

**APPENDIX E: Transportation Operations Review. Fehr & Peers,
January 2023**

Transportation Operations Review of Chevron Gas Station & Krispy Krunchy Chicken Restaurant on Leisure Lane

Prepared for:
City of Sacramento, Department of Public Works

FEHR  PEERS

January 19, 2023

SA22-0175



Table of Contents

Executive Summary	4
Purpose	4
Project Description	4
Existing Conditions	4
Baseline Conditions.....	5
Project Travel Characteristics.....	5
Vehicle Miles Traveled.....	5
Baseline Plus Project Conditions.....	5
Project Access and On-Site Circulation	5
1. Introduction	8
1.1 Purpose.....	8
1.2 Project Description.....	8
1.3 Study Intersections and Time Periods	8
1.4 Analysis Scenarios.....	10
1.5 Analysis Methodology	10
1.6 Regulatory Setting.....	10
2. Existing Conditions	12
2.1 Roadway System	12
2.2 Bicycle and Pedestrian System	14
2.3 Transit System.....	14
2.4 Traffic Volumes.....	14
2.5 Intersection Operations.....	17
3. Baseline Conditions	21
3.1 Approved Projects	21
3.2 Intersection Operations.....	21
4. Baseline Plus Project Conditions	25
4.1 Project Travel Characteristics	25
4.1.1 Trip Generation	25
4.1.2 Vehicle Trip Distribution and Assignment	26
4.2 Vehicle Miles Traveled (VMT).....	29
4.3 Intersection Operations.....	30
4.4 Signal Warrant Analysis.....	32



5. Project Access and On-Site Circulation Evaluation.....	34
5.1 Project Consistency with Applicable City Roadway Design Standards	34
5.2 Maximum Queues at Project Driveway.....	37
5.3 Recommendations	38

List of Figures

Figure ES-1: Recommendations.....	7
Figure 1: Project Site Plan	9
Figure 2: Existing Roadway Network	13
Figure 3: Bicycle and Pedestrian Facilities – Existing Conditions.....	15
Figure 4: Existing Peak Hour Traffic Volumes and Lane Configurations	16
Figure 5: Approved Projects.....	22
Figure 6: Baseline Peak Hour Traffic Volumes and Lane Configurations	23
Figure 7: Trip Distribution	27
Figure 8: Baseline Plus Project Peak Hour Traffic Volumes and Lane Configurations	28
Figure 9: Stopping Sight Distance – Leisure Lane and Proposed Project Driveway	36
Figure 10: Recommendations.....	40

List of Tables

Table 1: Observed Maximum Vehicle Queues - Existing Conditions.....	19
Table 2: Peak Hour Intersection Level of Service - Existing Conditions.....	20
Table 3: Peak Hour Intersection Level of Service - Baseline Conditions.....	24
Table 4: Peak Hour Maximum Vehicle Queues – Baseline Conditions.....	24
Table 5: Project Vehicle Trip Generation.....	26
Table 6: Peak Hour Intersection Level of Service – Baseline Plus Project Conditions.....	30
Table 7: Peak Hour Maximum Vehicle Queues – Baseline Plus Project Conditions.....	31
Table 8: Signal Warrant Analysis – Leisure Lane/Slobe Avenue/Canterbury Road/Expo Parkway Intersection ...	33
Table 9: Maximum Vehicle Queues at Project Driveway – Baseline Plus Project Conditions.....	38
Table 10: Recommendations	39



Executive Summary

Purpose

This study analyzes transportation operations associated with development of a proposed Chevron gas station, convenience market, and Krispy Krunchy Chicken fast-food restaurant, which would be located in the northeast quadrant of the Leisure Lane/State Route (SR) 160 intersection in the City of Sacramento. This study describes existing conditions, analyzes the project's expected travel characteristics, reviews how the project would affect travel conditions near the site vicinity, and recommends improvements to better accommodate all modes of travel and on-site circulation.

Project Description

According to the project site plan (*Leisure Ln. Expo Parkway, Boulevard Construction, July 2022*), the proposed project would consist of the following land uses:

- Chevron gas station with 12 vehicle fueling positions (passenger vehicles/SUVs/small trucks) and a 2,280 square foot convenience market
- 1,650 square foot Krispy Krunchy Chicken restaurant with drive-through lane
- 14 parking stalls (excluding vehicle fueling pump parking)

Vehicular access would be provided by one driveway on Leisure Lane located approximately 320 feet east of the Leisure Lane/SR 160 Eastbound Ramps intersection.

Existing Conditions

Morning and evening peak hour traffic operations were analyzed at the following five study intersections.

- Leisure Lane/Slobe Avenue/Expo Parkway/Canterbury Road
- Leisure Lane/SR 160 Eastbound Ramps
- Leisure Lane/Exposition Boulevard/SR 160 Eastbound Ramps
- Expo Parkway/Exposition Boulevard
- Leisure Lane/Project Driveway

All study intersections were analyzed using a state-of-the-practice microsimulation model and were found to operate at Level of Service (LOS) C or better during the AM and PM peak hours. Vehicle queues at the SR 160 Eastbound ramp terminal intersections did not spill back to the SR 160 mainline.



Baseline Conditions

Peak hour traffic operations were analyzed under baseline conditions, which represents existing conditions with the addition of trips generated by two approved projects near the study area. The approved projects did not result in deficient LOS, and queuing at critical turn movements increased marginally.

Project Travel Characteristics

The proposed project would generate approximately 266 AM peak hour and 276 PM peak hour gross trips. About 22% and 36% of these trips would be pass-by during the AM and PM peak hours, respectively, meaning they are not new trips added to the surrounding roadways, but rather existing trips on Leisure Lane that enter/exit the site. After accounting for pass-by trips, the proposed project would generate approximately 206 AM peak hour and 176 PM peak hour new vehicle trips. A significant proportion of new trips would be diverted from SR 160 given the considerable level of traffic on that adjacent facility and the ease of accessing the project site.

Vehicle Miles Traveled

The proposed project would generate a negligible amount of new VMT based on the proposed uses, the types of trips generated, and the project's location. Because the project would not generate a substantial amount of new VMT, impacts related to VMT are considered less than significant.

Baseline Plus Project Conditions

The project would cause minor increases in vehicle delay at the study intersections but would not cause any intersection LOS to degrade below LOS C. Based on City of Sacramento General Plan Policy M 1.2.2, LOS D or better conditions is considered the operating objective for the study intersections. Microsimulation showed that maximum queues for critical movements would increase by 50 feet or less compared to baseline conditions and would not cause spill back to the SR 160 mainline. Because the project would exacerbate vehicle queues, it is recommended that the signal be retimed at the Leisure Lane/SR 160 Eastbound Ramps/Exposition Boulevard intersection.

The peak hour and four-hour signal warrants (as described in the *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014) were evaluated at the Leisure Lane/Slobe Avenue/Expo Parkway/Canterbury Road intersection. The warrants were not met for existing, baseline, or baseline plus project conditions. All-way stop control is therefore recommended to remain.

Project Access and On-Site Circulation

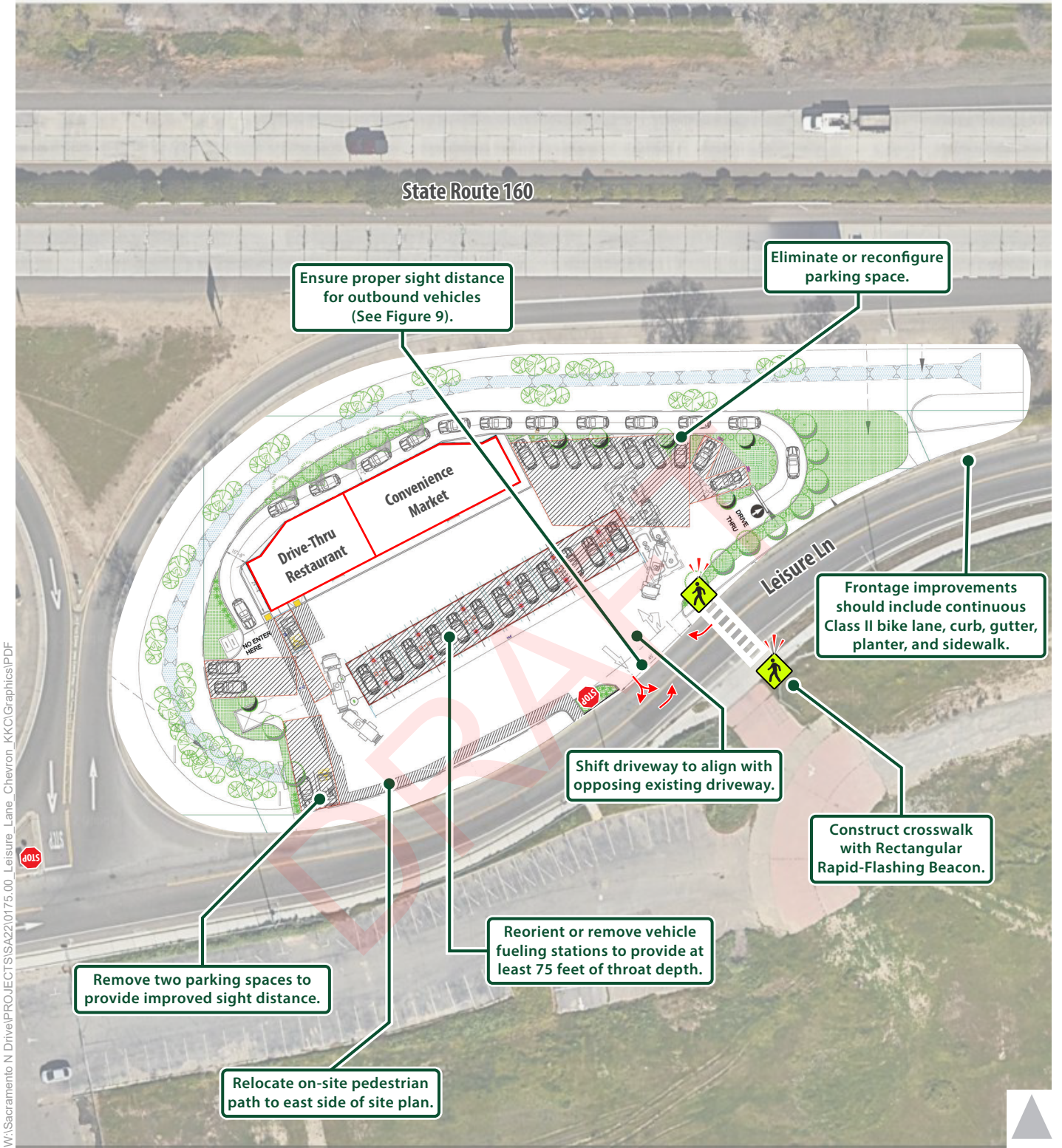
City of Sacramento *Street Design Standards* (2009) were compared to the project site plan for consistency. The project was found to be consistent in 4 topical areas and inconsistent in 4 other areas. Recommendations are made in Section 5.3 (also summarized below) to achieve consistency.



Recommended improvements include the following (See Table 10 for additional details):

- Pay fair share cost of signal retiming at the Leisure Lane/SR 160 Eastbound Ramps/Exposition Boulevard intersection;
- Construct frontage improvements consistent with a minor collector (i.e., a continuous Class II bike lane, curb, gutter, planter, and sidewalk);
- Shift the project driveway approximately 25 feet to the east to align with the existing driveway south of Leisure Lane.
- Ensure adequate sight distance is provided for vehicles exiting the relocated project driveway (see Figure 9). This includes removing/relocating two parking spaces and a monument sign in the southwest corner of the project site to be outside the line of sight;
- Construct a crosswalk across Leisure Lane (with Rectangular Rapid-Flashing Beacon) immediately east of the project driveway;
- Revise the site plan to reorient and/or remove vehicle fueling stations, thereby resulting in at least 75 feet of throat depth for outbound traffic;
- Relocate the on-site pedestrian path to begin at Leisure Lane east of the project driveway (at Leisure Lane crosswalk) and extend into the site to provide pedestrian access to the buildings; and
- Eliminate or reconfigure the specified parking space in Figure ES-1.

Figure ES-1 illustrates the study recommendations at or near the project site.



W:\Sacramento N Drive\PROJECTS\SA22\0175.00_Leisure_Lane_Chevron_KKC\Graphics\PDF



Figure ES-1
Recommendations



1. Introduction

1.1 Purpose

This study analyzes transportation operations associated with development of a proposed Chevron gas station, convenience market, and Krispy Krunchy Chicken fast-food restaurant, to be located in the northeast quadrant of the Leisure Lane/State Route (SR) 160 Eastbound Ramps intersection in the City of Sacramento. This study describes existing conditions, analyzes the project's expected travel characteristics, reviews how the project would affect travel conditions near the site vicinity, and recommends improvements to better accommodate all modes of travel and on-site circulation.

