University Research Park

Transportation Study

Prepared for:
City of Davis

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RS18-3712

FEHR PEERS

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INTRODUCTION

Purpose

This study analyzes the following transportation-related elements of the proposed University Research Park mixed-use project in the City of Davis:

- Effects on surrounding intersection operations under Existing and Cumulative conditions
- Site access

This study does not provide a CEQA-level review of the project's potential environmental impacts and associated mitigation measures. Instead, the study assesses the project's consistency with applicable goals, policies, and standards related to multi-modal transportation operations and access, including those set forth in the City of Davis General Plan and street design standards. Recommendations are provided in instances where access to and from the project site was found to be inadequate, where improvements to the surrounding circulation system would benefit project-related vehicle, bicycle, pedestrian, or transit trips, or where the project would have an adverse effect on the operations of the surrounding multi-modal transportation system.

Transportation Setting

The project site is located in South Davis on the east side of Research Park Drive north of the Richards Boulevard/Cowell Boulevard corridor (see Figure 1). The project site is situated on 4.5 acres of vacant land located within the broader University Research Park business park.

Roadway Network

This section describes the roadway facilities serving the project site. Freeway access is available via the Interstate 80 (I-80) interchange at Richards Boulevard, located just west of the project site. Key local roadways in the project vicinity include the following:

- **Research Park Drive** is a collector running between West Chiles Road and Cowell Boulevard. Research Park Drive forms the western edge of the project site and would provide all vehicular access to the project site. Within the vicinity of the project site, Research Park Drive has two northbound lanes and one southbound lane, with a posted speed limit of 35 MPH. A horizontal curve with an approximate 320-foot radius is present on Research Park Drive north of the project site. Northbound Research Park Drive drops to a single lane east of the horizontal curve.

- **Richards Boulevard** is a four-lane arterial running between I-80 and Downtown Davis to the west. Richards Boulevard transitions into Cowell Boulevard east of Research Park Drive near I-80.
- **Cowell Boulevard** is a two-lane minor arterial running between I-80 and South Davis to the east. Cowell Boulevard transitions into Richards Boulevard west of Research Park Drive near I-80. Cowell Boulevard intersects with Research Park Drive at two locations, one near the I-80 interchange at Richards Boulevard and the other near Playfields Park at the eastern terminus of Research Park Drive.
- **Drew Avenue** is a two-lane local roadway running between Cowell Boulevard and Research Park Drive. Drew Avenue bisects the broader University Research Park business park.

Bicycle and Pedestrian Facilities

Existing bicycle and pedestrian facilities in the study area are presented in Figure 2.

Class II bike lanes are provided on several roadways within the vicinity of the project site, including Research Park Drive, Richards Boulevard, Cowell Boulevard, and Drew Avenue. Connections between the project site and the city-wide Class I off-street bike path network are available to the southwest on West Chiles Road (to/from Downtown Davis and the UC Davis campus), to the west at the Richards Boulevard tunnel (to/from Downtown Davis and the UC Davis campus), to the south at Da Vinci Court (to/from South Davis), and to the east at Pole Line Road and Cowell Boulevard (to/from South Davis and Central Davis).

Sidewalks are provided on all roadways in the project vicinity, including on the east side of Research Park Drive along the immediate project site frontage. Marked crosswalks are provided on all legs of the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection, including a marked crosswalk facilitating pedestrian flows across the westbound channelized right-turn lane.

Transit Service and Facilities

The project site is located within the Yolo Transit Priority Area. Transit Priority Areas (TPAs) are areas of the region within one-half mile of a major transit stop or an existing or planned high-quality transit corridor identified in the Sacramento Area Council of Governments (SACOG) 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS).

Several transit operators provide transit service in the study area:

- **Unitrans** provides local fixed route bus service to the City of Davis and the UC Davis campus. Jointly operated between UC Davis and the City of Davis, Unitrans offers 19 routes serving campus and Davis neighborhoods, shopping centers, schools, and medical centers. Service is provided on weekdays between 7:00 AM to 11:00 PM, and on Saturdays from 9:00 AM to 6:00 PM. Buses run

more frequently during the UC Davis academic year, corresponding to higher ridership demand, and less frequently during the summer and breaks. Unitrans charges a one-dollar cash fare, and many types of prepaid discounted tickets and passes are available. One notable fare category is for UC Davis undergraduate students, who can show a valid student ID as fare payment; paying a portion of their quarterly ASUCD fees to Unitrans. Table 1 summarizes the service characteristics of Unitrans routes operating near the project site.

- **Yolobus** provides fixed route bus service throughout Yolo County. It offers service between Davis, Winters, Vacaville, Downtown Sacramento, Woodland, and the Sacramento International Airport, with connections to other cities in the County.
- Amtrak's **Capitol Corridor** provides inter-city rail service between Sacramento and the Bay Area on weekdays and weekends. The Capitol Corridor serves Davis at the Davis Train Station, located in Downtown Davis approximately one mile walking distance from the project site.

Table 1
Unitrans Route Summary – Study Area Bus Routes

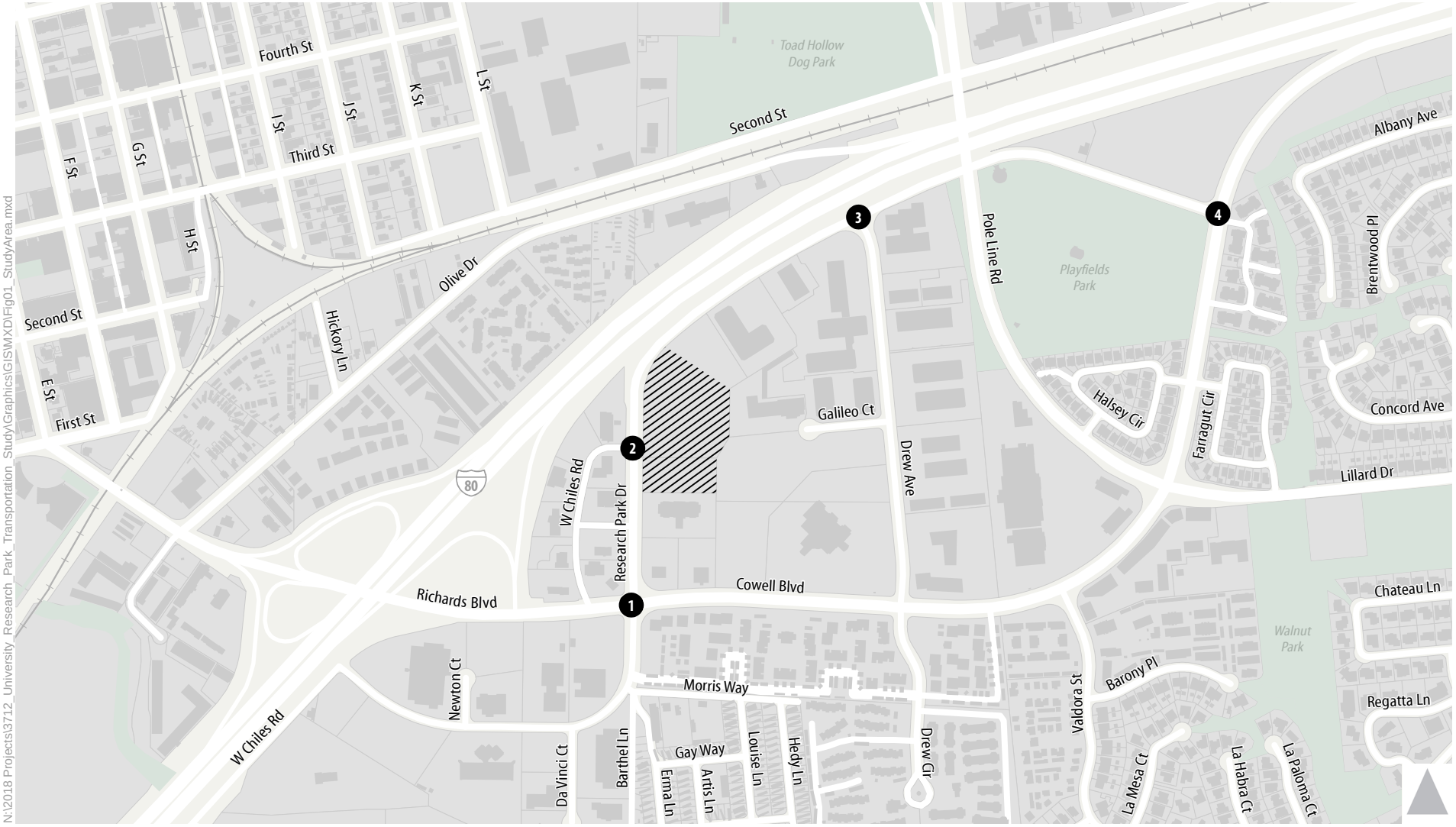
Route	Weekday (Monday-Thursday)		Friday		Weekend (Saturday-Sunday)	
	Frequency (min)	Span	Frequency (min)	Span	Frequency (min)	Span
M – MU / Cowell Boulevard / Drew Avenue	30 min	7 AM – 8:30 PM	30 min	7 AM – 8:30 PM	30 min	9 AM – 6:30 PM
T – Davis High / Holmes & Harper Jr. High	One morning trip and one afternoon trip				N/A	N/A
W – Silo / Cowell / Lillard / Drummond	10 - 20 min	7 AM – 11 PM	30 min	7 AM – 8:30 PM	N/A	N/A
P – MU / Davis Perimeter Counter Clockwise	30 min / 60 min (after 6 PM)	6:30 AM – 11 PM	30 min / 60 min (after 6 PM)	6:30 AM – 9 PM	60 min	8:30 AM – 7 PM
Q – MU / Davis Perimeter Clockwise	30 min / 60 min (after 6 PM)	6:30 AM – 11 PM	30 min / 60 min (after 6 PM)	6:30 AM – 9 PM	60 min	8:30 AM – 7 PM

Source: Unitrans, 2018.

Figure 3 illustrates the existing bus routes and stops in the study area. Bus stops nearest to the project site are located approximately 750 feet south of the project driveway on either side of the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection. These stops serve eastbound and westbound Unitrans and Yolobus service along the Richards Boulevard / Cowell Boulevard corridor (Unitrans routes M, T, and W and Yolobus routes 44, 231, and 242).

Collision History

According to the Statewide Integrated Traffic Records System (SWITRS), a single reported collision has occurred on the segment of Research Park Drive within the vicinity of the project site over the past five years. The collision involved a westbound vehicle turning left out of the southerly Holiday Inn Express driveway and striking a vehicle traveling southbound on Research Park Drive. The westbound motorist was found to be at fault for this broadside collision.



1 Study Intersection

Project Site

Figure 1

Study Area

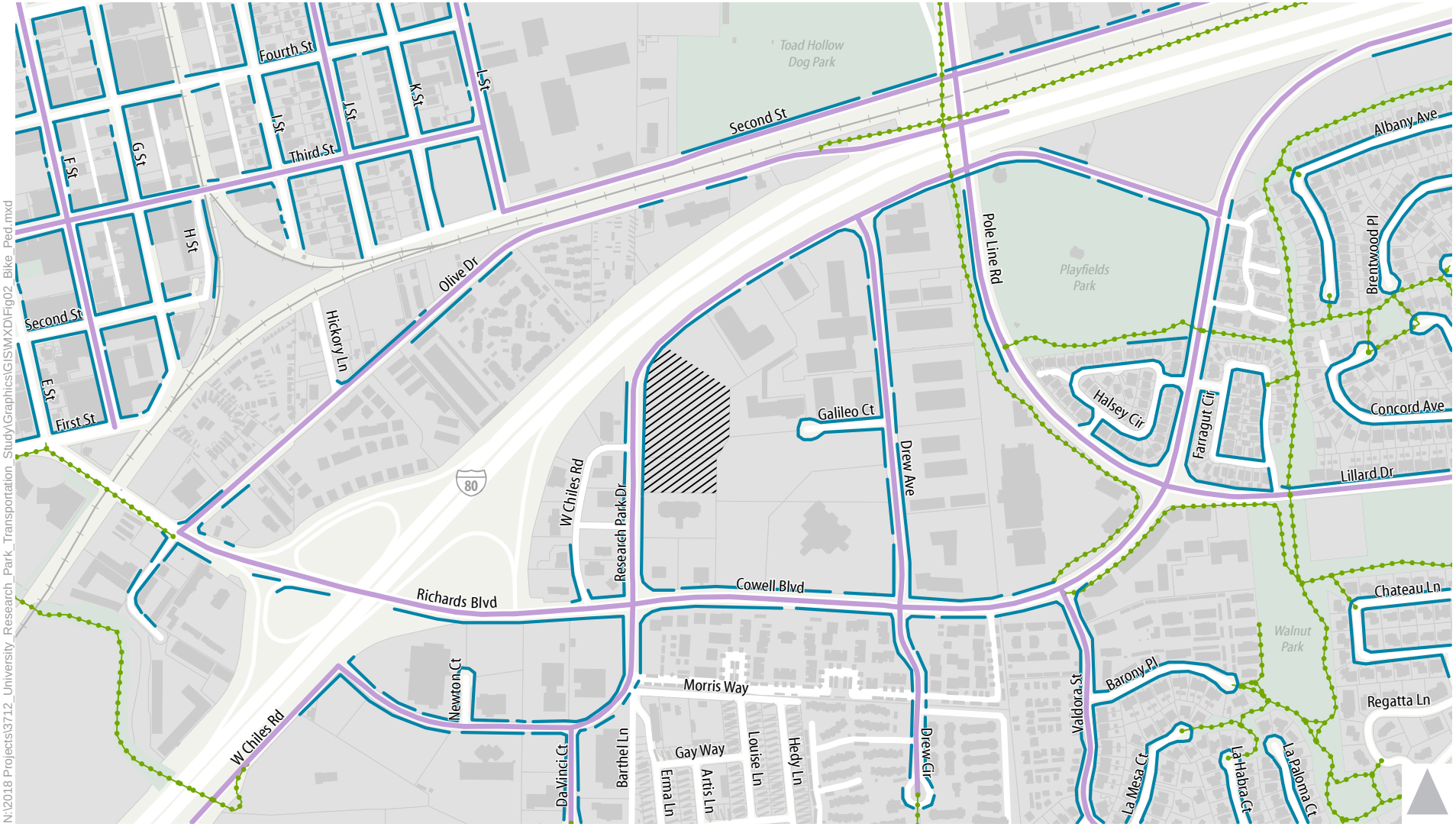


Figure 2

Bicycle and Pedestrian Facilities Existing Conditions

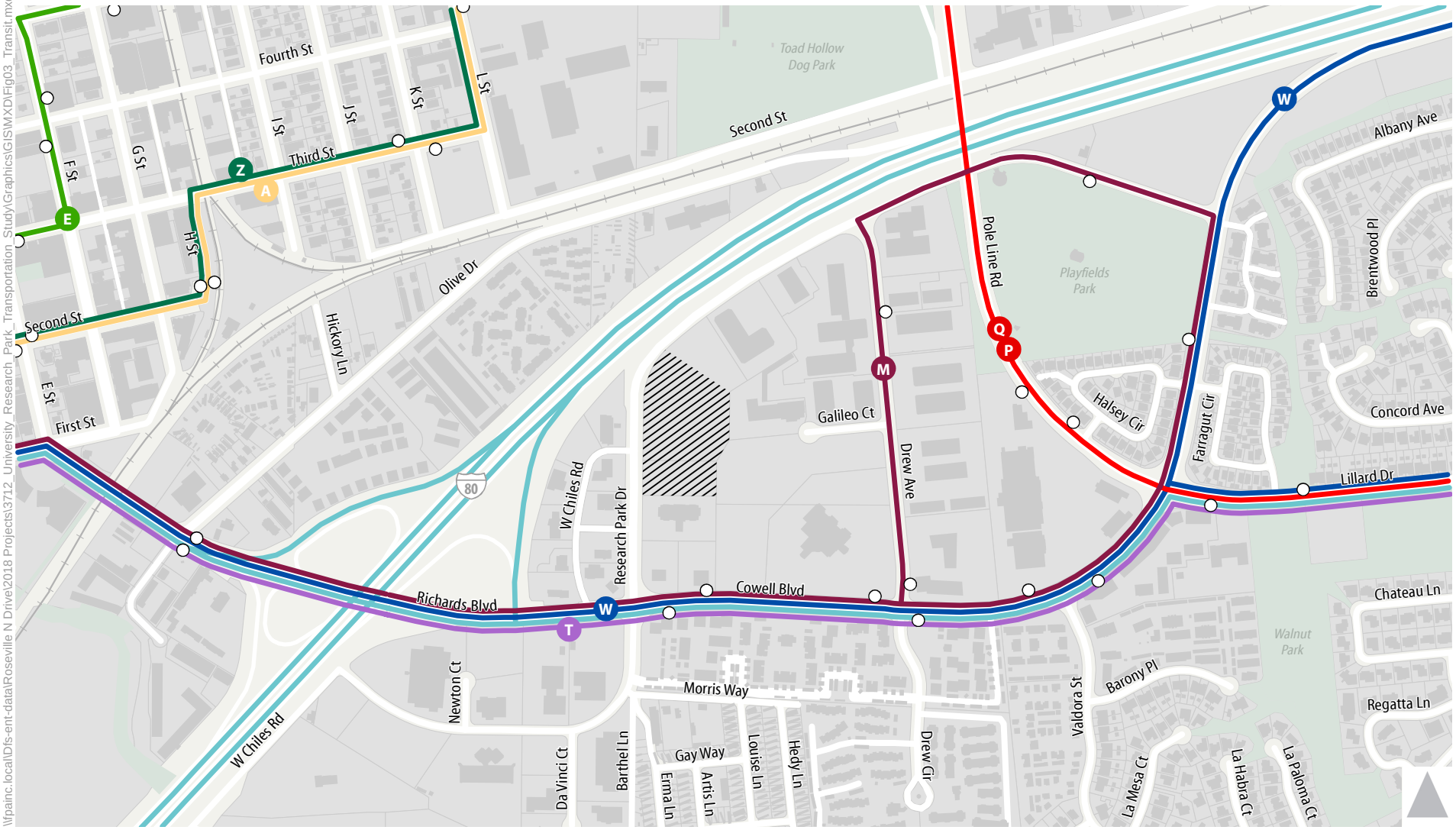


Figure 3

Transit Service and Facilities
Existing Conditions

PROJECT OVERVIEW

Project Description

According to the most recent project site plan (*University Research Park Planning Design Review Application*, Cunningham Engineering, September 2018), the proposed project would consist of 160 apartment units and 26,912 square feet of tech space. The residential component of the project would be comprised of a mix of studio, one-bedroom, and two-bedroom apartments totaling 192 bedrooms. On-site parking accommodations would include 214 vehicular parking spaces and 216 bicycle parking spaces. Refer to Figure 4 for the project site plan.

Access to the project would be provided by the following driveways that provide direct and indirect access onto Research Park Drive and Cowell Boulevard, as described below:

- Project Driveway – would be situated approximately 190 feet north of the project's southern property line, opposite the existing private roadway west of Research Park Drive between Devi Plaza and La Quinta Inn. This project driveway would form the east leg of a four-legged side-street stop-controlled intersection. Movements at this driveway are proposed to be full-access. This driveway would serve the majority of project vehicle trips.
- Secondary Adjoining Driveways – the project would include two internal driveways along the project's southern property line providing access to the existing parking lots serving the Holiday Inn Express, Carl's Jr., and IHOP located immediately south of the project site. The Holiday Inn Express parking lot features two existing driveways onto Research Park Drive, one of which permits full access and the other permitting right-turns only. The Carl's Jr. and IHOP parking lots features one existing driveway onto Research Park Drive which permits right-turns only, and two existing driveways onto Cowell Boulevard, one which permits full access and the other permitting right-turns only. Each of the secondary driveways would serve a minimal number of project vehicle trips.

Pedestrian, bicycle, and transit trips would be accommodated along the Research Park Drive frontage. The project site plan includes a stub connection to a future bicycle and pedestrian pathway towards Galileo Court along the project's eastern property line.

Project Travel Characteristics

This section describes the anticipated travel characteristics of the proposed University Research Park project.

Trip Generation

Vehicle trip generation estimates were developed based on the procedures from the *ITE Trip Generation Handbook, 3rd Edition* (September 2017) and the equations and rates from the *ITE Trip Generation Manual, 10th Edition* (September 2017). The proposed University Research Park residential and tech space components are consistent with the land use descriptions for mid-rise multifamily residential housing and general office buildings. Based on the guidance in the *Handbook*, the fitted curve trip generation equations in the *Manual* were used to estimate the project's trip generation, shown in Table 2.

Table 2
University Research Park Vehicle Trip Generation Summary

Land Use	Units[1]	Daily	AM Peak Hour			PM Peak Hour		
		Trips	Trips	In	Out	Trips	In	Out
Multifamily Housing (Mid-Rise)[2]	160 DUs	871	55	14	41	70	43	27
General Office Building[3]	27 ksf	298	52	45	7	33	5	28
Total		**1,169**	**107**	**59**	**48**	**103**	**48**	**55**

Notes:
1. DUs = dwelling units; ksf = 1,000 square feet
2. ITE Trip Generation land use category 221
   - Daily: T = 5.45X – 1.75
   - Adj Streets (7-9A): LN(T) = 0.98LN(X) - 0.98 (25% In, 75% Out)
   - Adj Streets (4-6P): LN(T) = 0.96LN(X) – 0.63 (61% In, 39% Out)
3. ITE Trip Generation land use category 710
   - Daily: LN(T) = 0.97LN(X) + 2.5
   - Adj Streets (7-9A): T = 0.94X + 26.49 (86% In, 14% Out)
   - Adj Streets (4-6P): LN(T) = 0.95LN(X) + 0.36 (16% In, 84% Out)

Source: Fehr & Peers, 2018.

Based on these procedures, the proposed project would generate an estimated 1,169 daily, 107 AM peak hour, and 103 PM peak hour vehicle trips. The AM and PM peak hour project vehicle trip generation would be balanced between inbound and outbound trips due to the mix of uses on-site. These estimates do not include any specific adjustments for increased levels of bicycling associated with residents and employees of the project. However, given the provision of 216 on-site bike parking spaces, travel by bike is expected. Adjustments were not made in this instance because credible data on bicycle mode split for projects of this type and in this area were not available. For similar reasons, adjustments for travel by bus were also not

made. Accordingly, this analysis should be considered conservative when reviewing the results of the traffic operations analysis.

According to the project applicant, the unit composition of the proposed project is intended to emphasize workforce housing for employees working within the City of Davis, including those employed in the nearby University Research Park. A high percentage of project residents working nearby (or on-site) would likely shift a portion of project vehicle trips to walk, bike, or transit trips due to the shortened trip distances and abundance of local non-automobile travel options, particularly for commute trips. However, it is not known how the project's residential component would be managed to prioritize local workforce housing, or the percentage of project residents expected to be comprised of local employees. Therefore, for the purposes of this study, the residential component of the project is assumed to be general multi-family housing. This approach ensures that the study avoids overstating the vehicle trip reduction potential of a local workforce housing program and, in turn, understating the project's effects on nearby intersection operations.

