

MEMORANDUM

Date: April 17, 2019 Project #: 23472

To: Kryz Saldivar, City of Tustin Public Works Manager – Traffic/Transportation

Cc: Diana Salazar, Costco Wholesale Warehouse
Terry Odle, MG2

From: Neelam Dorman & Michael Sahimi, Kittelson & Associates, Inc

Project: Tustin Ranch Costco Fuel Station Addition

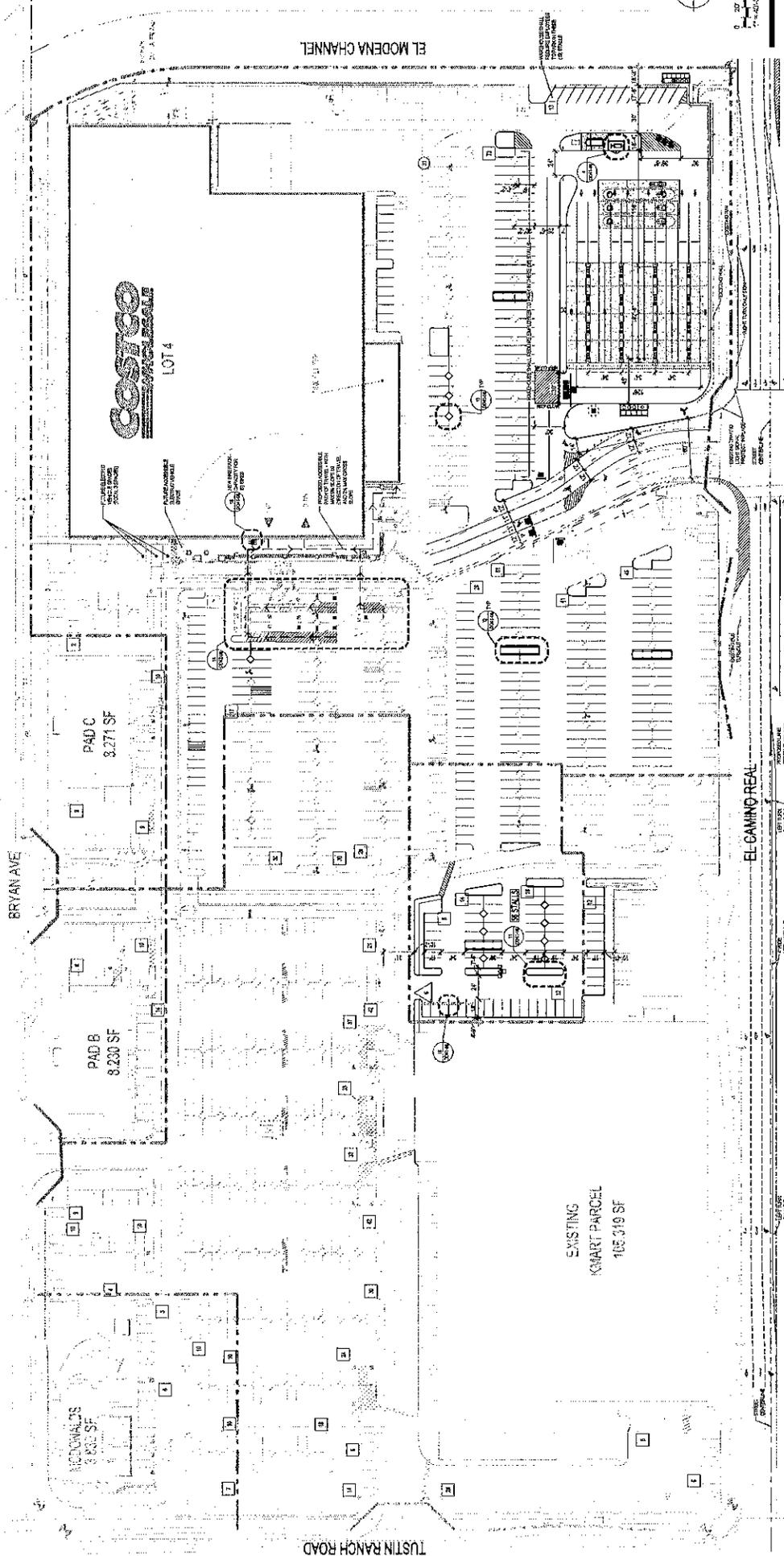
Subject: Final – Traffic Analysis

Kittelison & Associates, Inc. (KAI) has prepared this updated traffic analysis memorandum for the proposed addition of a Costco Gasoline fuel station to the existing Tustin Ranch Costco Warehouse on El Camino Real in Tustin, California. The initial traffic analysis was submitted in February 2019 based on initial scoping discussions with City of Tustin (City) engineering and planning staff. The traffic analysis was updated based on comments provided by the City. The following topics are discussed in this memorandum:

- Proposed Development
- Trip Generation
- Intersection Level of Service Analysis
- Intersection Queuing Analysis
- Fuel Area Layout and Stacking Analysis
- Parking Analysis
- Fuel Delivery Truck Site Circulation

PROPOSED DEVELOPMENT

Costco is proposing to build a Costco Gasoline fuel station on the southeastern portion of the parking lot of their El Camino Real location. The site for the fuel station is currently Costco Warehouse parking, which will be relocated to the west in place of the existing Goodyear service facility (to be demolished). The Tustin Ranch Costco Gasoline fuel station will consist of four islands (sixteen dispensers) with a total of thirty-two (32) vehicle fueling positions. The site plan for the proposed Costco Gasoline fuel station is provided in Figure 1.



VICINITY MAP



NOTES:
 EXISTING CONDITIONS TO BE FIELD VERIFIED.

SITE PLAN

APRIL 15, 2019

EXISTING	PROPOSED	TOTAL
37 STALLS	37 STALLS	74 STALLS
32 STALLS	32 STALLS	64 STALLS
37 STALLS	37 STALLS	74 STALLS
32 STALLS	32 STALLS	64 STALLS
619 STALLS	619 STALLS	1238 STALLS
646 STALLS	646 STALLS	1292 STALLS

PROJECT DATA

CLIENT:	COSTCO WHOLESALE 899 LAKE DRIVE ISSAQUAH, WA 98027	PROPOSED GAS CANOPY 12,684 S.F.	PROPOSED CONTROLLER ENCLOSURE 121 S.F.
PROJECT ADDRESS:	2855 EL CAMINO REAL TUSTIN, CA 92782	EXISTING COSTCO PARKING: 116 STALLS 494 STALLS 13 STALLS 623 STALLS	EXISTING Kmart 105,319 S.F. X 4,570'00" 105,319 S.F. X 5,010'00" PER COARS. 577 STALLS 530 STALLS
EXISTING SITE AREA: GOOD YEAR SITE AREA: TOTAL SITE AREA:	10.96 ACRES (477,988 S.F.) 1.00 ACRES (43,566 S.F.) 11.97 ACRES (517,557 S.F.)	NO. OF STALLS PER 100 S.F. PROPOSED COSTCO PARKING: 171 WIDE STALLS 10 WIDE STALLS 10% HANDICAP STALLS 625 STALLS	EXISTING MCDONALD'S 8,230 S.F. X 4,570'00" 57 STALLS 55 STALLS
SOUNDWALL INFORMATION:	THIS PLAN HAS BEEN PREPARED BY JUNIOR ARCHITECTS SITE PLANNING DIVISION PC COMMERCIAL - E. TUSTIN OVERLAY	NO. OF BUILDING AREAS PROPOSED COSTCO PARKING: 171 WIDE STALLS 10 WIDE STALLS 10% HANDICAP STALLS 625 STALLS	EXISTING MCDONALD'S 8,230 S.F. X 4,570'00" 57 STALLS 55 STALLS
ZONING:	EXISTING BUILDING DATA: EXISTING BUILDING AREA EXISTING FIRE CENTER EXISTING TOTAL BUILDING	NO. OF STALLS PER 100 S.F. PROPOSED COSTCO PARKING: 171 WIDE STALLS 10 WIDE STALLS 10% HANDICAP STALLS 625 STALLS	EXISTING MCDONALD'S 8,230 S.F. X 4,570'00" 57 STALLS 55 STALLS
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COSTCO WHOLESALE

TUSTIN, CALIFORNIA

TRIP GENERATION

The methodology for the estimated trip generation for the project is outlined in the *Costco-Specific Trip Generation Information* memorandum (updated December 26, 2018). Table 1 presents the estimated trip generation for the proposed Costco gas addition. The internal capture, pass-by and diverted trip adjustments applied have been approved by City staff.

Table 1: Costco Gasoline Peak Hour Trip Generation Characteristics

Costco Gasoline Fuel Station	Size (positions)	Weekday AM Peak Hour Trips	Weekday PM Peak Hour Trips
Total Trip Ends (50/50 split)	32	346	615
<i>Internal Trips (34% PM)</i>		-	209
Total External Trips		346	406
<i>Pass-by Trips (33% AM, 37% PM)</i>		114	150
<i>Diverted Trips (43% AM, 37% PM)</i>		149	150
Total Net New Costco Trips		83	106

Evaluating the trip impact of the proposed Costco Gasoline fuel station must account for the fact that it will replace an existing use on site, the Goodyear tire facility. Table 2 presents the net new trips for the proposed project with existing trip credit for the existing Goodyear service facility applied. When applying the existing trip credit, the net new trips for the proposed project would be 58 trip ends in the a.m. peak hour and 70 trip ends in the p.m. peak hour. This represents on average approximately one additional net new trip into or out of the site each minute during peak periods, as compared to existing conditions.

Table 2: Overall New Trip Differential (Utilizing Existing Trip Credit)

Scenario	AM Peak Hour	PM Peak Hour
	Total	Total
Project Trips	83	106
Existing Trip Credit	-25	-36
Net New Project Trips	58	70

Trip Distribution and Assignment

The traffic volumes figures provided in Appendix 1 show Existing traffic volumes, Project trip assignment, and Existing Plus Project traffic volumes. New Project trips were assigned to the roadway network based on travel patterns determined from the existing turning movements at the site access points.

For example, the existing outbound volumes at the intersection of Auto Center Drive & El Camino Real inform the percentage of outbound Project trip turn movements at intersection. The driveway assignment was also traced through the intersection of Tustin Ranch Road & El Camino Real.

Existing traffic volumes were not collected at the right-in/right-out driveway on Tustin Ranch Road as this location was not a study location identified by the City. It was assumed that five percent of inbound and outbound project trips would use that driveway, based on the directional distribution of existing traffic volumes at the surrounding intersections.

INTERSECTION LEVEL OF SERVICE ANALYSIS

Based on discussion with City staff, the following study locations were evaluated for weekday a.m. and p.m. conditions:

- Market Street & Bryan Avenue (Project Driveway)
- Tustin Ranch Road & El Camino Real
- Auto Center Drive & El Camino Real (Project Driveway)

Level of service (LOS) associated with the project are discussed below. Existing traffic volume data was collected for the weekday a.m. and p.m. peak hours on Wednesday, November 28, 2018. Geometric improvements at Tustin Ranch Road & El Camino Real would be in place at time of Project opening and have thereby been assumed to be in place in the traffic analyses presented below. In addition, the Project would provide a dedicated westbound right turn lane into the site at Auto Center Drive & El Camino Real.

The study intersections were analyzed using the Intersection Capacity Utilization (ICU) methodology, consistent with City of Tustin standards. Under the ICU methodology, the critical movement and critical movement capacity of an intersection are used to calculate a volume-to-capacity (V/C) ratio. After the V/C ratio is calculated, the ICU methodology assigns a LOS grade (A to F) representing the quality of intersection operations, with LOS F signifying volumes exceeding capacity. LOS grades and corresponding V/C ratios under the ICU methodology are provide in Table 3. The maximum acceptable level of service for the study intersections is LOS D.

Table 3: Intersection Level of Service and ICU Values

Level of Service	Maximum ICU Value
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	Above 1.00

Based on the analysis methodology, the results for the Existing and Existing Plus Project LOS for the study intersections is shown in Table 4. All study intersections operate acceptably at LOS A and B under Existing and Existing Plus Project conditions.

Table 4: Existing and Existing Plus Project LOS

#	Intersection	Control	Peak Hour	Existing		Existing Plus Project		Increase
				ICU	LOS	ICU	LOS	
1	Market St. & Bryan Ave.	Signal	AM	0.29	A	0.36	A	0.07
			PM	0.43	A	0.49	A	0.06
2	Tustin Ranch Rd. & El Camino Real ¹	Signal	AM	0.68	B	0.69	B	0.01
			PM	0.60	A	0.60	A	0.00
3	Auto Center Dr. & El Camino Real	Signal	AM	0.27	A	0.28	A	0.01
			PM	0.47	A	0.47	A	0.00

Note: 1. Planned and funded intersection improvements at this location are assumed under Existing Conditions.

INTERSECTION QUEUING ANALYSIS

In addition to the LOS analysis presented above, queues were reviewed for the turn lanes at the Project driveways to determine if signal timing adjustments or additional storage would be required. This includes the outbound left and right turn lanes (northbound left and right turn lanes) and inbound left turn lane (westbound left turn lane) at the intersection of Market Street & Bryan Avenue. The analysis was conducted using Synchro traffic analysis software and signal timing data provided by the City.

For the intersection of Auto Center Drive & El Camino Real, outbound left and right turn lanes (southbound left and right turn lanes) and inbound left turn lane (eastbound left turn lane). Table 5 shows the 95th percentile queues for Existing and Existing Plus Project conditions. As shown in the table, the existing northbound left and northbound right queues (queues out of the Project site) exceed available storage at the intersection of Market Street & Bryan Avenue during the existing p.m. peak hour. Both queues are expected to increase with the addition of project trips.

As shown in the table, the available storage for the northbound left turn at Market Street & Bryan Avenue is 105 feet and 60 feet for the northbound right turn; this is the distance from the intersection to the intersection of the closest drive aisle. The total storage available along Market Street is approximately 335 feet.

Northbound queues during the p.m. peak hour can be reduced by optimizing signal timing. By updating the cycle length to 60 seconds from the current 103.5 seconds and increasing the northbound maximum split from 19 seconds to 23 seconds, the northbound left turn and right turn 95th percentile queues can be decreased to 113 feet and 42 feet, respectively. The queue for the northbound left turn would exceed capacity by 8 feet. Please note that the storage capacity of 105 feet is defined by the location an internal drive aisle intersection, the full storage along Market Street is 335 feet therefore the 113 foot queue can

be accommodated with causing significant impacts to on-site circulation. Recommended maximum splits for each movement are as follows:

- Northbound left/right: 23 seconds
- Eastbound through: 26 seconds
- Westbound through: 37 seconds
- Westbound left: 11 seconds

All other queuing movement were found to have sufficient storage under both Existing and Existing Plus Project conditions.

Table 5: Existing and Existing Plus Project Queuing Results

#	Intersection	Movement	Available Storage (feet)	Peak Hour	Existing	Existing Plus Project	Increase
1	Market St. & Bryan Ave.	NBL	105	AM	30	62	32
				PM	120	#180	60
		NBR	60	AM	19	30	11
				PM	62	108	46
		WBL	260	AM	44	90	46
				PM	100	138	38
3	Auto Center Dr. & El Camino Real	SBL	105	AM	18	33	15
				PM	54	65	11
		SBR	95	AM	0	12	12
				PM	30	31	1
		EBL	200	AM	9	19	10
				PM	37	52	14
		WBR	155	AM	-	0	-
				PM	-	#134	-

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

Bold signifies queue that exceeds storage length.

FUEL AREA LAYOUT AND STACKING ANALYSIS

The proposed fuel station is in the southeastern portion of the parking lot. This location was selected because it is farthest away from the main entry and has sufficient land area to allow for the four dispenser wide by four dispenser deep Southern California gas layout.

One other location was previously looked at by Costco which put the gas station on the Goodyear site Costco is purchasing (Preliminary Review Site Plan figure provided in Appendix 1). The site area only allowed for a three dispenser wide by three dispenser deep gas layout. This gas layout is too small for

this market. The site also was not large enough to allow for the gas delivery truck to be out of the members stacking and dispensing area.

The proposed layout of the fuel station has vehicles entering on the east and exiting to the west. This layout directs traffic further into the site to reduce effects on the El Camino Real. Flipping the layout would have vehicles entering from the west and exiting to the east which would have vehicles queuing towards the signalized driveway and El Camino Real. The City of Tustin requested Costco look at another option to keep the location of the gas station at the most southern portion of the site but rotate it 90 degrees. This north-south layout was analyzed in detail (Analyzed Alternative Site Plan figure provided in Appendix 1). This alternative layout of the fuel station has vehicles entering on the north and existing to the south. This alternative layout creates major conflict between the Costco Warehouse receiving truck maneuvering area and the queue area at the fuel station. In addition, the queue length for this alternative is only 82 feet which is below Costco’s minimum queue length area of 100 feet. This layout would also have 27 less parking stalls than the proposed fuel station layout. Based on the analysis, this alternative layout was not selected.

The proposed fuel addition would provide a total of 32 fueling positions. The queueing area beyond the pumps extending toward the parking area measures approximately 110 feet in depth. Figure 2 illustrates the queue storage area which holds 32 vehicles in queue in addition to the 32 vehicles at the fueling positions.

Vehicular queuing data has been collected at other representative Costco Gasoline fueling station sites to provide reliable information related to the anticipated queues for the proposed station. For purposes of this analysis, Costco Gasoline queuing data collected in 2016 and 2017 was gathered from six Costco Gasoline sites each having 22 or more fueling positions. Table 6 summarizes the four comparable locations. Observed queues were reported for maximum, average, and 95th percentile scenarios during both the Weekday PM peak hour and during a Weekend Midday peak. The 95th percentile queue is defined to be the queue length (in vehicles) that has only a 5-percent probability of being exceeded during the analysis time period. The industry standard methodology for queuing analysis considers the 95th percentile queues.

Table 6: Costco Gasoline Stacking Observations

Location	Dates Collected	Size (pumps)	Weekday PM Peak Queue				Weekend Midday Peak Queue			
			Min	Max	Average	95 th	Min	Max	Average	95 th
Tustin II, CA	7/28/16 & 7/30/16	22	11	35	26	34	14	38	29	35
Rohnert Park, CA	8/18/16 & 8/20/16	24	0	8	3	7	0	22	8	16
Concord, CA	8/25/16 & 8/27/16	24	0	10	3	8	11	32	19	28
NE San Jose, CA	2/9/17 & 2/11/17	24	6	6	1	3	10	31	20	29
Temecula, CA	12/8/2018 & 12/11/2018	30	0	24	11	18	5	26	16	22
Average		25	3	17	9	14	8	30	18	26

As shown in Table 6, the highest recorded 95th percentile queue was 35 vehicles observed at the Tustin II Costco Gasoline site during the Weekend Midday peak period while the lowest 95th percentile queue was 16 vehicles and was observed at both the Rohnert Park Costco Gasoline sites. The average 95th percentile queue for all four sites is 26 vehicles. Within the fuel station area, stacking space is provided for 40 vehicles. Therefore, 95th percentile as well as maximum observed queue of 35 vehicles can be accommodated. With the 32 vehicles fueling at the pump, a total of 72 vehicles can be accommodated without interfering with site operations.

Please note that recent data collection at the Temecula Costco site which was recently expanded to 30 fueling positions shows a maximum queue of 26 vehicles. Similar to the number of open cash registers at a grocery store, having more fueling positions available to serve members reduces the number of vehicles that have to wait in the queue. The same is anticipated at the Tustin Ranch site which is proposed to have 32 fueling positions.

The fuel station would be equipped with a red-light/green-light system to indicate which pump was open and available to the next person in line. This system improves station efficiency and helps shorten lines of waiting members. In addition, CostcoPay would be in place at the fuel station. The CostcoPay system provides members with a key-chain fob that contains membership and secure payment information. Using the fob instead of membership and credit cards reduces time at the pumps by approximately 35 seconds per transaction. The implementation of both these devices would help reduce time at the pumps which in turn reduces queues.

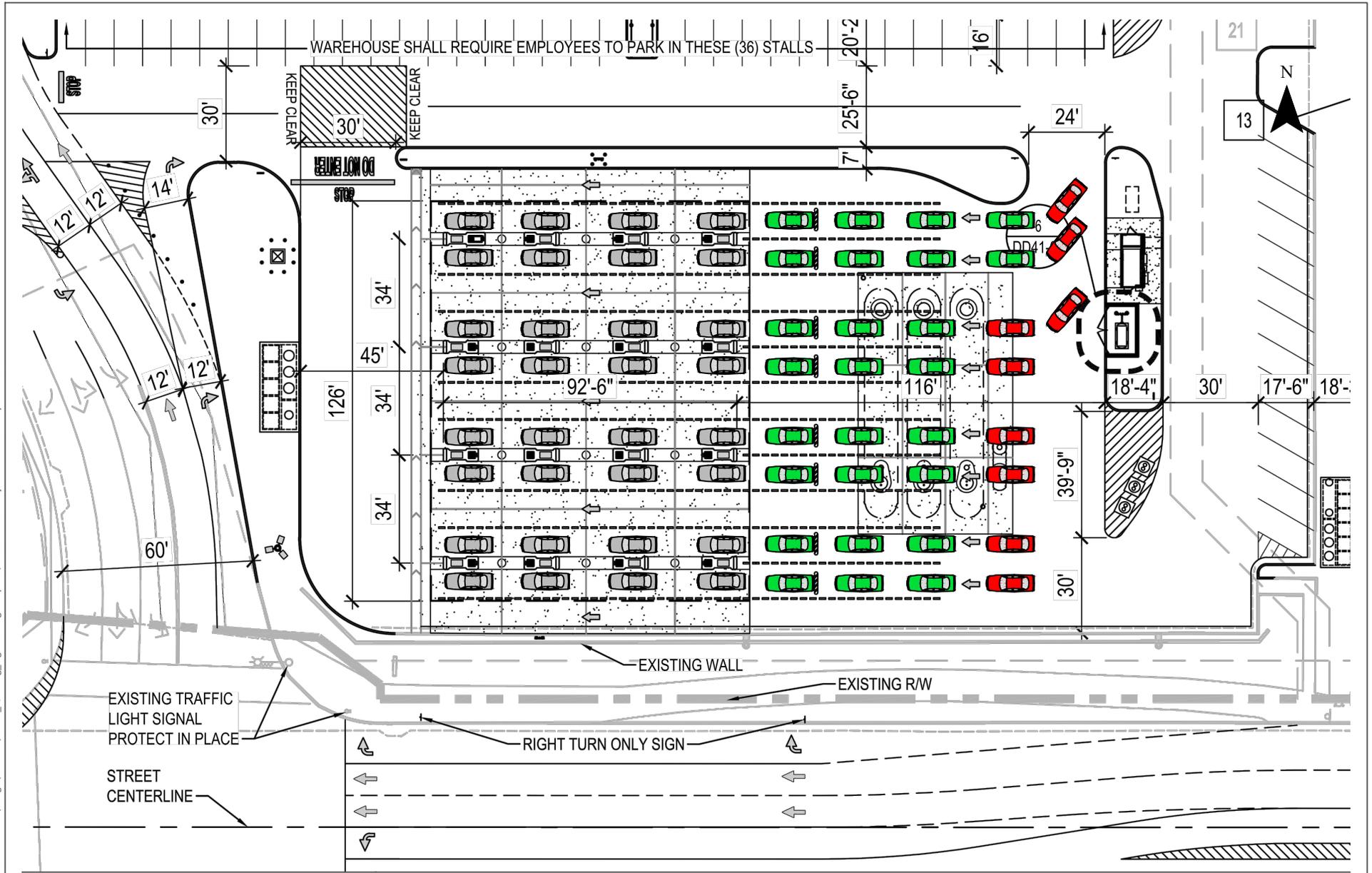
Although not expected, a queue management plan was developed for rare occurrences if the fuel station queues extend beyond the designated queue area. This plan is illustrated in Figure 3 and includes the following measures:

- Using cones/delineators limit access to the fuel station from the north entry. This would provide additional queueing space for vehicles in the north-south drive aisle.

If queues cannot be managed by the strategy shown in Figure 3, the northbound right turn into the parking aisle adjacent to the fuel station would be closed using bollards or similar retractable device to route members to the next parking aisle to provide more queuing area prior to affecting street operations (shown in Figure 4). Both queue strategies would be implemented when the queue reaches the fuel station exit. In addition, and as requested by the City, a second attendant would also be on-site at the fuel station when queues exceed the fuel station area.

It is important to note that the additional demand and resultant queuing shown in Figure 3 and 4 is not anticipated with the fuel station addition and is shown only to illustrate how the management plan would operate under extreme/unusual conditions. Implementation of this plan under such circumstances will effectively minimize the impacts of queued vehicles and limit impacts to parking supply, retain appropriate access and onsite circulation.