1.2 Project Description

According to the project site plan (*Leisure Ln. Expo Parkway, Boulevard Construction, July 2022*), the proposed project would consist of the following land uses:

- Chevron gas station with 12 vehicle fueling positions (passenger vehicles/SUVs/small trucks) and a 2,280 square foot convenience market
- 1,650 square foot Krispy Krunchy Chicken restaurant with drive-through lane; the restaurant building would be attached to the convenience market
- 14 parking stalls (excluding vehicle fueling pump parking)

Access to the project would be provided by one 45 foot wide, full-access driveway located approximately 320 feet east of the Leisure Lane/SR 160 Eastbound Ramps intersection (center line to center line). This driveway would be opposite, though slightly offset from, an existing driveway on the south side of Leisure Lane. The area south of the project site is approved for a development that will include retail, hotel, and residential uses. Consideration of nearby approved developments is addressed in Chapters 3 and 4.

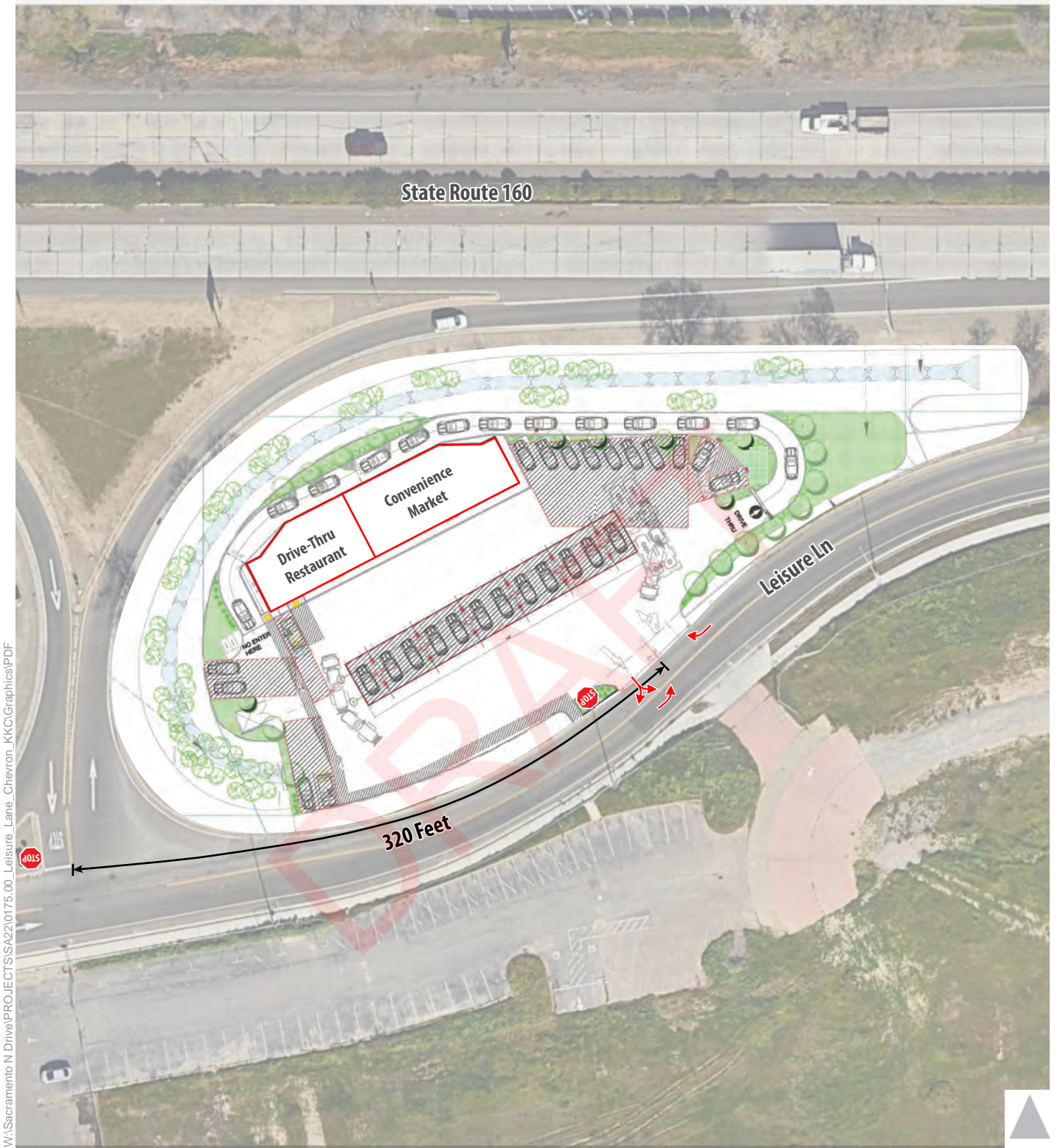
Refer to **Figure 1** for the project site plan.

1.3 Study Intersections and Time Periods

Through coordination with City of Sacramento staff, it was determined that the following study intersections should be analyzed for weekday AM and PM peak hour conditions:

1. Expo Parkway/Canterbury Road/Slobe Avenue/Leisure Lane (#1)
2. SR 160 Eastbound Ramps/Leisure Lane (#2)
3. SR 160 Eastbound Ramps/Exposition Boulevard (#3)
4. Expo Parkway/Exposition Boulevard (#4)

Operations are also evaluated at the project driveway on Leisure Lane (#5).



W:\Sacramento N Drive\PROJECTS\SA22\0175.00_Leisure_Lane_Chevron_KKC\Graphics\PDF

-  Permitted Movement
-  Stop Sign



Figure 1
Project Site Plan



1.4 Analysis Scenarios

The following scenarios are analyzed in this study:

- **Existing Conditions** – represents October 2022 conditions.
- **Baseline Conditions** – represents existing conditions with the addition of vehicle trips generated by approved projects in the study area vicinity. This is the baseline condition upon which project effects are evaluated.
- **Baseline Plus Project Conditions** – represents changes in travel conditions from baseline conditions associated with implementation of the proposed project.

1.5 Analysis Methodology

This study uses the SimTraffic microsimulation software to analyze traffic operations (i.e., delay, level of service, and queuing) at the study intersections. SimTraffic considers the effects of lane utilization, heavy vehicle composition, turn pocket storage lengths, upstream/downstream queue spillbacks, and coordinated signal timings on intersection queuing and delays. Reported results are based on an average of 10 runs. The following procedures and assumptions were applied in the development of the SimTraffic model:

- Roadway geometric data were gathered using aerial photographs and field observations.
- Peak hour traffic volumes were entered into the model according to the peak hour of the study area.
- The peak hour factor (PHF) was set at 1.0 in accordance with City of Sacramento Traffic Impact Study Guidelines.
- Counted pedestrian and bicycle volumes were entered into the model according to peak hour measurements.
- Signal phasing and timings were based on existing signal timing plans provided by the City of Sacramento and field observations.
- Roadway speeds for the model network were based on posted speed limits.

1.6 Regulatory Setting

On March 3, 2015, the Sacramento City Council adopted the *2035 General Plan*. The Mobility Element of the City of Sacramento's *2035 General Plan* outlines goals and policies that coordinate the transportation and circulation system with planned land uses. The following LOS policy is relevant to this study:

Policy M 1.2.2 The City shall implement a flexible context-sensitive Level of Service (LOS) standard, and will measure traffic operations against the vehicle LOS thresholds established in this policy. The City will measure vehicle LOS based on the methodology contained in the latest version of the Highway Capacity Manual (HCM) published by the Transportation Research Board. The City's specific vehicle LOS thresholds have been defined based on community values with respect to modal priorities, land use context, economic



development, and environmental resources and constraints. As such, the City has established variable LOS thresholds appropriate for the unique characteristics of the City's diverse neighborhoods and communities. The City will strive to operate the roadway network at LOS D or better for vehicles during typical weekday conditions including AM and PM peak hour with certain exceptions mapped on Figure M1 (and listed in the General Plan document).

A. Core Area (Central City Community Plan Area) – LOS F allowed

B. Priority Investment Areas – LOS F allowed

C. LOS E Roadways (11 distinct segments listed). LOS E is also allowed on all roadway segments and associated intersections located within ½ mile walking distance of light rail stations.

D. LOS F roadways (24 distinct segments listed)

E. If maintaining the above LOS standards would, in the City's judgment, be infeasible and/or conflict with the achievement of other goals, LOS E or F conditions may be accepted provided that provisions are made to improve the overall system, promote non-vehicular transportation and/or implement vehicle trip reduction measures as part of a development project or a city-initiated project. Additionally, the City shall not expand the physical capacity of the planned roadway network to accommodate a project beyond that identified in Figure M4 and M4a (2035 General Plan Roadway Classification and Lanes).

None of the roadways in the study area are included in the list of exceptions. Thus, in accordance with General Plan Policy M 1.2.2, LOS D is considered the operating objective for this study.



2. Existing Conditions

This chapter describes the existing physical and operational characteristics of the transportation system within the study area including the roadway, bicycle, pedestrian, and transit components of the system.

2.1 Roadway System

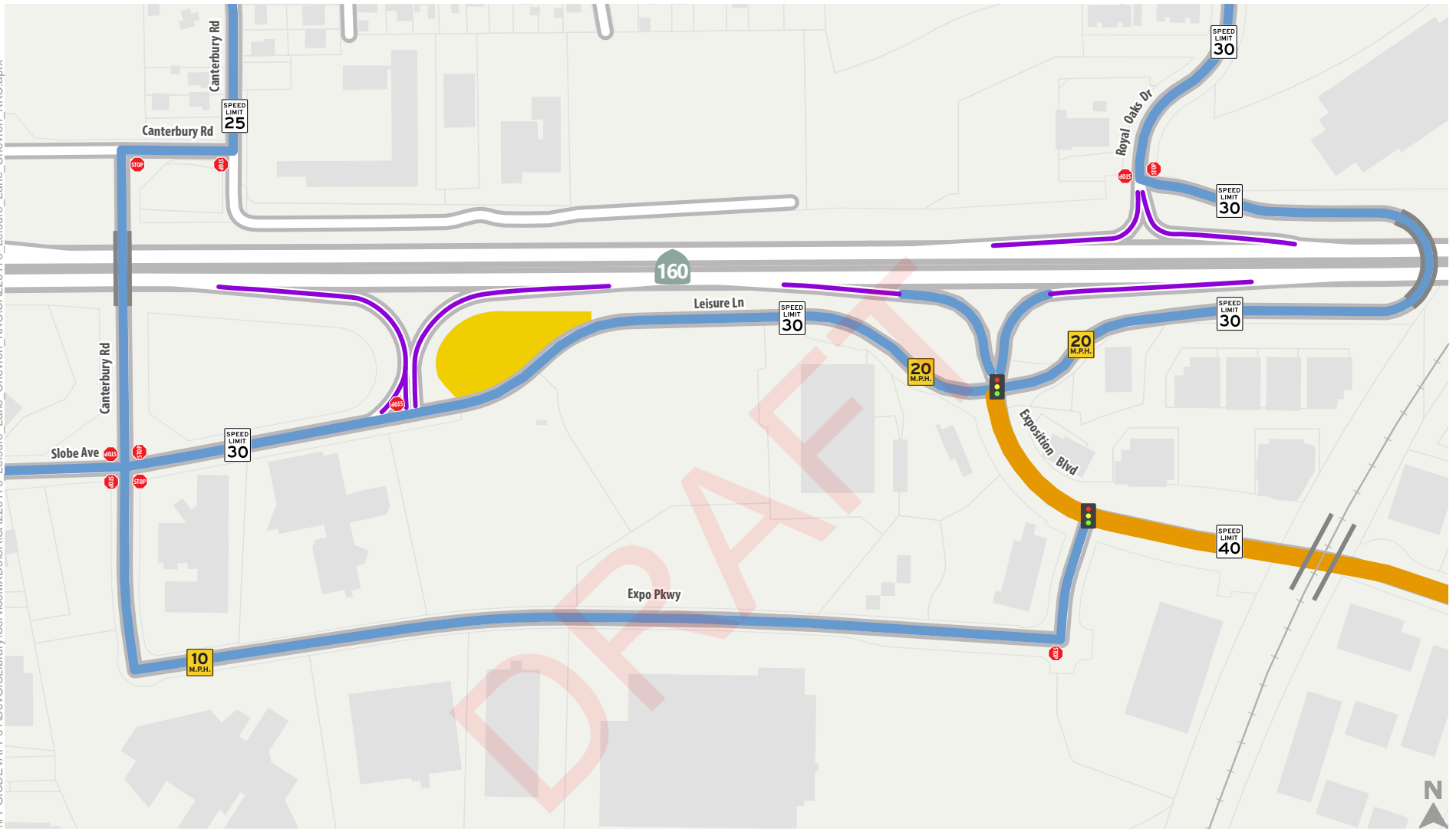
The project site is situated on the north side of Leisure Lane between two State Route (SR) 160 Eastbound ramp terminal intersections. **Figure 2** shows the study area roadway network. Key streets are described below:

- **SR 160** is a four-lane east/west freeway extending from the American River crossing at N. 12th Street/N. 16th Street to I-80 Business (Capital City Freeway) at Arden Way. As shown in Figure 2, SR 160 has two eastbound and two westbound ramp terminal intersections within a $\frac{3}{4}$ mile stretch in the study area.
- **Leisure Lane** is a two-lane east-west street that begins at Canterbury Road, extends easterly through the study area, and crosses over SR 160 before terminating at Royal Oaks Drive. It provides access to the two Eastbound SR 160 on/off-ramps and to one Westbound SR 160 on/off-ramp (at Royal Oaks Drive). Leisure Lane has a posted speed limit of 30 miles per hour (MPH) near the project site.
- **Exposition Boulevard** is an east-west arterial that begins at the SR 160 Eastbound Ramps/Exposition Boulevard/Leisure Lane (#3) intersection and extends easterly until it becomes Arden Way. In the study area, Exposition Boulevard is a four-lane arterial with a raised median and posted speed limit of 40 MPH.
- **Canterbury Road** is a two-lane north-south local road that begins north of SR 160 at Arden Way and reaches its terminus at the Leisure Lane/Slobe Avenue/Expo Parkway/Canterbury Road (#1) intersection. It provides access to the SR 160 Westbound Ramps on the west end of the study area.
- **Expo Parkway** is a two-lane local road that serves medical, residential, and retail land uses between Leisure Lane/Slobe Avenue and Exposition Boulevard.