Trip Distribution

The new UC Davis/City of Davis travel demand forecasting model was used to estimate project vehicle trip distribution. This involved running a "select zone" analysis, which tracks trips associated with a designated traffic analysis zone (TAZ) as they are assigned in the model. Select zone analyses were run separately for the residential and office components of the project to capture the trip distribution characteristics unique to the individual land use components of the project. Figures 5 and 6 show the trip distribution of the multi-family residential component, and Figures 7 and 8 show the trip distribution of the office component.

As shown in Figures 5, 6, 7, and 8, the majority of residential and office trips traveling to and from the project site would utilize the Richards Boulevard corridor west of the project site for the following purposes:

- Access to/from the I-80 interchange at Richards Boulevard for regional travel
- Access to/from Downtown or Central Davis
- Access to/from the UC Davis campus

The project vehicle trip distribution estimates also include a percentage of project trips traveling through the Cowell Boulevard / Research Park Drive intersection east of the project site for the following purposes:

- Access to/from East Davis and the Fifth Street corridor via the Pole Line Road overcrossing
- Access to/from South Davis destinations via Cowell Boulevard and Lillard Drive (e.g., the El Macero Shopping Center)
- Access to/from the I-80 interchange at Mace Boulevard to bypass peak hour traffic congestion on I-80 between Richards Boulevard and Mace Boulevard

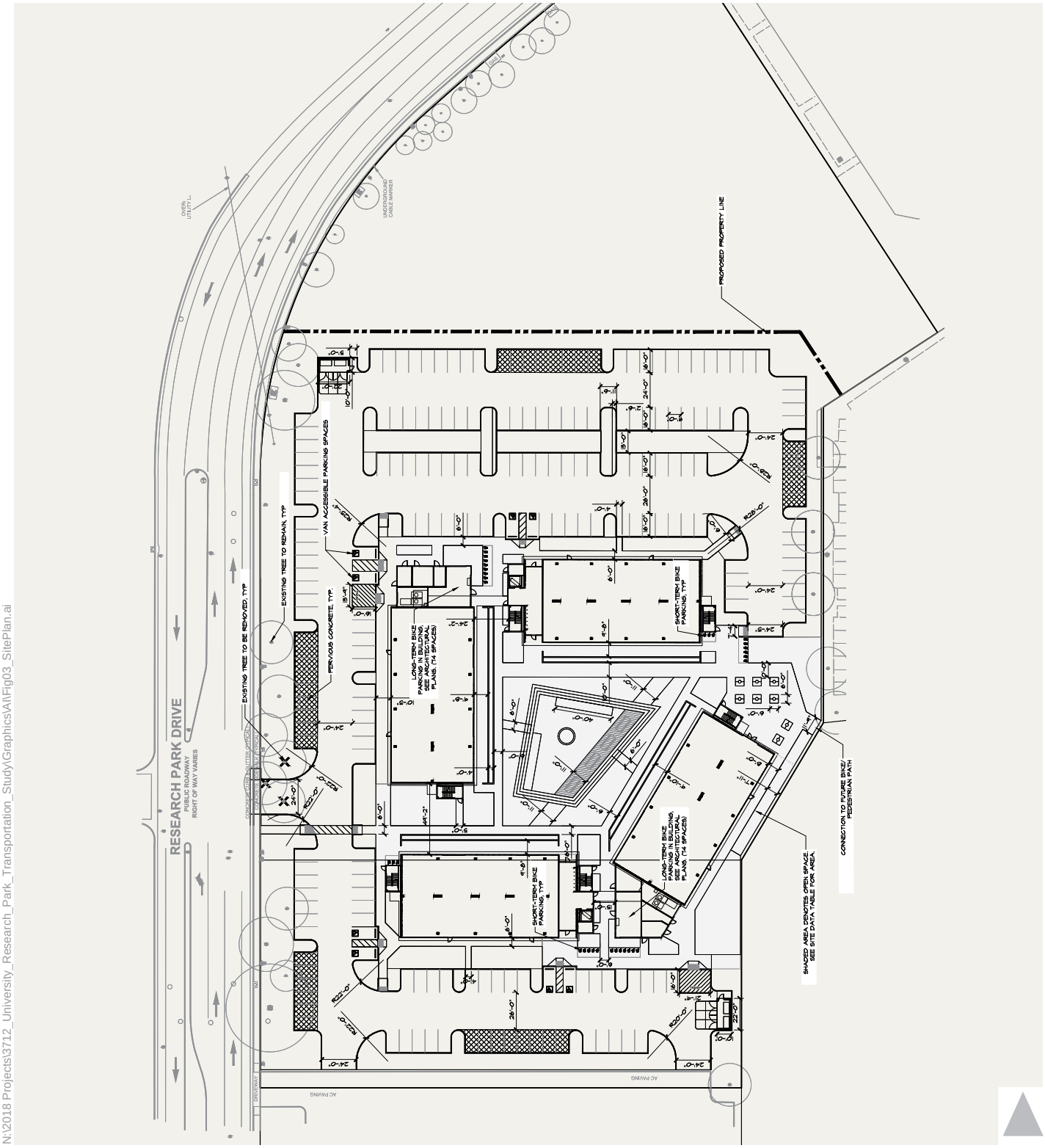


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Figure 4

Project Site Plan

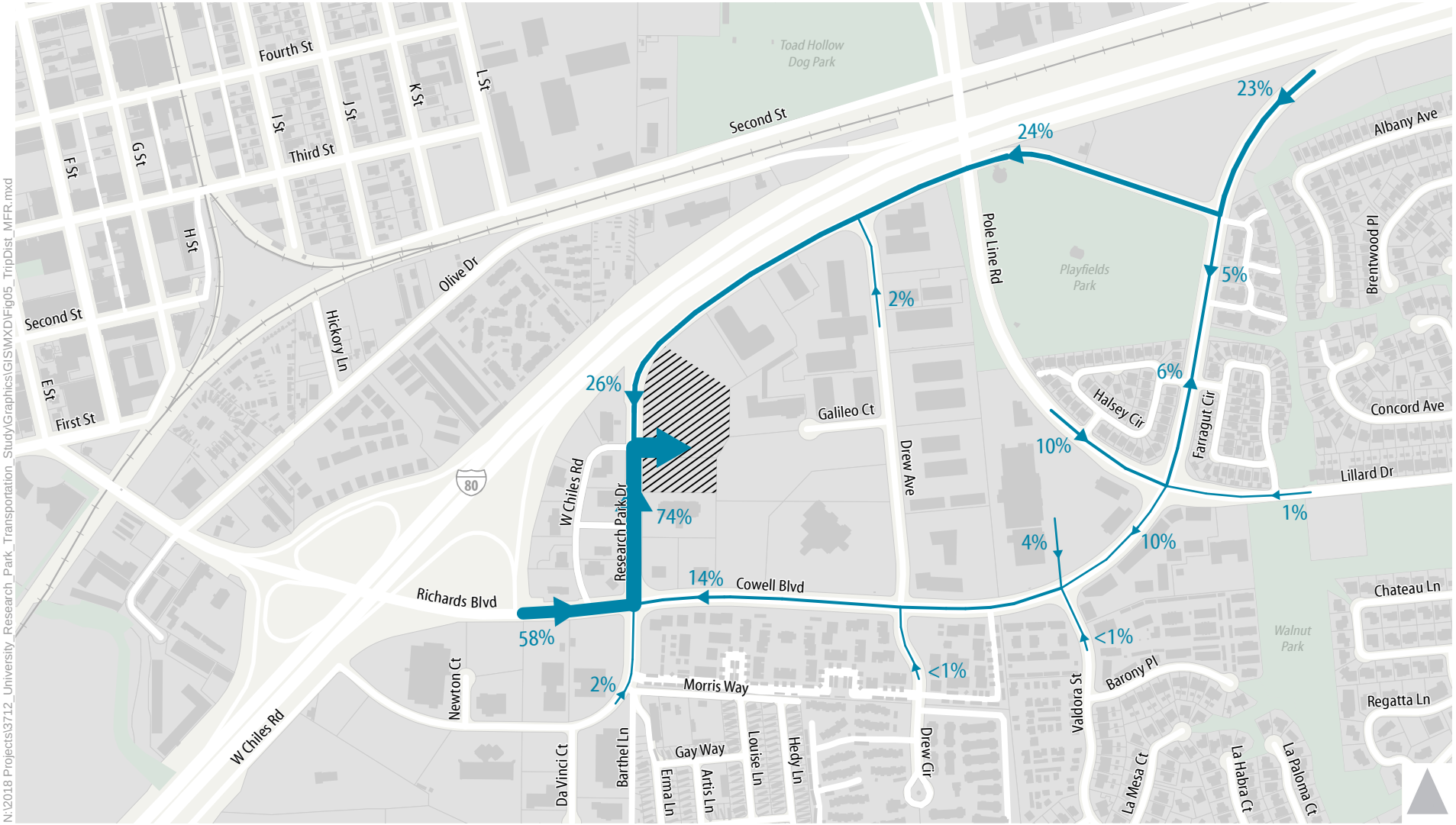


Figure 4

Project Trip Distribution - Inbound Multifamily Residential Component

Figure 4

Project Trip Distribution - Outbound
Multifamily Residential Component

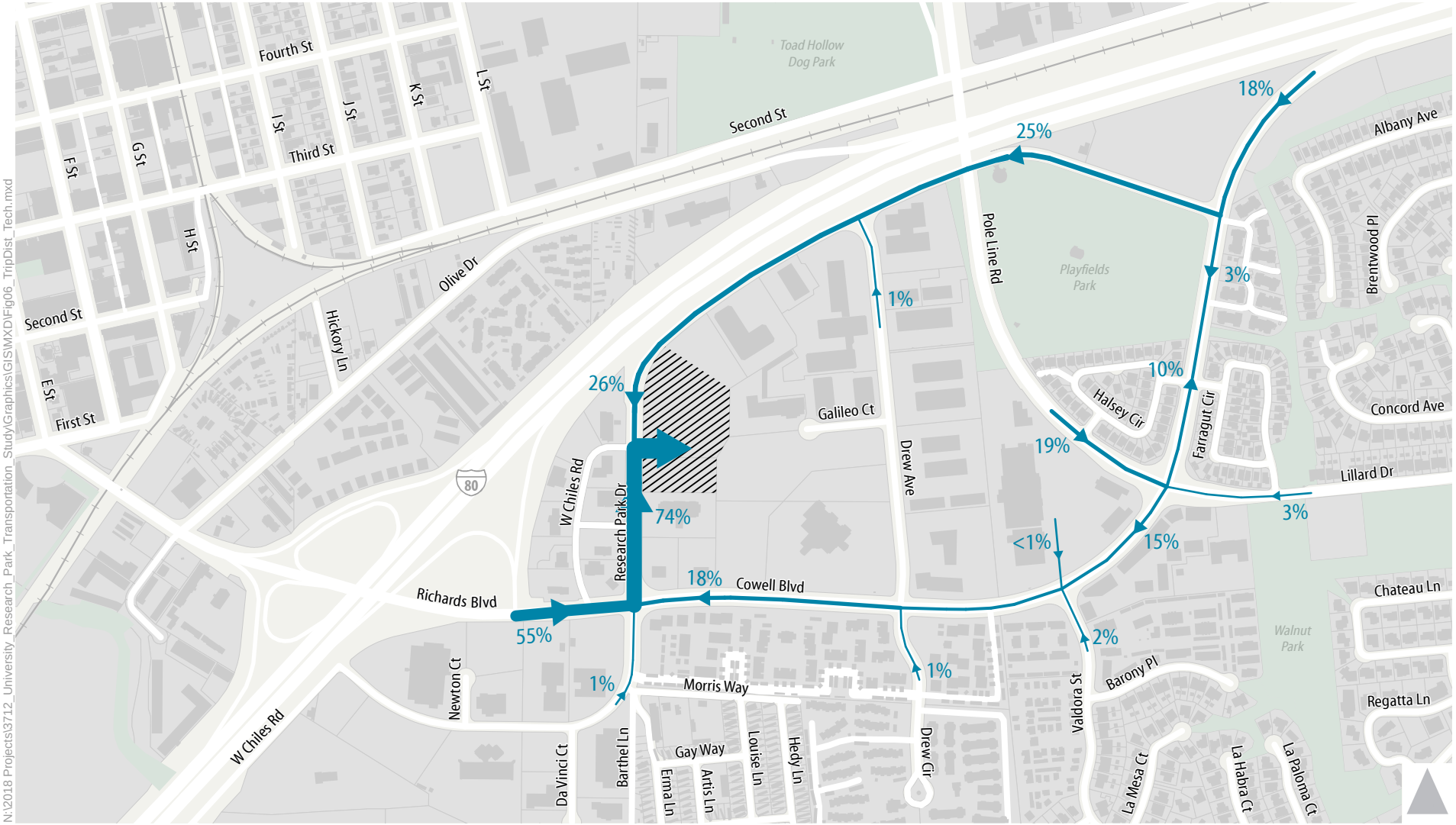


Figure 5

Project Trip Distribution - Inbound
Office Component

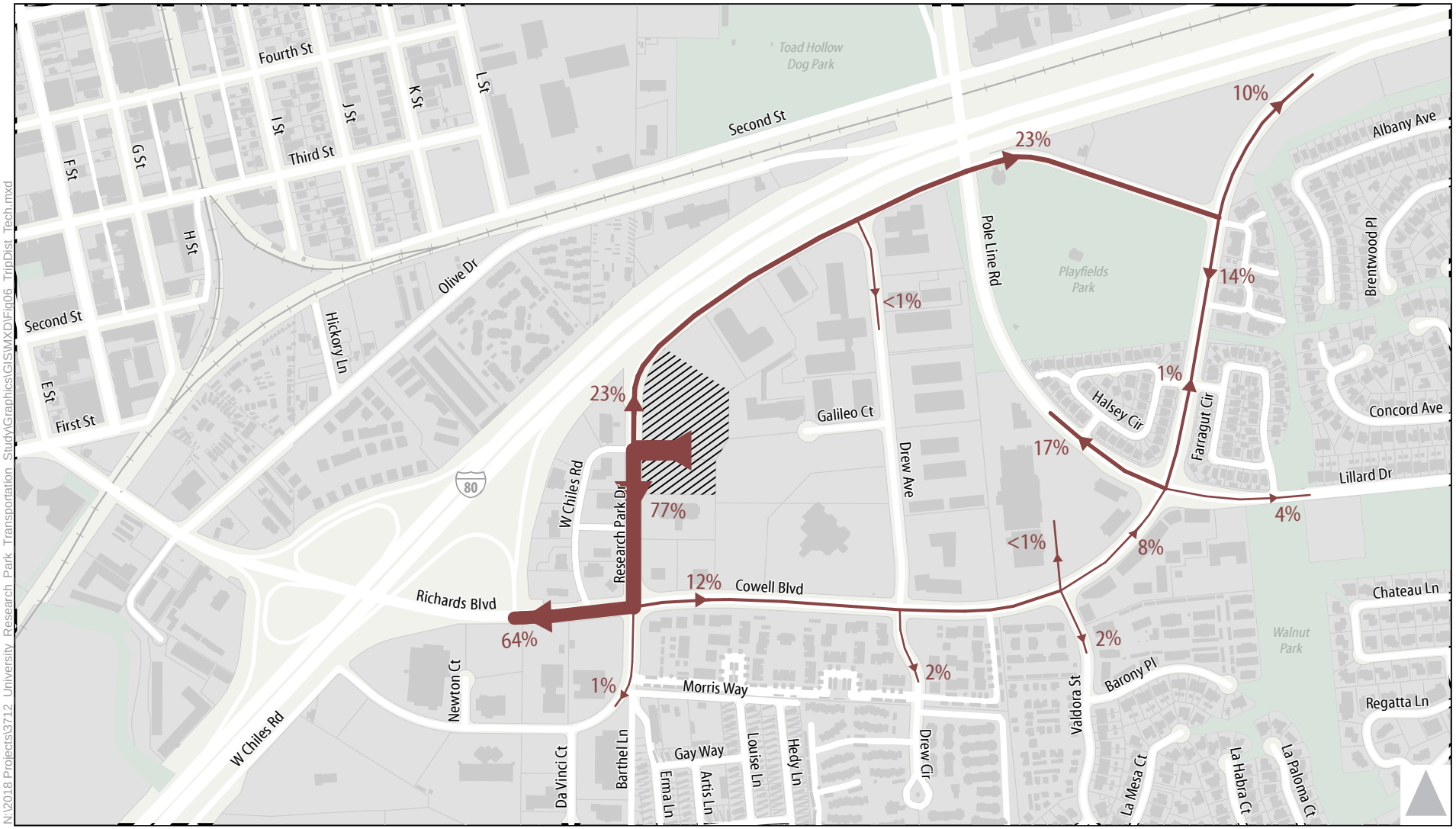


Figure 5

Project Trip Distribution - Outbound
Office Component

TRAFFIC OPERATIONS ANALYSIS

Study Intersections and Time Periods

The study area includes the following four study intersections in the project vicinity (see Figure 1):

1. Richards Boulevard / Cowell Boulevard / Research Park Drive
2. Research Park Drive / Project Driveway
3. Research Park Drive / Drew Avenue
4. Cowell Boulevard / Research Park Drive

These intersections were selected based on the project's forecasted vehicle trip generation and distribution. Study intersections were analyzed during the weekday AM and PM peak hours under Existing, Existing Plus Project, and Cumulative conditions.

Analysis Methodology

This study analyzes traffic operating conditions using level of service (LOS) as the primary measure of operational performance. Vehicle LOS is a qualitative measure of traffic flow from the perspective of motorists and are an indication of the comfort and convenience associated with driving. The LOS analysis uses procedures identified in the *Highway Capacity Manual, 6th Edition* (HCM) published by the Transportation Research Board of the National Academies of Science. The HCM defines six levels of service ranging from LOS A (representing free-flow vehicular traffic conditions with little to no congestion) to LOS F (oversaturated conditions where traffic demand exceeds capacity resulting in long queues and delays).

The analysis procedures were applied using the SimTraffic 10 microsimulation model software. Traffic simulation analysis was selected as the analysis method so that the queue interactions between adjacent intersections could be modeled more accurately. In addition, the use of microsimulation software allows for a better understanding of the interactions of vehicles, bicycles, and pedestrians and their effects on intersection operations. A 15-minute analysis period was selected, and an average of ten simulation model runs are reported.

The simulation model was calibrated to local conditions by adjusting driver and vehicle parameters based on past experience on City of Davis projects. The model was validated to observed queues at the study intersections during the peak hours. Table 3 presents the delay range for each LOS category for signalized and unsignalized intersections according to HCM procedures.

Table 3 Intersection Level of Service Criteria			
Level of Service	**Description**	**Average Control Delay (seconds per vehicle)**	
		Signalized Intersections	**Unsignalized Intersections**
A	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.	≤ 10	≤ 10
B	Stable flow, but the presence of other users in the traffic stream begins to be noticeable.	> 10 to 20	> 10 to 15
C	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream.	> 20 to 35	> 15 to 25
D	Represents high-density, but stable flow.	> 35 to 55	> 25 to 35
E	Represents operating conditions at or near the capacity level.	> 55 to 80	> 35 to 50
F	Represents forced or breakdown flow.	> 80	> 50

Source: Transportation Research Board, 2016.

Evaluation Criteria

The following criteria are used to identify operational deficiencies based on the intersection LOS analysis. . These thresholds are based on policies from the City of Davis General Plan, criteria utilized in previous transportation studies completed in the City, and professional judgment.

Per the City of Davis General Plan Transportation Element, LOS E is the minimum acceptable LOS for the majority of intersections within the City, and for each study intersection described previously. LOS F is acceptable for other areas (e.g., Downtown Davis and the Richards Boulevard corridor west of Interstate 80) as established in the General Plan and contingent on approval by the City Council.

For the purposes of this transportation study, adverse effects at intersections are defined when the addition of project traffic would cause any of the following:

- For signalized intersections, cause overall intersection operations to deteriorate from an acceptable level (LOS E or better) to an unacceptable level (LOS F);
- For signalized intersections, exacerbate unacceptable (LOS F) operations by increasing an intersection's average delay by five seconds or more;

- For unsignalized intersections, cause the worst-case movement (or average of all movements for all-way stop-controlled intersections) to worsen from an acceptable level (LOS E or better) to an unacceptable level (LOS F) and meet the peak hour signal warrant;
- For unsignalized intersections that operate unacceptably (LOS F) and meet the peak hour signal warrant without the project, worsen operations by increasing the overall intersection's volume by more than one percent; or
- For unsignalized intersections that operate unacceptably but do not meet the peak hour signal warrant without the project, add sufficient volume to meet the warrant

Existing Conditions

Peak Hour Traffic Volumes

Fehr & Peers conducted morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period traffic counts at the four study intersections in October 2016 (intersection #1), June 2018 (intersection #4), and September 2018 (intersections #2 and #3). During the counts, no unusual traffic patterns were observed, and local schools and UC Davis were in session. In addition to collecting vehicle turning movements at the study intersections, all counts included pedestrian and bicycle activity.

Based on the traffic data collection, the AM peak hour within the study area occurred from 8:00 to 9:00 AM, and the PM peak hour occurred from 4:45 to 5:45 PM. Figure 9 shows the existing peak hour intersection traffic volumes and lane configurations at the study intersections.

Intersection Operations

Table 4 presents peak hour delay and level of service at the study intersections under existing conditions. All study intersections operate at acceptable levels of service during the AM and PM peak hours.

Table 4
Peak Hour Intersection Operations – Existing Conditions

Intersection	Traffic Control	Peak Hour	Existing Conditions	
			Delay[1]	LOS
1. Richards Boulevard / Cowell Boulevard / Research Park	Signal	AM PM	25 31	C C
2. Research Park Drive / Project Driveway	SSSC	AM PM	1 (3) (EB LT) 1 (5) (EB LT)	A (A) A (A)
3. Research Park Drive / Drew Avenue	SSSC	AM PM	2 (5) (NB LT) 1 (6) (NB LT)	A (A) A (A)
4. Cowell Boulevard / Research Park Drive	SSSC	AM PM	2 (6) (EB LT) 6 (21) (EB LT)	A (A) A (A)

Notes: LOS = Level of Service. SSSC = Side-Street Stop-Controlled.
[1] For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For SSSC intersections, the LOS and control delay for the worst movement is shown in parentheses next to the average intersection LOS and delay. Adverse effects to intersections are determined based on the overall LOS and average delay. Intersection LOS and delay is calculated based on the procedures and methodology contained in the HCM, 6th Edition (TRB, 2016).
Source: Fehr & Peers, 2018

Peak Hour Signal Warrant Analysis

Peak hour signal warrant analyses were conducted for the three unsignalized study intersections (#2, #3, and #4) in accordance with Warrants 3A and 3B included in the *2014 California Manual on Uniform Traffic Control Devices* (CA MUTCD). Urban peak hour signal warrants were used since the design speeds for all study roadways do not exceed 40 MPH. As shown in Table 5, none of the three unsignalized study intersections meet the peak hour signal warrants under existing conditions.

