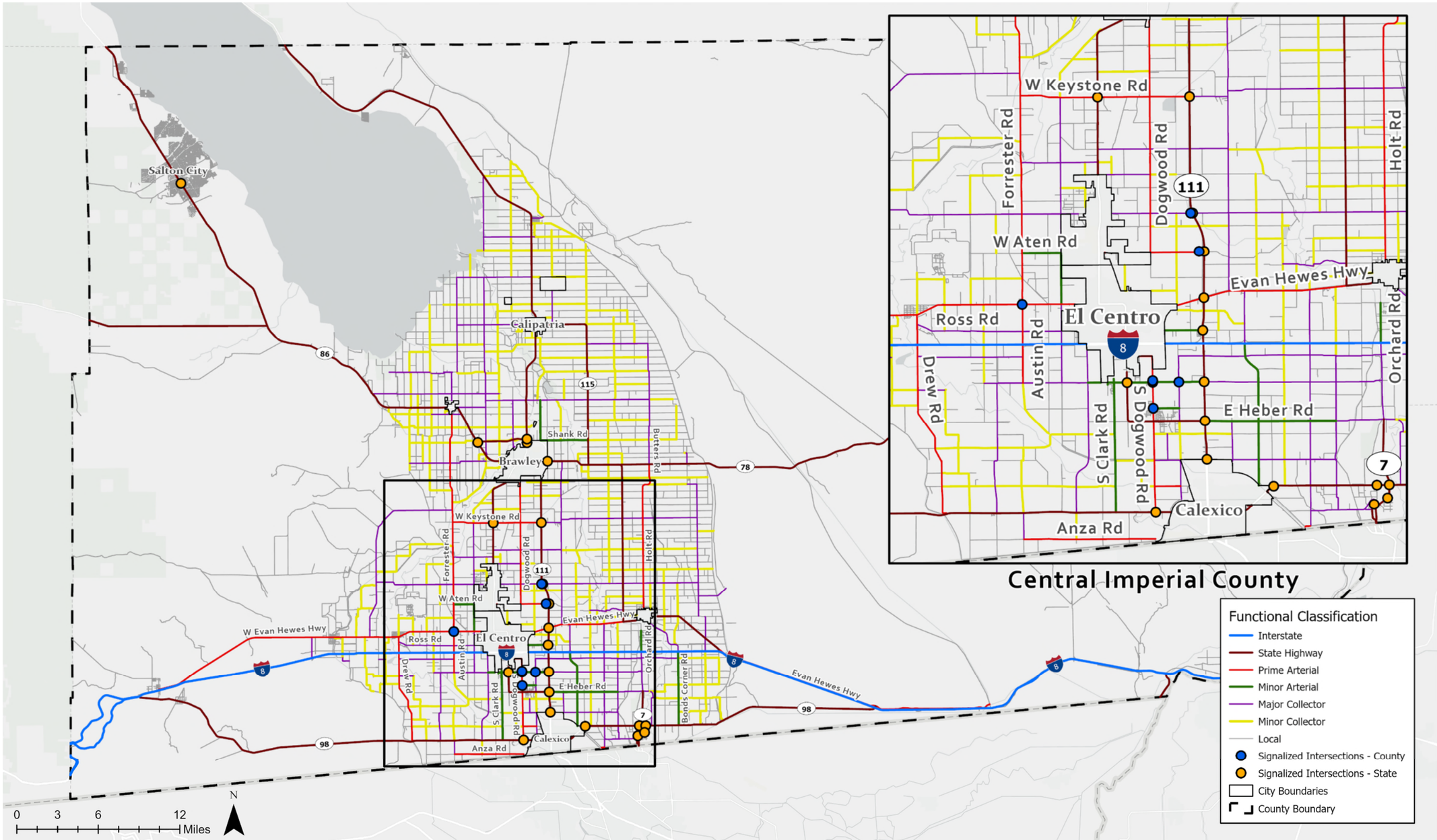
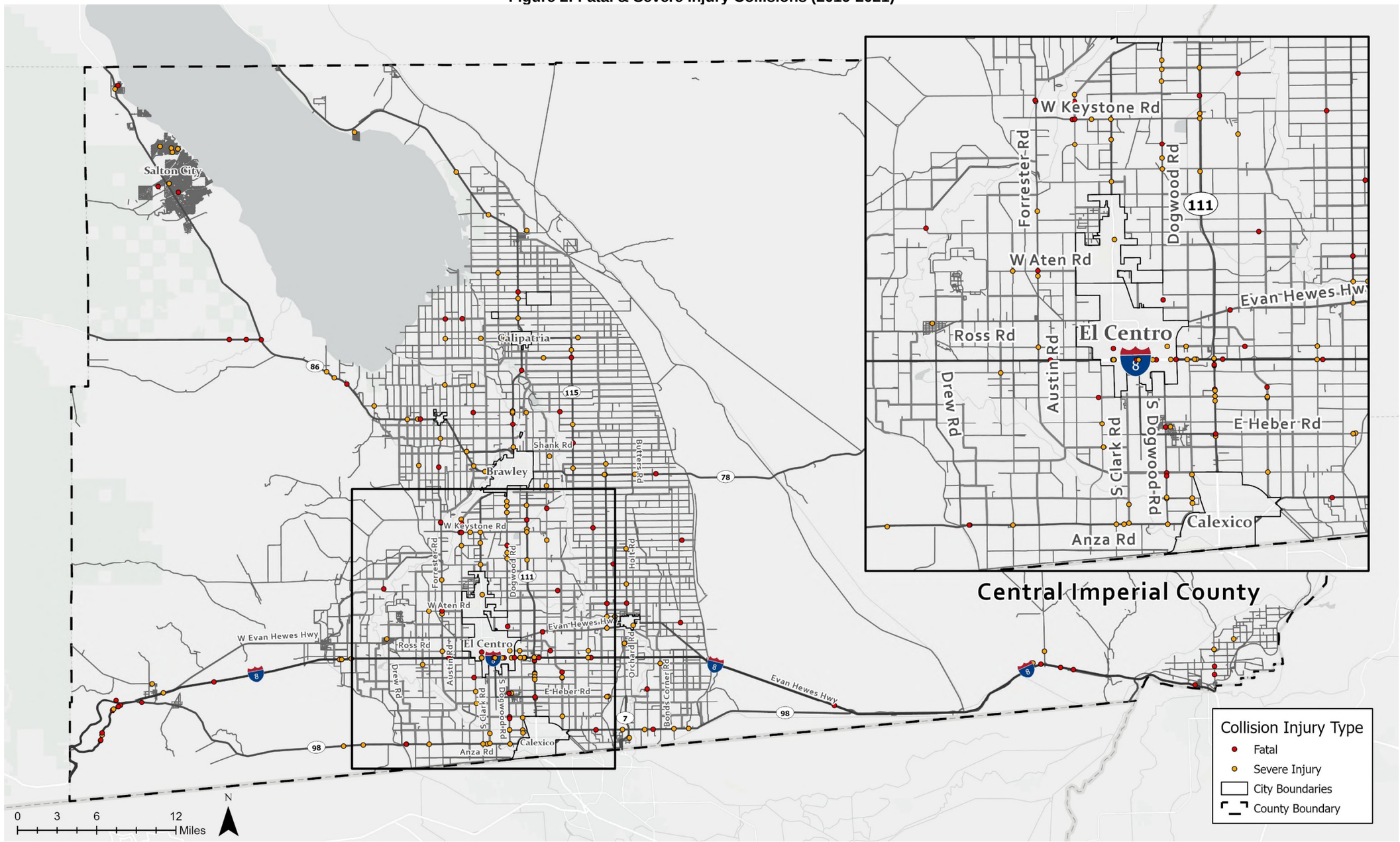


Figure 2: Fatal & Severe Injury Collisions (2016-2021)



2 COLLISION SAFETY TRENDS

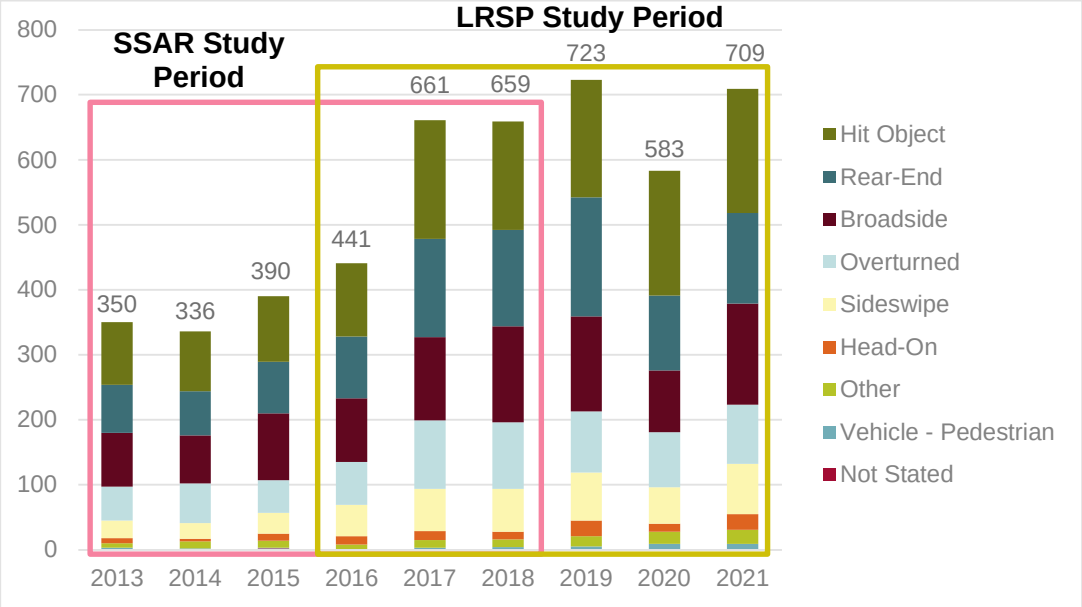
The following section breaks down the collision data by a variety of input factors and user types. This information will be used to highlight areas of concern for the County.