The City of Sacramento has established City-designated truck routes as well as Surface Transportation Assistance Act (STAA) truck routes throughout the City.¹ STAA routes allow large trucks (longer than California legal trucks) to operate on the interstate freeway system. According to the City's website, SR 160 is designated as an STAA route and Canterbury Road north of the SR 160 Westbound ramps is designated as a "weight restricted route." Signs are posted near each end of Canterbury Road prohibiting truck travel.

¹ <https://www.cityofsacramento.org/Public-Works/Transportation/Traffic-Data-Maps>

\\FPGIS\DEV\APP01\Dev\GIS\Library\ServiceMXDs\SA\SA220175_Leisure_Lane_Chevron_KKC.aprx









- | | | |
|---|------------------------|--|
|  | Project Site | Number of Lanes |
|  | Advisory Speed Limit |  One |
|  | Regulatory Speed Limit |  Two |
| | |  Four |

Figure 2



Existing Roadway Network



2.2 Bicycle and Pedestrian System

Figure 3 displays the existing bicycle and pedestrian facilities in the study area. This data is derived from aerial imagery and field observations. As shown, Class II bike lanes are present on Exposition Boulevard, as well as a portion of the south side of Leisure Lane (though it is noted that markings and signage are not present). Within the study area, sidewalks are generally continuous on the south side of Leisure Lane and Slobe Avenue, as well as both sides of Exposition Boulevard and Expo Parkway. Sidewalks are not present on the north side of Leisure Lane between the two SR 160 Eastbound ramps. Only one Leisure Lane intersection (SR 160 Eastbound Ramps/Exposition Boulevard on the south leg) features a marked crosswalk. There are no existing bicycle or pedestrian facilities on the project frontage.

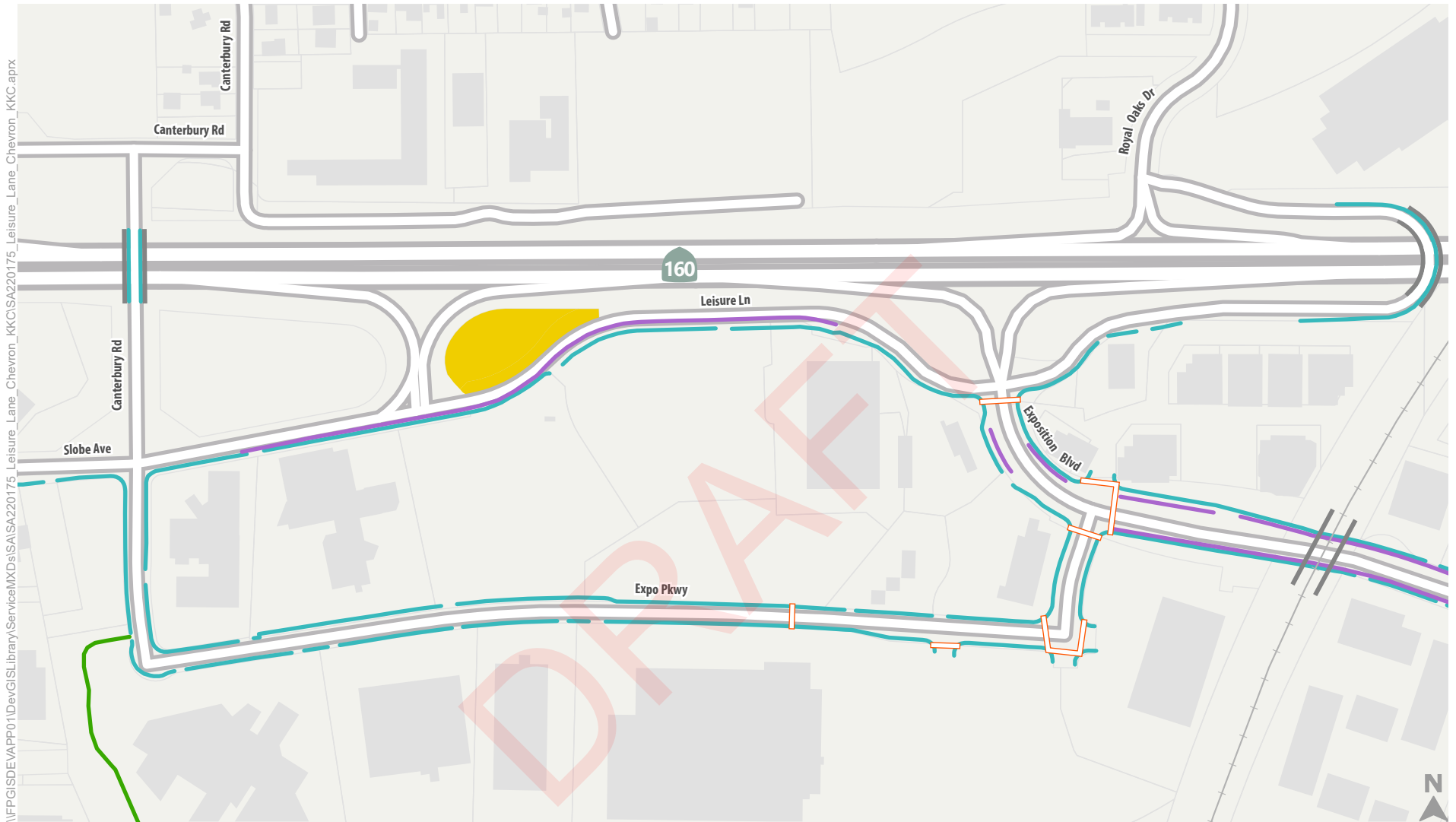
2.3 Transit System

There are no transit facilities or services within the immediate project vicinity. Sacramento Regional Transit (SacRT) operates Routes 13 and 23 along Arden Way, as well as the Arden/Del Paso and Royal Oaks light rail stations, which are all approximately 0.8 miles away from the project site. Routes 67 and 68 have stops on Exposition Boulevard; however, the nearest stop is approximately 1 mile away, east of I-80 Business.

2.4 Traffic Volumes

Fehr & Peers collected AM and PM peak period traffic counts at the study intersections on Tuesday, October 25, 2022. The system peak hours occurred from 7:45 to 8:45 AM and 4:30 to 5:30 PM. The counts included passenger vehicles/SUVs, heavy vehicles, bicyclists, and pedestrians. Trucks represented about 3% of total traffic at study intersections during the morning peak hour and 1% during the evening peak hour. Pedestrian and bicycle activity was low (i.e., 3 or less pedestrian crossings per hour and 3 or less bicycles per hour), except at the Leisure Lane/Slobe Avenue/Expo Parkway/Canterbury Road (#1) intersection, which experienced 4 pedestrians in the PM peak hour and 11 bicyclists in the AM peak hour. At the time of the counts, weather conditions were dry and schools were in session.

Figure 4 displays the existing weekday AM and PM peak hour traffic volumes, lane configurations, and traffic controls at the study intersections.



\\FPG\SIDEVAPP01\Dev\GIS\Library\ServiceMXDs\SA\SA220175_Leisure_Lane_Chevron_KKC\SA220175_Leisure_Lane_Chevron_KKC.aprx

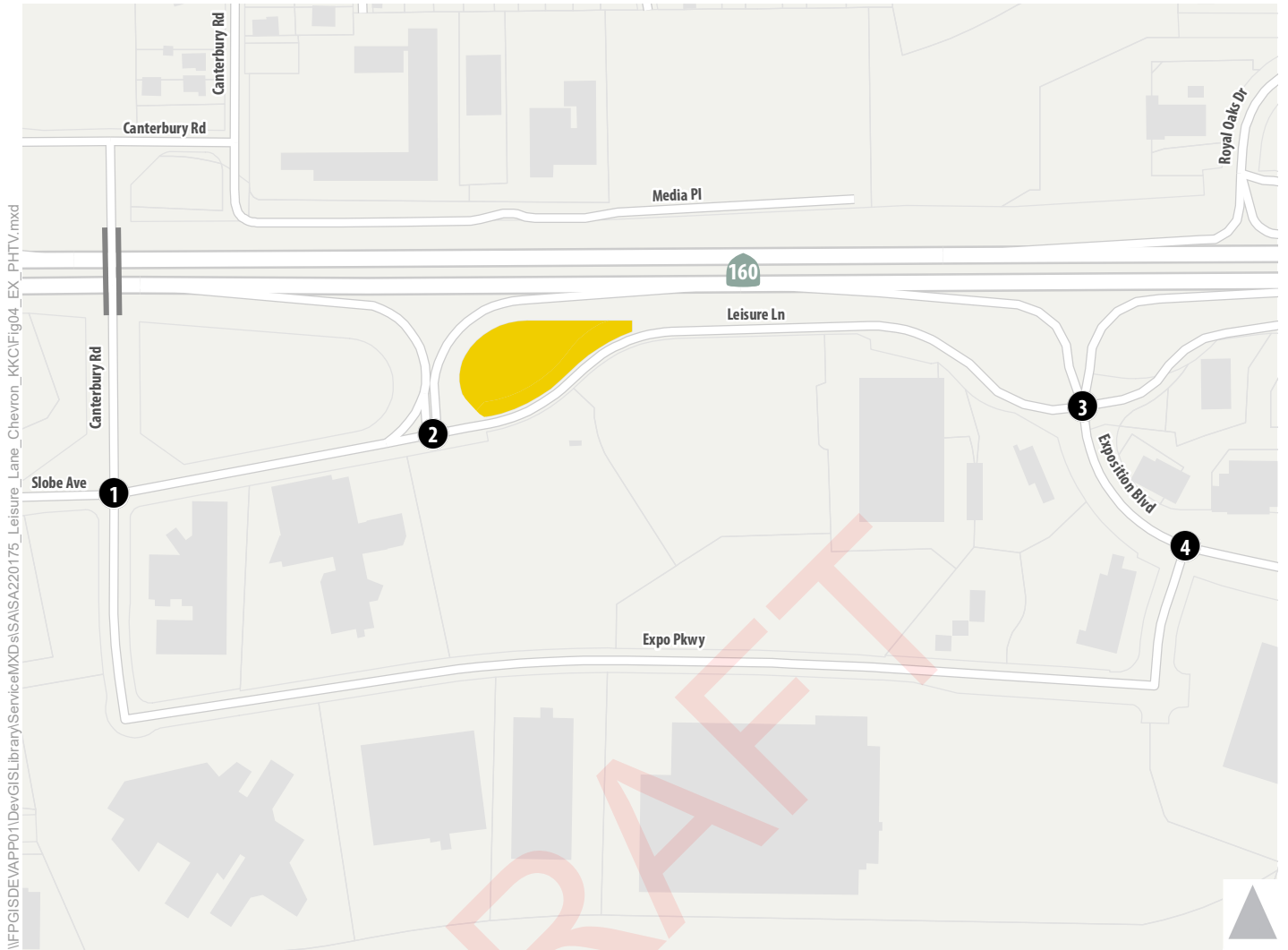
- Bike Facilities
- Class I Bike Path
- Class II Bike Lane
- Sidewalk
- Marked Crosswalk
- Project Site



Note: Only showing bicycle and pedestrian facilities south of State Route 160.