Note that the peak hour signal warrant analysis for Cowell Boulevard / Research Park Drive (intersection #4) omits the eastbound right-turn volume from the minor street turn movement volume total, as allowed by the CA MUTCD procedures. This is due to the availability of an eastbound right-turn pocket, which accommodates right-turn demand in an exclusive lane and diminishes its effect on the eastbound left-turn movement (i.e., the primary movement that would benefit from the construction of a traffic signal). This methodology is preferred by City staff and was similarly utilized on the recent *Traffic Operations Study for Plaza 2555* (KD Anderson & Associates, August 2018). This methodology is repeated for the peak hour signal warrant analyses completed for Existing Plus Project and Cumulative conditions (discussed below).

Table 5 Peak Hour Signal Warrant Analysis – Existing Conditions				
Intersection	**AM Peak Hour**		**PM Peak Hour**	
	Warrant 3A	**Warrant 3B**	**Warrant 3A**	**Warrant 3B**
2. Research Park Drive / Project Driveway	Not Met	Not Met	Not Met	Not Met
3. Research Park Drive / Drew Avenue	Not Met	Not Met	Not Met	Not Met
4. Cowell Boulevard / Research Park Drive	Not Met	Not Met	Not Met	Not Met

Note: Peak hour signal warrant analyses (Warrants 3A and 3B, Urban) conducted in accordance with procedures described in the *2014 California Manual on Uniform Traffic Control Devices* (CA MUTCD).
Source: Fehr & Peers, 2018

Existing Plus Project Conditions

Peak Hour Traffic Volumes

Project trips were assigned to the study intersections in accordance with the trip generation estimates and distribution percentages described previously. Those trips were then added to the existing volumes to yield Existing Plus Project conditions. Figure 10 shows the peak hour intersection traffic volumes under Existing Plus Project conditions.

While a nominal number of project vehicle trips would utilize the adjacent secondary driveways (e.g., the Holiday Inn Express driveway), this analysis assumes that all project vehicle trips would use the primary project driveway off of Research Park Drive (intersection #2). This approach ensures that the analysis does not understate the delay and queueing associated with project vehicle trips at the primary project driveway. Moreover, assigning a small number of project vehicle trips to the adjacent secondary driveways would not have a material effect on the outcome of the traffic operations analysis at other study intersections.

Intersection Operations

Table 6 presents peak hour delay and level of service at the study intersections under Existing Plus Project conditions. The project would cause minor changes to intersection delay, and all study intersections would operate at acceptable levels of service during the AM and PM peak hours. Therefore, the project would not cause adverse effects to intersection operations under Existing Plus Project conditions.

Table 6
Peak Hour Intersection Operations – Existing Plus Project Conditions

Intersection	Traffic Control	Peak Hour	Existing Conditions		Existing Plus Project	
			Delay[1]	LOS	Delay[1]	LOS
1. Richards Boulevard / Cowell Boulevard / Research Park	Signal	AM PM	25 31	C C	26 31	C C
2. Research Park Drive / Project Driveway	SSSC	AM PM	1 (3) (EB LT) 1 (5) (EB LT)	A (A) A (A)	1 (6) (WB LT) 2 (8) (WB LT)	A (A) A (A)
3. Research Park Drive / Drew Avenue	SSSC	AM PM	2 (5) (NB LT) 1 (6) (NB LT)	A (A) A (A)	1 (5) (NB LT) 1 (5) (NB LT)	A (A) A (A)
4. Cowell Boulevard / Research Park Drive	SSSC	AM PM	2 (6) (EB LT) 6 (21) (EB LT)	A (A) A (C)	2 (6) (EB LT) 6 (21) (EB LT)	A (A) A (C)

Notes: LOS = Level of Service. SSSC = Side-Street Stop-Controlled.
[1] For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For SSSC intersections, the LOS and control delay for the worst movement is shown in parentheses next to the average intersection LOS and delay. Adverse effects to intersections are determined based on the overall LOS and average delay. Intersection LOS and delay is calculated based on the procedures and methodology contained in the HCM, 6th Edition (TRB, 2016).
Source: Fehr & Peers, 2018.

The project would extend the maximum queue for the eastbound left-turn movement at the Richards Boulevard / Cowell Boulevard / Research Park intersection (intersection #1) from 325 feet to 350 feet during the PM peak hour. The existing eastbound left-turn lane has 450 feet of available storage, therefore, the project would not cause queue spillback to occur into the upstream Richards Boulevard / Eastbound I-80 Ramps intersection.

Peak Hour Signal Warrant Analysis

Peak hour signal warrant analyses were conducted for the three unsignalized study intersections under Existing Plus Project conditions. As shown in Table 7, none of the three unsignalized study intersections would meet the peak hour signal warrants under Existing Plus Project conditions.

Table 7 Peak Hour Signal Warrant Analysis – Existing Plus Project Conditions				
Intersection	AM Peak Hour		PM Peak Hour	
	Warrant 3A	Warrant 3B	Warrant 3A	Warrant 3B
2. Research Park Drive / Project Driveway	Not Met	Not Met	Not Met	Not Met
3. Research Park Drive / Drew Avenue	Not Met	Not Met	Not Met	Not Met
4. Cowell Boulevard / Research Park Drive	Not Met	Not Met	Not Met	Not Met

Note: Peak hour signal warrant analyses (Warrants 3A and 3B, Urban) conducted in accordance with procedures described in the *2014 California Manual on Uniform Traffic Control Devices* (CA MUTCD).
Source: Fehr & Peers, 2018

Cumulative Conditions

This study analyzes a single Cumulative scenario using a 2036 analysis year. Under Cumulative conditions, the project would cause adverse effects to intersection operations if both of the following criteria are met:

- An unacceptable condition would exist; and
- The project would have a cumulatively considerable contribution to the unacceptable condition.

Peak Hour Traffic Volumes

Traffic forecasts for the Cumulative scenario were prepared using the new UC Davis/City of Davis travel demand model. Traffic forecasts were developed for Cumulative conditions using the difference method procedure, which adds the growth in traffic between the base year and future year models to the existing volumes. This method is commonly used in forecasting because it accounts for errors in the base year model, which could also translate to the cumulative forecasts if not accounted for by this method.

The travel demand model includes reasonably foreseeable land use and transportation system changes, including 2016 SACOG MTP/SCS and City of Davis General Plan land use growth and transportation improvement projects, as well as the UC Davis 2018 Long Range Development Plan (LRDP). The land use inputs in the model include the construction and operation of the proposed University Research Park project. The planned transportation system improvements in the model include the reconstructed I-80 interchange at Richards Boulevard, which also includes modifications to the lane configurations at the Richards Boulevard / Cowell Boulevard / Research Park intersection approaches.

The Cumulative year peak hour traffic volumes are presented in Figure 11.

Intersection Operations

Table 8 presents peak hour delay and level of service at the study intersections under Cumulative conditions.

Under Cumulative conditions, all study intersections would operate at LOS E or better for the overall intersection LOS. The eastbound left-turn side-street stop movement at Cowell Boulevard / Research Park Drive (intersection #4) would operate at unacceptable LOS F conditions during the PM peak hour. The project would add 32 PM peak hour trips through the intersection, which constitutes a two percent increase in overall intersection volumes during the PM peak hour compared to Cumulative No Project conditions. The project's contribution to the unacceptable intersection operating conditions would be cumulatively considerable, therefore, the project would contribute to cumulatively adverse intersection operations at Cowell Boulevard / Research Park Drive under Cumulative conditions.

Table 8
Peak Hour Intersection Operations – Cumulative Conditions

Intersection	Traffic Control	Peak Hour	Cumulative Plus Project Conditions	
			Delay[1]	LOS
1. Richards Boulevard / Cowell Boulevard / Research Park	Signal	AM PM	33 44	C D
2. Research Park Drive / Project Driveway	SSSC	AM PM	2 (9) (WB LT) 1 (9) (WB LT)	A (A) A (A)
3. Research Park Drive / Drew Avenue	SSSC	AM PM	2 (7) (NB LT) 2 (8) (NB LT)	A (A) A (A)
4. Cowell Boulevard / Research Park Drive	SSSC	AM PM	5 (18) (EB TH) 48 (197) (EB LT)	A (C) E (F)

Notes: LOS = Level of Service. SSSC = Side-Street Stop-Controlled.
[1] For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For SSSC intersections, the LOS and control delay for the worst movement is shown in parentheses next to the average intersection LOS and delay. Adverse effects to intersections are determined based on the overall LOS and average delay. Intersection LOS and delay is calculated based on the procedures and methodology contained in the HCM, 6th Edition (TRB, 2016).
Source: Fehr & Peers, 2018

During the PM peak hour under cumulative conditions, the maximum queue for the eastbound left-turn movement at the Richards Boulevard / Cowell Boulevard / Research Park intersection (intersection #1) would spill back to a distance of 500 feet, 50 feet (approximately two car lengths) beyond the available 450 feet of storage. This condition would persist for several consecutive cycles before the queue would dissipate. The signal would operate with excess green time for lower demand movements and overall intersection operations would fall within the acceptable LOS threshold. Accordingly, signal timing at the intersection could be adjusted to reduce the likelihood that the queue spillback would occur.

Peak Hour Signal Warrant Analysis

Peak hour signal warrant analyses were conducted for the three unsignalized study intersections under Cumulative conditions. As shown in Table 9, the Cowell Boulevard / Research Park Drive intersection (intersection #4) would meet Warrants 3A and 3B during the PM peak hour under Cumulative conditions.

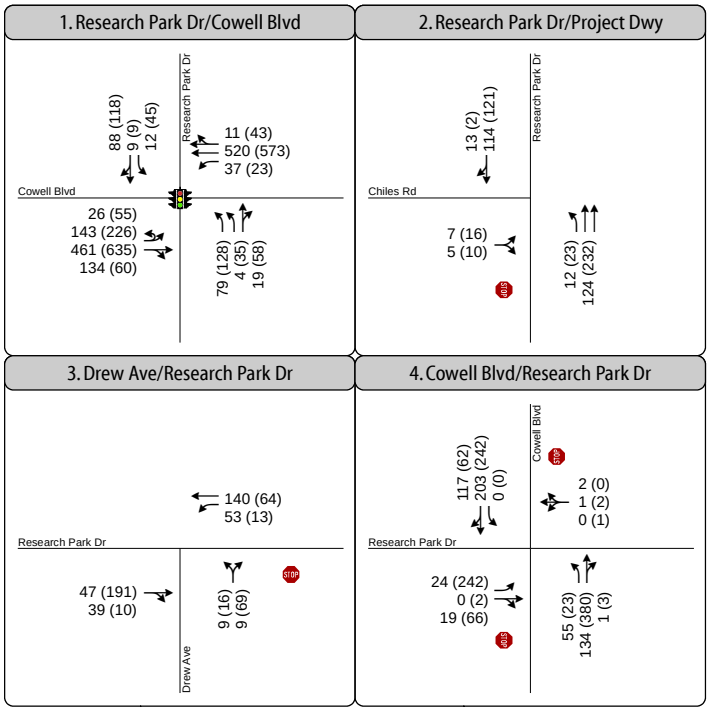
Table 9
Peak Hour Signal Warrant Analysis – Cumulative Conditions

Intersection	AM Peak Hour		PM Peak Hour	
	Warrant 3A	Warrant 3B	Warrant 3A	Warrant 3B
2. Research Park Drive / Project Driveway	Not Met	Not Met	Not Met	Not Met
3. Research Park Drive / Drew Avenue	Not Met	Not Met	Not Met	Not Met
4. Cowell Boulevard / Research Park Drive	Not Met	Not Met	Met	Met

Note: Peak hour signal warrant analyses (Warrants 3A and 3B, Urban) conducted in accordance with procedures described in the *2014 California Manual on Uniform Traffic Control Devices* (CA MUTCD).
Source: Fehr & Peers, 2018

1 Study Intersection

Project Site



Turn Lane

AM (PM) Peak Hour Traffic Volume

Traffic Signal

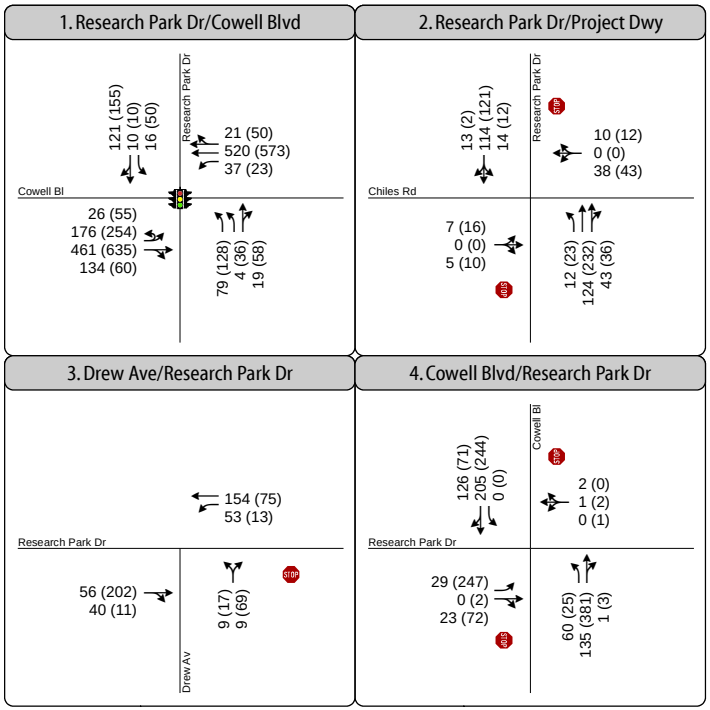
Stop Sign

Figure 9

Peak Hour Intersection Turning Movements
Existing Conditions

1 Study Intersection

Project Site



Turn Lane

AM (PM) Peak Hour Traffic Volume

Traffic Signal

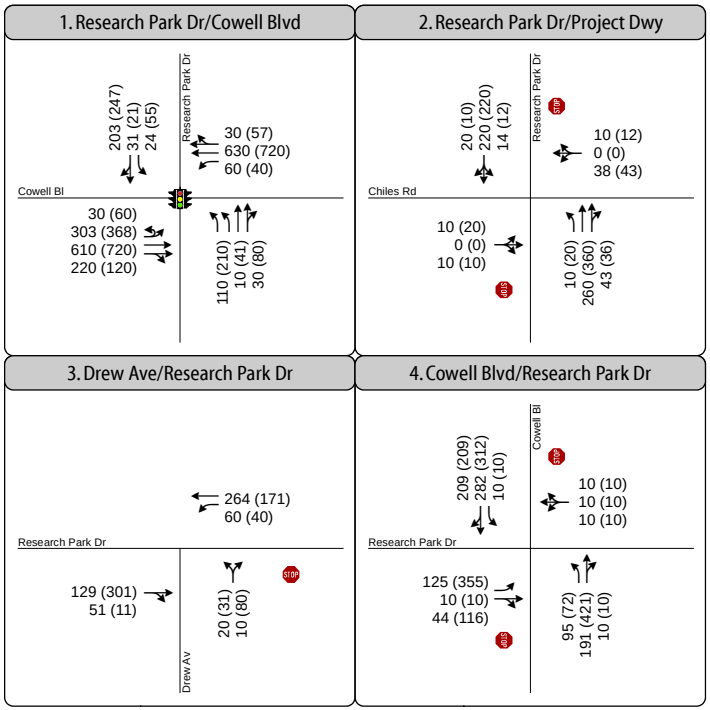
Stop Sign

Figure 10

Peak Hour Intersection Turning Movements
Existing Plus Project Conditions

1 Study Intersection

Project Site



Turn Lane

AM (PM) Peak Hour Traffic Volume

Traffic Signal

Stop Sign

Figure 11

Peak Hour Intersection Turning Movements
Cumulative Conditions

SITE ACCESS REVIEW

The following section provides a review of multi-modal site access.

Vehicle Access

The vehicle access review included the following elements:

- Consistency with City design standards
- Permitted turning movements at project driveway
- Sight distance at project driveway

Consistency with City Design Standards

The *City of Davis Public Works Department 2016 Street Standards* (October 2016) identifies City standards related to driveway spacing and width for a variety of street classifications and land use types.

The *2016 Street Standards* allows for "limited" driveway and street access for collector streets such as Research Park Drive within the project vicinity. The project would construct a single new driveway on Research Park Drive along its lone public street frontage. Internal driveway access along the southern edge of the project site would connect the project with adjacent parking lots and their existing driveways on Research Park Drive and Cowell Boulevard. Project driveway spacing would be consistent with applicable City standards, therefore, no modifications to the proposed driveway spacing are recommended.

The *2016 Street Standards* establishes an acceptable width of 20 feet to 35 feet for driveways serving multiple family land uses such as the proposed project. The project site plan indicates a width of 24 feet for the primary project driveway, which would be within the established range in the *2016 Street Standards*. However, given the mix of uses on the project site, the variety of vehicle types entering and exiting the project site, and the speed of traffic on the adjacent roadway, a driveway width of 30 feet is recommended.

The *2016 Street Standards* does not provide standards for driveway throat depth. However, the adequacy of driveway throat depth for the project site was assessed based on the anticipated queue length for vehicles exiting the project site. Westbound queues for vehicles exiting the project site at the primary project driveway on Research Park Drive (intersection #2) would reach a length of approximately 50 feet (equivalent to two vehicle lengths). This queue would extend back into the project site up to the centerline of the north-south drive aisle adjacent to the project driveway. This queue would not block arriving vehicles from turning

left or right after entering the project site at the primary project driveway. Therefore, no modifications to the proposed project driveway throat depth are recommended.

The *2016 Street Standards* describes the following requirements related to intersection sight distance:

- Corner sight distance shall be provided at all intersections and crossings
- Corner sight distance shall be designed for the intersecting street design speed and stopping sight distance
- Intersections shall provide line-of-sight between users for the minimum stopping sight distance
- Areas requiring corner sight distance shall limit the height of landscaping and visual obstructions to 30 inches above the paved travel way

Each of the above sight distance standards are applicable to the proposed project driveway and applied in the sight distance evaluation described below.

Permitted Turning Movements at Project Driveway

The project driveway would be situated on the east side of Research Park Drive approximately 190 feet north of the project's southern property line, immediately opposite the existing private roadway west of Research Park Drive near La Quinta Inn. The driveway would form the east leg of a four-legged side-street stop-controlled intersection. This segment of Research Park Drive features two northbound lanes and one southbound lane separated by a median. The median is discontinued at the location of the project driveway. According to the project site plan, all turning movements would be permitted at the project driveway.

The proposed permitted turning movements at the project driveway would sufficiently accommodate inbound and outbound vehicular routes. Full-access at the project driveway would accommodate the primary project vehicular movements between the project site and the Richards Boulevard / Cowell Boulevard corridor to the south, particularly for left-turns departing the project site. Similarly, full-access at the project driveway would accommodate left-turns into the project site traveling from Research Park Drive to the northeast.

Southbound left-turn movements into the project driveway would occur from the existing through lane on Research Park Drive, since an exclusive southbound left-turn lane is not currently provided or proposed as an element of the project. Accordingly, southbound left-turning vehicles would queue in the through lane while waiting to for a gap in northbound traffic to complete their maneuver. This condition would require adequate stopping sight distance for upstream southbound vehicles approaching queued vehicles waiting to turn into the project site. Refer to the following sight distance evaluation for additional discussion.

Sight Distance at Project Driveway

Corner Sight Distance for Vehicles Exiting Project Driveway

The available sight distance for motorists exiting the project driveway was analyzed using guidelines in the *Highway Design Manual – HDM* (Caltrans 2014). Table 405.1A of the *HDM* describes corner sight distance, which corresponds to providing a motorist with 7.5 seconds of sight distance.

National Data and Surveying Services (NDS) conducted a speed survey for two distinct segments on Research Park Drive within the vicinity of the project site during the off-peak period of a dry weekday in September 2018. The results are described below:

- Segment 1: Northbound Research Park Drive (south of southern project property line)
  - Posted speed limit = 35 MPH
  - 85th percentile speed = 39 MPH
- Segment 2: Southbound Research Park Drive (at the approximate midpoint of the Research Park Drive horizontal curve near the northern project property line)
  - Posted speed limit = 35 MPH
  - 85th percentile speed = 38 MPH

Absent any significant horizontal or vertical roadway profile elements, standard practice for sight distance analysis entails selecting a design speed that corresponds to the first 5 MPH increment above the 85th percentile speed, but not less than the posted speed limit. Accordingly, a design speed of 40 MPH was selected for Segments 1 and 2 with a required corner sight distance of 440 feet. Driver's eye (3½-foot height) and driver setback (10-foot setback from the road plus the width of the bike lane, shoulder, and sidewalk) were applied in accordance with the *HDM*. An approaching vehicle height of two feet was utilized to represent a headlight during nighttime or inclement weather conditions.

Figure 12 summarizes the corner sight distance evaluation. Key findings from the corner sight distance analysis are as follows:

- Looking south (at approaching northbound vehicles), the required 440-foot sight distance is partially obstructed by low-hanging branches from trees planted in the landscaped berm along the project site frontage.
- Looking north (at approaching southbound vehicles), the required 440-foot sight distance is obstructed by the trunks of trees planted in the landscaped berm along the project site frontage (see Image 9). While the project site plan proposes the removal of some existing trees to accommodate the project driveway, the trees creating the corner sight distance obstructions would remain. Sight distance is also obstructed by landscaping in the Research Park Drive median, which

exceeds the allowable 30-inch height established in the *2016 Street Standards* (see Image 10). The turning movement associated with this sight triangle (westbound left-turn looking north) as well as the surrounding roadway conditions are similar to those involved in the reported broadside collision on Research Park Drive described previously.

A detailed evaluation of the effects of the existing landscaped berm on corner sight distance has not been performed due to the lack of final site elevations and details regarding proposed physical modifications to the berm to accommodate the project driveway. Given the height of the berm, it could create a sight distance obstruction for motorists departing the project driveway looking both southbound and northbound. Similarly, a detailed evaluation of potential vertical sight distance limitations has not been performed due to the lack of final parking lot and driveway elevations. A final review of corner sight distance and vertical sight distance is recommended once final site elevations are available.