2.1 ALL COLLISIONS

This report utilized collision data for a six-year period (2016-2021) to provide a better understanding of trends and to reflect the patterns in crashes that have occurred on County streets. Additional data for a six-year period (2013-2018) was incorporated to analyze data from the SSAR. Additional data included from SSAR compares similarities and differences to the LRSP dataset. Data used for this report was extracted from Crossroads Software analytics on October 31, 2022, and was current as of that date. Collision data from January 1, 2016, through December 31, 2021, as reported to Crossroads from the local enforcement indicated that during this time there were **3,776 collisions** recorded within Imperial County, although some collisions may not have occurred within County right-of-way.

During this time, the most common occurring collision types were Hit Object (27%) and Rear-End (22%). The total number of collisions remained roughly constant throughout the study period, as shown in **Figure 3.** In comparison, the most common occurring collision types during the 2013-2018 collision period were Hit Object (27%) and Broadside (22%).

Figure 3: Collision Type by Year (2013-2018 and 2016-2021)



2.2 FATALITIES & SEVERE INJURIES

93 fatal collisions and 216 severe injury collisions occurred during the 2016-2021 Study Period. In comparison, 75 fatal collisions and 120 severe injury collisions occurred during the 2013-2018 period. The locations of fatal and severe injury collisions are shown in **Figure 2. Figure 4** shows the distribution of fatal and severe collisions over the study period. While the overall number of crashes is steady, the number of fatal and severe collisions generally increased from 2016 to

2021 during the study period. **Table 1** outlines the fatal and severe injury collisions categorized by modes involved.

Figure 4: Fatal and Severe Injury Collision (2013-2018 and 2016-2021)

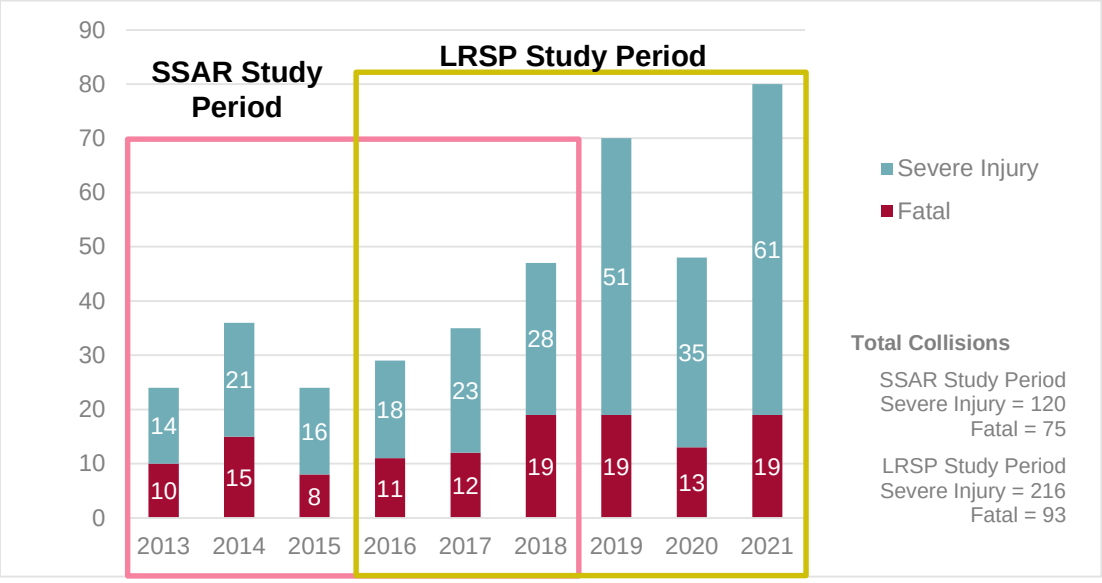


Table 1: Fatal and Serve Injury Collisions Categorized by Modes Involved (2013-2018 and 2016-2021)

Involved With	# of Fatal Collisions (2013-2018)	# of Severe Injury Collisions (2013-2018)	# of Fatal Collisions (2016-2021)	# of Severe Injury Collisions (2016-2021)
Other Motor Vehicle	34	55	40	91
Non-Collisions (Overturned)	18	24	18	51
Fixed Object	13	27	20	51
Pedestrian	5	1	10	7
Other Object	-	3	-	8
Bicycle	1	2	3	2
Parked Motor Vehicle	2	3	1	2
Motor Vehicle on Other Roadway	1	4	-	3
Animal	1	1	1	-
Train	-	-	-	1
TOTAL	**75**	**120**	**93**	**216**

2.3 INJURY LEVELS

57% of the collisions reported during the time-period (2016-2018) resulted in property damage only, followed by 19% of complaint of pain and 16% of other visible injuries. Fatalities and severe injuries totaled 8% of all collisions, as shown in **Figure 5.** In comparison, the most common collision reported during the 2013-2018 period resulted in 56% in property damage only, followed by 23% of compliant of pain and 14% of other visible injuries as shown in **Figure 6.**

Figure 5: Collisions by Injury Levels (2016-2021)

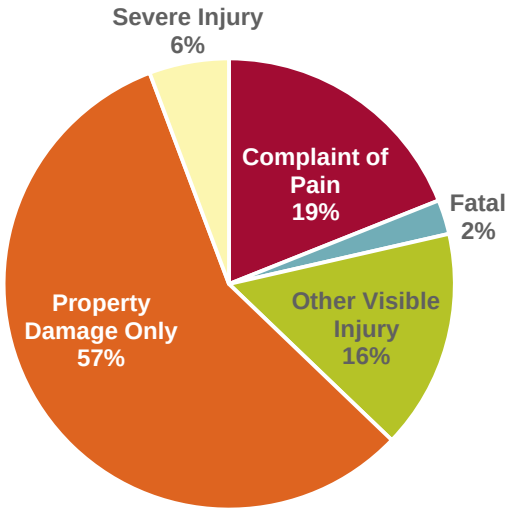
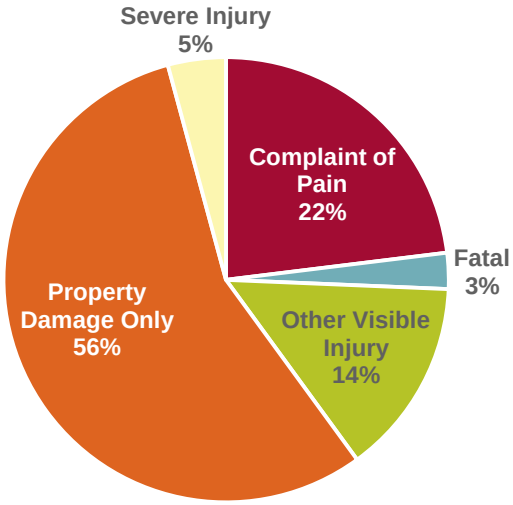


Figure 6: Collisions by Injury Levels (2013-2018)



2.4 CAUSE OF COLLISIONS

The highest recorded cause of collisions in Imperial County during the LRSP Study Period (2016-2021) is Improper Turning at 36.8%, followed by Unsafe Speed at 28.8% and Auto Right-of-Way Violation at 14.50%, as shown on **Table 2.** Issues with Driving Under the Influence also had a substantial impact on the County, comprising 8.17% of the collisions. The highest recorded cause of collisions for the SSAR which utilized 2013-2018 collision data was also Improper Turning at 32%, followed by Unsafe Speed at 24%, and Auto Right-of-Way Violation at 16% of the total collisions.

Table 2: Cause of Collisions (2013-2018 and 2016-2021)

Primary Collision Factor	No. of Collisions (2013-2018)	%	No. of Collisions (2016-2021)	%
Improper Turning	929	32.7%	1226	32.5%
Unsafe Speed	669	23.6%	964	25.5%
Auto R/W Violation	448	15.8%	547	14.5%
Driving Under Influence	235	8.3%	308	8.2%
Ignoring Traffic Signals and Signs	132	4.7%	170	4.5%
Wrong Side of Road	102	3.6%	118	3.1%
Unsafe Starting or Backing	77	2.7%	81	2.1%
Other Than Driver or Ped	66	2.3%	131	3.5%
Unknown	33	1.2%	33	0.9%
Unsafe Lane Change	31	1.1%	61	1.6%
Other Hazardous Movement	29	1.0%	29	0.8%
Improper Passing	25	0.9%	35	0.9%
Following Too Closely	19	0.7%	15	0.4%
Other Equipment	16	0.6%	22	0.6%
Pedestrian Violation	8	0.3%	19	0.5%
Other Improper Driving	7	0.2%	11	0.3%
Other	6	0.2%	2	0.1%
Impeding Traffic	2	0.1%	3	0.1%
Lights	2	0.1%	-	-
Ped R/W Violation	1	0.04%	-	-
Hazardous Parking	-	-	1	0.03%
Total	**2837**	**100%**	**3776**	**100%**

