EXHIBIT 8

CRASH ANALYSIS – FINDINGS

Glendale Bicycle Plan Update

October 11, 2023

The below document outlines findings from the crash analysis portion of the Existing Conditions subtask of the Glendale Bicycle Plan Update. The crash analysis utilizes data on bicycle crashes from California's Statewide Integrated Traffic Records System (SWITRS) and reflects requested changes to the Crash Analysis methodology. Incorporating these changes, this analysis utilizes bicycle-involved crashes within the City of Glendale within a ten-year period between 2012 and 2021 and considers all bicycle crashes inclusive of property damage-only (PDO) crashes. Bicycle-involved crashes that took place on a state highway within Glendale have been excluded.

Summary Crash Statistics

The below section presents descriptive data derived from the last ten years of available data from bicycle crashes in the City of Glendale. The descriptive data also notes crashes included from the overall dataset that resulted in fatalities or severe injuries (killed or severely injured, or KSI).

General Crash Descriptions

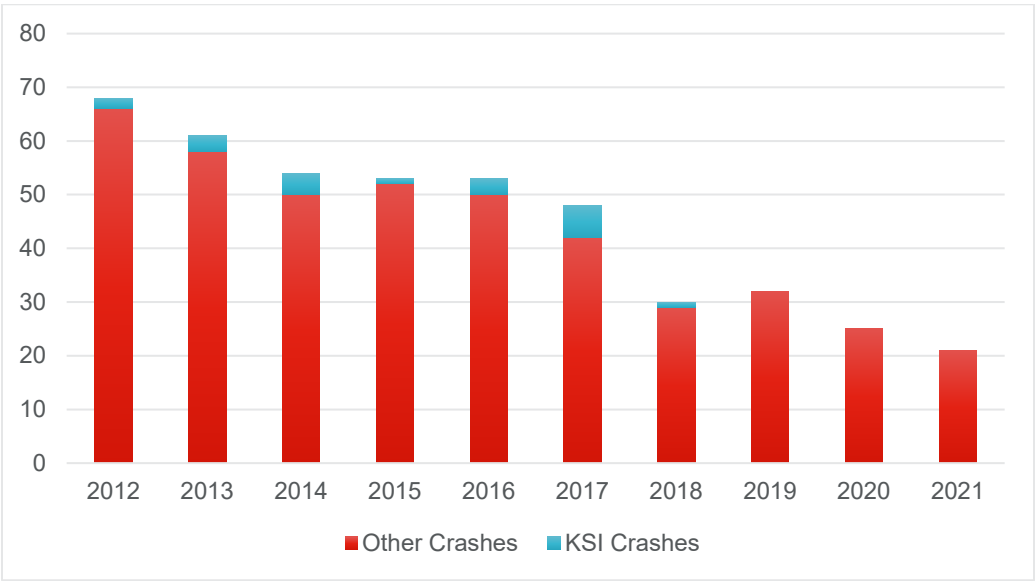**Figure 1. Glendale Bicycle Crashes by Year (2012 – 2021)**

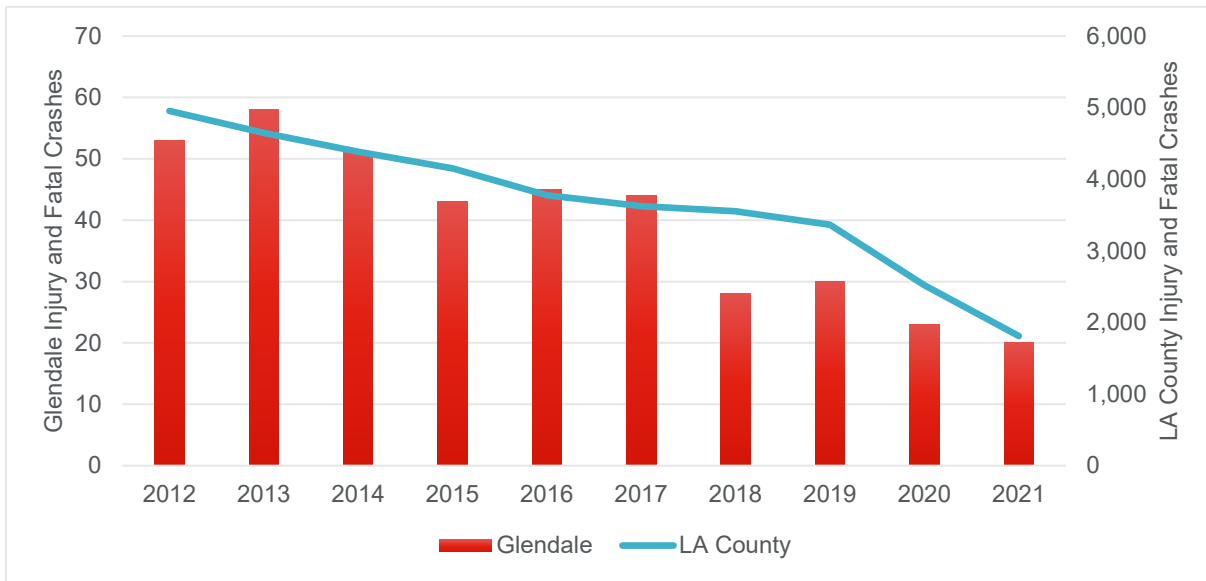**Figure 2. Bicycle Injury and Fatal Crashes Comparison by Year (2012 – 2021)**

