FEHR PEERS

Final Memorandum

Date: January 7, 2022

To: Kenneth Strelo, City of Oakley

From: Mark Howard, Cody Lim, and Bill Burton, Fehr & Peers

Subject: Laurel Plaza Supplemental Traffic Operations Analysis Assessment

WC21-3831

This technical memorandum documents the results of the updated transportation analysis prepared for the development of the Laurel/O'Hara Retail Center (Project) in Oakley, California. A previous study, *Draft Traffic Impact Study for the Laurel/O'Hara Retail Center* dated April 10, 2007, for development of this retail parcel was prepared by Kimley-Horn and approved by the city. An updated transportation study, *Oakley McDonald's and Quick Quack Traffic Analysis* dated March 15, 2021, was completed by Kimley-Horn to analyze proposed modifications to the original land use plan reviewed and approved in 2007. This transportation assessment was prepared to review and update the analysis and recommendations of the previous traffic studies.

The current site features a 4,000 square foot bank and a gas station with convenience market. The proposed project would add a 4,597 square foot McDonalds restaurant and 3,600 square foot Quick Quack carwash. Future development of the site would include adding a shopping center with 26,000 square feet of retail space. The primary purpose of this evaluation is to identify the effects of the proposed project on the surrounding transportation system, with an emphasis on potential impacts and conflicts of McDonald's and Quick Quack carwash related traffic with local school traffic (specifically, Laurel Elementary School).

Executive Summary

The results of this transportation assessment indicate that the operations of the study intersections would remain within the acceptable level of service limits outlined by the City of Oakley's deficiency thresholds when project traffic is added to existing traffic levels. Vehicle queues would slightly increase with the addition of the proposed project trips, but not to the degree to cause negative consequences to circulation. Field observations found that inadequate pick-up and drop-off

capacity exists at Laurel Elementary School, causing excessive vehicle queuing and parents picking-up or dropping-off their children in Laurel Plaza.

Based on the results of the assessment and field observations, the following improvements are recommended to enhance site access, safety, and circulation for all travel modes:

- Install high-visibility crosswalks with advanced stop bars for all crosswalks at the intersection of Laurel Road & Mercedes Lane.
- Modify the signal phasing to include leading pedestrian intervals at the Laurel Road/Mercedes Lane intersection to improve pedestrian visibility and reduce conflicts between pedestrians and vehicles.
- Install blank out "No Turn on Red" signage to increase pedestrian safety for the eastbound and southbound approaches at the Laurel Road/Mercedes Lane intersection. The blank out signs should be operational during school pick-up and drop-off hours.
- Provide signage on-site in the Laurel Plaza center that indicates parking is for Laurel Plaza customers only (i.e., Laurel Elementary School parking, pick-up and drop-off is prohibited).
- Eliminate spaces 35, 36 and 37 in the McDonald's parking lot due to potential conflicts with drive-thru queues. Increase the drive-thru throat depth to accommodate additional vehicle queues.
- Shift the drive-thru pedestrian crossing to the east, bulb out the pedestrian areas adjacent to the crossing, and incorporate a raised crossing to improve pedestrian visibility. Additionally, include a 10-to-15-foot pedestrian barrier (i.e., fence) to the right of pedestrians exiting the McDonalds building to increase visibility to vehicles exiting the drive-thru.
- Provide bicycle parking as part of the proposed project.
- To provide for safe and more efficient on-site circulation, shift the Quick Quack internal connector south to align with the McDonalds driveway.

Introduction

This section discusses the study's purpose, study locations, analysis scenarios, analysis methods, and criteria used to identify potential violations of the city's established Level of Service policies.

Study Purpose and Project Description

The study's purpose is to evaluate the potential effects of the development of the Laurel Plaza Project on the nearby area roadway Levels of Service, evaluate the proposed site plan, review

collision trends adjacent to the Project site and assess the Project's compatibility with the adjacent transportation network and land uses. The Project site is in the City of Oakley, bound by Laurel Road to the south, O'Hara Avenue to the east, and residential development to the north and west. (See **Figure 1** – all figures are provided at the end of this memorandum). The existing site is currently occupied by a gas station with a convenience store and a drive-in bank. Complete buildout of the development will include a shopping center with 26,000 square feet of retail space, a 4,597 square foot McDonalds, and a Quick Quack carwash. Vehicular access would be provided via Laurel Road and O'Hara Avenue. The project site plans are shown on **Figure 2A** and **2B**.

Study Location and Analysis Scenarios

The effects of the Project on the study area roadway facilities were determined by measuring the change in delay that Project-generated traffic would create at intersections in the vicinity of the site during the weekday morning (7:00 to 9:00 AM) and afternoon (1:30 to 6:00 PM) peak periods. Based off project trip generation, trip distribution and previous traffic reports prepared for this plaza, analysis of the following intersections were included in the assessment:

1. Laurel Road/O'Hara Avenue

2. Laurel Road/Mercedes Lane

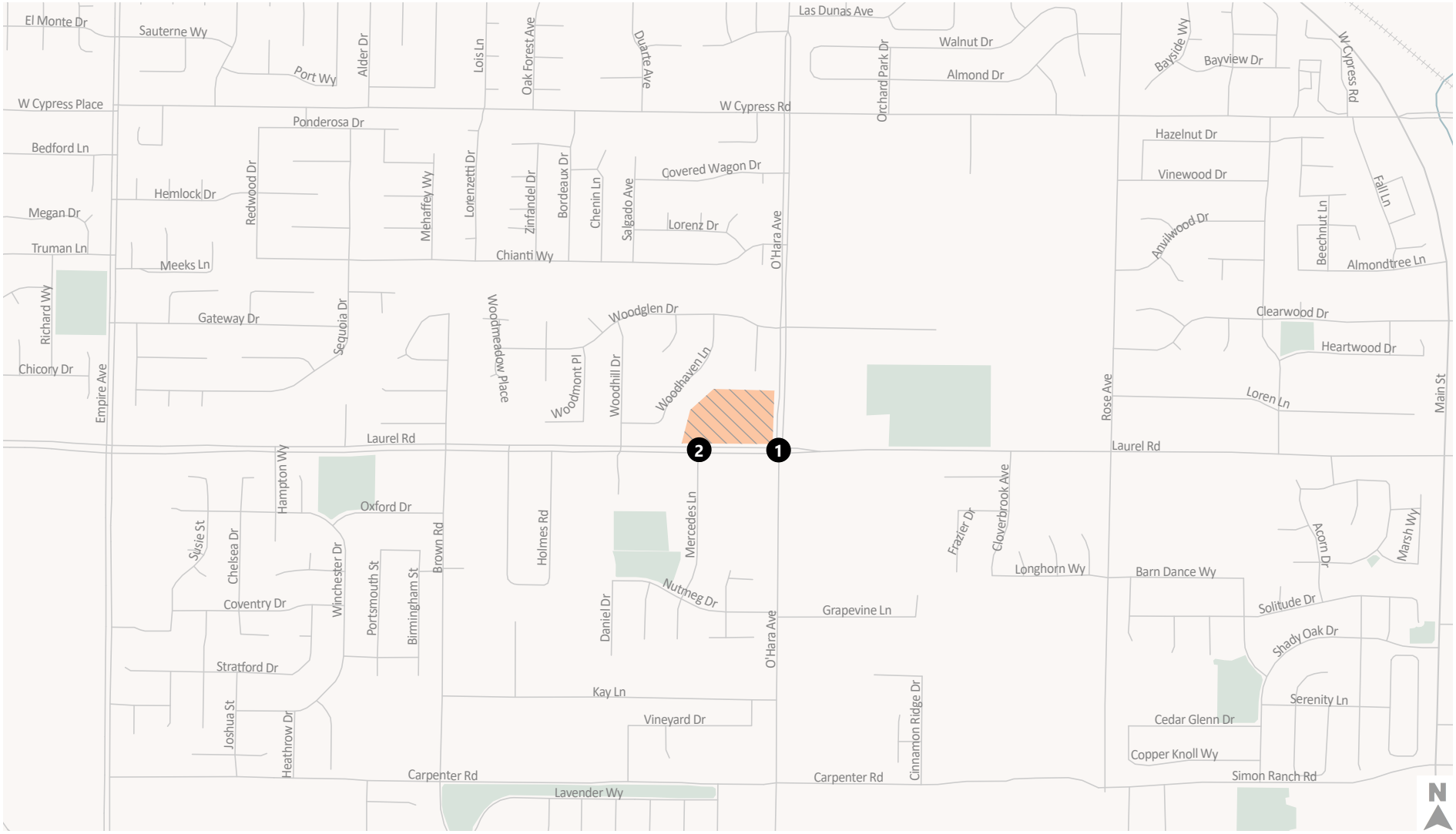
Operations of signalized intersections were evaluated using the method from Transportation Research Board's *Highway Capacity Manual 6th Edition* methods. The following scenarios were evaluated:

1. ***Existing*** – Based on traffic counts collected at the above intersections when area schools were in normal session. The existing conditions analysis makes use of the highest hour of traffic counted during the observation period.

2. ***Existing Plus Project*** – Existing traffic counts plus traffic generated by the proposed Project.

3. ***Cumulative*** – Projected traffic volumes based on traffic growth trends that are described in the Oakley General Plan and supplemented by traffic forecasts for the study area in the 2040 Contra Costa Countywide travel demand model. Land uses assumed on the parcels adjacent to the Project site, including the parcels zoned for commercial and retail business at the Laurel Road & O'Hara Avenue intersection.

4. ***Cumulative with Project*** – Cumulative forecasts plus traffic expected to be generated by the Project.



Study Intersections

Project Site

Parks

Figure 1

Project Site Vicinity and Study Locations

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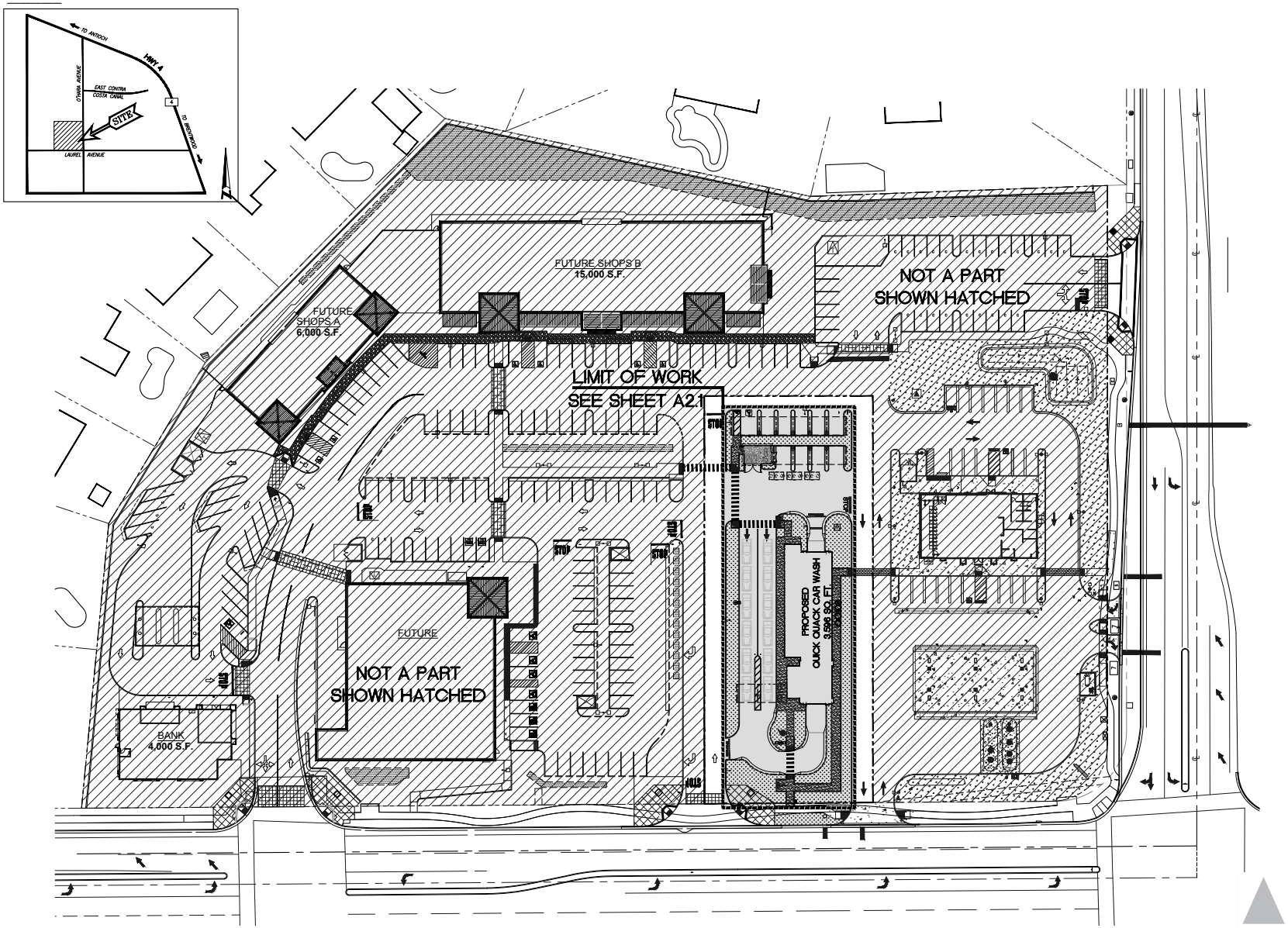
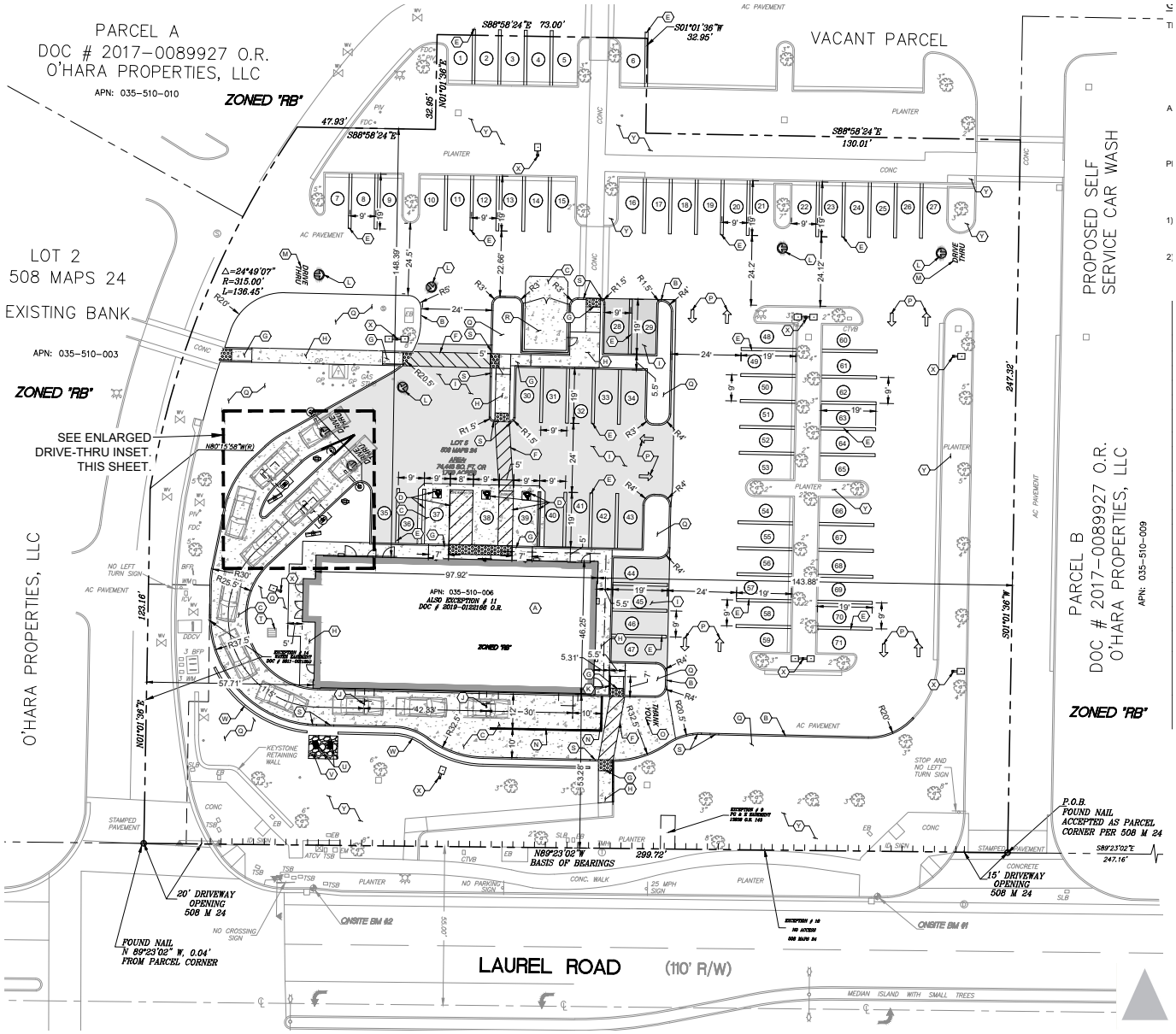


Source: CRM Architects & Planners, Inc.

Figure 2A

Site Plan – Quick Quack



Source: CORE STATES Group

Figure 2B

Site Plan - McDonalds

Laurel Elementary School

Figure 2C

Site Plan – Laurel Elementary School

Analysis Methods

The operations of roadway facilities are described with the term "level of service" (LOS). LOS is a qualitative description of traffic flow from a vehicle drivers' perspective based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels of service are defined ranging from LOS A (free-flow conditions) to LOS F (over-capacity conditions). LOS E corresponds to operations "at capacity." When volumes exceed capacity, stop-and-go conditions result, and operations are designated LOS F.

Signalized Intersections

Traffic conditions at signalized intersections were evaluated using methods developed by the Transportation Research Board (TRB), as documented in the *Highway Capacity Manual 6th Edition* for vehicles using the analysis software Synchro 11.0. The HCM method calculates control delay at an intersection based on inputs such as traffic volumes, lane geometry, signal phasing and timing, pedestrian crossing times, and peak hour factors. Control delay is defined as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The relationship between LOS and control delay for signalized intersections is summarized in Table 1**.**

Table 1: Signalized Intersection LOS Criteria

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: Highway Capacity Manual 6th Edition (Transportation Research Board).

Regulatory Setting and LOS Policies

Intersection levels of service were evaluated in this study for General Plan compliance and to identify potential transportation improvements that could be implemented as part of the Project to improve the overall operations of the transportation system for all travel modes. The City of Oakley generally strives to maintain level of service D operations for signalized intersections, unless other standards are adopted by CCTA or another regional agency.

The Project could have a noticeable effect on local and regional travel if it would cause an increase in traffic which is substantial in relation to the traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, or delay and congestion at intersections), or change the condition of an existing street (e.g., street closures, changing direction of travel) in a manner that would substantially change access or traffic load and capacity of the street system. Criteria were developed based on level of service policies contained within the City of Oakley General Plan and previously used by the City of Oakley as signalized intersection thresholds of significance.

Recommendations will be designed to enhance mobility for all travel modes, including transit vehicles, without degrading or precluding the provision of planned bicycle, pedestrian, and transit facilities. Intersection or roadway improvements may be recommended under the following circumstances for signalized intersections:

1. Project-related traffic causes the Level of Service (LOS) rating to deteriorate from LOS D (55-seconds) or better to LOS E or F, or from LOS E to LOS F.
2. For intersections already operating at an unacceptable LOS without the Project it is considered a significant impact of the Project increase the average intersection delay by more than 5 seconds.

