

Memorandum

Date: August 19, 2022
To: David Mohlenbrok & Bret Finning, City of Rocklin
From: Rob Hananouchi & John Gard, Fehr & Peers
Subject: **Highway 65 Corridor Trip Cap Reallocation Traffic Study**

RS21-4090.02

Background

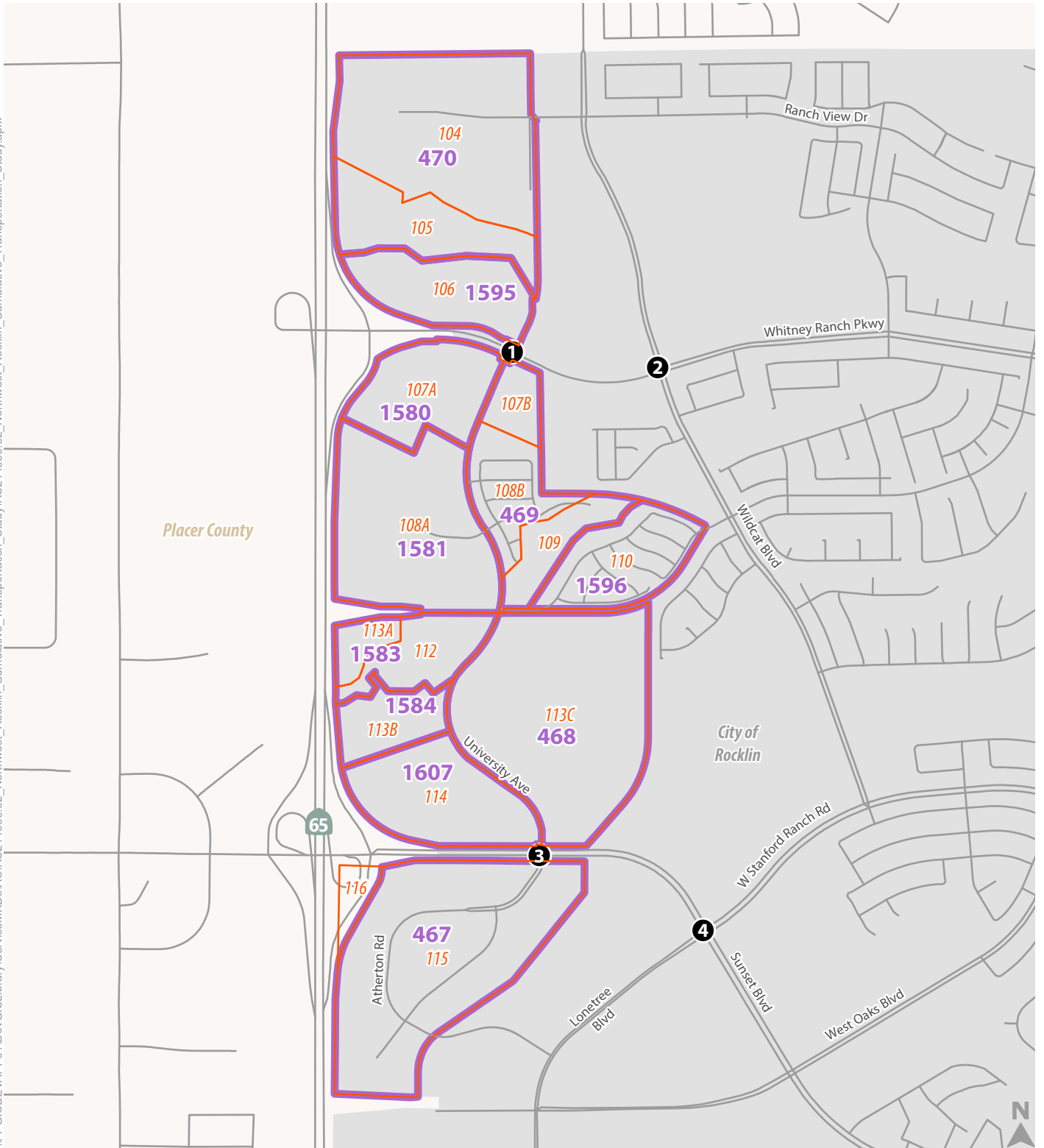
This memorandum presents the results of the Highway 65 Corridor Trip Cap Reallocation traffic study. Following completion of the final transportation impact study (TIS) for the Estia at Rocklin project, City of Rocklin staff determined that the trip capacities (i.e., Trip Caps) originally assigned to the 30-acre site on which the proposed Estia at Rocklin project is located would not be fully utilized by the proposed mixed-use project. City staff determined that these available trips should be reallocated to other commercially designated properties in the Northwest Rocklin Highway 65 Corridor to preserve the opportunity for their use if needed for future commercial projects in the area. This study analyzes the potential traffic effects of this trip reallocation.