2.5 VULNERABLE USERS

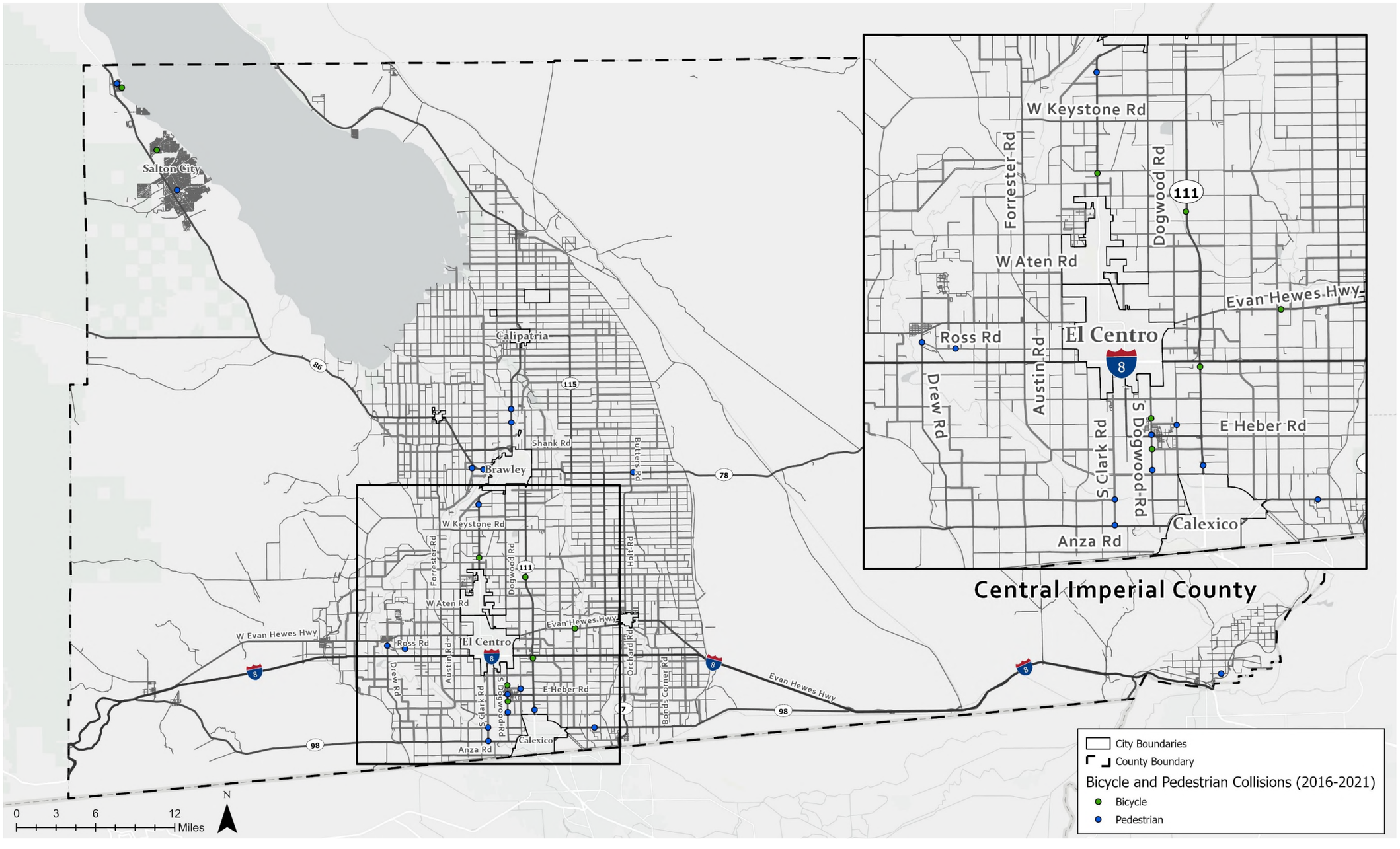
2.5.1 Pedestrians

30 pedestrian involved collisions occurred during the LRSP Study Period (2016-2021), resulting in 10 fatal collisions, 7 severe injuries, and 13 collisions with some other form of reported injury or pain. A majority of the County is rural, therefore, pedestrian facilities such as sidewalks and crosswalks are limited to areas with urban and suburban densities. **Figure 7** shows the locations of pedestrian collisions during the LRSP Study Period (2016-2021).

2.5.2 Bicyclists

During the LRSP Study Period (2016-2021), 14 collisions involving bicycles were reported. Of these, 3 were fatal, and 2 resulted in severe injuries. **Figure 7** shows the location of bicycle collisions during the LRSP Study Period (2016-2021).

Figure 7: Pedestrian & Bicycle Collisions (2016-2021)



2.6 TIME OF DAY

Collisions during the LRSP Study Period (2016-2021) in Imperial County occurred more in the PM hours versus the AM hours, with 58% of collisions occurring in the PM hours, and 42% occurring in the AM hours. There were two peak periods of collision activity, from 6 AM to 9 AM, and from 1 PM to 6 PM. The 3-4 PM hour period was the most common time for collisions. This appears to match general traffic volume trends in the county. A significant number of collisions also occurred in the nighttime hours. 28% of collisions occurred at night or during the dusk/dawn hours. 24% of collisions occurred at night at locations with no streetlights.

During the SSAR Study Period (2013-2018), collisions in Imperial County occurred more in the PM hours versus the AM hours. 56% collisions occurred in the PM hours, and 44% occurred in the AM hours. There were two peak periods of collision activity, from 5 AM to 7 AM, and from 3 PM to 5 PM. About 15% of collisions occurred at night or during the dusk/dawn hours. 22% of collisions occurred at night at locations with no streetlights.

2.7 BEHAVIORAL DRIVING

Aggressive driving and impaired driving are two important behavioral factors that often significantly contribute to collision patterns. These areas are studied in the analysis.

Caltrans defines aggressive driving as behaviors that include driving at an Unsafe Speed, Following Too Closely, and Ignoring Traffic Signals and Signs. These behaviors contributed to slightly over 30% of the collisions in Imperial County during the LRSP Study Period (2016-2021). In SSAR Study Period (2013-2018), over 29% of the collisions contributed to aggressive driving.

Impaired driving is defined by Caltrans as any instance where a driver, pedestrian, bicyclists, or motorcyclist is under the influence of alcohol, illicit drugs, or prescribed or over-the-counter medication. Approximately 8% of the collisions in Imperial County during SSAR Study Period (2013-2018) were impaired driving related. Compared to 2016-2021, impaired driving related collisions also resulted in about 8%.

2.8 DRIVER AGE

Two groups of drivers typically have a higher impact on the number of collisions. Aging Drivers (age 65 and up) and Young Drivers (ages 15-20) are more often found at fault for collisions they are involved in. The collision data for 2016-2021 period indicated that 10% of the collisions within Imperial County involved Aging Drivers and 12% involved Young Drivers. These percentages are similar to those seen statewide. In comparison, collision data for 2013-2018 indicated that 5% of the collisions within Imperial County involved Aging Drivers and 8% involved Young Drivers.

2.9 STATEWIDE COMPARISON

A comparison of fatal & severe injury collision data to the State averages was conducted for data from 2009-2018 (the most recent statewide data available). These numbers may vary slightly from those mentioned previously due to the differences in the years of the study period. The study period for this comparison is 10 years to explore the trends over a longer time period. The following are areas where Imperial County's collision rates are higher or lower than those of the State. These numbers specifically compare the proportion of fatal and severe injury crashes that have the characteristics listed in **Table 3.**

Table 3: Comparison of Statewide and Imperial County Fatal & Severe Injury Crashes (2009-2018)

California SHSP Challenge Areas	Imperial County No. of Fatal and Severe Injury Collisions	Imperial County % of Fatal and Severe Injuries in Challenge Area	Statewide % of Fatal and Severe Injuries in Challenge Area	% Difference
Lane Departure	375	62.4%	43.3%	19.1%
Commercial Vehicles	98	16.3%	6.4%	9.9%
Occupant Protection	139	23.1%	14.2%	8.9%
Aging Drivers	96	16.0%	12.4%	3.6%
Distracted Driving	33	5.5%	5.0%	0.5%
Work Zones	7	1.2%	1.4%	-0.2%
Young Drivers	71	11.8%	13.1%	-1.3%
Intersections	127	21.1%	23.6%	-2.5%
Impaired Driving	122	20.3%	25.3%	-5.0%
Bicyclists	10	1.7%	8.3%	-6.6%
Motorcyclists	67	11.1%	21.0%	-9.9%
Aggressive Driving	131	21.8%	33.1%	-11.3
Pedestrians	31	5.2%	19.2%	-14.0%

3 ANALYSIS METHODOLOGY

The following section describes the analysis process undertaken to evaluate safety within Imperial County at a systemic level. This report includes State Route data as a reference but will not include improvements on State Routes as projects require coordination with Caltrans that may be fiscally burdensome and be temporally prolonged, which jeopardizes the County's ability to meet funding milestones. Using a network screening process, locations within the County that will most likely benefit from safety enhancements will be identified. Using historic collision data, collision risk factors for the entire network are derived. The outcomes will inform the identification and prioritization of engineering and non-infrastructure safety countermeasures that address certain roadway characteristics and related behaviors that contribute to motor vehicle collisions with active transportation users.

3.1 EXISTING GUIDANCE

This process uses the latest National and State best practices for statistical roadway analysis described as follows.

3.1.1 Local Roadway Safety Manual

The *Local Roadway Safety Manual: A Manual for California's Local Road Owners* (Version 1.5, April 2020) purpose is to encourage local agencies to pursue a proactive approach to identifying and analyzing safety issues, while preparing to compete for project funding opportunities. A

proactive approach is defined as analyzing the safety of the entire roadway network through either a one-time, network wide analysis, or by routine analyses of the roadway network.[1]

According to the *Local Roadway Safety Manual* (LRSM), "The California Department of Transportation (Caltrans) – Division of Local Assistance is responsible for administering California's federal safety funding intended for local safety improvements."

To provide the most benefit and to be competitive for funding, the analysis leading to countermeasure selection should focus on both intersections and roadway segments and be considerate of roadway characteristics and traffic volumes. The result should be a list of locations that are most likely to benefit from cost-effective countermeasures, preferably prioritized by benefit/cost ratio. The manual suggests using a mixture of quantitative and qualitative measures to identify and rank locations that considers both crash frequency and crash rates. These findings should then be screened for patterns such as crash types and severity to aid in the determination of issues causing higher numbers of crashes and the potential countermeasures that could be most effective. Qualitative analysis should include field visits and a review of existing roadway characteristics and devices. The specific roadway context can then be used to assess what conditions may increase safety risk at the site and systematic level.

Countermeasure selection should be supported using Crash Modification Factors (CMFs). These factors are the peer reviewed product of before and after research that quantifies the expected rate of collision reduction that can be expected from a given countermeasure. If more than one countermeasure is under consideration, the LRSM provides guidance on how to apply CMFs appropriately.

3.1.2 Highway Safety Manual

"The AASHTO *Highway Safety Manual* (HSM), published in 2010, presents a variety of methods for quantitatively estimating crash frequency or severity at a variety of locations."[2] This four-part manual is divided into Parts: A) Introduction, Human Factors, and Fundamentals, B) Roadway Safety Management Process, C) Predictive Method, D) Crash Modification Factors.

Chapter 4 of Part B of the HSM discusses the Network Screening process. The Network Screening Process is a tool for an agency to analyze their entire network and identify/rank locations that (based on the implementation of a countermeasure) are most likely to least likely to realize a reduction in the frequency of collisions.