Existing Conditions

This section describes the transportation facilities in the study area, including the surrounding roadway network, transit, pedestrian, and bicycle facilities in the Project's vicinity. Existing intersection operations are also described.

Existing Transportation System

Vehicular access to the site is provided from Laurel Road, O'Hara Avenue, and Mercedes Lane.

Laurel Road is an east-west arterial road with two travel lanes in each direction, traveling from State Route 4 to Teton Road in the City of Oakley. The posted speed limit along Laurel Road is 35 miles per hour. Sidewalks are located on both sides of the roadway along the Project frontage. Adjacent land uses along Laurel Road are primarily residential. Laurel Elementary School is bounded by Laurel Road to the north.

O'Hara Avenue is a north-south suburban roadway that provides two lanes in each direction, connecting Oakley to Brentwood. Land uses along O'Hara Avenue primarily consist of residential, developments, with vacant parcels that have a commercial or retail designation for future development. There is a posted speed limit of 35 miles per hour, and a designated sidewalk along the western side of the roadway along the Project frontage.

Mercedes Lane is a north-south local residential roadway that connects Laurel Plaza to the nearby residential area with one lane in each direction. Laurel Elementary School is located on the western side of the roadway. There is a sidewalk on the western side of the road adjacent to the Elementary School and posted speed limit of 25 miles per hour.

Transit Service

Transit service in the area is provided by Tri Delta Transit with transit stops located within 0.5 miles of the Project site. There are stops located north of the project site at O' Hara Avenue & West Cypress Road which provide both eastbound and westbound travel for routes 383, 391, and 393. Additional stops exist east of the project site along Laurel Road which provide east and westbound travel for Route 383. Route 383 connects the study area to the Antioch BART Station on weekdays with 60-minute headways from 5:00 AM to 6:00 PM. Route 391 connects the study area to the Brentwood Park & Ride and the Antioch & Pittsburg Center BART stations on weekdays. The route runs from 5:00 AM to 11:00 PM on 30-minute headways in the AM peak hours, 15-minute headways in the PM peak hours, and 60-minute headways during off-peak hours. Route 393 provides weekend service from the study area to the Antioch BART station on 60-minute headways from 8:00 AM to 12:00 AM on Saturdays and 60-minutes headways from 7:00 AM to 10:00 PM on Sundays and holidays.

Bicycle Facilities

Class II bike lanes denoted by pavement striping exist in both directions along Laurel Road. There are also Class II bike lanes along O'Hara Avenue in both directions, north of the O'Hara Avenue & Laurel Road intersection. However, only the bike lane on the western side of O'Hara Avenue continues south past the intersection.

Pedestrian Facilities

There are existing sidewalks along both sides of Laurel Road and the western side of O'Hara Avenue with crosswalks at all four approaches of the Laurel Road/O'Hara Avenue intersection and all the approaches except the westbound approach at the Laurel Road/Mercedes Lane intersection. The western crosswalk at Laurel Road/Mercedes Lane experiences higher than normal pedestrian volumes in the morning and afternoon peak times due to Laurel Plaza being used as a pick-up/drop-off area for students attending Laurel Elementary School.

Data Collection

Intersection turning movement counts were collected in August 2021 during the weekday morning (6:00-9:00 AM) and afternoon (1:30-6:00 PM) peak periods to coincide with the time-periods when adjacent street traffic demands are the greatest, and with the nearby school arrival and departure patterns. The counts were collected at the intersection of Laurel Road and O'Hara Avenue, immediately adjacent to the Project site, and at the intersection of Laurel Road and Mercedes Lane, the location of one of the Project driveways. The traffic analysis incorporates volumes from the highest hours of traffic observed during the count periods, which reflect peak traffic associated with activities at the Laurel Elementary School. Peak hour intersection vehicle volumes are summarized

in **Figure 3** along with existing lane configurations and traffic controls. Existing pedestrian and bicycle volumes are summarized in **Figure 4**. The traffic counts for existing conditions at O'Hara Avenue/Laurel Road and Mercedes Lane/Laurel Road are provided in **Attachment A**.

Laurel Elementary School Field Observations

Field observations of pick-up and drop-off activities at the Laurel Elementary School were conducted. The following observations were made:

- Inadequate pick-up and drop-off capacity at Laurel Elementary School results in vehicles spilling back onto Laurel Road.
- One of the eastbound through lanes on Laurel Road gets blocked due to pick-up and drop off.
- Vehicles in the westbound left turn lane at Laurel Road & Mercedes Lane are unable to complete their movement due to vehicle spill back from the drop-off and pick-up area.
- Parents use Laurel Plaza to drop off their children or park their vehicle at Laurel Plaza and walk their children to and from school. In the afternoon peak hour, more than 100 pedestrians were observed to cross Laurel Road, primarily due to pick-up and drop-off occurring in Laurel Plaza.
- A crossing guard at Laurel Road & Mercedes Lane is present to assist children crossing to and from Laurel Plaza.

A vehicle traveling into opposing traffic to get around the student pick-up queue on Mercedes Lane at Laurel Road.

Existing Intersection LOS

Existing intersection lane configurations, signal timings, and peak hour turning movement volumes were input into the Synchro 11.0 software program to calculate the levels of service for the study intersections during each peak hour. The existing conditions peak hour intersection LOS results are presented below in **Table 2**. Detailed LOS calculation worksheets can be found in **Attachment B**. Both intersections were found to operate within the level of service standards set by the City of Oakley during both peak hours.

Table 2: Existing Level of Service Summary

	Intersection	Control[1]	Peak Hour	Delay	LOS
1	O'Hara Avenue/Laurel Road	Signal	AM PM	33.9 28.9	C C
2	Mercedes Lane/Laurel Road	Signal	AM PM	26.8 12.8	C B

Notes:

1. Existing intersection traffic control type (Signal = Signalized)
2. AM= Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized and all-way stop-controlled intersections. Delay calculated per HCM 6th methodologies.
   Source: Fehr & Peers, November 2021

Existing Vehicle Queues

Table 3 presents AM and PM peak hour 95th percentile queues for approaches to the study intersections. These queues are indicative of maximum design queues occurring during periods of peak traffic.

Table 3: Existing Conditions 95th Percentile Queue Summary

Intersection		Movement	Storage Length (ft)[1]	AM Peak Period	PM Peak Period
1	O'Hara Avenue/Laurel Road	EBL	325	275	225
		EBT	525	75	450
		WBL	300	**400**	225
		WBT	1,700	500	400
		NBL	100	**125**	**150**
		NBT	1,175	300	325
		NBR	50	**200**	**200**
		SBL	175	100	100
		SBT	900	350	250
2	Mercedes Lane/Laurel Road	EBL	125	25	25
		EBT	500	225	250
		WBL	100	75	25
		WBT	525	275	200
		NBL	1,100	100	50
		NBT	50	25	25
		SBT	200	50	25

Notes:

1. An additional 60 to 90 feet of storage is typically provided in the taper area outside of the through lane, which is not reflected in the storage length above.

Bold indicates queue potentially extends beyond available storage.

Source: Fehr & Peers, November 2021.

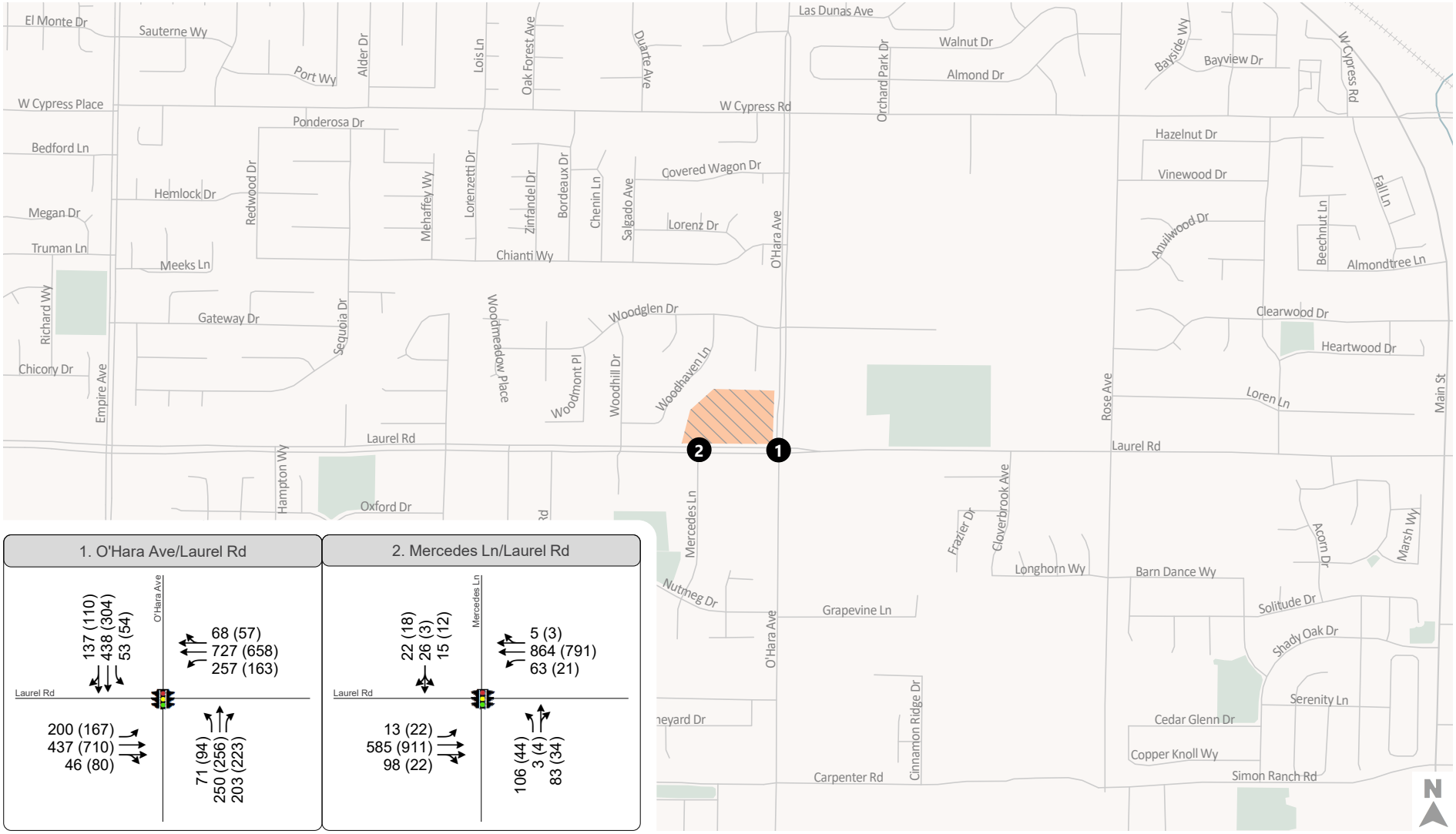


Figure 3

Existing Conditions Peak Hour
Intersection Traffic Volumes, Lane Configurations and Traffic Controls

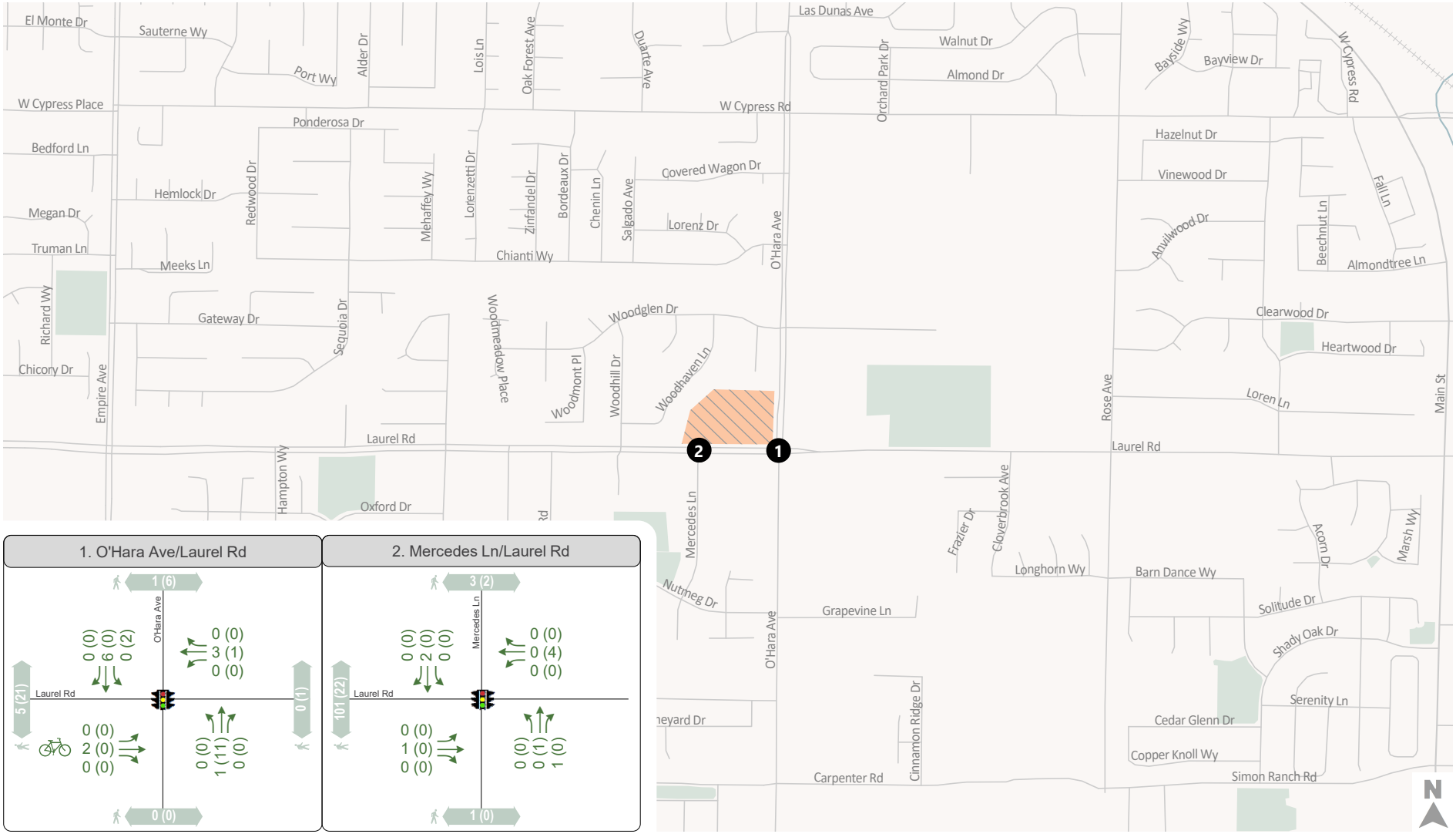


Figure 4

Existing Conditions Peak Hour Bicycle and Pedestrian Volumes

Project Characteristics

This section provides an overview of the proposed Project components and addresses the proposed Project trip generation, distribution, and assignment characteristics, allowing for an evaluation of potential Project effects on the surrounding roadway network. The amount of traffic associated with the Project was estimated using a three-step process:

1. **Trip Generation** – The *amount* of vehicle traffic entering/exiting the Project site was estimated.
2. **Trip Distribution** – The *direction* trips would use to approach and depart the site was projected.
3. **Trip Assignment** – Trips were then *assigned* to specific roadway segments and intersection turning movements.

Trip Generation

Trip generation refers to the process of estimating the amount of vehicular traffic a project would add to the surrounding roadway system. Estimates are created for the daily condition and for the peak one-hour periods during the morning and afternoon commute when traffic volumes on the adjacent streets are typically the highest. Project trip generation was estimated using rates from the data found in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (10th Edition). The ITE *Trip Generation Manual* is a published guide on trip generation rates of various land uses. It is continually updated and includes information on over 170 land uses. The *Trip Generation Manual* is considered the industry standard for transportation professionals for evaluating the potential transportation outcomes of various land use decisions within the United States.

Trip generation estimates were developed for the proposed Project and existing land uses. Reduction in the form of pass-by and internal capture trips were applied to reflect a more accurate estimation of the site's trip generation. Pass-by trips are a subset of trips traveling along a road that make a stop at a location along their route. These vehicles are already travelling along the street system with a different ultimate destination in mind. They are not considered as new trips, since they are just stops along a trip route that was already occurring. They are assigned to the project's driveways, but not the adjacent street network. Internal capture trips are trips contained within an integrated mixed-use development. Since mixed-use developments contain multiple different land uses, people may travel between the various uses, making multiple stops within a single trip. The trip generation data from the ITE *Trip Generation Manual* reflects all trips generated by a specific land use and does not factor out pass-by and internal capture trips. Adjustments for reductions

associated with both trip types were made from data provided within the ITE *Trip Generation Handbook* (3rd Edition), a supplemental document to the ITE *Trip Generation Manual*. The results of this assessment are presented in **Table 4**. The proposed McDonalds, Quick Quack Car Wash and Shopping Center is anticipated to generate 2,154 daily trips, 146 AM peak hour trips and 177 PM peak hour trips on a typical weekday.