Study Area

This study analyzes traffic operations (i.e., level of service (LOS)) at the following four intersections (refer to **Figure 1** for a map of study intersection locations):

1. Whitney Ranch Parkway / University Avenue
2. Whitney Ranch Parkway / Wildcat Boulevard
3. Sunset Boulevard / University Avenue/Atherton Road
4. Sunset Boulevard / Lonetree Boulevard/West Stanford Ranch Road

This study specifically analyzes LOS during the PM peak hour under cumulative conditions. The PM peak hour was chosen because the City's General Plan LOS policy pertains only to PM peak hour conditions.



- 1 Study Intersection
- Traffic Analysis Zone Boundary
- City of Rocklin
- Northwest Rocklin GDP Development Area

Figure 1

Study Area





Trip Cap Reallocation

City of Rocklin staff determined changes to the Highway 65 Corridor Trip Allocation by Development Area. **Table 1** shows the current Trip Allocation table (i.e., before trip cap reallocation), which is presented in Table 8 of the *Northwest Rocklin General Development Plan Amendment* (City of Rocklin, October 2019).

Figure 1 provides a map showing the individual Development Areas in the Northwest Rocklin Highway 65 Corridor and the corresponding traffic analysis zones (TAZs) for the City's travel forecasting model.

Table 1: Highway 65 Corridor Trip Allocation by Development Area

	Dev. Area #	Acres	Zoning	Trips (ADT)	Potential Building Square Footage (in thousands)			
					BP	Comm	LI	Total
JBC	104	66.3	PD-BP/COMM	20,127	708	216	0	924
	105	23.6	OS	0	-	-	-	-
	106	24.3	PD-COMM	9,275	0	265	0	265
	Subtotal	114.2		29,402	708	481	0	1,189
Placer Ranch	107A	32.4	PD-COMM	12,335	0	353	0	353
	107B	6.0	PD-COMM	2,310	0	66	0	66
	108A	47.6	PD-BP/COMM	14,452	508	156	0	644
	108B	20.4	PD-8.7A	1,566	N/A	N/A	N/A	Converted to Single Family
	109	15.7	OS	0	-	-	-	-
	110	22.9	PD-8.7A	1,764	N/A	N/A	N/A	Converted to Single Family
	111	2.3	OS	0	-	-	-	-
Subtotal	147.3		32,447	508	575		1,083	
William Jessup University	112	19.6	OS	0	-	-	-	-
	113A	13.9	PD-LI	2,711	0	0	356	356
	113B	17.7	¹ PD-LI	5,785	135	97	0	232
	113C	74.5	PD-LI (WJU Campus)	² 7,425	N/A	N/A	N/A	See Footnote 2
	114	30.1	PD-COMM	11,480	0	328	0	328
	Subtotal	155.8		27,401	135	425	356	916



Table 1: Highway 65 Corridor Trip Allocation by Development Area

	Dev. Area #	Acres	Zoning	Trips (ADT)	Potential Building Square Footage (in thousands)			
					BP	Comm	LI	Total
Atherton Tech	115	81.8	PD-LI	³ 8,760	39	0	91	130
	116	5.0	OS		-	-	-	-
	Subtotal	86.8		8,760	39	0	91	130
TOTAL		527.8		98,010	1,390	1,481	447	3,318

Notes:

Replication of Table 8 from the *Northwest Rocklin General Development Plan Amendment* (City of Rocklin, October 2019)

ADT = Average Daily Traffic

1. This site is designated as Mixed Use in the General Plan, therefore, Retail and Office development are allowed. Project specific zoning will be applied when a development project comes forward.
2. Includes traffic capacity for existing and planned William Jessup University (assuming an ultimate student capacity of up to 3,300 students).
3. Includes traffic capacity for existing occupied 659,700 square foot light industrial and office buildings. Remaining traffic capacity for new development in Atherton Tech Center (last undeveloped parcels) is 3,130 trips.