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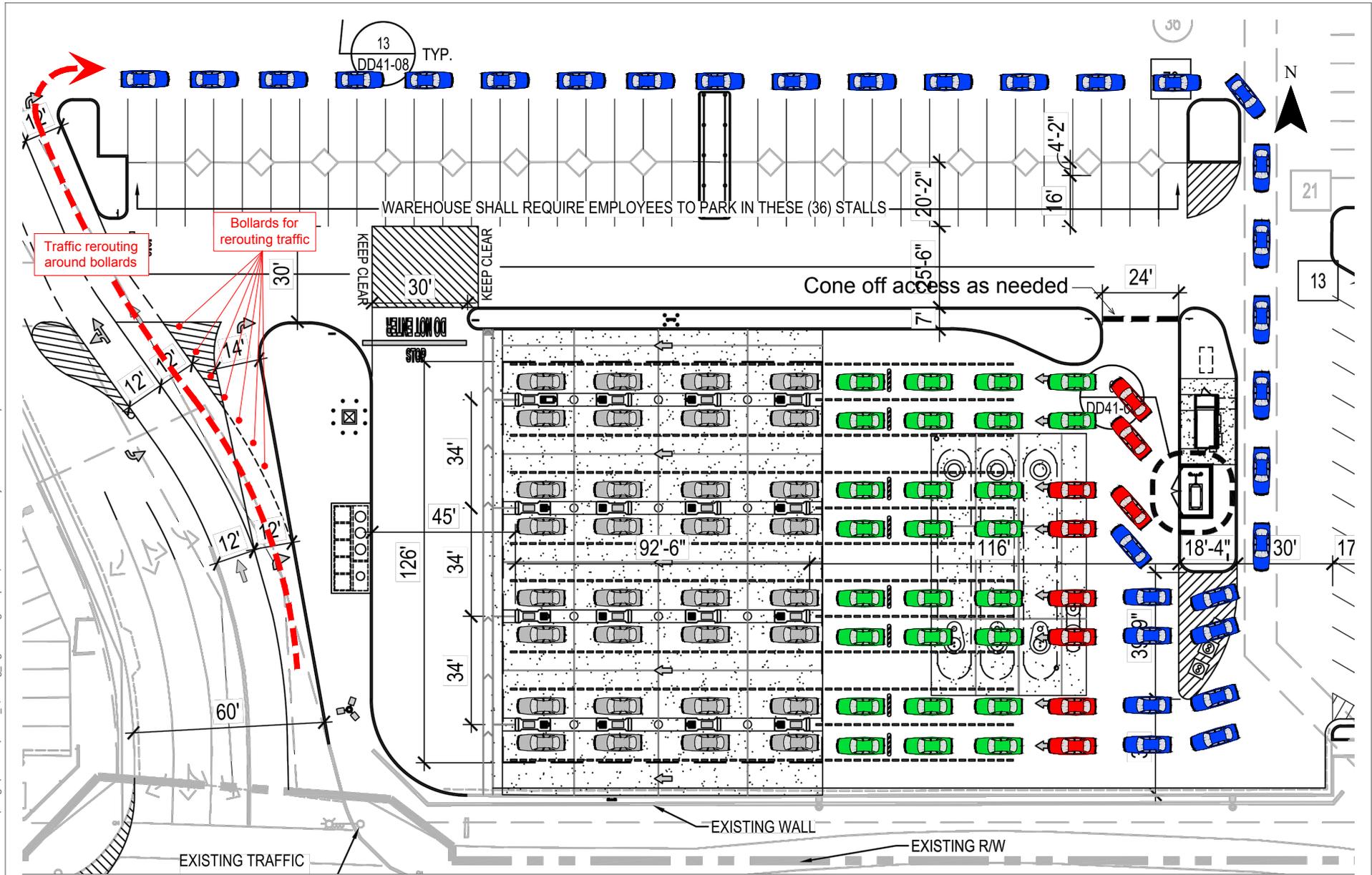


-  - 95th percentile queue
-  - Maximum observed queues

Stacking Plan
Tustin, California

Figure
2

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-  - 95th percentile queue
-  - Maximum observed queues
-  - Additional vehicles that can be accommodated prior to interfering with street circulation.

Queue Management Plan 2
Tustin, California

Figure
4

PARKING ANALYSIS

The proposed site for the fuel station is currently Costco Warehouse parking. To offset the parking lost due to construction of the fuel station, additional Costco Warehouse parking will be provided on the existing Goodyear service facility site which would be demolished as part of the Project. With the proposed Project the number of Costco Warehouse parking spaces would decrease from 623 stalls to 606 stalls. However, the parking provided will still exceed the City’s minimum parking requirement of 544 spaces. In addition, minimum parking requirements for the shopping center as a whole will be met. Shopping center parking requirements and supply by pad are shown in Table 7. Parking spaces abutting the fuel station would be designated for employees to limit interaction with fuel station operations.

Table 7: Proposed Shopping Center Parking Supply

Pad	City Parking Requirement	Supply
Costco (proposed)	544	606
Kmart	474	530
McDonald’s	18	55
Pad B	37	32
Pad C	37	32

While the City’s minimum parking requirements for the shopping center as a whole will be met, there are also opportunities for shared parking. Shared parking means that parking facilities are shared by more than one use, increasing the efficiency of the parking supply. Time-of-day factors for various land uses, published by the Urban Land Institute (ULI), show that utilization peaks at different times of day depending on the use. As shown in Table 8, peak utilization for different uses at the shopping center can take place at different times of the day.

Table 8: Weekday and Weekend Peak Parking Utilization

Land Use	Weekday Peak Utilization Hour(s)	Weekend Peak Utilization Hour(s)
Shopping Center (Typical)	1:00 p.m.	2:00 p.m. 3:00 p.m.
Fast Food	12:00 p.m. 1:00 p.m.	12:00 p.m. 1:00 p.m.
Medical Office	10:00 a.m. 11:00 a.m. 2:00 p.m. 3:00 p.m.	10:00 a.m. 11:00 a.m.

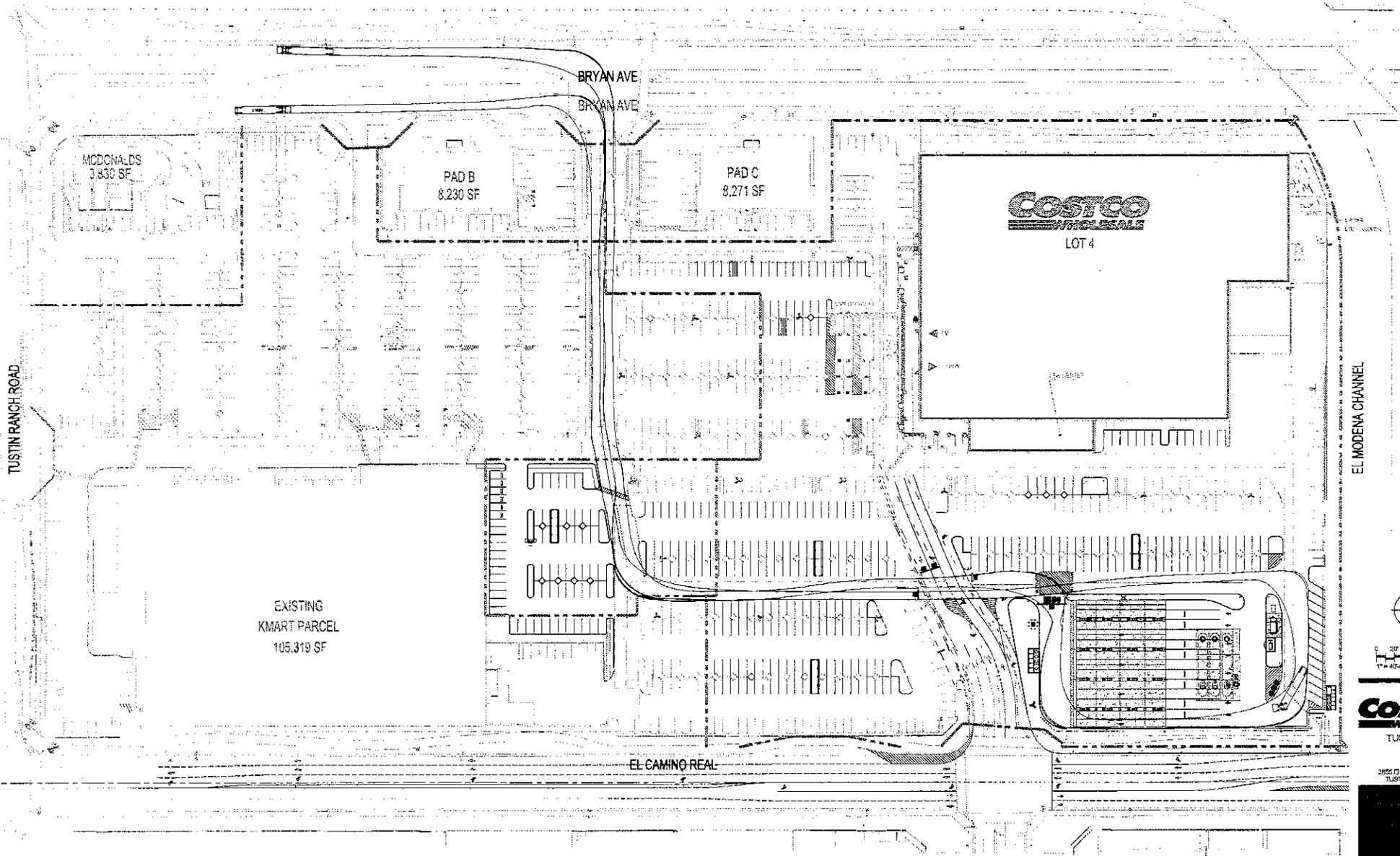
FUEL DELIVERY TRUCK SITE CIRCULATION

The City expressed concern on truck circulation turn templates provided as part of *Costco-Specific Trip Generation Information* memorandum (November 25, 2018). The turn template shown on the figures was run for the largest delivery vehicle used by Costco Wholesale. The largest truck, however, is larger than the fuel delivery trucks, therefore an updated truck turning template figure is provided to better outline the site circulation. As shown in Figure 5, the fuel truck (62.5 feet long) has a smaller turn radius and adequate spacing for maneuverability is provided on-site. As an alternative circulation path, the fuel delivery trucks can be directed to use the Bryan Avenue driveway.

SUMMARY OF FINDINGS

Based on the analysis provided in this memo, the Project would have the following effect on the topic areas requested for evaluation by the City:

- Level of service at study intersections:
 - All study intersections were found to operate at LOS B or better during the peak hour periods.
- Queuing at project driveways:
 - Project trips increase the northbound left turn and right turn queues exiting at Market Street & Bryan Avenue during the p.m. peak hour. These queues exceed the available storage length as measured to the first drive aisle but can be accommodated along the Market Street drive aisle. Queues can be reduced to be accommodated by the available storage through signal timing and increasing the signal timing split available for the northbound approach.
 - All other access points were found to have sufficient storage to accommodate Existing and Existing Plus Project queues.
- Fuel area stacking:
 - Adequate queuing capacity would be provided for the fuel station and queue management strategies can be implemented in the unlikely event that queues were to exceed available capacity.
- Parking analysis:
 - With the proposed changes to parking supply, City parking requirements will be met.
- Fuel delivery truck circulation:
 - The revised fuel delivery truck turn template shows adequate spacing for maneuverability on-site.



COSTCO WHOLESALE
TUSTIN, CALIFORNIA

FUEL DELIVERY ROUTE
APRIL 15, 2019

COSTCO WHOLESALE
TUSTIN, CA
#122

3855 EL CAMINO REAL
TUSTIN, CA 92782

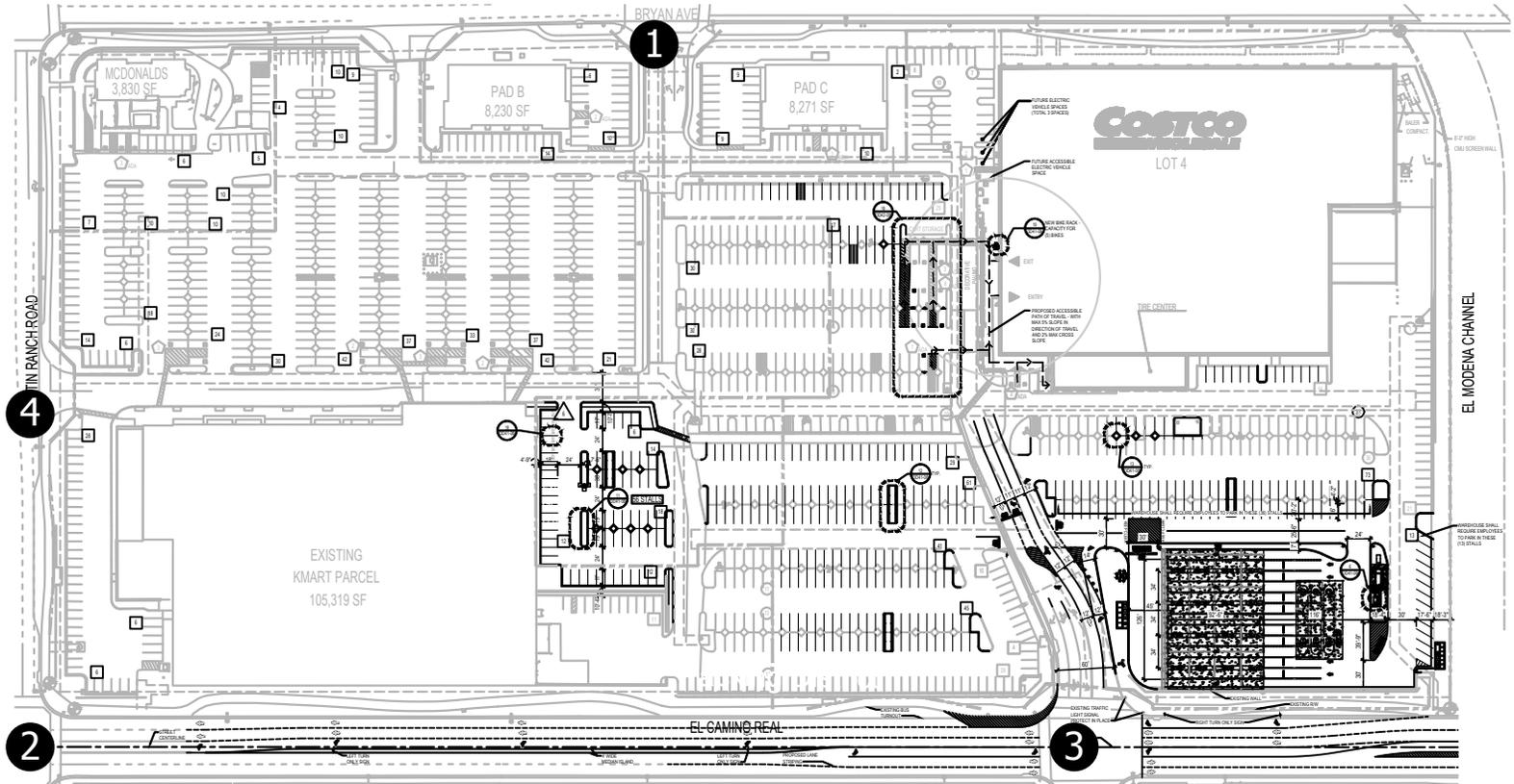


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APRIL 15, 2019
FUEL DELIVERY ROUTE
DD13-08

Appendix 1 Additional Figures

Tustin Ranch Costco Fuel Station Addition

<p>1 Market St. & Bryan Ave.</p> <p>46% / 24% 14% / 21%</p>
<p>2* Tustin Ranch Rd. & El Camino Real</p> <p>8% / 14% 19% / 9% 7% / 6%</p>
<p>3 Auto Center Dr. & El Camino Real</p> <p>17% / 28% 12% / 20%</p>
<p>4 Tustin Ranch Rd. & Driveway</p> <p>5% / 5% 5% / 5%</p>



*Intersection improvement project underway to provide a northbound right turn lane, a southbound right turn lane, an eastbound right turn lane, a second westbound left turn lane, and a westbound right turn lane.

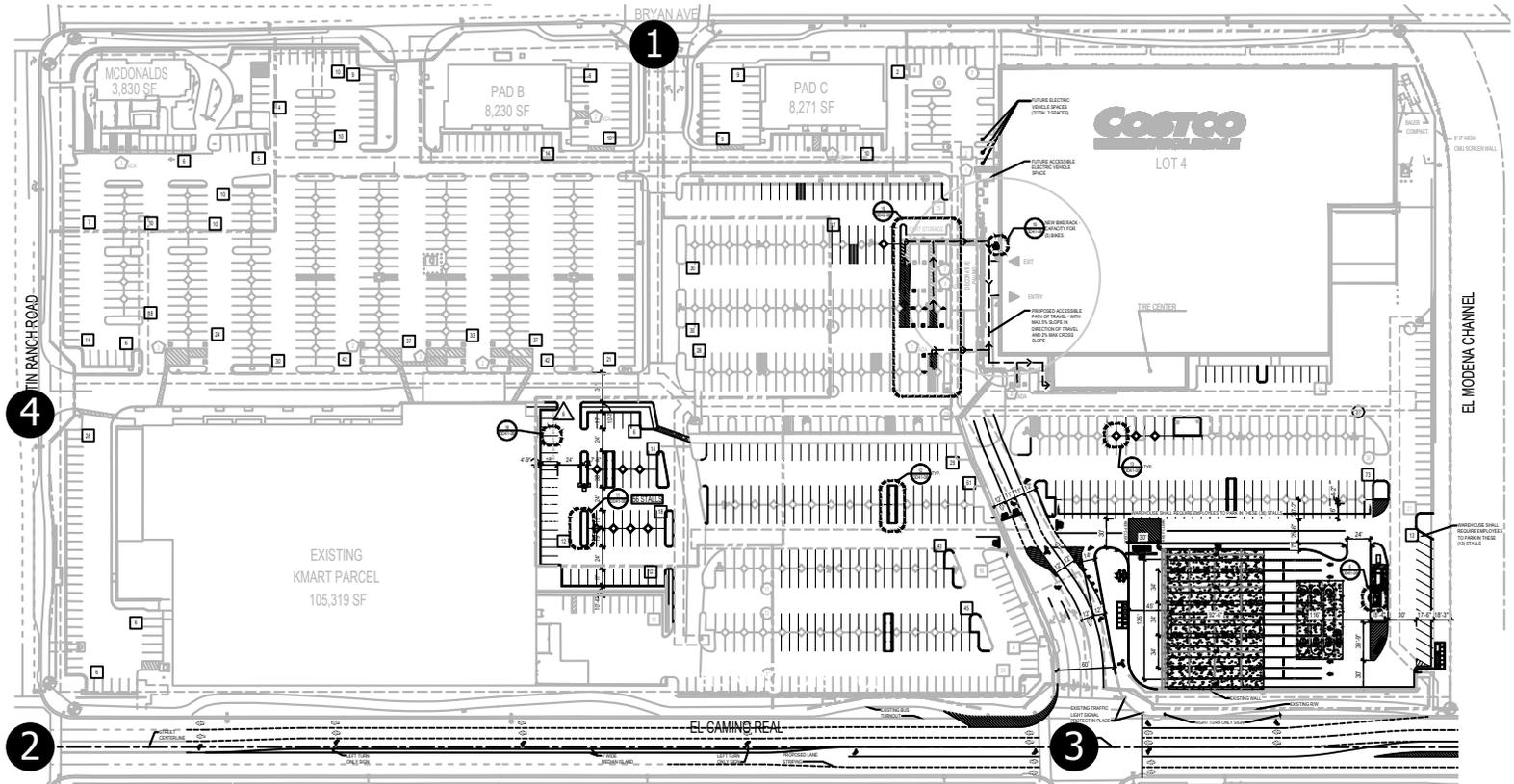
##/## AM/PM Inbound Trip Distribution
 ##/## AM/PM Outbound Trip Distribution

PROJECT TRIP DISTRIBUTION
 Tustin, California

Figure
 A-2

Tustin Ranch Costco Fuel Station Addition

1	Market St. & Bryan Ave.	<p>0/0 13/8</p> <p>0/0 4/7</p> <p>7/9</p> <p>6/10</p>
2*	Tustin Ranch Rd. & El Camino Real	<p>0/0 0/0 0/0</p> <p>0/0 2/2 0/0</p> <p>0/0 2/5 5/3</p> <p>2/5</p> <p>1/2</p> <p>0/0</p>
3	Auto Center Dr. & El Camino Real	<p>7/8 2/0 4/5</p> <p>5/10 0/0 0/0</p> <p>4/7 0/0 0/0</p> <p>0/0 2/1 0/0</p>
4	Tustin Ranch Rd. & Driveway	<p>1/2</p> <p>1/2</p> <p>0/0</p>



*Intersection improvement project underway to provide a northbound right turn lane, a southbound right turn lane, an eastbound right turn lane, a second westbound left turn lane, and a westbound right turn lane.

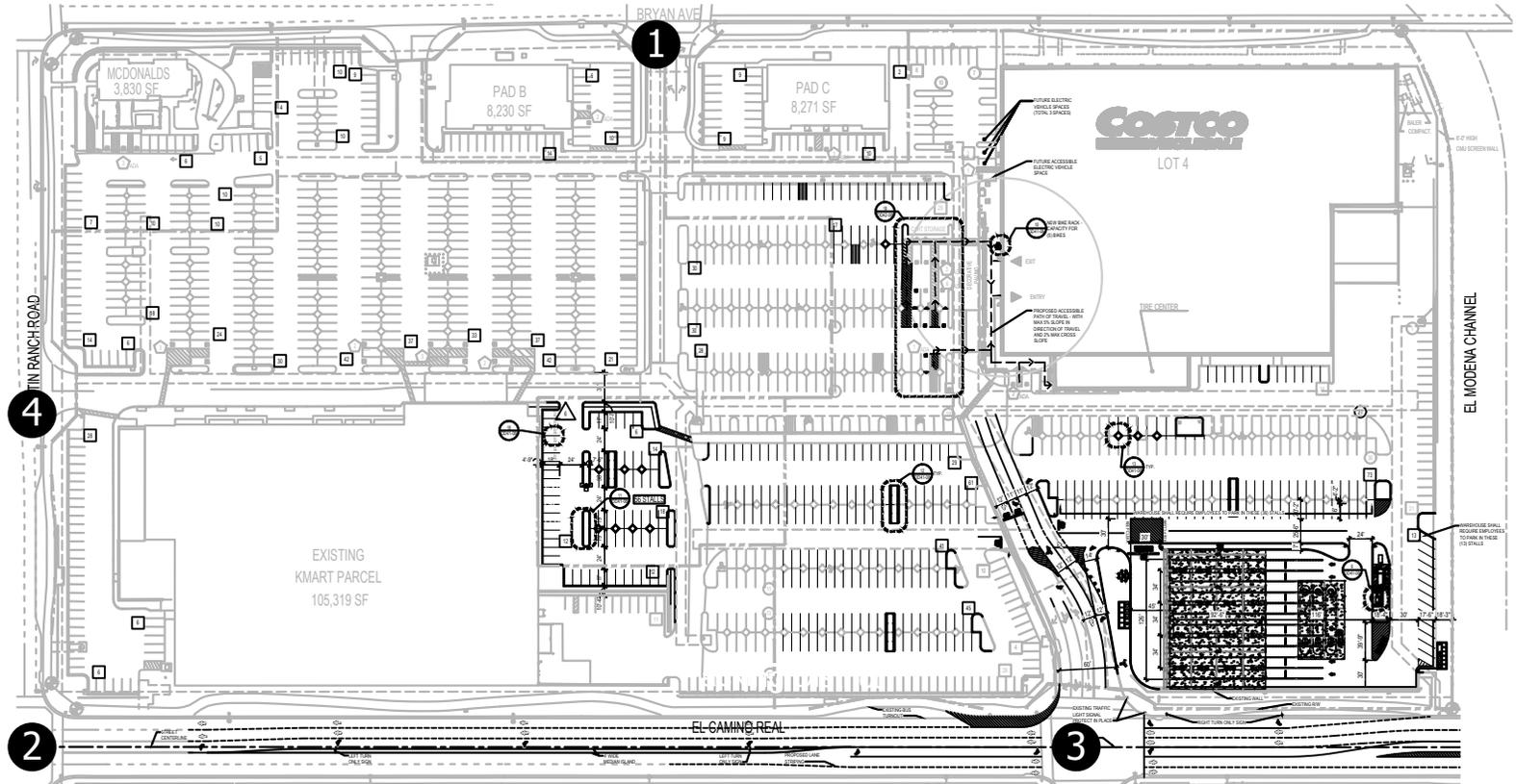
##/## AM/PM Peak Hour Volumes

PROJECT PRIMARY TRIP ASSIGNMENT
Tustin, California

Figure
A-3

Tustin Ranch Costco Fuel Station Addition

1	Market St. & Bryan Ave.	
2*	Tustin Ranch Rd. & El Camino Real	
3	Auto Center Dr. & El Camino Real	
4	Tustin Ranch Rd. & Driveway	



*Intersection improvement project underway to provide a northbound right turn lane, a southbound right turn lane, an eastbound right turn lane, a second westbound left turn lane, and a westbound right turn lane.