Figure 3

Existing Bicycle and Pedestrian Facilities



1. Expo Pkwy/Canterbury Rd/Slobe Ave/Leisure Ln	2. SR 160 EB Ramps/Leisure Ln	3. Exposition Blvd/SR 160 EB Ramps/Leisure Ln	4. Expo Pkwy/Expo Pointe Dwy/Exposition Blvd
<p>Canterbury Rd</p> <p>Slobe Ave</p> <p>Leisure Ln</p> <p>Expo Pkwy</p> <p>99 (83) 70 (73) 118 (100)</p> <p>38 (124) 105 (43) 30 (67)</p> <p>16 (73) 58 (163) 5 (9)</p> <p>12 (6) 52 (150) 18 (43)</p> <p>Stop Sign</p>	<p>Leisure Ln</p> <p>SR 160 EB Ramps</p> <p>63 (77) 6 (12)</p> <p>0 (3) 110 (156)</p> <p>0 (1) 64 (119) 130 (186)</p>	<p>Leisure Ln</p> <p>SR 160 EB Ramps</p> <p>Exposition Blvd</p> <p>0 (3) 189 (304) 26 (37) 1 (0)</p> <p>20 (37) 9 (8) 196 (196)</p> <p>1 (5) 6 (10) 134 (190)</p> <p>4 (7) 108 (151) 24 (58) 210 (410)</p>	<p>Exposition Blvd</p> <p>Expo Pointe Dwy</p> <p>Expo Pkwy</p> <p>4 (12) 5 (1) 16 (34)</p> <p>66 (5) 286 (446) 233 (357) 1 (4)</p> <p>443 (518) 20 (93)</p> <p>56 (168) 7 (0) 130 (397)</p>

- 1** Study Intersection
- Project Site
- Turn Lane
- Traffic Signal
- Stop Sign
- AM (PM) Peak Hour Traffic Volume

Figure 4

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions





2.5 Intersection Operations

Queue spillbacks at both SR 160 Eastbound off-ramps was studied in detail given the following:

- The SR 160 Eastbound off-ramp approach at the Leisure Lane/SR 160 Eastbound Ramps (#2) intersection is side-street stop-controlled (see **Image 1**)
- The Leisure Lane/Exposition Boulevard/SR 160 Eastbound Ramps (#3) intersection operates with northbound/southbound split phasing. Split phasing is typically associated with greater intersection cycle length and delay. This intersection is also proximate to the signalized Exposition Boulevard/Expo Parkway (#4) intersection, which serves retail uses anchored by Costco. Consistent with signal timing data received from the City, field observations confirmed that these two intersections are not coordinated.
- Fehr & Peers staff observed that eastbound Exposition Boulevard vehicle queues at Expo Parkway (i.e., the eastbound queue at #4) spilled back to the Exposition Boulevard/Leisure Lane/SR 160 Eastbound Ramps (#3) intersection several times during both AM and PM peak hours (see **Image 2**). The spillback occurred in the outside (through/right-turn) lane and was more frequent during the PM peak hour.

The data collection effort on Tuesday, October 25, 2022, included observations of maximum vehicle queues for selected movements. These are shown in **Table 1**. As shown, vehicles at the SR 160 off-ramps at Intersections 2 and 3 (i.e., the southbound approaches) do not spill back to the freeway mainline during peak hours. The only movement shown that exceeds available storage length is the westbound left at the Leisure Lane/SR 160 Eastbound Ramps/Exposition Boulevard (#3) intersection, where a PM peak hour queue of 10 vehicles spills out of the turn pocket. As described below, this queue is not caused by queue spillback from the Exposition Boulevard/Expo Parkway (#4) intersection.

As Image 2 shows, eastbound Exposition Boulevard vehicles at Expo Parkway filled the distance between Intersections 3 and 4 (on the outside lane), and this occurred during both peak hours. However, on the day of the counts, this vehicle queue spillback was observed to not affect operations on Leisure Lane or the SR 160 Eastbound off-ramp. Supplemental observations conducted on December 7, 2022, confirmed that queue spill back between Intersections 3 and 4 occurs several times during the PM peak hour, but no southbound through or westbound left-turn vehicles at Intersection 3 were forced to wait an additional cycle to complete their movements. During one observed cycle, three vehicles taking a right turn from eastbound Leisure Lane were forced to wait until the queue cleared before completing their turn onto southbound Exposition Boulevard. In general, the entire eastbound queue at Intersection 4 dissipates with every signal cycle.



Image 1: View of the southbound off-ramp at the Leisure Lane/SR 160 Eastbound Ramps (#2) intersection.



Image 2: View of the Exposition Boulevard eastbound queue extending back from Expo Parkway (i.e., from Intersection 4) toward Intersection 3.



Table 1: Observed Maximum Vehicle Queues - Existing Conditions

Intersection	Movement	Available Storage ¹	Maximum Queue ²	
			AM Peak Hour	PM Peak Hour
2. Leisure Lane / SR 160 Eastbound Ramps	Southbound Left-Turn	560 ft	25 ft	25 ft
	Southbound Right-Turn	560 ft	50 ft	50 ft
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Northbound Left-Turn	210 ft	125 ft	200 ft
	Northbound Through	275 ft	50 ft	125 ft
	Northbound Right-Turn	275 ft	75 ft	150 ft
	Southbound Left-Turn/Through	290 ft	75 ft	100 ft
	Southbound Through/Right-Turn	390 ft	125 ft	200 ft
	Eastbound Left-Turn	100 ft	25 ft	25 ft
	Eastbound Through	>1,000 ft	50 ft	25 ft
	Eastbound Right-Turn	150 ft	50 ft	150 ft
	Westbound Left-Turn	190 ft	150 ft	<u>250 ft</u>
	Westbound Through/Right-Turn	>1,000 ft	25 ft	50 ft

Notes: **Bold** and underlined indicates exceedance of available storage length.

For above descriptions, Leisure Lane defined as east-west, SR 160 Eastbound ramps and Exposition Boulevard defined as north-south.

1. Defined as length of turn pocket, distance to upstream public street intersection, or distance to freeway diverge gore point.

2. Maximum queue calculated assuming 25 feet of storage per passenger vehicle. All reported values are on a "per lane" basis.

Source: Observations performed on Tuesday, October 25, 2022.

Settings within SimTraffic were calibrated to match (to the extent possible) the maximum queues shown in Table

1.² The following critical movements were compared:

<u>Intersection</u>	<u>Movement</u>	<u>Observed</u>	<u>SimTraffic</u>
2	Southbound Left (AM Peak Hour):	25 feet	50 feet
3	Southbound Through (AM Peak Hour):	125 feet	125 feet
3	Northbound Left (AM Peak Hour):	125 feet	150 feet
3	Westbound Left (AM Peak Hour):	150 feet	175 feet
2	Southbound Left (PM Peak Hour):	25 feet	50 feet
3	Southbound Through (PM Peak Hour):	200 feet	200 feet
3	Northbound Left (PM Peak Hour):	200 feet	175 feet
3	Westbound Left (PM Peak Hour):	250 feet	200 feet

² Perfect calibration is not possible due to random nature of actual arriving traffic (and the assumption of a 1.0 PHF in SimTraffic, versus the slightly more peaked condition in the field).



Table 2 displays the existing LOS and delay during the AM and PM peak hours at the study intersections. Technical calculations are provided in **Appendix A**. As shown, study intersections operate at LOS C or better during both peak hours.

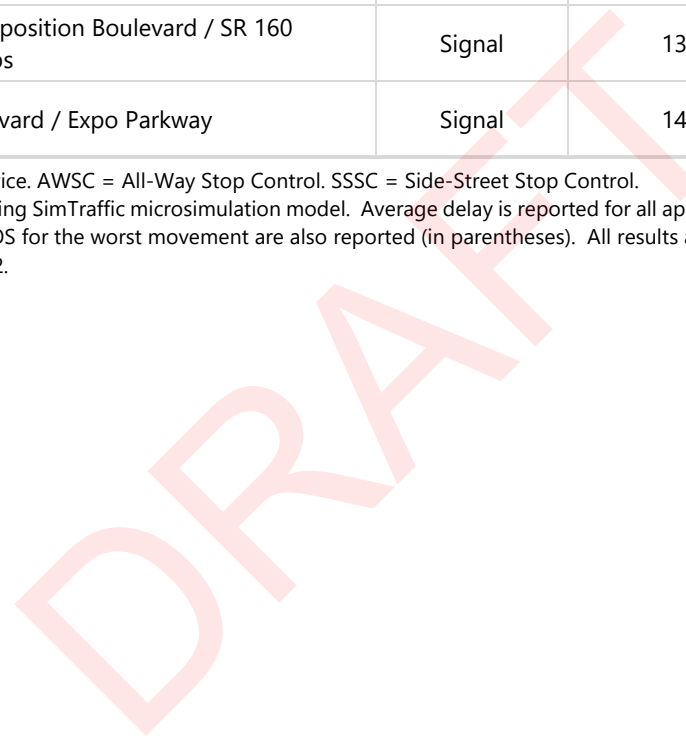
Table 2: Peak Hour Intersection Level of Service - Existing Conditions

Intersection	Control	Average Delay ¹ /LOS	
		AM Peak Hour	PM Peak Hour
1. Expo Parkway / Canterbury Road / Slobe Avenue / Leisure Lane	AWSC	7 / A	7 / A
2. Leisure Lane / SR 160 Eastbound Ramps	SSSC	2 (3) / A (A)	2 (6) / A (A)
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Signal	13 / B	15 / B
4. Exposition Boulevard / Expo Parkway	Signal	14 / B	23 / C

Notes: LOS = Level of Service. AWSC = All-Way Stop Control. SSSC = Side-Street Stop Control.

1. Intersection analyzed using SimTraffic microsimulation model. Average delay is reported for all approaches. For side-street stop-controlled intersections, delay and LOS for the worst movement are also reported (in parentheses). All results are rounded to the nearest second.

Source: Fehr & Peers, 2022.





3. Baseline Conditions

This chapter describes the development of the baseline conditions scenario, upon which project effects are evaluated.

3.1 Approved Projects

Based on discussions with City staff, a “baseline no project” conditions scenario was developed, which represents existing conditions with the addition of trips generated by two approved projects near the study area (see **Figure 5**). These projects are referenced by their corresponding traffic impact studies, described in more detail as follows:

- *Self-Storage Sacramento Traffic Impact Study* (Kimley Horn, 2018) – includes four parcels south of Leisure Lane containing a self-storage facility, 170 units of senior housing, 120-room hotel, and a 50,000 square-foot shopping center. The self-storage facility (CubeSmart) was recently constructed.
- *Media Place Traffic Impact Analysis* (DKS Associates, 2021) – includes two residential developments north of SR 160, adjacent to Media Place and the Royal Oaks Drive/Leisure Lane intersection. These approved developments include a combined 280 units of mid-rise multi-family housing.

The travel characteristics (i.e., trip generation and trip distribution) from the above traffic studies were used to determine the assignment of trips generated by the two approved projects (excluding the self-storage facility, as those trips would already be captured by the October 2022 data collection). The trips were assigned to the roadway network and layered on top of existing conditions traffic volumes to determine baseline conditions volumes. **Figure 6** displays the traffic volumes under baseline conditions.

3.2 Intersection Operations

Table 3 displays the LOS and delay during the AM and PM peak hours at the study intersections under baseline conditions (technical calculations are provided in **Appendix A**). As shown, average delay increased by up to four seconds at each intersection compared to existing conditions. All study intersections would continue to operate at LOS C or better under baseline conditions.

Baseline conditions would add an average of 40 vehicles per intersection approach during the AM and PM peak hours, which equates to about 1 additional vehicle every 90 seconds. As a result, vehicle queues increased mildly compared to existing conditions. **Table 4** shows the westbound and northbound left-turn queues at Leisure Lane/Exposition Boulevard/SR 160 Eastbound Ramps (#3) exceed available storage under baseline conditions, while the SR 160 Eastbound off-ramp queues continue to be contained within available storage. As in existing conditions, queue spillback on eastbound Exposition Boulevard at Expo Parkway did not appreciably affect upstream operations.