Source: *Northwest Rocklin General Development Plan Amendment*, City of Rocklin, 2019.

City staff determined the reallocation of the unused trips from the 30-acre Estia at Rocklin project site (Development Area 114) to other development areas in the Highway 65 Corridor. This reallocation resulted in the following land use changes:

- Development Area 106: Commercial floor area increases from 265,000 square feet (SF) to 297,000 SF
- Development Area 107A: Commercial floor area increases from 353,000 SF to 396,000 SF
- Development Area 108A: Commercial floor area increases from 156,000 SF to 219,000 SF
- Development Area 113A: Light industrial floor area is removed and converted to high-density residential. Note that **Table 2** shows this does not affect the trip allocation for this development area.
- Development Area 113B: Commercial floor area increases from 97,000 SF to 120,000 SF
- Development Area 114: gets split into two development areas (114A and 114B). Overall, commercial floor area decreases from 328,000 SF to 129,000 SF. Multi-family residential added to 114B.

Table 2 presents the Highway 65 Corridor Trip Allocation by Development Area table with these proposed changes, as prepared by City of Rocklin staff. **Table 2** shows that the total daily trips for the Highway 65 Corridor remains 98,010 with the trip reallocation.



Table 2: Updated Highway 65 Corridor Trip Allocation by Development Area

	Dev. Area #	Current ¹					Proposed ²				
		Trips (ADT)	Potential Building Floor Area ³				Trips (ADT)	Potential Building Floor Area ³			
			BP	Comm	LI	Total		BP	Comm	LI	Total
JBC	104	20,127	708	216	0	924	20,127	708	216	0	924
	105	0	-	-	-	-	0	-	-	-	-
	106	9,275	0	265	0	265	10,398	0	297	0	297
	Subtotal	29,402	708	481	0	1,189	30,525	708	513	0	1,221
Placer Ranch	107A	12,335	0	353	0	353	13,852	0	396	0	396
	107B	2,310	0	66	0	66	2,310	0	66	0	66
	108A	14,452	508	156	0	644	16,651	508	219	0	727
	108B	1,566	N/A	N/A	N/A	SFDUs	1,566	N/A	N/A	N/A	SFDUs
	109	0	-	-	-	-	0	-	-	-	-
	110	1,764	N/A	N/A	N/A	SFDUs	1,764	N/A	N/A	N/A	SFDUs
	111	0	-	-	-	-	0	-	-	-	-
Subtotal	32,447	508	575		1,083	36,143	508	681	0	1,189	
William Jessup University	112	0	-	-	-	-	0	-	-	-	-
	113A	2,711	0	0	356	356	2,711	0	0	0	Future HDR ⁴
	113B	5,785	135	97	0	232	6,603	135	120	0	255
	113C	7,425	N/A	N/A	N/A	WJU ⁵	7,425	N/A	N/A	N/A	WJU ⁵
	114A	11,480	0	328	0	328	4,515	0	129	0	129
	114B						1,328	N/A	N/A	N/A	Converted to Multi-family
Subtotal	27,401	135	425	356	916	22,582	135	249	0	384	
Atherton Tech	115	⁶ 8,760	39	0	91	130	⁶ 8,760	39	0	91	130
	116		-	-	-	-		-	-	-	-
	Subtotal	8,760	39	0	91	130	8,760	39	0	91	130
TOTAL		98,010	1,390	1,481	447	3,318	98,010	1,390	1,443	91	2,924



Table 2: Updated Highway 65 Corridor Trip Allocation by Development Area

	Dev. Area #	Current ¹				Proposed ²			
		Trips (ADT)	Potential Building Floor Area ³			Trips (ADT)	Potential Building Floor Area ³		
			BP	Comm	LI		Total	BP	Comm

Notes:

ADT = Average Daily Traffic

Values shown in yellow indicate a proposed increase in floor area or trip capacity. Values shown in light purple indicate a proposed decrease in floor area or trip capacity.