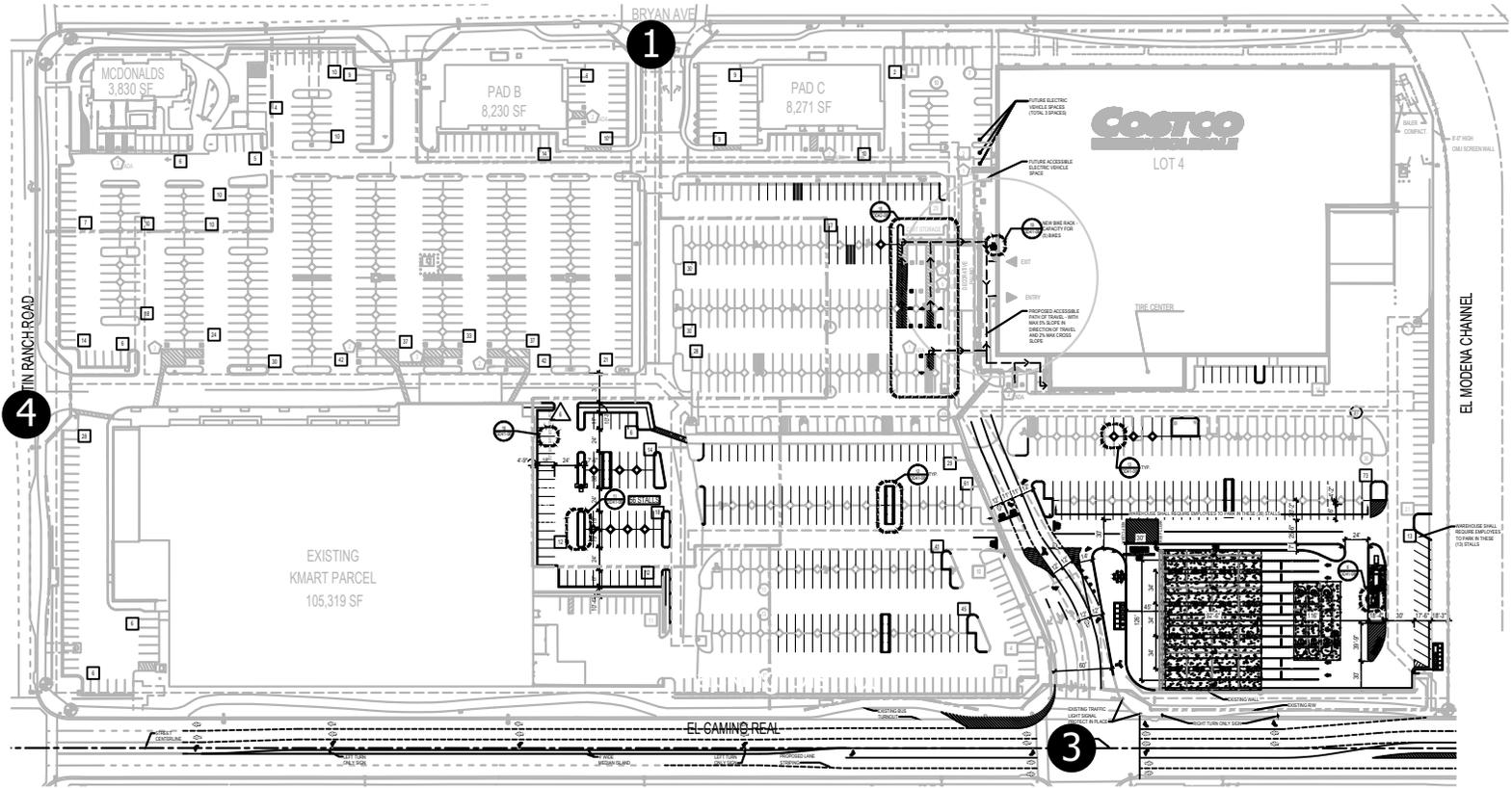
##/## AM/PM Peak Hour Volumes

PROJECT DIVERTED TRIP ASSIGNMENT
Tustin, California

Figure
A-4

Tustin Ranch Costco Fuel Station Addition

1	Market St. & Bryan Ave.
<p>← -17/-19 → 17/19</p> <hr/> <p>← -16/-15 → 16/15</p> <p>↻ 14/23</p> <p>↻ 13/18</p>	
3	Auto Center Dr. & El Camino Real
<p>↻ 11/19</p> <p>↻ 16/11</p> <p>↻ 8/24</p> <p>↻ 8/-24</p> <hr/> <p>↻ 13/14</p> <p>↻ -13/-14</p>	
4	Tustin Ranch Rd. & Driveway
<p>↻ 3/4</p> <hr/> <p>↻ 3/4</p> <p>↻ -3/-4</p>	



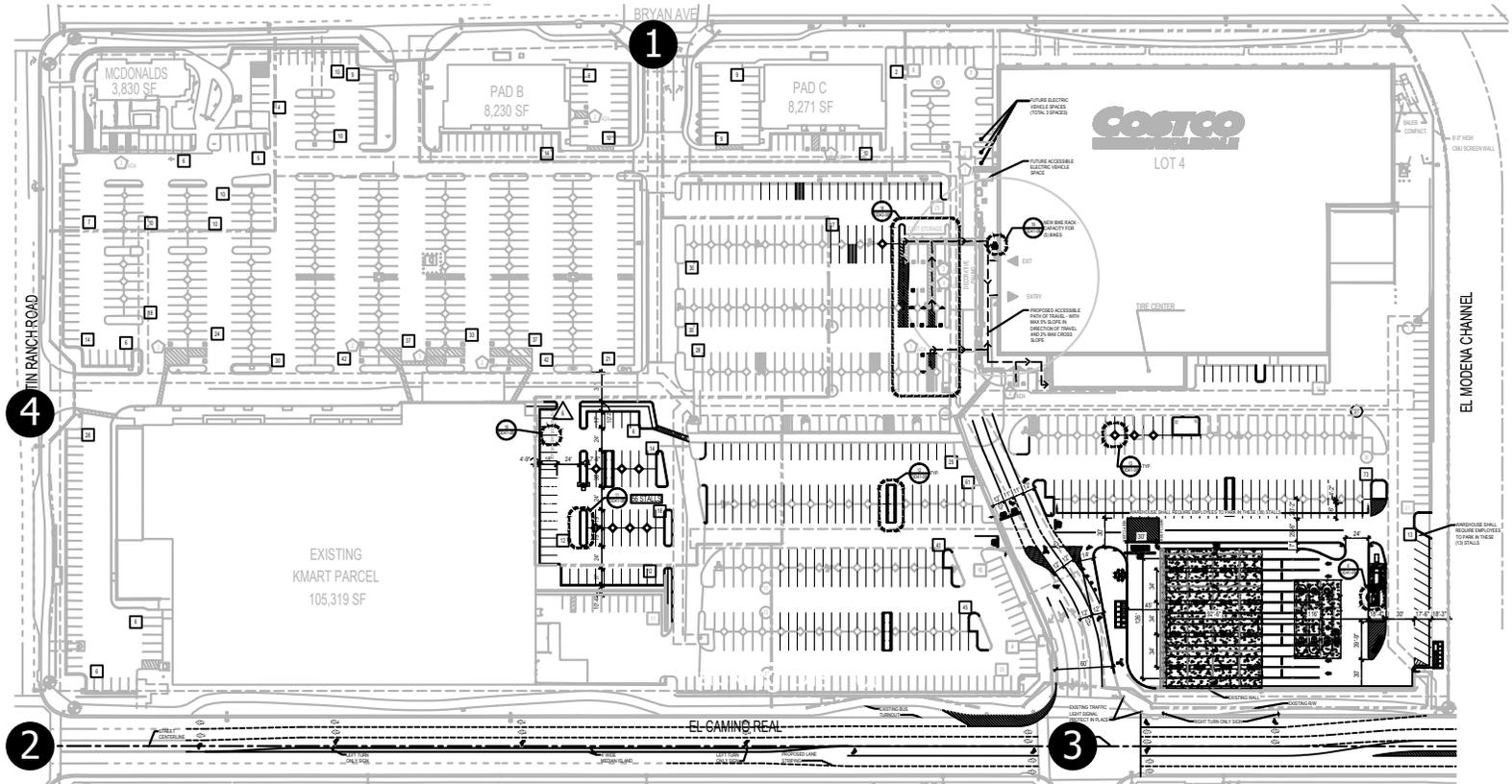
##/## AM/PM Peak Hour Volumes

PASS-BY TRIP ADJUSTMENT
Tustin, California

Figure
A-5

Tustin Ranch Costco Fuel Station Addition

1	Market St. & Bryan Ave.	
	← 648/821 ↖ 121/159	↗ 64/207 → 620/632 ↘ 47/137
2*	Tustin Ranch Rd. & El Camino Real	
	↖ 24/48 ↗ 2100/598 ↘ 124/96	↖ 54/254 ↗ 84/441 ↘ 190/285
3	Auto Center Dr. & El Camino Real	
	↖ 72/177 ↗ 13/7 ↘ 49/110	↖ 47/187 ↗ 247/768 ↘ 113/94
	↖ 41/128 ↗ 385/469 ↘ 52/20	↖ 63/171 ↗ 16/18 ↘ 15/43

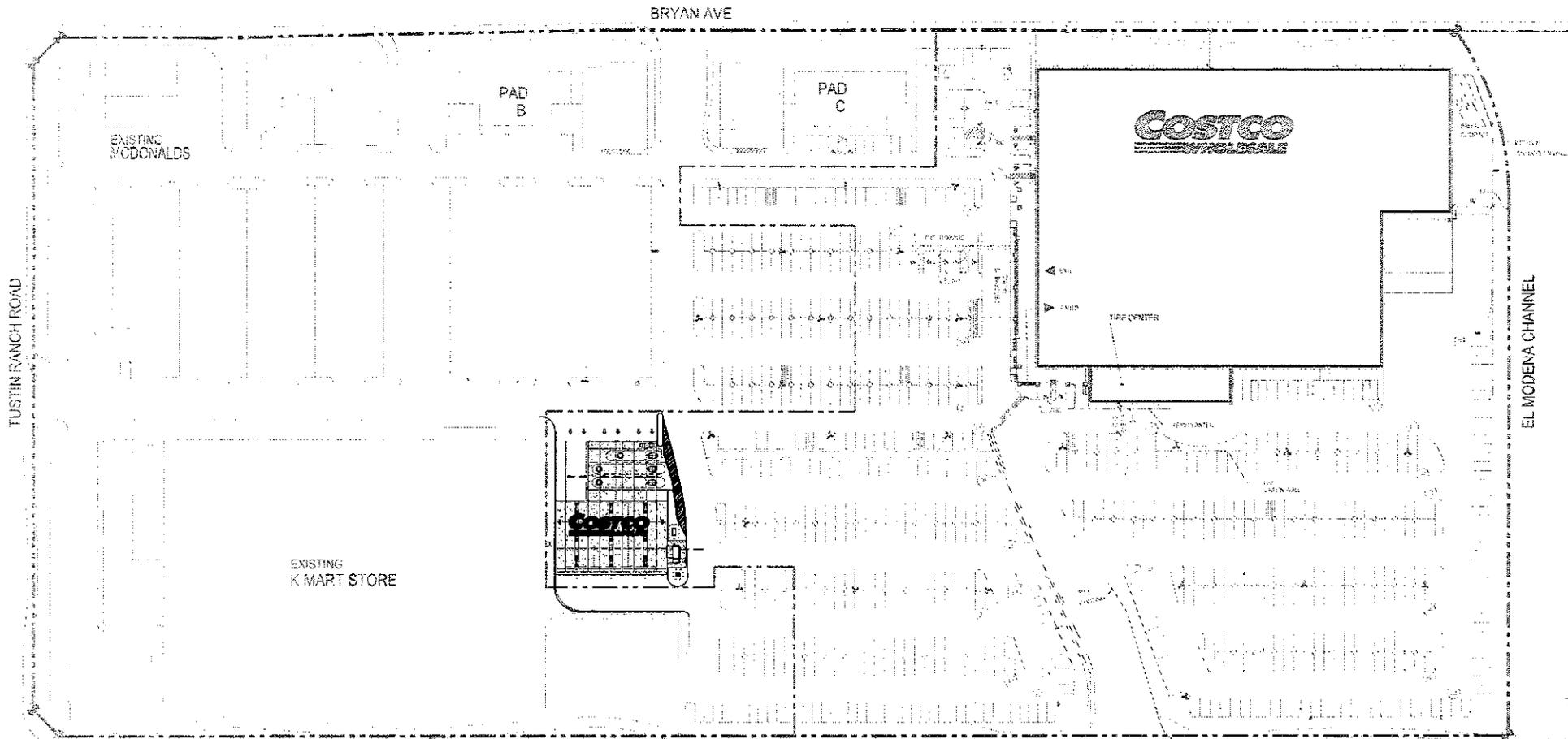


*Intersection improvement project underway to provide a northbound right turn lane, a southbound right turn lane, an eastbound right turn lane, a second westbound left turn lane, and a westbound right turn lane.

##/## AM/PM Peak Hour Volumes

EXISTING PLUS PROJECT TRIPS
Tustin, California

Figure
A-6



PROJECT DATA

CLIENT: COSTCO WHOLESALE
 999 LAKE DRIVE
 ISSAQUAH, WA 98027

PROJECT ADDRESS: 2655 EL CAMINO REAL
 TUSTIN, CA 92782

EXISTING SITE AREA: 10.96 ACRES (477,588 S.F.)
 GOOD YEAR SITE AREA: 1.00 ACRES (43,849 S.F.)
 TOTAL SITE AREA: 11.97 ACRES (521,537 S.F.)

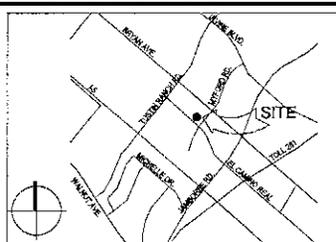
BOUNDARIES INFORMATION: THIS PLAN HAS BEEN PREPARED BY USING MULVANNY ARCHITECTS SITE PLAN DATED 9/97.

BUILDING DATA:
 BUILDING AREA 115,724 S.F.
 TIRE CENTER 5,196 S.F.
 TOTAL BUILDING 120,920 S.F.

NO. OF STALLS PER 1000 S.F. OF BUILDING AREA: 5.27 STALLS

PARKING DATA:	
① 9' WIDE STALLS	91 STALLS
② 10' WIDE STALLS	532 STALLS
③ HC HANDICAP STALLS	13 STALLS
TOTAL PARKING	636 STALLS
TOTAL SITE PARKING	1,317 STALLS
PROPOSED SITE PARKING:	
① 10' WIDE STALLS	-15 STALLS
③ HC HANDICAP STALLS	-2 STALLS
TOTAL SITE PARKING	1,300 STALLS

VICINITY MAP



NOTES:
 EXISTING CONDITIONS TO BE FIELD VERIFIED.

COSTCO WHOLESALE

TUSTIN, CALIFORNIA

PRELIMINARY REVIEW SITE PLAN

FEBRUARY 6, 2018

COSTCO WHOLESALE

TUSTIN, CA #122

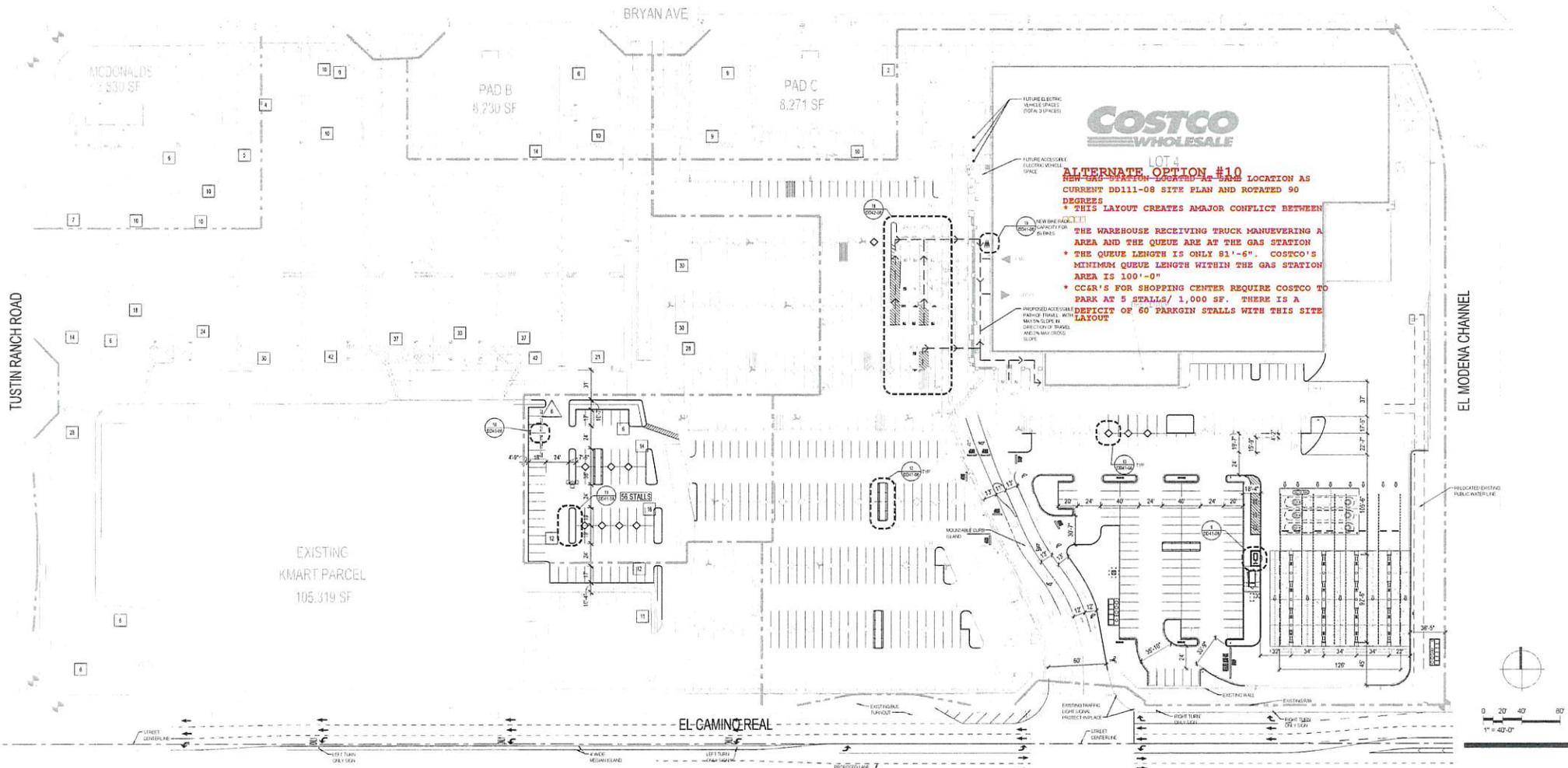
2655 EL CAMINO REAL TUSTIN, CA 92782

MG2

94-1380-23
 FEBRUARY 6, 2018

PRELIMINARY SITE PLAN

DD11.01



PROJECT DATA

CLIENT:	COSTCO WHOLESALE 999 LAKE DRIVE ISSAQUAH, WA 98027
PROJECT ADDRESS:	2655 EL CAMINO REAL TUSTIN, CA 92782
EXISTING SITE AREA:	10.96 ACRES (477,588 S.F.)
GOOD YEAR SITE AREA:	1.00 ACRES (43,949 S.F.)
TOTAL SITE AREA:	11.97 ACRES (521,537 S.F.)
BOUNDARIES INFORMATION:	THIS PLAN HAS BEEN PREPARED BY USING MULVANNY ARCHITECTS SITE PLAN DATED 9/97.
ZONING:	PC COMMERCIAL - E TUSTIN OVERLAY
EXISTING BUILDING DATA:	
EXISTING BUILDING AREA	115,724 S.F.
EXISTING TIRE CENTER	5,196 S.F.
EXISTING TOTAL BUILDING	120,920 S.F.
GOODYEAR TIRE CENTER - DEMO	9,136 S.F.

PROPOSED GAS: PROPOSED GAS CANOPY	12,684 S.F.
PROPOSED CONTROLLER ENCLOSURE	121 S.F.
EXISTING COSTCO PARKING:	
9' WIDE STALLS	116 STALLS
10' WIDE STALLS	494 STALLS
HANDICAP STALLS	13 STALLS
TOTAL PARKING	623 STALLS
NO. OF STALLS PER 100 S.F. OF BUILDING AREA:	5.15 STALLS
PROPOSED COSTCO PARKING:	
9' WIDE STALLS	434 STALLS
9' WIDE LOW EMISSION/ VAN POOL/ ELECTRICAL VEHICLE PARKING	6 STALLS
10' WIDE STALLS	126 STALLS
HANDICAP STALLS	13 STALLS
TOTAL PARKING	579 STALLS
REQ'D PARKING PER CITY: 4.5/1000	545 STALLS
REQ'D PARKING PER CC&R'S:	605 STALLS

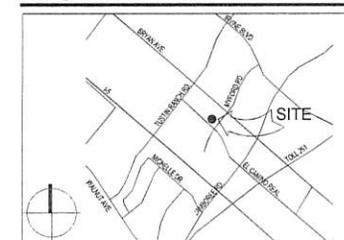
TOTAL ADDITIONAL PARKING SPACES RELATED TO 2016 CALIFORNIA GREEN BUILDING CODE:	56 STALLS
REQ'D SHORT TERM BICYCLE PARKING (5%): PROVIDED:	3 BIKES
REQ'D CLEAN AIR VEHICLE PARKING: PROVIDED:	5 BIKES
REQ'D FUTURE ELECTRIC VEHICLE CHARGING STATIONS: PROVIDED:	6 STALLS
	6 STALLS
	4 STALLS
	4 STALLS

SHOPPING CENTER PARKING DATA	
EXISTING KMART	
PARKING REQUIRED BY CITY	474 STALLS
105,319 S.F. X 4.5/1000:	474 STALLS
105,319 S.F. X 5.0/1000 PER CC&R'S:	527 STALLS
PARKING PROVIDED:	530 STALLS

EXISTING MCDONALDS	
PARKING REQUIRED BY CITY	18 STALLS
8,230 S.F. X 4.5/1000:	18 STALLS
PARKING PROVIDED:	55 STALLS

PAD B	
PARKING REQUIRED BY CITY	37 STALLS
8,230 S.F. X 4.5/1000:	37 STALLS
PARKING PROVIDED:	32 STALLS
PAD C	
PARKING REQUIRED BY CITY	37 STALLS
8,271 S.F. X 4.5/1000:	37 STALLS
PARKING PROVIDED:	32 STALLS
TOTAL PARKING REQ'D BY CITY:	566 STALLS
TOTAL PARKING REQ'D PER CC&R'S:	619 STALLS
TOTAL PROVIDED:	649 STALLS

VICINITY MAP



NOTES:
EXISTING CONDITIONS TO BE FIELD VERIFIED.