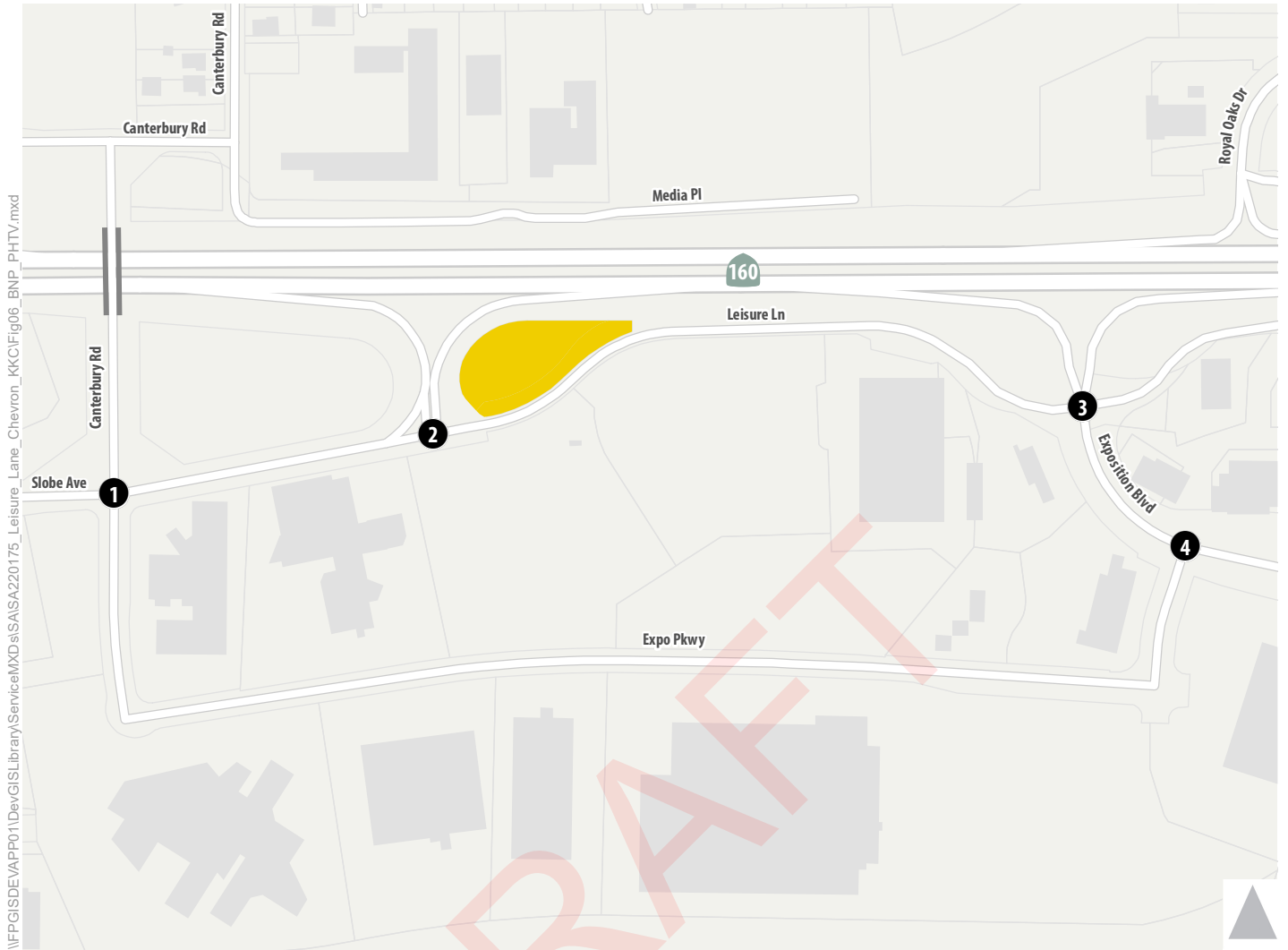
\\FGISDEVAPP011\Dev\GIS\Library\ServiceMXDs\SA\SA220175_Leisure_Lane_Chevron_KKC\SA220175_Leisure_Lane_Chevron_KKC.aprx

- Project Site
- Approved Projects
- Media Place Multi-Family Housing Development
- CubeSmart Storage (Developed)
- BLR Apartments, LLC Development: Senior Housing, Hotel, and Shopping Center

Figure 5



Approved Projects



1. Expo Pkwy/Canterbury Rd/Slobe Ave/Leisure Ln	2. SR 160 EB Ramps/Leisure Ln	3. Exposition Blvd/SR 160 EB Ramps/Leisure Ln	4. Expo Pkwy/Expo Pointe Dwy/Exposition Blvd
<p>Canterbury Rd</p> <p>Slobe Ave</p> <p>Leisure Ln</p> <p>Expo Pkwy</p> <p>99 (83) 74 (76) 142 (120)</p> <p>70 (177) 105 (43) 39 (76)</p> <p>16 (73) 58 (163) 5 (9)</p> <p>12 (6) 61 (157) 21 (45)</p> <p>Stop Sign</p>	<p>Leisure Ln</p> <p>SR 160 EB Ramps</p> <p>77 (100) 27 (36)</p> <p>7 (11) 137 (195)</p> <p>0 (1) 77 (128) 144 (199)</p>	<p>Leisure Ln</p> <p>SR 160 EB Ramps</p> <p>Exposition Blvd</p> <p>11 (16) 192 (304) 28 (43) 1 (0)</p> <p>29 (43) 51 (49) 222 (218)</p> <p>30 (49) 10 (18) 150 (215)</p> <p>4 (7) 129 (179) 35 (67) 214 (416)</p>	<p>Exposition Blvd</p> <p>Expo Pointe Dwy</p> <p>Expo Pkwy</p> <p>4 (12) 5 (1) 16 (34)</p> <p>66 (5) 309 (478) 242 (368) 1 (4)</p> <p>466 (548) 42 (110)</p> <p>69 (178) 7 (0) 136 (402)</p>

- 1** Study Intersection
- Project Site
- Turn Lane
- AM (PM)** Peak Hour Traffic Volume
- Traffic Signal
- Stop Sign

Figure 6

Peak Hour Traffic Volumes and Lane Configurations - Baseline No Project Conditions





Table 3: Peak Hour Intersection Level of Service - Baseline Conditions

Intersection	Control	Average Delay ¹ /LOS	
		AM Peak Hour	PM Peak Hour
1. Expo Parkway / Canterbury Road / Slobe Avenue / Leisure Lane	AWSC	7 / A	8 / A
2. Leisure Lane / SR 160 Eastbound Ramps	SSSC	2 (7) / A (A)	3 (7) / A (A)
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Signal	15 / B	17 / B
4. Exposition Boulevard / Expo Parkway	Signal	14 / B	25 / C

Notes: LOS = Level of Service. AWSC = All-Way Stop Control. SSSC = Side-Street Stop Control.

1. Intersection analyzed using SimTraffic microsimulation model. Average delay is reported for all approaches. For side-street stop-controlled intersections, delay for the worst movement is also reported (in parentheses). All results are rounded to the nearest second.

Source: Fehr & Peers, 2022.

Table 4: Peak Hour Maximum Vehicle Queues – Baseline Conditions

Intersection	Movement	Available Storage ¹	Maximum Queue ²			
			Baseline Conditions		Increase from Existing	
			AM	PM	AM	PM
2. Leisure Lane / SR 160 Eastbound Ramps	Southbound Left-Turn	560 ft	50 ft	50 ft	+25 ft	+25 ft
	Southbound Right-Turn	560 ft	75 ft	75 ft	+25 ft	+25 ft
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Northbound Left-Turn	210 ft	125 ft	225 ft	-	+25 ft
	Northbound Through	275 ft	75 ft	125 ft	+25 ft	-
	Northbound Right-Turn	275 ft	100 ft	175 ft	+25 ft	+25 ft
	Southbound Left-Turn/Through	290 ft	75 ft	150 ft	-	+50 ft
	Southbound Through/Right-Turn	390 ft	150 ft	225 ft	+25 ft	+25 ft
	Eastbound Left-Turn	100 ft	75 ft	75 ft	+50 ft	+50 ft
	Eastbound Through	>1,000 ft	50 ft	75 ft	-	+50 ft
	Eastbound Right-Turn	150 ft	50 ft	150 ft	-	-
	Westbound Left-Turn	190 ft	200 ft	275 ft	+50 ft	+25 ft
	Westbound Through/Right-Turn	>1,000 ft	100 ft	150 ft	+75 ft	+100 ft

Notes: **Bold** indicates exceedance of available storage length.

1. Defined as length of turn pocket, distance to upstream public street intersection, or distance to freeway diverge gore point.

2. Increase in maximum queue determined by adding additional queue from the project (estimated by SimTraffic) to the baseline conditions maximum queue. All reported values are on a "per lane" basis.

Source: Fehr & Peers, 2022.



4. Baseline Plus Project Conditions

This chapter analyzes how the proposed project would affect transportation conditions in the study area.

4.1 Project Travel Characteristics

This section describes the project's expected travel characteristics including new and pass-by vehicle trips, and the directionality of those trips.

4.1.1 Trip Generation

Project trip generation estimates were calculated using trip rates from the *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, 2021). **Table 5** presents the project's daily, AM peak hour, and PM peak hour trip generation. Table 5 also shows expected pass-by traffic. A pass-by trip is made by a motorist who enters the site to purchase gas or food while en-route to a different primary destination. These trips are already present on Leisure Lane, though they would add trips to the project driveway. The *Trip Generation Manual* contains estimates as high as 76% pass-by for gas stations with 9 to 20 vehicle fueling positions. However, based on a review of peak hour and daily traffic data, the existing traffic volume on Leisure Lane would not support this level of pass-by activity (as it would require an unreasonably high proportion of travelers to pull into the project site). Consistent with standard industry practice, pass-by trips to the site were capped at 15% of the existing, adjacent street traffic flow. All remaining project trips (including diverted trips made by motorists already traveling on SR 160) are new trips and added to the study intersections and project driveway.

After accounting for pass-by trips, the project is expected to generate about 2,522 net new external vehicles on a weekday, with 206 vehicle trips during the AM peak hour, and 176 vehicle trips during the PM peak hour.



Table 5: Project Vehicle Trip Generation

ITE Land Use Category	ITE Code	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total	In	Out	Total
Convenience Store/Gas Station (2-4k GFA) ¹	945	12 VFP	1,375	1,375	2,750	96	96	192	111	111	222
Fast-Food Restaurant with Drive-Through Window ²	934	1.65 KSF	386	386	772	38	36	74	28	26	54
Gross Project Trips			1,761	1,761	3,522	134	132	266	139	137	276
Pass-By Trips ³			500	500	1,000	30	30	60	50	50	100
Net New External Project Trips			1,261	1,261	2,522	104	102	206	89	87	176

Notes: VFP = vehicle fueling position. KSF = thousand square feet.

¹ Daily trip generation derived from the fitted curve equation of the "Convenience Store/Gas Station" land use category. The AM and PM peak hour trip generation is derived from the weighted average trip rate.

² Trip generation derived from weighted average trip rate of the "Fast-Food Restaurant with Drive-Through Window" land use category.

³ Refer to above text for discussion of pass-by reductions.

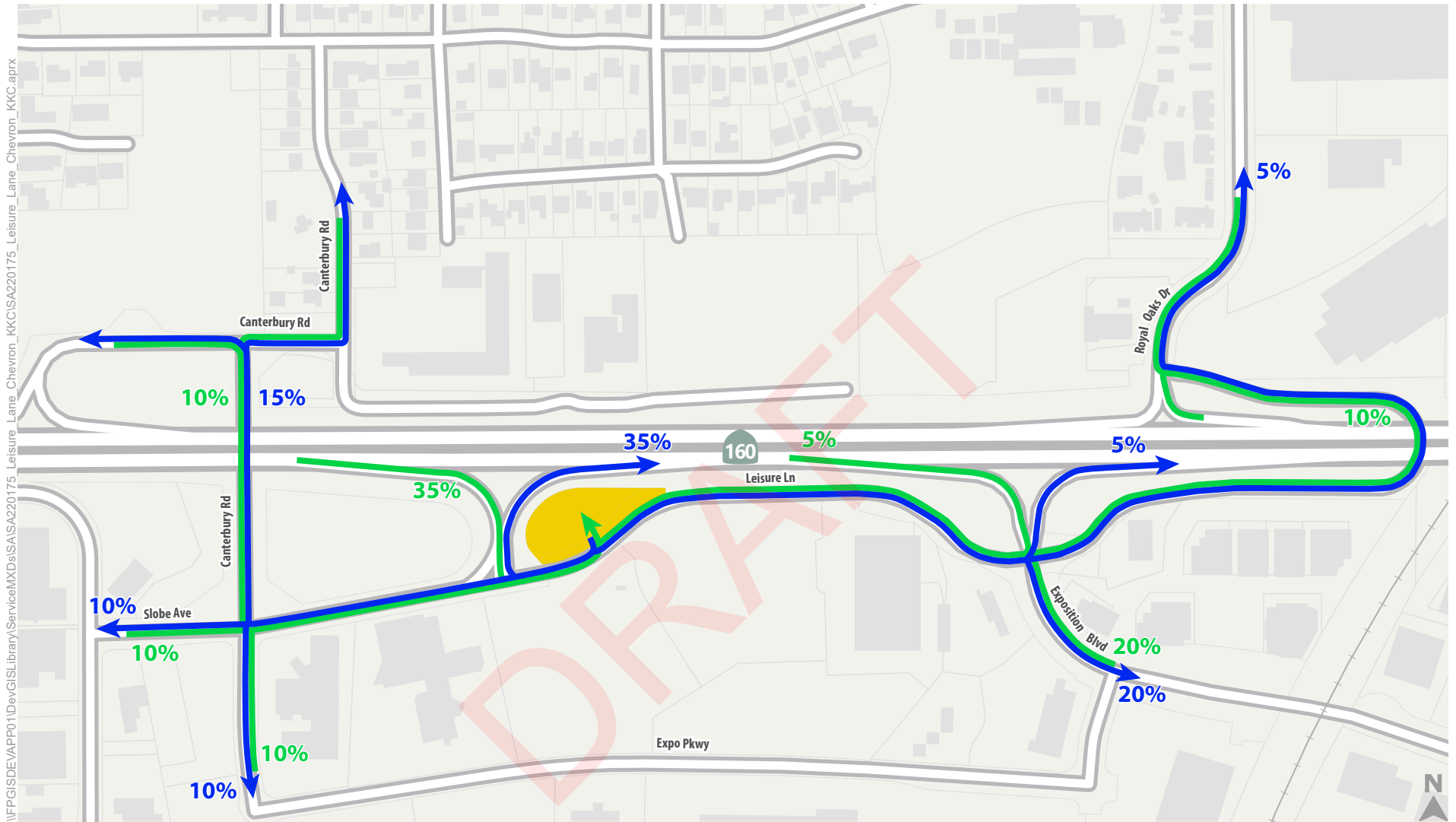
Source: *Trip Generation Manual, 11th Edition* (ITE, 2021); Fehr & Peers, 2022.