Table 4: Weekday Vehicle Trip Generation Estimates

Use	Size	Daily	Weekday					
			AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Proposed Land Uses								
Project Trips – Automated Car Wash								
Automated Car Wash[1]	1 Tunnel	706[9]	25	24	49	39	39	78
Less Pass-by Trips		-	-	-	--	-	-	--
Less Internal Trips Between Land Uses[2]		-77	-2	-3	-5	-5	-4	-9
Net-New		***629***	*23*	*21*	***44***	*34*	*35*	***69***
Project Trips- Fast-Food Restaurant with Drive-Through Window								
Fast-Food Restaurant with Drive-Through Window[3]	4,516 SF	2,127	93	89	182	77	71	148
Less Pass-by Trip[4]		-797	-38	-37	-75	-25	-23	-48
Less Internal Trips Between Land Uses[5]		-531	-14	-13	-27	-27	-24	-51
Net-New		***799***	*41*	*39*	***80***	*25*	*24*	***49***
Project Trips- Shopping Center								
Shopping Center[6]	26,000 SF	982	15	9	24	48	51	99
Less Pass-by Trips[7]		-148	0	0	0	-14	-15	-29
Less Internal Trips Between Land Uses[8]		-108	-1	-1	-2	-5	-6	-11
Net-New		***726***	*14*	*8*	***22***	*29*	*30*	***59***
Project Trip Generation		***2,154***	***78***	***68***	***146***	***88***	***89***	***177***
Existing Land Uses								
Existing Trips- Gasoline/Service Station with Convenience Market								
Gasoline/Service Station with Convenience Market[10]	12 Fueling Positions	2,465	77	73	150	86	82	168
Less Pass-by Trips[11]		-1294	-42	-40	**-82**	-42	-40	**-82**
Less Internal Trips Between Land Uses[12]		-271	-8	-8	**-16**	-10	-10	**-20**
Net-New		***900***	*27*	*25*	***52***	*34*	*32*	***66***

Project Trips- Drive-in Bank								
Drive-in Bank[13]	4 KSF	402	22	16	38	41	41	82
Less Pass-by Trips[14]		-114	-5	-4	**-9**	-12	-12	**-25**
Less Internal Trips Between Land Uses[15]		-44	-2	-2	**-4**	-5	-4	**-9**
Net-New		***244***	*15*	*10*	***25***	*24*	*25*	***48***
Existing Trip Generation		***1,144***	***42***	***35***	***77***	***58***	***57***	***114***
Total Site Trips Generated		***3,298***	***120***	***103***	***223***	***146***	***146***	***291***

1. ITE land use category 948 – Automated Car Wash - (Adj Streets, 7-9A, 4-6P):
   Weekday AM Peak Hour: 50% of PM peak hour; Enter = 50%; Exit = 50%
   Weekday PM Peak Hour: T = 77.5(X); Enter = 50%; Exit = 50%
2. Internal Capture rates: Daily 11%, Weekday AM 11%, Weekday PM 12%
3. ITE land use category 934 – Fast-Food Restaurant with Drive-Through Window - (Adj Streets, 7-9A, 4-6P):
   Daily: T = 470.95(X)
   AM Peak Hour: T = 40.19(X); Enter = 51%; Exit = 49%
   PM Peak Hour: T = 32.76(X); Enter = 52%; Exit = 48%
4. Pass-by rates: Daily 17%; Weekday AM 0%; Weekday PM 34%
5. Internal Capture rates: Daily 25%, Weekday AM 15%, Weekday PM 35%
6. ITE land use category 820 – Shopping Center - (Adj Streets, 7-9A, 4-6P):
   Daily: T = 37.75X)
   AM Peak Hour: T = 0.94(X); Enter = 62%; Exit = 38%
   PM Peak Hour: T = 3.81(X); Enter = 48%; Exit = 52%
7. Pass-by rates: Daily 17%; Weekday AM 0%; Weekday PM 34%
8. Internal Capture rates: Daily 11%, Weekday AM 11%, Weekday PM 12%
9. Daily rates are not available for Automated Car Wash (ITE land use category 948), the daily rate was calculated assuming the AM and PM peaks are 18% of the daily traffic.
10. ITE land use category 945 – Gasoline/Service Station with Convenience Market - (Adj Streets, 7-9A, 4-6P):
    Daily: T = 205.36(X)
    AM Peak Hour: T = 12.47(X); Enter = 51%; Exit = 49%
    PM Peak Hour: T = 13.99(X); Enter = 51%; Exit = 49%
11. Pass-by rates: Daily 59%; Weekday AM 62%; Weekday PM 56%
12. Internal Capture rates: Daily 11%, Weekday AM 11%, Weekday PM 12%
13. ITE land use category 912 – Drive-in Bank - (Adj Streets, 7-9A, 4-6P):
    Daily: T = 100.3(X)
    AM Peak Hour: T = 9.5(X); Enter = 58%; Exit = 42%
    PM Peak Hour: T = 20.45(X); Enter = 50%; Exit = 50%
14. Pass-by rates: Daily 32%; Weekday AM 29%; Weekday PM 35%
15. Internal Capture rates: Daily 11%, Weekday AM 11%, Weekday PM 12%

Source: *Trip Generation Manual* (10th Edition), ITE, 2017; Fehr & Peers, September 2021.

Project Trip Distribution and Assignment

Project trip distribution refers to the directions of approach and departure that vehicles would take to access and leave the site. Estimates of regional project trip distribution were developed based on existing travel patterns in the area, the City's Vistro Model, and the location of complementary land uses. The resulting trip distribution percentages are shown on **Figure 5**. The Project trip generation estimates, in combination with the expected trip distribution patterns, were used to assign vehicle trips to the local roadway network, as shown on ***Figure 6***.

Existing with Project Traffic Conditions

This section presents the evaluation of intersection Levels of Service under Existing with Project conditions.

Existing with Project Traffic Volumes

The Project traffic volumes on **Figure 6** were added to the existing traffic volumes from **Figure 3** to estimate the Existing with Project traffic volumes, as shown on **Figure 7**.

Analysis of Existing with Project Conditions

Intersection Operations

Existing with Project intersection operations were evaluated using the methods described in Section 1. The Existing with Project analysis results are presented in **Table 5**, based on the traffic volumes and intersection configurations presented on **Figure 7**. **Table 5** also includes the operations results for Existing conditions. The addition of project traffic would slightly increase delay at the study intersections, but not result in conditions that fall below the City of Oakley's thresholds.

Table 5: Existing and Existing Plus Project Level of Service Summary

	Intersection	Control[1]	Peak Hour	Existing Conditions		Existing with Project Conditions	
				Delay	LOS	Delay	LOS
1	O'Hara Avenue/Laurel Road	Signal	AM PM	33.9 28.9	C C	35.6 29.8	D C
2	Mercedes Lane/Laurel Road	Signal	AM PM	26.8 12.8	C B	28.6 15.0	C B

Notes:

1. Existing intersection traffic control type (Signal = Signalized)
2. AM= Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized and all-way stop-controlled intersections. Delay calculated per HCM 6th methodologies.

Source: Fehr & Peers, November 2021

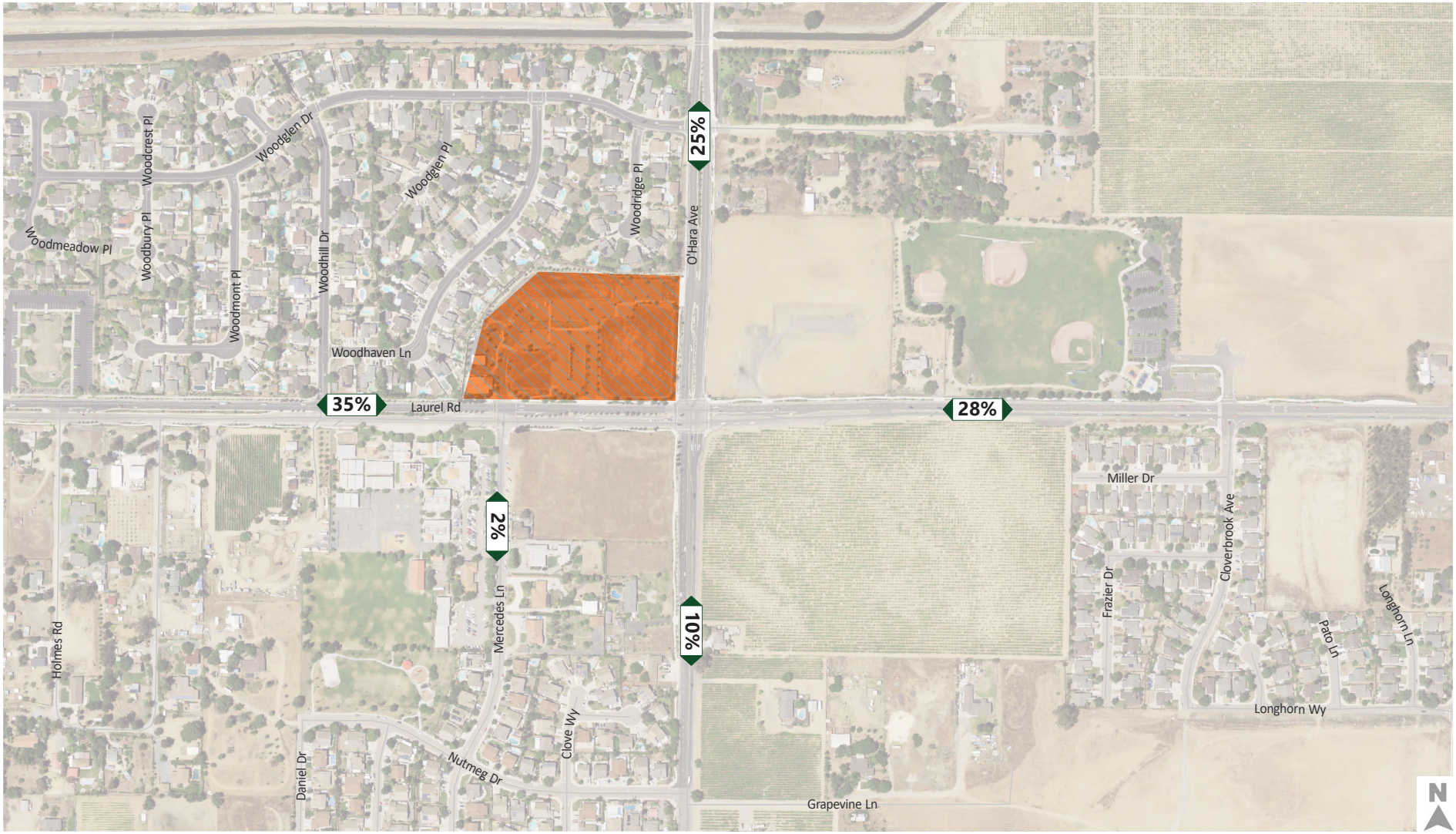


Figure 5

Project Trip Distribution

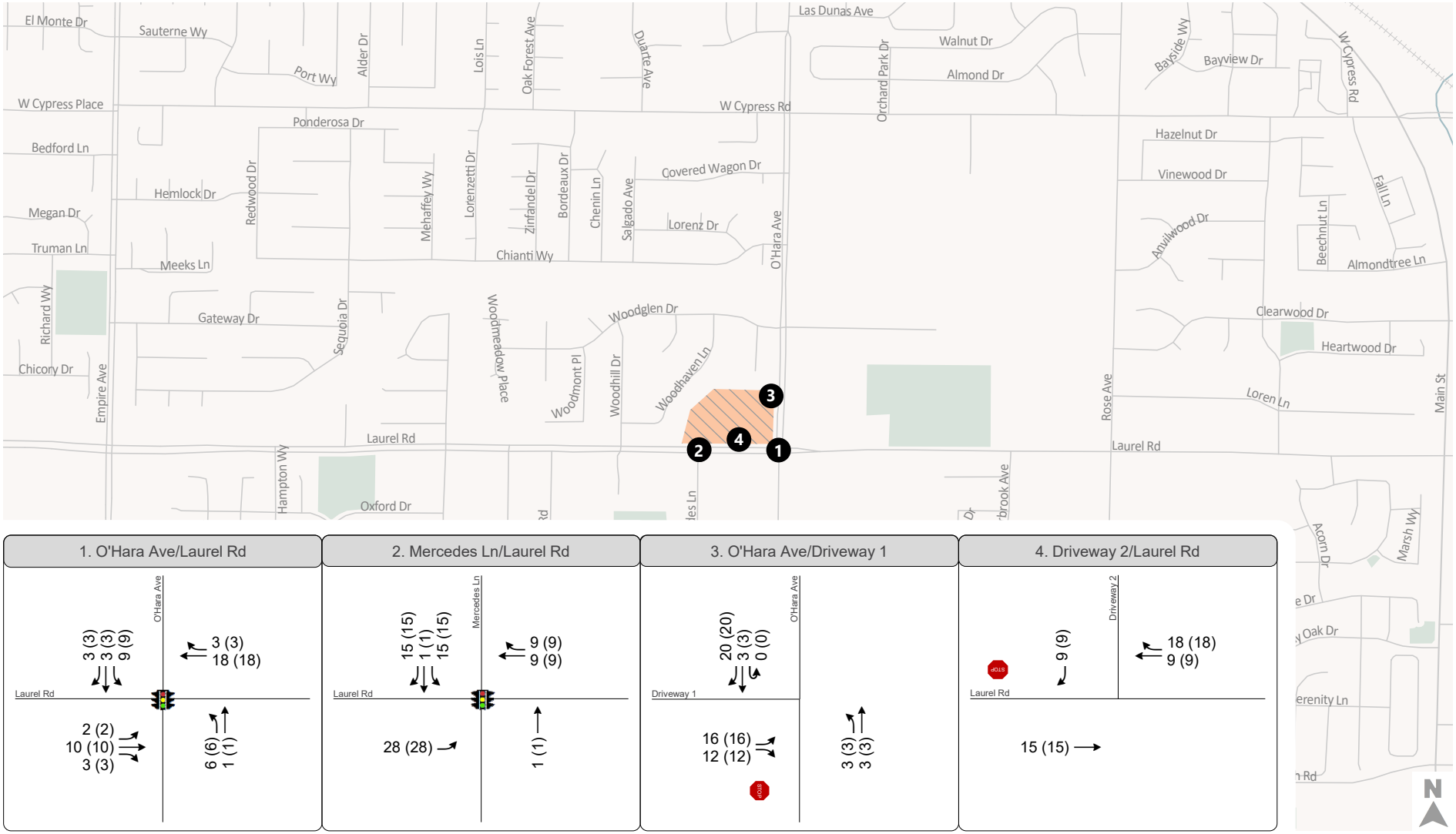
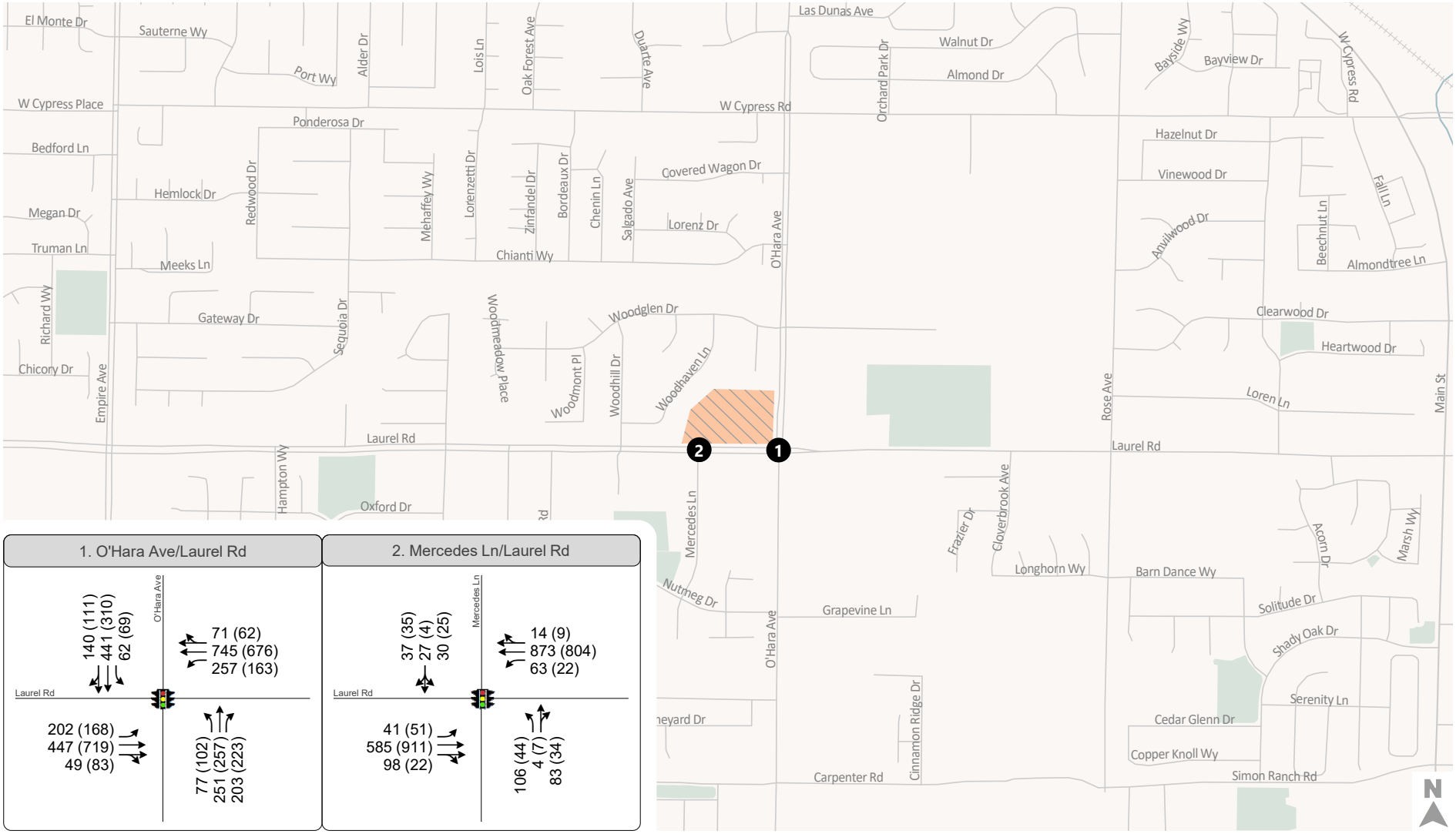


Figure 6

Project Trip Assignment



XX (YY) AM (PM) Peak Hour Traffic Volumes

Signalized Intersection

Study Intersections

Project Site

Parks

Figure 7

Existing with Project Conditions Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

Vehicle Queues

The addition of Project traffic is not expected to increase queues for movements where the queue already exceeds the available storage, as shown in **Table 6.**

Table 6: Existing with Project Conditions 95th Percentile Queue Summary

Intersection		Movement	Storage Length (ft)[1]	AM Peak Period		PM Peak Period	
				Without Project	With Project	Without Project	With Project
1	O'Hara Avenue/Laurel Road	EBL	325	275	300	225	225
		EBT	525	75	275	450	450
		WBL	300	**400**	**400**	225	225
		WBT	1,700	500	525	400	425
		NBL	100	**125**	**125**	**150**	**150**
		NBT	1,175	300	325	325	350
		NBR	50	**200**	**200**	**200**	**200**
		SBL	175	100	100	100	125
		SBT	325	**350**	**350**	250	250
2	Mercedes Lane/Laurel Road	EBL	125	25	50	25	50
		EBT	500	225	250	250	250
		WBL	100	75	75	25	25
		WBT	525	275	325	200	225
		NBL	1,100	100	125	50	50
		NBT	50	25	25	25	25
		SBT	200	50	100	25	50

Notes:

1. An additional 60 to 90 feet of storage is typically provided in the taper area outside of the through lane, which is not reflected in the storage length above.

Bold indicates queue potentially extends beyond available storage.

Source: Fehr & Peers, November 2021.

Cumulative Traffic Conditions

This section discusses Cumulative traffic conditions both without and with the Project.

Cumulative Traffic Volumes

Cumulative forecasts were developed using traffic growth trends as described in the Oakley General Plan and supplemented by a check of traffic forecasts for the study area in the 2040 Contra Costa Countywide travel demand model. To develop a more accurate 2040 cumulative forecast, future potential developments on the surrounding parcels adjacent to the project site were included in this analysis scenario. The three relevant parcels are located to the northeast, southeast, and southwest relative to the Laurel Road & O'Hara Avenue intersection and are zoned for future retail development. The potential additional future trips associated with development on these parcels were manually added to the model forecasts. **Table 7** shows the trip generation associated with the adjacent parcels.

Table 7: Cumulative Vehicle Trip Generation Estimates

Use	Parcel Size (KSF)	Size[3] (KSF)	Daily	Weekday					
				AM			PM		
				In	Out	Total	In	Out	Total
Project Trips - Northeast Corner									
Shopping Center[1]	424.7	169.9	6,414	99	61	160	311	337	648
Less Pass-by Trips			-1,090	0	0	0	-106	-114	-220
Net-New			***5,324***	***99***	***61***	***160***	***205***	***223***	***428***
Project Trips - Southeast Corner									
Shopping Center[1]	1008	403.2	15,221	235	144	379	737	799	1536
Less Pass-by Trips			-2,588	0	0	0	-251	-271	-522
Net-New			***12,633***	***235***	***144***	***379***	***486***	***528***	***1,014***
Project Trips - Southwest Corner									
Shopping Center[1]	248.7	99.5	3,757	58	36	94	182	197	379
Less Pass-by Trips			-639	0	0	0	-62	-67	-129
Net-New			***3,118***	***58***	***36***	***94***	***120***	***130***	***250***
Total New Vehicle Trips			**21,075**	**392**	**241**	**633**	**811**	**881**	**1,692**

1. ITE land use category 820 – Shopping Center - (Adj Streets, 7-9A, 4-6P):

Daily: T = 37.75(X)
AM Peak Hour: T = 0.94(X); Enter = 62%; Exit = 38%
PM Peak Hour: T = 3.81(X); Enter = 48%; Exit = 52%

2. Pass-by rates: Daily 17%; Weekday AM 0%; Weekday PM 34%
3. Maximum building site coverage assumed to be 40% of the parcel size

Source: *Trip Generation Manual* (10th Edition), ITE, 2017; Fehr & Peers, November 2021.