COSTCO WHOLESALE

TUSTIN, CALIFORNIA

ANALYZED ALTERNATIVE SITE PLAN

MARCH 15, 2019



TUSTIN, CA #122

2655 EL CAMINO REAL
TUSTIN, CA 92782

1151 Pacific Ave, Ste 110
Seattle, WA 98101
206.263.6500
MG2.com



94-1380-23
MARCH 15, 2019

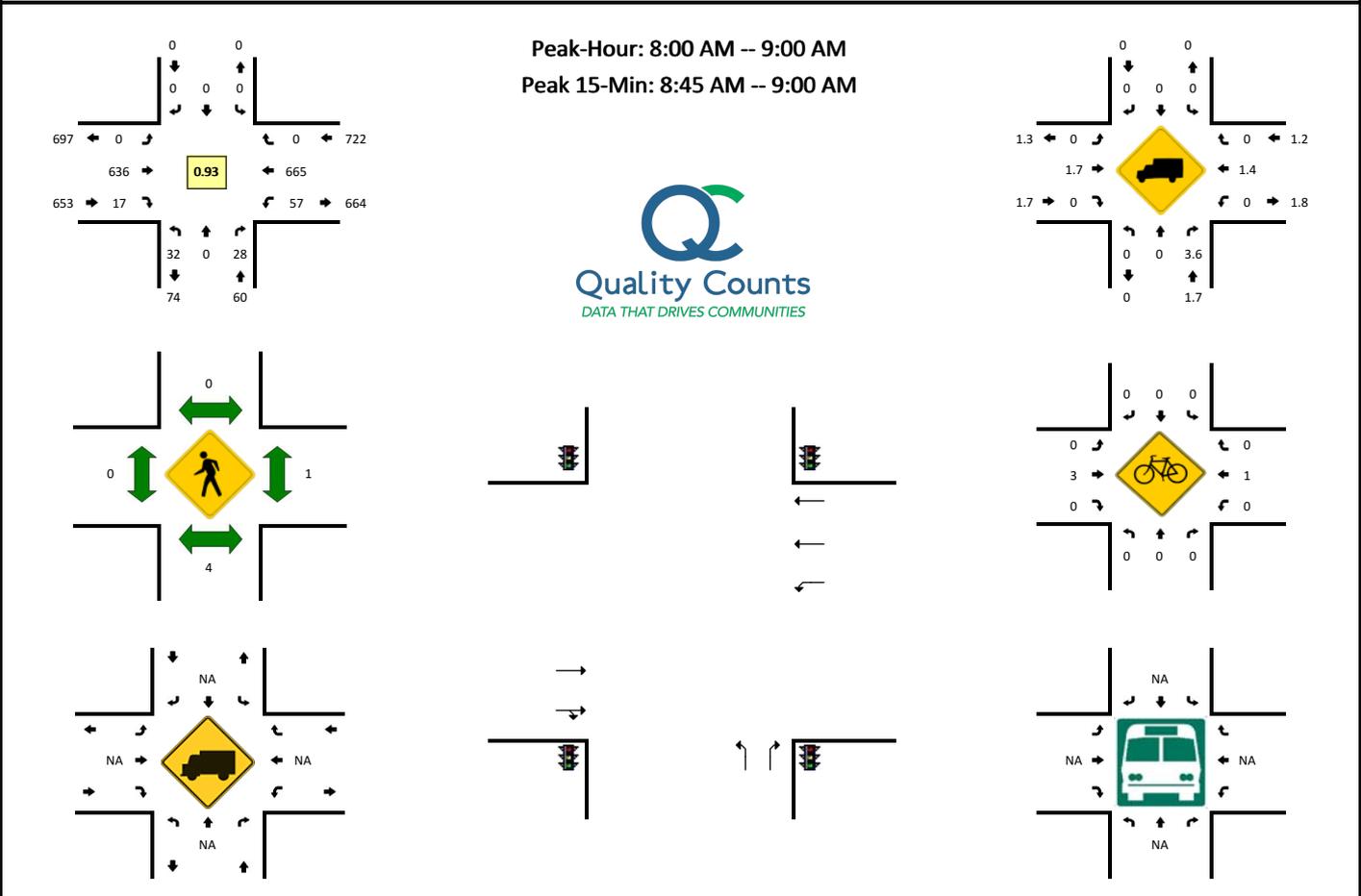
PROPOSED
SITE PLAN

DD11-10

Appendix 2 Traffic Counts

LOCATION: Market St -- Bryan Ave
CITY/STATE: Orange, CA

QC JOB #: 14853916
DATE: Wed, Nov 28 2018

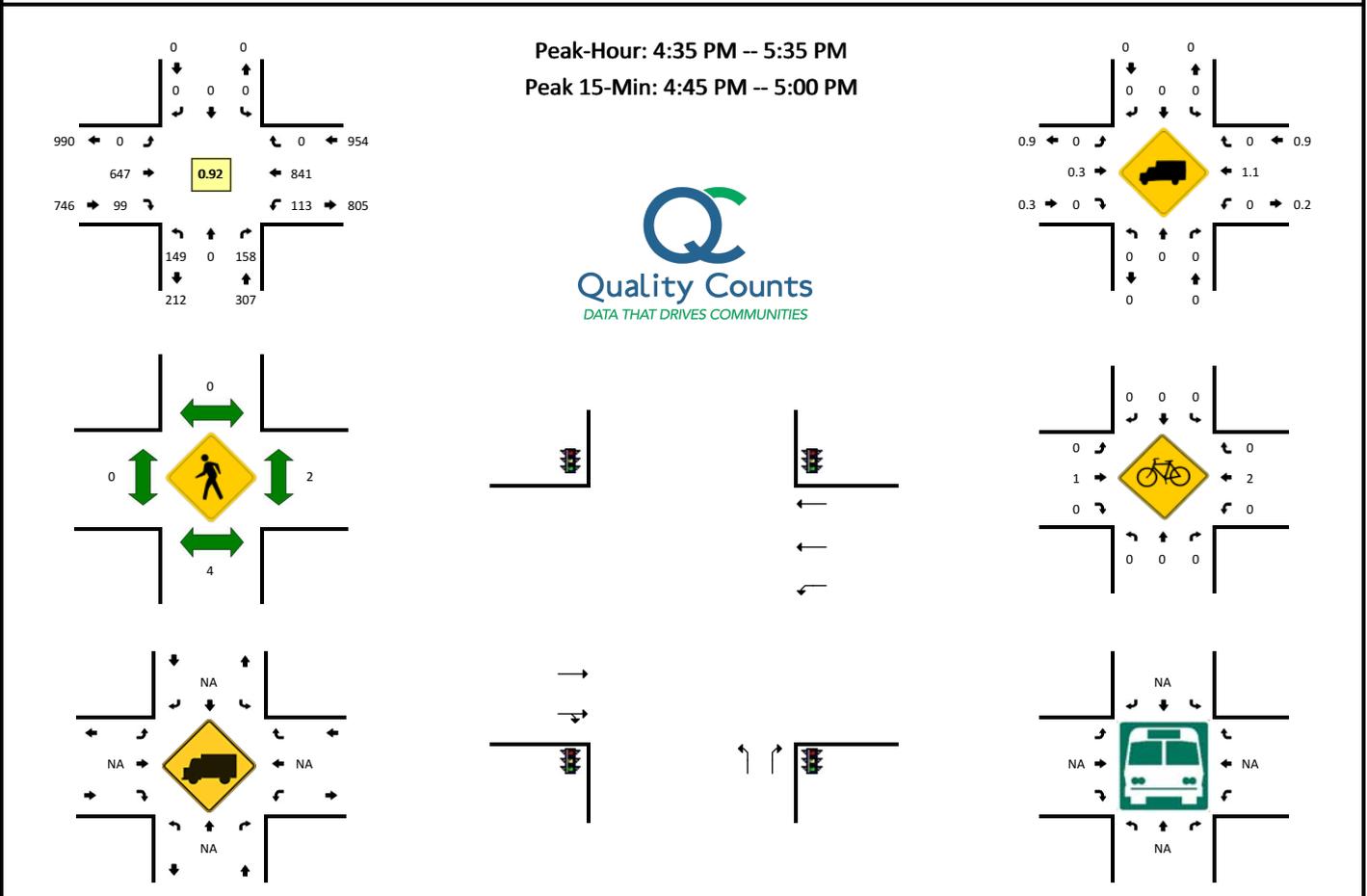


5-Min Count Period Beginning At	Market St (Northbound)				Market St (Southbound)				Bryan Ave (Eastbound)				Bryan Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	0	1	0	0	0	0	0	0	15	2	0	3	17	0	0	41	
7:05 AM	4	0	1	0	0	0	0	0	0	20	0	0	3	23	0	0	51	
7:10 AM	1	0	0	0	0	0	0	0	0	25	0	0	5	25	0	0	56	
7:15 AM	3	0	0	0	0	0	0	0	0	26	0	0	1	27	0	0	57	
7:20 AM	3	0	0	0	0	0	0	0	0	39	0	0	4	23	0	0	69	
7:25 AM	3	0	1	0	0	0	0	0	0	27	0	0	6	42	0	0	79	
7:30 AM	2	0	2	0	0	0	0	0	0	37	1	0	4	32	0	0	78	
7:35 AM	2	0	0	0	0	0	0	0	0	31	1	0	2	36	0	0	72	
7:40 AM	0	0	2	0	0	0	0	0	0	44	1	0	1	38	0	0	86	
7:45 AM	2	0	2	0	0	0	0	0	0	35	2	0	6	37	0	0	84	
7:50 AM	1	0	0	0	0	0	0	0	0	38	1	0	3	41	0	0	84	
7:55 AM	0	0	0	0	0	0	0	0	0	42	1	0	3	52	0	0	98	855
8:00 AM	4	0	2	0	0	0	0	0	0	52	2	0	4	43	0	0	107	921
8:05 AM	1	0	1	0	0	0	0	0	0	44	1	0	8	58	0	0	113	983
8:10 AM	5	0	1	0	0	0	0	0	0	49	0	0	4	42	0	0	101	1028
8:15 AM	1	0	5	0	0	0	0	0	0	53	2	0	5	57	0	0	123	1094
8:20 AM	3	0	3	0	0	0	0	0	0	45	1	0	4	59	0	0	115	1140
8:25 AM	2	0	3	0	0	0	0	0	0	47	2	0	5	73	0	0	132	1193
8:30 AM	4	0	4	0	0	0	0	0	0	49	1	0	3	57	0	0	118	1233
8:35 AM	1	0	1	0	0	0	0	0	0	58	0	0	6	67	0	0	133	1294
8:40 AM	1	0	1	0	0	0	0	0	0	56	2	0	4	45	0	0	109	1317
8:45 AM	2	0	1	0	0	0	0	0	0	65	2	0	3	61	0	0	134	1367
8:50 AM	3	0	2	0	0	0	0	0	0	63	2	0	7	49	0	0	126	1409
8:55 AM	5	0	4	0	0	0	0	0	0	55	2	0	4	54	0	0	124	1435
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	40	0	28	0	0	0	0	0	0	732	24	0	56	656	0	0	1536	
Heavy Trucks	0	0	4	0	0	0	0	0	0	20	0	0	0	16	0	0	40	
Pedestrians		4				0				0				0			4	
Bicycles	0	0	0		0	0	0		0	3	0		0	0	0		3	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Market St -- Bryan Ave
CITY/STATE: Orange, CA

QC JOB #: 14853917
DATE: Wed, Nov 28 2018

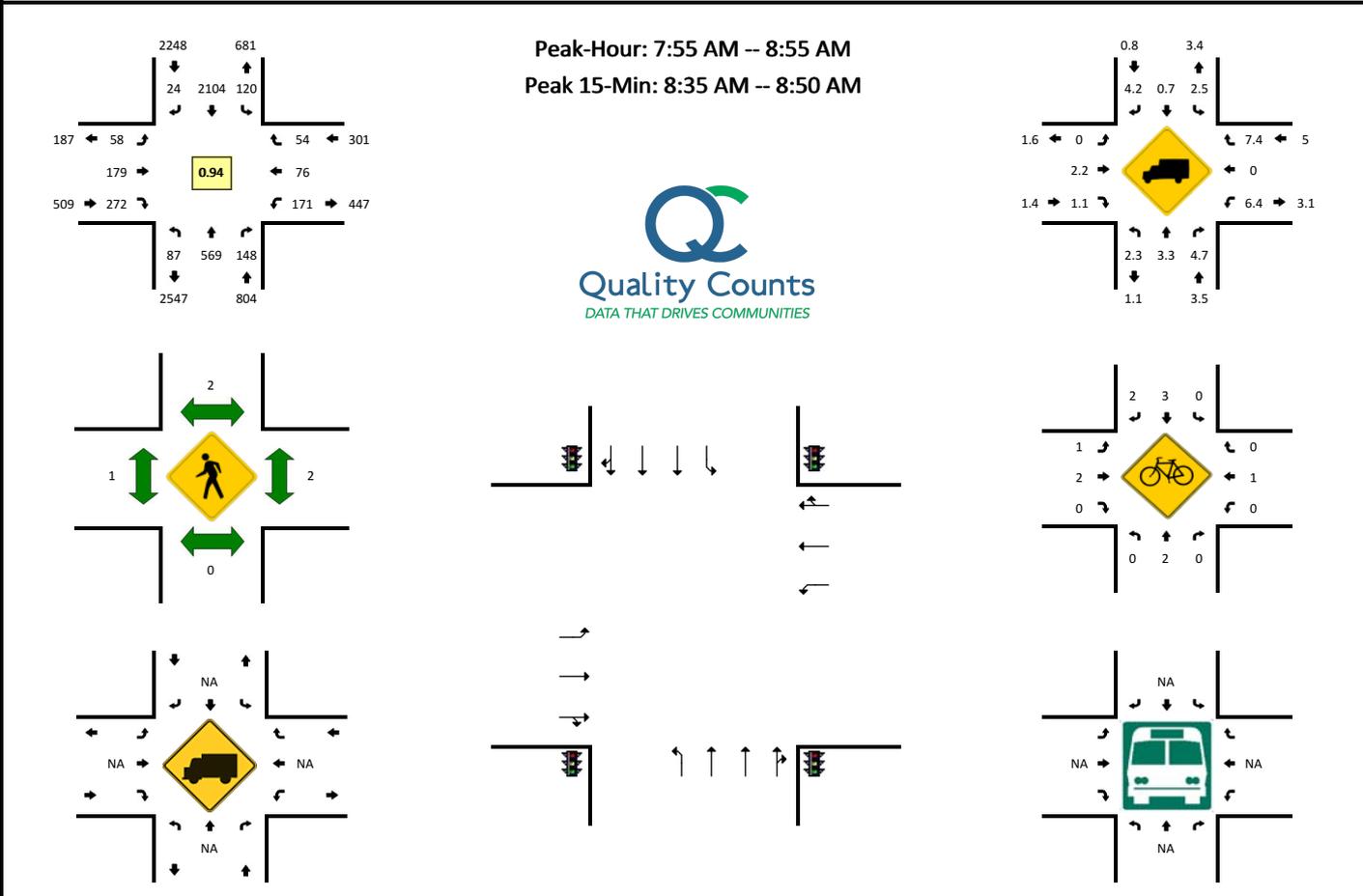


5-Min Count Period Beginning At	Market St (Northbound)				Market St (Southbound)				Bryan Ave (Eastbound)				Bryan Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	11	0	16	0	0	0	0	0	0	35	7	0	8	66	0	0	143	
4:05 PM	7	0	16	0	0	0	0	0	0	45	5	0	14	64	0	0	151	
4:10 PM	13	0	12	0	0	0	0	0	0	34	12	0	9	64	0	0	144	
4:15 PM	18	0	19	0	0	0	0	0	0	46	3	0	6	71	0	0	163	
4:20 PM	8	0	6	0	0	0	0	0	0	55	4	0	11	71	0	0	155	
4:25 PM	14	0	13	0	0	0	0	0	0	48	10	0	10	80	0	0	175	
4:30 PM	16	0	7	0	0	0	0	0	0	46	13	0	5	63	0	0	150	
4:35 PM	14	0	15	0	0	0	0	0	0	40	11	0	11	72	0	0	163	
4:40 PM	11	0	11	0	0	0	0	0	0	56	8	0	13	62	0	0	161	
4:45 PM	14	0	16	0	0	0	0	0	0	57	17	0	8	81	0	0	193	
4:50 PM	15	0	13	0	0	0	0	0	0	54	4	0	13	78	0	0	177	
4:55 PM	10	0	11	0	0	0	0	0	0	51	10	0	8	83	0	0	173	1948
5:00 PM	16	0	9	0	0	0	0	0	0	49	9	0	6	64	0	0	153	1958
5:05 PM	15	0	8	0	0	0	0	0	0	61	12	0	5	57	0	0	158	1965
5:10 PM	11	0	11	0	0	0	0	0	0	64	6	0	8	59	0	0	159	1980
5:15 PM	11	0	12	0	0	0	0	0	0	57	4	0	10	56	0	0	150	1967
5:20 PM	11	0	20	0	0	0	0	0	0	49	5	0	11	87	0	1	184	1996
5:25 PM	9	0	17	0	0	0	0	0	0	51	8	0	10	82	0	0	177	1998
5:30 PM	12	0	15	0	0	0	0	0	0	58	5	0	10	59	0	0	159	2007
5:35 PM	9	0	13	0	0	0	0	0	0	67	5	0	3	63	0	0	160	2004
5:40 PM	11	0	14	0	0	0	0	0	0	48	9	0	12	69	0	0	163	2006
5:45 PM	5	0	7	0	0	0	0	0	0	54	3	0	7	57	0	0	133	1946
5:50 PM	10	0	13	0	0	0	0	0	0	48	8	0	6	80	0	0	165	1934
5:55 PM	10	0	16	0	0	0	0	0	0	56	4	0	7	68	0	1	162	1923
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	156	0	160	0	0	0	0	0	0	648	124	0	116	968	0	0	2172	
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	12	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Tustin Ranch Rd -- El Camino Real
CITY/STATE: Tustin, CA

QC JOB #: 14853901
DATE: Wed, Nov 28 2018

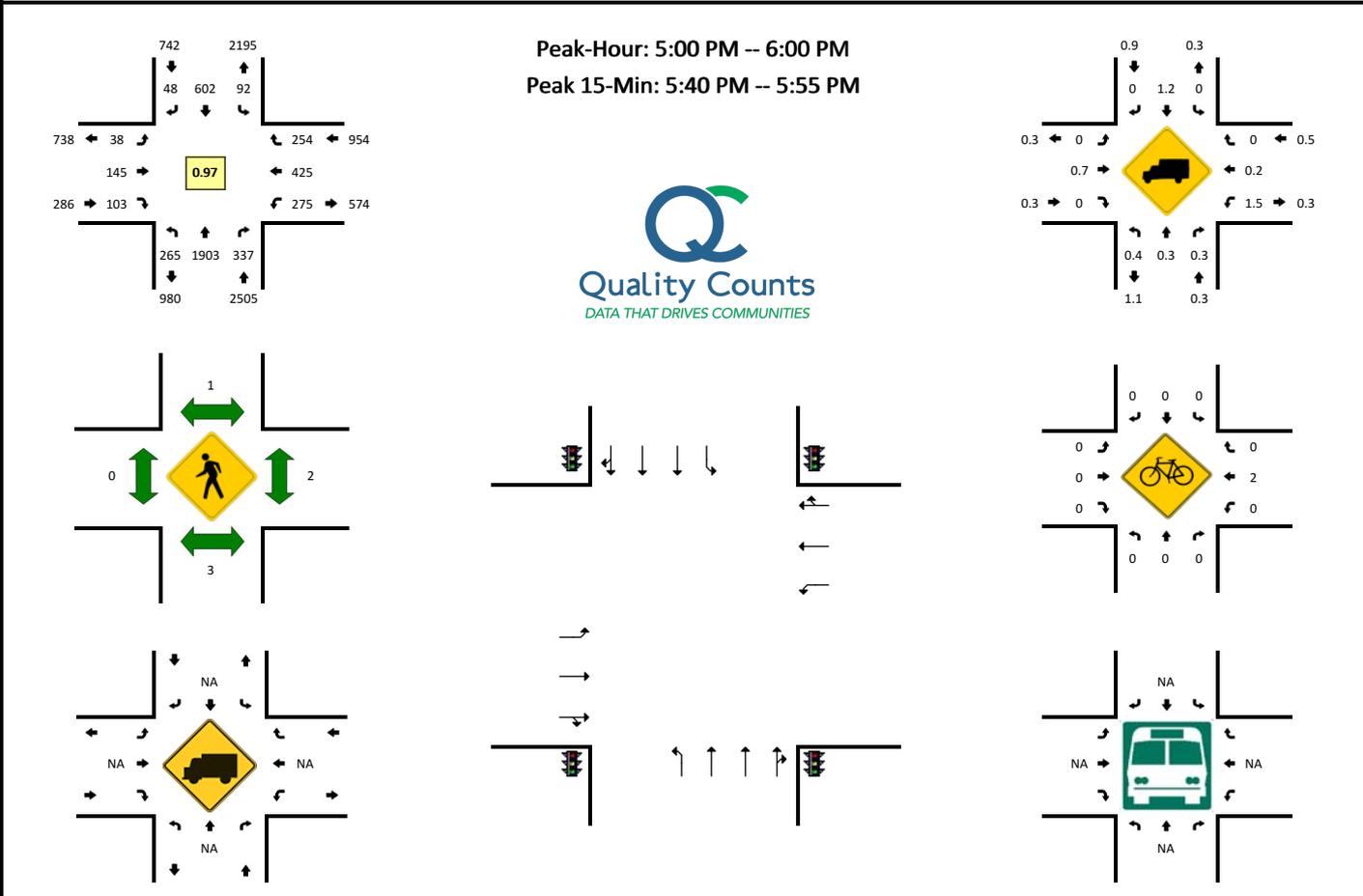


5-Min Count Period Beginning At	Tustin Ranch Rd (Northbound)				Tustin Ranch Rd (Southbound)				El Camino Real (Eastbound)				El Camino Real (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	2	21	10	0	8	105	0	1	2	10	12	0	8	2	4	0	185	
7:05 AM	2	26	8	0	3	90	1	0	1	3	11	0	15	4	4	0	168	
7:10 AM	6	32	7	0	5	108	0	0	3	9	16	0	10	5	2	0	203	
7:15 AM	2	36	8	0	4	116	1	0	2	10	13	0	14	1	3	0	210	
7:20 AM	4	42	7	0	6	152	0	0	2	3	22	0	10	2	6	0	256	
7:25 AM	3	30	5	1	8	163	2	1	3	3	19	0	15	2	1	0	256	
7:30 AM	5	42	17	0	5	150	1	0	4	12	28	0	15	5	2	0	286	
7:35 AM	6	39	6	0	5	134	2	0	7	5	33	0	17	5	2	0	261	
7:40 AM	5	46	15	0	6	199	1	0	5	16	30	0	13	8	1	0	345	
7:45 AM	6	64	12	0	4	197	2	0	5	7	21	0	14	4	1	0	337	
7:50 AM	5	47	4	0	9	152	1	0	1	11	31	0	11	9	7	0	288	
7:55 AM	4	52	15	1	5	152	1	0	4	10	15	0	16	4	7	0	286	3081
8:00 AM	9	50	14	0	8	173	2	0	5	4	16	0	8	5	3	0	297	3193
8:05 AM	2	63	13	1	13	147	5	0	7	19	28	0	18	8	2	0	326	3351
8:10 AM	2	60	16	0	8	185	2	0	3	11	20	0	8	12	3	0	330	3478
8:15 AM	6	50	10	0	7	196	2	0	5	13	17	0	13	8	7	0	334	3602
8:20 AM	7	46	9	0	7	163	0	0	3	13	21	0	26	7	5	0	307	3653
8:25 AM	8	47	12	0	13	213	3	0	2	14	24	0	14	2	2	0	354	3751
8:30 AM	7	32	10	0	10	160	1	0	5	20	25	0	11	5	4	0	290	3755
8:35 AM	19	47	5	0	9	181	1	2	4	19	22	0	10	10	3	0	332	3826
8:40 AM	12	43	13	0	9	204	4	1	7	14	24	0	16	3	4	0	354	3835
8:45 AM	8	40	15	0	14	180	2	0	9	17	32	0	16	7	6	0	346	3844
8:50 AM	3	37	16	0	17	146	1	1	4	25	28	0	15	5	8	0	306	3862
8:55 AM	5	58	25	0	9	134	5	0	1	12	14	0	7	9	6	0	285	3861
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	156	520	132	0	128	2272	28	12	80	200	312	0	168	80	52	0	4140	
Heavy Trucks	4	4	8		4	20	0		0	12	4		24	0	8		88	
Pedestrians		0				4				4				0			8	
Bicycles	0	2	0		0	2	0		1	0	0		0	1	0		6	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Tustin Ranch Rd -- El Camino Real
CITY/STATE: Tustin, CA

QC JOB #: 14853902
DATE: Wed, Nov 28 2018

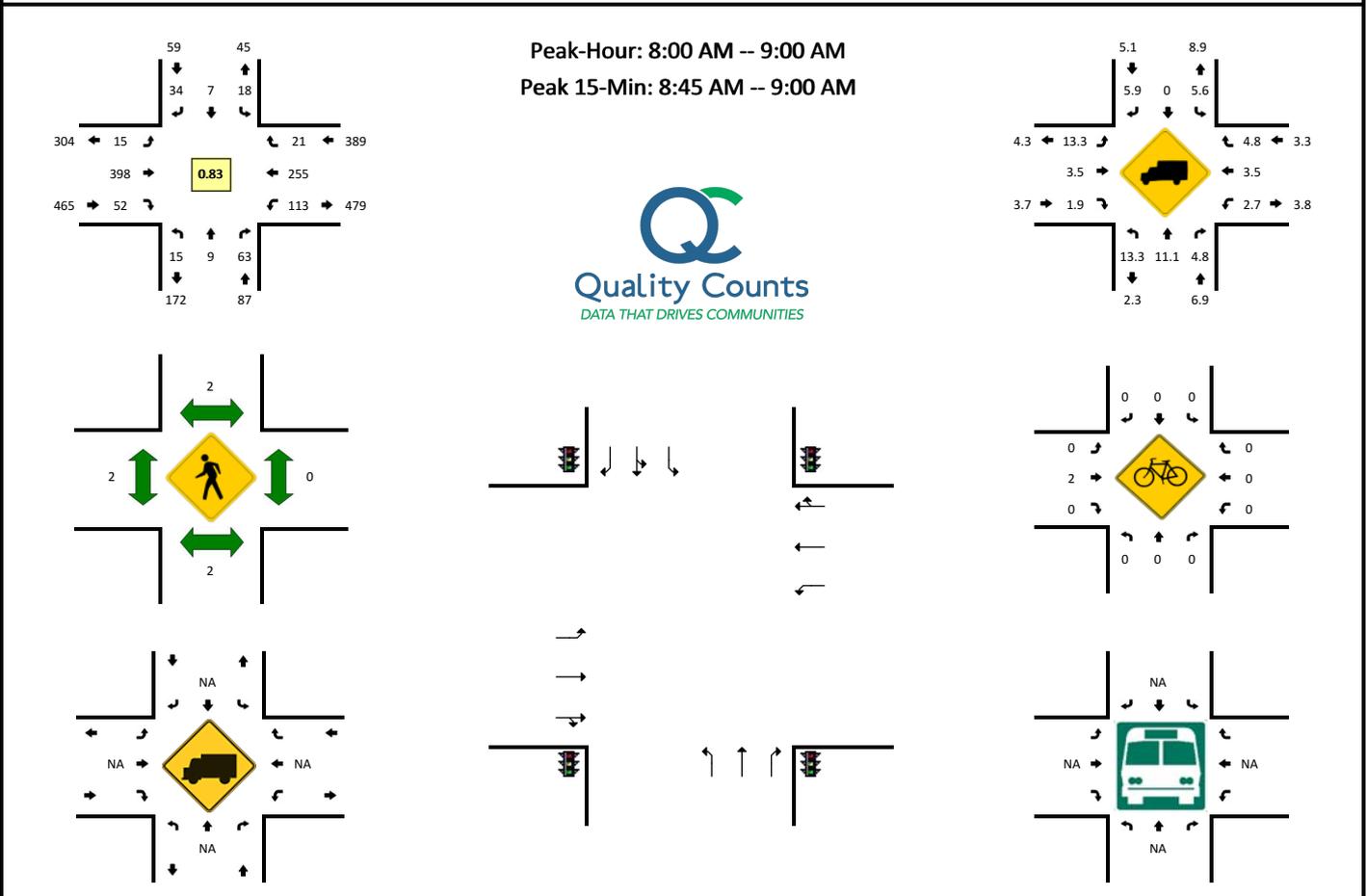


5-Min Count Period Beginning At	Tustin Ranch Rd (Northbound)				Tustin Ranch Rd (Southbound)				El Camino Real (Eastbound)				El Camino Real (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	7	85	21	0	3	42	2	1	6	22	8	0	23	33	15	0	268	
4:05 PM	12	120	17	0	8	73	2	0	6	9	7	0	21	19	17	0	311	
4:10 PM	13	121	23	0	8	61	3	0	0	3	16	0	27	44	29	0	348	
4:15 PM	13	101	22	3	3	45	2	0	5	17	9	0	33	47	23	0	323	
4:20 PM	19	134	25	1	8	51	2	0	3	8	6	0	15	37	23	0	332	
4:25 PM	22	116	31	0	9	53	7	1	1	14	10	0	26	40	17	0	347	
4:30 PM	16	123	40	0	9	35	4	0	2	11	13	0	17	33	15	0	318	
4:35 PM	25	161	20	0	7	64	5	0	4	10	8	0	21	17	7	0	349	
4:40 PM	25	127	28	0	15	49	2	0	5	18	9	0	20	51	21	0	370	
4:45 PM	12	121	33	1	7	53	1	0	3	22	7	0	20	37	20	0	337	
4:50 PM	20	115	23	0	10	53	1	0	2	10	6	0	23	31	24	0	318	
4:55 PM	19	136	29	1	5	62	5	0	0	6	6	0	28	38	21	0	356	3977
5:00 PM	34	175	15	0	6	58	5	0	1	8	6	0	24	32	27	0	391	4100
5:05 PM	18	143	27	1	9	43	4	1	3	15	19	0	15	43	22	0	363	4152
5:10 PM	20	122	30	0	14	53	1	2	2	6	10	0	39	44	27	0	370	4174
5:15 PM	18	165	25	4	8	69	4	0	6	14	6	0	35	39	26	0	419	4270
5:20 PM	10	140	27	0	10	40	8	0	4	9	13	0	20	31	25	0	337	4275
5:25 PM	25	157	30	1	12	63	5	0	0	10	6	0	21	24	14	0	368	4296
5:30 PM	17	141	22	2	11	34	3	1	5	19	10	0	21	45	20	0	351	4329
5:35 PM	14	157	28	0	8	41	4	0	1	10	11	0	33	31	21	0	359	4339
5:40 PM	21	190	32	0	2	63	1	0	1	14	6	0	12	28	15	0	385	4354
5:45 PM	26	142	27	0	4	36	5	0	5	12	6	0	23	38	21	0	345	4362
5:50 PM	35	188	36	0	5	71	4	0	3	8	5	0	17	31	20	0	423	4467
5:55 PM	27	173	38	2	3	27	4	0	7	20	5	0	15	39	16	0	376	4487
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	328	2080	380	0	44	680	40	0	36	136	68	0	208	388	224	0	4612	
Heavy Trucks	0	12	0		0	8	0		0	0	0		0	0	0		20	
Pedestrians		0				4				0				0			4	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Costco Dwy/Auto Center Dr -- El Camino Real
CITY/STATE: Tustin, CA