4.1.2 Vehicle Trip Distribution and Assignment

Based on a review of existing AM and PM peak hour turning movement volumes, the distribution of new project trips was estimated and is shown in **Figure 7**. The project site may be accessed by vehicles on a variety of roads in the study area, including diverted link trips from SR 160. The relative ease of accessing the project site for motorists on eastbound SR 160 (versus westbound SR 160) was considered in the development of trip distribution, as was the location of other Chevron gas stations. The *Trip Generation Manual* indicates that diverted link trips represent 20 to 30% of trips generated by gas stations and fast-food restaurants during peak hours. This, along with the ease of exiting and then re-entering eastbound SR 160, explains why 40% of new project trips are distributed to and from eastbound SR 160. As shown on Figure 7, the remaining trips are distributed across a variety of different roadways including westbound SR 160, Canterbury Road, Slobe Avenue, Expo Parkway, Leisure Lane, and Exposition Boulevard.

Pass-by trips generated by the project are assigned to the project driveway in proportion to adjacent traffic flows on Leisure Lane.

Project trips were assigned to study intersections in accordance with the project's trip generation estimate from Table 5 and trip distribution percentages in Figure 7. Project trips were then added to the baseline conditions volumes to yield the baseline plus project AM and PM peak hour intersection turning movement volume forecasts shown on **Figure 8**.



\\FPGIS\DEV\APP011\Dev\GIS\Library\ServiceMXDs\SA\SA220175_Leisure Lane Chevron_KKC\SA220175_Leisure Lane Chevron_KKC.aprx

- Project Site
- Outbound Trip Distribution (%)
- Inbound Trip Distribution (%)



Figure 7

Trip Distribution

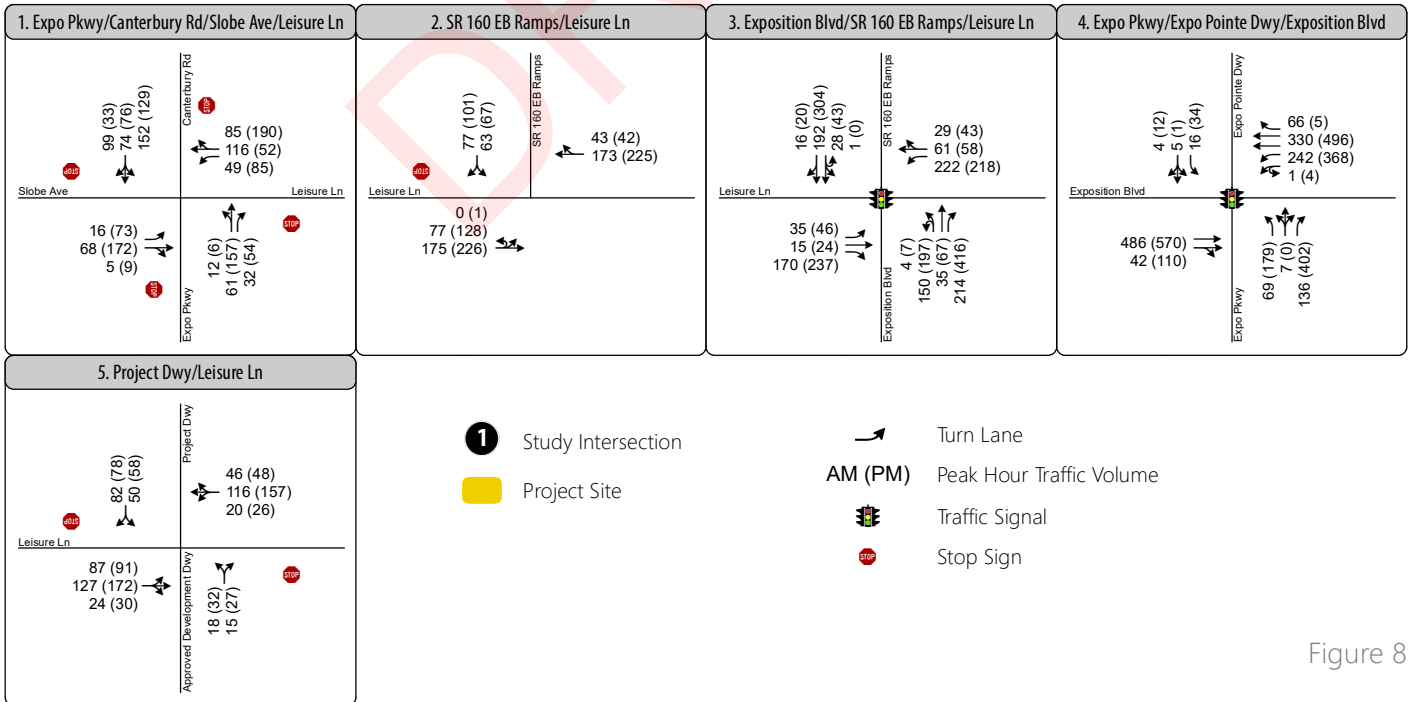
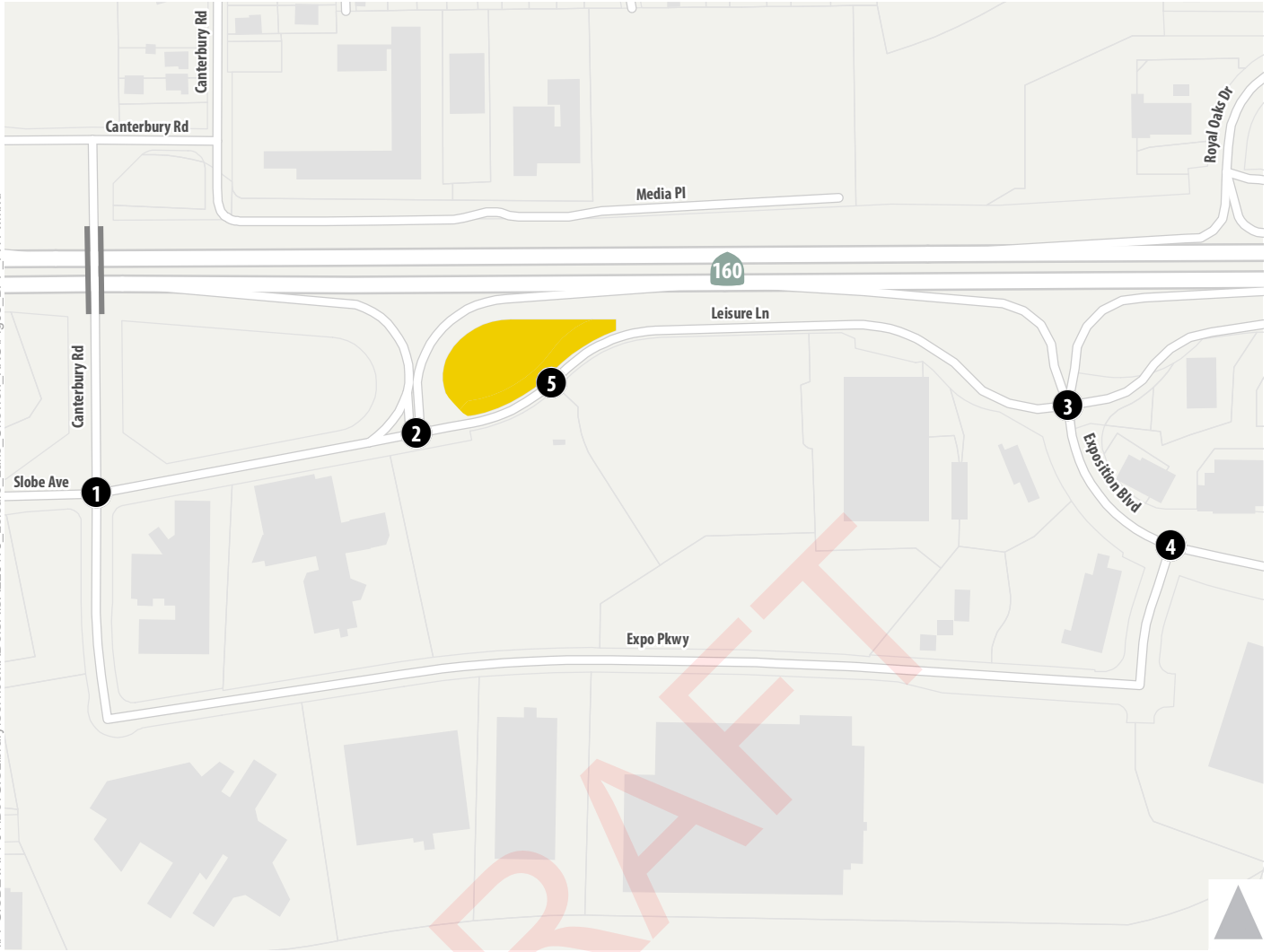


Figure 8

Peak Hour Traffic Volumes and Lane Configurations - Baseline Plus Project Conditions





4.2 Vehicle Miles Traveled (VMT)

The *Transportation Impact Analysis Guidelines* (City of Sacramento, 2020) recommend the use of “screening thresholds” to quickly determine whether a project may be presumed to have a less-than-significant VMT impact without conducting a detailed project generated VMT analysis. Screening can be used for “small projects” based on the definition and project sizes below:

- Absent substantial evidence indicating that a project would generate a potentially significant level of VMT or inconsistency with the regional Sustainable Communities Strategy (SCS) or inconsistency with the adopted General Plan, projects with up to 10 single unit homes, projects with up to 15 multiple unit homes, retail projects up to 50,000 cumulative square feet, light industrial projects up to 20,000 square feet, and office projects up to 10,000 square feet may be assumed to cause a less-than significant transportation impact.

Although far less than 50,000 square feet of building space is proposed on the project site, the project’s trip generation is nevertheless considerable given the proposed uses. The *Transportation Impact Analysis Guidelines* (City of Sacramento, 2020) contains the following significance criteria for retail projects:

- Retail projects greater than 50,000 cumulative square feet that do not create a net increase in total VMT should be presumed to have a less than significant impact.

The proposed project would generate a negligible amount of new VMT. This conclusion is based on the following facts:

1. About 28% of trips generated by the project would be ‘pass-by’ from Leisure Lane. Pass-by traffic, by definition, does not generate VMT as the trip is already on the adjacent street.
2. Of the project trips that are net new (i.e., non-pass-by), a significant proportion will be ‘diverted’ from SR 160, which is a key commute corridor between downtown Sacramento and eastern Sacramento/Placer Counties. Each day, over 37,000 motorists travel the adjacent segment of SR 160 according to Caltrans. The project site is highly accessible for those motorists to divert off the freeway for gas or convenience market items. In fact, the project provides an “intervening opportunity”, whereby a traveling motorist may instead choose to visit this site versus a different site located a greater distance away from SR 160 or the Capital City Freeway. These shifted trips would result in a net reduction in VMT.
3. There are six other Chevron gas stations and convenience markets already constructed within a 3-mile radius of the project site. Hence, the vast majority of new trips that are made to the site will be of short distance.