Table 1. Bicycle Crashes by Year[1]
(excluding PDO crashes)

	Total Bicycle Crashes	% Crashes	# of KSI Crashes	% of KSI	Injury and Fatal Crashes / 100,000 residents		
					Glendale	Pasadena	LA County
2012	68	15%	2	10%	27.4	65.1	49.9
2013	61	14%	3	15%	29.8	68.5	46.5
2014	54	12%	4	20%	26.0	76.9	43.7
2015	53	12%	1	5%	21.7	51.1	41.2
2016	53	12%	3	15%	22.0	45.1	37.2
2017	48	11%	6	30%	22.3	45.8	35.6
2018	30	7%	1	5%	13.4	29.7	34.9
2019	32	7%	0	0%	15.6	43.3	33.1

[1] The first column of each table lists total bicycle-involved crashes, including those resulting in fatalities or severe injuries (KSI). The KSI columns record the number of KSI crashes (20 total over ten years), and the percent of KSI crashes by year out of that separate total.

2020	25	6%	0	0%	11.7	32.4	24.9
2021	21	5%	0	0%	10.4	39.8	18.4
Grand Total	445	100%	20	100%			

Bicycle crashes in Glendale have declined in the past ten years, from a peak in 2012 at the beginning of the observed period. The most number of severe injuries occurred in 2017. The decrease in overall bicycle-involved crashes in this period follows broader regional trends, as shown in Figure 2. KSI crashes in Glendale peaked in 2017, and none have been recorded in the last three years of the observed period.

The chart also shows rates of bicycle crashes resulting in injury or fatality per 100,000 residents, comparing to Pasadena and broader LA County. PDO crashes were excluded for comparison purposes. Pasadena, a peer city with similar land uses and approximately a third fewer people, also experienced a similar drop in crashes. While a multitude of factors likely influenced this trend, American Community Survey data does show bicycle commuting falling significantly in this period, suggesting fewer people were biking overall. When comparing by population, Glendale has fewer bicycle crashes per 100,000 people than LA County or Pasadena throughout this period.

It should be noted, however, that the data is not normalized by exposure and ridership, and data collected during 2020 and 2021 may be affected by changes in travel patterns brought upon by the COVID-19 pandemic. Additional factors such as land use, availability of bicycle facilities, and demographic composition also likely influence exposure and ridership rates.