QC JOB #: 14853904
DATE: Wed, Nov 28 2018

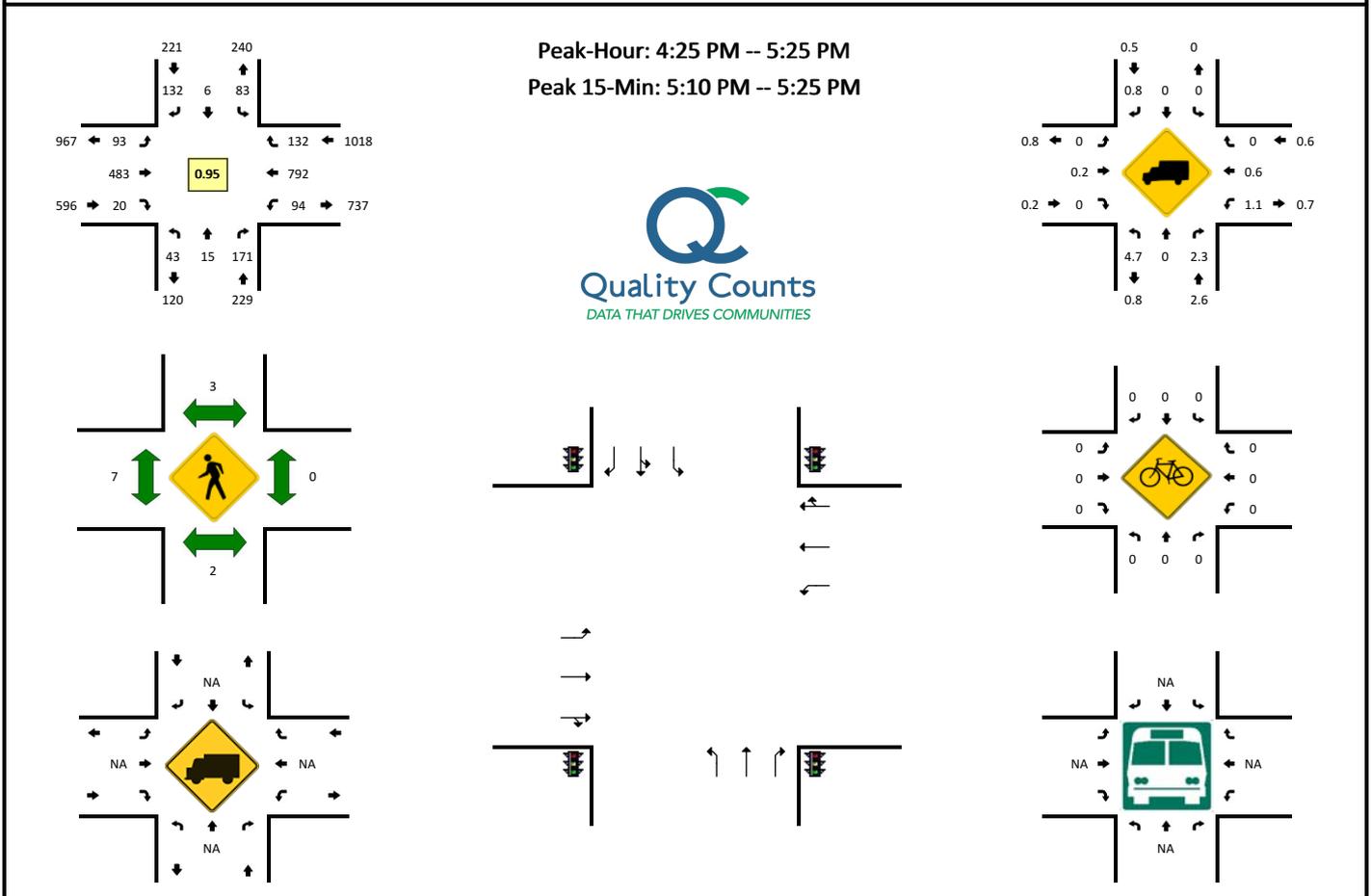


5-Min Count Period Beginning At	Costco Dwy/Auto Center Dr (Northbound)				Costco Dwy/Auto Center Dr (Southbound)				El Camino Real (Eastbound)				El Camino Real (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	1	0	1	1	2	0	1	24	3	0	4	14	1	0	52	
7:05 AM	0	0	1	0	2	0	1	0	0	14	1	0	7	19	1	0	46	
7:10 AM	1	1	2	0	3	1	2	0	0	20	1	0	7	16	0	0	54	
7:15 AM	0	0	1	0	0	0	2	0	0	18	1	0	3	15	2	0	42	
7:20 AM	1	0	1	0	0	1	2	0	0	15	4	0	2	18	0	0	44	
7:25 AM	0	0	0	0	3	1	1	0	0	14	2	0	5	17	0	0	43	
7:30 AM	0	1	0	0	1	0	4	0	2	22	5	0	8	19	4	0	66	
7:35 AM	0	0	5	0	0	0	5	0	0	14	4	0	11	20	0	0	59	
7:40 AM	0	0	0	0	1	2	2	0	2	31	3	0	7	19	3	0	70	
7:45 AM	0	0	5	0	1	0	1	0	1	22	2	0	12	20	2	0	66	
7:50 AM	1	0	1	0	1	0	3	0	0	18	7	0	9	22	0	0	62	
7:55 AM	1	0	4	0	2	2	1	0	2	25	2	0	10	21	2	0	72	676
8:00 AM	1	0	3	0	1	1	1	0	1	22	5	0	11	21	2	0	69	693
8:05 AM	0	0	3	0	0	1	2	0	2	38	3	0	7	20	0	0	76	723
8:10 AM	1	2	8	0	0	0	5	0	3	28	2	0	3	19	0	0	71	740
8:15 AM	2	0	4	0	0	1	5	0	1	23	4	0	9	26	3	0	78	776
8:20 AM	2	1	7	0	0	1	3	0	0	31	4	0	6	27	2	0	84	816
8:25 AM	1	0	4	0	5	2	3	0	3	32	4	0	13	17	0	0	84	857
8:30 AM	0	1	5	0	1	0	4	0	0	36	4	0	11	12	4	0	78	869
8:35 AM	0	1	6	0	3	0	0	0	0	24	5	0	16	28	0	0	83	893
8:40 AM	2	0	4	0	0	0	3	0	0	31	7	0	10	18	1	0	76	899
8:45 AM	2	0	5	0	3	1	2	0	1	37	6	0	5	26	3	0	91	924
8:50 AM	2	0	10	0	2	0	5	0	1	48	5	0	9	15	2	0	99	961
8:55 AM	2	4	4	0	3	0	1	0	3	48	3	0	13	26	4	0	111	1000
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	24	16	76	0	32	4	32	0	20	532	56	0	108	268	36	0	1204	
Heavy Trucks	4	4	4		0	0	8		0	28	4		4	8	0		64	
Pedestrians		4				0				4				0			8	
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Costco Dwy/Auto Center Dr -- El Camino Real
CITY/STATE: Tustin, CA

QC JOB #: 14853905
DATE: Wed, Nov 28 2018



5-Min Count Period Beginning At	Costco Dwy/Auto Center Dr (Northbound)				Costco Dwy/Auto Center Dr (Southbound)				El Camino Real (Eastbound)				El Camino Real (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	2	16	0	6	0	15	0	9	38	2	0	8	43	7	0	146	
4:05 PM	5	2	6	0	7	1	13	0	7	21	1	0	13	64	13	0	153	
4:10 PM	3	4	13	0	7	1	16	0	6	30	0	0	5	79	6	0	170	
4:15 PM	4	2	18	0	6	1	10	0	8	37	1	0	9	67	9	0	172	
4:20 PM	3	3	11	0	11	1	9	0	8	26	0	0	15	66	16	0	169	
4:25 PM	0	0	17	0	6	3	8	0	9	37	1	0	7	59	10	0	157	
4:30 PM	4	2	14	0	6	0	8	0	6	60	3	0	9	61	11	0	184	
4:35 PM	4	1	5	0	7	0	13	0	7	30	3	0	12	50	11	0	143	
4:40 PM	7	6	19	0	9	0	11	0	6	51	2	0	7	65	8	0	191	
4:45 PM	3	1	10	0	5	0	6	0	11	55	0	0	8	52	17	0	168	
4:50 PM	3	0	16	0	6	2	10	0	8	32	2	0	9	61	11	0	160	
4:55 PM	7	0	8	0	3	1	10	0	5	31	2	0	7	84	19	0	177	1990
5:00 PM	2	1	20	0	4	0	18	0	8	28	3	0	5	66	13	0	168	2012
5:05 PM	7	0	22	0	11	0	5	0	6	34	1	0	9	74	5	0	174	2033
5:10 PM	2	1	8	0	8	0	20	0	12	45	0	0	7	82	10	0	195	2058
5:15 PM	3	0	15	0	8	0	11	0	9	35	1	0	5	73	9	0	169	2055
5:20 PM	1	3	17	0	10	0	12	0	6	45	2	0	9	65	8	0	178	2064
5:25 PM	1	0	12	0	13	1	13	0	10	42	0	0	5	46	10	0	153	2060
5:30 PM	1	1	14	0	6	0	12	0	9	42	0	0	7	68	13	0	173	2049
5:35 PM	1	0	15	0	11	0	19	0	9	36	1	0	4	53	8	0	157	2063
5:40 PM	4	3	10	0	8	2	6	0	10	40	0	0	8	67	7	0	165	2037
5:45 PM	2	4	16	0	3	1	13	0	10	34	0	0	3	62	9	0	157	2026
5:50 PM	0	1	13	0	2	1	13	0	5	40	1	0	3	50	12	0	141	2007
5:55 PM	0	1	19	0	6	0	6	0	11	50	1	0	7	58	8	0	167	1997
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	24	16	160	0	104	0	172	0	108	500	12	0	84	880	108	0	2168	
Heavy Trucks	4	0	0	0	0	0	0	0	0	0	0	0	4	8	0	0	16	
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

Comments:

Appendix 3 ICU Worksheets

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 1. MARKET ST. & BRYAN AVE.
Description: EXISTING CONDITIONS

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.00	N-S(1):	0.00
	TH	0.00	0	0	0.00 *	N-S(2):	0.02 *
	LT	0.00	0	0	0.00	E-W(1):	0.22 *
Westbound	RT	0.00	0	0	0.00	E-W(2):	0.20
	TH	2.00	665	3,400	0.20	V/C:	0.24
	LT	1.00	57	1,700	0.03 *	Lost Time:	0.05
Northbound	RT	1.00	28	1,700	0.00	ITS:	0.00
	TH	0.00	0	0	0.00	ICU:	0.29
	LT	1.00	32	1,700	0.02 *	LOS:	A
Eastbound	RT	0.00	17	0	0.00		
	TH	2.00	636	3,400	0.19 *		
	LT	0.00	0	0	0.00		

Date/Time: PM PEAK HOUR (4:35-5:35)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	0.00	0	0	0.00	N-S(1):	0.04
	TH	0.00	0	0	0.00 *	N-S(2):	0.09 *
	LT	0.00	0	0	0.00	E-W(1):	0.29 *
Westbound	RT	0.00	0	0	0.00	E-W(2):	0.25
	TH	2.00	840	3,400	0.25	V/C:	0.38
	LT	1.00	114	1,700	0.07 *	Lost Time:	0.05
Northbound	RT	1.00	158	1,700	0.04	ITS:	0.00
	TH	0.00	0	0	0.00	ICU:	0.43
	LT	1.00	149	1,700	0.09 *	LOS:	A
Eastbound	RT	0.00	99	0	0.00		
	TH	2.00	647	3,400	0.22 *		
	LT	0.00	0	0	0.00		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 2. TUSTIN RANCH RD. & EL CAMINO REAL
Description: EXISTING CONDITIONS

Date/Time: AM PEAK HOUR (7:55-8:55)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	24	1,700	0.00	N-S(1):	0.15
	TH	3.00	2,100	5,100	0.41 *	N-S(2):	0.44 *
	LT	2.00	124	3,400	0.04	E-W(1):	0.19 *
Westbound	RT	1.00	54	1,700	0.00	E-W(2):	0.05
	TH	2.00	76	3,400	0.02	V/C:	0.63
	LT	2.00	171	3,400	0.05 *	Lost Time:	0.05
Northbound	RT	1.00	148	1,700	0.05	ITS:	0.00
	TH	3.00	567	5,100	0.11	ICU:	0.68
	LT	2.00	89	3,400	0.03 *	LOS:	B
Eastbound	RT	1.00	272	1,700	0.14 *		
	TH	2.00	179	3,400	0.05		
	LT	1.00	58	1,700	0.03		

Date/Time: PM PEAK HOUR (5:00-6:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	48	1,700	0.01	N-S(1):	0.40 *
	TH	3.00	598	5,100	0.12	N-S(2):	0.20
	LT	2.00	96	3,400	0.03 *	E-W(1):	0.12
Westbound	RT	1.00	254	1,700	0.13	E-W(2):	0.15 *
	TH	2.00	425	3,400	0.13 *	V/C:	0.55
	LT	2.00	275	3,400	0.08	Lost Time:	0.05
Northbound	RT	1.00	337	1,700	0.14	ITS:	0.00
	TH	3.00	1,893	5,100	0.37 *	ICU:	0.60
	LT	2.00	275	3,400	0.08	LOS:	A
Eastbound	RT	1.00	103	1,700	0.00		
	TH	2.00	145	3,400	0.04		
	LT	1.00	38	1,700	0.02 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 3. AUTO CENTER DR. & EL CAMINO REAL
Description: EXISTING CONDITIONS

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	34	1,700	0.01	N-S(1):	0.02 *
	TH	0.56	7	952	0.01	N-S(2):	0.00
	LT	1.44	18	2,448	0.01 *	E-W(1):	0.20 *
Westbound	RT	0.00	21	0	0.00	E-W(2):	0.09
	TH	2.00	255	3,400	0.08	V/C:	0.22
	LT	1.00	113	1,700	0.07 *	Lost Time:	0.05
Northbound	RT	1.00	63	1,700	0.00	ITS:	0.00
	TH	1.00	9	1,700	0.01	ICU:	0.27
	LT	1.00	15	1,700	0.01 *	LOS:	A
Eastbound	RT	0.00	52	0	0.00		
	TH	2.00	398	3,400	0.13 *		
	LT	1.00	15	1,700	0.01		

Date/Time: PM PEAK HOUR (4:25-5:25)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	132	1,700	0.04 *	N-S(1):	0.10 *
	TH	0.13	6	229	0.03	N-S(2):	0.00
	LT	1.87	83	3,171	0.03	E-W(1):	0.21
Westbound	RT	0.00	132	0	0.00	E-W(2):	0.32 *
	TH	2.00	792	3,400	0.27 *	V/C:	0.42
	LT	1.00	94	1,700	0.06	Lost Time:	0.05
Northbound	RT	1.00	171	1,700	0.06 *	ITS:	0.00
	TH	1.00	15	1,700	0.01	ICU:	0.47
	LT	1.00	43	1,700	0.03	LOS:	A
Eastbound	RT	0.00	20	0	0.00		
	TH	2.00	483	3,400	0.15		
	LT	1.00	93	1,700	0.05 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 1. MARKET ST. & BRYAN AVE.
Description: EXISTING PLUS PROJECT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.00
	TH	0.00	0	0	0.00 *	N-S(2): 0.04 *
	LT	0.00	0	0	0.00	E-W(1): 0.27 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.22
	TH	2.00	648	3,400	0.19	V/C: 0.31
	LT	1.00	121	1,700	0.07 *	Lost Time: 0.05
Northbound	RT	1.00	64	1,700	0.00	ITS: 0.00
	TH	0.00	0	0	0.00	
	LT	1.00	72	1,700	0.04 *	ICU: 0.36
Eastbound	RT	0.00	0	0	0.00	
	TH	2.00	620	3,400	0.20 *	LOS: A
	LT	0.00	47	1,700	0.03	

Date/Time: PM PEAK HOUR (4:35-5:35)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.05
	TH	0.00	0	0	0.00 *	N-S(2): 0.12 *
	LT	0.00	0	0	0.00	E-W(1): 0.32 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.24
	TH	2.00	821	3,400	0.24	V/C: 0.44
	LT	1.00	159	1,700	0.09 *	Lost Time: 0.05
Northbound	RT	1.00	207	1,700	0.05	ITS: 0.00
	TH	0.00	0	0	0.00	
	LT	1.00	201	1,700	0.12 *	ICU: 0.49
Eastbound	RT	0.00	137	0	0.00	
	TH	2.00	632	3,400	0.23 *	LOS: A
	LT	0.00	0	0	0.00	

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 2. TUSTIN RANCH RD. & EL CAMINO REAL
Description: EXISTING PLUS PROJECT

Date/Time: AM PEAK HOUR (7:55-8:55)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	24	1,700	0.00	N-S(1):	0.15
	TH	3.00	2,100	5,100	0.41 *	N-S(2):	0.44 *
	LT	2.00	124	3,400	0.04	E-W(1):	0.20 *
Westbound	RT	1.00	54	1,700	0.00	E-W(2):	0.05
	TH	2.00	84	3,400	0.02	V/C:	0.64
	LT	2.00	190	3,400	0.06 *	Lost Time:	0.05
Northbound	RT	1.00	154	1,700	0.05	ITS:	0.00
	TH	3.00	572	5,100	0.11	ICU:	0.69
	LT	2.00	89	3,400	0.03 *	LOS:	B
Eastbound	RT	1.00	272	1,700	0.14 *		
	TH	2.00	186	3,400	0.05		
	LT	1.00	58	1,700	0.03		

Date/Time: PM PEAK HOUR (5:00-6:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	48	1,700	0.01	N-S(1):	0.40 *
	TH	3.00	598	5,100	0.12	N-S(2):	0.20
	LT	2.00	96	3,400	0.03 *	E-W(1):	0.12
Westbound	RT	1.00	254	1,700	0.13	E-W(2):	0.15 *
	TH	2.00	441	3,400	0.13 *	V/C:	0.55
	LT	2.00	285	3,400	0.08	Lost Time:	0.05
Northbound	RT	1.00	352	1,700	0.14	ITS:	0.00
	TH	3.00	1,899	5,100	0.37 *	ICU:	0.60
	LT	2.00	275	3,400	0.08	LOS:	A
Eastbound	RT	1.00	103	1,700	0.00		
	TH	2.00	151	3,400	0.04		
	LT	1.00	38	1,700	0.02 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 3. AUTO CENTER DR. & EL CAMINO REAL
Description: EXISTING PLUS PROJECT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	72	1,700	0.02	N-S(1):	0.03 *
	TH	0.42	13	713	0.02	N-S(2):	0.00
	LT	1.58	49	2,687	0.02 *	E-W(1):	0.20 *
Westbound	RT	1.00	47	1,700	0.01	E-W(2):	0.09
	TH	2.00	247	3,400	0.07	V/C:	0.23
	LT	1.00	113	1,700	0.07 *	Lost Time:	0.05
Northbound	RT	1.00	63	1,700	0.00	ITS:	0.00
	TH	1.00	16	1,700	0.01	ICU:	0.28
	LT	1.00	15	1,700	0.01 *	LOS:	A
Eastbound	RT	0.00	52	0	0.00		
	TH	2.00	385	3,400	0.13 *		
	LT	1.00	41	1,700	0.02		

Date/Time: PM PEAK HOUR (4:25-5:25)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	177	1,700	0.05 *	N-S(1):	0.11 *
	TH	0.12	7	203	0.03	N-S(2):	0.00
	LT	1.88	110	3,197	0.03	E-W(1):	0.20
Westbound	RT	1.00	187	1,700	0.08	E-W(2):	0.31 *
	TH	2.00	768	3,400	0.23 *	V/C:	0.42
	LT	1.00	94	1,700	0.06	Lost Time:	0.05
Northbound	RT	1.00	171	1,700	0.06 *	ITS:	0.00
	TH	1.00	18	1,700	0.01	ICU:	0.47
	LT	1.00	43	1,700	0.03	LOS:	A
Eastbound	RT	0.00	20	0	0.00		
	TH	2.00	469	3,400	0.14		
	LT	1.00	128	1,700	0.08 *		

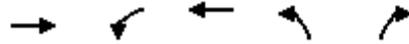
* - Denotes critical movement

Appendix 4 Synchro Queue and Timing Worksheets

Queues

1: Market St. & Bryan Ave/Bryan Ave.

01/14/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	702	61	715	34	30
v/c Ratio	0.29	0.27	0.25	0.16	0.14
Control Delay	7.1	22.2	2.6	21.1	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.1	22.2	2.6	21.1	10.8
Queue Length 50th (ft)	58	14	28	8	0
Queue Length 95th (ft)	106	44	51	30	19
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	3525	806	3574	604	540
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.20	0.08	0.20	0.06	0.06

Intersection Summary

Queues

3: Auto Center Dr. & El Camino Real

01/14/2019



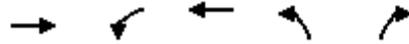
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	18	543	136	332	18	11	76	15	15	41
v/c Ratio	0.03	0.38	0.21	0.15	0.08	0.05	0.20	0.07	0.07	0.13
Control Delay	5.9	12.0	5.3	7.9	22.2	21.9	5.4	22.2	22.2	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	12.0	5.3	7.9	22.2	21.9	5.4	22.2	22.2	0.9
Queue Length 50th (ft)	1	24	0	10	3	2	0	2	2	0
Queue Length 95th (ft)	9	110	39	58	20	15	19	18	18	0
Internal Link Dist (ft)		1070		392		350			241	
Turn Bay Length (ft)	200		155		130			105		95
Base Capacity (vph)	884	2422	1067	2850	1342	1439	919	778	825	619
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.22	0.13	0.12	0.01	0.01	0.08	0.02	0.02	0.07

Intersection Summary

Timings

1: Market St. & Bryan Ave/Bryan Ave.

01/23/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	636	57	665	32	28
Future Volume (vph)	636	57	665	32	28
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	60.5	24.0	60.5	19.0	19.0
Total Split (%)	58.5%	23.2%	58.5%	18.4%	18.4%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None
Act Effct Green (s)	30.5	5.7	36.5	5.5	5.5
Actuated g/C Ratio	0.67	0.13	0.81	0.12	0.12
v/c Ratio	0.29	0.27	0.25	0.16	0.14
Control Delay	7.1	22.2	2.6	21.1	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.1	22.2	2.6	21.1	10.8
LOS	A	C	A	C	B
Approach Delay	7.1		4.2	16.3	
Approach LOS	A		A	B	

Intersection Summary

Cycle Length: 103.5

Actuated Cycle Length: 45.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.29

Intersection Signal Delay: 6.0

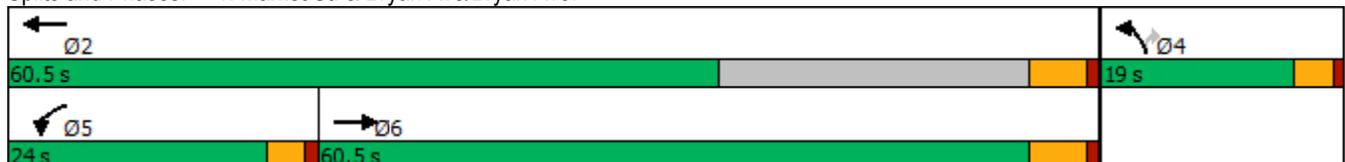
Intersection LOS: A

Intersection Capacity Utilization 36.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Market St. & Bryan Ave/Bryan Ave.



Timings

3: Auto Center Dr. & El Camino Real

01/23/2019



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	15	398	113	255	15	9	63	18	7	34
Future Volume (vph)	15	398	113	255	15	9	63	18	7	34
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6	5	2	8	8	5	4	4	1
Permitted Phases	6		2				8			4
Detector Phase	1	6	5	2	8	8	5	4	4	1
Switch Phase										
Minimum Initial (s)	2.0	8.0	2.0	8.0	3.0	3.0	2.0	3.0	3.0	2.0
Minimum Split (s)	6.5	22.4	6.5	22.4	7.7	7.7	6.5	23.6	23.6	6.5
Total Split (s)	16.5	22.5	24.5	40.4	40.4	40.4	24.5	22.6	22.6	16.5
Total Split (%)	13.8%	18.8%	20.4%	33.7%	33.7%	33.7%	20.4%	18.8%	18.8%	13.8%
Yellow Time (s)	3.5	4.4	3.5	4.4	3.7	3.7	3.5	3.6	3.6	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	5.4	4.5	5.4	4.7	4.7	4.5	4.6	4.6	4.5
Lead/Lag	Lead	Lag	Lead	Lag			Lead			Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes			Yes
Recall Mode	None	Min	None	Min	None	None	None	None	None	None
Act Effct Green (s)	22.5	17.4	29.7	27.5	5.6	5.6	8.7	5.4	5.4	5.8
Actuated g/C Ratio	0.54	0.42	0.72	0.66	0.14	0.14	0.21	0.13	0.13	0.14
v/c Ratio	0.03	0.38	0.21	0.15	0.08	0.05	0.20	0.07	0.07	0.13
Control Delay	5.9	12.0	5.3	7.9	22.2	21.9	5.4	22.2	22.2	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	12.0	5.3	7.9	22.2	21.9	5.4	22.2	22.2	0.9
LOS	A	B	A	A	C	C	A	C	C	A
Approach Delay		11.8		7.2		10.0			9.9	
Approach LOS		B		A		B			A	

Intersection Summary

Cycle Length: 119.9

Actuated Cycle Length: 41.4

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.38

Intersection Signal Delay: 9.7

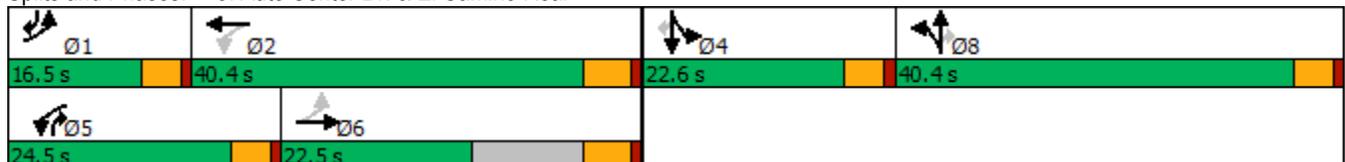
Intersection LOS: A

Intersection Capacity Utilization 38.7%

ICU Level of Service A

Analysis Period (min) 15

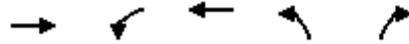
Splits and Phases: 3: Auto Center Dr. & El Camino Real



Queues

1: Market St & Bryan Ave/Bryan Ave.

01/14/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	811	124	913	162	172
v/c Ratio	0.50	0.46	0.40	0.50	0.43
Control Delay	12.7	30.3	5.4	28.7	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	30.3	5.4	28.7	11.2
Queue Length 50th (ft)	93	37	58	48	9
Queue Length 95th (ft)	179	100	112	120	62
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	3273	698	3574	523	566
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.25	0.18	0.26	0.31	0.30

Intersection Summary

Queues

3: Auto Center Dr. & El Camino Real

01/14/2019



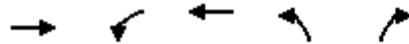
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	98	529	99	973	45	16	180	46	47	139
v/c Ratio	0.27	0.32	0.17	0.59	0.23	0.07	0.44	0.23	0.23	0.33
Control Delay	8.0	12.3	6.7	14.8	32.8	30.9	7.8	32.8	32.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	12.3	6.7	14.8	32.8	30.9	7.8	32.8	32.8	5.5
Queue Length 50th (ft)	15	71	15	150	17	6	0	18	18	0
Queue Length 95th (ft)	37	122	38	245	51	25	45	54	55	30
Internal Link Dist (ft)		1070		392		350			241	
Turn Bay Length (ft)	200		155		130			105		95
Base Capacity (vph)	599	2010	923	2222	1106	1222	814	600	605	632
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.26	0.11	0.44	0.04	0.01	0.22	0.08	0.08	0.22

Intersection Summary

Timings

1: Market St & Bryan Ave/Bryan Ave.