Therefore, because the project would not generate a substantial amount of new VMT, project impacts related to VMT are considered less than significant.



4.3 Intersection Operations

Table 6 displays the baseline plus project intersection LOS and delay during the AM and PM peak hours at the study intersections and project driveway. Technical calculations are provided in **Appendix A**. As discussed in Chapter 1, LOS D or better conditions is the operating objective for the study intersections. Table 6 indicates that the project would cause minor vehicle delay increases at study intersections and would not cause LOS to degrade below LOS C. This is likely due to the following three factors:

- The project site can be accessed by vehicles on a variety of roads in the study area (e.g., SR 160, Royal Oaks Drive, Canterbury Road, Exposition Boulevard, etc.), which spreads out the effect of project trips.
- The study intersections have reserve capacity, as they operate efficiently under existing and baseline conditions.
- Approximately 23% of AM peak hour trips and 36% of PM peak hour trips generated by the project would be pass-by, meaning they would not be adding vehicles to the surrounding network.

Table 6: Peak Hour Intersection Level of Service – Baseline Plus Project Conditions

Intersection	Control	Average Delay ¹ /LOS			
		Baseline Conditions		Baseline Plus Project Conditions	
		AM	PM	AM	PM
1. Expo Parkway / Canterbury Road / Slobe Avenue / Leisure Lane	AWSC	7 / A	8 / A	8 / A	9 / A
2. Leisure Lane / SR 160 Eastbound Ramps	SSSC	2 (7) / A (A)	3 (7) / A (A)	3 (7) / A (A)	4 (9) / A (A)
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Signal	15 / B	17 / B	16 / B	19 / B
4. Exposition Boulevard / Expo Parkway	Signal	14 / B	25 / C	14 / B	25 / C
5. Leisure Lane/Project Driveway	SSSC	-	-	4 (9) / A (A) ²	9 (15) / A (B) ²

Notes: LOS = Level of Service. AWSC = All-Way Stop Control. SSSC = Side-Street Stop Control.

¹ Intersection analyzed using SimTraffic microsimulation model. Average delay is reported for all approaches. For side-street stop-controlled intersections, delay for the worst movement is also reported (in parentheses). All results are rounded to the nearest second.

² Worst-case movement is the project driveway approach to Leisure Lane.

Source: Fehr & Peers, 2022.

Table 7 displays the maximum expected queue lengths under baseline plus project conditions for critical turning movements at the study intersections. Vehicle queues increased 50 feet or less compared to baseline conditions for the movements shown. The project exacerbates the northbound left-turn queue at Intersection 3, which already exceeds available storage during the PM peak hour under baseline conditions. Since the project would increase the northbound left turn queue by 50 feet, it is recommended that the signal at this intersection be retimed. The project would be responsible for the fair share cost of signal retiming.



The eastbound Exposition Boulevard vehicle queues at Expo Parkway are marginally worse under baseline plus project conditions. As shown in **Image 3**, vehicles momentarily queue into the Leisure Lane/Exposition Boulevard/SR 160 Eastbound Ramps (#3) intersection. This type of intersection blockage rarely occurred in the microsimulation (i.e., one time or less on an average run) and did not impair operations at Intersection 3 beyond the cycle it occurred. Table 7 shows that off-ramp queuing at Intersection 3 is contained within available storage.

This table shows a maximum queue of four vehicles waiting to exit the project driveway during each peak hour. This occurs as a result of over 130 vehicles per hour attempting to turn out of this driveway, and having to find gaps in Leisure Lane through traffic, which totals 524 vehicles during the PM peak hour. Options for addressing this condition are discussed in Chapter 5. Table 7 also indicates that vehicle queues of two to three vehicles are expected in the shared eastbound left/through/right and westbound left/through/right lanes. This is caused by the lack of dedicated left-turn pockets and the level of through traffic on Leisure Lane.

Table 7: Peak Hour Maximum Vehicle Queues – Baseline Plus Project Conditions

Intersection	Movement	Available Storage ¹	Maximum Queue ²			
			Baseline Plus Project Conditions		Change from Baseline	
			AM	PM	AM	PM
2. Leisure Lane / SR 160 Eastbound Ramps	Southbound Left-Turn	560 ft	75 ft	75 ft	+25 ft	+25 ft
	Southbound Right-Turn	560 ft	100 ft	100 ft	+25 ft	+25 ft
3. Leisure Lane / Exposition Boulevard / SR 160 Eastbound Ramps	Northbound Left-Turn	210 ft	150 ft	<u>275 ft</u>	+25 ft	+50 ft
	Northbound Through	275 ft	75 ft	150 ft	-	+25 ft
	Northbound Right-Turn	275 ft	100 ft	175 ft	-	-
	Southbound Left-Turn/Through	290 ft	100 ft	150 ft	+25 ft	-
	Southbound Through/Right-Turn	390 ft	150 ft	225 ft	-	-
	Eastbound Left-Turn	100 ft	75 ft	75 ft	-	-
	Eastbound Through	>1,000 ft	50 ft	75 ft	-	-
	Eastbound Right-Turn	150 ft	50 ft	150 ft	-	-
	Westbound Left-Turn	190 ft	<u>200 ft</u>	<u>275 ft</u>	-	-
	Westbound Through/Right-Turn	>1,000 ft	100 ft	150 ft	-	-
5. Leisure Lane / Project Driveway	Southbound Left-Turn/Right-Turn	25 ft	<u>100 ft</u>	<u>100 ft</u>	-	-
	Eastbound Left-Turn/Through	265 ft	75 ft	75 ft	-	-
	Westbound Through/Right-Turn	1,000 ft	50 ft	50 ft	-	-

Notes: **Bold** and underlined indicates exceedance of available storage length.

For above descriptions, Leisure Lane defined as east-west, SR 160 Eastbound ramps and Exposition Boulevard defined as north-south.

1. Defined as length of turn pocket, distance to upstream public street intersection, or distance to freeway diverge gore point.

2. Increase in maximum queue determined by adding additional queue from the project (estimated by SimTraffic) to the baseline conditions maximum queue. All reported values are on a “per lane” basis.

Source: Fehr & Peers, 2022.

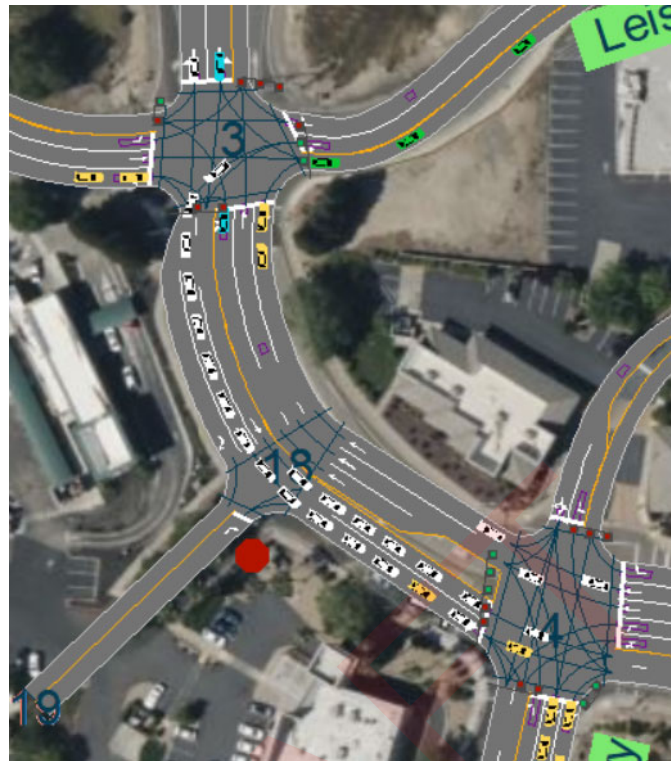


Image 3: SimTraffic modeling shows queue spillback on Exposition Boulevard under baseline plus project conditions. This condition exists currently but is exacerbated to a slight degree by the addition of project trips.

4.4 Signal Warrant Analysis

Per direction received from City staff, the four-hour (Warrant 2) and peak hour (Warrant 3) signal warrants were evaluated at the Leisure Lane/Canterbury Road/Slobe Avenue/Expo Parkway (#1) intersection based on the *California Manual on Uniform Control Devices* (MUTCD) (Caltrans, 2014). The signal warrant analysis was completed for existing, baseline, and baseline plus project conditions. To develop volume estimates, projections of background traffic (i.e., traffic from the two approved projects) and project trips were performed for 4 specific peak hours using 24-hour temporal arrival/departure patterns for the various land uses, as described in the *Trip Generation Manual, 11th Edition*.

A review of 24-hour volumes at the Leisure Lane/Canterbury Road/Slobe Avenue/Expo Parkway (#1) intersection showed that the designation of “major street” and “minor street” varied by hour, and volumes during several hours were similar between the eastbound/westbound and northbound/southbound approaches. Therefore, the warrants were completed twice, each assuming either Leisure Lane/Slobe Avenue or Canterbury Road/Expo Parkway as the “major street.”

The following guidance in the MUTCD (Section 4C.01) is particularly relevant to the signal warrants analysis:

...[For] an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn



lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.

Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.

Based on this guidance and the projected intersection volumes, the signal warrants were applied assuming a one-lane approach on both major and minor streets. In addition, for the case where Leisure Lane/Slobe Avenue was considered the minor street, westbound right-turning vehicles were not included in the side-street volume, as they are channelized and enter the major street with “minimal conflict.”

Table 8 displays the results of the signal warrant analysis (see **Appendix C** for signal warrant inputs and outputs). The analysis shows that neither Warrant 2 nor Warrant 3 are met under any scenario analyzed. All-way stop control is therefore recommended to remain.

Table 8: Signal Warrant Analysis – Leisure Lane/Slobe Avenue/Canterbury Road/Expo Parkway Intersection

Scenario	Number of Hours Warrant 2 Met ¹	Warrant 2 Met?	Warrant 3 Met? ²	
			AM Peak Hour	PM Peak Hour
Existing Conditions	0	No	No	No
Baseline Conditions	1	No	No	No
Baseline Plus Project Conditions	2	No	No	No

Notes:

¹ To meet Warrant 2 (Four-Hour Warrant), the warrant must be met during 4 non-overlapping hours in a 24-hour period.

² Warrant 3 (Peak Hour Warrant) results reflect both Warrant 3A and 3B.

Source: Fehr & Peers, 2022.



5. Project Access and On-Site Circulation Evaluation

This chapter evaluates access to the project site as well as internal circulation within the site. Recommendations are offered to improve circulation for all modes of travel.

5.1 Project Consistency with Applicable City Roadway Design Standards

The *City of Sacramento Design and Procedures Manual: Section 15 Street Design Standard* (2009) includes various standards pertaining to the design of roadways, driveways, bicycle, pedestrian, and transit facilities. Additional design standards can be found in the City's municipal code.³ Each applicable standard from the above resources is described below, followed by an evaluation of the extent to which the project conforms to it.

For purposes of evaluating required frontage improvements, City of Sacramento staff directed Fehr & Peers to consider Leisure Lane to be a minor collector. Therefore, the standards below are applied for minor collectors, where applicable.

Driveway Design Elements

1. *Offset intersections (i.e., spaced across the street from each other) that permit full access should be located at least 120 feet apart (relative to each driveway's centerline).*

Evaluation: A driveway has recently been constructed on the south side of Leisure Lane across from the project site. If the project driveway was constructed in its currently proposed location, it would be offset by about 25 feet.

Consistent: No.

2. *Non-residential driveways shall be designed in accordance with the "Sight Distance" requirements as defined by the Caltrans Highway Design Manual, HDM, Sections 201 and 405.*

Evaluation: Based on discussions with City staff, a "stopping sight distance (SSD)" value was used to evaluate sight distance for motorists exiting the project driveway looking to the left and right. This is necessary given the horizontal curvature of Leisure Lane and proposed landscaping along the project frontage. A SSD value of 250 feet was applied based on a design speed of 35 MPH (*Highway Design Manual*, Table 201.1), which is 5 MPH above the posted speed limit. An adequate SSD is achieved if a motorist exiting the project site has an unimpeded view of an approaching vehicles for a distance of at least 250 feet (measured along Leisure Lane). The HDM has other specific measurement requirements (e.g., vehicle setback distance from edge of

³ https://library.qcode.us/lib/sacramento_ca/pub/city_code/item/title_17-division_v-chapter_17_508-17_508_050



traveled way), which were followed in this analysis. **Figure 9** displays the line of sight for a motorist exiting the project driveway looking to the left and right. Just west of the project driveway is an area highlighted in green, which is shown as a planter strip on the project site plan. Figure 9 indicates that any plantings in this area should be restricted to low height landscaping (six inches or less) or hardscaping. A similar exercise was performed for outbound motorists looking to the left.