The HSM identifies five steps in this process:[3]

1. **Establish Focus:** Identify the purpose or intended outcome of the network screening analysis. This decision will influence data needs, the selection of performance measures and the screening method that can be applied.

---

[1] Local Roadway Safety Manual (Version 1.5) 2020. Page 5.
[2] AASHTO, Highway Safety Manual, 2010, Washington D.C., http://www.highwaysafetymanual.org/Pages/About.aspx
[3] AASHTO. *Highway Safety Manual.* 2010. Washington, DC. Page 4-2.

2. **Identify Network and Establish Reference Populations:** Specify the types of sites or facilities being screened (e.g., segments, intersections, geometrics) and identify groupings of similar sites or facilities.
3. **Select Performance Measures:** There are a variety of performance measures available to evaluate the potential to reduce crash frequency at a site. In this step, the performance measure is selected as a function of the screening focus and the data and analytical tools available.
4. **Select Screening Method:** There are three principal screening methods described in this chapter (ranking, sliding window, peak searching). Each method has advantages and disadvantages; the most appropriate method for a given situation should be selected.
5. **Screen and Evaluate Results:** The final step in the process is to conduct the screening and analysis and evaluate the results.

The HSM provides several statistical methods for screening roadway networks to identify high risk locations based on overall collision histories. In addition to identifying the total number of collisions, this study uses a method referred to as Critical Crash Rate to analyze the data.

3.2 ANALYSIS TECHNIQUE

3.2.1 Collision and Network Screening Analysis

Intersections and roadways were analyzed using four collision metrics:

- Number of Collisions
- Critical Crash Rate (HSM Ch. 4)
- Probability of Specific Crash Types Exceeding Threshold Proportion (HSM Ch. 4)
- Equivalent Property Damage Only (HSM Ch. 4)

The initial steps of the collision analysis established sub-populations of roadway segments and intersections that have similar characteristics. For this study, intersections were grouped by their control type (Signalized or Unsignalized) and segments by their roadway category (Prime Arterial, Minor Arterial, Major Collector, Minor Collector, or Local Street). Individual collision rates were calculated for each sub-population. The population level crash rates were then used to assess whether a specific location has more or fewer crashes than expected. These sub-populations were also used to determine typical crash patterns to help identify locations where unusual numbers of specific crash types are seen.

The network screening process ranks intersections and roadway segments by the number of crashes that occurred at each one over the analysis period, and then identifies areas that had more of a given type of crash than would be expected for that type of location. These crash type factors were 1) collision injury (fatal, severe injury, other visible injury, complaint of pain, property damage only), 2) collision type (broadside, rear-end, sideswipe, head-on, hit object, overturned, bicycle, pedestrian, other), 3) environmental factors (lighting, wet roads), 4) driver behavior (aggressive), and 5) driver impairment. With these additional factors, the locations were further analyzed and assigned a new rank.

From the results of the network screening analyses, a short-list of locations was chosen based on crash activity, crash severity, crash patterns, location type, and area of Imperial County to provide the greatest variety of locations covering the widest range of safety opportunities for

safety toolbox development. The intent is to populate the safety toolbox with mitigation measures that will be applicable to most of the crash activity in the County. Ten locations will ultimately be selected for mitigation analysis.

4 STATISTICAL PERFORMANCE MEASURES

4.1 CRITICAL CRASH RATE (CCR)

Reviewing the number of collisions at a location is a method used to understand the cost to society incurred at the local level; however, it does not give a complete indication of the level of risk for those who use that intersection or roadway segment daily. The Highway Safety Manual describes the Critical Crash Rate method which provides a statistical review of locations to determine where risk is higher than that experienced by other similar locations. It is also the first step in analyzing for patterns that may suggest systemic issues that can be addressed at that location, and proactively at others to prevent new safety challenges from emerging.

The Critical Crash Rate compares the observed crash rate to the expected crash rate at a location based on facility type and volume using a locally calculated average crash rate for the specific type of intersection or roadway segment being analyzed. Based on traffic volumes and a weighted Countywide crash rate for each facility type, a critical crash rate threshold is established at the 95% confidence level to determine locations with higher crash rates that are unlikely to be random. The threshold is calculated for each location individually based on its traffic volume and the crash profile of similar facilities; formula is shown on **Figure 8.**

Figure 8: Critical Crash Rate Formula

$$R_{c,i} = R_a + \left[P \times \sqrt{\frac{R_a}{MEV_i}} \right] + \left[\frac{1}{(2 \times (MEV_i))} \right]$$

Where,

$R_{c,i}$ = Critical crash rate for intersection i

R_a = Weighted average crash rate for reference population

P = P-value for corresponding confidence level

MEV_i = Million entering vehicles for intersection i

Source: Highway Safety Manual

Data Needs

CCR can be calculated using:

- Daily entering volume for intersections, or VMT for roadway segments.
- Intersection control types to separate them into like populations.
- Roadway functional classification to separate them into like populations.
- Collision records in GIS or tabular form including coordinates or linear measures.

Strengths

- Reduces low volume exaggeration
- Considers variance
- Establishes comparison threshold

4.2 CCR METHODOLOGY

The Process of analyzing the CCR and comparing locations (separately by intersections and segments) is a multi-step process. The following is a high-level description of the process undertaken to develop the initial ranking of locations.

The first step in the process was to establish a County-wide crash rate for each facility population. These populations are broken into two categories with sub-categories:

- Intersection:
    - Signalized
    - Unsignalized
- Roadway Classification:
    - Prime Arterial
    - Minor Arterial
    - Major Collector
    - Minor Collector
    - Local Street

The individual crash rate for each location was then calculated based on the associated traffic volume. This volume was either collected through data count resources (from the SSAR) or calculated based on the roadway classification. The next step was to establish a Significance Threshold. This Threshold was used to determine what level of exceedance (how much the crash rate exceeded the critical crash rate) a location must have based on traffic volume to provide a high level of confidence that the collision occurring at the location is not random. For this study, a confidence level of 95% was used. The local crash rates were then compared to Significance Threshold to see if each location exceeded the expected CCR and if so, by how much. After this analysis was completed, the locations were ranked by their categories according to that level of exceedance.

4.3 EQUIVALENT PROPERTY DAMAGE ONLY (EPDO)

The equivalent property damage only (EPDO) method is described in the Highway Safety Manual. This method assigns weighting factors to crashes based on injury level (severe injury, property damage only) to develop a property damage only score. In this analysis, the injury crash costs were calculated for each location (based on the latest Caltrans injury costs). This figure is then divided by the injury cost for a property damage only crash. The resulting number is the equivalent number of property damage only crashes at each site. This figure allows all locations to be compared based on injury crash costs (Highway Safety Manual, Chapter 4).

4.4 PROBABILITY

The Highway Safety Manual describes the methodology for determining the probability that crash type is greater than an identified threshold proportion, as shown in **Figure 9.** This helps to identify locations where a crash type is more likely to occur.

Data Needs

The probability of a specific crash type can be determined using collisions records with location data, and classifications of the locations (intersections or segments) studied.

Strengths

- Can be used as a diagnostic tool
- Considers variance in data
- Not affected by selection bias

The HSM methodology first determines the frequency of a specific collision type at an individual location, then determines the observed proportion of that collision type relative to all collision types at that location. A threshold proportion is then determined for the specific collision type; HSM suggests utilizing the proportion of the collision type observed in the entire reference population (i.e., throughout the entire Imperial County area).

These proportions are then utilized to determine the probability that the proportion of a specific crash type is greater than the long-term expected proportion of that crash type.

Figure 9: Probability of Specific Crash Types Exceeding Threshold Proportion

$$P\left(p_i > \overline{p^*_i} \,/\, N_{observedj}, N_{observedj(TOTAL)}\right) = 1 - betadist\left(\overline{p^*_i}, \alpha + N_{observedj}, \beta + N_{observedj(TOTAL)} - N_{observedj}\right)$$

Where:

$\overline{p^*_i}$ = Threshold proportion

p_i = Observed proportion

$N_{observed,i}$ = Observed target crashes for a site i

$N_{observed,i(TOTAL)}$ = Total number of crashes for a site i

P = Probability of crash type exceeding threshold proportion

α = alpha parameters

β = beta parameters

Source: Highway Safety Manual

5 COLLISION NETWORK SCREENING ANALYSIS RESULTS

Figure 10 and **Figure 11** below show the results of the collision network screening analysis, with the number of collisions at both intersection and mid-block roadway segments.

Figure 10: Collision Network Screening Analysis Results-Intersections (2016-2021)