01/23/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	647	114	840	149	158
Future Volume (vph)	647	114	840	149	158
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	60.5	24.0	60.5	19.0	19.0
Total Split (%)	58.5%	23.2%	58.5%	18.4%	18.4%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None
Act Effct Green (s)	25.2	8.2	34.9	9.9	9.9
Actuated g/C Ratio	0.46	0.15	0.64	0.18	0.18
v/c Ratio	0.50	0.46	0.40	0.50	0.43
Control Delay	12.7	30.3	5.4	28.7	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	30.3	5.4	28.7	11.2
LOS	B	C	A	C	B
Approach Delay	12.7		8.4	19.7	
Approach LOS	B		A	B	

Intersection Summary

Cycle Length: 103.5

Actuated Cycle Length: 54.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 11.7

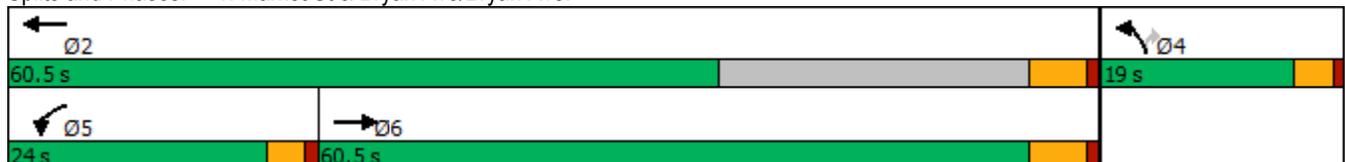
Intersection LOS: B

Intersection Capacity Utilization 46.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Market St & Bryan Ave/Bryan Ave.



Timings

3: Auto Center Dr. & El Camino Real

01/23/2019



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	93	483	94	792	43	15	171	83	6	132
Future Volume (vph)	93	483	94	792	43	15	171	83	6	132
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6	5	2	8	8	5	4	4	1
Permitted Phases	6		2				8			4
Detector Phase	1	6	5	2	8	8	5	4	4	1
Switch Phase										
Minimum Initial (s)	2.0	8.0	2.0	8.0	3.0	3.0	2.0	3.0	3.0	2.0
Minimum Split (s)	6.5	22.4	6.5	22.4	7.7	7.7	6.5	23.6	23.6	6.5
Total Split (s)	16.5	22.5	24.5	40.4	40.4	40.4	24.5	22.6	22.6	16.5
Total Split (%)	13.8%	18.8%	20.4%	33.7%	33.7%	33.7%	20.4%	18.8%	18.8%	13.8%
Yellow Time (s)	3.5	4.4	3.5	4.4	3.7	3.7	3.5	3.6	3.6	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	5.4	4.5	5.4	4.7	4.7	4.5	4.6	4.6	4.5
Lead/Lag	Lead	Lag	Lead	Lag			Lead			Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes			Yes
Recall Mode	None	Min	None	Min	None	None	None	None	None	None
Act Effct Green (s)	33.6	27.2	34.7	27.7	6.8	6.8	9.7	6.9	6.9	11.5
Actuated g/C Ratio	0.57	0.46	0.59	0.47	0.12	0.12	0.16	0.12	0.12	0.20
v/c Ratio	0.27	0.32	0.17	0.59	0.23	0.07	0.44	0.23	0.23	0.33
Control Delay	8.0	12.3	6.7	14.8	32.8	30.9	7.8	32.8	32.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	12.3	6.7	14.8	32.8	30.9	7.8	32.8	32.8	5.5
LOS	A	B	A	B	C	C	A	C	C	A
Approach Delay		11.7		14.0		14.0			16.5	
Approach LOS		B		B		B			B	

Intersection Summary

Cycle Length: 119.9

Actuated Cycle Length: 58.8

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 13.6

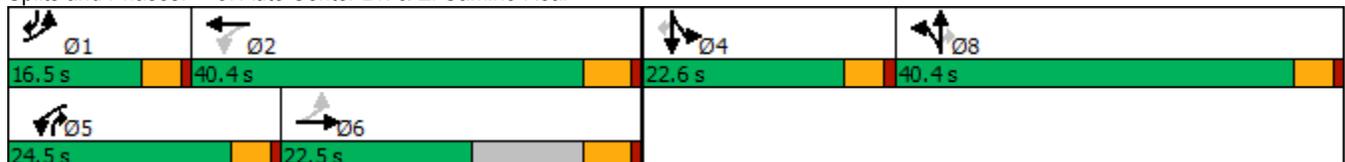
Intersection LOS: B

Intersection Capacity Utilization 52.5%

ICU Level of Service A

Analysis Period (min) 15

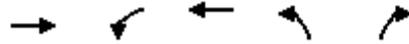
Splits and Phases: 3: Auto Center Dr. & El Camino Real



Queues

1: Market St. & Bryan Ave.

01/18/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	718	130	697	77	69
v/c Ratio	0.37	0.46	0.26	0.32	0.26
Control Delay	10.3	26.5	3.4	25.4	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	26.5	3.4	25.4	9.8
Queue Length 50th (ft)	71	35	32	20	0
Queue Length 95th (ft)	137	90	60	62	30
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	3398	730	3574	548	519
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.18	0.20	0.14	0.13

Intersection Summary

Queues

3: Auto Center Dr. & El Camino Real

03/13/2019



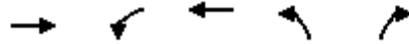
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	49	527	136	298	57	18	19	76	37	38	87
v/c Ratio	0.09	0.39	0.22	0.16	0.30	0.09	0.09	0.21	0.17	0.16	0.22
Control Delay	6.5	13.5	6.3	10.4	4.1	23.7	23.6	5.7	23.4	23.2	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	13.5	6.3	10.4	4.1	23.7	23.6	5.7	23.4	23.2	3.6
Queue Length 50th (ft)	3	46	9	22	0	4	4	0	8	8	0
Queue Length 95th (ft)	19	111	41	58	0	21	21	19	33	34	12
Internal Link Dist (ft)		1070		392			350			241	
Turn Bay Length (ft)	200		155		155	130			105		95
Base Capacity (vph)	836	2268	1000	2791	188	1303	1397	858	717	752	665
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.23	0.14	0.11	0.30	0.01	0.01	0.09	0.05	0.05	0.13

Intersection Summary

Timings

1: Market St. & Bryan Ave.

01/23/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↖	↑↑	↖	↗
Traffic Volume (vph)	620	121	648	72	64
Future Volume (vph)	620	121	648	72	64
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	60.5	24.0	60.5	19.0	19.0
Total Split (%)	58.5%	23.2%	58.5%	18.4%	18.4%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None
Act Effct Green (s)	27.8	7.9	37.6	6.9	6.9
Actuated g/C Ratio	0.55	0.16	0.74	0.14	0.14
v/c Ratio	0.37	0.46	0.26	0.32	0.26
Control Delay	10.3	26.5	3.4	25.4	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	26.5	3.4	25.4	9.8
LOS	B	C	A	C	A
Approach Delay	10.3		7.0	18.0	
Approach LOS	B		A	B	

Intersection Summary

Cycle Length: 103.5

Actuated Cycle Length: 50.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 9.4

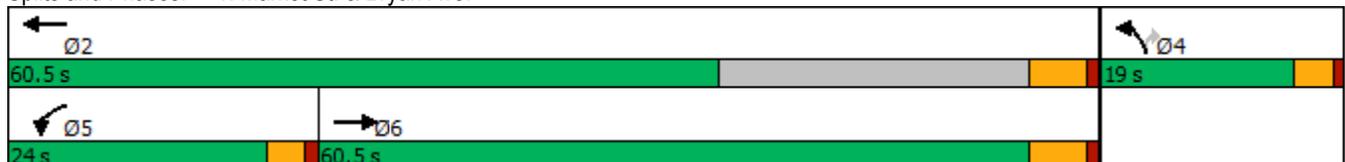
Intersection LOS: A

Intersection Capacity Utilization 40.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Market St. & Bryan Ave.



Timings

3: Auto Center Dr. & El Camino Real

03/13/2019



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	41	385	113	247	47	15	16	63	49	13	72
Future Volume (vph)	41	385	113	247	47	15	16	63	49	13	72
Turn Type	pm+pt	NA	pm+pt	NA	NA	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6	5	2		8	8	5	4	4	1
Permitted Phases	6		2					8			4
Detector Phase	1	6	5	2		8	8	5	4	4	1
Switch Phase											
Minimum Initial (s)	2.0	8.0	2.0	8.0		3.0	3.0	2.0	3.0	3.0	2.0
Minimum Split (s)	6.5	22.4	6.5	22.4		7.7	7.7	6.5	23.6	23.6	6.5
Total Split (s)	16.5	22.5	24.5	40.4		40.4	40.4	24.5	22.6	22.6	16.5
Total Split (%)	13.8%	18.8%	20.4%	33.7%		33.7%	33.7%	20.4%	18.8%	18.8%	13.8%
Yellow Time (s)	3.5	4.4	3.5	4.4		3.7	3.7	3.5	3.6	3.6	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	5.4	4.5	5.4		4.7	4.7	4.5	4.6	4.6	4.5
Lead/Lag	Lead	Lag	Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				Yes			Yes
Recall Mode	None	Min	None	Min		None	None	None	None	None	None
Act Effct Green (s)	23.0	17.5	28.4	23.0	0.0	5.5	5.5	8.7	6.1	6.1	8.9
Actuated g/C Ratio	0.52	0.40	0.64	0.52	0.00	0.12	0.12	0.20	0.14	0.14	0.20
v/c Ratio	0.09	0.39	0.22	0.16	0.30	0.09	0.09	0.21	0.17	0.16	0.22
Control Delay	6.5	13.5	6.3	10.4	4.1	23.7	23.6	5.7	23.4	23.2	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	13.5	6.3	10.4	4.1	23.7	23.6	5.7	23.4	23.2	3.6
LOS	A	B	A	B	A	C	C	A	C	C	A
Approach Delay		12.9		8.5			11.6			12.7	
Approach LOS		B		A			B			B	

Intersection Summary

Cycle Length: 119.9

Actuated Cycle Length: 44.1

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 11.2

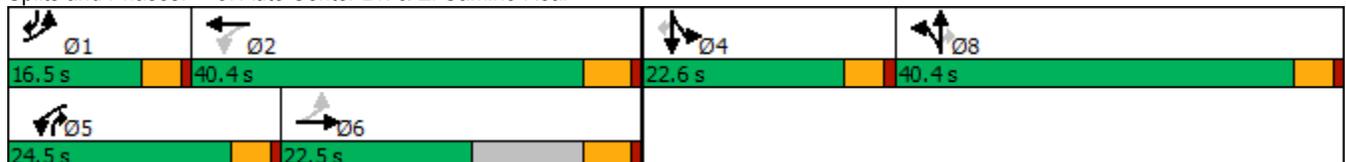
Intersection LOS: B

Intersection Capacity Utilization 39.2%

ICU Level of Service A

Analysis Period (min) 15

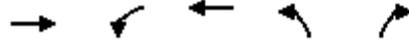
Splits and Phases: 3: Auto Center Dr. & El Camino Real



Queues

1: Market St. & Bryan Ave.

01/18/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	836	173	892	218	225
v/c Ratio	0.56	0.59	0.39	0.60	0.52
Control Delay	15.5	35.4	5.8	33.3	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.5	35.4	5.8	33.3	16.3
Queue Length 50th (ft)	119	63	75	75	29
Queue Length 95th (ft)	198	138	107	#180	108
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	3033	586	3558	440	494
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.28	0.30	0.25	0.50	0.46

Intersection Summary

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

Queues

3: Auto Center Dr. & El Camino Real

03/13/2019



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	135	515	99	808	197	45	19	180	61	62	186
v/c Ratio	0.33	0.36	0.18	0.56	1.05	0.21	0.08	0.41	0.26	0.26	0.36
Control Delay	9.2	14.2	7.6	16.3	91.4	30.6	29.3	7.1	30.2	30.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	14.2	7.6	16.3	91.4	30.6	29.3	7.1	30.2	30.3	4.6
Queue Length 50th (ft)	22	71	16	124	~7	15	6	0	22	22	0
Queue Length 95th (ft)	52	125	39	210	#134	50	27	44	65	66	31
Internal Link Dist (ft)		1070		392			350			241	
Turn Bay Length (ft)	200		155		155	130			105		95
Base Capacity (vph)	649	2064	932	2401	188	1171	1294	872	657	662	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.25	0.11	0.34	1.05	0.04	0.01	0.21	0.09	0.09	0.26

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

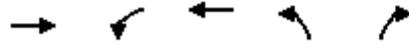
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Timings

1: Market St. & Bryan Ave.

01/23/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	632	159	821	201	207
Future Volume (vph)	632	159	821	201	207
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	60.5	24.0	60.5	19.0	19.0
Total Split (%)	58.5%	23.2%	58.5%	18.4%	18.4%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None
Act Effct Green (s)	26.6	10.3	41.0	12.7	12.7
Actuated g/C Ratio	0.42	0.16	0.64	0.20	0.20
v/c Ratio	0.56	0.59	0.39	0.60	0.52
Control Delay	15.5	35.4	5.8	33.3	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.5	35.4	5.8	33.3	16.3
LOS	B	D	A	C	B
Approach Delay	15.5		10.7	24.7	
Approach LOS	B		B	C	

Intersection Summary

Cycle Length: 103.5

Actuated Cycle Length: 63.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 15.0

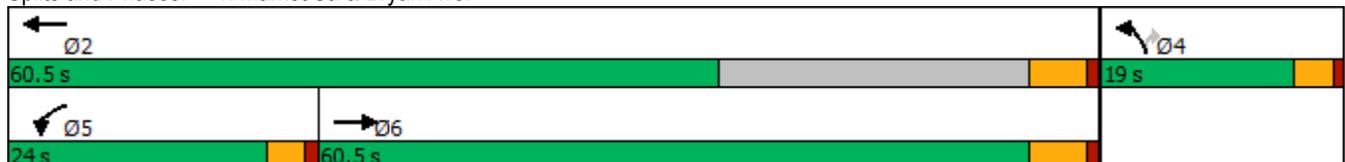
Intersection LOS: B

Intersection Capacity Utilization 53.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Market St. & Bryan Ave.



Timings

3: Auto Center Dr. & El Camino Real

03/13/2019



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	128	469	94	768	187	43	18	171	110	7	177
Future Volume (vph)	128	469	94	768	187	43	18	171	110	7	177
Turn Type	pm+pt	NA	pm+pt	NA	NA	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6	5	2		8	8	5	4	4	1
Permitted Phases	6		2					8			4
Detector Phase	1	6	5	2		8	8	5	4	4	1
Switch Phase											
Minimum Initial (s)	2.0	8.0	2.0	8.0		3.0	3.0	2.0	3.0	3.0	2.0
Minimum Split (s)	6.5	22.4	6.5	22.4		7.7	7.7	6.5	23.6	23.6	6.5
Total Split (s)	16.5	22.5	24.5	40.4		40.4	40.4	24.5	22.6	22.6	16.5
Total Split (%)	13.8%	18.8%	20.4%	33.7%		33.7%	33.7%	20.4%	18.8%	18.8%	13.8%
Yellow Time (s)	3.5	4.4	3.5	4.4		3.7	3.7	3.5	3.6	3.6	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	5.4	4.5	5.4		4.7	4.7	4.5	4.6	4.6	4.5
Lead/Lag	Lead	Lag	Lead	Lag				Lead			Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				Yes			Yes
Recall Mode	None	Min	None	Min		None	None	None	None	None	None
Act Effct Green (s)	29.2	22.0	29.4	22.1	0.0	6.9	6.9	10.0	7.5	7.5	12.9
Actuated g/C Ratio	0.53	0.40	0.54	0.40	0.00	0.13	0.13	0.18	0.14	0.14	0.24
v/c Ratio	0.33	0.36	0.18	0.56	1.05	0.21	0.08	0.41	0.26	0.26	0.36
Control Delay	9.2	14.2	7.6	16.3	91.4	30.6	29.3	7.1	30.2	30.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	14.2	7.6	16.3	91.4	30.6	29.3	7.1	30.2	30.3	4.6
LOS	A	B	A	B	F	C	C	A	C	C	A
Approach Delay		13.1		29.0			13.2			14.8	
Approach LOS		B		C			B			B	

Intersection Summary

Cycle Length: 119.9

Actuated Cycle Length: 54.7

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 20.9

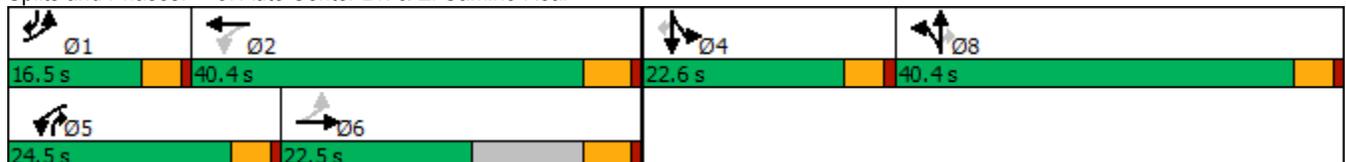
Intersection LOS: C

Intersection Capacity Utilization 50.3%

ICU Level of Service A

Analysis Period (min) 15

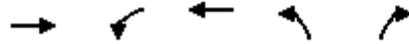
Splits and Phases: 3: Auto Center Dr. & El Camino Real



Queues

1: Market St. & Bryan Ave.

01/22/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	836	173	892	218	225
v/c Ratio	0.59	0.72	0.41	0.59	0.44
Control Delay	14.1	43.0	6.4	25.4	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	43.0	6.4	25.4	6.1
Queue Length 50th (ft)	93	51	60	60	0
Queue Length 95th (ft)	165	#145	118	113	42
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	1433	247	2206	672	742
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.58	0.70	0.40	0.32	0.30

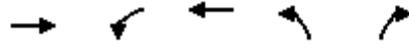
Intersection Summary

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

Timings

1: Market St. & Bryan Ave.

01/23/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	632	159	821	201	207
Future Volume (vph)	632	159	821	201	207
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	26.0	11.0	37.0	23.0	23.0
Total Split (%)	43.3%	18.3%	61.7%	38.3%	38.3%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None
Act Effct Green (s)	20.4	6.9	31.3	10.5	10.5
Actuated g/C Ratio	0.40	0.13	0.61	0.20	0.20
v/c Ratio	0.59	0.72	0.41	0.59	0.44
Control Delay	14.1	43.0	6.4	25.4	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	43.0	6.4	25.4	6.1
LOS	B	D	A	C	A
Approach Delay	14.1		12.4	15.6	
Approach LOS	B		B	B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 51.3

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.6

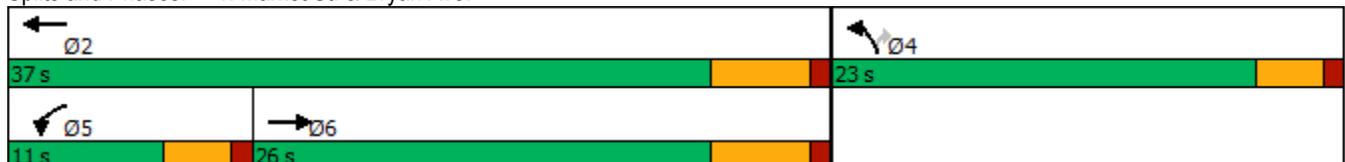
Intersection LOS: B

Intersection Capacity Utilization 53.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Market St. & Bryan Ave.



Appendix 5 Signal Timing Sheets

Configuration

```

-----
                Controller Sequence Priority
                1     2     3     4     5     6     7     8     9     10    11    12
Ring 1 Phases . . 1     2 | 3     4 | 9     10 | 0     0     0     0     0     0
Ring 2 Phases . . 5     6 | 7     8 |11    12 | 0     0     0     0     0     0
    
```

```

                Phase
                1     2     3     4     5     6     7     8     9     10    11    12
In Use. . . . . . . X     .     X     X     X     .     .     .     .     .     .
Exclusive Ped . . . . . . . .     .     .     .     .     .     .     .     .     .     .
Direction . . . . . EB     .     NB     EBL  WB
    
```

```

                Overlap
                A     B     C     D
Direction . . . .
    
```

Load Switch Channel/Driver Group Assign (Info Only):

Load Switch (MMU) Channel	Driver Phase/Ovlap	Signal Group Ped
1	1	.
2	2	.
3	3	.
4	4	.
5	5	.
6	6	.
7	7	.
8	8	.
9	2	X
10	4	X
11	6	X
12	8	X
13	A	.
14	B	.
15	C	.
16	D	.

Configuration Continued

Event Enabling	Alarm Enabling
Critical RFE'S (MMU/TF) X	ALARM 1 X
Non-Critical RFE'S (DET/TEST) . . . X	ALARM 2 X
Detector Errors X	ALARM 3
Coordination Errors X	ALARM 4 X
MMU Flash Faults. X	ALARM 5
Local Flash Faults. X	ALARM 6
Preempt X	ALARM 7
Power On/Off. X	ALARM 8
Low Battery X	ALARM 9
	ALARM 10.
	ALARM 11.
	ALARM 12.
	ALARM 13.
	ALARM 14.
	ALARM 15.
	ALARM 16.

Supervisor Access Code . . . ****
 Data Change Access Code . . . ****

MMU Compatibility Program (Info Only)

Channel	Is Allowed to Time With Channel														
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	X	X	.	.	.
2	X	X	.	.	.
3	X	X	.	.	.	.	.
4	X	X	.	.	.	.	.
5
6
7
8
9	X	X	.	.	.	.	.	.	.	.	.
10.	X	X	.	.	.	.	.	.	.	.	.
11.
12.
13. . . .	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
14. . . .	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.
15.

Version Info:	Part No.	Version
Software Assy.		
Boot	27831	2.83
Program	45561	6.5
Application		. 3
Help	27891	5.13
Configuration	27908	C000

Power Start, Remote Flash

	Phase															
	1	2	3	4	5	6	7	8	9	10	11	12				
Power Start	X	.	.	.	X	.	.	.	.	.	.
External Start	X	.	.	.	X	.	.	.	.	.	.
Into Remote Flash.	X	.	.	.	X	.	.	.	.	.	.
Exit Remote Flash.	X	.	.	.	X	.	.	.	.	.	.	Overlap			
Remote Flash Yellow.	A	B	C	D
Flash Together	X	.	X	.	X	.	X	.	X	.	X	.	.	.	.

Initialization Interval:

Power Start Green
 External Start. Green

Power Start All Red Time. 6
 Power Start Flash Time. 8

Remote Flash Options:

Out of Flash Yellow NO
 Out of Flash All Red. NO
 Minimum Recall. NO
 Alternate Flash NO
 Flash Thru Load Switches. NO
 Cycle Through Phases. NO

Option Data

	Phase											
	1	2	3	4	5	6	7	8	9	10	11	12
Guaranteed Passage
Call To NonActuated 1	X	.	.	.	X	.	.	.	.	.	.
Call To NonActuated 2	X	.	.	.	X	.	.	.	.
Dual Entry.	X	.	.	.	X	.	.	.	.	.	.
Conditional Service
Conditional Reservice
Actuated Rest in Walk
Flashing Walk

Enable Programmable Options

Dual Entry.	ON	Backup Protection Group 1	OFF
Conditional Service	OFF	Backup Protection Group 2	OFF
Ped Clearance Protection.	OFF	Backup Protection Group 3	OFF
Special Preempt Overlap Flash	OFF	Simultaneous Gap Group 1.	ON
Cond Service Det Cross Switch	OFF	Simultaneous Gap Group 2.	OFF
Lock Detectors in Red Only.	OFF	Simultaneous Gap Group 3.	OFF

Five Section Left Turn Control

Phases: 5-2 7-4 1-6 3-8 11-10 9-12

Left Turn Head.
-------------------------	---	---	---	---	---	---

Detector Type/Timers

Det.	Locking	Log	Timers		Don't Reset	Type
	Memory	Enable	Extend	Delay	Extend	
1	NO	NO	0.0	0	.	0 - Normal
2	NO	YES	0.0	0	.	0 - Normal
3	NO	NO	0.0	0	.	0 - Normal
4	NO	NO	0.0	0	.	0 - Normal
5	NO	NO	0.0	0	.	0 - Normal
6	NO	YES	0.0	0	.	0 - Normal
7	NO	YES	0.0	0	.	6 - Calling
8	NO	YES	0.0	0	.	0 - Normal
9	NO	YES	0.0	0	.	0 - Normal
10	NO	YES	0.0	0	.	0 - Normal
11	NO	NO	0.0	15	.	1 - Extend/Delay
12	NO	NO	0.0	15	.	1 - Extend/Delay
13	NO	YES	0.0	0	.	0 - Normal
14	NO	YES	0.0	0	.	0 - Normal
15	NO	NO	0.0	0	.	0 - Normal
16	NO	NO	0.0	0	.	0 - Normal
17	NO	NO	0.0	0	.	0 - Normal
18	NO	NO	0.0	0	.	0 - Normal
19	NO	NO	0.0	0	.	0 - Normal
20	NO	NO	0.0	0	.	0 - Normal
21	NO	NO	0.0	0	.	0 - Normal
22	NO	NO	0.0	0	.	0 - Normal
23	NO	NO	0.0	0	.	0 - Normal
24	NO	NO	0.0	0	.	0 - Normal
25	NO	NO	0.0	0	.	0 - Normal
26	NO	NO	0.0	0	.	0 - Normal
27	NO	NO	0.0	0	.	0 - Normal
28	NO	NO	0.0	0	.	0 - Normal
29	NO	NO	0.0	0	.	0 - Normal
30	NO	NO	0.0	0	.	0 - Normal
31	NO	NO	0.0	0	.	0 - Normal
32	NO	NO	0.0	0	.	0 - Normal

Detector Names

Det 1: Detector 1	Det 17: Detector 17
Det 2: WB PH 2 LIMIT 1-2	Det 18: Detector 18
Det 3: Detector 3	Det 19: Detector 19
Det 4: NB PH 4 LT	Det 20: Detector 20
Det 5: WB PH 5 LT	Det 21: Detector 21
Det 6: EB PH 6 LIMIT 1-2	Det 22: Detector 22
Det 7: Detector 7	Det 23: Detector 23
Det 8: Detector 8	Det 24: Detector 24
Det 9: Detector 9	Det 25: Detector 25
Det 10: WB PH 2 ADV 1-2	Det 26: Detector 26
Det 11: Detector 11	Det 27: Detector 27
Det 12: NB PH 4 RT	Det 28: Detector 28
Det 13: Detector 13	Det 29: Detector 29
Det 14: EB PH 6 ADV 1-2	Det 30: Detector 30
Det 15: Detector 15	Det 31: Detector 31
Det 16: Detector 16	Det 32: Detector 32

Recall & Start/Flash Data

	Phase							
	1	2	3	4	5	6	7	8
Phases In Use	X	X	X	X	X	X	.	.
Locking Detector.	X	.	.	.	X	.	.
Vehicle Recall.
Pedestrian Recall
Recall To Max
Soft Recall	X	.	.	.	X	.	.
Power Start	X	.	.	.	X	.	.
External Start.	X	.	.	.	X	.	.
Remote Flash Phases	X	.	.	.	X	.	.

	Initialization Interval			
	Green	Yellow	Red	Yellow Ovrlps
Power Start.	X	.	.
External Start	X	.	.