Figure 9 indicates that the two parking spaces proposed in the southwest corner of the project site do not preclude the minimal SSD from being achieved. However, parking vehicles in these spaces would become the limiting factor in terms of what initially blocks the line of sight of an oncoming eastbound vehicle. The HDM includes a second type of sight distance, known as "Corner Sight Distance". While not required for project driveways, CSD is often desired to provide an improved line of sight of oncoming traffic. As shown on Figure 9, if the two parking spaces were removed, a much-improved line of sight of oncoming traffic would be provided. It is therefore recommended that these two parking spaces be relocated to a different part of the project site.

Consistent: No.

3. *No driveways shall be allowed within the corner radius of an intersection, nor areas of turn lanes or tapers at freeway ramps. Additionally, no driveways shall be allowed within 10 feet of a pedestrian ramp.*

Evaluation: The project would not construct a driveway within the corner radius of an intersection, a turn lane or taper at a freeway ramp, or within 10 feet of a pedestrian ramp.

Consistent: Yes.

4. *Unless approved by the city traffic engineer, no gates or other obstructions may be placed within 20 feet of the public right-of-way on entrance driveways.*

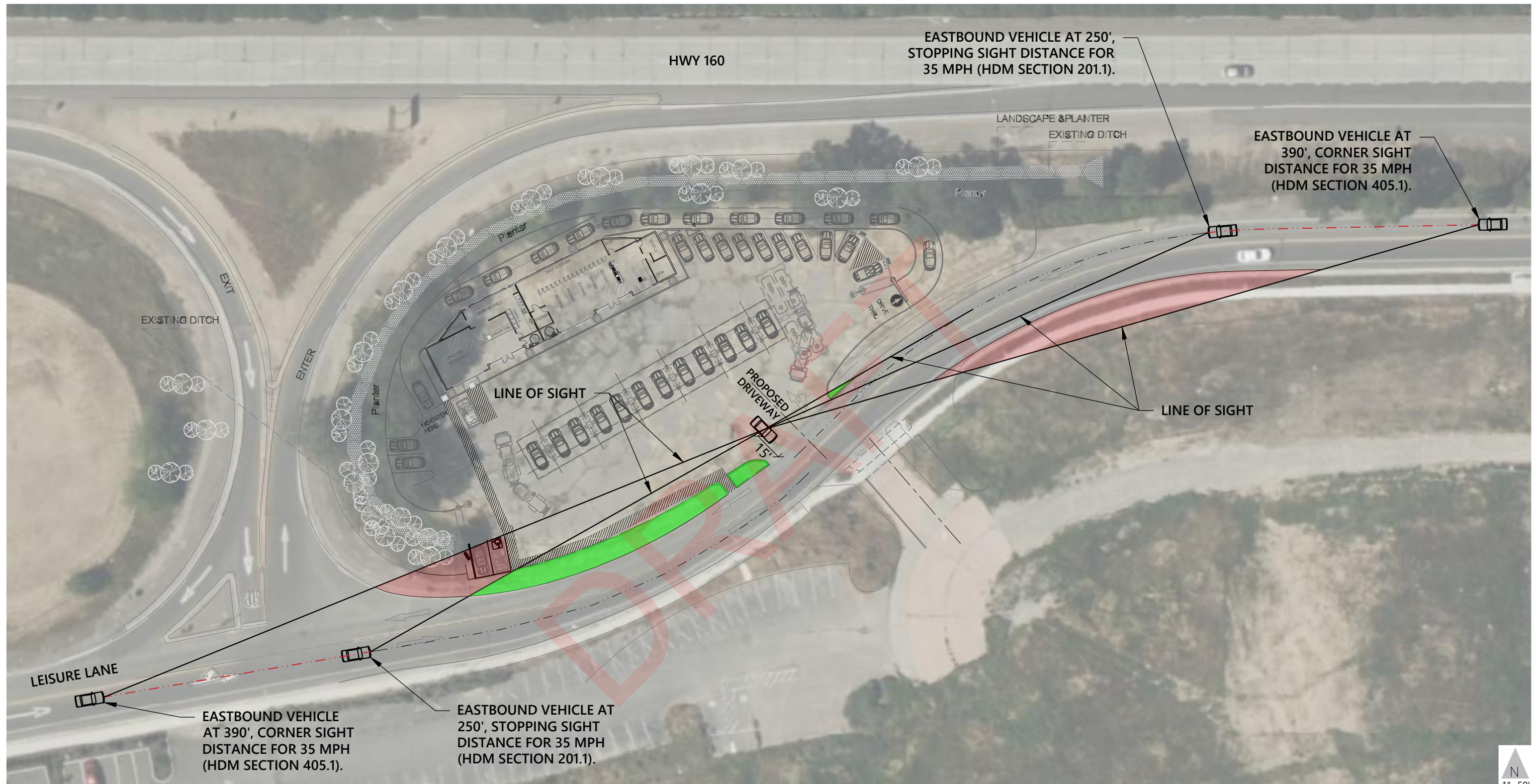
Evaluation: The project would place fueling pumps more than 20 feet away from the public right-of-way.

Consistent: Yes.

5. *Except on minor local streets where the size or shape of the lot is such that development would be otherwise precluded, no commercial driveway, industrial driveway, or parking area shall be designed to require a vehicle to back into or out of the public right-of-way.*

Evaluation: The project would not require vehicles to back into or out of the public right-of-way.

Consistent: Yes.



1" = 50'



LEGEND

--- SIGHT DISTANCE

 DESIGN OF VERTICAL ELEMENTS IN THIS AREA TO CONSIST OF MINIMAL HEIGHT LANDSCAPING OR HARDSCAPING.

Figure 9
Sight Distance
Leisure Lane and Proposed Project Driveway

CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

Dec 15, 2022 CADD FILE: M:\PROJECTS\3042\0175.00_Leisure_Lane_Chevron_KKC_Analysis\CAD\0175-Sight-Distance_v2.dwg



6. *Acceleration and deceleration lanes may be required at driveways and minor intersections based on the street designation, design speed, and projected volumes. These lanes may be required on narrow or high-speed roads or for large shopping centers, industrial developments, or other large developments.*

Evaluation: The project site plan does not show acceleration or deceleration lanes at the driveway. Based on discussions with City staff, these lanes are not feasible given that construction of such turn lanes would require reconstruction of the frontage for the parcel south of Leisure Lane and/or the lanes would encroach into Caltrans' right-of-way. Additionally, it is noted that acceleration and deceleration lanes are not present at private driveways along the rest of Leisure Lane.

Consistent: Yes.

Bicycle Facility Design Elements

7. *Bike lanes are required on Minor Collector streets (according to Plate 15-5) and are to be 6 feet in width. Bike lane placement is to be coordinated with the City's Bike/Pedestrian Coordinator, as designated in the City/County Bikeway Master Plan and approved by the City Traffic Engineer.*

Evaluation: The site plan does not show a Class II bike lane along the project frontage. The City's Bike Master Plan facilities map⁴ shows a planned Class II bike lane along the entirety of Leisure Lane.

Consistent: No.

Pedestrian Facility Design Elements

8. *Sidewalks are required on Minor Collector streets (according to Plate 15-5) and are to be 5 feet in width.*

Evaluation: The site plan shows a pedestrian walkway behind the planter island west of the project driveway. However, no pedestrian facilities are shown east of the project driveway (or across the driveway).

Consistent: No.

Overall, the project is found to be consistent in 4 topical areas and inconsistent in 4 areas. Recommendations to address the inconsistencies in items 1, 2, 7, and 8 are presented in Section 5.3.

5.2 Maximum Queues at Project Driveway

Table 9 displays the maximum expected queue lengths under baseline plus project conditions at the project driveway. As shown, a maximum outbound queue of 100 feet (4 vehicles) is expected. The values shown in the table were compared to outputs calculated using the methodology described in *Estimation of Maximum Queue Lengths at Unsignalized Intersections* (ITE Journal, 2001). This method produced a similar, if not slightly less lengthy, result of a maximum of 3 outbound vehicles queued at the driveway during the PM peak hour.

The site plan does not show any type of vertical curb that would extend into the project site to create driveway throat depth. Instead, the 45-foot driveway opens up to a wide but shallow swath of pavement that may be used

⁴ <https://saccity.maps.arcgis.com/apps/webappviewer/index.html?id=eef65d0ab1e04f8e997726d1a8c84ced>



for travel in all directions. Fueling pumps are positioned about 50 feet from the driveway opening. In summary, the project site plan provides insufficient throat depth to serve outbound traffic at this driveway. This could cause inbound traffic to spill onto Leisure Lane. Recommendations to address throat depth and on-site storage are presented in Section 5.3.

Table 9: Maximum Vehicle Queues at Project Driveway – Baseline Plus Project Conditions

Movement	Available Storage ¹	Maximum Queue ²	
		AM Peak Hour	PM Peak Hour
Eastbound Left/Through	270 ft	75 ft	75 ft
Westbound Through/Right	>1,000 ft	50 ft	50 ft
Southbound Left/Through/Right	– ³	100 ft⁴	100 ft⁴

Notes: Bolded cells represent queues that exceeds available storage.

1. Based on project site plan or aerial imagery.
 2. Maximum queue estimated by SimTraffic model. Rounded up to the nearest 25 feet.
 3. The site plan shows minimal throat depth (i.e., insufficient throat depth for even one vehicle) at the project driveway.
 4. These values were compared to outputs using the methodology described in *Estimation of Maximum Queue Lengths at Unsignalized Intersections* (ITE Journal, 2001), which estimated maximum southbound queues of 50 feet and 75 feet during the AM and PM peak hours, respectively.
- Source: Fehr & Peers, 2022.

5.3 Recommendations

Table 10 summarizes each recommendation and provides additional background, reasoning, effectiveness, and/or other information. **Figure 10** illustrates the recommendations at or near the project site.



Table 10: Recommendations

Recommendation	Notes
<i>Along Leisure Lane</i>	
Pay fair share cost of signal retiming at the Leisure Lane/SR 160 Eastbound Ramps/Exposition Boulevard (#3) intersection.	The project would increase the northbound left turn queue at Intersection 3 by more than 1 vehicle during the PM peak hour under baseline plus project conditions. This queue would already exceed available storage under baseline conditions and the project would exacerbate this condition.
Construct frontage improvements consistent with City standards for minor collectors with no on-street parking. This would include a continuous Class II bike lane, curb, gutter, planter, and sidewalk, constructed to the specifications shown in Plate 15-5 of the City's Street Design Standards.	This would provide consistency with the City's standards for minor collectors, as well as the Bikeway Master Plan. If right-of-way restrictions exist, the applicant should coordinate with City staff on variances (e.g., an attached sidewalk).
Shift the project driveway approximately 25 feet to the east to align with existing driveway on the south side of Leisure Lane.	This is recommended to comply with City design standards and to reduce conflicts between left-turns on Leisure Lane that would otherwise occupy the same area to turn into each driveway.
Ensure that adequate sight distance is provided for vehicles exiting the relocated driveway. This includes removing the two parking spaces in the southwest corner of the project site and relocating the monument to be outside the line of sight.	Once an updated site plan is prepared, a revised sight distance analysis should be conducted to ensure that adequate sight distance is provided. One of the parking spaces to be relocated is designated as ADA, which should be situated closer to the buildings.
Construct a crosswalk across Leisure Lane directly east of the project driveway and also install a Rectangular Rapid-Flashing Beacon (RRFB). The crosswalk should include pedestrian curb ramps consistent with guidance in Section 15.15 of the City's Street Design Standards.	There are no marked crosswalks near the project site. This recommendation is intended to provide a visible pedestrian crossing for pedestrians traveling between the project and residential/lodging land use located on the south of Leisure Lane.
<i>Within Project Site</i>	
Revise the site plan to reorient and/or remove vehicle fueling stations, thereby resulting in at least 75 feet of throat depth for outbound traffic.	Options for completing this modification include relocating the pumps to the west part of the site and facing in an east/west direction (potentially two rows). The site plan modifications (i.e., relocated driveway with greater throat depth) should also explicitly plan for how motorists would enter the fast-food drive-through lane after turning into the site from Leisure Lane. The project architect should confirm the site plan accommodates trucks.
Relocate the on-site pedestrian walkway to begin at Leisure Lane east of the project driveway (at Leisure Lane crosswalk) and extend into the site to provide pedestrian access to the convenience market and fast-food restaurant.	This provides a more direct connection than the current plan with less interactions with fueling vehicles.
Eliminate or reconfigure specified parking space in Figure 10 (adjacent to the drive through lane).	The horizontal curvature of parking spaces in this area could result in vehicles blocking adjacent spaces or underutilized parking.

Source: Fehr & Peers, 2022.