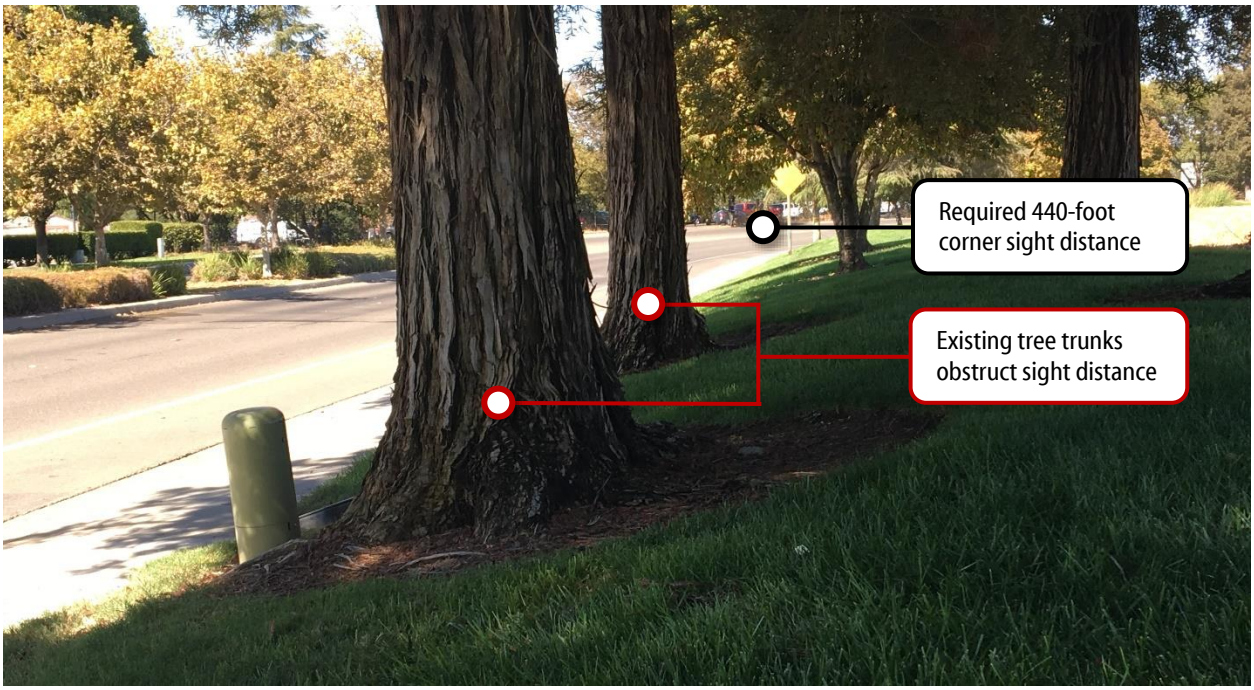


Image 1. View of existing tree trunks obstructing corner sight distance at the project driveway looking north on Research Park Drive, taken from approximate driver's eye height.

Image 2. Research Park Drive median landscaping height relative to a 36-inch measuring stick. The existing shrubs in the median are approximately 3½ feet tall.

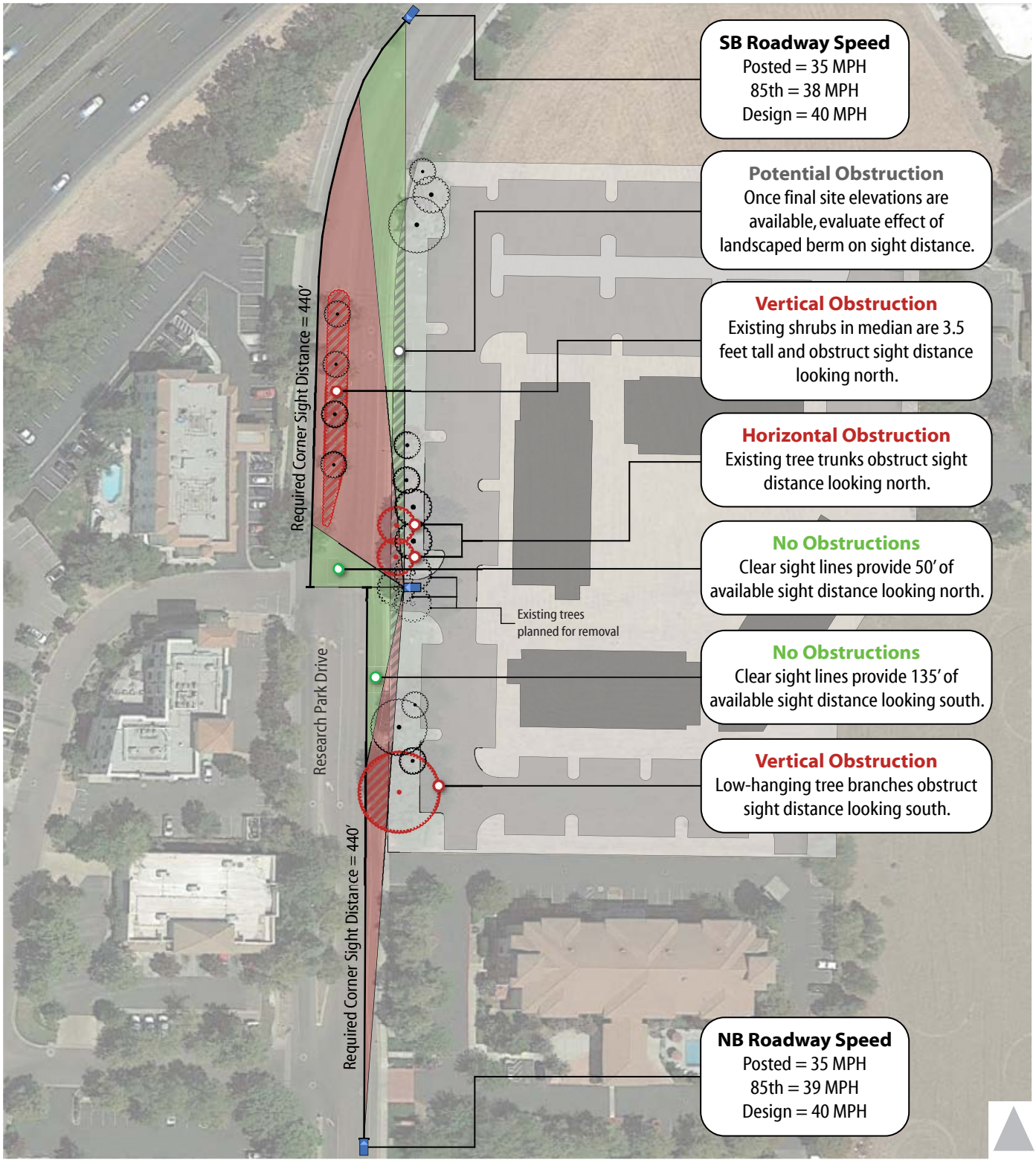
Stopping Sight Distance

The available stopping sight distance for southbound motorists approaching the project site on Research Park Drive was analyzed using guidelines in the *HDM*. Table 201.1 of the *HDM* describes stopping sight distance, which corresponds to the distance required by motorists, traveling at a given speed, to bring a vehicle to a stop after an object ½-foot high on the road become visible.

According to the *HDM*, a 40 MPH design speed has a required stopping sight distance of 300 feet. Driver's eye (3½-foot height) and roadway obstruction height (½-foot height) were applied in accordance with the *HDM*.

The required 300-foot sight distance was applied for the project driveway, north along the centerline of the southbound travel lane on Research Park Drive. The available stopping sight distance was found to be inadequate due to the horizontal curvature of the roadway as well as the landscaping in the Research Park Drive median, which exceeds the allowable 30-inch height established in the *2016 Street Standards* (see Figure 13). In other words, a motorist on southbound Research Park Drive would have less than the HDM-recommended 300 feet of visibility of a vehicle stopped at the project intersection waiting to turn left.

Image 3. View of median landscaping obstructing stopping sight distance between southbound motorists on Research Park Drive and the project driveway, taken from approximate driver's eye height.



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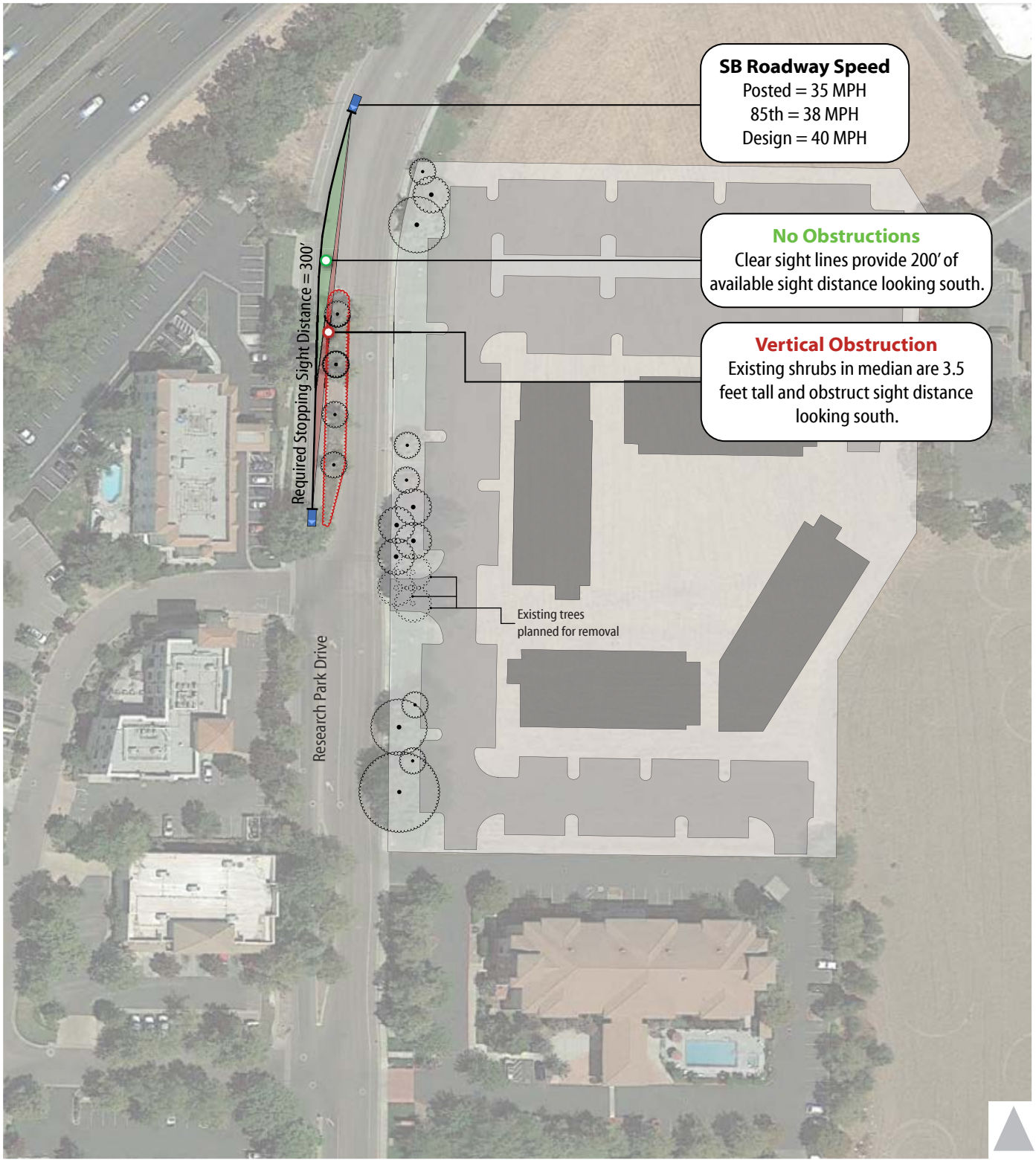
Red cross-hatched or outlined objects represent sight distance obstructions that require modification to provide adequate sight distance.

Figure 12

Project Driveway Corner Sight Distance Evaluation



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Red cross-hatched or outlined objects represent sight distance obstructions that require modification to provide adequate sight distance.

Figure 13

Project Driveway Stopping Sight Distance Evaluation

Pedestrian Access

The project site plan includes several existing and future connections to the surrounding pedestrian network. An internal 6-foot wide pedestrian pathway would connect the interior of the project site with the existing sidewalk on the eastern side of Research Park Drive. The site plan includes an access point to a future bicycle and pedestrian path along the eastern project property line. This path would eventually connect east to Galileo Court and the University Research Park business park.

Nearby destinations expected to attract project pedestrian trips include Oakshade Town Center, Downtown Davis, and the University Research Park business park. Project pedestrian trips would be accommodated on the existing sidewalk and crosswalk facilities on roadways surrounding the project site, including Research Park Drive, Cowell Boulevard, and Richards Boulevard.

The existing pedestrian environment serving the project site is generally contiguous and comfortable. However, the following conditions could adversely affect pedestrian access to and from the project site:

- Richards Boulevard / Cowell Boulevard / Research Park intersection – The channelized westbound right-turn lane creates a lengthened crossing distance for pedestrians crossing the north and east legs of the intersection, increasing their exposure to conflicting vehicular traffic. Moreover, channelized right-turn lanes facilitate higher vehicle turning speeds than typical right-turn lanes. Project pedestrian trips would be expected to cross at this location for travel between the project site and Downtown Davis, as well as for access to the farside eastbound and westbound bus stops on either side of the intersection.
- Drew Avenue / Galileo Court intersection – The future bicycle and pedestrian path departing from the eastern project property line would eventually connect pedestrians with Galileo Court and the surrounding business park. Project residents working within the business park would utilize this path for commute travel to and from work. Currently, the Drew Avenue / Galileo Court intersection is side-street stop-controlled, with no marked crosswalks on any legs of the intersection. The lack of north-south traffic controls, marked crosswalks, or other pedestrian crossing treatments could hinder pedestrian access between the project site and work destinations east of Drew Avenue.

Bicycle Access

Project bicycle trips would be accommodated on the existing on- and off-street bicycle facilities within the study area, including Class II bike lanes on Research Park Drive, Richards Boulevard, and Cowell Boulevard. Bicyclists departing the project site would utilize the nearby on-street bicycle facilities for at least some portion of their trip. These on-street bicycle facilities would connect project bicyclists with the citywide off-

street bicycle network serving local destinations including Downtown Davis, the UC Davis campus, and the Oakshade Town Center.

The existing bicycle environment serving the project site is generally contiguous and comfortable. However, the following conditions could adversely affect bicycle access to and from the project site:

- Research Park Drive – As described above, the 85th percentile speed of existing vehicle traffic on Research Park Drive within the project site vicinity exceeds 35 MPH in both the northbound and southbound direction. Even with the existing Class II bike lanes on Research Park Drive, high speeds of vehicle traffic can adversely affect the bicycling environment for less confident or less experienced bicyclists who prefer greater physical separation from moving vehicles. Existing guidance recommends providing greater levels of physical separation in circumstances where bicyclists ride in-street alongside high speeds and/or volumes of vehicle traffic. For example, the NACTO *Designing for All Ages & Abilities* guidance recommends providing a protected bike lane (i.e., a Class IV cycle track) or a shared-use path on roadways with vehicle traffic exceeding 26 MPH.
- Richards Boulevard / Cowell Boulevard / Research Park Drive and Research Park Drive / Drew Avenue intersections – Both of these intersections feature channelized right-turn lanes that lengthen the crossing distance for bicyclists and create higher-speed mixing zones with automobiles, increasing bicyclist exposure to conflicting automobile traffic. These include the westbound channelized right-turn lane at Richards Boulevard / Cowell Boulevard / Research Park Drive and eastbound and northbound channelized right-turn lanes at Research Park Drive / Drew Avenue. These turn lanes currently do not have bicycle conflict markings to draw attention to bicycle-automobile mixing zones. The City of Davis Beyond Platinum Bicycle Action Plan recommends providing these markings for the westbound channelized right-turn lane at the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection.

Transit Access

The project is served by multiple Unitrans and Yolobus bus routes with bus stops less than a quarter mile from the project site. Moreover, Capitol Corridor intercity rail service is available less than a mile away at the Davis Train Station in Downtown Davis. Project transit trips could be accommodated by the existing bus and rail service operating within the study area.

As previously discussed, first-/last-mile access to transit stops at the Richards Boulevard / Cowell Boulevard / Research Park intersection could be limited by the presence of the westbound channelized right-turn lane at the intersection.

RECOMMENDATIONS

The following section describes on- and off-site recommendations that would improve multi-modal access to and from the project site, as well as recommendations that would address the adverse effects on the surrounding multi-modal circulation system that would be caused by the project. The recommendations are based on City goals, policies, and standards related to multi-modal transportation established in the General Plan and street design standards, as well as industry best practices.

Recommendations #1 and #2 describe the physical modifications necessary to ensure adequate site access for motorists entering and exiting the project driveway on Research Park Drive. Accordingly, the on-site modifications described in Recommendations #1 and #2 should be considered as elements of the project description and site plan. Similarly, for off-site modifications described in Recommendations #1 and #2 that would be completed by the City (i.e., those within the public right-of-way), the project applicant should be responsible for their full cost.

Recommendations #3 through #10 are off-site improvements that would benefit all users of the study area circulation system, including those generated by the project. Accordingly, the City should determine an appropriate fair share contribution for each improvement identified in Recommendations #3 through #10 to be provided by the project applicant.

Figures 14 and 15 illustrate the proposed recommendations.

Recommendation #1 – Remove corner and stopping sight distance obstructions.

The following actions should be completed to eliminate corner and stopping sight distance obstructions at the project driveway on Research Park Drive:

- Remove low-hanging branches of trees planted in the landscaped berm on the east side of Research Park Drive south of the project driveway.
- Remove the two existing trees proposed to remain immediately north of the project driveway (as shown in Image 1).
- Remove the shrubs in the Research Park Drive landscaped median north of the project driveway and replace with hardscaping or groundcover that does not exceed a height of six inches. The median trees could remain since their trunks do not materially affect sight distance.
- Gather details regarding the landscaped berm and site elevation and conduct supplemental sight distance analyses. If the landscaped berm is found to obstruct corner sight distance, remove portions of the berm by a depth sufficient to maintain required 440-foot sight distance.

Implementation of these actions would maintain adequate corner and stopping sight distance at the project driveway per the requirements set forth in the *HDM*.

Recommendation #2 – Construct project driveway with a width of 30 feet.

The project applicant should construct the primary project driveway on Research Park Drive with a width of 30 feet, instead of the 24-foot width identified in the current project site plan. This modification would be necessary given the mix of uses on the project site, the variety of vehicle types entering and exiting the project site, and the speed of traffic on the adjacent roadway.

Recommendation #3 – Coordinate with owner of adjacent undeveloped property to construct a bicycle and pedestrian path to Galileo Court.

Coordination should occur with affected property owners to facilitate the construction of a bicycle and pedestrian path between the project site and Galileo Court. The path should connect with the designated access point identified on the project site plan. This path would improve bicycle and pedestrian access by providing a direct route between the project site and the University Research Park business park.

Recommendation #4 – Upgrade existing Class II bike lanes on Research Park Drive.

The existing Class II bike lanes on Research Park Drive between the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection and the Research Park Drive / Cowell Boulevard intersection should be upgraded to provide additional physical separation between bicyclists and adjacent vehicle traffic to improve the level of comfort for bicyclists traveling to and from the project site. Potential improvements include buffered Class II bike lanes or Class IV cycle tracks. This modification could require a reconfiguration of the on-street parking currently permitted on the south side of Research Park Drive immediately adjacent to Playfields Park. Modifications should be designed to meet City Standards and are subject to the review and approval of the City Engineer.

Recommendation #5 – Modify the eastbound and northbound channelized right-turn lanes at the Research Park Drive / Drew Avenue intersection.

The existing channelized right-turn lanes at the Research Park Drive / Drew Avenue intersection should be modified to reduce the potential for conflicts involving bicyclists. Potential modifications include installing bicycle conflict markings/signage, reducing the corner turning radii, and/or removal of the channelized right-turn lanes altogether. Modifications to the channelized right-turn lanes should accommodate design vehicles associated with the business park operations (e.g., potential large trucks). Modifications should be designed to meet City Standards and are subject to the review and approval of the City Engineer.

Recommendation #6 – Construct traffic signal or roundabout at the Cowell Boulevard / Research Park Drive intersection.

A traffic signal or roundabout should be constructed at the Cowell Boulevard / Research Park Drive intersection to accommodate peak hour vehicle demand under Cumulative conditions. The installation of a traffic signal or roundabout would improve operations at the intersection to an acceptable level of service under Cumulative conditions. For example, the construction of a traffic signal would improve PM peak hour operating conditions to an acceptable LOS C under Cumulative conditions.

The University Research Park project applicant should pay a fair share contribution towards this improvement. The *Guide for the Preparation of Traffic Impact Studies* (Caltrans 2002) includes the following recommended methodology for calculating equitable share responsibility for roadway improvements:

$$\text{Equitable Share} = \frac{\text{Project Peak Hour Vehicle Trips}}{\text{Future Peak Hour Vehicle Trips} - \text{Existing Peak Hour Vehicle Trips}}$$

This formula is used to determine the percentage of future traffic growth at a given roadway facility that can be attributed to a project. Using this methodology at Cowell Boulevard / Research Park Drive, the project's fair share contribution would be 4.3 percent, calculated as follows:

$$4.3\% = \frac{25 \text{ Peak Hour Vehicle Trips}}{1{,}545 \text{ Peak Hour Vehicle Trips} - 963 \text{ Peak Hour Vehicle Trips}}$$

Recommendation #7 – Construct bicycle and pedestrian crossing improvements at the Drew Avenue / Galileo Court intersection.

Bicycle and pedestrian crossing improvements should be constructed at the Drew Avenue / Galileo Court intersection to facilitate crossing movements across Drew Avenue. Potential improvements include marked ladder crosswalks, a rapid rectangular flashing beacon (RRFB), HAWK signal, advance warning signage for approaching motorists, reconfiguration of Drew Avenue approaches to reduce crossing distance, improved traffic controls, and/or traffic calming devices. These treatments would improve bicycle and pedestrian access by facilitating travel between the project site and the University Research Park business park. Modifications should be designed to meet City Standards and are subject to the review and approval of the City Engineer.

Recommendation #8 – Prepare corridor plan for Cowell Boulevard.