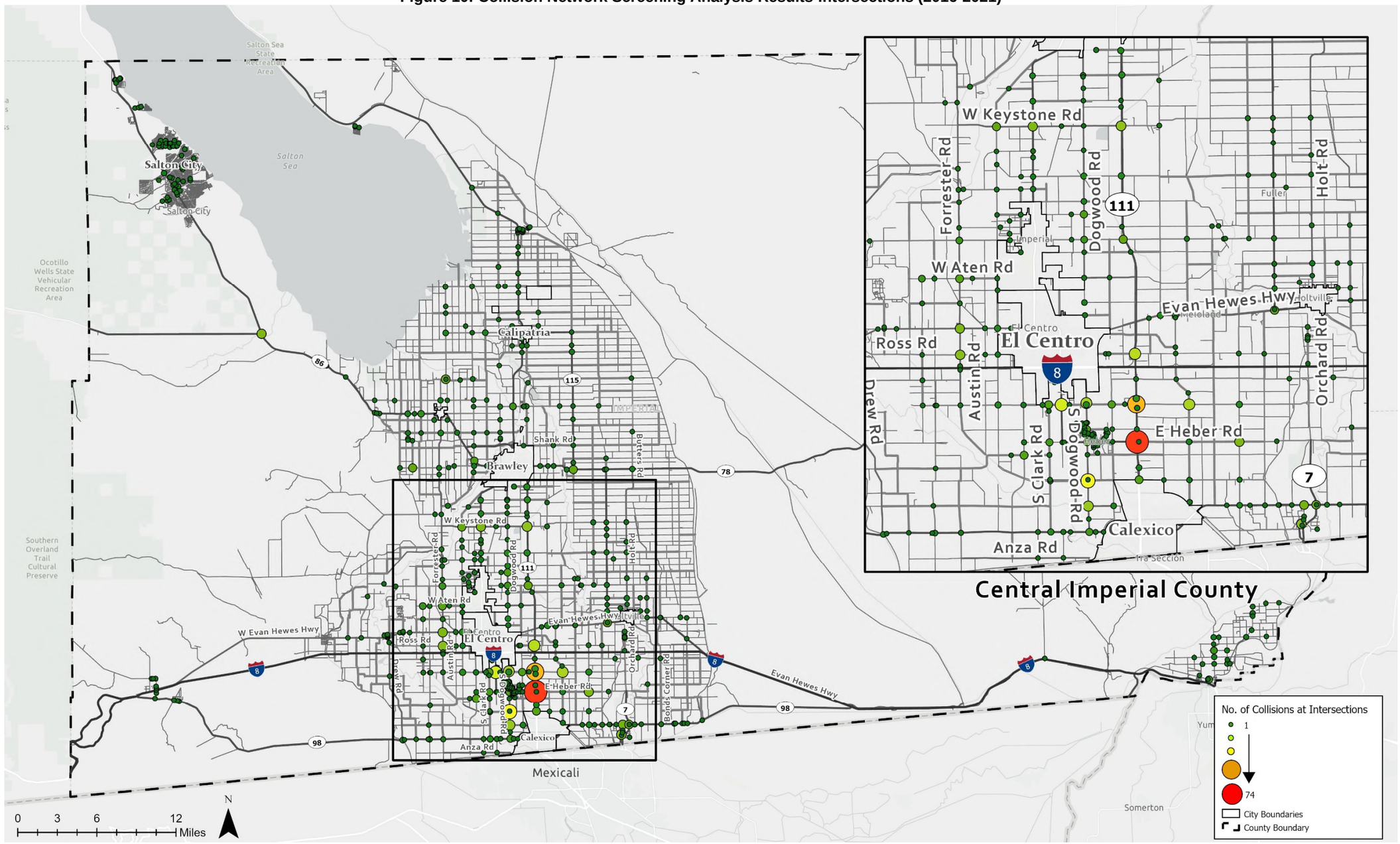


Figure 11: Collision Network Screening Analysis Results- Roadways (2016-2021)

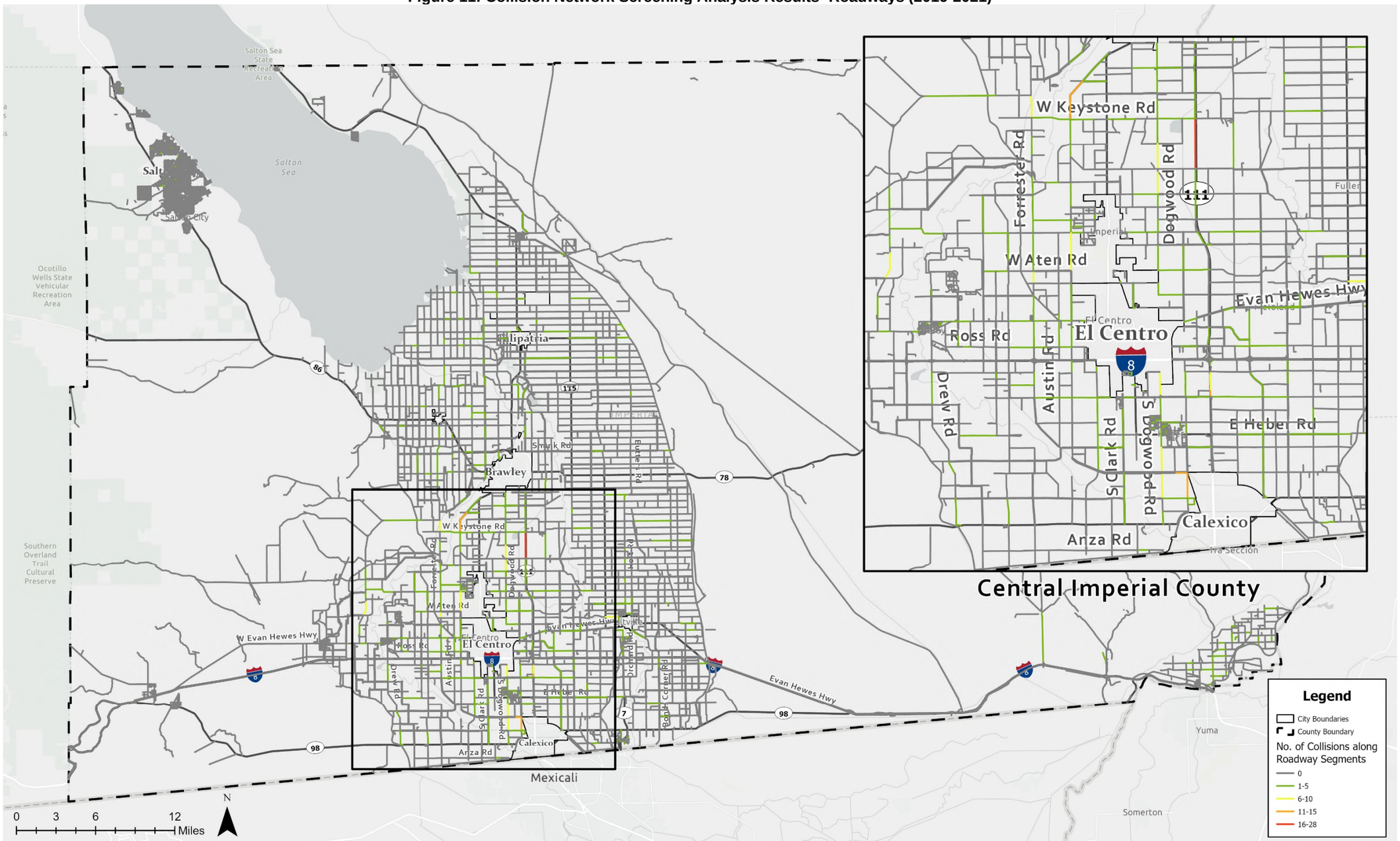


Table 4: Analysis List - Intersections and **Table 5: Analysis List – Segments** show the number of crashes occurring at locations in Imperial County by crash type for the location that will be studied further in the Report and highlight locations in which the probability of those crash types exceeding the threshold proportion is greater than 33%. This report includes State Route data as reference but will not include improvements on State Routes as projects require coordination with Caltrans that may be fiscally burdensome and be temporally prolonged, which jeopardizes the County's ability to meet funding milestones.

The tables are ordered by the number of collisions that occurred at that segment or intersection (for the 2016-2021 Study Period). The number of collisions in the SSAR Study Period (2013-2018) are also shown as a comparison. In order to be statistically significant, only locations where more than two collisions occurred are represented. At locations with two or less collisions, random chance can account for crash history as much or more than specific roadway characteristics.

The tables are separated into sub-sections visible by the blue gradient. The first two columns, Collisions and Local Critical Crash Rate (CCR) Differential, represent the level of crash activity in absolute terms, and as relative to other similar locations, respectively.

Per guidance from the LRSM each sub-population of locations was ranked according to the number of collisions. The second column shows the CCR, which highlights whether the collision activity was higher or lower than the average for the sub-population based on the individual segment or intersection volume. This volume was either collected through data count resources or calculated based on the roadway classification. All averages used in the CCR calculation were established based on Imperial County Crossroads crash data to determine what locations might be best to prioritize at the local level. This process highlights locations of collisions that are unusual for the County to determine Imperial County's challenge areas, and not problems faced by peer cities that do not apply in Imperial County. The remaining columns total collisions by type, to evaluate each sub-population and understand what proportion of crashes in the County are of a particular type. The Countywide proportion was compared with the local intersection or segment specific proportion to determine which locations have more of a given crash type than would be expected when considering the County average. A confidence level of 95% was used for the CCR Calculations. For this study, three categories of ranges were highlighted:

- **Light Gray:** >70% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. Although these locations have a slightly higher probability of this crash type than their counterparts, they are not necessarily highly significant.
- **Medium Gray:** >80% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. Although these locations have a higher probability of this crash type than their counterparts, they have potential to be further investigated.
- **Dark Gray:** >90% probability that this crash type is over-represented on this segment/intersection as compared to other characteristically similar locations within the Imperial County. These locations are highly significant regarding the number of collisions occurring here and should be further investigated.

After this analysis was completed, the locations were ranked against other similar locations within the County by their categories according to the expected proportion of that crash type within Imperial County. Locations with higher-than-expected crashes of that type were identified by the probability that random chance would not account for exceedances.

Additionally, it should be noted that the columns for Collision Severity, Type, Involved With, and Behavior are additional characteristics of the collisions and should not be counted as a separate collision.