Table 2. Bicycle Crash Severity

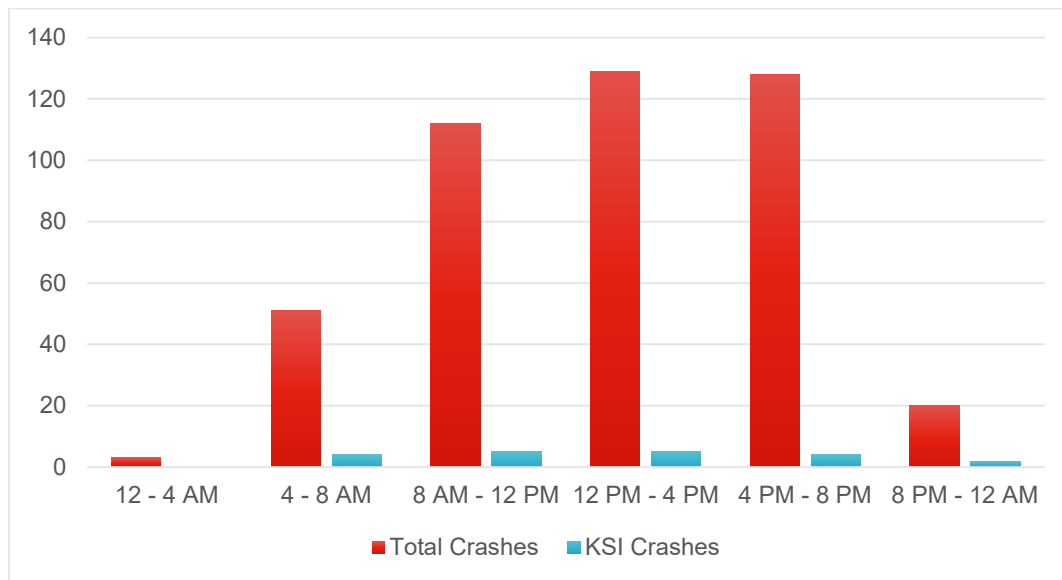| Crash Severity	# Crashes	% Crashes
Property Damage Only	50	11%
Complaint of Pain	165	37%
Other Visible Injury	210	47%
Severe	18	4%
Fatal	2	0.4%
Grand Total	445	100%

Two fatal crashes and 18 crashes resulting in severe injuries took place in City of Glendale streets between 2012 and 2020. Only 11 percent of crashes in Glendale were property damage only, and nearly half resulted in a visible injury. By comparison, Pasadena had a similar distribution of severe and fatal crashes over this period, while LA County as a whole saw higher rates of severe and fatal crashes.

Table 3. COVID-19 and Crash Injury Comparison

Year	KSI	Visible Injury	Complaint of Pain	PDO	Total Crashes
Pre-COVID-19 Total	**1**	**30**	**27**	**4**	**62**
2018	1	15	12	2	30
2019	0	15	15	2	32
COVID-19 Total	**0**	**26**	**17**	**3**	**46**
2020	0	13	10	2	25
2021	0	13	7	1	21

The incidence of bicycle-involved crashes within Glendale slowed during the COVID-19 pandemic. Compared to the two preceding years, the total number of crashes fell by approximately 25 percent. Crashes causing complaints of pain fell by nearly a third. While there was only one crash resulting in a severe injury in 2018, no crashes caused fatalities or severe injuries during the pandemic. Causes for the sharp reduction during the pandemic likely have multiple complex causes, possibly owing to a combination of changes in commuting behaviors and modes.

Figure 3. Bicycle Crashes by Time of Day

More than half of all crashes, including KSI crashes, occurred during the daytime, between 8:00 am and 4:00 pm. Notably, nearly a third of crashes occurred in the early evening hours, between 4:00 pm and 8:00 pm, when conditions are darker or becoming darker. KSI crashes followed these trends, with 90 percent taking place during the day or early evening.

Crash Behaviors

Table 4. Most Common Vehicle Code Violation Categories

Violation Category	# Crashes	% Crashes	# of KSI	% of KSI
Wrong Side of Road	98	22%	2	10%
Automobile Right of Way	88	20%	3	15%
Improper Turning	75	17%	2	10%
Other Hazardous Violation	47	11%	2	10%
Traffic Signals and Signs	38	9%	4	20%
Unsafe Speed	31	7%	3	15%

Table 4 shows the six most common vehicle code violation categories cited in the crash data. As this is a selection of most common factors, the table does not total to 445 crashes. These violations include "Wrong Side of the Road," "Automobile Right of Way," and "Improper Turning." The first refers to a vehicle operating on the wrong side of the street or bicyclists not riding as far right as practicable as required by law, while the second includes violations where road users fail to yield properly, such as failing to yield to others when making turns or entering the roadway. "Improper Turning" refers to unsafe turning practices by road users.

Notably, while "Traffic Signals and Signs" and "Unsafe Speed" are cited for only 9 and 7 percent of all crashes respectively, they comprise 20 and 15 percent of KSI crashes. "Unsafe Speed" includes instances where a person was driving or riding at a speed considered "unreasonable," which includes exceeding the speed limit, while "Traffic Signals and Signs" includes violations such as failing to come to a complete stop at stop signs and red lights. Responding officers to these crashes under these common violation categories found both drivers and bicyclists commonly at fault.