The resulting Cumulative without Project forecasts and lane configurations are presented in **Figure 8**, which are representative of anticipated conditions in the year 2040. The project volumes from Figure 6 were added to the Cumulative without Project traffic volumes to represent Cumulative with Project Conditions, as presented on **Figure 9**.

Heavy vehicle percentages and pedestrian and bicycle activity at the study intersections were left unchanged with respect to existing conditions. Traffic signal timing was optimized at intersections where the initial analysis indicated LOS D, E or F operations, reflecting that as part of Oakley's continuing maintenance of traffic signals, signal timing for intersections near capacity are regularly updated to better accommodate actual travel demand.

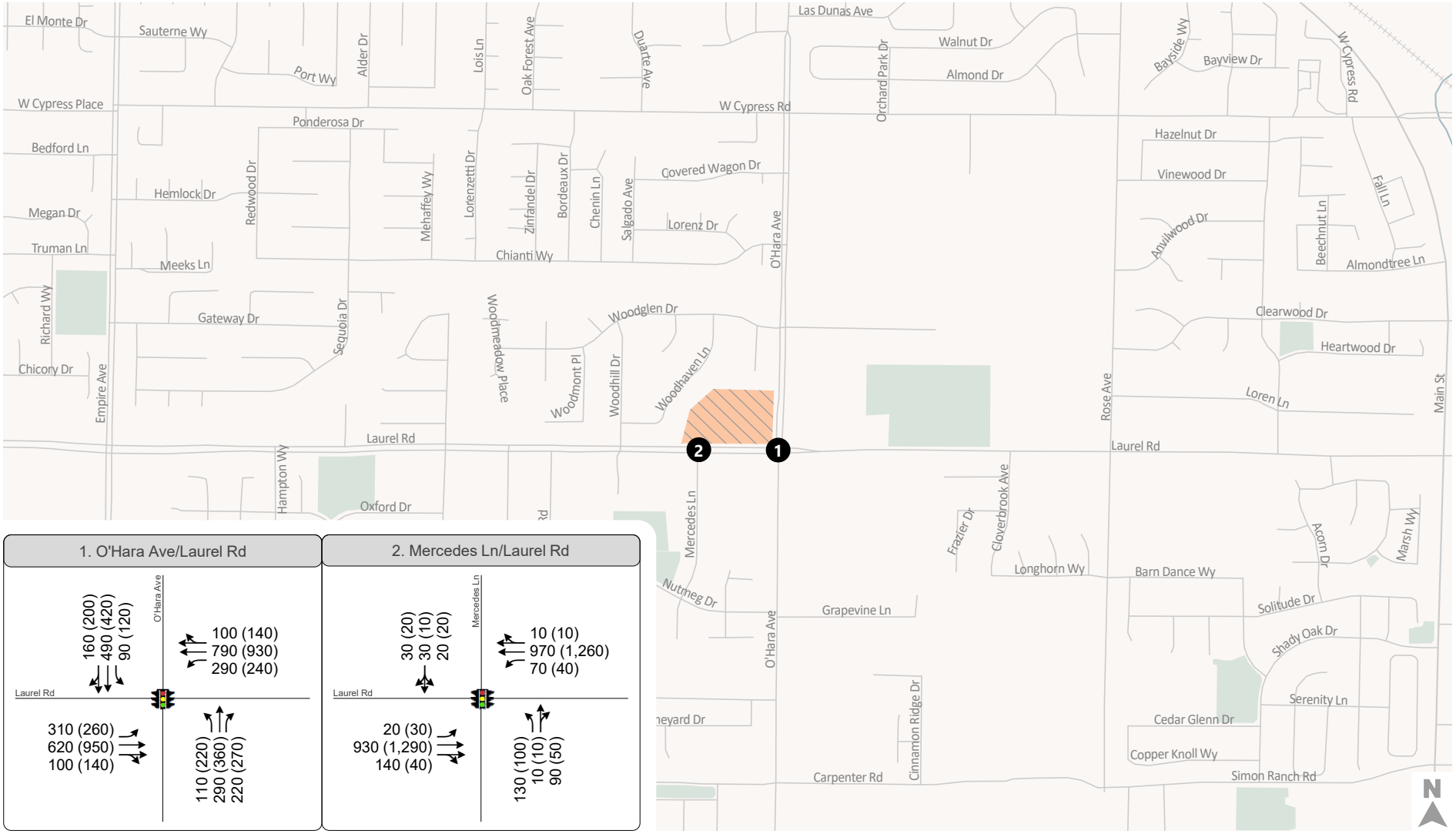
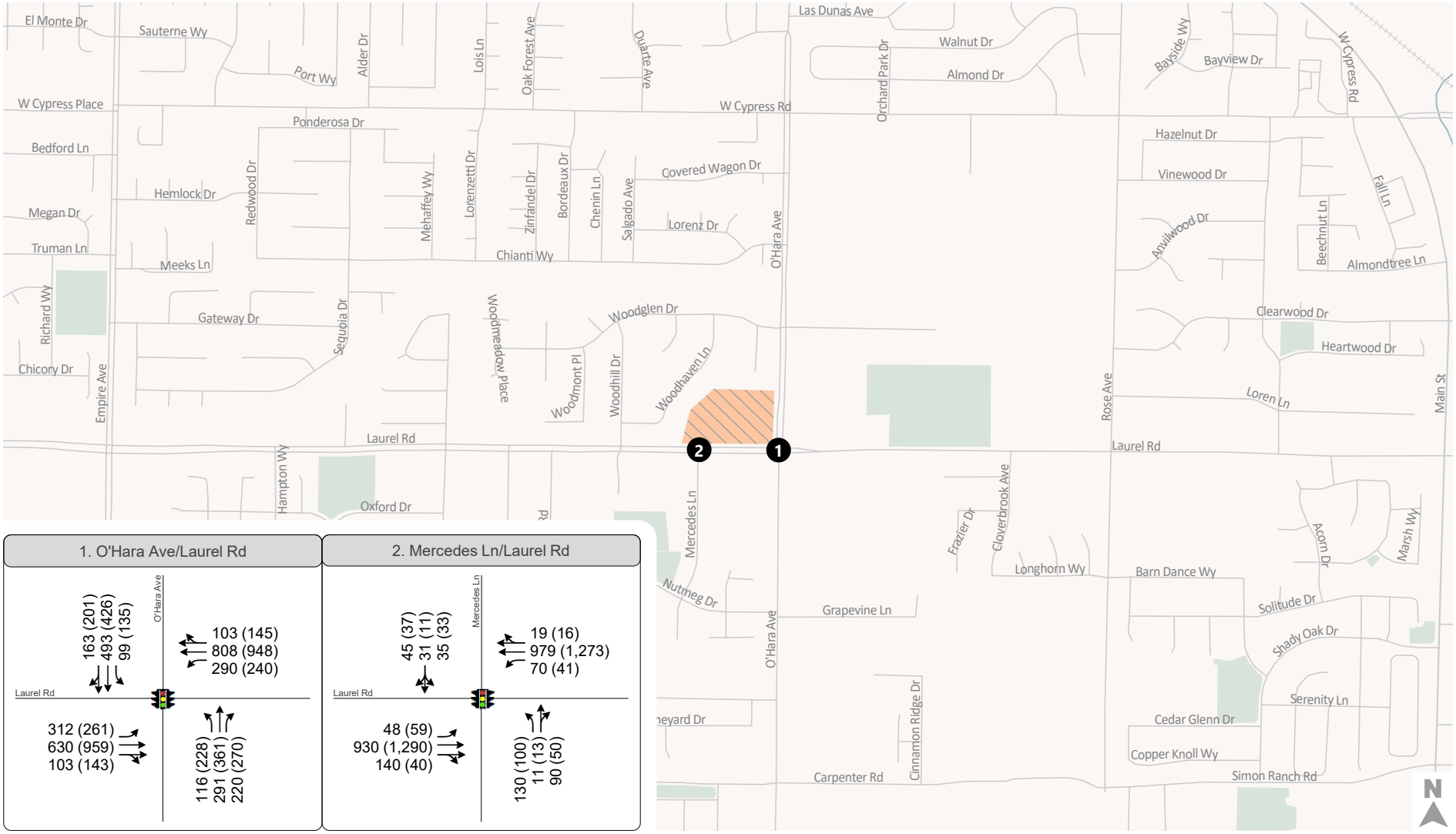


Figure 8

Cumulative without Project Conditions Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls



XX (YY) AM (PM) Peak Hour Traffic Volumes

Signalized Intersection

Study Intersections

Project Site

Parks

Figure 9

Cumulative with Project Conditions Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

Analysis of Cumulative Conditions

Intersection Operations

Levels of service calculations were conducted to evaluate intersection operations under Cumulative conditions both without and with the Project. The LOS results are summarized in **Table 8**. The corresponding LOS calculation sheets are included in **Attachment B**. The results of the LOS calculations indicate that with planned development and growth in Oakley in the cumulative condition, the intersection of O'Hara Avenue at Laurel Road will operate at LOS E during the morning peak and will be below acceptable serviceable levels during the afternoon peak as dictated by the City of Oakley. The addition of project traffic is expected to further degrade the operation of O'Hara Avenue at Laurel Road, but the intersections will remain at their same service level classifications.

Table 8: Cumulative Conditions Peak Hour Intersection LOS Summary

	Intersection	Control	Peak Hour	Cumulative Conditions		Cumulative with Project Conditions	
				Delay	LOS	Delay	LOS
1	O'Hara Avenue/Laurel Road	Signal	AM PM	**60.9** **80.9**	**E** **F**	**64.3** **85.2**	**E** **F**
2	Mercedes Lane/Laurel Road	Signal	AM PM	32.0 18.6	C B	34.0 20.9	C C

Notes: **Bold** text indicates unacceptable operations; **Bold Underline** text indicates a policy violation resulting from Project-related traffic.

1. Existing intersection traffic control type (Signal = Signalized)
2. AM= Weekday morning peak hour, PM = Weekday evening peak hour
3. Whole intersection average delay reported for signalized and all-way stop-controlled intersections. Delay calculated per HCM 6th methodologies.

Source: Fehr & Peers, November 2021

Vehicle Queues

The addition of Project traffic is expected to increase vehicle turn queues at Laurel Road & O'Hara Avenue, as illustrated in **Table 9**. Though queues would exceed available storage by more than 25 feet for several movements in the "Without Project" cumulative scenario, project traffic would further increase the lengths of these queues. Below are listed those movements for which project volumes would further exacerbate excessive queue lengths at Laurel Road & O'Hara Avenue in the cumulative condition:

- Southbound left turn (storage capacity of 175 feet) increases from 175 to 200 feet in the morning peak hour and 250 to 300 feet in the afternoon peak hour.

Table 9: Cumulative Conditions 95th Percentile Queue Summary

Intersection		Movement	Storage Length (ft)[1]	AM Peak Period		PM Peak Period	
				Without Project	With	Without Project	With
1	O'Hara Avenue/Laurel Road	EBL	325	**450**	**450**	**475**	**475**
		EBT	525	350	350	725	750
		WBL	300	**400**	**400**	**450**	**450**
		WBT	1,700	500	525	725	750
		NBL	450	200	225	425	450
		NBT	1,175	300	300	500	500
		NBR	300	150	150	300	300
		SBL	175	175	**200**	**250**	**300**
		SBT	900	325	325	450	450
2	Mercedes Lane/Laurel Road	EBL	125	100	100	50	125
		EBT	500	450	475	475	500
		WBL	100	100	100	75	75
		WBT	525	350	375	425	475
		NBL	1,100	175	175	125	150
		NBT	50	50	50	50	50
		SBT	200	100	125	50	100

Notes:

1. An additional 60 to 90 feet of storage is typically provided in the taper area outside of the through lane, which is not reflected in the storage length above.

Bold indicates queue potentially extends beyond available storage.

Source: Fehr & Peers, November 2021.

Collision Data Review and Countermeasures

A quantitative crash/collision analysis was prepared using collision data from the Statewide Integrated Traffic Records System (SWITRS) collected over a five-year period (January 1, 2015 through December 31, 2019). The two study locations for this assessment include the segment of Laurel Road between Woodhill Drive and O'Hara Avenue and the intersection of Laurel Road and Mercedes Lane.

Over the five-year period, there were 10 total collisions with reported injuries or property damage. There were 2 collisions within the study segment with 1 non-severe visible injury collision and 1 property damage only collision. There were 8 collisions at the Laurel Road/Mercedes Lane

intersection, and all were property damage only collisions. Of all collisions within the study area, 9 collisions were property damage only, and 1 collision was a non-severe visible injury. There were no fatal or severe injury collisions within the study area in the five-year evaluation period. **Table 10** summaries the collision severity along the study segment and at the study intersection on Laurel Road.

Table 10: Collision by Severity

Location	Total	Collision Severity				
		Fatal	Injury (Severe)	Injury (Other Visible)	Injury (Complaint of Pain)	Property Damage Only
Laurel Road (between Woodhill Drive and O'Hara Avenue)	2	0	0	1	0	1
Laurel Road and Mercedes Lane	8	0	0	0	0	8
Total	**10**	**0**	**0**	**1**	**0**	**9**

Source: Fehr & Peers, 2021, SWITRS.

Table 11 summarizes the collision types for the analysis segment and at the intersection. None of the collisions involved a bicyclist or pedestrian within the five-year evaluation period. Rear end collisions were the most common collision type with 5 rear-end collisions of the 10 total collisions. All of collisions that occurred along the study segment were rear end collisions. The study intersection had 3 broadside collisions, 1 sideswipe collision, and 1 hit object collision. All but one collision in the study area involved multiple vehicles. The only single vehicle collision was a hit object collision that occurred at the intersection.

Table 11: Collisions by Type

Location	Total	Collision Type						
		Head-On	Sideswipe	Rear End	Broadside	Hit Object	Overturned	Vehicle/ Pedestrian
Laurel Road (between Woodhill Drive and O'Hara Avenue)	2	0	0	2	0	0	0	0
Laurel Road and Mercedes Lane	8	0	1	3	3	1	0	0
Total	10	0	1	5	3	1	0	0

Source: Fehr & Peers, 2021, SWITRS.

Table 12 summarizes the primary collision factors for the study segment and at the study intersection. Unsafe speed is the most common collision factor as the primary factor for 5 of the 10 total collisions. All collisions that occurred along the study segment were due to unsafe speed. The study intersection had 3 collisions due to unsafe speed, 2 collisions due to traffic signals and signs, 1 collision due to following too closely, and 1 collision due to unsafe starting or backing. A collision map is provided in **Figure 10**.

Table 12: Collision by Primary Collision Factor

Location	Total	Primary Collision Factor				
		Unsafe Speed	Following Too Closely	Traffic Signals and Signs	Unsafe Starting or Backing	Unknown
Laurel Road (between Woodhill Drive and O'Hara Avenue)	2	2	0	0	0	0
Laurel Road and Mercedes Lane	8	3	1	2	1	1
Total	**10**	**5**	**1**	**2**	**1**	**1**

Source: Fehr & Peers, 2021, SWITRS.

Collision Type: Rear End · Broadside · Hit Object · Sideswipe

Figure 10

2015 to 2019 Collision Locations and Type

Predictive Method Comparison and Collision Concerns

A comparison of the observed collision frequencies to the expected collision frequencies was prepared. The predictive method analysis used for the crash rate comparison is based on the procedures outlined in the *AASHTO Highway Safety Manual (HSM)*. The predictive method for urban and suburban arterials is a procedure used to estimate the expected average crash frequency within a study area. It accounts for traffic volume and various roadway characteristics such as the cross section, number of driveways, annual daily traffic, speed, presence of on-street parking, and fixed objects near the roadway. When observed crash data is available, the Empirical Bayes method is applied within the predicted method to combine predicted average crash frequency with observed crash frequency. The segment of Laurel Road from Woodhill Drive to O'Hara Avenue and the intersection of Laurel Road and Mercedes Lane were defined as the study area for the collision assessment. Since observed crash data is available, the area was evaluated using the Empirical Bayes Method within the predictive method.

The number of crashes expected is presented as the number of crashes per year. Using the model, the expected number of crashes per year is 1.8 along the study segment and 4.7 at the study intersection. Based on the SWITRS collision data, there were 2 crashes over five years (0.4 crashes per year) along the study segment and 8 crashes over five years (1.4 crashes per year) at the study intersection. **Table 13** shows the actual and predicted collision frequencies of the study segment and intersection. The data indicates that fewer accidents occur within the study area than would be expected at locations with similar characteristics.

Table 13: Actual versus Predicted Collision Frequencies

Location	Type[1]	AADT (Major)	AADT (Minor)	Actual Collisions[2]		Predicted Collision Frequency	Difference[3]
				Total	Per Year		
Laurel Road (between Woodhill Drive and O'Hara Avenue)	4D	23,880	-	2	0.4	1.8	-1.4
Laurel Road and Mercedes Lane	4SG	23,880	2,060	7	1.4	4.7	-3.3

Notes:
1. 4D = 4 lane divided arterials; 4SG = 4 leg signalized intersection
2. Collision data obtained from SWIRTS for the segment and intersections between 2015 and 2019.
3. Negative values indicate that the actual collision frequency is less than the predicted collision frequency for a typical segment and intersection with similar attributes. Positive values indicate that the actual collision frequency is greater than the predicted collision frequency for a typical segment and intersection with similar attributes.

Source: Fehr & Peers, 2021.

Fehr & Peers also evaluated the collision trends based on the type of occurrence. The collisions that occurred most frequently were rear end collisions and broadside collisions which occurred 6 and 3 times respectively. Although they are the most common, the number of occurrences is small, and below the predicted values. With rear end accidents averaging 1.2 occurrences per year and broadside collisions averaging less than one occurrence per year.

Site Plan Review

This section summarizes the assessment of site access and internal circulation for vehicles, pedestrians, and bicycles. See **Figure 11A** and **11B** for a summary of the site plan recommendations.

McDonalds

Site access is proposed to be provided from two existing driveways on Laurel Road, one full access signalized intersection at Laurel Road & Mercedes Lane and one unsignalized right-in, right-out intersection east of Mercedes Lane. From field observations, as previously discussed, it was noted that extensive pick-up and drop-off activity occurs in Laurel Plaza for Laurel Elementary School associated with inadequate capacity at that location.

> ***Site Recommendation 1:*** Provide signage on-site that indicates parking is for Laurel Plaza customers only and that school pick-ups and drop offs are prohibited.

Vehicles in the drive-thru queue may obstruct vehicle parking spaces 35, 36 and 37 during peak customer periods.

> ***Site Recommendation 2:*** Eliminate spaces 35, 36 and 37. Increase the drive-thru throat depth to accommodate additional vehicle queues.

Pedestrian access is provided via the Laurel Road & Mercedes Lane intersection and by an access point located on Laurel Road between the two driveways. The pedestrian path connecting to Laurel Road between Mercedes Lane and the Project driveway has a path of travel that crosses the drive-thru travel lanes. With the proposed layout, the building may impede pedestrian visibility for vehicles leaving the drive-thru.

> ***Site Recommendation 3:*** Shift the drive-thru pedestrian crossing to the east, bulb out the pedestrian areas adjacent to the crossing, and incorporate a raised crossing to improve pedestrian visibility. Additionally, include a 10-to-15-foot pedestrian barrier (i.e., fence) to the right of pedestrians exiting the McDonalds building to increase visibility to vehicles exiting the drive-thru.