1. Represents the current trip allocation in the *Northwest Rocklin General Development Plan Amendment* (see Table 1).
2. Proposed changes to trip capacity allocation and building floor area, as provided by City of Rocklin staff.
3. Potential building floor area values shown in thousand square feet (i.e., 508 = 508,000 square feet).
4. This site is on the City of Rocklin's (2021-2029) Housing Element Regional Housing Needs Allocation (RHNA) Available Sites List and was assumed as High Density Residential (HDR) / 30 DUs per acre (417 total MF units) in Table 3 of the City's *2016 Final Transportation Impact Analysis for the Northwest Rocklin Area General Development Plan* (Trip Caps Study) (Fehr & Peers, 2016).
5. Includes traffic capacity for existing and planned William Jessup University (assuming an ultimate student capacity of up to 3,300 students).
6. Includes traffic capacity for existing occupied 659,700 square foot light industrial and office buildings. Remaining traffic capacity for new development in Atherton Tech Center (last undeveloped parcels) is 3,130 trips.

Source: City of Rocklin, 2022.

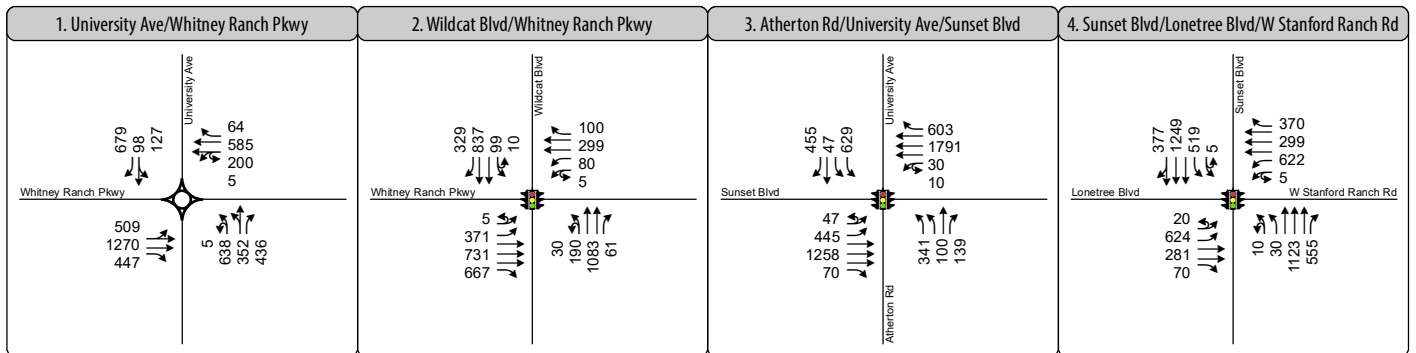
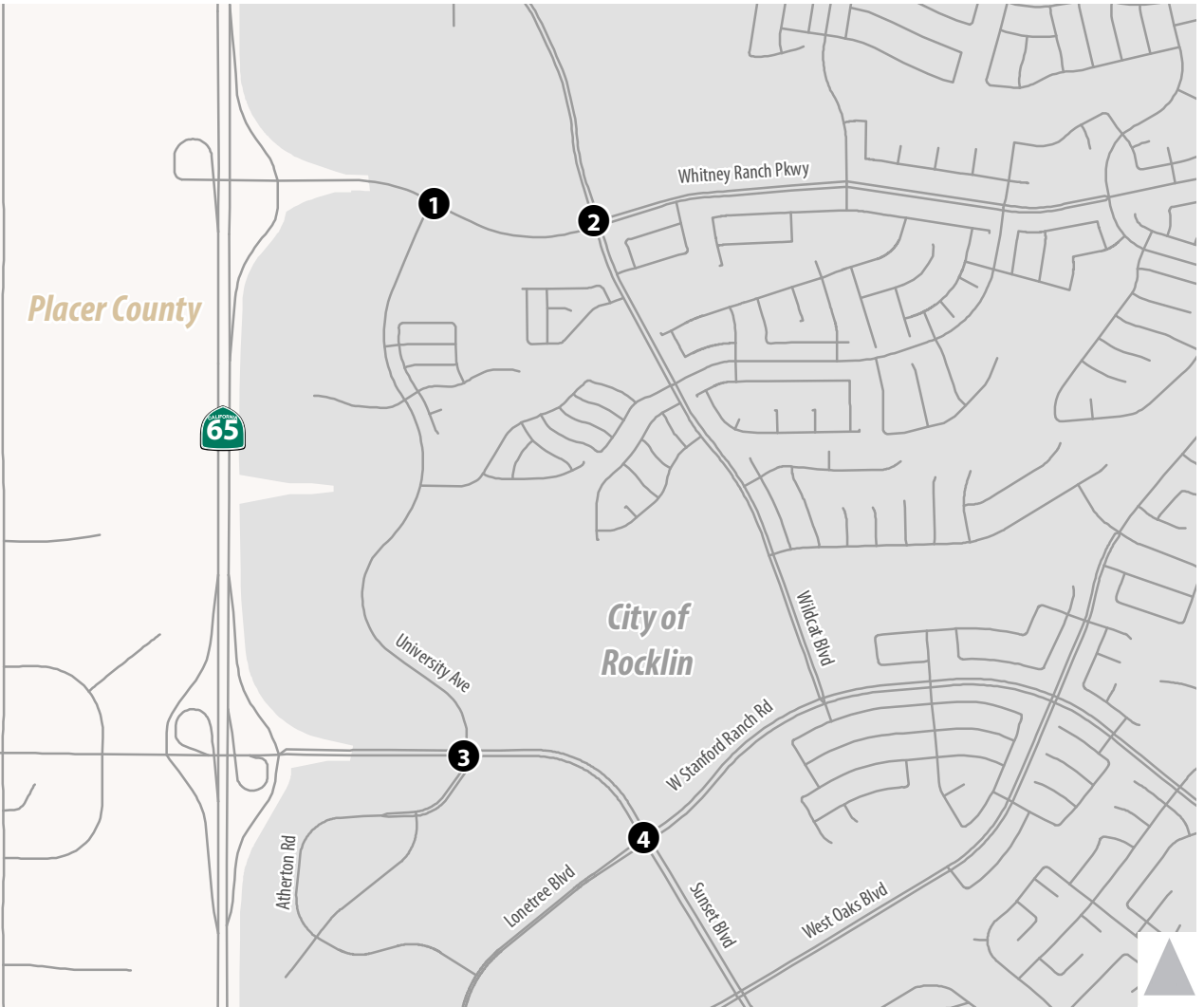
Traffic Forecasts