Table 4: Analysis List - Intersections

Intersection	Crashes (2013-2018)	Crashes (22016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Signalized Intersections																								
State Hwy 111 & E Heber Rd	**86**	**74**	0.37	735	2	1	6	22	43	17	8	45	4	0	0	0	0	0	51	0	3	28	2	5
State Hwy 111 & McCabe Rd	**45**	**40**	0.02	317	0	1	7	9	23	3	5	28	0	2	2	0	0	0	24	0	3	9	1	1
State Hwy 86 & W McCabe Rd	**21**	**25**	3.59	123	0	0	7	6	12	16	0	6	1	0	1	1	0	0	17	0	0	8	0	1
State Hwy 111 & E Ross Rd	**18**	**22**	-0.11	81	0	0	5	2	15	3	4	14	1	0	0	0	0	0	17	0	0	4	0	3
S Dogwood Rd & E McCabe Rd	**23**	**20**	-0.07	59	0	0	3	2	15	0	4	13	1	2	0	0	0	0	16	0	0	2	0	1
Menvielle Rd & State Hwy 7	**21**	**16**	0.71	41	0	0	1	3	12	0	6	8	0	0	1	1	0	0	6	0	0	4	0	2
Forrester Rd & W Evan Hewes Hwy	**8**	**15**	0.35	45	0	0	1	4	10	2	1	10	0	1	0	1	0	0	8	0	2	4	0	3
State Hwy 86 & W Keystone Rd	**17**	**15**	-0.13	387	1	1	3	3	7	6	0	7	0	2	0	0	0	0	10	0	2	5	0	1
State Hwy 98 & Menvielle Rd	**19**	**14**	0.42	187	0	1	1	0	12	2	1	10	0	1	0	0	0	0	10	0	0	3	0	3
State Hwy 7 & State Hwy 98	**11**	**13**	0.14	43	0	0	1	4	8	5	0	5	0	2	0	1	0	0	8	0	0	5	1	3
Old Highway 111 & E Worthington Rd	**20**	**12**	0.58	37	0	0	1	3	8	3	2	7	0	0	0	0	0	0	10	0	0	2	0	0
State Hwy 111 & Jasper Rd	**25**	**11**	-0.27	41	0	0	1	4	6	0	2	9	0	0	0	0	0	0	7	0	0	4	0	1
S Dogwood Rd & Correll Rd	**10**	**10**	-0.19	35	0	0	1	3	6	2	0	8	0	0	0	0	0	0	6	0	0	1	0	0
Pitzer Rd & E McCabe Rd	**4**	**10**	0.23	46	0	0	0	7	3	7	1	0	2	0	0	0	0	0	4	0	0	2	1	0
Dogwood Rd & State Hwy 98	**8**	**9**	0.13	336	0	2	0	0	7	3	3	1	0	2	0	0	0	0	6	0	0	2	0	1
S Dogwood Rd & McCabe Rd (S)	**7**	**6**	-0.37	21	0	0	0	3	3	0	1	2	0	1	2	0	0	0	2	0	3	5	1	0
Unsignalized Intersections																								
S Dogwood Rd & Willoughby Rd	**31**	**30**	2.94	471	1	1	6	11	11	20	1	5	2	1	1	0	0	0	4	0	4	4	2	0
Bowker Rd & E McCabe Rd	**13**	**20**	3.68	541	0	3	1	4	12	14	0	1	2	0	3	0	0	0	4	0	1	10	1	1
Dogwood Rd & Cole Rd	**9**	**18**	1.58	583	1	2	4	7	4	12	1	2	2	0	1	0	0	0	6	0	1	7	0	1
Old Highway 111 & E Keystone Rd	**15**	**17**	4.01	870	1	4	2	3	7	13	0	2	0	2	0	0	0	0	11	0	1	5	1	5
Forrester Rd & Ross Rd	**16**	**16**	2.10	239	0	1	4	4	7	10	1	4	0	1	0	0	0	0	5	0	0	1	0	2
Barbara Worth Rd & E Heber Rd	**16**	**15**	3.46	40	0	0	1	3	11	13	0	0	0	1	0	1	0	0	3	0	0	5	0	3
State Hwy 86 & State Hwy 78	**1**	**15**	0.67	386	1	1	4	1	8	7	1	2	1	1	3	0	0	0	4	0	1	4	1	6
Gentry Rd & W Walker Rd	**11**	**14**	8.68	236	0	1	5	2	6	1	2	0	0	8	3	0	0	0	10	0	0	7	2	3
Austin Rd & W Keystone Rd	**16**	**12**	6.35	384	1	1	2	5	3	12	0	0	0	0	0	0	0	0	2	1	0	2	0	2
State Hwy 115 & Evan Hewes Hwy	**12**	**12**	0.59	196	0	1	1	2	8	5	2	2	0	3	0	0	0	0	2	0	1	5	0	2
State Hwy 115/Wiest Rd & State Hwy 78	**10**	**12**	2.88	36	0	0	2	1	9	4	0	1	1	5	1	0	0	0	5	0	1	6	0	2
Wieman Rd & W Cady Rd	**7**	**12**	2.64	42	0	0	2	2	8	0	0	0	1	10	1	0	0	0	7	0	0	6	1	0
S La Brucherie Rd & W Wahl Rd	**8**	**11**	2.37	200	0	1	1	3	6	6	2	0	1	1	1	0	0	0	2	0	0	2	0	2

Intersection	Crashes (2013-2018)	Crashes (22016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Forrester Rd & W Aten Rd	**8**	**11**	0.47	368	1	1	2	2	5	8	2	0	0	1	0	0	0	0	2	0	0	2	1	3
S Clark Rd & W McCabe Rd	**5**	**11**	0.53	31	0	0	1	2	8	7	2	1	1	0	0	0	0	0	2	0	0	3	0	0
Dogwood Rd & Neckel Rd	**11**	**10**	1.09	30	0	0	0	4	6	2	2	4	0	2	0	0	0	0	5	0	1	3	1	0
State Hwy 86 & Kalin Rd	**10**	**10**	0.85	223	0	1	3	4	2	5	1	1	1	2	0	0	0	0	1	0	0	2	0	1
S Dogwood Rd & State Hwy 86	**8**	**10**	0.20	30	0	0	0	4	6	4	2	3	0	1	0	0	0	0	3	0	1	4	1	2
S Clark Rd & W Heber Rd	**12**	**9**	0.70	63	0	0	4	3	2	9	0	0	0	0	0	0	0	0	2	0	0	2	0	0
Picacho Rd & Quechan Rd	**7**	**9**	0.34	14	0	0	0	1	8	2	0	3	0	3	0	1	0	0	4	0	0	4	0	1
Willoughby Rd & Kloke Rd	**10**	**8**	3.72	231	0	1	1	4	2	0	0	0	0	6	1	1	0	0	2	0	1	3	0	0
Picacho Rd & Haughtelin Rd	**8**	**8**	6.31	8	0	0	0	0	8	2	2	0	0	4	0	0	0	0	1	1	0	3	1	2
W Aten Rd & Silsbee Rd	**8**	**8**	3.47	37	0	0	3	0	5	0	0	0	0	7	1	0	0	0	5	0	1	8	1	0
Forrester Rd & W Worthington Rd	**6**	**8**	0.61	72	0	0	5	3	0	7	0	1	0	0	0	0	0	0	0	0	1	2	0	2
State Hwy 111 & Rutherford Rd	**6**	**8**	0.19	355	0	2	1	2	3	3	0	0	1	2	2	0	0	0	2	0	1	2	0	1
Dogwood Rd & E Worthington Rd	**5**	**8**	0.04	38	0	0	1	4	3	3	0	2	1	2	0	0	0	0	5	0	1	6	0	0
Lack Rd & State Hwy 86	**6**	**7**	0.12	508	1	2	1	0	3	4	0	1	0	2	0	0	0	0	1	0	0	5	0	3
Dogwood Rd & E Harris Rd	**5**	**6**	0.16	204	0	1	3	1	1	3	2	1	0	0	0	0	0	0	0	0	1	1	0	1
Austin Rd & W Evan Hewes Hwy	**10**	**6**	0.10	16	0	0	0	2	4	4	0	2	0	0	0	0	0	0	3	0	0	1	0	0
S Dogwood Rd & Hawk St	**8**	**6**	-0.05	190	1	0	1	2	2	4	0	1	0	1	0	0	0	0	2	0	1	0	0	0
Old Highway 111 & E Harris Rd	**7**	**6**	5.70	25	0	0	2	0	4	5	0	1	0	0	0	0	0	0	2	0	2	0	0	2
Old Highway 111 & Mead Rd	**7**	**6**	3.36	16	0	0	1	0	5	1	0	0	0	3	1	1	0	0	0	0	0	2	0	0
Evan Hewes Hwy & McConnell Rd	**6**	**6**	0.24	36	0	0	2	2	2	1	0	2	0	1	2	0	0	0	2	0	1	2	0	0
S Clark Rd & State Hwy 98	**5**	**6**	0.47	175	0	1	0	1	4	0	0	0	0	4	1	0	1	0	4	0	0	2	0	0
Austin Rd & W McCabe Rd	**5**	**6**	2.67	16	0	0	1	0	5	1	1	4	0	0	0	0	0	0	3	0	0	0	0	0
Barbara Worth Rd & McCabe Rd	**5**	**6**	7.25	31	0	0	0	5	1	4	0	0	0	2	0	0	0	0	3	0	0	3	0	0
State Hwy 111 & Schartz Rd	**5**	**6**	-0.08	363	1	1	2	2	0	3	0	1	0	1	1	0	0	0	1	0	0	2	0	1
Evan Hewes Hwy & Bowker Rd	**3**	**6**	0.21	30	0	0	2	1	3	4	1	1	0	0	0	0	0	0	1	0	0	0	0	1
Barbara Worth Rd & State Hwy 98	**10**	**5**	-0.08	15	0	0	1	0	4	4	0	0	1	0	0	0	0	0	0	0	0	2	0	1
Brockman Rd & State Hwy 98	**7**	**5**	4.77	183	0	1	1	1	2	2	1	1	0	1	0	0	0	0	2	0	0	0	0	1
Gentry Rd & Eddins Rd	**7**	**5**	2.14	174	0	1	0	1	3	1	1	0	1	2	0	0	0	0	3	0	0	4	0	0
Kloke Rd & Maddox Rd	**2**	**5**	0.74	169	0	1	0	0	4	1	0	1	3	0	0	0	0	0	2	0	0	1	0	0
Dogwood Rd & Ralph Rd	**6**	**5**	0.33	34	0	0	3	0	2	4	0	0	0	1	0	0	0	0	3	0	0	1	0	1
State Hwy 86 & Schartz Rd	**6**	**5**	-0.15	29	0	0	2	1	2	0	1	2	0	2	0	0	0	0	2	0	1	2	0	0
Brandt Rd & Eddins Rd	**1**	**5**	5.73	25	0	0	1	2	2	4	0	0	0	1	0	0	0	0	3	0	0	2	0	1
State Hwy 86 & Desert Shores Dr	**2**	**5**	-0.08	15	0	0	1	0	4	2	0	2	0	1	0	0	0	0	0	0	1	2	1	1