Bicycle lanes are provided on Laurel Road for bicyclists traveling to the Project site, however it is unclear if bicycle parking is included on site.

> ***Site Recommendation 4:*** Provide at least four bicycle parking spaces.

Quick Quack Car Wash

Site access is proposed to be provided primarily from three existing driveways, two on Laurel Road, and one on O'Hara Avenue. Both driveways on Laurel Road are unsignalized right-in, right-out intersections; the driveway located on O'Hara Avenue is a full access unsignalized intersection. Bicycle lanes are provided on Laurel Road for bicyclists traveling to the Project site with bicycle parking located on-site along the pedestrian path on the southern portion of the site. Pedestrian access is provided by an access point on Laurel Road. Pedestrian paths of travel are provided for pedestrians wishing to go to other parts of the shopping plaza. An on-site intersection is proposed in the northeast corner of the project site that does not align with the on-site driveway associated with the proposed McDonald's. Offset intersections are nonstandard and may present safety and operational issues.

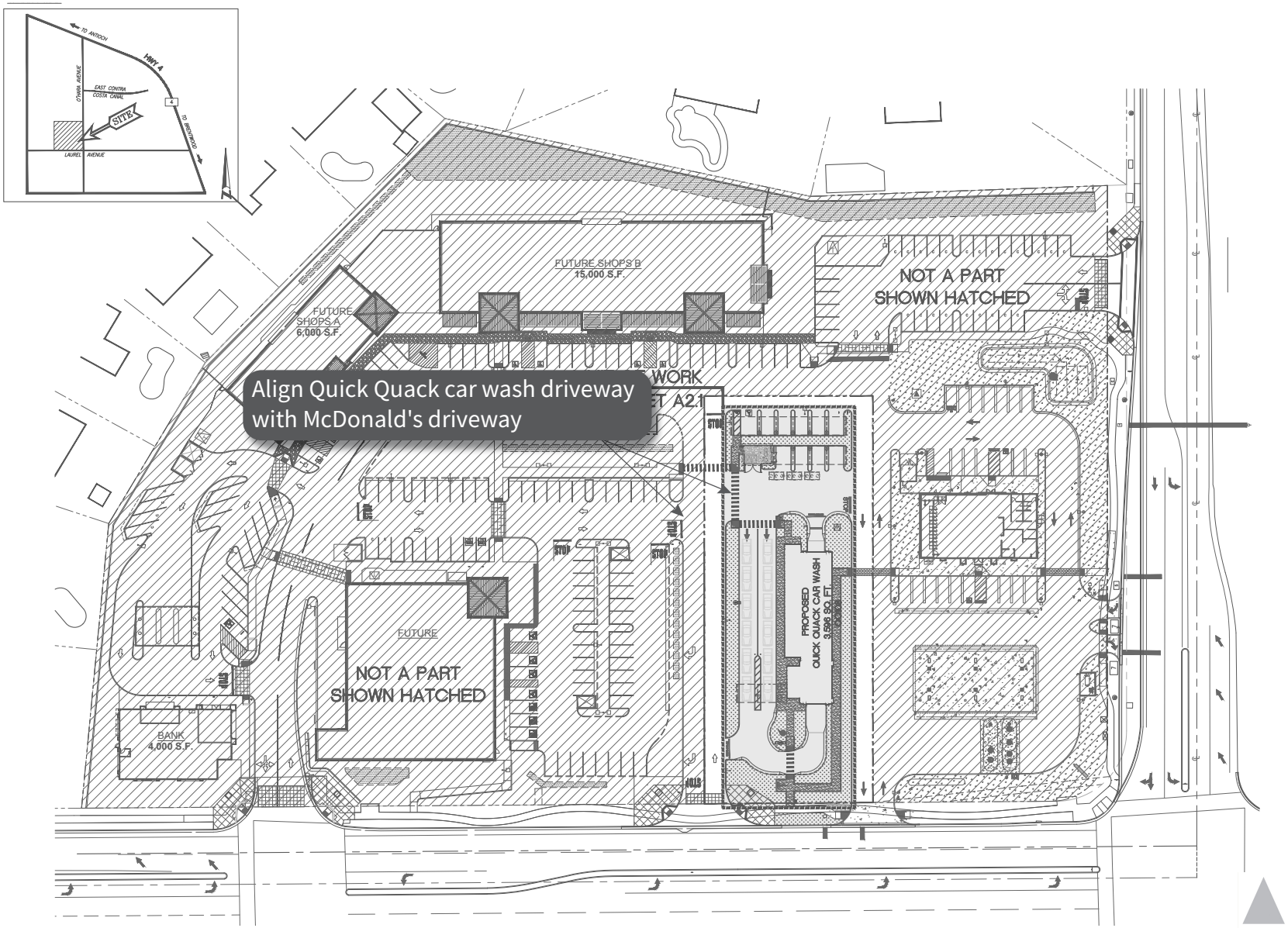
> ***Site Recommendation 1:*** To provide for safe and more efficient on-site circulation, shift the Quick Quack internal north-south connector to align with the McDonalds driveway.

Laurel Road & Mercedes Lane Recommendations

Based on the intersection operations analysis, collision assessment and observations made during school pick-up and drop-off activities, the following improvements are suggested for pedestrian and vehicle activity at this Laurel Road/Mercedes Lane intersection:

- Modify the traffic signal phasing and timing to install leading pedestrian intervals at the intersection to improve pedestrian visibility and reduce potential conflicts between pedestrians and vehicles.
- Install blank out "No Turn on Red" signage for the eastbound and southbound approaches. This signage should be operational during school pick up and drop off periods only.
- Install high-visibility crosswalks with advanced stop bars for all crosswalks.

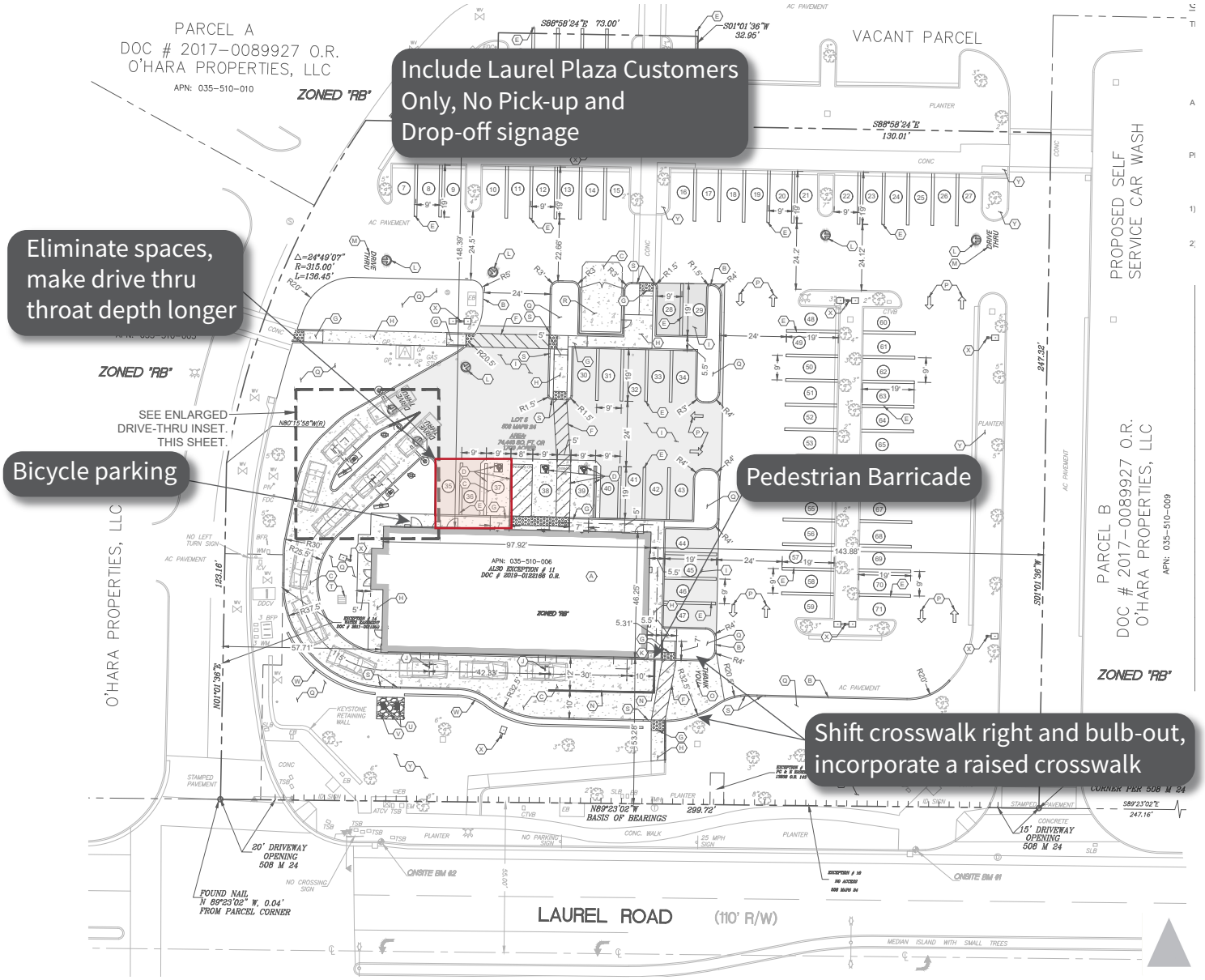
A school high visibility school crosswalk.



Source: CRM Architects & Planners, Inc.

Figure 11A

Quick Quack Car Wash Site Plan Recommendations



Source: CORE STATES Group

Figure 11B

McDonald's Site Plan Recomendations

Vehicle Parking Requirements

Parking requirements and design guidance are outlined in the *City of Oakley Municipal Code of Ordinances* Chapter 9.1.1402. For the proposed McDonald's, the City's Municipal code specifies a minimum of one (1) parking space per each 150 square feet of net public area for primary use eating and drinking establishments. For the Quick Quack Carwash, the City's Municipal Code calls for one (1) space for each five hundred (500) square feet of gross floor area. Thus, seven total parking spaces are required for the Quick Quack Carwash. The current proposed site shows 71 parking spots provided within the adjacent parking lot which is more adequate for the required 38 minimum spots.

Vehicle Miles Traveled

On September 27, 2013, Senate Bill (SB) 743 was signed into law. The California state legislature found that with the adoption of the Sustainable Communities and Climate Protection Act of 2008 (SB 375), the State had signaled its commitment to encourage land use and transportation planning decisions and investments that reduce vehicle miles traveled and thereby contribute to the reduction of greenhouse gas emissions, as required by the California Global Warming Solutions Act of 2006 (Assembly Bill 32). In December 2018, the Governor's Office of Planning and Research (OPR) finalized new CEQA guidelines (CEQA Guidelines section 15064.3), that identify vehicle-miles traveled (VMT) as the most appropriate criteria to evaluate a project's transportation impacts.

The implementation of SB 743 eliminated the use of criteria such as auto delay, level of service, and similar measures of vehicle capacity of traffic congestion as the basis for determining significant impacts as part of CEQA compliance. The SB 743 VMT criteria promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses.

In November 2017, OPR released a technical advisory containing recommendations regarding the assessment of VMT, proposed thresholds of significance, and potential mitigation measures for lead agencies to use while implementing the required changes contained in Senate Bill 743 (SB 743). Also in November 2017, OPR released the proposed text for Section 15064.3, "Determining the Significance of Transportation Impacts," which summarized the criteria for analyzing transportation impacts for land use projects and transportation projects and directs lead agencies to "choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change in absolute terms, per capita, per household or in any other measure." OPR recommends that for most instances a per service population threshold should be adopted and that a fifteen percent reduction below that of existing development would be a reasonable threshold.

As the City of Oakley has not yet formally adopted VMT criteria, standards, or thresholds at the time this report was prepared, this assessment follows the current OPR and CCTA guidance related to VMT.

Based on the guidance published by both CCTA and OPR, the project can be assumed to have a less than significant impact related to VMT. The project is a local serving retail use that is not expected to attract regional trips. Projects that consist of local-serving retail uses can be presumed to have a less-than-significant impact absent substantial evidence to the contrary, since these types of projects will primarily draw users and customers from a relatively small geographic area that will lead to short-distance trips and trips that are linked to other destinations.

Conclusions

Results of this transportation assessment indicate that no new impacts were identified and operations of the intersections that would provide primary site access would not significantly change with the addition of project traffic. Based on the land use changes on the proposed site, such as no pharmacy/drugstore, the currently proposed project would generate fewer trips than the project evaluated in the previously approved study. Inadequate pick-up and drop-off capacity at the adjacent Laurel Elementary School result in a substantial number of parents using the Laurel Plaza shopping center parking lot to pick up and drop off their children. This results in many pedestrians crossing Laurel Road at Mercedes Lane during the morning and afternoon peaks, with the school stationing a crossing-guard at this location. The assessment of historic collisions in the vicinity of the project site found collision rates substantially below predicted values on roadways of similar design and volume (i.e., the adjacent roadways have operated in a manner safer than what would be expected with the given conditions). Based on the results of the transportation assessment, the following improvements are recommended to enhance site access, circulation, and safety for all travel modes.

- Install high-visibility crosswalks with advanced stop bars for all crosswalks at the intersection of Laurel Road & Mercedes Lane.
- Modify the signal phasing to include leading pedestrian intervals at the Laurel Road/Mercedes Lane intersection to improve pedestrian visibility and reduce conflicts between pedestrians and vehicles.
- Install blank out “No Turn on Red” signage to increase pedestrian safety for the eastbound and southbound approaches at the Laurel Road/Mercedes Lane intersection. The blank out signs should be operational during school pick-up and drop-off hours.

- Provide signage on-site in the Laurel Plaza center that indicates parking is for Laurel Plaza customers only (i.e., Laurel Elementary School parking is prohibited).
- Eliminate spaces 35, 36 and 37 in the McDonald's parking lot due to potential conflicts with drive-thru queues. Increase the drive-thru throat depth to accommodate additional vehicle queues.
- Shift the drive-thru pedestrian crossing to the east, bulb out the pedestrian areas adjacent to the crossing, and incorporate a raised crossing to improve pedestrian visibility. Additionally, include a 10-to-15-foot pedestrian barrier (i.e., fence) to the right of pedestrians exiting the McDonalds building to increase visibility to vehicles exiting the drive-thru.
- Provide bicycle parking as part of the proposed project.
- To provide for safe and more efficient on-site circulation, shift the Quick Quack internal connector south to align with the McDonalds driveway.

This completes our draft assessment of the Laurel Plaza shopping center development project. Please call Mark or Bill at (925) 930-7100 with questions.

Attachments:

Attachment A: Counts
Attachment B: LOS & Queue Calculation Worksheets

Attachment A: Counts

Prepared by National Data & Surveying Services

O'Hara Ave & Laurel Rd

Peak Hour Turning Movement Count

ID: 21-080198-001
City: Oakley

Day: Tuesday
Date: 8/31/2021

PEAK HOURS		COUNT PERIODS
AM	07:30 AM - 08:30 AM	7:00 AM - 09:00 AM
NOON	NONE	NONE
PM	02:45 PM - 03:45 PM	1:30 PM - 06:00 PM

SOUTHBOUND (O'Hara Ave)

AM	137	438	50	3	515	AM
NOON	0	0	0	0	0	NOON
PM	110	304	53	1	467	PM
	0	2	1	0		

EASTBOUND (Laurel Rd)

AM	NOON	PM	
941	0	876	
6	0	14	0
194	0	153	1
437	0	700	2
46	0	80	0
AM	NOON	PM	

WESTBOUND (Laurel Rd)

PM	NOON	AM	
57	0	68	0.5
658	0	727	1.5
163	0	257	1
0	0	0	0
976	0	690	
PM	NOON	AM	

CONTROL

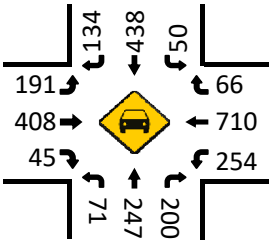
Signalized

TEV	2887	0	2866
	AM	NOON	PM
PHF	0.85		0.88

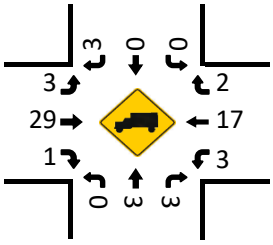
NORTHBOUND (O'Hara Ave)

	0	1	1	1		
PM	547	0	94	256	223	PM
NOON	0	0	0	0	0	NOON
AM	741	0	71	250	203	AM

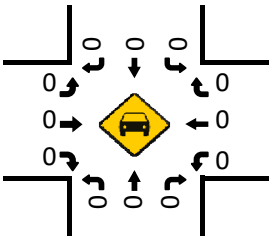
Cars (AM)



HT (AM)



Cars (NOON)



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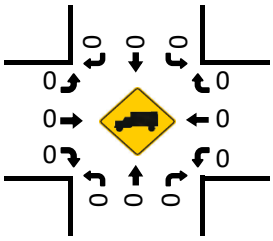
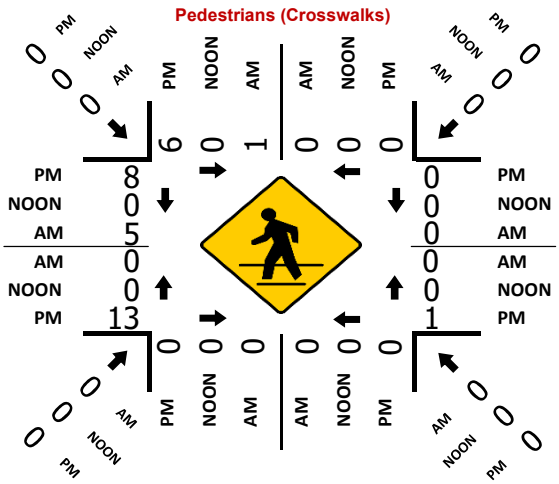
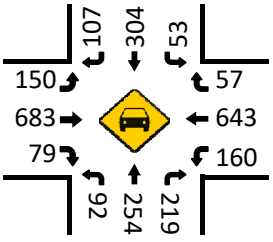


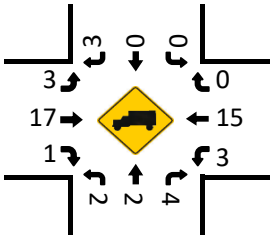
Pedestrians (Crosswalks)



Cars (PM)



HT (PM)



Prepared by National Data & Surveying Services

Mercedes Ln & Laurel Rd

Peak Hour Turning Movement Count

ID: 21-080198-002
City: Oakley

Day: Tuesday
Date: 8/31/2021

PEAK HOURS	COUNT PERIODS
07:30 AM - 08:30 AM	7:00 AM - 09:00 AM
NONE	NONE
02:30 PM - 03:30 PM	1:30 PM - 06:00 PM

SOUTHBOUND (Mercedes Ln)

AM	22	26	15	0	20	AM
NOON	0	0	0	0	0	NOON
PM	18	3	12	0	25	PM
	0.3	0.3	0.3	0		

EASTBOUND (Laurel Rd)

AM	NOON	PM		
995	0	857		
3	0	4	0	
12	0	18	1	
579	0	911	2	
98	0	22	0	
AM	NOON	PM		

WESTBOUND (Laurel Rd)

PM	NOON	AM		
3	0	5	0	
791	0	864	2	
20	0	61	1	
1	0	2	0	
958	0	679		
PM	NOON	AM		

NORTHBOUND (Mercedes Ln)