Table 5. Crashes by Collision Type

Collision Type	# Crashes	% Crashes	# of KSI	% of KSI
Head-On	15	3%	1	5%
Sideswipe	77	17%	0	0%
Rear End	37	8%	4	20%
Broadside	244	55%	8	40%
Hit Object	4	1%	0	0%
Overturned	3	1%	0	0%
Vehicle/Pedestrian	16	4%	1	5%
Other/Not Recorded	49	11%	6	30%

Grand Total	**445**	**100%**	**20**	**100%**

Table 5 details the distribution of crashes by their collision type, or how the collision physically occurred. Many collisions in this period were broadsides, in which a bicyclist and motorist collided at a right angle. This also contributed to a plurality of KSI crashes, suggesting that conditions relating to broadside crashes may include those that frequently yield more severe crash outcomes, such as higher speeds.

Table 6. Alcohol Involved Crashes

Alcohol Involved?	# Crashes	% Crashes	# of KSI	% of KSI
Yes	26	6%	4	20%
No	419	94%	16	80%
	445	100%	20	100%

Table 6 depicts the influence of alcohol in bicycle-involved crashes. Six percent of all crashes involved alcohol, but 20 percent of all KSI crashes involved at least one party being under the influence of alcohol.

Environmental Factors

Table 7. Collision by Lighting Condition

Lighting Condition	# Crashes	% Crashes	# of KSI	% of KSI
Daylight	348	78%	15	75%
Dusk - Dawn	12	3%	0	0%
Dark - Street Lights	78	18%	4	20%
Dark - No Street Lights	3	1%	1	5%
Not Stated	4	1%	0	0%
Grand Total	**445**	**100%**	**20**	**100%**

As most crashes took place during the day, daylight lighting is the most common condition. However, almost a fifth of crashes took place during the dark under streetlights. This pattern is shared by KSI crashes as well.

Table 8. Collisions by Location in Street

Crash Location	# Crashes	% Crashes	# of KSI	% of KSI
At street segment	127	29%	6	30%
At intersection	318	71%	14	70%
Grand Total	445	100%	20	100%

More than a third of bicycle collisions took place at intersections, which, when combined with the above rates of right-of-way and turning vehicle violations, may support a high need for intersection safety improvements.

Bicycle Crash Party Descriptions

Table 9. Bicyclists by Race

Bicyclist Race	Count
Not stated	253
White	94
Hispanic	72
Asian	11
Black	9
Other	6
Total	**445**

Note: Table 9 documents the race of bicyclist parties involved in crashes, as is presented in the SWITRS crash data. For more than half of people involved in a crash, no race was provided.
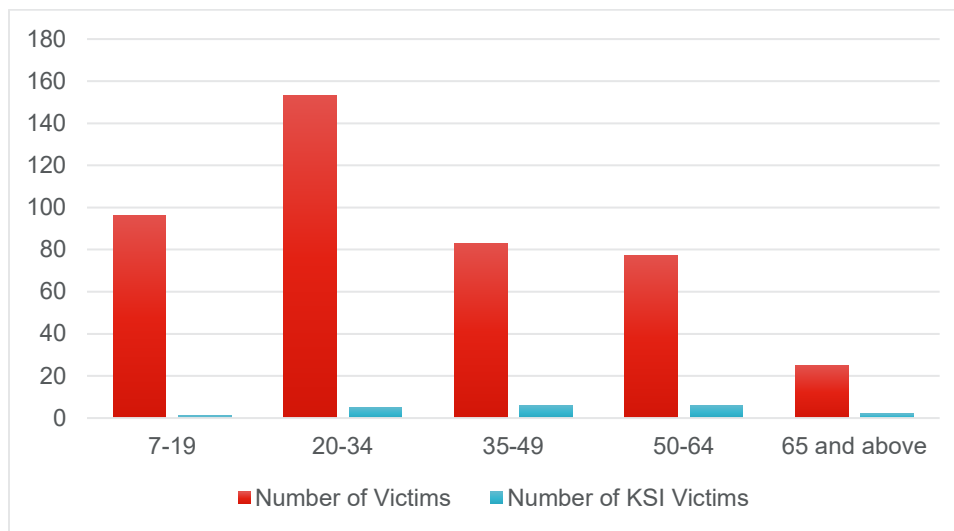
Additional work may be done to separate racial makeup of crash victims from other parties involved; however, the large number of missing entries may not yield data that is easily comparable to other trends or conditions.