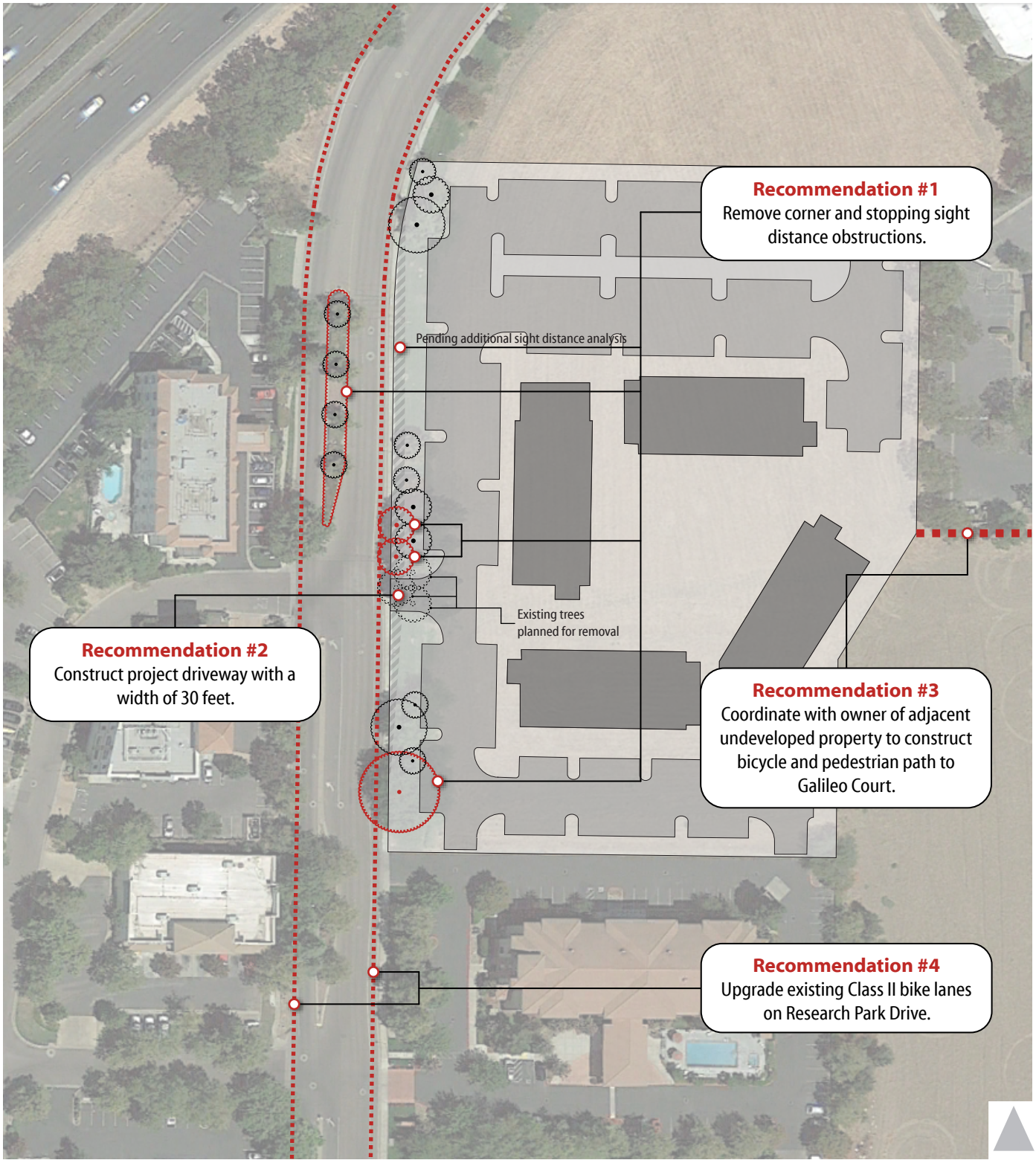
In accordance with General Plan Policy TRANS 2.8, a corridor plan should be prepared for Cowell Boulevard between I-80 and Drummond Avenue to determine the future multimodal transportation needs for the corridor. Potential corridor improvements that could be explored in this planning process include enhanced bicycle facilities, transit priority measures, and improved pedestrian crossing treatments. The majority of project trips would utilize this corridor and benefit from improved facilities for all travel modes.

Recommendation #9 – Modify the westbound channelized right-turn lane at the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection.

The westbound channelized right-turn lane at the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection should be modified to reduce the potential for conflicts involving bicyclists and pedestrians. Potential modifications include installing bicycle/pedestrian conflict markings/signage, reducing the corner turning radii, and/or removal of the channelized right-turn lane altogether. Modifications should be designed to meet City Standards and are subject to the review and approval of the City Engineer. Project bicycle, pedestrian, and transit trips would benefit from this improvement by experiencing reduced exposure to conflicting automobile traffic while walking to destinations along the Richards Boulevard / Cowell Boulevard corridor.

Recommendation #10 – Monitor operations and adjust signal timing, if necessary, at the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection.

Peak hour operations should be monitored at the Richards Boulevard / Cowell Boulevard / Research Park Drive intersection, particularly potential eastbound queues that could adversely affect I-80 off-ramp . If warranted, the green time allocated to the eastbound left-turn phase should be increased to reduce the likelihood of a queue spillback occurring into the upstream Richards Boulevard / Eastbound I-80 Ramps intersection. The signal would operate with excess green time for lower demand movements, which could be reallocated to the eastbound left-turn phase without adversely affecting overall intersection operations.



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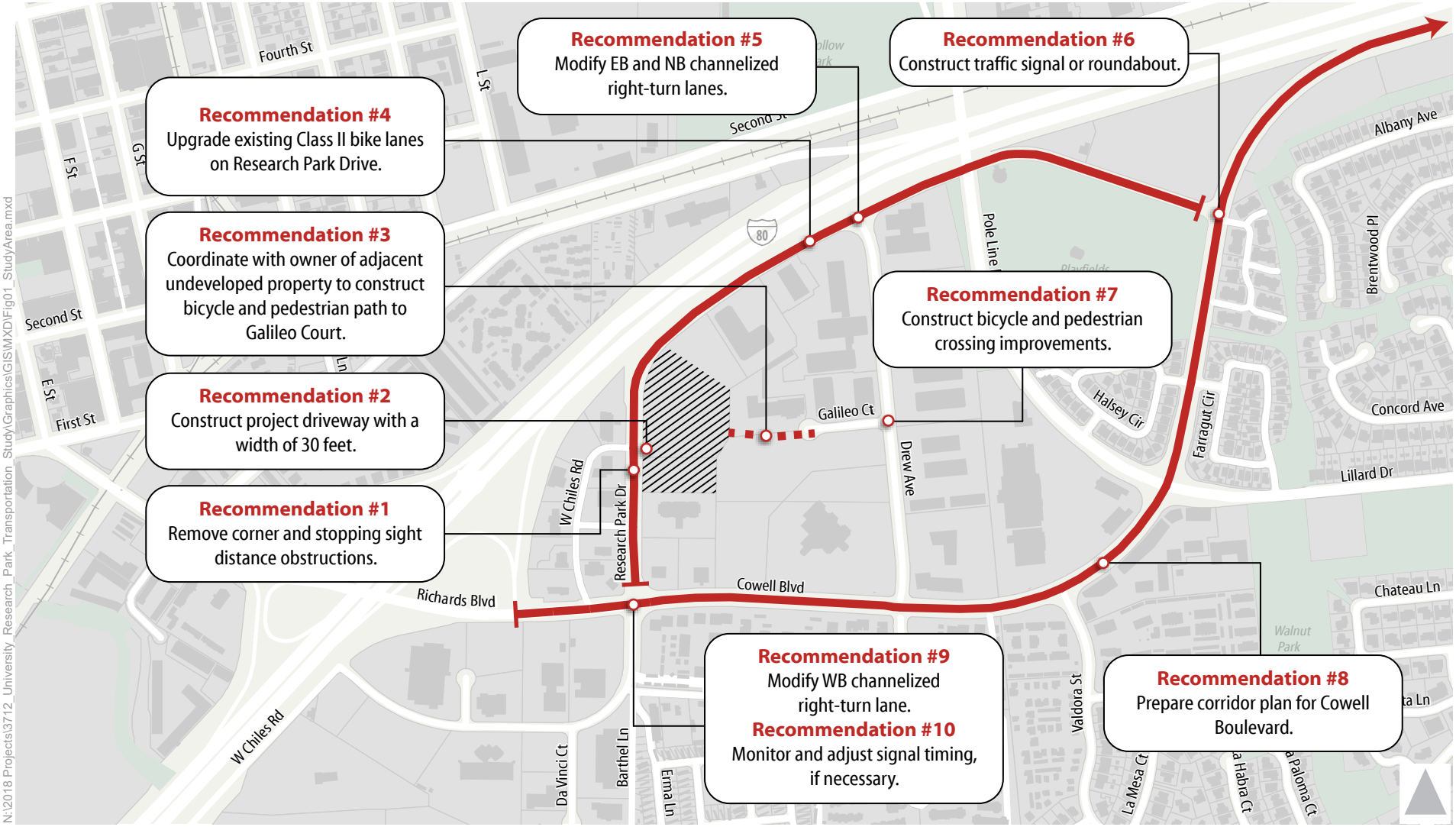
Note: Off-site improvements (Recommendations #3 and #4) would benefit all users of the study area circulation system. The City should determine an appropriate fair share contribution for each improvement to be provided by the project applicant.

Figure 14

Site Access Recommendations
Immediate Project Site Vicinity



Project Site

Note: Off-site improvements (Recommendations #3 through #10) would benefit all users of the study area circulation system. The City should determine an appropriate fair share contribution for each improvement to be provided by the project applicant.

Figure 15

Site Access Recommendations Surrounding Circulation System

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University Research Park

Transportation Study Appendix

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Conditions**
Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	79	74	94.1%	50.5	7.2	D
	Through	4	3	73.6%	33.2	33.2	C
	Right Turn	19	15	81.3%	8.0	5.0	A
	Subtotal	102	93	90.9%	43.3	8.0	D
SB	Left Turn	12	11	88.9%	51.0	13.9	D
	Through	9	4	49.1%	46.9	38.9	D
	Right Turn	88	92	105.0%	9.0	4.2	A
	Subtotal	109	107	98.6%	14.7	6.3	B
EB	Left Turn	169	176	103.9%	45.2	6.5	D
	Through	461	468	101.5%	22.9	3.8	C
	Right Turn	134	129	96.4%	18.9	3.0	B
	Subtotal	764	773	101.2%	27.3	3.8	C
WB	Left Turn	37	35	94.5%	58.4	23.4	E
	Through	520	539	103.7%	18.9	3.0	B
	Right Turn	11	12	107.1%	4.4	4.2	A
	Subtotal	568	586	103.2%	20.7	3.4	C
Total		1,543	1,559	101.1%	25.0	2.5	C

Intersection 2 **Research Park Dr/W Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	12	14	113.5%	2.2	0.9	A
	Through	124	139	111.9%	0.3	0.1	A
	Right Turn						
	Subtotal	136	152	112.0%	0.5	0.3	A
SB	Left Turn						
	Through	114	109	95.9%	0.4	0.2	A
	Right Turn	13	9	67.9%	0.1	0.2	A
	Subtotal	127	118	93.0%	0.4	0.2	A
EB	Left Turn	7	4	57.8%	3.0	1.9	A
	Through						
	Right Turn	5	7	139.8%	2.6	0.7	A
	Subtotal	12	11	92.0%	2.9	1.3	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		275	282	102.4%	0.5	0.1	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	9	9	102.2%	4.6	1.2	A
	Through						
	Right Turn	9	9	98.1%	0.7	0.3	A
	Subtotal	18	18	100.2%	2.7	0.9	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	47	52	110.4%	4.4	2.4	A
	Right Turn	39	42	108.5%	3.2	0.5	A
	Subtotal	86	94	109.5%	3.9	1.5	A
WB	Left Turn	53	39	73.6%	1.5	0.8	A
	Through	140	141	100.4%	0.2	0.1	A
	Right Turn						
	Subtotal	193	180	93.0%	0.5	0.2	A
Total		297	292	98.3%	1.7	0.5	A

Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	55	57	104.4%	3.2	0.6	A
	Through	134	137	101.9%	0.3	0.1	A
	Right Turn	1	1	147.2%	0.3	0.8	A
	Subtotal	190	195	102.8%	1.2	0.3	A
SB	Left Turn						
	Through	203	197	97.0%	1.9	0.4	A
	Right Turn	117	106	90.3%	0.7	0.2	A
	Subtotal	320	302	94.5%	1.4	0.3	A
EB	Left Turn	24	26	108.9%	6.0	2.5	A
	Through						
	Right Turn	19	15	77.5%	3.1	1.6	A
	Subtotal	43	41	95.0%	4.7	1.4	A
WB	Left Turn						
	Through	1	1	73.6%	1.2	2.5	A
	Right Turn	2	2	110.4%	1.3	1.4	A
	Subtotal	3	3	98.1%	2.0	2.2	A
Total		556	542	97.4%	1.6	0.2	A

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Conditions**
Volume and Delay by Movement **AM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	407	401	98.6%	38.0	2.0	D
	Through						
	Right Turn	186	183	98.1%	9.8	3.1	A
	Subtotal	593	584	98.4%	29.2	2.2	C
EB	Left Turn	228	204	89.3%	61.0	5.8	E
	Through	357	361	101.0%	9.0	1.4	A
	Right Turn						
	Subtotal	585	564	96.4%	27.8	2.7	C
WB	Left Turn						
	Through	608	584	96.1%	24.0	4.9	C
	Right Turn	98	105	106.6%	10.5	3.3	B
	Subtotal	706	689	97.5%	21.9	4.6	C
Total		1,884	1,836	97.5%	26.0	1.9	C

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	128	145	113.6%	46.6	6.0	D
	Through	35	29	84.1%	35.7	12.5	D
	Right Turn	58	57	97.7%	24.4	7.1	C
	Subtotal	221	231	104.7%	39.8	5.0	D
SB	Left Turn	45	52	114.5%	56.7	10.5	E
	Through	9	8	94.0%	37.7	30.6	D
	Right Turn	118	123	103.9%	12.4	4.1	B
	Subtotal	172	183	106.1%	26.2	4.5	C
EB	Left Turn	281	274	97.4%	54.9	4.4	D
	Through	635	636	100.1%	15.3	2.9	B
	Right Turn	60	54	90.2%	11.9	4.0	B
	Subtotal	976	963	98.7%	26.3	2.0	C
WB	Left Turn	23	24	105.6%	68.7	24.2	E
	Through	573	577	100.6%	35.5	7.6	D
	Right Turn	43	42	97.6%	15.9	7.0	B
	Subtotal	639	643	100.6%	35.4	7.6	D
Total		2,008	2,020	100.6%	30.8	2.8	C

Intersection 2 **Research Park Dr/W Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	23	22	97.6%	1.7	0.2	A
	Through	232	234	100.9%	0.3	0.1	A
	Right Turn						
	Subtotal	255	256	100.6%	0.4	0.1	A
SB	Left Turn						
	Through	121	124	102.8%	0.4	0.1	A
	Right Turn	2	1	73.6%	0.2	0.4	A
	Subtotal	123	126	102.3%	0.4	0.1	A
EB	Left Turn	16	12	75.9%	5.3	1.6	A
	Through						
	Right Turn	10	11	106.7%	2.7	1.1	A
	Subtotal	26	23	87.8%	4.3	1.2	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		404	405	100.3%	0.6	0.1	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	Total Delay (sec/veh) LOS
NB	Left Turn	16	14	85.1%	5.5	2.3	A
	Through						
	Right Turn	69	59	85.9%	0.9	0.2	A
	Subtotal	85	73	85.7%	1.8	0.7	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	191	181	94.6%	1.5	0.4	A
	Right Turn	10	13	125.1%	2.7	0.3	A
	Subtotal	201	193	96.1%	1.6	0.4	A
WB	Left Turn	13	14	104.7%	2.3	1.8	A
	Through	64	72	113.3%	0.1	0.1	A
	Right Turn						
	Subtotal	77	86	111.8%	0.4	0.3	A
Total		363	352	97.0%	1.3	0.2	A

Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	Total Delay (sec/veh) LOS
NB	Left Turn	23	27	116.8%	2.9	0.5	A
	Through	380	390	102.7%	0.9	0.1	A
	Right Turn	3	3	110.4%	0.1	0.1	A
	Subtotal	406	420	103.5%	1.0	0.1	A
SB	Left Turn						
	Through	242	236	97.3%	1.5	0.3	A
	Right Turn	62	66	106.2%	0.4	0.2	A
	Subtotal	304	301	99.1%	1.2	0.2	A
EB	Left Turn	242	226	93.2%	21.0	7.0	C
	Through	2	3	128.8%	4.7	6.8	A
	Right Turn	66	53	80.3%	5.8	1.6	A
	Subtotal	310	281	90.7%	18.2	6.1	C
WB	Left Turn	1	1	73.6%	1.9	4.1	A
	Through	2	3	165.6%	5.3	5.4	A
	Right Turn						
	Subtotal	3	4	134.9%	6.2	5.2	A
Total		1,023	1,007	98.4%	6.0	2.1	A

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Conditions**
Volume and Delay by Movement **PM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	513	482	94.0%	60.0	20.0	E
	Through						
	Right Turn	214	219	102.1%	37.8	20.1	D
	Subtotal	727	701	96.4%	53.1	20.2	D
EB	Left Turn	200	207	103.6%	60.1	6.6	E
	Through	463	481	103.8%	11.5	2.0	B
	Right Turn						
	Subtotal	663	688	103.7%	26.2	3.0	C
WB	Left Turn						
	Through	763	781	102.3%	16.9	2.3	B
	Right Turn	103	102	99.3%	9.3	2.1	A
	Subtotal	866	883	101.9%	16.0	2.3	B
Total		2,256	2,271	100.7%	30.6	6.8	C

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Plus Project Conditions**
Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	79	88	111.8%	47.5	5.0	D
	Through	4	5	119.6%	29.7	27.9	C
	Right Turn	19	21	110.4%	8.7	5.4	A
	Subtotal	102	114	111.8%	39.4	4.6	D
SB	Left Turn	16	10	62.1%	53.4	21.9	D
	Through	10	12	117.8%	45.0	27.7	D
	Right Turn	121	118	97.6%	13.6	8.5	B
	Subtotal	147	140	95.1%	18.8	9.8	B
EB	Left Turn	202	199	98.4%	44.9	7.9	D
	Through	461	486	105.4%	24.3	5.7	C
	Right Turn	134	146	108.8%	19.7	3.7	B
	Subtotal	797	830	104.2%	28.3	4.9	C
WB	Left Turn	37	31	83.5%	48.3	10.7	D
	Through	520	538	103.5%	20.1	2.8	C
	Right Turn	21	21	99.9%	6.0	4.3	A
	Subtotal	578	590	102.1%	21.1	2.9	C
Total		1,624	1,674	103.1%	25.8	3.7	C

Intersection 2 **Research Park Dr/W Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	12	8	70.5%	1.8	1.2	A
	Through	124	127	102.4%	0.7	0.3	A
	Right Turn	43	40	93.3%	0.4	0.4	A
	Subtotal	179	176	98.1%	0.7	0.2	A
SB	Left Turn	14	15	110.4%	2.2	0.7	A
	Through	114	110	96.5%	0.6	0.2	A
	Right Turn	13	10	79.3%	0.3	0.5	A
	Subtotal	141	136	96.3%	0.7	0.3	A
EB	Left Turn	7	7	105.1%	4.1	2.0	A
	Through						
	Right Turn	5	6	117.8%	1.6	1.3	A
	Subtotal	12	13	110.4%	3.7	2.0	A
WB	Left Turn	38	38	100.7%	5.9	1.1	A
	Through						
	Right Turn	10	12	117.8%	3.1	0.8	A
	Subtotal	48	50	104.3%	5.3	1.1	A
Total		380	375	98.6%	1.4	0.3	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	9	11	118.6%	5.0	3.0	A
	Through						
	Right Turn	9	8	94.0%	0.6	0.3	A
	Subtotal	18	19	106.3%	3.3	1.7	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	56	61	108.4%	2.8	1.4	A
	Right Turn	40	40	99.4%	3.0	0.3	A
	Subtotal	96	100	104.7%	2.9	0.8	A
WB	Left Turn	53	53	100.7%	1.5	0.8	A
	Through	154	155	100.6%	0.3	0.1	A
	Right Turn						
	Subtotal	207	208	100.6%	0.6	0.3	A
Total		321	328	102.1%	1.4	0.5	A

Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	60	64	106.1%	3.8	0.6	A
	Through	135	127	93.8%	0.5	0.2	A
	Right Turn	1	1	147.2%	0.1	0.2	A
	Subtotal	196	192	97.8%	1.6	0.4	A
SB	Left Turn						
	Through	205	213	103.8%	2.0	0.4	A
	Right Turn	126	124	98.1%	0.8	0.2	A
	Subtotal	331	336	101.6%	1.6	0.3	A
EB	Left Turn	29	30	102.8%	6.4	3.1	A
	Through						
	Right Turn	23	22	96.0%	2.1	0.5	A
	Subtotal	52	52	99.8%	4.8	2.8	A
WB	Left Turn						
	Through	1	0	36.8%	1.9	5.9	A
	Right Turn	2	3	147.2%	1.9	1.3	A
	Subtotal	3	3	110.4%	3.8	5.4	A
Total		582	583	100.2%	1.9	0.2	A

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Plus Project Conditions**
Volume and Delay by Movement **AM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	418	425	101.6%	72.1	30.4	E
	Through						
	Right Turn	186	206	110.8%	43.5	28.3	D
	Subtotal	604	631	104.4%	62.9	29.8	E
EB	Left Turn	228	213	93.6%	61.3	5.4	E
	Through	379	387	102.0%	8.6	1.6	A
	Right Turn						
	Subtotal	607	600	98.9%	27.4	3.1	C
WB	Left Turn						
	Through	631	629	99.7%	26.7	2.8	C
	Right Turn	108	106	98.1%	11.8	2.4	B
	Subtotal	739	735	99.5%	24.5	2.6	C
Total		1,950	1,966	100.8%	37.9	10.7	D

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	128	144	112.1%	48.0	5.3	D
	Through	36	26	73.6%	40.1	16.5	D
	Right Turn	58	57	99.0%	19.8	4.5	B
	Subtotal	222	227	102.4%	39.9	5.1	D
SB	Left Turn	50	56	111.1%	54.4	5.5	D
	Through	10	14	143.5%	32.1	26.5	C
	Right Turn	155	146	94.0%	15.6	7.2	B
	Subtotal	215	216	100.3%	26.8	5.9	C
EB	Left Turn	309	282	91.3%	54.9	4.1	D
	Through	635	623	98.2%	15.2	4.0	B
	Right Turn	60	61	101.8%	11.2	4.9	B
	Subtotal	1,004	967	96.3%	26.5	3.1	C
WB	Left Turn	23	18	76.8%	77.9	29.0	E
	Through	573	590	103.0%	38.1	5.5	D
	Right Turn	50	51	102.3%	17.1	5.4	B
	Subtotal	646	659	102.0%	37.3	5.3	D
Total		2,087	2,069	99.1%	31.4	2.4	C