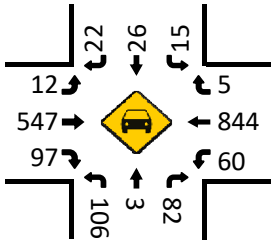
PM	45	0	44	4	34	PM
NOON	0	0	0	0	0	NOON
AM	185	0	106	3	83	AM
		0	1	0.5	0.5	

CONTROL

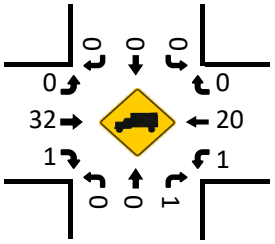
Signalized

TEV	1879 AM	0 NOON	1885 PM
PHF	0.85		0.88

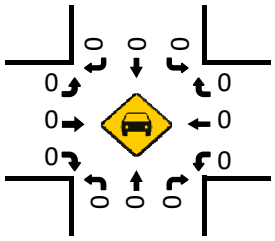
Cars (AM)



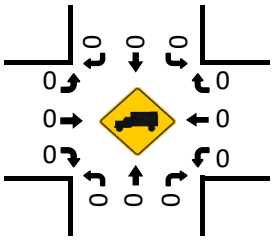
HT (AM)



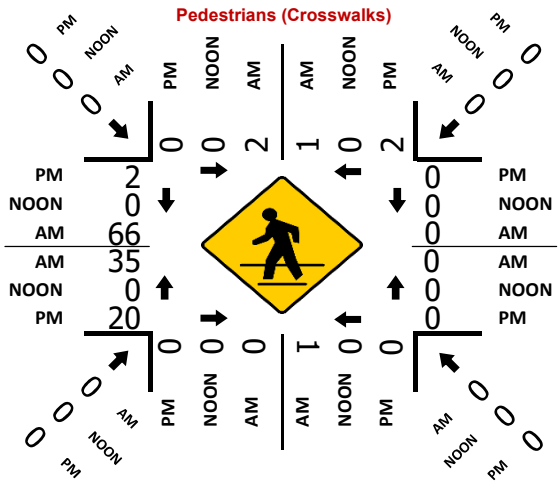
Cars (NOON)



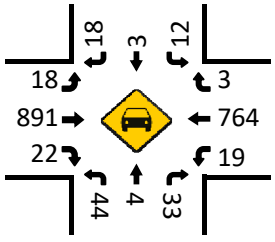
HT (NOON)



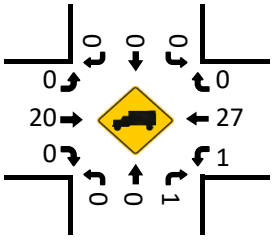
Pedestrians (Crosswalks)



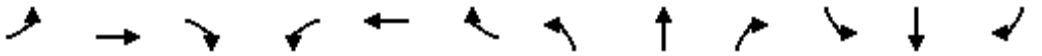
Cars (PM)



HT (PM)



Attachment B: LOS & Queue Calculation Worksheets



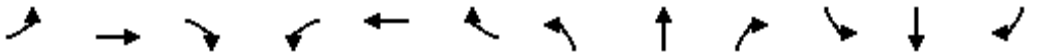
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	437	46	257	727	68	71	250	203	53	438	137
Future Volume (veh/h)	200	437	46	257	727	68	71	250	203	53	438	137
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.99	1.00		0.98
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	235	514	48	302	855	75	84	294	179	62	515	142
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	277	990	92	345	1121	98	109	454	380	92	639	175
Arrive On Green	0.16	0.30	0.30	0.20	0.34	0.34	0.06	0.24	0.24	0.05	0.24	0.24
Sat Flow, veh/h	1767	3256	303	1767	3274	287	1767	1856	1552	1767	2718	745
Grp Volume(v), veh/h	235	278	284	302	460	470	84	294	179	62	333	324
Grp Sat Flow(s),veh/h/ln	1767	1763	1796	1767	1763	1799	1767	1856	1552	1767	1763	1700
Q Serve(g_s), s	11.9	12.0	12.1	15.3	21.4	21.4	4.3	13.1	9.1	3.2	16.4	16.6
Cycle Q Clear(g_c), s	11.9	12.0	12.1	15.3	21.4	21.4	4.3	13.1	9.1	3.2	16.4	16.6
Prop In Lane	1.00		0.17	1.00		0.16	1.00		1.00	1.00		0.44
Lane Grp Cap(c), veh/h	277	536	546	345	604	616	109	454	380	92	415	400
V/C Ratio(X)	0.85	0.52	0.52	0.88	0.76	0.76	0.77	0.65	0.47	0.68	0.80	0.81
Avail Cap(c_a), veh/h	575	860	877	575	860	878	575	805	674	575	765	738
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.8	26.5	26.5	36.0	27.0	27.0	42.6	31.2	29.7	42.9	33.2	33.3
Incr Delay (d2), s/veh	7.1	1.1	1.1	8.2	3.3	3.2	4.4	0.6	0.3	3.2	1.4	1.5
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	5.6	5.0	5.1	7.1	9.0	9.2	2.0	5.7	3.3	1.4	6.8	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.9	27.6	27.6	44.2	30.3	30.2	47.0	31.8	30.0	46.2	34.6	34.8
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		797			1232			557			719	
Approach Delay, s/veh		32.7			33.7			33.5			35.7	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.0	33.4	9.7	27.1	18.5	37.0	8.8	28.0
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	30.0	45.0	30.0	* 40	30.0	* 45	30.0	40.0
Max Q Clear Time (g_c+I1), s	17.3	14.1	6.3	18.6	13.9	23.4	5.2	15.1
Green Ext Time (p_c), s	0.7	5.2	0.1	2.4	0.6	8.1	0.1	1.3

Intersection Summary	
HCM 6th Ctrl Delay	33.9
HCM 6th LOS	C

Notes

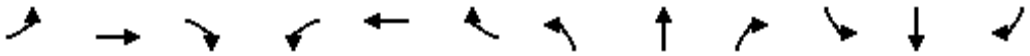
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	585	98	63	864	5	106	3	83	15	26	22
Future Volume (veh/h)	13	585	98	63	864	5	106	3	83	15	26	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.69	1.00		0.89
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	15	688	115	74	1016	6	125	4	12	18	31	8
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	37	1011	169	106	1345	8	163	28	84	163	280	72
Arrive On Green	0.02	0.34	0.34	0.06	0.37	0.37	0.09	0.09	0.09	0.30	0.30	0.30
Sat Flow, veh/h	1767	3011	503	1767	3593	21	1767	304	913	552	950	245
Grp Volume(v), veh/h	15	402	401	74	498	524	125	0	16	57	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1751	1767	1763	1852	1767	0	1217	1747	0	0
Q Serve(g_s), s	0.7	16.0	16.1	3.4	20.1	20.1	5.6	0.0	1.0	1.9	0.0	0.0
Cycle Q Clear(g_c), s	0.7	16.0	16.1	3.4	20.1	20.1	5.6	0.0	1.0	1.9	0.0	0.0
Prop In Lane	1.00		0.29	1.00		0.01	1.00		0.75	0.32		0.14
Lane Grp Cap(c), veh/h	37	592	588	106	660	693	163	0	112	516	0	0
V/C Ratio(X)	0.40	0.68	0.68	0.70	0.76	0.76	0.77	0.00	0.14	0.11	0.00	0.00
Avail Cap(c_a), veh/h	433	865	859	433	865	908	542	0	373	857	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	39.4	23.3	23.3	37.6	22.3	22.3	36.2	0.0	34.0	20.9	0.0	0.0
Incr Delay (d2), s/veh	2.6	2.0	2.0	3.1	3.4	3.2	2.8	0.0	0.2	0.0	0.0	0.0
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	0.3	6.6	6.5	1.5	8.3	8.7	2.5	0.0	0.3	0.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.0	25.3	25.3	40.7	25.6	25.5	39.0	0.0	34.3	21.0	0.0	0.0
LnGrp LOS	D	C	C	D	C	C	D	A	C	C	A	A
Approach Vol, veh/h		818			1096			141			57	
Approach Delay, s/veh		25.6			26.6			38.5			21.0	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	32.5		12.1	5.7	35.6		28.1				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	20.0	40.0		25.0	20.0	40.0		40.0				
Max Q Clear Time (g_c+I1), s	5.4	18.1		7.6	2.7	22.1		3.9				
Green Ext Time (p_c), s	0.1	7.2		0.2	0.0	8.4		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		26.8	
HCM 6th LOS		C	



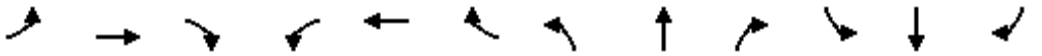
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	167	710	80	163	658	57	94	256	223	54	304	110
Future Volume (veh/h)	167	710	80	163	658	57	94	256	223	54	304	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	190	807	86	185	748	62	107	291	187	61	345	100
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	235	1124	120	229	1141	94	138	439	363	97	574	163
Arrive On Green	0.13	0.35	0.35	0.13	0.35	0.35	0.08	0.24	0.24	0.05	0.21	0.21
Sat Flow, veh/h	1767	3214	342	1767	3291	273	1767	1856	1535	1767	2687	766
Grp Volume(v), veh/h	190	443	450	185	401	409	107	291	187	61	224	221
Grp Sat Flow(s),veh/h/ln	1767	1763	1794	1767	1763	1801	1767	1856	1535	1767	1763	1690
Q Serve(g_s), s	8.6	17.9	17.9	8.3	15.8	15.8	4.9	11.6	8.7	2.8	9.4	9.7
Cycle Q Clear(g_c), s	8.6	17.9	17.9	8.3	15.8	15.8	4.9	11.6	8.7	2.8	9.4	9.7
Prop In Lane	1.00		0.19	1.00		0.15	1.00		1.00	1.00		0.45
Lane Grp Cap(c), veh/h	235	616	627	229	611	624	138	439	363	97	376	361
V/C Ratio(X)	0.81	0.72	0.72	0.81	0.66	0.66	0.78	0.66	0.52	0.63	0.60	0.61
Avail Cap(c_a), veh/h	647	967	984	647	967	988	647	905	749	647	860	825
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.5	23.1	23.1	34.7	22.7	22.7	37.1	28.4	27.2	37.9	29.1	29.2
Incr Delay (d2), s/veh	6.5	2.2	2.2	6.6	1.7	1.7	3.6	0.6	0.4	2.5	0.6	0.6
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	4.0	7.3	7.4	3.8	6.3	6.4	2.2	4.9	3.0	1.2	3.8	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.1	25.4	25.4	41.3	24.4	24.3	40.7	29.0	27.6	40.4	29.6	29.8
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		1083			995			585			506	
Approach Delay, s/veh		28.1			27.5			30.7			31.0	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.6	34.1	10.4	22.9	14.9	33.8	8.5	24.8
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	30.0	45.0	30.0	* 40	30.0	* 45	30.0	40.0
Max Q Clear Time (g_c+I1), s	10.3	19.9	6.9	11.7	10.6	17.8	4.8	13.6
Green Ext Time (p_c), s	0.5	8.6	0.1	1.6	0.5	7.5	0.1	1.3

Intersection Summary	
HCM 6th Ctrl Delay	28.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	911	22	21	791	3	44	4	34	12	3	18
Future Volume (veh/h)	22	911	22	21	791	3	44	4	34	12	3	18
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		0.97	1.00		0.93	1.00		0.94
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	25	1035	25	24	899	3	50	5	3	14	3	2
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	61	1613	39	59	1648	5	114	68	41	152	32	22
Arrive On Green	0.03	0.46	0.46	0.03	0.46	0.46	0.06	0.06	0.06	0.12	0.12	0.12
Sat Flow, veh/h	1767	3518	85	1767	3604	12	1767	1052	631	1286	276	184
Grp Volume(v), veh/h	25	519	541	24	440	462	50	0	8	19	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1840	1767	1763	1853	1767	0	1684	1745	0	0
Q Serve(g_s), s	0.8	12.3	12.3	0.7	9.8	9.8	1.5	0.0	0.2	0.5	0.0	0.0
Cycle Q Clear(g_c), s	0.8	12.3	12.3	0.7	9.8	9.8	1.5	0.0	0.2	0.5	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.01	1.00		0.38	0.74		0.11
Lane Grp Cap(c), veh/h	61	808	844	59	806	847	114	0	108	206	0	0
V/C Ratio(X)	0.41	0.64	0.64	0.40	0.55	0.55	0.44	0.00	0.07	0.09	0.00	0.00
Avail Cap(c_a), veh/h	650	1298	1355	650	1298	1364	813	0	775	1285	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.7	11.3	11.3	25.7	10.7	10.7	24.5	0.0	23.9	21.4	0.0	0.0
Incr Delay (d2), s/veh	1.6	1.2	1.2	1.6	0.8	0.8	1.0	0.0	0.1	0.1	0.0	0.0
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	0.3	4.0	4.2	0.3	3.2	3.3	0.6	0.0	0.1	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.3	12.5	12.5	27.4	11.5	11.4	25.5	0.0	24.0	21.4	0.0	0.0
LnGrp LOS	C	B	B	C	B	B	C	A	C	C	A	A
Approach Vol, veh/h		1085			926			58			19	
Approach Delay, s/veh		12.8			11.9			25.3			21.4	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.8	30.0		8.1	5.9	29.9		10.4				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	20.0	40.0		25.0	20.0	40.0		40.0				
Max Q Clear Time (g_c+I1), s	2.7	14.3		3.5	2.8	11.8		2.5				
Green Ext Time (p_c), s	0.0	10.6		0.1	0.0	9.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		12.8	
HCM 6th LOS		B	

HCM 6th Signalized Intersection Summary
1: O'Hara Ave & Laurel Rd

Existing Plus Project AM

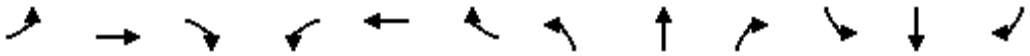
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	202	447	49	257	745	71	77	251	203	62	441	140
Future Volume (veh/h)	202	447	49	257	745	71	77	251	203	62	441	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.99	1.00		0.98
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	238	526	52	302	876	79	91	295	179	73	519	146
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	279	999	98	343	1127	102	117	460	385	95	637	178
Arrive On Green	0.16	0.31	0.31	0.19	0.34	0.34	0.07	0.25	0.25	0.05	0.24	0.24
Sat Flow, veh/h	1767	3237	319	1767	3266	294	1767	1856	1552	1767	2704	756
Grp Volume(v), veh/h	238	286	292	302	473	482	91	295	179	73	337	328
Grp Sat Flow(s),veh/h/ln	1767	1763	1793	1767	1763	1797	1767	1856	1552	1767	1763	1698
Q Serve(g_s), s	12.6	12.9	12.9	16.0	23.1	23.1	4.9	13.7	9.4	3.9	17.4	17.6
Cycle Q Clear(g_c), s	12.6	12.9	12.9	16.0	23.1	23.1	4.9	13.7	9.4	3.9	17.4	17.6
Prop In Lane	1.00		0.18	1.00		0.16	1.00		1.00	1.00		0.45
Lane Grp Cap(c), veh/h	279	544	553	343	608	620	117	460	385	95	415	400
V/C Ratio(X)	0.85	0.53	0.53	0.88	0.78	0.78	0.78	0.64	0.46	0.77	0.81	0.82
Avail Cap(c_a), veh/h	552	826	840	552	826	842	552	772	646	552	734	707
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.4	27.4	27.4	37.6	28.2	28.2	44.2	32.3	30.7	44.9	34.7	34.8
Incr Delay (d2), s/veh	7.4	1.1	1.1	9.5	4.1	4.0	4.2	0.6	0.3	4.9	1.5	1.6
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	5.9	5.4	5.5	7.5	9.8	10.0	2.2	5.9	3.4	1.8	7.3	7.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.7	28.5	28.6	47.2	32.2	32.2	48.3	32.8	31.0	49.8	36.2	36.4
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	D	D
Approach Vol, veh/h		816			1257			565			738	
Approach Delay, s/veh		33.9			35.8			34.8			37.6	
Approach LOS		C			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.6	35.0	10.4	28.0	19.1	38.5	9.1	29.2
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	30.0	45.0	30.0	* 40	30.0	* 45	30.0	40.0
Max Q Clear Time (g_c+I1), s	18.0	14.9	6.9	19.6	14.6	25.1	5.9	15.7
Green Ext Time (p_c), s	0.7	5.3	0.1	2.4	0.6	8.1	0.1	1.3

Intersection Summary	
HCM 6th Ctrl Delay	35.6
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



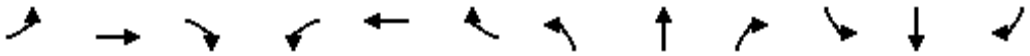
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	585	98	63	873	14	106	4	83	30	27	37
Future Volume (veh/h)	41	585	98	63	873	14	106	4	83	30	27	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.69	1.00		0.88
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	48	688	115	74	1027	16	125	5	12	35	32	26
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	84	1085	181	101	1315	20	162	33	80	181	165	134
Arrive On Green	0.05	0.36	0.36	0.06	0.37	0.37	0.09	0.09	0.09	0.29	0.29	0.29
Sat Flow, veh/h	1767	3011	503	1767	3553	55	1767	365	876	628	574	466
Grp Volume(v), veh/h	48	402	401	74	510	533	125	0	17	93	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1751	1767	1763	1845	1767	0	1241	1668	0	0
Q Serve(g_s), s	2.3	16.5	16.5	3.6	22.3	22.3	6.0	0.0	1.1	3.7	0.0	0.0
Cycle Q Clear(g_c), s	2.3	16.5	16.5	3.6	22.3	22.3	6.0	0.0	1.1	3.7	0.0	0.0
Prop In Lane	1.00		0.29	1.00		0.03	1.00		0.71	0.38		0.28
Lane Grp Cap(c), veh/h	84	635	631	101	653	683	162	0	114	480	0	0
V/C Ratio(X)	0.57	0.63	0.63	0.73	0.78	0.78	0.77	0.00	0.15	0.19	0.00	0.00
Avail Cap(c_a), veh/h	406	810	804	406	810	847	507	0	356	766	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	40.6	23.1	23.1	40.4	24.3	24.3	38.7	0.0	36.4	23.4	0.0	0.0
Incr Delay (d2), s/veh	2.3	1.5	1.5	3.7	4.6	4.4	3.0	0.0	0.2	0.1	0.0	0.0
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	1.0	6.7	6.7	1.6	9.5	9.9	2.7	0.0	0.3	1.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.9	24.6	24.6	44.1	28.9	28.7	41.6	0.0	36.7	23.5	0.0	0.0
LnGrp LOS	D	C	C	D	C	C	D	A	D	C	A	A
Approach Vol, veh/h		851			1117			142			93	
Approach Delay, s/veh		25.6			29.8			41.0			23.5	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.0	36.5		12.6	8.1	37.3		29.1				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	20.0	40.0		25.0	20.0	40.0		40.0				
Max Q Clear Time (g_c+I1), s	5.6	18.5		8.0	4.3	24.3		5.7				
Green Ext Time (p_c), s	0.1	7.1		0.2	0.0	7.9		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			28.6									
HCM 6th LOS			C									