Intersection	Crashes (2013-2018)	Crashes (22016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
State Hwy 98 & 0.1 mi W of Drew Rd	**5**	**5**	3.83	10	0	0	0	1	4	0	0	0	0	4	1	0	0	0	0	0	0	2	0	0
Forrester Rd & Andre Rd	**5**	**5**	0.32	183	0	1	1	1	2	2	0	2	0	1	0	0	0	0	2	0	0	0	0	1
Bowker Rd & E Heber Rd	**4**	**5**	0.43	20	0	0	0	3	2	4	0	0	0	0	1	0	0	0	3	0	0	2	0	0
State Hwy 86 & W Carey Rd	**4**	**5**	-0.15	15	0	0	0	2	3	0	1	2	0	2	0	0	0	0	2	0	0	0	0	2
Hoskins Rd & State Hwy 86	**4**	**5**	-0.02	174	0	1	0	1	3	5	0	0	0	0	0	0	0	0	0	0	0	3	1	2
Cruickshank Rd & Dogwood Rd	**3**	**5**	5.70	10	0	0	0	1	4	2	0	1	0	0	1	1	0	0	1	0	0	1	0	0
State Hwy 86 & W Harris Rd	**7**	**4**	-0.18	28	0	0	2	1	1	0	0	2	0	2	0	0	0	0	1	0	1	3	0	0
S Dogwood Rd & Black Hills Rd	**6**	**4**	-0.15	28	0	0	2	1	1	3	1	0	0	0	0	0	0	1	0	0	0	2	0	0
Holt Rd & Norrish Rd	**5**	**4**	2.51	177	1	0	1	0	2	4	0	0	0	0	0	0	0	0	3	0	0	1	0	1
Austin Rd & Ross Rd	**1**	**4**	0.29	9	0	0	0	1	3	2	1	0	0	0	1	0	0	0	1	0	0	0	1	0
State Hwy 86 & Larsen Rd	**5**	**4**	-0.12	182	0	1	1	1	1	3	0	0	0	0	0	1	0	0	0	0	1	2	0	0
Flood Rd & Bailey Rd	**2**	**4**	2.81	4	0	0	0	0	4	0	0	0	0	3	1	0	0	0	3	0	0	4	0	0
Dogwood Rd & Schartz Rd	**1**	**4**	-0.04	24	0	0	1	2	1	1	1	1	0	1	0	0	0	0	1	0	1	1	0	0
Butters Rd & State Hwy 78	**1**	**4**	2.36	19	0	0	1	1	2	2	0	1	0	0	0	1	0	0	2	0	0	3	0	3
Brandt Rd & State Hwy 86	**1**	**4**	0.04	9	0	0	0	1	3	3	0	0	1	0	0	0	0	0	1	0	0	1	0	0
Wiest Rd & E Albright Rd	**2**	**4**	9.53	177	1	0	1	0	2	2	0	1	0	1	0	0	0	0	2	0	1	0	0	1
Marina Dr & Service Rd	**2**	**4**	2.59	14	0	0	1	0	3	2	1	1	0	0	0	0	0	0	1	0	0	1	0	0
S La Brucherie Rd & W McCabe Rd	**4**	**4**	0.54	19	0	0	1	1	2	1	0	3	0	0	0	0	0	0	2	0	1	1	0	0
Picacho Rd & Indian Rock Rd	**4**	**4**	1.13	19	0	0	1	1	2	2	1	0	0	1	0	0	0	0	0	0	1	1	0	0
Willoughby Rd & S Clark Rd	**3**	**4**	0.20	4	0	0	0	0	4	0	0	2	0	2	0	0	0	0	2	0	1	3	0	0
Bowker Rd & E Jasper Rd	**3**	**4**	0.13	188	0	1	1	2	0	3	0	0	0	1	0	0	0	0	1	0	0	0	0	1
Maple Ave & Correll Rd	**3**	**4**	2.52	9	0	0	0	1	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Base Line Rd & Arnold Rd	**3**	**4**	1.58	4	0	0	0	0	4	1	0	0	0	2	1	0	0	0	1	0	0	0	1	1
Picacho Rd & Ross Rd	**3**	**4**	4.13	28	0	0	2	1	1	1	0	0	0	3	0	0	0	0	1	1	1	3	0	0
Forrester Rd & Bannister Rd	**3**	**4**	1.51	9	0	0	0	1	3	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0
State Hwy 115 & E Worthington Rd	**12**	**3**	1.00	18	0	0	1	1	1	2	0	0	0	1	0	0	0	0	2	0	0	2	0	1
State Hwy 111 & Yocum Rd	**5**	**3**	-0.16	3	0	0	0	0	3	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0
Rockwood Rd & State Hwy 98	**2**	**3**	1.34	22	0	0	2	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2
State Hwy 98 & Hammer Rd	**2**	**3**	-0.05	13	0	0	1	0	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0
State Hwy 98 & 0.6 mi W of Bonesteele Rd	**2**	**3**	0.53	186	0	1	2	0	0	0	0	0	0	0	3	0	0	0	0	0	1	3	0	0
Base Line Rd & Haughtelin Rd	**2**	**3**	4.72	8	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1	2
Orchard Rd & Edwards Rd	**1**	**3**	-0.07	172	0	1	0	1	1	0	0	1	1	1	0	0	0	0	1	0	1	2	0	0
Ave F & Flood Rd	**0**	**3**	0.34	22	0	0	2	0	1	0	0	1	0	1	1	0	0	0	1	0	0	1	0	0

Intersection	Crashes (2013-2018)	Crashes (22016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
James Rd & E Worthington Rd	**1**	**3**	0.85	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
Barbara Worth Rd & E Jasper Rd	**4**	**3**	1.96	18	0	0	1	1	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0
State Hwy 115 & Harris Rd	**1**	**3**	3.62	8	0	0	0	1	2	0	1	0	0	2	0	0	0	0	0	0	0	3	2	2
Casey Rd & Keystone Rd	**1**	**3**	7.83	167	1	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	0	3	0	0
Urquhart Rd & W Carter Rd	**2**	**3**	3.21	3	0	0	0	0	3	0	0	0	0	2	1	0	0	0	2	0	0	3	0	0
Bryant Rd & Mead Rd	**2**	**3**	4.44	8	0	0	0	1	2	0	0	0	0	3	0	0	0	0	2	0	1	2	0	0
State Hwy 78 & Fifield Rd	**1**	**3**	0.26	3	0	0	0	0	3	1	0	0	0	2	0	0	0	0	0	0	1	2	0	1
Forrester Rd & W Cady Rd	**4**	**3**	-0.02	22	0	0	2	0	1	2	0	0	0	0	1	0	0	0	2	0	1	0	0	0
Kalin Rd & Cady Rd	**1**	**3**	1.95	3	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	2	0	1
Hoskins Rd & Wieman Rd	**2**	**3**	0.44	3	0	0	0	0	3	0	1	0	0	0	2	0	0	0	1	0	0	1	0	2
State Hwy 86 & Andre Rd	**2**	**3**	-0.17	13	0	0	1	0	2	2	0	1	0	0	0	0	0	0	1	0	0	1	0	0
Rutherford Rd & N Best Rd	**1**	**3**	5.11	176	0	1	1	0	1	0	1	0	0	1	1	0	0	0	2	0	1	1	0	0
Treadwell Blvd & Bering Ave	**1**	**3**	3.01	167	0	1	0	0	2	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0
Camino Dr & Bering Ave	**0**	**3**	2.18	8	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S La Brucherie Rd & W Heber Rd	**3**	**3**	4.97	3	0	0	0	0	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Rockwood Rd & State Hwy 86	**3**	**3**	-0.12	3	0	0	0	0	3	1	0	1	0	0	0	1	0	0	3	0	0	1	0	0
State Hwy 115 & E Alamo Rd	**3**	**3**	0.62	176	0	1	1	0	1	1	0	2	0	0	0	0	0	0	2	0	0	1	0	1
Nance Rd & W Worthington Rd	**3**	**3**	0.12	13	0	0	1	0	2	0	1	1	0	0	0	1	0	0	0	0	1	1	0	0
Hoskins Rd & Andre Rd	**3**	**3**	1.01	13	0	0	0	2	1	2	0	1	0	0	0	0	0	0	3	0	0	0	0	2
Hovley Rd & W Rutherford Rd	**3**	**3**	1.64	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2	0	0	2	0	0
W McCabe Rd & Sperber Rd	**3**	**3**	0.94	8	0	0	0	1	2	0	1	2	0	0	0	0	0	0	2	0	0	1	0	0