Intersection 2 **Research Park Dr/Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	23	20	86.4%	2.2	0.4	A
	Through	232	220	95.0%	0.4	0.1	A
	Right Turn	36	35	97.1%	0.4	0.1	A
	Subtotal	291	275	94.6%	0.5	0.2	A
SB	Left Turn	12	7	55.2%	2.8	2.1	A
	Through	121	115	95.2%	0.6	0.2	A
	Right Turn	2	2	110.4%	0.1	0.2	A
	Subtotal	135	124	91.9%	0.7	0.3	A
EB	Left Turn	16	12	75.9%	4.5	2.0	A
	Through						
	Right Turn	10	8	77.3%	3.1	1.2	A
	Subtotal	26	20	76.4%	4.2	0.8	A
WB	Left Turn	43	47	109.5%	7.5	2.4	A
	Through						
	Right Turn	12	15	122.7%	3.5	1.1	A
	Subtotal	55	62	112.4%	6.6	2.0	A
Total		507	481	94.9%	1.5	0.3	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	17	18	108.2%	5.2	2.2	A
	Through						
	Right Turn	69	76	109.9%	1.1	0.3	A
	Subtotal	86	94	109.5%	2.0	0.7	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	202	196	96.9%	1.2	0.4	A
	Right Turn	11	13	117.1%	2.6	0.2	A
	Subtotal	213	209	98.0%	1.2	0.4	A
WB	Left Turn	13	15	116.1%	1.8	1.9	A
	Through	75	70	93.7%	0.1	0.1	A
	Right Turn						
	Subtotal	88	85	97.0%	0.3	0.2	A
Total		387	388	100.3%	1.2	0.3	A

Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	25	24	95.7%	3.4	0.8	A
	Through	381	380	99.8%	1.0	0.1	A
	Right Turn	3	3	110.4%	0.3	0.5	A
	Subtotal	409	407	99.6%	1.1	0.1	A
SB	Left Turn						
	Through	244	246	100.9%	1.6	0.2	A
	Right Turn	71	70	99.0%	0.5	0.2	A
	Subtotal	315	316	100.5%	1.4	0.2	A
EB	Left Turn	247	245	99.2%	20.6	3.7	C
	Through	2	1	73.6%	2.6	5.1	A
	Right Turn	72	71	98.6%	5.4	1.0	A
	Subtotal	321	318	98.9%	17.3	3.0	C
WB	Left Turn	1	0	36.8%	1.7	5.3	A
	Through	2	2	110.4%	4.6	6.0	A
	Right Turn						
	Subtotal	3	3	85.9%	6.3	6.9	A
Total		1,048	1,044	99.6%	6.1	0.9	A

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Existing Plus Project Conditions**
Volume and Delay by Movement **PM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	522	479	91.7%	55.1	18.3	E
	Through						
	Right Turn	214	215	100.4%	35.4	18.5	D
	Subtotal	736	694	94.3%	49.0	18.6	D
EB	Left Turn	200	201	100.5%	54.1	7.8	D
	Through	482	493	102.4%	12.1	1.5	B
	Right Turn						
	Subtotal	682	694	101.8%	24.3	3.2	C
WB	Left Turn						
	Through	788	796	101.1%	17.2	2.6	B
	Right Turn	115	114	98.9%	9.4	1.3	A
	Subtotal	903	910	100.8%	16.3	2.6	B
Total		2,321	2,298	99.0%	28.6	5.4	C

SimTraffic Post-Processor **University Research Park Transportation Study**
Average Results from 10 Runs **Cumulative Plus Project Conditions**
Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	110	98	89.0%	67.9	15.9	E
	Through	10	7	66.2%	34.0	20.0	C
	Right Turn	30	31	101.8%	5.8	2.1	A
	Subtotal	150	135	90.0%	52.4	12.8	D
SB	Left Turn	24	18	73.6%	61.4	32.4	E
	Through	31	31	98.5%	35.4	10.9	D
	Right Turn	203	203	99.9%	18.0	3.6	B
	Subtotal	258	251	97.3%	22.6	3.9	C
EB	Left Turn	333	358	107.5%	53.7	9.1	D
	Through	610	605	99.1%	16.2	3.4	B
	Right Turn	220	204	92.8%	12.7	4.6	B
	Subtotal	1,163	1,167	100.3%	27.1	5.5	C
WB	Left Turn	60	61	101.8%	64.5	10.6	E
	Through	630	636	101.0%	39.1	5.2	D
	Right Turn	30	29	98.1%	19.5	7.9	B
	Subtotal	720	727	100.9%	40.5	5.1	D
Total		2,291	2,280	99.5%	32.5	3.4	C

Intersection 2 **Research Park Dr/Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	10	9	92.0%	2.4	1.4	A
	Through	260	271	104.3%	0.7	0.4	A
	Right Turn	43	42	97.6%	0.8	0.5	A
	Subtotal	313	322	103.0%	0.8	0.3	A
SB	Left Turn	14	13	92.0%	3.2	2.3	A
	Through	220	223	101.4%	1.2	0.3	A
	Right Turn	20	21	104.9%	0.9	1.6	A
	Subtotal	254	257	101.1%	1.2	0.4	A
EB	Left Turn	10	11	114.1%	6.5	2.4	A
	Through						
	Right Turn	10	9	88.3%	4.6	1.8	A
	Subtotal	20	20	101.2%	5.7	1.7	A
WB	Left Turn	38	37	97.8%	8.5	1.4	A
	Through						
	Right Turn	10	6	58.9%	3.3	3.8	A
	Subtotal	48	43	89.7%	7.9	1.7	A
Total		635	643	101.2%	1.6	0.4	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	20	18	88.3%	6.5	1.5	A
	Through						
	Right Turn	10	13	132.5%	0.8	0.4	A
	Subtotal	30	31	103.0%	4.2	1.6	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	129	120	92.7%	4.0	1.1	A
	Right Turn	51	50	98.1%	3.3	0.4	A
	Subtotal	180	170	94.2%	3.7	0.8	A
WB	Left Turn	60	72	120.2%	2.4	0.8	A
	Through	264	276	104.7%	0.4	0.1	A
	Right Turn						
	Subtotal	324	348	107.6%	0.8	0.2	A
Total		534	549	102.8%	1.9	0.4	A

Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	95	101	106.5%	6.9	1.6	A
	Through	191	193	101.0%	1.1	0.3	A
	Right Turn	10	10	103.0%	0.3	0.4	A
	Subtotal	296	304	102.8%	3.0	0.7	A
SB	Left Turn	10	10	99.4%	3.8	1.6	A
	Through	282	271	96.0%	4.1	0.6	A
	Right Turn	209	223	106.9%	1.7	0.4	A
	Subtotal	501	504	100.6%	3.0	0.4	A
EB	Left Turn	125	122	97.7%	16.6	4.1	C
	Through	10	7	69.9%	17.6	10.0	C
	Right Turn	44	43	97.0%	6.3	4.7	A
	Subtotal	179	172	96.0%	14.2	3.2	B
WB	Left Turn	10	9	92.0%	10.7	5.9	B
	Through	10	12	117.8%	14.8	4.6	B
	Right Turn	10	12	117.8%	4.8	1.7	A
	Subtotal	30	33	109.2%	10.0	3.2	A
Total		1,006	1,013	100.7%	5.1	0.7	A

SimTraffic Post-Processor | **University Research Park Transportation Study**
Average Results from 10 Runs | **Cumulative Plus Project Conditions**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	691	714	103.3%	57.5	13.9	E
	Through						
	Right Turn	270	274	101.4%	40.9	14.4	D
	Subtotal	961	988	102.8%	52.9	14.0	D
EB	Left Turn	340	330	97.0%	41.5	6.6	D
	Through	472	454	96.3%	12.3	1.4	B
	Right Turn						
	Subtotal	812	784	96.6%	24.7	3.8	C
WB	Left Turn						
	Through	763	717	94.0%	22.8	3.4	C
	Right Turn	200	194	97.2%	11.7	1.2	B
	Subtotal	963	912	94.7%	20.5	2.9	C
Total		2,736	2,683	98.1%	33.8	5.4	C

Intersection 1 **Research Park Dr/Richards Bl-Cowell Bl** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	210	177	84.1%	109.6	24.8	F
	Through	41	39	94.2%	42.9	16.7	D
	Right Turn	80	69	86.0%	14.7	7.7	B
	Subtotal	331	284	85.8%	77.8	20.3	E
SB	Left Turn	55	49	89.0%	62.3	7.4	E
	Through	21	17	80.6%	42.7	15.4	D
	Right Turn	247	244	98.6%	20.2	3.5	C
	Subtotal	323	309	95.8%	27.9	4.0	C
EB	Left Turn	428	415	97.1%	55.4	8.4	E
	Through	720	725	100.6%	19.0	5.1	B
	Right Turn	120	131	109.5%	17.7	4.5	B
	Subtotal	1,268	1,271	100.3%	30.9	6.5	C
WB	Left Turn	40	32	80.0%	72.4	21.5	E
	Through	720	710	98.6%	59.4	16.4	E
	Right Turn	57	59	102.7%	44.3	21.8	D
	Subtotal	817	800	98.0%	58.9	16.9	E
Total		2,739	2,665	97.3%	44.1	7.3	D

Intersection 2 **Research Park Dr/Chiles Rd** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	20	22	112.2%	2.4	0.4	A
	Through	360	345	95.9%	0.5	0.1	A
	Right Turn	36	42	115.5%	0.4	0.2	A
	Subtotal	416	409	98.4%	0.6	0.1	A
SB	Left Turn	12	12	98.1%	4.0	2.4	A
	Through	220	210	95.3%	0.8	0.3	A
	Right Turn	10	6	62.6%	0.2	0.3	A
	Subtotal	242	228	94.1%	0.9	0.3	A
EB	Left Turn	20	13	66.2%	7.4	2.4	A
	Through						
	Right Turn	10	12	117.8%	3.4	1.1	A
	Subtotal	30	25	83.4%	5.4	1.2	A
WB	Left Turn	43	47	108.7%	8.5	1.7	A
	Through						
	Right Turn	12	9	76.7%	3.9	3.5	A
	Subtotal	55	56	101.7%	7.7	1.8	A
Total		743	718	96.6%	1.4	0.2	A

Intersection 3 **Drew Av/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	31	29	93.8%	7.5	1.2	A
	Through						
	Right Turn	80	86	107.2%	1.4	0.5	A
	Subtotal	111	115	103.4%	2.9	0.8	A
SB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
EB	Left Turn						
	Through	301	263	87.3%	1.6	1.2	A
	Right Turn	11	10	93.7%	2.5	1.0	A
	Subtotal	312	273	87.5%	1.6	1.2	A
WB	Left Turn	40	39	98.4%	2.0	0.9	A
	Through	171	161	94.3%	0.2	0.1	A
	Right Turn						
	Subtotal	211	201	95.1%	0.5	0.2	A
Total		634	588	92.8%	1.5	0.6	A

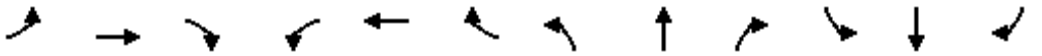
Intersection 4 **Cowell Bl/Research Park Dr** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	72	74	102.2%	6.9	1.5	A
	Through	421	422	100.2%	1.4	0.2	A
	Right Turn	10	8	81.0%	0.5	0.7	A
	Subtotal	503	503	100.1%	2.2	0.3	A
SB	Left Turn	10	9	88.3%	3.9	0.8	A
	Through	312	307	98.4%	3.8	0.4	A
	Right Turn	209	204	97.5%	1.6	0.4	A
	Subtotal	531	520	97.9%	2.9	0.4	A
EB	Left Turn	355	250	70.4%	196.9	67.1	F
	Through	10	10	95.7%	132.5	72.7	F
	Right Turn	116	84	72.6%	161.1	85.0	F
	Subtotal	481	344	71.5%	186.8	71.7	F
WB	Left Turn	10	8	81.0%	9.3	6.5	A
	Through	10	8	84.6%	19.9	7.0	C
	Right Turn	10	13	125.1%	8.9	2.1	A
	Subtotal	30	29	96.9%	13.7	4.6	B
Total		1,545	1,396	90.3%	48.0	17.1	E

SimTraffic Post-Processor | **University Research Park Transportation Study**
Average Results from 10 Runs | **Cumulative Plus Project Conditions**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 30 **I-80 EB Ramps/Richards Bl** **Signal**

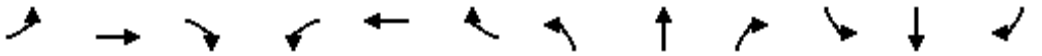
Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
SB	Left Turn	699	645	92.2%	81.2	45.5	F
	Through						
	Right Turn	240	219	91.1%	53.5	36.1	D
	Subtotal	939	863	91.9%	74.3	43.3	E
EB	Left Turn	360	365	101.5%	72.5	14.8	E
	Through	569	580	101.9%	11.4	1.9	B
	Right Turn						
	Subtotal	929	945	101.7%	35.3	6.8	D
WB	Left Turn						
	Through	1,045	987	94.4%	17.0	1.7	B
	Right Turn	182	162	88.8%	7.8	1.8	A
	Subtotal	1,227	1,148	93.6%	15.7	1.7	B
Total		3,095	2,957	95.5%	39.2	12.7	D



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	10	44	10	10	10	95	191	10	10	282	209
Future Volume (veh/h)	125	10	44	10	10	10	95	191	10	10	282	209
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	136	11	2	11	11	0	103	208	10	11	307	200
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	314	271	49	48	48	0	137	745	36	25	375	245
Arrive On Green	0.17	0.17	0.17	0.05	0.05	0.00	0.08	0.42	0.42	0.01	0.36	0.36
Sat Flow, veh/h	1795	1552	282	920	920	0	1795	1782	86	1795	1054	687
Grp Volume(v), veh/h	136	0	13	22	0	0	103	0	218	11	0	507
Grp Sat Flow(s),veh/h/ln	1795	0	1834	1839	0	0	1795	0	1867	1795	0	1741
Q Serve(g_s), s	3.4	0.0	0.3	0.6	0.0	0.0	2.8	0.0	3.8	0.3	0.0	13.2
Cycle Q Clear(g_c), s	3.4	0.0	0.3	0.6	0.0	0.0	2.8	0.0	3.8	0.3	0.0	13.2
Prop In Lane	1.00		0.15	0.50		0.00	1.00		0.05	1.00		0.39
Lane Grp Cap(c), veh/h	314	0	321	97	0	0	137	0	781	25	0	620
V/C Ratio(X)	0.43	0.00	0.04	0.23	0.00	0.00	0.75	0.00	0.28	0.43	0.00	0.82
Avail Cap(c_a), veh/h	719	0	734	368	0	0	287	0	1046	287	0	975
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.4	0.0	17.1	22.7	0.0	0.0	22.6	0.0	9.6	24.4	0.0	14.6
Incr Delay (d2), s/veh	0.9	0.0	0.1	1.2	0.0	0.0	8.1	0.0	0.2	11.2	0.0	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.1	0.3	0.0	0.0	1.4	0.0	1.3	0.2	0.0	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.4	0.0	17.2	23.9	0.0	0.0	30.7	0.0	9.8	35.6	0.0	17.7
LnGrp LOS	B	A	B	C	A	A	C	A	A	D	A	B
Approach Vol, veh/h		149			22			321			518	
Approach Delay, s/veh		19.2			23.9			16.5			18.1	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.7	25.9		12.7	7.8	22.8		6.6				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	8.0	28.0		20.0	8.0	28.0		10.0				
Max Q Clear Time (g_c+I1), s	2.3	5.8		5.4	4.8	15.2		2.6				
Green Ext Time (p_c), s	0.0	1.1		0.3	0.1	2.6		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	355	10	116	10	10	10	72	421	10	10	312	209
Future Volume (veh/h)	355	10	116	10	10	10	72	421	10	10	312	209
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	386	11	24	11	11	0	78	458	10	11	339	197
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	449	132	288	47	47	0	109	738	16	25	393	228
Arrive On Green	0.25	0.25	0.25	0.05	0.05	0.00	0.06	0.40	0.40	0.01	0.36	0.36
Sat Flow, veh/h	1795	527	1151	920	920	0	1795	1837	40	1795	1107	643
Grp Volume(v), veh/h	386	0	35	22	0	0	78	0	468	11	0	536
Grp Sat Flow(s),veh/h/ln	1795	0	1678	1839	0	0	1795	0	1877	1795	0	1750
Q Serve(g_s), s	12.3	0.0	1.0	0.7	0.0	0.0	2.6	0.0	11.9	0.4	0.0	17.1
Cycle Q Clear(g_c), s	12.3	0.0	1.0	0.7	0.0	0.0	2.6	0.0	11.9	0.4	0.0	17.1
Prop In Lane	1.00		0.69	0.50		0.00	1.00		0.02	1.00		0.37
Lane Grp Cap(c), veh/h	449	0	420	94	0	0	109	0	754	25	0	622
V/C Ratio(X)	0.86	0.00	0.08	0.23	0.00	0.00	0.72	0.00	0.62	0.44	0.00	0.86
Avail Cap(c_a), veh/h	597	0	558	306	0	0	239	0	874	239	0	815
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.5	0.0	17.3	27.4	0.0	0.0	27.7	0.0	14.3	29.4	0.0	18.0
Incr Delay (d2), s/veh	9.4	0.0	0.1	1.3	0.0	0.0	8.5	0.0	1.1	11.6	0.0	7.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	0.0	0.3	0.3	0.0	0.0	1.3	0.0	4.5	0.2	0.0	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.0	0.0	17.3	28.7	0.0	0.0	36.3	0.0	15.4	41.0	0.0	25.5
LnGrp LOS	C	A	B	C	A	A	D	A	B	D	A	C
Approach Vol, veh/h		421			22			546			547	
Approach Delay, s/veh		29.8			28.7			18.4			25.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.8	29.2		19.1	7.6	26.4		7.1				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	8.0	28.0		20.0	8.0	28.0		10.0				
Max Q Clear Time (g_c+I1), s	2.4	13.9		14.3	4.6	19.1		2.7				
Green Ext Time (p_c), s	0.0	2.4		0.7	0.0	2.2		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			24.3									
HCM 6th LOS			C									

FEHR PEERS

Major Street	Research Park Drive
Minor Street	W Chiles Road

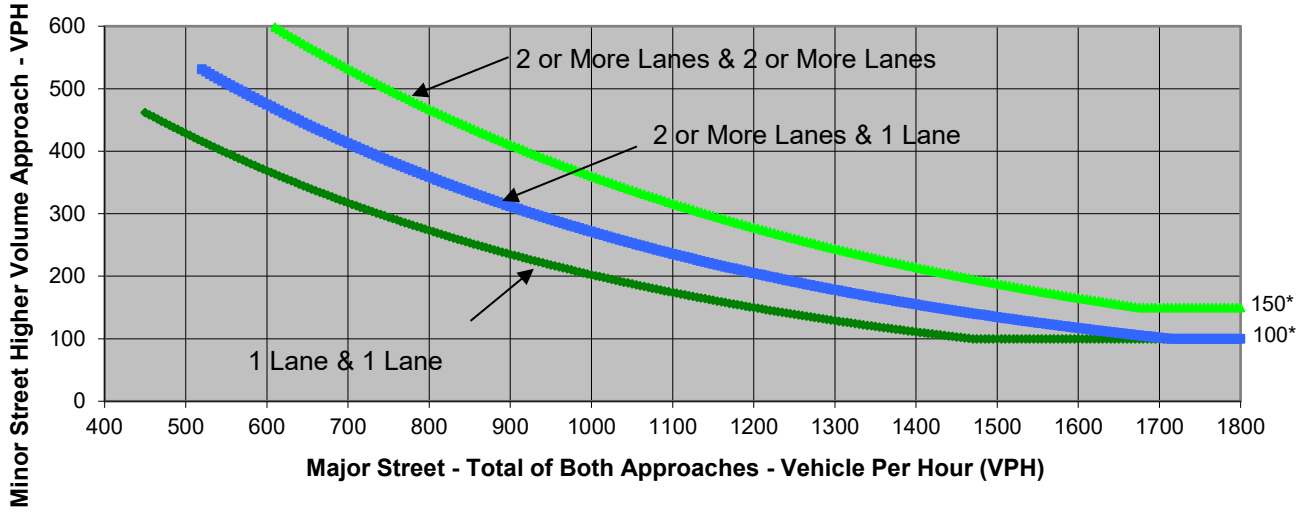
Project	University Research Park
Scenario	Existing Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	12		7	
Through	124	114		
Right		13	5	
Total	136	127	12	0

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**263**	**12**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Scenario	Existing Conditions
Peak Hour	AM

Major Street	Research Park Drive
Minor Street	W Chiles Road

Turn Movement Volumes

	NB	SB	EB	WB
Left	12	0	7	0
Through	124	114	0	0
Right	0	13	5	0
Total	136	127	12	0

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	2.9
Approach with Worst Case Delay	EB
Total Vehicles on Approach	12

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**0**	**12**	**275**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

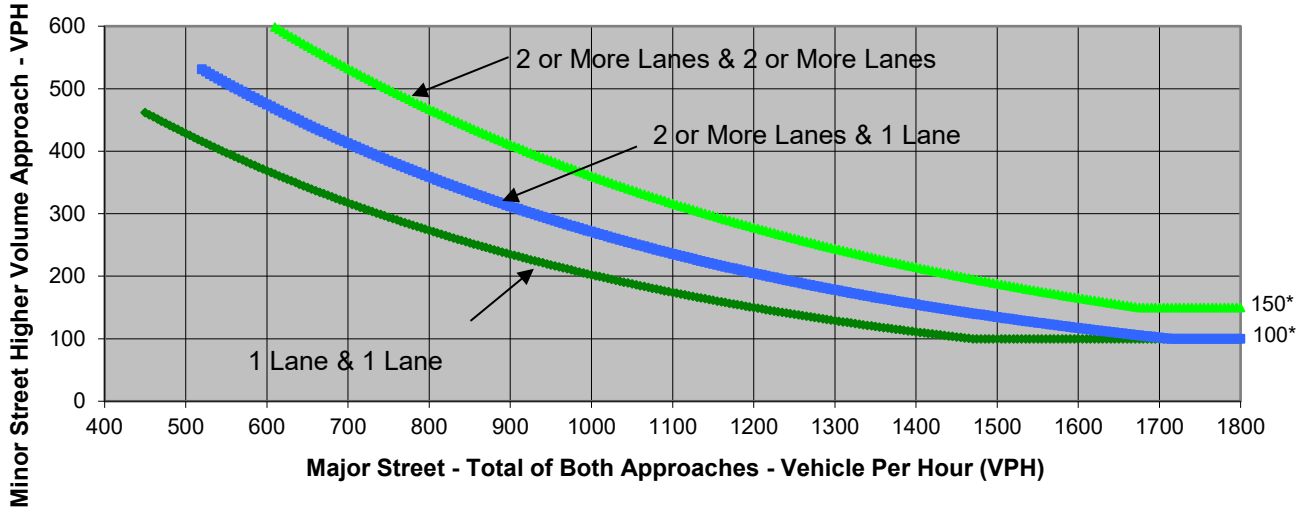
Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Existing Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	23		16	
Through	232	121		
Right		2	10	
Total	255	123	26	0