Table 10. Bicyclist Victims by Age

Ages	Number of Victims	Percent of Victims	Number of KSI Victims	Percent of KSI Victims
7-14	35	8%	1	5%

Age	Number	Percent	KSI	Percent
15-19	61	14%	0	0%
20-24	46	10%	0	0%
25-29	56	13%	4	20%
30-34	51	11%	1	5%
35-39	26	6%	1	5%
40-44	29	7%	2	10%
45-49	28	6%	3	15%
50-54	31	7%	3	15%
55-59	32	7%	3	15%
60-64	14	3%	0	0%
65-69	13	3%	0	0%
70 and Above	12	3%	1	5%
Unknown	11	2%	1	5%
Total	**445**	**100%**	**20**	**100%**

Figure 4. Bicycle Crash Victims by Age Range[2]

---

[2] For summary purposes, age ranges are not presented in equal intervals.

More than 50 percent of crash victims were 34 or younger, and more than a third were between the ages of 20 and 34.

Table 11. Collision Victims by Gender

Gender	Total Crashes	Percent of Total Crashes	KSI Crashes	Percent of KSI Crashes
Female	55	12%	3	15%
Male	385	87%	17	85%
Unknown	5	1%	0	0%
Grand Total	**445**	**100%**	**20**	**100%**

Bicycle Crash Density

The below map shown in Figure 5 demonstrates the density of bicycle-involved crashes within the City of Glendale. As with the above summary statistics, this analysis uses 2012-2021 crash data from the Statewide Integrated Traffic Record System.

Methodology

Based on these trends, several Safety Corridors have been identified. The analysis uses the Sliding Windows methodology to understand crashes throughout the street network, identifying segments with the highest crash density, weighted by crash severity. The analysis is done by determining the number and severity of crashes in a half-mile "window" on a roadway and shifting that window along the roadway 1/10 mile at a time. Crashes are weighted by severity, and individual street segments receive a score. Following input from the Project Development Team, crashes resulting in only property damage were included in the analysis. To preserve the balance in segment scoring by severity, weights were adjusted to five points for KSI crashes, two points for all other injuries, and one point for PDO crashes.

The below findings present the results of the Sliding Windows analysis of historical crash data with functional classifications, with some cleaning conducted to remove segments double-counted at intersection crashes. The list comprises the highest-scoring segments, as well as several additional streets that included consistent clusters of crashes. The Sliding Windows results may be further modified based on additional considerations, such as ground truthing lane width, intersection conditions on high-scoring segments, and stakeholder input.

Initial Findings

The below Safety Corridors are largely major arterials that connect major destinations, neighborhoods, and commercial areas in downtown and central Glendale. Several arterials, such as Glenoaks Blvd and Brand Blvd, are key connections to Burbank and Los Angeles, respectively. Several corridors that cross SR-134 north-south appear in the list: these are often where access across the highway is restricted to major streets. No streets in northern Glendale appeared in the list, as fewer crashes occurred there.

The inclusion of additional years of bicycle crash data, as well as PDO crashes, within the analysis, surfaced several additional low and medium crash density segments, several of which are along residential streets. These include Columbus Ave and Riverdale Dr in southwestern Glendale, as well as E Chevy Chase Dr and E Glenoaks Blvd as they pass beneath the 2 Freeway in eastern Glendale.

Highest-scoring streets generally include wide thoroughfares with four-to-six lanes and no bicycling infrastructure. Some, such as Pacific Ave and Broadway, include sharrow markings on the outer lanes to signify bicycling routes. Glenoaks Blvd, which is six lanes wide with a planted median, does include a striped, Class II bike lane adjacent to parking lanes. Central Ave features Class II bike lanes as well, though these end to the north of the highest scoring segment (Broadway to Chevy Chase Dr).

Table 12. Draft Safety Corridors

CORRIDOR	FROM	TO
GLENOAKS BLVD	Allen Ave	Brand Blvd
S BRAND BLVD	Los Feliz Rd	Glenoaks Blvd
COLORADO ST	Pacific Ave	Brand Blvd

BROADWAY	San Fernando Rd	Chevy Chase Dr
S GLENDALE AVE	San Fernando Rd	Chestnut St
N GLENDALE AVE/ VERDUGO RD	Broadway	Mountain St
PACIFIC AVE	Broadway	Glenwood Rd
SAN FERNANDO RD	Central Ave	SR-134
S CENTRAL AVE	Broadway	Chevy Chase Dr
CHEVY CHASE DR	Windsor Rd	Broadway

Figure 5. Revised Bicycle Crash Density and Bicycle Crashes (2012 – 2021)