This study updated the City of Rocklin cumulative travel forecasting model to reflect the proposed changes to building floor area values shown in **Table 2**. The model's PM peak hour traffic outputs were compared to the original model's PM peak hour traffic outputs to determine the net change in traffic volumes at the four study intersections listed above.

This net change in PM peak hour traffic was added to the cumulative plus project PM peak hour forecasts obtained from the *Wildcat West Subdivision Transportation Impact Study* (TIS) (Fehr & Peers, July 2022) for intersections 1 and 2, and from the *Estia at Rocklin TIS* (Fehr & Peers, April 2022) for intersections 3 and 4. Hence, these traffic forecasts account for the following:

- Change in PM peak hour traffic demand resulting from the land use changes in the Highway 65 Corridor shown in **Table 2**.
- Trips generated by the proposed Wildcat West Subdivision and Estia at Rocklin projects.
- Cumulative growth in the City of Rocklin and the surrounding region, as reflected in the City's cumulative travel forecasting model

Figure 2 shows the cumulative PM peak hour turning movement forecasts at the four study intersections analyzed in this study.



1 Study Intersection

City of Rocklin

Turn Lane

PM Peak Hour Traffic Volume

Traffic Signal

Stop Sign

U-Turn

Roundabout

Figure 2

PM Peak Hour Traffic Volumes and Lane Configurations - Cumulative with Trip Reallocation Conditions





Traffic Operations Analysis

Methodology

This study analyzes traffic operations (i.e., LOS) according to the *Highway Capacity Manual*, 6th Edition (HCM). The HCM methodology determines intersection LOS by the average control delay per vehicle experienced by motorists travelling through the intersection, as described in Volume 3 of the HCM, 6th Edition (Transportation Research Board, 2016). **Table 3** presents the average control delay thresholds for each LOS grade for unsignalized (i.e., stop-controlled or roundabout) and signalized intersections.