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**378**	**26**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Existing Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	23	0	16	0
Through	232	121	0	0
Right	0	2	10	0
Total	255	123	26	0

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	4.3
Approach with Worst Case Delay	EB
Total Vehicles on Approach	26

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**0**	**26**	**404**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

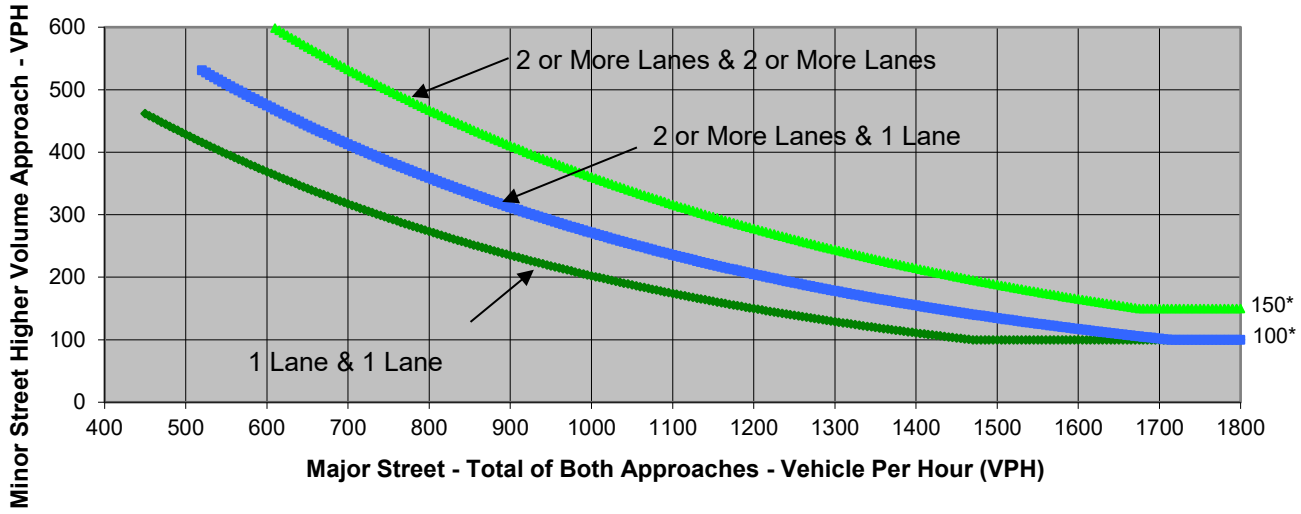
Project	University Research Park
Scenario	Existing Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	9			53
Through			47	140
Right	9		39	
Total	18	0	86	193

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**279**	**18**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Scenario	Existing Conditions
Peak Hour	AM

Major Street	Research Park Drive
Minor Street	Drew Avenue

Turn Movement Volumes

	NB	SB	EB	WB
Left	9	0	0	53
Through	0	0	47	140
Right	9	0	39	0
Total	18	0	86	193

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	3.9
Approach with Worst Case Delay	EB
Total Vehicles on Approach	86

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**0.1**	**18**	**297**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

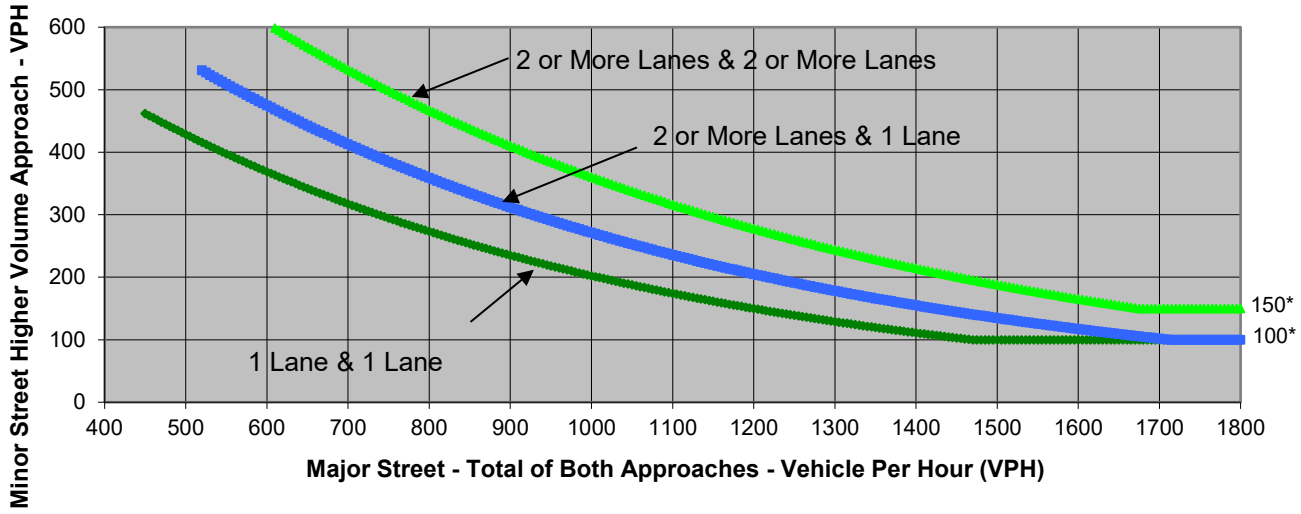
Project	University Research Park
Scenario	Existing Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	16			13
Through			191	64
Right	69		10	
Total	85	0	201	77

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**278**	**85**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Research Park Drive	Project	University Research Park
Minor Street	Drew Avenue	Scenario	Existing Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	16	0	0	13
Through	0	0	191	64
Right	69	0	10	0
Total	85	0	201	77

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	1.8
Approach with Worst Case Delay	NB
Total Vehicles on Approach	85

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**0**	**85**	**363**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Existing Conditions
		Peak Hour	AM

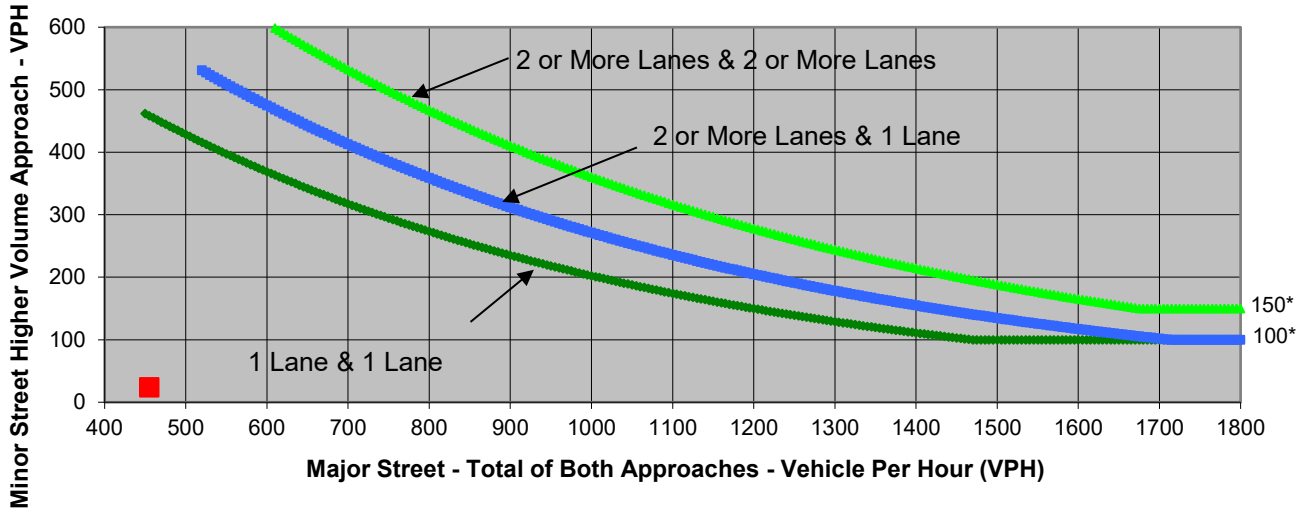
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	24	0
Through	134	203		1
Right	1	117		2
Total	135	320	24	3

Major Street Direction

x	North/South
	East/West

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**455**	**24**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Cowell Boulevard
Scenario	Existing Conditions
Minor Street	Research Park Drive
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	55	0	24	0
Through	134	203	0	1
Right	1	117	19	2
Total	190	320	43	3

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	4.7
Approach with Worst Case Delay	EB
Total Vehicles on Approach	24

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**0**	**43**	**556**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Existing Conditions
		Peak Hour	PM

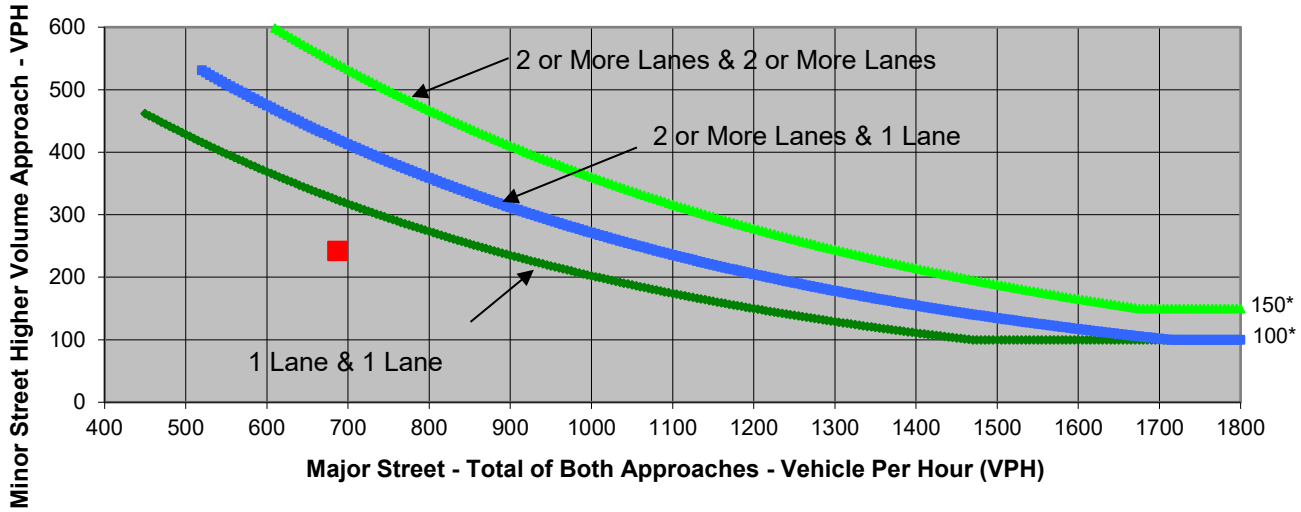
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	242	1
Through	380	242		2
Right	3	62		0
Total	383	304	242	3

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**687**	**242**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Cowell Boulevard
Scenario	Existing Conditions
Minor Street	Research Park Drive
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	23	0	242	1
Through	380	242	2	2
Right	3	62	66	0
Total	406	304	310	3

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	18.2
Approach with Worst Case Delay	EB
Total Vehicles on Approach	242

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Conditions	**1.2**	**310**	**1,023**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Met**	**Met**
Warrant Met	**NO**		

FEHR PEERS

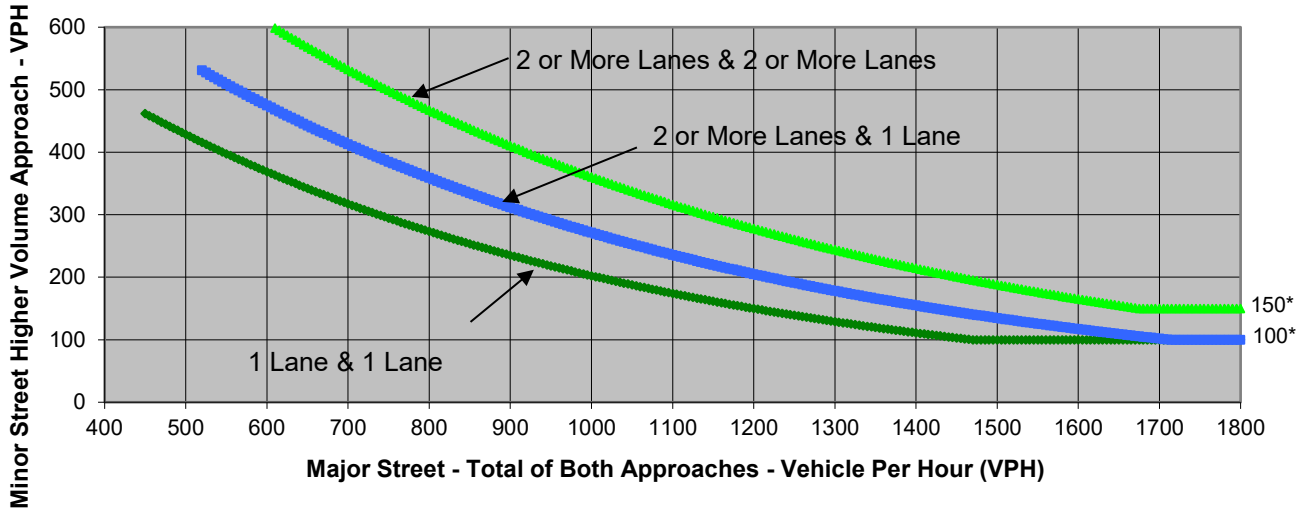
Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Existing Plus Project Conditions
		Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	12	14	7	38
Through	124	114	0	0
Right	43	13	5	10
Total	179	141	12	48

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**320**	**48**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Existing Plus Project Conditions
		Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	12	14	7	38
Through	124	114	0	0
Right	43	13	5	10
Total	179	141	12	48

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	5.3
Approach with Worst Case Delay	WB
Total Vehicles on Approach	48

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**0.1**	**48**	**380**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

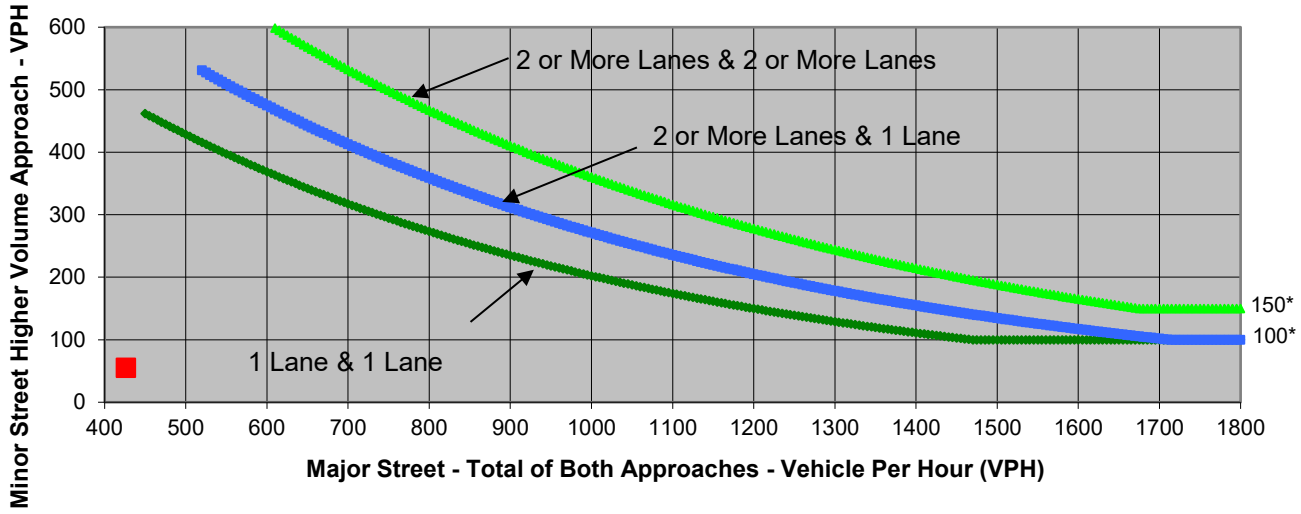
Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Existing Plus Project Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	23	12	16	43
Through	232	121	0	0
Right	36	2	10	12
Total	291	135	26	55

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**426**	**55**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	PM

Major Street	Research Park Drive
Minor Street	W Chiles Road

Turn Movement Volumes

	NB	SB	EB	WB
Left	23	12	16	43
Through	232	121	0	0
Right	36	2	10	12
Total	291	135	26	55

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	6.6
Approach with Worst Case Delay	WB
Total Vehicles on Approach	55

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**0.1**	**55**	**507**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

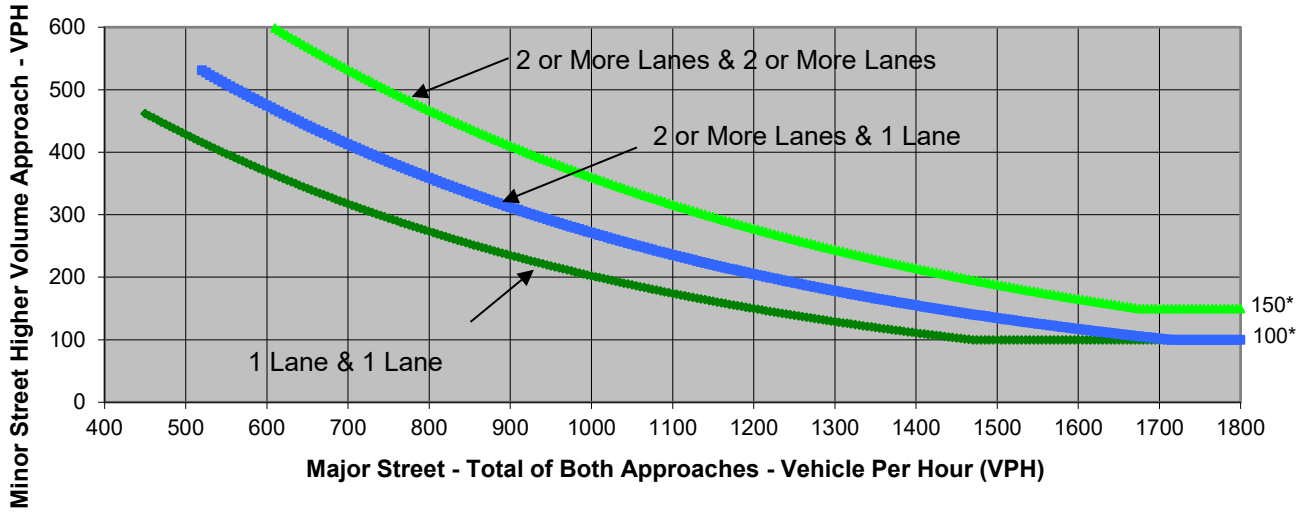
Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	9			53
Through			56	154
Right	9		40	
Total	18	0	96	207

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**303**	**18**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	AM
Major Street	Research Park Drive
Minor Street	Drew Avenue

Turn Movement Volumes

	NB	SB	EB	WB
Left	9	0	0	53
Through	0	0	56	154
Right	9	0	40	0
Total	18	0	96	207

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	3.3
Approach with Worst Case Delay	NB
Total Vehicles on Approach	18

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**0**	**18**	**321**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

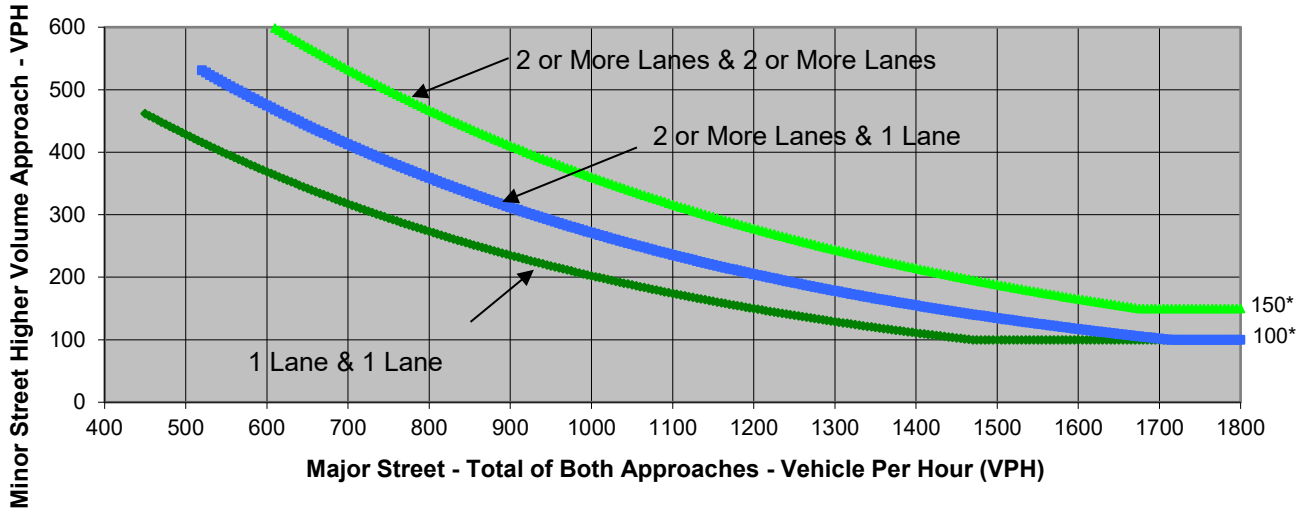
Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	17			13
Through			202	75
Right	69		11	
Total	86	0	213	88

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**301**	**86**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Research Park Drive
Scenario	Existing Plus Project Conditions
Minor Street	Drew Avenue
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	17	0	0	13
Through	0	0	202	75
Right	69	0	11	0
Total	86	0	213	88

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	2
Approach with Worst Case Delay	NB
Total Vehicles on Approach	86

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**0**	**86**	**387**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Existing Plus Project Conditions
		Peak Hour	AM