1. Local Critical Crash Rate Differential
2. Equivalent Property Damage Only Crashes

Table* 5: Analysis *List* –*Segments

Facility	Limits	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Prime Arterial																									
Dogwood Rd	Ralph Rd - E Harris Rd	**5**	**10**	1.17	45	0	0	2	3	5	0	0	0	0	3	7	0	0	0	1	0	0	4	1	1
Forrester Rd	W Keystone Rd - Imler Rd	**8**	**8**	0.59	355	1	1	2	0	4	0	1	0	1	6	0	0	0	0	1	0	1	4	0	1
Dogwood Rd	Willoughby Rd - Cole Rd	**6**	**8**	0.16	201	1	0	2	2	3	0	1	1	0	5	1	0	0	0	1	0	2	2	1	0
Forrester Rd	Aten Rd - 0.50 mi S of Aten Rd	**4**	**7**	0.42	171	0	1	0	0	6	0	1	1	1	3	1	0	0	0	1	0	0	3	0	2
S Dogwood Rd	Willoughby Rd - E Fawcett Rd	**7**	**7**	0.05	51	0	0	3	3	1	0	0	1	0	2	3	0	1	0	1	0	1	4	0	0
Dogwood Rd	E Harris Rd - 1 mi N of Harris Rd	**5**	**6**	0.18	204	0	1	3	1	1	1	1	0	2	1	1	0	0	0	0	0	2	3	0	0
Forrester Rd	Steiner Rd - Monte Rd	**6**	**5**	0.40	20	0	0	1	1	3	0	0	0	0	2	3	0	0	0	0	0	0	2	0	1
Dogwood Rd	1 mi S of Keystone Rd - Keystone Rd	**3**	**5**	0.03	15	0	0	0	2	3	1	1	1	0	1	1	0	0	0	2	0	0	0	0	0
Forrester Rd	Hackleman Rd - Evan Hewes Hwy	**6**	**5**	-0.25	25	0	0	1	2	2	1	1	1	0	0	2	0	0	0	1	0	1	3	0	1
Forrester Rd	Ross Rd - W Evan Hewes Hwy	**4**	**5**	0.02	20	0	0	1	1	3	0	1	0	0	3	1	0	0	0	0	0	2	2	0	1
S Dogwood Rd	W Black Hills Rd - W McCabe Rd	**4**	**5**	-0.32	15	0	0	1	0	4	1	0	1	0	1	1	1	0	0	1	0	0	3	1	0
Forrester Rd	W Cady Rd - Monte Rd	**3**	**4**	-0.29	168	1	0	0	0	3	0	1	0	0	2	1	0	0	0	1	0	1	1	0	0
W Keystone Rd	Forrester Rd - Austin Rd	**2**	**4**	-0.28	177	1	0	1	0	2	0	1	1	0	0	2	0	0	0	1	0	0	2	0	0
Dogwood Rd	W Aten Rd - E Huston Rd	**6**	**4**	-0.31	14	0	0	0	2	2	0	0	1	0	2	0	1	0	0	2	0	0	2	0	0
E Evan Hewes Hwy	James Rd - Meloland Rd	**5**	**4**	-0.29	14	0	0	1	0	3	0	0	1	0	1	2	0	0	0	1	0	0	2	0	0
Drew Rd	Lyons Rd - 0.46 mi N of State Hwy 98	**1**	**4**	0.22	19	0	0	1	1	2	0	0	0	0	3	1	0	0	0	1	0	0	2	0	0
Forrester Rd	Andre Rd - W Baughman Rd	**1**	**3**	-0.33	13	0	0	1	0	2	0	1	0	0	2	0	0	0	0	0	0	0	2	0	0
Dogwood Rd	0.38 mi S of Mead Rd - Schartz Rd	**4**	**3**	-0.42	172	0	1	0	1	1	0	0	0	0	3	0	0	0	0	1	0	0	1	1	0
W Keystone Rd	0.70 mi W of State Hwy 98 - 0.91 mi E of Dogwood Rd	**2**	**3**	3.78	3	0	0	0	0	3	0	0	1	0	2	0	0	0	0	2	0	0	1	1	0
Minor Arterial																									
Austin Rd	Aten Rd - Evan Hewes Hwy	**12**	**7**	0.33	31	0	0	2	1	4	0	0	2	0	4	1	0	0	0	2	0	1	3	0	0
Bowker Rd	E Chick Rd - 0.46 mi N of McCabe Rd	**3**	**4**	0.04	14	0	0	1	0	3	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0
Correll Rd	S Dogwood Rd - Bloomfield St	**6**	**4**	0.20	9	0	0	0	1	3	1	1	0	1	1	0	0	0	0	0	0	1	2	0	0
Bowker Rd	E McCabe Rd - 0.46 mi N of McCabe Rd	**2**	**3**	0.02	167	1	0	0	0	2	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0
W McCabe Rd	Clark Rd - Corfman Rd	**2**	**3**	-0.17	8	0	0	0	1	2	0	0	1	1	1	0	0	0	0	2	0	0	1	1	0
S Clark Rd	W Heber Rd - Hospital Loop	**3**	**3**	-0.56	13	0	0	0	2	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0
S Clark Rd	W Wahl Rd - W Heber Rd	**0**	**3**	-0.23	3	0	0	0	0	3	0	0	0	0	1	2	0	0	0	0	0	1	1	0	0
Bowker Rd	Cole Rd - E Jasper Rd	**1**	**3**	-0.51	13	0	0	1	0	2	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
Major Collector																									
Austin Rd	W Aten Rd - W Worthington Rd	**10**	**7**	4.10	12	0	0	0	1	6	2	2	0	0	3	0	0	0	0	1	0	1	4	0	0

Facility	Limits	Collisions (2013-2018)	Collisions (2016-2021)	Local CCR Differential[1]	EPDO[2]	*Fatal*	*Severe Injury*	*Other Visible Injury*	*Complaint of Pain*	*PDO*	Broadside	Sideswipe	Rear End	Head On	Hit Object	Overturned	Other	Pedestrian	Bicycle	Aggressive	Distracted	Impaired	Dark	Wet	Commercial
Huff Rd	Hetzel Rd - Adair Rd	**5**	**7**	0.39	12	0	0	0	1	6	0	0	0	0	4	3	0	0	0	4	0	0	2	0	3
Austin Rd	Grimes Rd - W Keystone Rd	**6**	**4**	-0.59	14	0	0	1	0	3	0	0	0	0	3	1	0	0	0	0	0	0	1	0	0
Bowker Rd	E Gillett Rd - Sandoval Ln	**1**	**4**	0.49	14	0	0	1	0	3	0	1	2	0	1	0	0	0	0	0	1	1	0	0	0
Gentry Rd	Bowles Rd - Eddins Rd	**0**	**3**	0.82	3	0	0	0	0	3	0	0	1	0	1	0	1	0	0	1	0	0	2	0	0
Austin Rd	Evan Hewes Hwy - Ross Rd	**3**	**3**	-1.06	13	0	0	0	2	1	1	0	2	0	0	0	0	0	0	2	0	0	3	0	0
S La Brucherie Rd	W Van Der Poel Rd - W McCabe Rd	**2**	**3**	6.33	3	0	0	0	0	3	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0
Minor Collector																									
Austin Rd	W Keystone Rd - Weaver Rd	**4**	**13**	1.03	177	1	0	0	0	12	0	1	0	0	8	3	1	0	0	3	0	1	4	0	0
Brandt Rd	Walker Rd - New River	**1**	**4**	-0.45	14	0	0	1	0	3	0	0	0	0	0	4	0	0	0	0	0	1	1	0	0
Cross Rd	0.7 mi S of Kadin Dr - Villa Ave	**5**	**3**	-0.81	8	0	0	0	1	2	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0
Local Street																									
E Alamo Rd	State Hwy 115 - Melon Rd	**3**	**8**	-1.66	192	0	1	1	2	4	1	0	1	1	5	0	0	0	0	1	0	2	5	1	0
Old Highway 111	Carey Rd - Keystone Rd	**4**	**5**	3.42	169	0	1	0	0	4	0	2	1	0	1	1	0	0	0	1	0	0	2	0	0
Old Highway 111	Harris Rd - Ralph Rd	**5**	**5**	2.37	183	0	1	1	1	2	0	2	0	0	1	2	0	0	0	0	0	0	2	0	2
San Pasqual Rd	Picacho Rd - Baseline Rd	**5**	**5**	6.94	15	0	0	1	0	4	1	1	0	0	2	0	0	1	0	1	0	1	2	1	0
Menvielle Rd	State Hwy 98 - Gateway Rd	**6**	**5**	0.68	15	0	0	0	2	3	0	0	4	0	1	0	0	0	0	4	0	0	0	0	0
Cruickshank Rd	Dogwood Rd - Cooley Rd	**2**	**4**	0.93	19	0	0	1	1	2	0	1	0	0	2	1	0	0	0	0	0	1	1	0	0
Old Highway 111	Mead Rd - 0.5 mi S of Mead Rd	**1**	**3**	0.90	8	0	0	0	1	2	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0
Old Highway 111	Schartz Rd - Carey Rd	**2**	**3**	0.91	3	0	0	0	0	3	1	0	1	0	0	1	0	0	0	0	0	0	1	0	2
Old Highway 111	E Ross Rd - E Gillett Rd	**2**	**3**	2.31	13	0	0	0	2	1	0	1	0	0	1	1	0	0	0	0	0	0	1	1	0
Fredricks Rd	Elder Rd - Kalin Rd	**0**	**3**	9.81	172	0	1	0	1	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0

1. Local Critical Crash Rate Differential
2. Equivalent Property Damage Only Crashes

5.1 SITE VISITS

Through the initial collision and network screening analysis an initial rank of locations of interests was developed. In addition to looking at locations with a high number of collisions, other statistically important factors were evaluated.

A shortlist of 15 locations of all types is shown below in **Table 6.** From this list, 10 locations will be chosen for further study, including site visits. With the intent to diversify the studies and provide a range of countermeasures to propose to the County, chosen locations were distributed among the different intersection and roadway types. Given the additional factor of shared jurisdiction, some locations that are solely within Imperial County jurisdiction were prioritized.

Table 6: Shortlist of Locations

No.	Location Name	No. of Collisions (2016-2021)	Critical Crash Rate (CCR) Differential	Reason for Selection
Signalized Intersections				
1	Old Highway 111 & Worthington Rd	12	0.58	High number of rear-end and aggressive driving collisions
2	Pitzer Rd & McCabe Rd	10	0.23	High number of broadside and injury collisions
Unsignalized Intersections				
3	Dogwood Rd & Cole Rd	18	1.58	1 fatal and 2 severe injury collisions; high number of broadside collisions
4	Old Highway 111 & Keystone Rd	17	4.01	1 fatal and 4 severe injury collisions; high broadside and aggressive collisions
5	Forrester Rd & Ross Rd	16	2.10	Severe injury collision; high number of broadside collisions
6	Barbara Worth Rd & Heber Rd	15	3.46	Compliant of pain collision; broadside collisions

No.	Location Name	No. of Collisions (2016-2021)	Critical Crash Rate (CCR) Differential	Reason for Selection
7	Gentry Rd & Walker Rd	14	8.68	Injury collisions; hit object collisions; aggressive collisions
8	Willoughby Rd & Kloke Rd	8	3.72	Hit object collisions; aggressive collisions
Arterial Segments				
9	Dogwood Rd: Ralph Rd to Harris Rd	10	1.17	High CCR differential; high number of overturned collisions
10	Forrester Rd: Aten Rd to 0.50 mi S of Aten Rd	7	0.42	Severe injury collision, 2 commercial vehicle collisions
11	Austin Rd: Aten Rd to Evan Hewes Hwy	7	0.33	High number of hit object and dark collisions
Collector Segments				
12	Austin Rd: Keystone Rd to Weaver Rd	13	1.03	Fatal collision; aggressive collisions
13	Huff Rd: Hetzel Rd to Adair Rd	7	0.39	PDO collisions; hit collisions; aggressive collisions;
Local Street Segments				
14	Alamo Rd: State Hwy 115 to Melon Rd	8	-1.66	High number of injury and dark collisions
15	Old Highway 111: Harris Rd to Ralph Rd	5	2.37	High number of injury collisions; 2 commercial collisions, 2 dark collisions