Table 3: Level of Service Thresholds – Signalized & Unsignalized Intersections

Level of Service	Average Control Delay ¹	
	Unsignalized Intersections ²	Signalized Intersections
A	≤ 10	≤ 10
B	> 10 to 15	> 10 to 20
C	> 15 to 25	> 20 to 35
D	> 25 to 35	> 35 to 55
E	> 35 to 50	> 55 to 80
F	> 50	> 80

Notes:

1. Average control delay presented in seconds per vehicle.
2. Unsignalized intersections include roundabouts and intersections with all-way or side-street stop control.

Source: *Highway Capacity Manual*, 6th Edition, Transportation Research Board, 2016.

The HCM 6th Edition establishes different delay criteria for unsignalized versus signalized intersections since drivers expect to wait shorter durations at unsignalized intersections compared to traffic signals.

For consistency, this study analyzes traffic operations using the same methodology and software used for the *Wildcat West Subdivision TIS* and *Estia at Rocklin TIS*. This includes using the following:

- Sidra roundabout analysis software for the proposed roundabout at the Whitney Ranch Parkway / University Avenue intersection (intersection 1). Sidra applies the methodologies presented in Chapter 22 of the HCM 6th Edition.
- Synchro 11 traffic operations software for intersections along Sunset Boulevard (intersections 3 and 4). Synchro 11 applies the methodologies presented in the HCM 6th Edition, and considers peak hour traffic volumes, lane configurations, signal timings, signal coordination, and other pertinent parameters of intersection operations.
- SimTraffic microsimulation module of the Synchro 11 software to analyze operations at the Whitney Ranch Parkway / Wildcat Boulevard intersection (intersection 2). SimTraffic is particularly



well-suited to modeling individual vehicle interactions, such as merging from the Wildcat West driveway onto Whitney Ranch Parkway, the effects of vehicle platooning, queue spillback, and upstream/downstream bottlenecks.

Results

Table 4 presents the PM peak hour traffic operations analysis results at the four study intersections under cumulative conditions. See **Appendix A** for technical calculations. Table 4 presents both the cumulative conditions analysis results from the *Wildcat West Subdivision TIS* and *Estia at Rocklin TIS* as the “Before Trip Reallocation” baseline as well as the cumulative conditions analysis results for the “With Trip Reallocation” shown in **Table 2**.

Table 4: PM Peak Hour Intersection Operations – Cumulative Conditions

Intersection	Traffic Control	Before Trip Reallocation		With Trip Reallocation	
		Delay ¹	LOS ²	Delay ¹	LOS ²
1. Whitney Ranch Pkwy. / University Ave.	Roundabout	39	E	48	E
2. Whitney Ranch Pkwy. / Wildcat Blvd.	Signal	69	E	72	E
3. Sunset Blvd. / University Ave./Atherton Rd.	Signal	48	D	52	D
4. Sunset Blvd. / Lonetree Blvd./W. Stanford Ranch Rd.	Signal	44	D	44	D

Notes:

BOLD indicates LOS D or worse operations.

1. Average control delay (rounded to nearest second) is the weighted average for all movements.

2. LOS = level of service, determined according to the HCM 6th Edition methodology (see Table 3).

Source: Fehr & Peers, 2022.

Table 4 shows that reallocating these trips and increasing the amount of commercial development in the Northwest Rocklin Highway 65 Corridor will result in slightly greater delays at these four study intersections. However, it would not result in any changes to LOS, and all four study intersections would continue to operate at LOS D or worse. Degraded operations are caused by cumulative levels of background traffic (including approved development in the Placer Ranch Specific Plan and Sunset Area Plan west of SR 65), as well as the construction of Placer Parkway westerly from SR 65 to Santucci Boulevard.



Potential Operational Enhancements

Fehr & Peers previously analyzed potential operational enhancements at the four study intersections as part of the *Wildcat West Subdivision TIS* and the *Estia at Rocklin TIS*.

Per the *Wildcat West Subdivision TIS*, the operational enhancements considered at the Whitney Ranch Parkway / Wildcat Boulevard intersection were found to either not be effective, not supported by the City's Public Services Department, and/or detrimental to other travel modes. Examples of improvements considered include signal timing changes, adding an eastbound right-turn overlap arrow, and converting the outside eastbound travel lane to a shared through/right lane. Therefore, no additional operational enhancements are analyzed at this intersection for this study.