Power Start All Red Time. . . . 4
 Power Start Flash Time. 10

Option Data

	Phase							
	1	2	3	4	5	6	7	8
Guaranteed Passage
Call to Non Actuated 1.
Call to Non Actuated 2.
Dual Entry	X	.	.	.	X	.	.
Conditional Service
Conditional Reservice
Actuated Rest In Walk
Flashing Walk

Enable Programmable Options

Dual Entry	X	Backup Protection Group 1	X
Conditional Service . . . . .	.	Backup Protection Group 2 . . . . .	.
Ped Clearance Protection . . . . .	.	Simultaneous Gap Group 1	X
Special Preempt Ovlp Flash . . . . .	.	Simultaneous Gap Group 2 . . . . .	.

Five Section Left Turn Control

Phases:	1-6	3-8	5-2	7-4
Left Turn Head

Detector Type and Phase Assignment Data

				Type	Phase Assignment							
					1	2	3	4	5	6	7	8
Detector	1	.	.	0	X	.	.	.	.	.	.	.
Detector	2	.	.	5	.	X	.	.	.	.	.	.
Detector	3	.	.	0	.	.	X	.	.	.	.	.
Detector	4	.	.	0	.	.	.	X	.	.	.	.
Detector	5	.	.	0	.	.	.	.	X	.	.	.
Detector	6	.	.	5	.	.	.	.	.	X	.	.
Detector	7	.	.	0	.	.	.	.	.	.	.	.
Detector	8	.	.	0	.	.	.	.	.	.	.	.
Detector	9	.	.	0	.	.	.	.	.	.	.	.
Detector	10	.	.	0	.	X	.	.	.	.	.	.
Detector	11	.	.	0	.	.	.	.	.	.	.	.
Detector	12	.	.	1	.	.	.	X	.	.	.	.
Detector	13	.	.	1	.	.	X	.	.	.	.	.
Detector	14	.	.	0	.	.	.	.	.	X	.	.
Detector	15	.	.	1	.	.	.	X	.	.	.	.
Detector	16	.	.	1	.	.	X	.	.	.	.	.

Note on Detector Type:

0 = normal

1 = extend/delay

2 = stop bar

3 = stop bar w/timer (use extend timer)

4 = calling

5 = stop bar with resettable timer (use extend timer)

Detector Timers and Cross Switching Data

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                Timers                Cross Switching Phase
              Extend  Delay            1    2    3    4    5    6    7    8
Detector 1 . . . 0.0      0      .    .    .    .    .    X    .    .
Detector 2 . . . 2.0      0      .    .    .    .    .    .    .    .
Detector 3 . . . 0.0      0      .    .    .    .    .    .    .    .
Detector 4 . . . 0.0      0      .    .    .    .    .    .    .    .
Detector 5 . . . 0.0      0      .    X    .    .    .    .    .    .
Detector 6 . . . 2.0      0      .    .    .    .    .    .    .    .
Detector 7 . . . 0.0      0      .    .    .    .    .    .    .    .
Detector 8 . . . 0.0      0      .    .    .    .    .    .    .    .
Detector 9 . . . 0.0      0      .    .    .    .    .    .    .    .
Detector 10 . . . 0.0     0      .    .    .    .    .    .    .    .
Detector 11 . . . 0.0     0      .    .    .    .    .    .    .    .
Detector 12 . . . 0.0     5      .    .    .    .    .    .    .    .
Detector 13 . . . 0.0     5      .    .    .    .    .    .    .    .
Detector 14 . . . 0.0     0      .    .    .    .    .    .    .    .
Detector 15 . . . 0.0    10      .    .    .    .    .    .    .    .
Detector 16 . . . 0.0    10      .    .    .    .    .    .    .    .

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MEMORANDUM

Date: October 2, 2019

Project #: 23472

To: Dale Goldsmith

Cc: Diana Salazar, Costco Wholesale Warehouse
Terry Odle, MG2

From: Neelam Dorman & Michael Sahimi, Kittelson & Associates, Inc.

Project: Tustin Ranch Costco Fuel Station Addition

Subject: Long-Term Buildout Traffic Conditions

Kittelison & Associates, Inc. (KAI) has prepared this traffic analysis memorandum for the proposed addition of a Costco Gasoline fuel station to the existing Tustin Ranch Costco Warehouse on El Camino Real in Tustin, California. This memorandum builds upon the traffic analysis memorandum (dated April 17, 2019) by analyzing conditions for the long-term buildout scenario in the City of Tustin (Tustin).

The following topics are discussed in this memorandum:

- Long-Term Buildout Traffic Volume Forecasting
- Intersection Level of Service Results
- Driveway Queuing Results

LONG-TERM BUILDOUT TRAFFIC VOLUME FORECASTING

Long-term buildout traffic volumes were developed utilizing the Orange County Transportation Analysis Model (OCTAM), which is a countywide travel demand model developed and maintained by the Orange County Transportation Authority (OCTA). The model consists of two versions: a base year (2012) model and a future year (2040) model. The future year model includes planned improvements to transportation facilities in the region as well as planned development projects. The model also accounts for growth in the surrounding Southern California area.

The OCTAM model a growth in traffic volumes of 1% per year along roadways in Tustin. This yearly growth rate was applied to existing a.m. and p.m. peak hour counts to develop the long-term buildout traffic volumes. Project trips (as detailed in the April 2019 memo) were then added to the Long-Term Buildout volumes to develop the Long-Term Buildout Plus Project volumes.

INTERSECTION LEVEL OF SERVICE RESULTS

Consistent with the Existing and Existing Plus Project analyses conducted for the April 2019 memorandum, long-term buildout conditions were evaluated at the following study locations:

- Market Street & Bryan Avenue (Project Driveway)
- Tustin Ranch Road & El Camino Real
- Auto Center Drive & El Camino Real (Project Driveway)

Geometric improvements at Tustin Ranch Road & El Camino Real intersection would be in place at time of Project opening and have thereby been assumed to be in place in the traffic analyses presented below. In addition, the Project would provide a dedicated westbound right turn lane into the site at Auto Center Drive & El Camino Real.

Consistent with the April 2019 memorandum, the study intersections were analyzed using the Intersection Capacity Utilization (ICU) methodology, consistent with City of Tustin standards. Under the ICU methodology, the critical movement and critical movement capacity of an intersection are used to calculate a volume-to-capacity (V/C) ratio. After the V/C ratio is calculated, the ICU methodology assigns a LOS grade (A to F) representing the quality of intersection operations, with LOS F signifying volumes exceeding capacity. LOS grades and corresponding V/C ratios under the ICU methodology are provide in Table 1. The maximum acceptable level of service for the study intersections is LOS D.

Table 1: Intersection Level of Service and ICU Values

Level of Service	Maximum ICU Value
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	Above 1.00

Based on the analysis methodology, the results for the Long-Term Buildout and Buildout Plus Project analysis are shown in Table 2. As shown in the table below, all study intersections operate acceptably at LOS D or better under Buildout and Buildout Plus Project conditions.

Table 2: Long-Term Buildout and Buildout Plus Project LOS

#	Intersection	Control	Peak Hour	Buildout		Buildout Plus Project		Increase
				ICU	LOS	ICU	LOS	
1	Market St. & Bryan Ave.	Signal	AM	0.35	A	0.42	A	0.07
			PM	0.51	A	0.58	A	0.07
2	Tustin Ranch Rd. & El Camino Real ¹	Signal	AM	0.82	D	0.83	D	0.01
			PM	0.73	C	0.73	C	0.00
3	Auto Center Dr. & El Camino Real	Signal	AM	0.32	A	0.32	A	0.00
			PM	0.58	A	0.55	A	-0.03

Note: 1. Planned and funded intersection improvements at this location are assumed under Buildout Conditions.

DRIVEWAY QUEUING RESULTS

Queues were also reviewed for the turn lanes at the Project driveways to determine if signal timing adjustments or additional storage would be required in the long-term buildout scenario. This includes the outbound left and right turn lanes (northbound left and right turn lanes) and inbound left turn lane (westbound left turn lane) at the intersection of Market Street & Bryan Avenue and the outbound left and right turn lanes (southbound left and right turn lanes) and inbound left turn lane (eastbound left turn lane) at the intersection of Auto Center Drive & El Camino Real. The analysis was conducted using Synchro traffic analysis software and signal timing data provided by the City (signal timing was optimized for the Buildout No Project conditions).

As shown in the Table 3, the available storage for the northbound left turn at Market Street & Bryan Avenue is 105 feet. Please note that the storage capacity of 105 feet is defined by the location an internal drive aisle intersection, the full storage along Market Street is 335 feet; therefore the 132-foot queue can be accommodated with causing significant impacts to on-site circulation. The addition of project trips would cause the northbound left-turning queue to exceed the available 105-foot storage during the p.m. peak hour.

Similar to recommendations outlined for the Existing Plus Project conditions in the April 2019 memorandum, northbound left-turning queues during the p.m. peak hour can be reduced by optimizing signal timing. By maintaining an optimized cycle length of 60 seconds and increasing the northbound maximum split to 35 seconds, the northbound left turn 95th percentile queue can be decreased to 96 feet. Recommended maximum splits for each movement are as follows:

- Northbound left/right: 35 seconds
- Eastbound through: 18 seconds
- Westbound through: 25 seconds
- Westbound left: 7 seconds

All other queuing movement were found to have sufficient storage under both Buildout and Buildout Plus Project conditions.

Table 3: Buildout and Buildout Plus Project Queuing Results

#	Intersection	Movement	Available Storage (feet)	Peak Hour	Buildout	Buildout Plus Project	Increase
1	Market St. & Bryan Ave.	NBL	105	AM	32	52	20
				PM	105	132	27
		NBR	60	AM	19	26	7
				PM	41	44	3
		WBL	260	AM	51	#122	71
				PM	#122	#180	58
3	Auto Center Dr. & El Camino Real	SBL	105	AM	20	32	12
				PM	53	63	10
		SBR	95	AM	1	12	11
				PM	32	49	17
		EBL	200	AM	9	17	8
				PM	37	#53	16
		WBR	155	AM	-	0	-
				PM	-	#61	-

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

Bold signifies queue that exceeds storage length.

Note: Optimized signal timing is assumed under Buildout Conditions.

SUMMARY OF FINDINGS

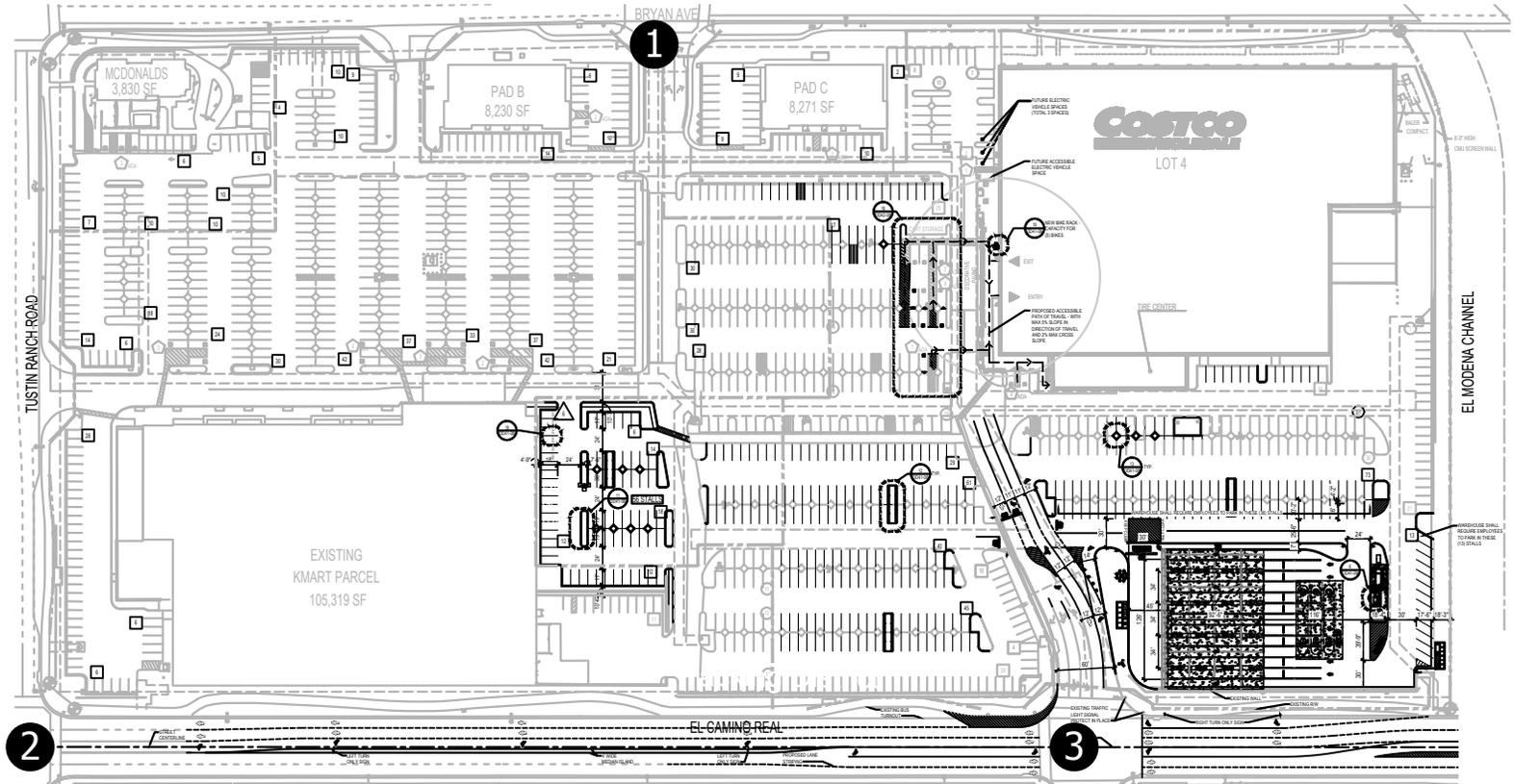
Based on the analysis provided in this memo, the Project would have the following effect on traffic conditions under long-term buildout conditions:

- Level of service at study intersections:
 - All study intersections would operate acceptably at LOS D or better during the peak hour periods.
- Queuing at project driveways:
 - Project trips would increase the northbound left turn queue exiting at Market Street & Bryan Avenue during the p.m. peak hour. These queues exceed the available storage length as measured to the first drive aisle but can be accommodated along the Market Street drive aisle. Queues can be reduced to be accommodated by the available storage through signal timing and increasing the signal timing split available for the northbound approach.
 - All other access points are estimated to have sufficient storage to accommodate Buildout and Buildout Plus Project queues.

Appendix 1 Intersection Volume Figures

Tustin Ranch Costco Fuel Station Addition

1	Market St. & Bryan Ave.	
	<p>← 803/1016 ← 134/185</p>	<p>↻ 71/244 ↻ 79/236</p>
2	Tustin Ranch Rd. & El Camino Real	
	<p>↻ 30/59 ↻ 2588/737 ↻ 153/118</p>	<p>↻ 67/313 ↻ 102/540 ↻ 230/349</p>
3	Auto Center Dr. & El Camino Real	
	<p>↻ 80/208 ↻ 15/8 ↻ 53/129</p>	<p>↻ 52/218 ↻ 306/952 ↻ 139/116</p>



##/## AM/PM Peak Hour Volumes

LONG-TERM BUILDOUT PLUS PROJECT INTERSECTION VOLUMES
Tustin, California

Figure
A-2

Appendix 2 ICU Worksheets

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 1. MARKET ST. & BRYAN AVE.
Description: LONG-TERM BUILDOUT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.00
	TH	0.00	0	0	0.00 *	N-S(2): 0.02 *
	LT	0.00	0	0	0.00	E-W(1): 0.28 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.24
	TH	2.00	820	3,400	0.24	V/C: 0.30
	LT	1.00	70	1,700	0.04 *	Lost Time: 0.05
Northbound	RT	1.00	35	1,700	0.00	ITS: 0.00
	TH	0.00	0	0	0.00	
	LT	1.00	39	1,700	0.02 *	
Eastbound	RT	0.00	21	0	0.00	ICU: 0.35
	TH	2.00	784	3,400	0.24 *	
	LT	0.00	0	0	0.00	LOS: A

Date/Time: PM PEAK HOUR (4:35-5:35)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.05
	TH	0.00	0	0	0.00 *	N-S(2): 0.11 *
	LT	0.00	0	0	0.00	E-W(1): 0.35 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.30
	TH	2.00	1,035	3,400	0.30	V/C: 0.46
	LT	1.00	140	1,700	0.08 *	Lost Time: 0.05
Northbound	RT	1.00	195	1,700	0.05	ITS: 0.00
	TH	0.00	0	0	0.00	
	LT	1.00	184	1,700	0.11 *	
Eastbound	RT	0.00	122	0	0.00	ICU: 0.51
	TH	2.00	797	3,400	0.27 *	
	LT	0.00	0	0	0.00	LOS: A

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 2. TUSTIN RANCH RD. & EL CAMINO REAL
Description: LONG-TERM BUILDOUT

Date/Time: AM PEAK HOUR (7:55-8:55)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	30	1,700	0.00	N-S(1):	0.19
	TH	3.00	2,588	5,100	0.51 *	N-S(2):	0.54 *
	LT	2.00	153	3,400	0.05	E-W(1):	0.23 *
Westbound	RT	1.00	67	1,700	0.01	E-W(2):	0.07
	TH	2.00	94	3,400	0.03	V/C:	0.77
	LT	2.00	211	3,400	0.06 *	Lost Time:	0.05
Northbound	RT	1.00	182	1,700	0.06	ITS:	0.00
	TH	3.00	699	5,100	0.14	ICU:	0.82
	LT	2.00	110	3,400	0.03 *	LOS:	D
Eastbound	RT	1.00	335	1,700	0.17 *		
	TH	2.00	221	3,400	0.07		
	LT	1.00	71	1,700	0.04		

Date/Time: PM PEAK HOUR (5:00-6:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	59	1,700	0.01	N-S(1):	0.49 *
	TH	3.00	737	5,100	0.14	N-S(2):	0.24
	LT	2.00	118	3,400	0.03 *	E-W(1):	0.15
Westbound	RT	1.00	313	1,700	0.16 *	E-W(2):	0.19 *
	TH	2.00	524	3,400	0.15	V/C:	0.68
	LT	2.00	339	3,400	0.10	Lost Time:	0.05
Northbound	RT	1.00	415	1,700	0.17	ITS:	0.00
	TH	3.00	2,333	5,100	0.46 *	ICU:	0.73
	LT	2.00	339	3,400	0.10	LOS:	C
Eastbound	RT	1.00	127	1,700	0.00		
	TH	2.00	179	3,400	0.05		
	LT	1.00	47	1,700	0.03 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 3. AUTO CENTER DR. & EL CAMINO REAL
Description: LONG-TERM BUILDOUT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	42	1,700	0.02 *	N-S(1):	0.03 *
	TH	0.58	9	987	0.01	N-S(2):	0.00
	LT	1.42	22	2,413	0.01	E-W(1):	0.24 *
Westbound	RT	0.00	26	0	0.00	E-W(2):	0.11
	TH	2.00	314	3,400	0.10	V/C:	0.27
	LT	1.00	139	1,700	0.08 *	Lost Time:	0.05
Northbound	RT	1.00	78	1,700	0.00	ITS:	0.00
	TH	1.00	11	1,700	0.01	ICU:	0.32
	LT	1.00	18	1,700	0.01 *	LOS:	A
Eastbound	RT	0.00	64	0	0.00		
	TH	2.00	490	3,400	0.16 *		
	LT	1.00	18	1,700	0.01		

Date/Time: PM PEAK HOUR (4:25-5:25)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	163	1,700	0.05 *	N-S(1):	0.12 *
	TH	0.13	7	218	0.03	N-S(2):	0.00
	LT	1.87	102	3,182	0.03	E-W(1):	0.25
Westbound	RT	0.00	163	0	0.00	E-W(2):	0.41 *
	TH	2.00	976	3,400	0.34 *	V/C:	0.53
	LT	1.00	116	1,700	0.07	Lost Time:	0.05
Northbound	RT	1.00	211	1,700	0.07 *	ITS:	0.00
	TH	1.00	18	1,700	0.01	ICU:	0.58
	LT	1.00	53	1,700	0.03	LOS:	A
Eastbound	RT	0.00	25	0	0.00		
	TH	2.00	595	3,400	0.18		
	LT	1.00	115	1,700	0.07 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 1. MARKET ST. & BRYAN AVE.
Description: LONG-TERM BUILDOUT PLUS PROJECT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.00
	TH	0.00	0	0	0.00 *	N-S(2): 0.05 *
	LT	0.00	0	0	0.00	E-W(1): 0.32 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.24
	TH	2.00	803	3,400	0.24	
	LT	1.00	134	1,700	0.08 *	V/C: 0.37
Northbound	RT	1.00	71	1,700	0.00	Lost Time: 0.05
	TH	0.00	0	0	0.00	ITS: 0.00
	LT	1.00	79	1,700	0.05 *	
Eastbound	RT	0.00	51	0	0.00	ICU: 0.42
	TH	2.00	768	3,400	0.24 *	
	LT	0.00	0	0	0.00	LOS: A

Date/Time: PM PEAK HOUR (4:35-5:35)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS
Southbound	RT	0.00	0	0	0.00	N-S(1): 0.06
	TH	0.00	0	0	0.00 *	N-S(2): 0.14 *
	LT	0.00	0	0	0.00	E-W(1): 0.39 *
Westbound	RT	0.00	0	0	0.00	E-W(2): 0.30
	TH	2.00	1,016	3,400	0.30	
	LT	1.00	185	1,700	0.11 *	V/C: 0.53
Northbound	RT	1.00	244	1,700	0.06	Lost Time: 0.05
	TH	0.00	0	0	0.00	ITS: 0.00
	LT	1.00	236	1,700	0.14 *	
Eastbound	RT	0.00	160	0	0.00	ICU: 0.58
	TH	2.00	782	3,400	0.28 *	
	LT	0.00	0	0	0.00	LOS: A

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 2. TUSTIN RANCH RD. & EL CAMINO REAL
Description: LONG-TERM BUILDOUT PLUS PROJECT

Date/Time: AM PEAK HOUR (7:55-8:55)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	30	1,700	0.00	N-S(1):	0.19
	TH	3.00	2,588	5,100	0.51 *	N-S(2):	0.54 *
	LT	2.00	153	3,400	0.05	E-W(1):	0.24 *
Westbound	RT	1.00	67	1,700	0.01	E-W(2):	0.07
	TH	2.00	102	3,400	0.03	V/C:	0.78
	LT	2.00	230	3,400	0.07 *	Lost Time:	0.05
Northbound	RT	1.00	188	1,700	0.06	ITS:	0.00
	TH	3.00	704	5,100	0.14	ICU:	0.83
	LT	2.00	110	3,400	0.03 *	LOS:	D
Eastbound	RT	1.00	335	1,700	0.17 *		
	TH	2.00	228	3,400	0.07		
	LT	1.00	71	1,700	0.04		

Date/Time: PM PEAK HOUR (5:00-6:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	59	1,700	0.01	N-S(1):	0.49 *
	TH	3.00	737	5,100	0.14	N-S(2):	0.24
	LT	2.00	118	3,400	0.03 *	E-W(1):	0.15
Westbound	RT	1.00	313	1,700	0.16	E-W(2):	0.19 *
	TH	2.00	540	3,400	0.16 *	V/C:	0.68
	LT	2.00	349	3,400	0.10	Lost Time:	0.05
Northbound	RT	1.00	430	1,700	0.18	ITS:	0.00
	TH	3.00	2,339	5,100	0.46 *	ICU:	0.73
	LT	2.00	339	3,400	0.10	LOS:	C
Eastbound	RT	1.00	127	1,700	0.00		
	TH	2.00	185	3,400	0.05		
	LT	1.00	47	1,700	0.03 *		

* - Denotes critical movement

Project Title: TUSTIN RANCH COSTCO FUEL STATION ADDITION
Intersection: 3. AUTO CENTER DR. & EL CAMINO REAL
Description: LONG-TERM BUILDOUT PLUS PROJECT

Date/Time: AM PEAK HOUR (8:00-9:00)

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	80	1,700	0.03 *	N-S(1):	0.04 *
	TH	0.44	15	750	0.02	N-S(2):	0.00
	LT	1.56	53	2,650	0.02	E-W(1):	0.23 *
Westbound	RT	1.00	52	1,700	0.02	E-W(2):	0.12
	TH	2.00	306	3,400	0.09	V/C:	0.27
	LT	1.00	139	1,700	0.08 *	Lost Time:	0.05
Northbound	RT	1.00	78	1,700	0.00	ITS:	0.00
	TH	1.00	18	1,700	0.01	ICU:	0.32
	LT	1.00	18	1,700	0.01 *	LOS:	A
Eastbound	RT	0.00	44	0	0.00		
	TH	2.00	477	3,400	0.15 *		
	LT	1.00	44	1,700	0.03		

Date/Time: PM PEAK HOUR (4:25-5:25)

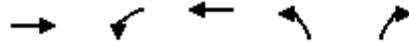
APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	1.00	208	1,700	0.06 *	N-S(1):	0.13 *
	TH	0.12	8	199	0.04	N-S(2):	0.00
	LT	1.88	129	3,201	0.04	E-W(1):	0.25
Westbound	RT	1.00	218	1,700	0.10	E-W(2):	0.37 *
	TH	2.00	952	3,400	0.28 *	V/C:	0.50
	LT	1.00	116	1,700	0.07	Lost Time:	0.05
Northbound	RT	1.00	211	1,700	0.07 *	ITS:	0.00
	TH	1.00	21	1,700	0.01	ICU:	0.55
	LT	1.00	53	1,700	0.03	LOS:	A
Eastbound	RT	0.00	25	0	0.00		
	TH	2.00	581	3,400	0.18		
	LT	1.00	150	1,700	0.09 *		

* - Denotes critical movement

Appendix 3 Synchro Queue and Timing Worksheets

Queues

1: Market St. & Bryan Ave/Bryan Ave.



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	866	75	882	42	38
v/c Ratio	0.36	0.39	0.31	0.19	0.17
Control Delay	7.0	25.9	3.0	20.2	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	25.9	3.0	20.2	9.6
Queue Length 50th (ft)	75	19	38	10	0
Queue Length 95th (ft)	123	51	68	32	19
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	2418	203	2858	773	687
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.36	0.37	0.31	0.05	0.06

Intersection Summary

Queues
3: Auto Center Dr. & El Camino Real

Long-Term Buildout AM
09/26/2019

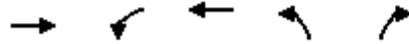


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	22	667	167	409	22	13	94	19	19	51
v/c Ratio	0.04	0.38	0.28	0.16	0.16	0.09	0.26	0.08	0.08	0.17
Control Delay	5.2	10.1	5.2	6.3	24.4	23.1	4.9	20.1	19.9	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.2	10.1	5.2	6.3	24.4	23.1	4.9	20.1	19.9	1.5
Queue Length 50th (ft)	1	28	0	0	3	2	0	3	3	0
Queue Length 95th (ft)	9	114	41	62	22	16	17	20	20	1
Internal Link Dist (ft)		1070		392		350			241	
Turn Bay Length (ft)	200		155		130			105		95
Base Capacity (vph)	560	2017	618	2601	141	151	391	876	934	309
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.33	0.27	0.16	0.16	0.09	0.24	0.02	0.02	0.17

Intersection Summary

Queues

1: Market St & Bryan Ave/Bryan Ave.