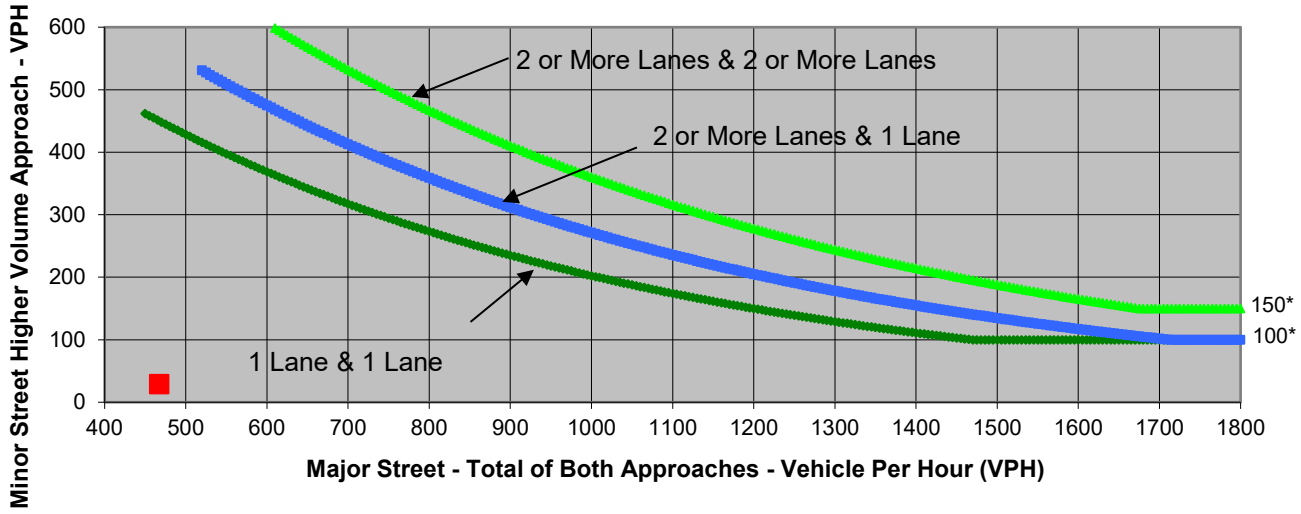
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	29	0
Through	135	205		1
Right	1	126		2
Total	136	331	29	3

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**467**	**29**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Cowell Boulevard
Minor Street	Research Park Drive

Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	60	0	29	0
Through	135	205	0	1
Right	1	126	23	2
Total	196	331	52	3

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	4.8
Approach with Worst Case Delay	EB
Total Vehicles on Approach	29

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**0**	**52**	**582**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Existing Plus Project Conditions
		Peak Hour	PM

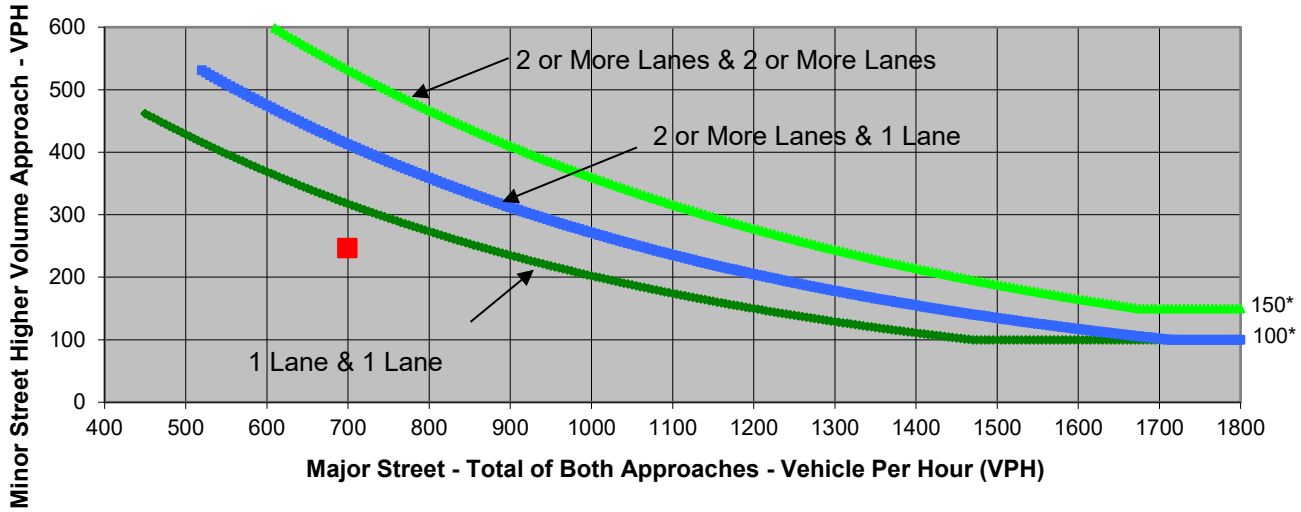
Turn Movement Volumes

	NB	SB	EB	WB
Left		0	247	1
Through	381	244		2
Right	3	71		0
Total	384	315	247	3

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**699**	**247**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Cowell Boulevard
Minor Street	Research Park Drive

Project	University Research Park
Scenario	Existing Plus Project Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	25	0	247	1
Through	381	244	1	2
Right	3	71	71	0
Total	409	315	319	3

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	17.3
Approach with Worst Case Delay	EB
Total Vehicles on Approach	247

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Existing Plus Project Conditions	**1.2**	**319**	**1,046**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Met**	**Met**
Warrant Met	**NO**		

FEHR PEERS

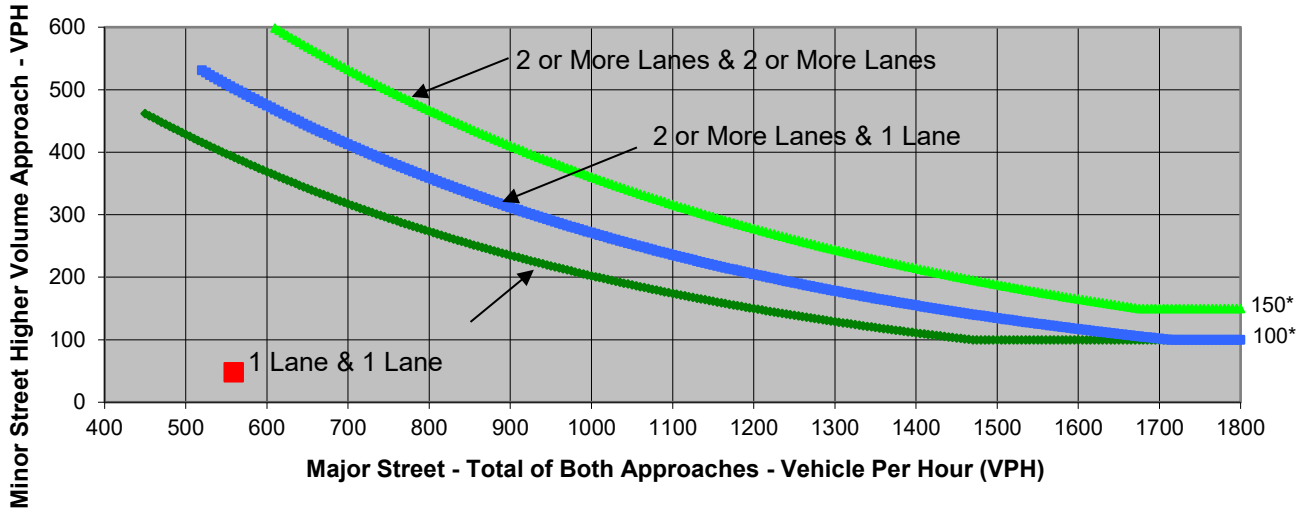
Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Cumulative Plus Project Conditions
		Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	10	14	10	38
Through	260	220	0	0
Right	35	20	10	10
Total	305	254	20	48

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**559**	**48**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Research Park Drive
Scenario	Cumulative Plus Project Conditions
Minor Street	W Chiles Road
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	10	14	10	38
Through	260	220	0	0
Right	35	20	10	10
Total	305	254	20	48

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	7.9
Approach with Worst Case Delay	WB
Total Vehicles on Approach	48

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**0.1**	**48**	**627**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

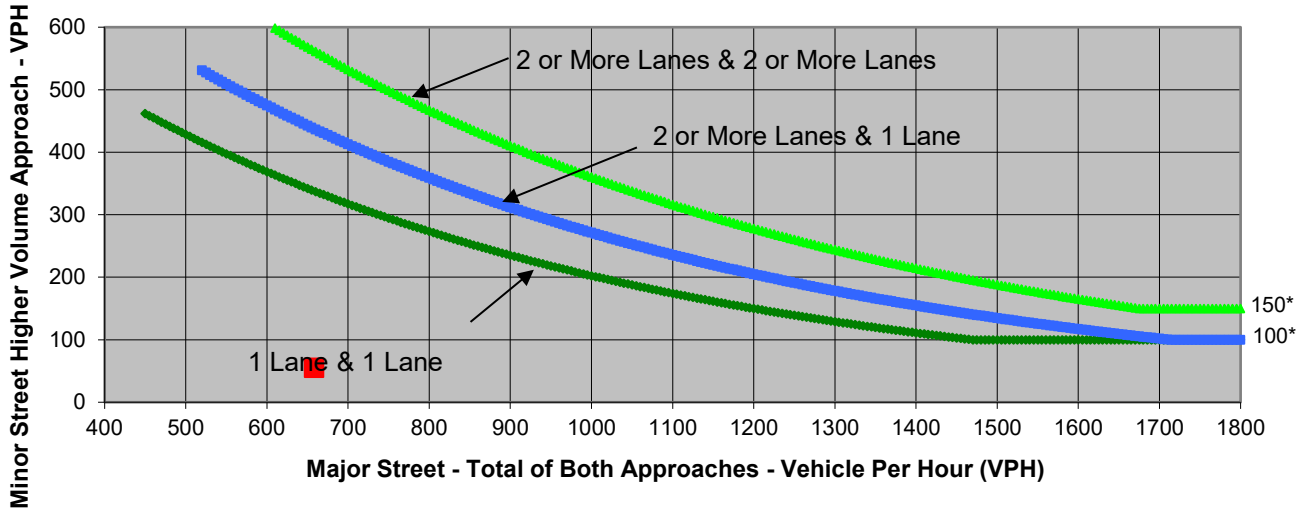
Major Street	Research Park Drive	Project	University Research Park
Minor Street	W Chiles Road	Scenario	Cumulative Plus Project Conditions
		Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	20	12	20	43
Through	360	220	0	0
Right	36	10	10	12
Total	416	242	30	55

Major Street Direction

x	North/South
	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	W Chiles Road	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**658**	**55**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Research Park Drive
Scenario	Cumulative Plus Project Conditions
Minor Street	W Chiles Road
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	20	12	20	43
Through	360	220	0	0
Right	36	10	10	12
Total	416	242	30	55

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	7.7
Approach with Worst Case Delay	WB
Total Vehicles on Approach	55

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**0.1**	**55**	**743**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

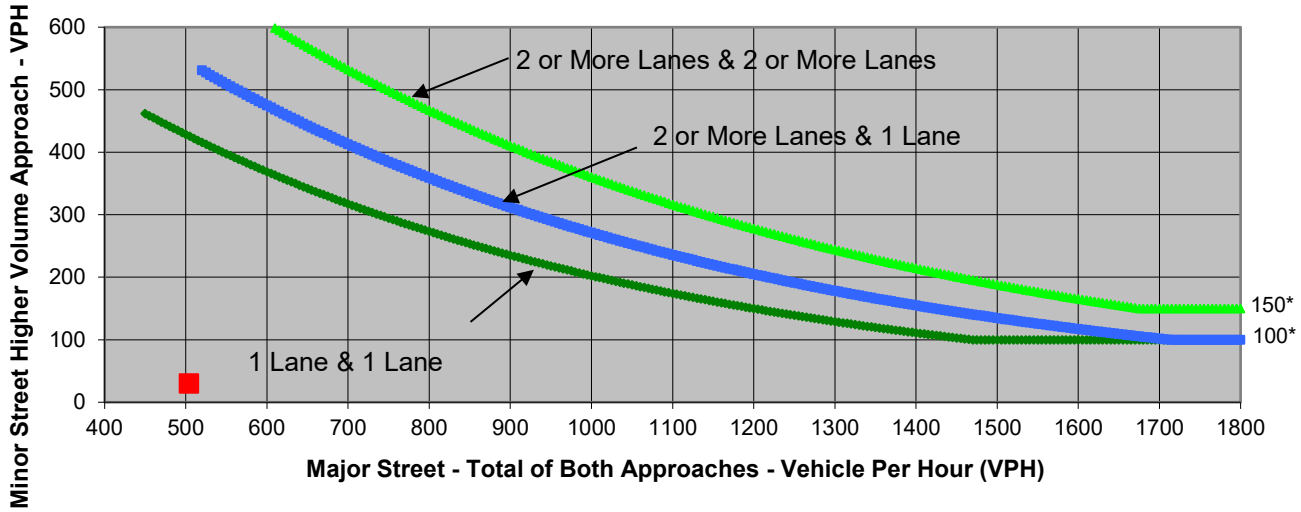
Project	University Research Park
Scenario	Cumulative Plus Project Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	20			60
Through			129	264
Right	10		51	
Total	30	0	180	324

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**504**	**30**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Research Park Drive
Scenario	Cumulative Plus Project Conditions
Minor Street	Drew Avenue
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	20	0	0	60
Through	0	0	129	264
Right	10	0	51	0
Total	30	0	180	324

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	4.2
Approach with Worst Case Delay	NB
Total Vehicles on Approach	30

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**0**	**30**	**534**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Not Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Research Park Drive
Minor Street	Drew Avenue

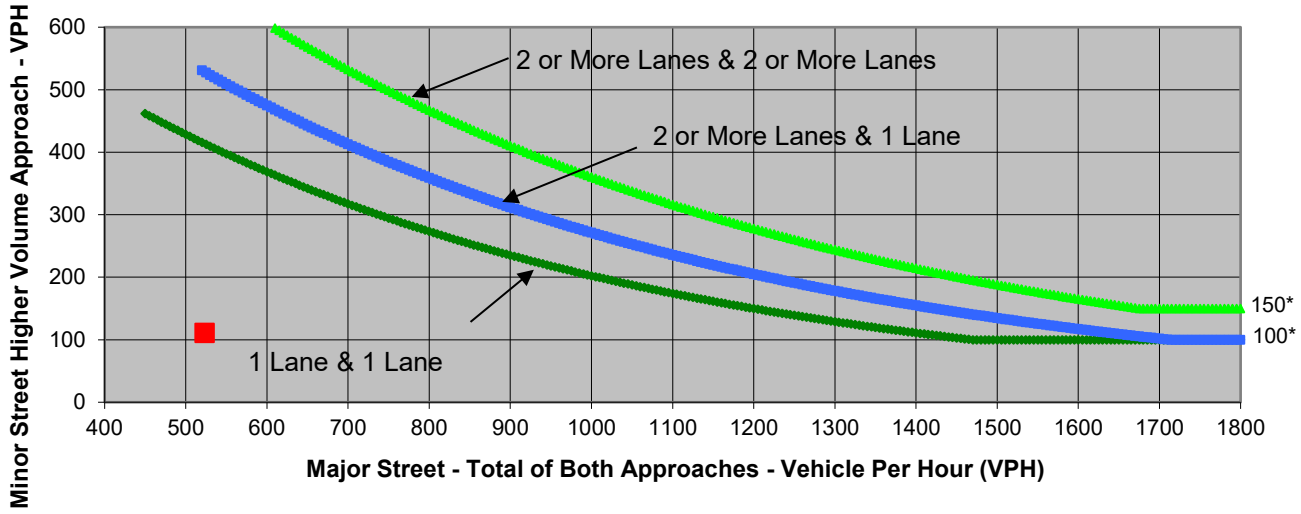
Project	University Research Park
Scenario	Cumulative Plus Project Conditions
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	31			40
Through			301	171
Right	80		11	
Total	111	0	312	211

Major Street Direction

	North/South
x	East/West



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Research Park Drive	Drew Avenue	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**523**	**111**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Research Park Drive
Scenario	Cumulative Plus Project Conditions
Minor Street	Drew Avenue
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	31	0	0	40
Through	0	0	301	171
Right	80	0	11	0
Total	111	0	312	211

Major Street Direction

	North/South
x	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	3

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	2.9
Approach with Worst Case Delay	NB
Total Vehicles on Approach	111

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**0.1**	**111**	**634**
Limiting Value	**4**	**100**	**650**
Condition Satisfied?	**Not Met**	**Met**	**Not Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Cumulative Plus Project Conditions
		Peak Hour	AM

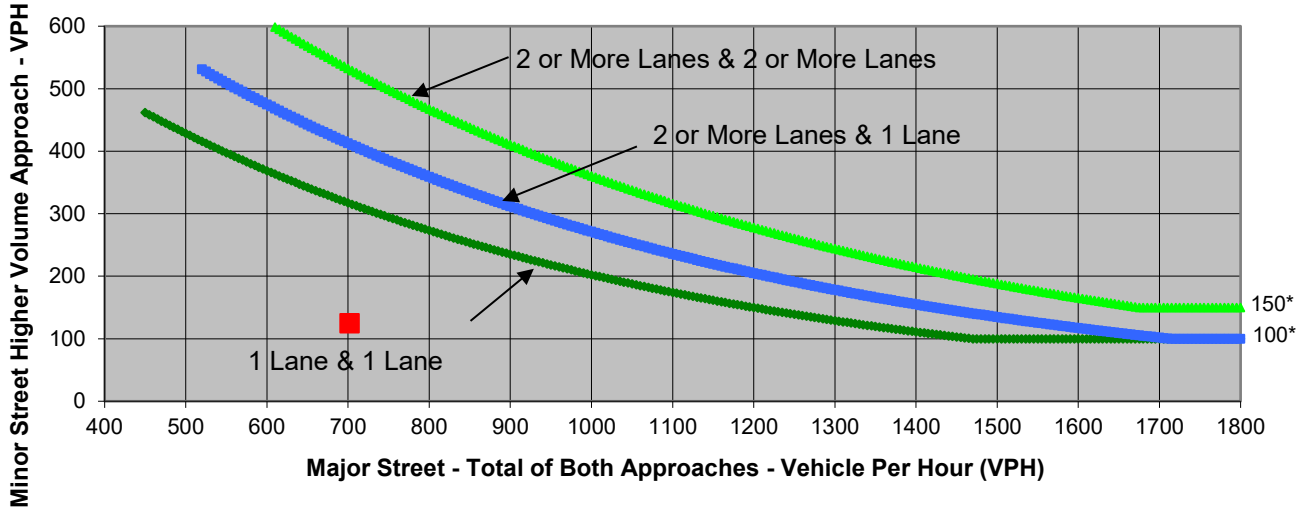
Turn Movement Volumes

	NB	SB	EB	WB
Left		10	125	10
Through	191	282		10
Right	10	209		10
Total	201	501	125	30

Major Street Direction

x	North/South
	East/West

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**NO**
Traffic Volume (VPH) *	**702**	**125**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Major Street	Cowell Boulevard
Minor Street	Research Park Drive

Project	University Research Park
Scenario	Cumulative Plus Project Conditions
Peak Hour	AM

Turn Movement Volumes

	NB	SB	EB	WB
Left	95	10	125	10
Through	191	282	10	10
Right	10	209	44	10
Total	296	501	179	30

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	14.2
Approach with Worst Case Delay	EB
Total Vehicles on Approach	125

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**0.5**	**179**	**1,006**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Not Met**	**Met**	**Met**
Warrant Met	**NO**		

FEHR PEERS

Major Street	Cowell Boulevard	Project	University Research Park
Minor Street	Research Park Drive	Scenario	Cumulative Plus Project Conditions
		Peak Hour	PM

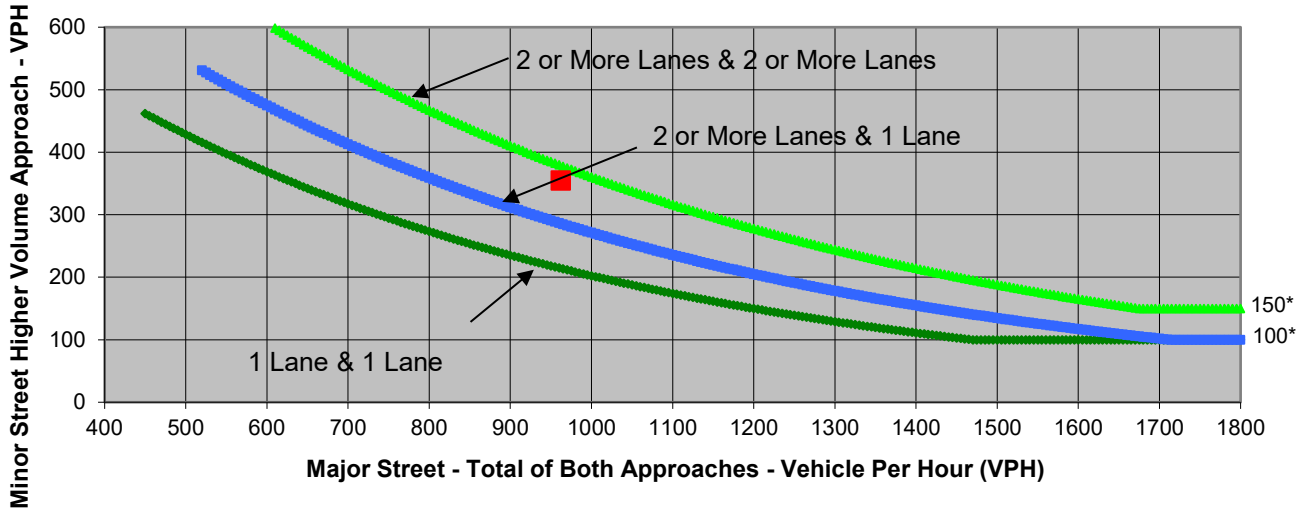
Turn Movement Volumes

	NB	SB	EB	WB
Left		10	355	10
Through	421	312		10
Right	10	209		10
Total	431	531	355	30

Major Street Direction

x	North/South
	East/West

*Single lane used on all approaches as NB left and EB through/EB right lanes have minor turn volumes relative to NB through/NB right and EB left lanes



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Source: *California Manual on Uniform Traffic Control Devices*, Caltrans, 2014

	Major Street	Minor Street	Warrant Met
	Cowell Boulevard	Research Park Drive	
Number of Approach Lanes	**1**	**1**	**YES**
Traffic Volume (VPH) *	**962**	**355**	

* Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

FEHR PEERS

Project	University Research Park
Major Street	Cowell Boulevard
Scenario	Cumulative Plus Project Conditions
Minor Street	Research Park Drive
Peak Hour	PM

Turn Movement Volumes

	NB	SB	EB	WB
Left	72	10	355	10
Through	421	312	10	10
Right	10	209	116	10
Total	503	531	481	30

Major Street Direction

x	North/South
	East/West

Intersection Geometry

Number of Approach Lanes for Minor Street	1
Total Approaches	4

Worst Case Delay for Minor Street

Stopped Delay (seconds per vehicle)	186.8
Approach with Worst Case Delay	EB
Total Vehicles on Approach	355

Warrant 3A, Peak Hour			
	Peak Hour Delay on Minor Approach (vehicle-hours)	**Peak Hour Volume on Minor Approach (vph)**	**Peak Hour Entering Volume Serviced (vph)**
Cumulative Plus Project Conditions	**18.4**	**481**	**1,545**
Limiting Value	**4**	**100**	**800**
Condition Satisfied?	**Met**	**Met**	**Met**
Warrant Met	**YES**		