HCM 6th Signalized Intersection Summary
1: O'Hara Ave & Laurel Rd

Existing Plus Project PM



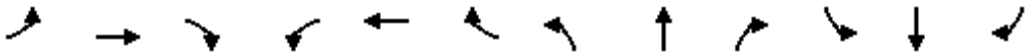
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	719	83	163	676	62	102	257	223	69	310	111
Future Volume (veh/h)	168	719	83	163	676	62	102	257	223	69	310	111
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	191	817	89	185	768	67	116	292	187	78	352	101
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	235	1123	122	228	1135	99	148	441	365	106	575	162
Arrive On Green	0.13	0.35	0.35	0.13	0.35	0.35	0.08	0.24	0.24	0.06	0.21	0.21
Sat Flow, veh/h	1767	3206	349	1767	3275	286	1767	1856	1536	1767	2694	760
Grp Volume(v), veh/h	191	449	457	185	413	422	116	292	187	78	228	225
Grp Sat Flow(s),veh/h/ln	1767	1763	1793	1767	1763	1798	1767	1856	1536	1767	1763	1691
Q Serve(g_s), s	8.8	18.7	18.7	8.6	16.8	16.9	5.4	12.0	8.9	3.7	9.8	10.1
Cycle Q Clear(g_c), s	8.8	18.7	18.7	8.6	16.8	16.9	5.4	12.0	8.9	3.7	9.8	10.1
Prop In Lane	1.00		0.19	1.00		0.16	1.00		1.00	1.00		0.45
Lane Grp Cap(c), veh/h	235	617	628	228	611	623	148	441	365	106	376	361
V/C Ratio(X)	0.81	0.73	0.73	0.81	0.68	0.68	0.78	0.66	0.51	0.74	0.61	0.62
Avail Cap(c_a), veh/h	630	942	958	630	942	961	630	882	730	630	838	804
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.5	23.8	23.8	35.6	23.5	23.5	37.8	29.0	27.9	38.9	29.9	30.0
Incr Delay (d2), s/veh	6.7	2.4	2.3	6.7	1.9	1.8	3.4	0.6	0.4	3.7	0.6	0.7
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	4.1	7.7	7.8	3.9	6.8	6.9	2.4	5.1	3.1	1.6	4.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.1	26.2	26.2	42.4	25.4	25.3	41.2	29.7	28.3	42.7	30.5	30.7
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		1097			1020			595			531	
Approach Delay, s/veh		29.0			28.4			31.5			32.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.9	34.9	11.0	23.4	15.2	34.6	9.0	25.4
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	30.0	45.0	30.0	* 40	30.0	* 45	30.0	40.0
Max Q Clear Time (g_c+I1), s	10.6	20.7	7.4	12.1	10.8	18.9	5.7	14.0
Green Ext Time (p_c), s	0.5	8.6	0.1	1.6	0.5	7.7	0.1	1.3

Intersection Summary	
HCM 6th Ctrl Delay	29.8
HCM 6th LOS	C

Notes

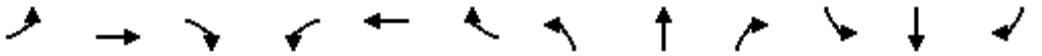
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	911	22	22	804	9	44	7	34	25	4	35
Future Volume (veh/h)	51	911	22	22	804	9	44	7	34	25	4	35
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		0.97	1.00		0.92	1.00		0.95
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	58	1035	25	25	914	10	50	8	3	28	5	22
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	111	1573	38	61	1495	16	115	82	31	122	22	96
Arrive On Green	0.06	0.45	0.45	0.03	0.42	0.42	0.06	0.06	0.06	0.15	0.15	0.15
Sat Flow, veh/h	1767	3518	85	1767	3571	39	1767	1255	471	843	151	663
Grp Volume(v), veh/h	58	519	541	25	451	473	50	0	11	55	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1840	1767	1763	1847	1767	0	1725	1657	0	0
Q Serve(g_s), s	1.8	13.2	13.2	0.8	11.5	11.5	1.6	0.0	0.3	1.7	0.0	0.0
Cycle Q Clear(g_c), s	1.8	13.2	13.2	0.8	11.5	11.5	1.6	0.0	0.3	1.7	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.02	1.00		0.27	0.51		0.40
Lane Grp Cap(c), veh/h	111	788	823	61	738	773	115	0	112	241	0	0
V/C Ratio(X)	0.52	0.66	0.66	0.41	0.61	0.61	0.44	0.00	0.10	0.23	0.00	0.00
Avail Cap(c_a), veh/h	615	1228	1282	615	1228	1287	769	0	751	1154	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	26.1	12.4	12.4	27.2	13.0	13.0	25.8	0.0	25.3	21.7	0.0	0.0
Incr Delay (d2), s/veh	1.4	1.3	1.3	1.7	1.2	1.1	1.0	0.0	0.1	0.2	0.0	0.0
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	0.8	4.5	4.7	0.3	4.0	4.2	0.7	0.0	0.1	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.5	13.8	13.7	28.8	14.2	14.2	26.8	0.0	25.4	21.9	0.0	0.0
LnGrp LOS	C	B	B	C	B	B	C	A	C	C	A	A
Approach Vol, veh/h		1118			949			61			55	
Approach Delay, s/veh		14.5			14.6			26.5			21.9	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.0	30.8		8.3	7.6	29.1		12.3				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	20.0	40.0		25.0	20.0	40.0		40.0				
Max Q Clear Time (g_c+I1), s	2.8	15.2		3.6	3.8	13.5		3.7				
Green Ext Time (p_c), s	0.0	10.5		0.1	0.0	9.0		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		15.0	
HCM 6th LOS		B	



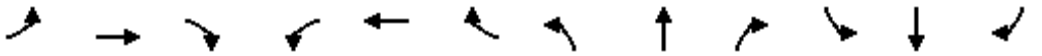
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	310	620	100	290	790	100	110	290	220	90	490	160
Future Volume (veh/h)	310	620	100	290	790	100	110	290	220	90	490	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		0.98
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	365	729	107	341	929	109	129	341	179	106	576	161
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	366	961	141	366	989	116	137	463	387	122	652	182
Arrive On Green	0.21	0.31	0.31	0.21	0.31	0.31	0.08	0.25	0.25	0.07	0.24	0.24
Sat Flow, veh/h	1767	3078	452	1767	3172	372	1767	1856	1552	1767	2707	754
Grp Volume(v), veh/h	365	417	419	341	516	522	129	341	179	106	374	363
Grp Sat Flow(s),veh/h/ln	1767	1763	1767	1767	1763	1782	1767	1856	1552	1767	1763	1698
Q Serve(g_s), s	23.9	24.7	24.7	21.9	33.0	33.0	8.4	19.6	11.3	6.9	23.7	23.9
Cycle Q Clear(g_c), s	23.9	24.7	24.7	21.9	33.0	33.0	8.4	19.6	11.3	6.9	23.7	23.9
Prop In Lane	1.00		0.26	1.00		0.21	1.00		1.00	1.00		0.44
Lane Grp Cap(c), veh/h	366	550	551	366	549	555	137	463	387	122	424	409
V/C Ratio(X)	1.00	0.76	0.76	0.93	0.94	0.94	0.94	0.74	0.46	0.87	0.88	0.89
Avail Cap(c_a), veh/h	366	551	553	366	556	562	137	529	443	122	492	474
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.8	35.9	35.9	45.1	38.8	38.8	53.1	39.9	36.9	53.3	42.4	42.4
Incr Delay (d2), s/veh	45.9	6.4	6.5	30.3	24.3	24.1	57.6	3.7	0.3	42.6	14.1	15.1
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	15.0	11.4	11.4	12.4	17.4	17.6	5.9	9.1	4.2	4.4	11.7	11.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.7	42.3	42.3	75.4	63.0	62.9	110.7	43.6	37.2	96.0	56.4	57.5
LnGrp LOS	F	D	D	E	E	E	F	D	D	F	E	E
Approach Vol, veh/h		1201			1379			649			843	
Approach Delay, s/veh		57.3			66.0			55.2			61.9	
Approach LOS		E			E			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.0	41.5	13.0	33.3	28.0	41.5	12.0	34.3
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	24.0	36.2	9.0	* 32	24.0	* 37	8.0	33.0
Max Q Clear Time (g_c+I1), s	23.9	26.7	10.4	25.9	25.9	35.0	8.9	21.6
Green Ext Time (p_c), s	0.0	4.6	0.0	1.7	0.0	1.1	0.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	60.9
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	930	140	70	970	10	130	10	90	20	30	30
Future Volume (veh/h)	20	930	140	70	970	10	130	10	90	20	30	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.71	1.00		0.86
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	24	1094	165	82	1141	12	153	12	15	24	35	17
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	49	1355	204	104	1691	18	183	62	78	129	188	91
Arrive On Green	0.03	0.44	0.44	0.06	0.47	0.47	0.10	0.10	0.10	0.24	0.24	0.24
Sat Flow, veh/h	1767	3062	461	1767	3574	38	1767	601	752	534	778	378
Grp Volume(v), veh/h	24	629	630	82	563	590	153	0	27	76	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1760	1767	1763	1849	1767	0	1353	1690	0	0
Q Serve(g_s), s	1.5	35.5	35.8	5.3	28.4	28.4	9.8	0.0	2.1	4.1	0.0	0.0
Cycle Q Clear(g_c), s	1.5	35.5	35.8	5.3	28.4	28.4	9.8	0.0	2.1	4.1	0.0	0.0
Prop In Lane	1.00		0.26	1.00		0.02	1.00		0.56	0.32		0.22
Lane Grp Cap(c), veh/h	49	780	779	104	834	875	183	0	140	408	0	0
V/C Ratio(X)	0.49	0.81	0.81	0.79	0.67	0.67	0.84	0.00	0.19	0.19	0.00	0.00
Avail Cap(c_a), veh/h	92	960	958	169	1036	1087	283	0	217	485	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.1	27.8	27.9	53.4	23.4	23.4	50.6	0.0	47.1	34.6	0.0	0.0
Incr Delay (d2), s/veh	2.7	4.7	4.9	4.9	1.6	1.6	7.1	0.0	0.2	0.1	0.0	0.0
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	0.7	15.4	15.5	2.5	11.7	12.3	4.7	0.0	0.7	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.8	32.5	32.7	58.4	25.1	25.0	57.7	0.0	47.4	34.7	0.0	0.0
LnGrp LOS	E	C	C	E	C	C	E	A	D	C	A	A
Approach Vol, veh/h		1283			1235			180			76	
Approach Delay, s/veh		33.1			27.2			56.2			34.7	
Approach LOS		C			C			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.8	56.0		16.5	7.2	59.5		31.8				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	11.0	62.6		18.4	6.0	67.6		33.0				
Max Q Clear Time (g_c+I1), s	7.3	37.8		11.8	3.5	30.4		6.1				
Green Ext Time (p_c), s	0.0	13.1		0.2	0.0	13.9		0.3				

Intersection Summary												
HCM 6th Ctrl Delay			32.0									
HCM 6th LOS			C									

HCM 6th Signalized Intersection Summary
1: O'Hara Ave & Laurel Rd

Cumulative PM

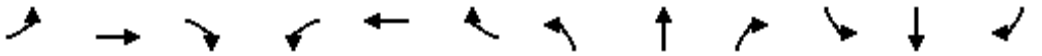
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	950	140	240	930	140	220	360	270	120	420	200
Future Volume (veh/h)	260	950	140	240	930	140	220	360	270	120	420	200
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	295	1080	151	273	1057	151	250	409	241	136	477	190
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	295	1150	161	271	1102	157	248	502	416	142	515	203
Arrive On Green	0.17	0.37	0.37	0.15	0.36	0.36	0.14	0.27	0.27	0.08	0.21	0.21
Sat Flow, veh/h	1767	3107	434	1767	3089	441	1767	1856	1538	1767	2444	966
Grp Volume(v), veh/h	295	612	619	273	602	606	250	409	241	136	343	324
Grp Sat Flow(s),veh/h/ln	1767	1763	1777	1767	1763	1767	1767	1856	1538	1767	1763	1647
Q Serve(g_s), s	25.0	50.2	50.4	23.0	50.0	50.2	21.0	30.9	20.3	11.5	28.6	29.0
Cycle Q Clear(g_c), s	25.0	50.2	50.4	23.0	50.0	50.2	21.0	30.9	20.3	11.5	28.6	29.0
Prop In Lane	1.00		0.24	1.00		0.25	1.00		1.00	1.00		0.59
Lane Grp Cap(c), veh/h	295	653	658	271	629	631	248	502	416	142	371	347
V/C Ratio(X)	1.00	0.94	0.94	1.01	0.96	0.96	1.01	0.81	0.58	0.96	0.92	0.93
Avail Cap(c_a), veh/h	295	653	658	271	633	634	248	504	418	142	376	352
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.4	45.5	45.6	63.4	47.1	47.1	64.4	51.1	47.2	68.7	58.0	58.1
Incr Delay (d2), s/veh	52.5	21.5	21.9	56.3	25.7	26.2	59.6	9.2	1.3	63.2	27.3	30.8
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	15.5	25.6	25.9	14.5	25.9	26.2	13.4	15.5	7.9	7.6	15.4	14.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	114.9	67.0	67.5	119.7	72.8	73.4	124.0	60.3	48.6	131.9	85.3	88.9
LnGrp LOS	F	E	E	F	E	E	F	E	D	F	F	F
Approach Vol, veh/h		1526			1481			900			803	
Approach Delay, s/veh		76.5			81.7			74.9			94.6	
Approach LOS		E			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	27.0	60.9	25.0	37.0	29.0	58.9	16.0	46.0
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	23.0	55.5	21.0	* 32	25.0	* 54	12.0	40.7
Max Q Clear Time (g_c+I1), s	25.0	52.4	23.0	31.0	27.0	52.2	13.5	32.9
Green Ext Time (p_c), s	0.0	2.4	0.0	0.3	0.0	1.2	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	80.9
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



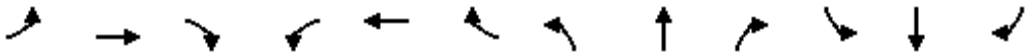
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	1290	40	40	1260	10	100	10	50	20	10	20
Future Volume (veh/h)	30	1290	40	40	1260	10	100	10	50	20	10	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.91	1.00		0.94
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	34	1466	45	45	1432	11	114	11	6	23	11	3
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	66	1976	61	78	2053	16	146	90	49	130	62	17
Arrive On Green	0.04	0.57	0.57	0.04	0.57	0.57	0.08	0.08	0.08	0.12	0.12	0.12
Sat Flow, veh/h	1767	3492	107	1767	3585	28	1767	1086	592	1097	525	143
Grp Volume(v), veh/h	34	739	772	45	704	739	114	0	17	37	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1836	1767	1763	1850	1767	0	1678	1765	0	0
Q Serve(g_s), s	1.8	29.4	29.6	2.3	26.7	26.7	5.9	0.0	0.9	1.8	0.0	0.0
Cycle Q Clear(g_c), s	1.8	29.4	29.6	2.3	26.7	26.7	5.9	0.0	0.9	1.8	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.01	1.00		0.35	0.62		0.08
Lane Grp Cap(c), veh/h	66	998	1039	78	1009	1059	146	0	139	209	0	0
V/C Ratio(X)	0.51	0.74	0.74	0.58	0.70	0.70	0.78	0.00	0.12	0.18	0.00	0.00
Avail Cap(c_a), veh/h	113	1344	1400	113	1344	1410	271	0	257	620	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.4	15.2	15.3	44.0	14.3	14.3	42.2	0.0	39.9	37.3	0.0	0.0
Incr Delay (d2), s/veh	2.3	1.9	1.9	2.5	1.4	1.3	3.4	0.0	0.1	0.1	0.0	0.0
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	0.8	11.0	11.5	1.1	9.8	10.3	2.7	0.0	0.4	0.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	17.1	17.1	46.5	15.7	15.6	45.6	0.0	40.1	37.4	0.0	0.0
LnGrp LOS	D	B	B	D	B	B	D	A	D	D	A	A
Approach Vol, veh/h		1545			1488			131			37	
Approach Delay, s/veh		17.8			16.6			44.9			37.4	
Approach LOS		B			B			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	58.3		12.4	7.5	58.9		15.1				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	6.0	71.6		14.4	6.0	71.6		33.0				
Max Q Clear Time (g_c+I1), s	4.3	31.6		7.9	3.8	28.7		3.8				
Green Ext Time (p_c), s	0.0	21.6		0.1	0.0	20.8		0.1				

Intersection Summary												
HCM 6th Ctrl Delay			18.6									
HCM 6th LOS			B									

HCM 6th Signalized Intersection Summary
1: O'Hara Ave & Laurel Rd

CumulativePP AM



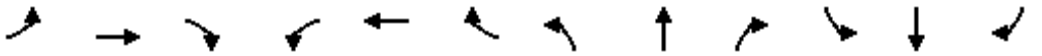
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	312	630	103	290	808	103	116	291	220	99	493	163
Future Volume (veh/h)	312	630	103	290	808	103	116	291	220	99	493	163
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		0.98
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	367	741	110	341	951	112	136	342	179	116	580	165
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	364	962	143	364	992	117	137	466	390	121	653	185
Arrive On Green	0.21	0.31	0.31	0.21	0.31	0.31	0.08	0.25	0.25	0.07	0.24	0.24
Sat Flow, veh/h	1767	3073	456	1767	3171	373	1767	1856	1552	1767	2695	764
Grp Volume(v), veh/h	367	425	426	341	529	534	136	342	179	116	379	366
Grp Sat Flow(s),veh/h/ln	1767	1763	1766	1767	1763	1782	1767	1856	1552	1767	1763	1696
Q Serve(g_s), s	24.0	25.4	25.4	22.1	34.3	34.3	9.0	19.7	11.4	7.6	24.2	24.3
Cycle Q Clear(g_c), s	24.0	25.4	25.4	22.1	34.3	34.3	9.0	19.7	11.4	7.6	24.2	24.3
Prop In Lane	1.00		0.26	1.00		0.21	1.00		1.00	1.00		0.45
Lane Grp Cap(c), veh/h	364	552	553	364	552	558	137	466	390	121	427	411
V/C Ratio(X)	1.01	0.77	0.77	0.94	0.96	0.96	1.00	0.73	0.46	0.96	0.89	0.89
Avail Cap(c_a), veh/h	364	552	553	364	552	558	137	526	440	121	489	470
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.2	36.2	36.2	45.5	39.3	39.3	53.7	40.1	36.9	54.1	42.6	42.6
Incr Delay (d2), s/veh	49.2	7.0	7.0	31.3	28.2	28.1	75.7	3.7	0.3	67.2	14.9	16.0
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	15.3	11.8	11.8	12.6	18.6	18.8	6.8	9.2	4.3	5.6	12.0	11.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.4	43.2	43.2	76.8	67.4	67.3	129.4	43.8	37.3	121.3	57.5	58.6
LnGrp LOS	F	D	D	E	E	E	F	D	D	F	E	E
Approach Vol, veh/h		1218			1404			657			861	
Approach Delay, s/veh		58.9			69.7			59.7			66.6	
Approach LOS		E			E			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.0	41.8	13.0	33.6	28.0	41.8	12.0	34.6
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	24.0	36.2	9.0	* 32	24.0	* 37	8.0	33.0
Max Q Clear Time (g_c+I1), s	24.1	27.4	11.0	26.3	26.0	36.3	9.6	21.7
Green Ext Time (p_c), s	0.0	4.4	0.0	1.6	0.0	0.2	0.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	64.3
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	930	140	70	979	19	130	11	90	35	31	45
Future Volume (veh/h)	48	930	140	70	979	19	130	11	90	35	31	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.71	1.00		0.87
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	56	1094	165	82	1152	22	153	13	15	41	36	35
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	76	1350	203	104	1615	31	183	66	76	147	129	125
Arrive On Green	0.04	0.44	0.44	0.06	0.46	0.46	0.10	0.10	0.10	0.24	0.24	0.24
Sat Flow, veh/h	1767	3062	461	1767	3538	68	1767	634	732	600	527	512
Grp Volume(v), veh/h	56	629	630	82	574	600	153	0	28	112	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1760	1767	1763	1843	1767	0	1366	1639	0	0
Q Serve(g_s), s	3.6	36.0	36.2	5.3	30.4	30.5	9.9	0.0	2.2	6.4	0.0	0.0
Cycle Q Clear(g_c), s	3.6	36.0	36.2	5.3	30.4	30.5	9.9	0.0	2.2	6.4	0.0	0.0
Prop In Lane	1.00		0.26	1.00		0.04	1.00		0.54	0.37		0.31
Lane Grp Cap(c), veh/h	76	777	776	104	805	841	183	0	141	401	0	0
V/C Ratio(X)	0.73	0.81	0.81	0.79	0.71	0.71	0.84	0.00	0.20	0.28	0.00	0.00
Avail Cap(c_a), veh/h	91	951	950	168	1027	1074	280	0	217	466	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	54.9	28.2	28.3	53.9	25.4	25.4	51.1	0.0	47.6	35.6	0.0	0.0
Incr Delay (d2), s/veh	16.4	4.9	5.1	5.0	2.1	2.0	7.6	0.0	0.3	0.1	0.0	0.0
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	2.0	15.6	15.7	2.5	12.7	13.3	4.8	0.0	0.8	2.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.3	33.1	33.3	58.9	27.5	27.5	58.6	0.0	47.9	35.7	0.0	0.0
LnGrp LOS	E	C	C	E	C	C	E	A	D	D	A	A
Approach Vol, veh/h		1315			1256			181			112	
Approach Delay, s/veh		34.8			29.6			57.0			35.7	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.8	56.3		16.6	9.0	58.1		32.4				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	11.0	62.6		18.4	6.0	67.6		33.0				
Max Q Clear Time (g_c+I1), s	7.3	38.2		11.9	5.6	32.5		8.4				
Green Ext Time (p_c), s	0.0	13.0		0.2	0.0	14.0		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		34.0	
HCM 6th LOS		C	