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	999	152	1125	200	212
v/c Ratio	0.65	0.61	0.53	0.55	0.43
Control Delay	14.8	35.6	7.2	24.3	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	35.6	7.2	24.3	6.2
Queue Length 50th (ft)	120	44	81	55	0
Queue Length 95th (ft)	205	#122	153	105	41
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	1539	265	2369	721	772
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.65	0.57	0.47	0.28	0.27

Intersection Summary

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

Queues
3: Auto Center Dr. & El Camino Real

Long-Term Buildout PM
09/26/2019



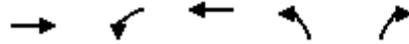
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	121	652	122	1199	56	19	222	57	57	172
v/c Ratio	0.42	0.41	0.24	0.73	0.45	0.14	0.53	0.27	0.27	0.41
Control Delay	10.7	12.8	6.8	16.5	43.7	31.2	8.7	29.1	29.0	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.7	12.8	6.8	16.5	43.7	31.2	8.7	29.1	29.0	6.1
Queue Length 50th (ft)	16	82	16	181	21	7	0	21	21	1
Queue Length 95th (ft)	37	137	38	273	#71	26	47	53	53	32
Internal Link Dist (ft)		1070		392		350			241	
Turn Bay Length (ft)	200		155		130			105		95
Base Capacity (vph)	302	1811	655	1985	125	138	554	644	649	427
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.36	0.19	0.60	0.45	0.14	0.40	0.09	0.09	0.40

Intersection Summary

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

Queues

1: Market St. & Bryan Ave/Bryan Ave.



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	881	144	863	85	76
v/c Ratio	0.49	0.77	0.34	0.34	0.27
Control Delay	9.8	52.4	4.0	22.1	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	52.4	4.0	22.1	8.4
Queue Length 50th (ft)	80	40	42	22	0
Queue Length 95th (ft)	136	#122	78	52	26
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	1830	188	2610	715	661
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.77	0.33	0.12	0.11

Intersection Summary

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

Queues
3: Auto Center Dr. & El Camino Real

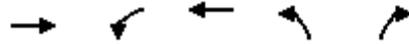


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	53	652	167	369	63	22	22	94	40	42	96
v/c Ratio	0.10	0.38	0.30	0.17	0.23	0.17	0.16	0.27	0.17	0.17	0.25
Control Delay	5.9	11.4	6.2	8.3	2.0	26.2	25.8	5.1	21.2	21.1	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	11.4	6.2	8.3	2.0	26.2	25.8	5.1	21.2	21.1	3.8
Queue Length 50th (ft)	3	56	11	26	0	5	5	0	9	9	0
Queue Length 95th (ft)	17	115	44	60	0	23	23	17	32	33	12
Internal Link Dist (ft)		1070		392			350			241	
Turn Bay Length (ft)	200		155		155	130			105		95
Base Capacity (vph)	545	1890	585	2269	272	131	140	373	813	852	379
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.34	0.29	0.16	0.23	0.17	0.16	0.25	0.05	0.05	0.25

Intersection Summary

Queues

1: Market St & Bryan Ave/Bryan Ave.



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1024	201	1104	257	265
v/c Ratio	0.74	0.84	0.52	0.64	0.47
Control Delay	18.4	57.1	7.9	26.3	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	57.1	7.9	26.3	5.7
Queue Length 50th (ft)	131	62	88	73	0
Queue Length 95th (ft)	#243	#180	172	132	44
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	1394	240	2142	652	753
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.73	0.84	0.52	0.39	0.35

Intersection Summary

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

Queues
3: Auto Center Dr. & El Camino Real



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	158	638	122	1002	229	56	22	222	72	72	219
v/c Ratio	0.49	0.43	0.25	0.65	0.76	0.43	0.15	0.51	0.31	0.31	0.49
Control Delay	13.0	13.8	7.3	15.8	20.4	42.0	31.0	8.4	28.4	28.3	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.0	13.8	7.3	15.8	20.4	42.0	31.0	8.4	28.4	28.3	8.4
Queue Length 50th (ft)	22	82	17	144	0	20	8	0	25	25	10
Queue Length 95th (ft)	#53	137	39	219	#61	#72	29	48	63	63	49
Internal Link Dist (ft)		1070		392			350			241	
Turn Bay Length (ft)	200		155		155	130			105		95
Base Capacity (vph)	326	1768	650	2086	301	131	144	569	672	676	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.36	0.19	0.48	0.76	0.43	0.15	0.39	0.11	0.11	0.49

Intersection Summary

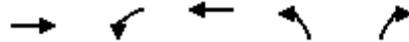
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

Long-Term Buildout Plus Project PM (Mitigated)

1: Market St & Bryan Ave/Bryan Ave.

09/26/2019



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1024	201	1104	257	265
v/c Ratio	0.89	1.45	0.61	0.57	0.47
Control Delay	26.1	259.9	9.4	17.9	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	259.9	9.4	17.9	6.5
Queue Length 50th (ft)	102	~63	77	48	8
Queue Length 95th (ft)	#237	#168	154	96	46
Internal Link Dist (ft)	629		822	131	
Turn Bay Length (ft)		255			55
Base Capacity (vph)	1157	139	1800	1445	1336
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.89	1.45	0.61	0.18	0.20

Intersection Summary

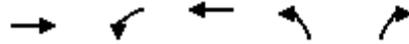
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Timings
1: Market St & Bryan Ave/Bryan Ave.



Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	782	185	1016	236	244
Future Volume (vph)	782	185	1016	236	244
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	6	5	2	4	
Permitted Phases					4
Detector Phase	6	5	2	4	4
Switch Phase					
Minimum Initial (s)	20.0	3.0	8.0	3.0	3.0
Minimum Split (s)	25.5	7.0	13.5	23.0	23.0
Total Split (s)	18.0	7.0	25.0	35.0	35.0
Total Split (%)	30.0%	11.7%	41.7%	58.3%	58.3%
Yellow Time (s)	4.5	3.0	4.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	4.0	4.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	Min	None	Min	None	None

Intersection Summary

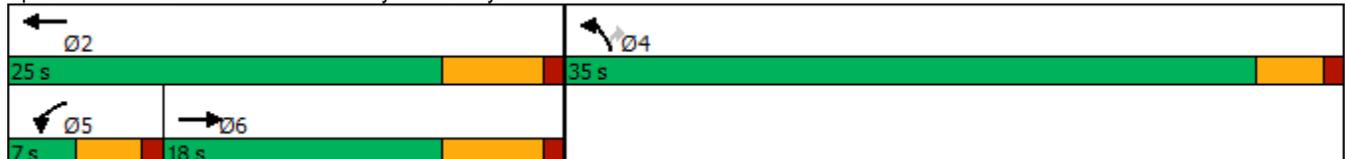
Cycle Length: 60

Actuated Cycle Length: 38.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Market St & Bryan Ave/Bryan Ave.



MEMORANDUM

Date: June 24, 2019

Project #: 23472

To: Diana Salazar, Costco Wholesale Warehouse

Cc: Terry Odle, MG2

From: Neelam Dorman & Michael Sahimi, Kittelson & Associates, Inc.

Project: Tustin Ranch Costco Fuel Station Addition

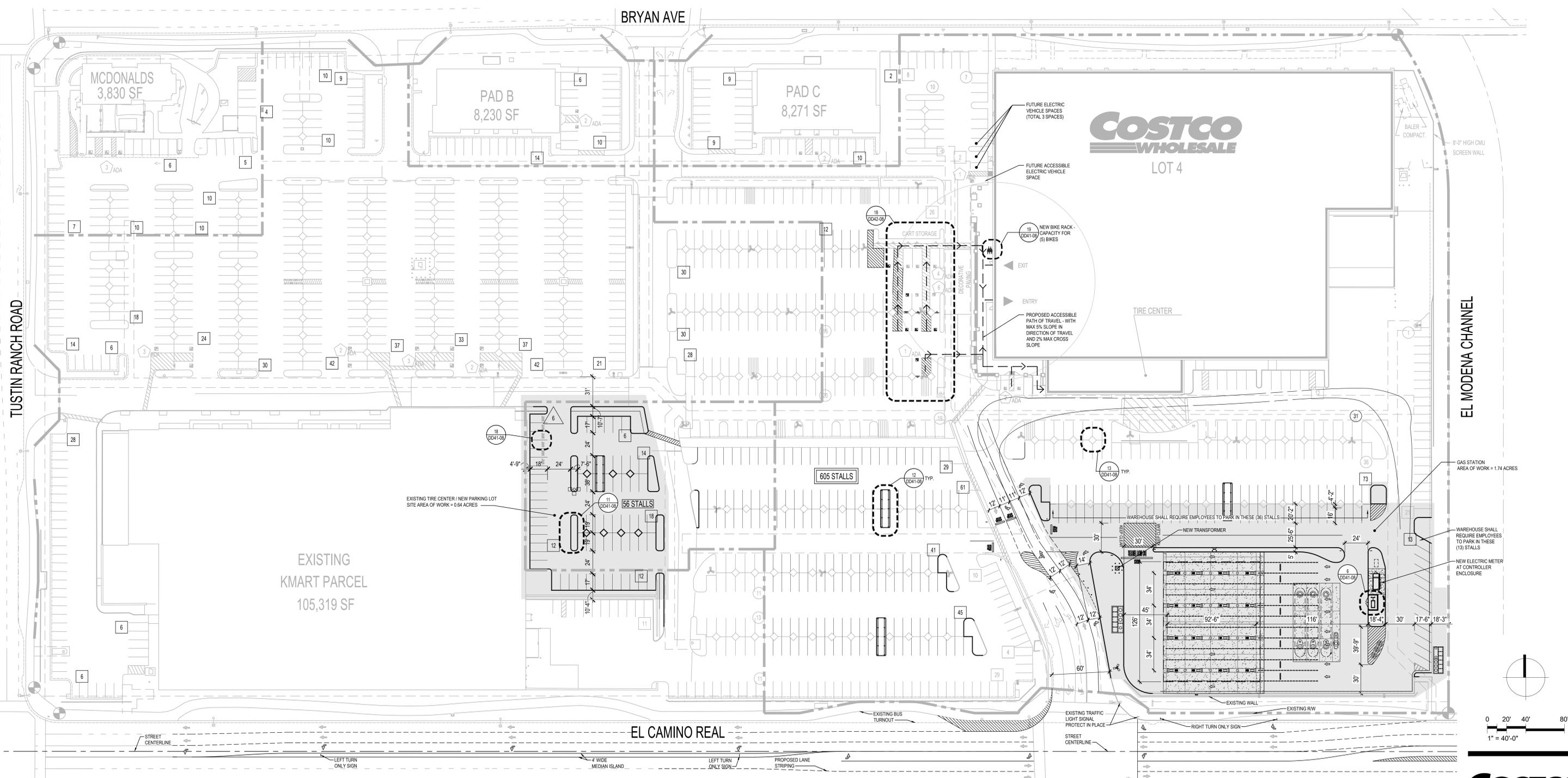
Subject: Planning Commission Topics

Kittelsson & Associates, Inc. (KAI) has prepared this memorandum for the proposed addition of a Costco Gasoline fuel station to the existing Tustin Ranch Costco Warehouse on El Camino Real in Tustin, California to address items discussed at the June 11th Planning Commission Hearing. The following topics are discussed in this memorandum:

- Proposed Development
- Tustin District Costco Gasoline Site Comparison
- Clarification on Gas Queues
- Clarification on Parking Agreement
- Clarification on Intersection Level of Service Analysis
- Additional information on Fuel Delivery Trucks
- Hours of Operation of Other Site Uses
- Effects of Kmart Occupancy

PROPOSED DEVELOPMENT

Costco is proposing to build a Costco Gasoline fuel station on the southeastern portion of the parking lot of their El Camino Real location. The site for the fuel station is currently Costco Warehouse parking, which will be relocated to the west in place of the existing Goodyear service facility (to be demolished). The Tustin Ranch Costco Gasoline fuel station will consist of four islands (sixteen dispensers) with a total of thirty-two (32) vehicle fueling positions. The site plan for the proposed Costco Gasoline fuel station is provided in Figure 1.



PROJECT DATA

CLIENT:	COSTCO WHOLESALE 999 LAKE DRIVE ISSAQUAH, WA 98027
PROJECT ADDRESS:	2655 EL CAMINO REAL TUSTIN, CA 92782
EXISTING SITE AREA:	10.96 ACRES (477,588 S.F.)
GOOD YEAR SITE AREA:	1.00 ACRES (43,949 S.F.)
SITE AREA OF WORK	2.38 ACRES (103,791 S.F.)
BOUNDARIES INFORMATION:	THIS PLAN HAS BEEN PREPARED BY USING MULVANNY ARCHITECTS SITE PLAN DATED 9/97.
ZONING:	PC COMMERCIAL - E. TUSTIN OVERLAY
EXISTING BUILDING DATA:	
EXISTING BUILDING AREA	115,724 S.F.
EXISTING TIRE CENTER	5,196 S.F.
EXISTING TOTAL BUILDING	120,920 S.F.
GOODYEAR TIRE CENTER - DEMO	9,136 S.F.

PROPOSED GAS:	
PROPOSED GAS CANOPY	12,684 S.F.
PROPOSED CONTROLLER ENCLOSURE	121 S.F.
EXISTING COSTCO PARKING:	
9' WIDE STALLS	116 STALLS
10' WIDE STALLS	494 STALLS
HANDICAP STALLS	13 STALLS
TOTAL PARKING	623 STALLS
NO. OF STALLS PER 100 S.F. OF BUILDING AREA:	5.15 STALLS
PROPOSED COSTCO PARKING:	
9' WIDE STALLS	439 STALLS
9' WIDE LOW EMISSION/ VEHICLE PARKING	6 STALLS
10' WIDE STALLS	134 STALLS
HANDICAP STALLS	14 STALLS
TOTAL PARKING	593 STALLS
REQ'D PARKING PER CITY: 4.5/1000	544 STALLS
REQ'D PARKING PER CC&R'S:	605 STALLS

TOTAL ADDITIONAL PARKING SPACES RELATED TO 2016 CALIFORNIA GREEN BUILDING CODE:	56 STALLS
REQ'D SHORT TERM BICYCLE PARKING (5%):	3 BIKES
PROVIDED:	5 BIKES
REQ'D CLEAN AIR VEHICLE PARKING:	6 STALLS
PROVIDED:	6 STALLS
REQ'D FUTURE ELECTRIC VEHICLE CHARGING STATIONS:	4 STALLS
PROVIDED:	4 STALLS
SHOPPING CENTER PARKING DATA	
EXISTING KMART PARKING REQUIRED BY CITY	474 STALLS
105,319 S.F. X 4.5/1000:	527 STALLS
105,319 S.F. X 5.0/1000 PER CC&R'S:	529 STALLS
PARKING PROVIDED:	
EXISTING MCDONALDS PARKING REQUIRED BY CITY	18 STALLS
8,230 S.F. X 4.5/1000:	55 STALLS
PARKING PROVIDED:	

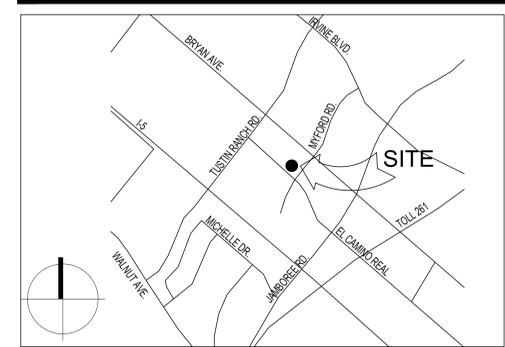
PAD B PARKING REQUIRED BY CITY	37 STALLS
8,230 S.F. X 4.5/1000:	32 STALLS
PARKING PROVIDED:	
PAD C PARKING REQUIRED BY CITY	37 STALLS
8,271 S.F. X 4.5/1000:	32 STALLS
PARKING PROVIDED:	
TOTAL PARKING REQ'D BY CITY:	619 STALLS
TOTAL PARKING REQ'D PER CC&R'S:	646 STALLS
TOTAL PROVIDED:	649 STALLS

LEGEND:

INDICATES SITE AREA OF WORK
TOTAL AREA = 2.38 ACRES

NOTE:
ALL PARKING FOR CENTER IS RECIPROCAL ACCESS PER AGREEMENT

VICINITY MAP



NOTES:
EXISTING CONDITIONS TO BE FIELD VERIFIED.

SITE PLAN

SEPTEMBER 30, 2019



TUSTIN, CA #122

2655 EL CAMINO REAL
TUSTIN, CA 92782

1101 Second Ave. Ste 100
Seattle, WA 98101
206 962 6500
MG2.com



94-1380-23
SEPTEMBER 30, 2019

PROPOSED
SITE PLAN

DD11-08

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TUSTIN DISTRICT COSTCO GASOLINE SITE COMPARISON

The Tustin District Costco Gasoline site was discussed in multiple comments at the Planning Commission Hearing. The following comparison between the District and proposed Tustin Ranch site was developed to better address the concerns:

- Tustin Ranch would have 32 pumps versus 22 pumps at Tustin District. Compared to Tustin District, the efficiency of fueling would be approximately 45% higher, therefore queues would be processed much quicker.
- The Tustin Ranch site can queue 40 vehicles in the stacking area with another 32 at the pumps for a total of 72 vehicles. The Tustin District site can queue approximately 38 vehicles in the stacking area with 22 at the pumps, for a total of 60 vehicles. In comparison, the Tustin Ranch site can hold 12 more vehicles in the stacking area.
- The Tustin Ranch site can queue an additional 8 vehicles without affecting on-site operations for a total of 80 vehicles. The Tustin District site cannot queue beyond the 60 vehicles without severely impacting traffic on Park Avenue.
- With the queue management plan in place, the Tustin Ranch site is designed to be able to contain an additional 18 vehicles within the Costco parking area before affecting operations to the on-site primary drive aisle. Another approximately 13 vehicles could also queue on-site prior to affecting operations on the El Camino Real. This would be a total queue of 111 vehicles prior to affecting El Camino Real. The Tustin District site would affect local road operations if one vehicle exceeds queues beyond the stacking area.
- The layout of the Tustin District site precludes access to the northmost pumps if the center pumps have queues blocking the single access point. The layout at the Tustin Ranch site provides access from two points which allows for access to the center pumps from either direction.
- The Tustin Ranch site provides a right-turn pocket on El Camino Real to accommodate additional queues for vehicles turning onto the site whereas the Tustin District does not.
- The Tustin Ranch site also has large underground fuel storage tanks which would reduce the number of re-fueling trucks and effects on gas operations.
- For the Tustin Ranch site, the fuel pumps are approximately 700 feet from the closest residential unit. For the Tustin District site, the fuel pumps are approximately 700 feet from the closest residential unit (Irvine Inn Apartments).
- The Tustin Ranch site would be served by two major arterials (Jamboree Road and Tustin Ranch Road), a primary arterial (Bryan Avenue) and a secondary arterial (El Camino Real). The Tustin District site is served by the same two major arterials (Jamboree Road and Tustin Ranch Road) as well as Barranca Parkway and a secondary arterial (Park Avenue).

CLARIFICATION OF GAS QUEUES

Multiple gas queue figures were provided in the April Traffic Analysis Memorandum and discussed at the meeting. Based on the discussions at the Planning Commission hearing, it should be clarified that over-capacity operations are not expected based on Costco data from multiple other sites. Queue

management plans have been prepared to have ready if peak operations exceed capacity. Over-capacity operations not an expected occurrence, and should it occur, it is not expected to occur on a consistent basis. Based on Costco data, the design 95th percentile queue of 26 vehicles as well as the maximum observed queue of 35 vehicles can be accommodated with an additional available capacity of 5 vehicles. The initial queue management strategy would provide additional space for 8 vehicles. To address City staff concerns for severe operating conditions, a second-tier queue management plan was prepared. The shows that an additional 18 vehicles can be accommodated prior to affecting access to the shopping center. Please note that this scenario is not expected to occur.

In addition, the location of Costco gas queue data sites as they relate to regional access was discussed at the meeting. Table 1 below provides a comparison of the distances from freeway ramps for each site. As shown, the Tustin District and Concord sites are the furthest from a freeway ramp. Most other sites are in similar regional access locations as the proposed Tustin Ranch site and therefore would experience similar demand and operations.

Table 1: Costco Gasoline Stacking Locations

Location	Size (pumps)	Distance from freeway (miles)
Tustin II, CA	22	2.0*
Rohnert Park, CA	24	0.4
Concord, CA	24	1.5
NE San Jose, CA	24	0.6
Temecula, CA	30	0.5
Tustin Ranch (Proposed)	32	0.5

*Jamboree Road ramps are 0.5 miles from site.

CLARIFICATION ON PARKING AGREEMENT

Shared parking was discussed at the Planning Commission hearing. However, please note that shared parking is not proposed as part of the project and is not part of the Covenants, Conditions, and Restrictions (CC&Rs). Although the CC&Rs established a non-exclusive easement for the passage and parking of vehicles over and across the parking and driveway areas, it also requires each tenant to meet parking requirements within each parcel. Therefore the Costco Warehouse meets both the City of Tustin and the CC&R requirements. Shopping center parking requirements and supply by pad are shown in Table 2. At the request of City staff, the Traffic Analysis Memorandum discussed the potential for shared parking between the various uses; however, this would require modifications to the CC&Rs.

Table 2: Proposed Shopping Center Parking Supply

Pad	City Parking Requirement	Supply
Costco (proposed)	544	606
Kmart	474	530
McDonald's	18	55
Pad B	37	32
Pad C	37	32

CLARIFICATION ON INTERSECTION LEVEL OF SERVICE ANALYSIS

At the Planning Commission Hearing, potential operational issues were discussed for intersections in the vicinity of the Project site. The Traffic Analysis Memorandum prepared in April 2019 evaluates performance at all study locations requested by City staff, including the Project driveways. As shown in the memorandum, all intersections operate at level of service (LOS) A or B during the Weekday AM and PM peak hours. Based on this analysis as well as the current roadway improvements taking place along Tustin Ranch Road and El Camino Real, the proposed Project is not expected to adversely affect intersection operations.

ADDITIONAL INFORMATION ON FUEL DELIVERY TRUCKS

The issue of potential interruption to traffic operations due to fuel truck deliveries was discussed at the Planning Commission Hearing. The Traffic Analysis Memorandum provided truck turning templates and the planned access route for fuel delivery trucks. In addition to the information previously provided, truck deliveries are not expected to affect traffic operations as only 1-2 deliveries are expected during operating hours which reduces the chances of deliveries within peak hours. Tank sizes at the Tustin Ranch site are expected to be three 40,000-gallon tanks, which will reduce the required number of daytime fuel deliveries (in comparison to Tustin District and other locations that have three 30,000-gallon tanks). In addition, the remove fill location design would allow the truck to unload without entering the pump queues and would allow operations to continue without interruption.

HOURS OF OPERATION OF OTHER SITE USES

The hours of operation of other uses on the site were discussed. The table below provides available information regarding hours of operation of other site uses, based on information available online.

Table 3: Hours of Operation of Other Site Uses

Business Name	Hours of Operation
McDonald's	Sunday to Thursday: 5:00 AM - 12:00 AM Friday and Saturday: 5:00 AM - 2:00 AM
Nails Luv	Monday to Saturday: 9:00 AM - 7:00 PM Sunday: 9:00 AM - 5:00 PM
Chase Cleaners	Monday to Friday: 7:00 AM - 7:00 PM Saturday: 9:00 AM - 5:00 PM Sunday: 9:00 AM - 2:00 PM
20-20 Eyecare Center Optometry	Monday to Friday: 10:00 AM - 7:00 PM Saturday: 10:00 AM - 6:00 PM Sunday: Closed
Dentistry Now	Monday/Tuesday/Thursday/Friday: 9:00 AM - 6:00 PM Wednesday: 12:00 PM - 4:00 PM Saturday: 8:00 AM - 2:00 PM Sunday: Closed
Hoag Urgent Care Tustin Ranch	Monday to Friday: 8:00 AM - 8:00 PM Saturday and Sunday: 8:00 AM - 5:00 PM

EFFECTS OF KMART OCCUPANCY

At the Planning Commission meeting, concern over potential effects of the Kmart building being in use and occupied on local traffic and parking was discussed. The April Traffic Analysis Memorandum did not assume occupancy of the Kmart building in its Existing Plus Project intersection Level of Service (LOS) analysis. The April memorandum disclosed that with the addition of project trips, the three study intersections (Market Street & Bryan Avenue; Tustin Ranch Road & El Camino Real; Auto Center Drive & El Camino Real) would operate acceptably at LOS A and B during the AM and PM peak hours.

For this memorandum, Kittelson added estimated trips that could be generated by the 105,319 square foot Kmart parcel to the study intersections, assuming full retail occupancy and with the proposed Tustin Ranch Costco gas station addition in place. With the addition of Kmart-generated vehicle trips to existing counts and Tustin Ranch Costco gas station trips, study intersections would still operate at LOS A or B, as shown in the table below.

Table 4: Existing Plus Project Plus Kmart LOS

#	Intersection	Control	Peak Hour	Existing		Existing Plus Project		Existing Plus Project Plus Kmart	
				ICU	LOS	ICU	LOS	ICU	LOS
1	Market St. & Bryan Ave.	Signal	AM	0.29	A	0.36	A	0.40	A
			PM	0.43	A	0.49	A	0.59	A
2	Tustin Ranch Rd. & El Camino Real ¹	Signal	AM	0.68	B	0.69	B	0.69	B
			PM	0.60	A	0.60	A	0.61	B
3	Auto Center Dr. & El Camino Real	Signal	AM	0.27	A	0.28	A	0.29	A
			PM	0.47	A	0.47	A	0.51	A

Note: 1. Planned and funded intersection improvements at this location are assumed under Existing Conditions.

In addition to traffic, the use of the Kmart building is not expected to affect parking at the site. Under City of Tustin minimum parking requirements, the Kmart parcel is required to provide 474 parking spaces (4.5 spaces per thousand square feet). The Kmart parcel provides 530 spaces, which is 56 spaces more than City requirements.