This study analyzes the operational enhancements identified in the *Estia at Rocklin TIS* for the study intersections on Sunset Boulevard (i.e., intersections 3 and 4) to confirm that they remain effective with the changes in the cumulative traffic forecasts. **Table 5** presents a comparison of the PM peak hour traffic operations analysis results before and after the trip reallocation. See **Appendix A** for technical calculations.

Table 5: PM Peak Hour Intersection Operations – Cumulative Conditions with Operational Enhancements

Intersection	Traffic Control	Before Trip Reallocation ¹				With Trip Reallocation			
		Without Enhancements		With Enhancements		Without Enhancements ²		With Enhancements	
		Delay ³	LOS ⁴	Delay ³	LOS ⁴	Delay ³	LOS ⁴	Delay ³	LOS ⁴
3. Sunset Blvd. / University Ave./ Atherton Rd.	Signal	48	D	38	D	52	D	39	D
4. Sunset Blvd. / Lonetree Blvd./ W. Stanford Ranch Rd.	Signal	44	D	33	C	44	D	34	C

Notes:

BOLD indicates LOS D or worse operations (i.e., unacceptable LOS).

1. Results obtained from the *Estia at Rocklin TIS Addendum* (Fehr & Peers, August 2022).

2. See results presented in Table 4.

3. Average control delay (rounded to nearest second) is the weighted average for all movements, per the HCM 6th Edition methodology.

4. LOS = level of service, determined according to the HCM 6th Edition methodology (see Table 10).

Source: Fehr & Peers, 2022.

Table 5 shows that the LOS results are the same both before and after the trip reallocation during the PM peak hour under cumulative conditions. There is a slight increase in delay after the trip reallocation, but overall, the potential operational enhancements studied in the *Estia at Rocklin TIS* provide a similar benefit. It should be noted that the Sunset Boulevard / University Avenue/Atherton Road intersection



would continue to operate at an unacceptable LOS D. Additional capacity enhancements to achieve LOS C (i.e., provide a fourth westbound travel lane) were determined to be infeasible.

Whitney Ranch Parkway / University Avenue

As presented in the tables above, this study analyzes the Whitney Ranch Parkway / University Avenue intersection as a future roundabout to be consistent with the *Wildcat West Subdivision TIS*, which was based on the *Intersection Control Evaluation – Whitney Ranch Parkway @ University Avenue* study (Kimley-Horn, 2021). Per the results in **Table 4**, the roundabout is forecast to operate at LOS E, both before and with the trip reallocation.

The *City of Rocklin General Plan Circulation Element* (2012) contains policies related to the operation of signalized intersections; however, a policy for unsignalized intersections (including roundabouts) is not provided. Therefore, this study conducts a comparative analysis of the Whitney Ranch Parkway / University Avenue intersection assuming it operates as a roundabout versus a traffic signal.

This study analyzes the roundabout configuration presented in the Kimley-Horn study, which features two circulating lanes and right-turn bypass lanes. Based on this initial concept and the site constraints, it is unlikely that expanding the footprint of the roundabout to accommodate additional circulating lanes or bypass lanes would be feasible.

The traffic signal option was analyzed assuming intersection lane configurations that match the *2016 Final Transportation Impact Analysis for the Northwest Rocklin Area General Development Plan* (Fehr & Peers, 2016). These lane configurations include two left-turn lanes and one right-turn lane on all four approaches; three eastbound and three westbound through lanes on Whitney Ranch Parkway; and two northbound and two southbound through lanes on University Avenue.

The Whitney Ranch Parkway / University Avenue intersection was analyzed using Sidra for the roundabout option and with SimTraffic for the traffic signal option.

Sidra is a deterministic model that tends to operate best under moderately congested, non-gridlock conditions. When such models are applied under over-saturated conditions, delays can be underestimated. In contrast, SimTraffic captures the effect of queue spillback on eastbound Whitney Ranch Parkway from Wildcat Boulevard back to University Avenue, as described in the *Wildcat West Subdivision TIS*. The SimTraffic model also accounts for vehicle queues that may block access to turn pockets.

Table 6 compares the PM peak hour traffic operations analysis results for the Whitney Ranch Parkway / University Avenue intersection as a roundabout and a signal. See **Appendix A** for technical calculations.