HCM 6th Signalized Intersection Summary
1: O'Hara Ave & Laurel Rd

CumulativePP PM

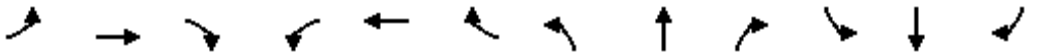
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	261	959	143	240	948	145	228	361	270	135	426	201
Future Volume (veh/h)	261	959	143	240	948	145	228	361	270	135	426	201
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	297	1090	154	273	1077	157	259	410	241	153	484	191
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	294	1151	162	270	1102	160	247	503	417	141	518	203
Arrive On Green	0.17	0.37	0.37	0.15	0.36	0.36	0.14	0.27	0.27	0.08	0.21	0.21
Sat Flow, veh/h	1767	3102	437	1767	3080	448	1767	1856	1538	1767	2451	960
Grp Volume(v), veh/h	297	619	625	273	615	619	259	410	241	153	347	328
Grp Sat Flow(s),veh/h/ln	1767	1763	1777	1767	1763	1765	1767	1856	1538	1767	1763	1648
Q Serve(g_s), s	25.0	51.1	51.4	23.0	51.8	52.1	21.0	31.1	20.4	12.0	29.1	29.5
Cycle Q Clear(g_c), s	25.0	51.1	51.4	23.0	51.8	52.1	21.0	31.1	20.4	12.0	29.1	29.5
Prop In Lane	1.00		0.25	1.00		0.25	1.00		1.00	1.00		0.58
Lane Grp Cap(c), veh/h	294	654	659	270	631	632	247	503	417	141	372	348
V/C Ratio(X)	1.01	0.95	0.95	1.01	0.98	0.98	1.05	0.81	0.58	1.08	0.93	0.94
Avail Cap(c_a), veh/h	294	654	659	270	631	632	247	503	417	141	375	351
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.7	45.8	45.9	63.7	47.6	47.7	64.7	51.3	47.4	69.2	58.2	58.4
Incr Delay (d2), s/veh	55.3	22.9	23.3	57.3	29.8	30.6	70.9	9.3	1.3	100.3	29.2	32.7
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	15.7	26.2	26.6	14.5	27.4	27.7	14.2	15.6	7.9	9.3	15.8	15.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	118.0	68.7	69.2	121.0	77.4	78.3	135.6	60.6	48.7	169.5	87.4	91.1
LnGrp LOS	F	E	E	F	E	E	F	E	D	F	F	F
Approach Vol, veh/h		1541			1507			910			828	
Approach Delay, s/veh		78.4			85.7			78.8			104.0	
Approach LOS		E			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	27.0	61.2	25.0	37.2	29.0	59.2	16.0	46.2
Change Period (Y+Rc), s	4.0	5.4	4.0	* 5.4	4.0	* 5.4	4.0	5.4
Max Green Setting (Gmax), s	23.0	55.5	21.0	* 32	25.0	* 54	12.0	40.7
Max Q Clear Time (g_c+I1), s	25.0	53.4	23.0	31.5	27.0	54.1	14.0	33.1
Green Ext Time (p_c), s	0.0	1.7	0.0	0.2	0.0	0.0	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	85.2
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	1290	40	41	1273	16	100	13	50	33	11	37
Future Volume (veh/h)	59	1290	40	41	1273	16	100	13	50	33	11	37
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		0.98	1.00		0.91	1.00		0.95
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	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	67	1466	45	47	1447	18	114	15	6	38	12	22
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	92	1957	60	79	1972	25	146	101	40	114	36	66
Arrive On Green	0.05	0.56	0.56	0.04	0.55	0.55	0.08	0.08	0.08	0.13	0.13	0.13
Sat Flow, veh/h	1767	3492	107	1767	3565	44	1767	1221	488	890	281	515
Grp Volume(v), veh/h	67	739	772	47	715	750	114	0	21	72	0	0
Grp Sat Flow(s),veh/h/ln	1767	1763	1836	1767	1763	1846	1767	0	1709	1685	0	0
Q Serve(g_s), s	3.6	30.5	30.7	2.5	29.4	29.4	6.1	0.0	1.1	3.7	0.0	0.0
Cycle Q Clear(g_c), s	3.6	30.5	30.7	2.5	29.4	29.4	6.1	0.0	1.1	3.7	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.02	1.00		0.29	0.53		0.31
Lane Grp Cap(c), veh/h	92	988	1029	79	975	1021	146	0	142	216	0	0
V/C Ratio(X)	0.73	0.75	0.75	0.60	0.73	0.73	0.78	0.00	0.15	0.33	0.00	0.00
Avail Cap(c_a), veh/h	110	1311	1366	110	1311	1373	264	0	256	578	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.0	16.0	16.0	45.1	16.2	16.2	43.3	0.0	41.0	38.2	0.0	0.0
Incr Delay (d2), s/veh	13.4	2.1	2.1	2.7	1.9	1.8	3.4	0.0	0.2	0.3	0.0	0.0
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	1.9	11.6	12.1	1.1	11.1	11.7	2.8	0.0	0.5	1.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.3	18.1	18.1	47.8	18.0	18.0	46.7	0.0	41.2	38.5	0.0	0.0
LnGrp LOS	E	B	B	D	B	B	D	A	D	D	A	A
Approach Vol, veh/h		1578			1512			135			72	
Approach Delay, s/veh		19.8			18.9			45.8			38.5	
Approach LOS		B			B			D			D	

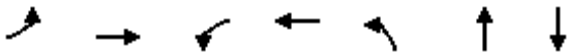
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	59.1		12.6	9.0	58.4		16.4				
Change Period (Y+Rc), s	4.0	5.1		4.6	4.0	5.1		4.0				
Max Green Setting (Gmax), s	6.0	71.6		14.4	6.0	71.6		33.0				
Max Q Clear Time (g_c+I1), s	4.5	32.7		8.1	5.6	31.4		5.7				
Green Ext Time (p_c), s	0.0	21.3		0.1	0.0	20.6		0.2				

Intersection Summary												
HCM 6th Ctrl Delay			20.9									
HCM 6th LOS			C									

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	235	568	302	935	84	294	239	62	676
v/c Ratio	0.75	0.55	0.77	0.78	0.56	0.59	0.50	0.48	0.82
Control Delay	66.0	39.9	62.0	43.9	73.3	47.7	31.3	73.2	53.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.0	39.9	62.0	43.9	73.3	47.7	31.3	73.2	53.7
Queue Length 50th (ft)	186	206	233	358	68	218	113	50	271
Queue Length 95th (ft)	290	283	#404	506	128	323	197	103	354
Internal Link Dist (ft)		557		530		384			337
Turn Bay Length (ft)	340		300		80		60	180	
Base Capacity (vph)	430	1277	430	1286	430	610	565	430	1125
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.44	0.70	0.73	0.20	0.48	0.42	0.14	0.60

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

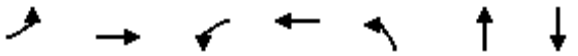


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	15	803	74	1022	125	102	75
v/c Ratio	0.10	0.51	0.37	0.51	0.50	0.33	0.39
Control Delay	39.0	18.5	39.4	12.9	39.1	11.6	33.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	18.5	39.4	12.9	39.1	11.6	33.4
Queue Length 50th (ft)	6	144	30	135	51	2	23
Queue Length 95th (ft)	27	233	80	281	118	41	70
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	489	1944	489	2061	611	615	931
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.41	0.15	0.50	0.20	0.17	0.08

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	190	898	185	813	107	291	253	61	470
v/c Ratio	0.65	0.72	0.64	0.65	0.56	0.66	0.59	0.43	0.72
Control Delay	56.2	35.4	56.4	33.6	62.3	49.2	32.9	63.0	47.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	35.4	56.4	33.6	62.3	49.2	32.9	63.0	47.4
Queue Length 50th (ft)	128	272	125	238	73	196	109	42	157
Queue Length 95th (ft)	233	457	229	406	151	329	219	99	246
Internal Link Dist (ft)		557		530		384			337
Turn Bay Length (ft)	340		300		80		60	180	
Base Capacity (vph)	500	1484	500	1494	500	702	636	500	1295
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.61	0.37	0.54	0.21	0.41	0.40	0.12	0.36

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	25	1060	24	902	50	44	37
v/c Ratio	0.16	0.45	0.15	0.38	0.29	0.23	0.22
Control Delay	35.1	9.9	35.0	9.2	35.9	16.3	24.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.1	9.9	35.0	9.2	35.9	16.3	24.3
Queue Length 50th (ft)	10	113	9	90	19	2	7
Queue Length 95th (ft)	34	248	34	200	55	31	35
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	510	2349	510	2358	638	600	964
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.45	0.05	0.38	0.08	0.07	0.04

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	238	584	302	960	91	295	239	73	684
v/c Ratio	0.76	0.55	0.79	0.79	0.59	0.61	0.51	0.53	0.84
Control Delay	68.1	40.3	64.8	44.8	74.8	49.3	32.1	74.8	55.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.1	40.3	64.8	44.8	74.8	49.3	32.1	74.8	55.8
Queue Length 50th (ft)	191	216	238	379	75	223	115	60	278
Queue Length 95th (ft)	296	294	#408	528	138	327	199	117	362
Internal Link Dist (ft)		557		530		384			337
Turn Bay Length (ft)	340		300		80		60	180	
Base Capacity (vph)	417	1237	417	1247	417	590	549	417	1092
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.47	0.72	0.77	0.22	0.50	0.44	0.18	0.63

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
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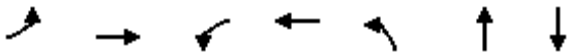
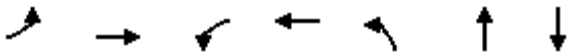


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	48	803	74	1043	125	103	111
v/c Ratio	0.31	0.51	0.41	0.59	0.55	0.36	0.53
Control Delay	44.4	19.1	45.0	18.7	45.4	12.8	39.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.4	19.1	45.0	18.7	45.4	12.8	39.5
Queue Length 50th (ft)	25	153	38	209	63	2	45
Queue Length 95th (ft)	62	250	84	330	123	43	99
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	437	1705	437	1759	546	560	820
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.47	0.17	0.59	0.23	0.18	0.14

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	191	911	185	838	116	292	253	78	478
v/c Ratio	0.66	0.72	0.65	0.67	0.59	0.67	0.59	0.50	0.73
Control Delay	58.0	36.6	58.3	35.1	63.9	50.8	33.8	65.1	48.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.0	36.6	58.3	35.1	63.9	50.8	33.8	65.1	48.4
Queue Length 50th (ft)	133	285	129	255	82	204	114	56	166
Queue Length 95th (ft)	239	481	234	435	163	337	222	121	254
Internal Link Dist (ft)		557		530		384			337
Turn Bay Length (ft)	340		300		80		60	180	
Base Capacity (vph)	487	1446	487	1453	487	684	621	487	1260
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.63	0.38	0.58	0.24	0.43	0.41	0.16	0.38

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	58	1060	25	924	50	47	73
v/c Ratio	0.32	0.47	0.16	0.47	0.29	0.24	0.38
Control Delay	37.6	11.2	36.7	14.1	37.4	17.8	24.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	11.2	36.7	14.1	37.4	17.8	24.6
Queue Length 50th (ft)	23	114	10	144	20	3	13
Queue Length 95th (ft)	64	263	36	234	58	34	55
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	498	2252	498	2225	623	593	950
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.47	0.05	0.42	0.08	0.08	0.08

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	365	847	341	1047	129	341	259	106	764
v/c Ratio	1.01	0.79	0.95	0.97	0.96	0.73	0.44	0.89	0.89
Control Delay	97.8	42.9	82.7	60.1	122.1	49.7	6.6	111.8	53.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	97.8	42.9	82.7	60.1	122.1	49.7	6.6	111.8	53.6
Queue Length 50th (ft)	~300	309	261	414	100	235	0	82	280
Queue Length 95th (ft)	#453	364	#412	#515	#210	317	50	#178	330
Internal Link Dist (ft)		557		530		542			337
Turn Bay Length (ft)	340		300		450		300	180	
Base Capacity (vph)	360	1073	360	1084	135	522	623	119	955
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.01	0.79	0.95	0.97	0.96	0.65	0.42	0.89	0.80

Intersection Summary

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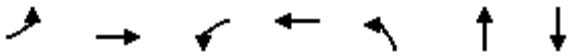

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	24	1259	82	1153	153	118	94
v/c Ratio	0.21	0.74	0.49	0.60	0.61	0.37	0.51
Control Delay	57.4	23.6	59.7	17.1	55.4	15.2	49.9
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	57.4	23.6	59.7	17.2	55.4	15.2	49.9
Queue Length 50th (ft)	15	335	52	264	95	7	47
Queue Length 95th (ft)	46	448	112	354	178	56	106
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	115	2317	212	2500	355	408	608
Starvation Cap Reductn	0	0	0	259	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.54	0.39	0.51	0.43	0.29	0.15

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	295	1239	273	1216	250	409	307	136	704
v/c Ratio	1.01	0.96	1.01	0.98	1.02	0.83	0.48	0.97	0.96
Control Delay	115.1	63.5	119.9	67.8	123.8	66.4	7.0	135.1	79.5
Queue Delay	0.0	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	115.1	95.9	119.9	67.8	123.8	66.4	7.0	135.1	79.5
Queue Length 50th (ft)	~297	620	~281	615	~258	377	0	135	340
Queue Length 95th (ft)	#477	#744	#452	#743	#425	#500	67	#268	#447
Internal Link Dist (ft)		557		530		542			337
Turn Bay Length (ft)	340		300		450		300	180	
Base Capacity (vph)	293	1284	269	1240	246	502	640	140	742
Starvation Cap Reductn	0	133	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.01	1.08	1.01	0.98	1.02	0.81	0.48	0.97	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
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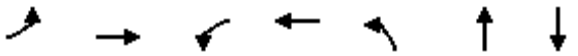

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	34	1511	45	1443	114	68	57
v/c Ratio	0.30	0.71	0.39	0.65	0.56	0.29	0.37
Control Delay	58.5	17.0	61.9	14.7	57.0	19.5	41.2
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	58.5	17.0	61.9	14.9	57.0	19.5	41.2
Queue Length 50th (ft)	22	355	29	327	71	7	22
Queue Length 95th (ft)	60	479	#78	442	143	49	67
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	115	2598	115	2606	276	299	623
Starvation Cap Reductn	0	0	0	321	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.58	0.39	0.63	0.41	0.23	0.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	367	862	341	1072	136	342	259	116	772
v/c Ratio	1.02	0.80	0.95	0.99	1.01	0.73	0.44	0.97	0.89
Control Delay	99.8	43.7	83.3	65.5	135.0	49.5	6.6	130.7	53.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	99.8	43.7	83.3	65.5	135.0	49.5	6.6	130.7	53.9
Queue Length 50th (ft)	~305	317	263	~438	~112	236	0	91	284
Queue Length 95th (ft)	#457	371	#412	#536	#225	318	50	#198	334
Internal Link Dist (ft)		557		530		542			337
Turn Bay Length (ft)	340		300		450		300	180	
Base Capacity (vph)	359	1071	359	1082	135	520	622	119	954
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	0.80	0.95	0.99	1.01	0.66	0.42	0.97	0.81

Intersection Summary

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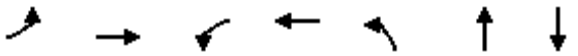

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	56	1259	82	1174	153	119	130
v/c Ratio	0.50	0.75	0.51	0.64	0.63	0.38	0.61
Control Delay	70.2	25.3	62.7	20.2	58.4	15.9	52.3
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	70.2	25.3	62.7	20.3	58.4	15.9	52.3
Queue Length 50th (ft)	38	356	54	290	100	8	70
Queue Length 95th (ft)	#107	477	115	390	184	58	140
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	112	2254	205	2427	344	399	585
Starvation Cap Reductn	0	0	0	269	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.56	0.40	0.54	0.44	0.30	0.22

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	297	1253	273	1242	259	410	307	153	712
v/c Ratio	1.02	0.98	1.01	1.00	1.06	0.82	0.48	1.09	0.97
Control Delay	117.1	66.1	120.4	73.1	132.6	66.2	6.9	163.7	80.9
Queue Delay	0.0	36.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	117.1	102.3	120.4	73.1	132.6	66.2	6.9	163.7	80.9
Queue Length 50th (ft)	~306	631	~281	~640	~277	378	0	~168	346
Queue Length 95th (ft)	#483	#758	#452	#770	#445	#502	67	#310	#457
Internal Link Dist (ft)		557		530		542			337
Turn Bay Length (ft)	340		300		450		300	180	
Base Capacity (vph)	292	1281	269	1239	245	501	640	140	740
Starvation Cap Reductn	0	132	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	1.09	1.01	1.00	1.06	0.82	0.48	1.09	0.96

Intersection Summary

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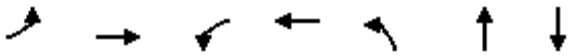

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	67	1511	47	1465	114	72	93
v/c Ratio	0.63	0.74	0.44	0.75	0.59	0.32	0.53
Control Delay	79.8	19.1	67.1	19.9	60.8	21.8	48.4
Queue Delay	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Total Delay	79.8	19.1	67.1	20.1	60.8	21.8	48.4
Queue Length 50th (ft)	45	377	32	357	74	9	43
Queue Length 95th (ft)	#134	516	#87	489	147	54	103
Internal Link Dist (ft)		530		557		398	300
Turn Bay Length (ft)	140		100				
Base Capacity (vph)	106	2517	106	2522	254	281	572
Starvation Cap Reductn	0	0	0	328	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.60	0.44	0.67	0.45	0.26	0.16

Intersection Summary

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