Table 6: PM Peak Hour Intersection Operations at Whitney Ranch Pkwy./University Ave. – Cumulative Conditions with Trip Reallocation

Intersection	Roundabout ¹		Signal ²	
	Delay ³	LOS ⁴	Delay ³	LOS ⁴
1. Whitney Ranch Pkwy. / University Ave.	48	E	97	F

Notes:

BOLD indicates LOS D or worse operations (i.e., unacceptable LOS). City LOS policy does not apply to roundabouts.

1. Roundabout analyzed using Sidra traffic operations software, which applies the methodologies presented in Chapter 22 of the HCM 6th Edition.
2. Signal analyzed using SimTraffic microsimulation module.
3. Average control delay (rounded to nearest second) is the weighted average for all movements, per the HCM 6th Edition methodology.
4. LOS = level of service, determined according to the HCM 6th Edition methodology (see Table 3).

Source: Fehr & Peers, 2022.

When a particular approach lane to a roundabout reaches a volume-to-capacity (v/c) ratio of 0.85 to 0.90, an approximate threshold for satisfactory operation is reached. Appendix A indicates that the northbound University Avenue approach would have a volume-to-capacity (v/c) ratio of 1.12, motorists would experience an average delay of two minutes, and have a maximum queue of 1,150 feet. This is caused by the heavy volume of traffic on this approach (1,430 peak hour vehicles) trying to find gaps within the roundabout, for which 2,200 peak hour vehicles enter from the immediately upstream eastbound Whitney Ranch Parkway approach.

The traffic signal option results in similar delays and queuing on the northbound approach as the roundabout. However, delays are also at LOS F on the southbound and eastbound approaches. Additional enhancements were considered, but found to either not be effective, not supported by City staff, infeasible due to existing or approved developments, and/or detrimental to other travel modes. Examples of improvements considered include signal timing changes, adding right-turn overlap phases, and channelizing and providing free right-turn movements.

Although **Table 6** suggests that the roundabout would experience half the delay of the traffic signal, the Sidra software used to analyze the roundabout does not consider the effects of downstream congestion (i.e., eastbound vehicle queues extending back from Wildcat Boulevard), Therefore, actual cumulative operations with a roundabout would be worse than shown here.



Summary

This study determined that reallocating trips from Development Area 114 (i.e., Estia at Rocklin project site) and increasing the amount of commercial development in the Northwest Rocklin Highway 65 Corridor will result in slightly greater delays at the four study intersections. However, it would not result in any changes to LOS (i.e., all four study intersections would continue to operate at their "Before Trip Reallocation" LOS). All four study intersections would continue to operate at LOS D or worse. These degraded operations are caused by cumulative levels of background traffic (including trips generated by approved development in the Placer Ranch Specific Plan and Sunset Area Plan west of SR 65), as well as the construction of Placer Parkway westerly from SR 65 to Santucci Boulevard.

The operational enhancements identified in the *Estia at Rocklin TIS* for the study intersections on Sunset Boulevard (i.e., intersections 3 and 4) would continue to provide a similar benefit to traffic operations. Delay would decrease at Sunset Boulevard / University Avenue/Atherton Road (although it would continue to operate at LOS D), and operations would improve to LOS C at Sunset Boulevard / Lonetree Boulevard/West Stanford Ranch Road.

Signalizing the Whitney Ranch Parkway / University Avenue intersection would result in LOS F operations during the PM peak hour, assuming the lane configurations in the *2016 Final Transportation Impact Analysis for the Northwest Rocklin Area General Development Plan*. Additional enhancements were considered, but found to either not be effective, not supported by City staff, infeasible due to existing or approved developments, and/or detrimental to other travel modes.

For the northbound approach, both a roundabout and signal are forecasted to result in LOS F level delays (i.e., average of almost two minutes) and maximum queues over 1,000 feet. However, delays are also at LOS F on the southbound and eastbound approaches with a signal, whereas these approaches are forecasted to operate at LOS D and LOS C, respectively, with a roundabout.

Although these results suggest that the roundabout would experience less delay than a traffic signal, the Sidra software used to analyze the roundabout does not consider the effects of downstream congestion (i.e., eastbound vehicle queues extending back from Wildcat Boulevard). Therefore, actual cumulative PM peak hour operations with a roundabout would be worse than presented in this study.