Appendix I:
Traffic Impact Analysis

TRAFFIC IMPACT STUDY

New Gas Station and Convenient Store

NWC of Pennsylvania Ave and I-10 WB Off Ramp

In the City of Beaumont

Date: October 7, 2021

Prepared For:

JSJ Property Holding, LLC

9484 Sherwood Dr,

Rancho Cucamonga, CA 91737

Prepared By:

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Traffic Impact Study for New Gas Station and Convenient Store
NWC of Pennsylvania Ave and I-10 WB Off Ramp
In the City of Beaumont

Prepared under the supervision of

Jende Kay Hsu, P.E., T. E.

Lic. # T2285

EXECUTIVE SUMMARY

The purpose of this study is to evaluate traffic impact of the proposed development located at northwest corner of Pennsylvania Avenue and I-10 WB Off Ramp in the City of Beaumont. Project site is currently unimproved and vacant. The proposed development includes a new gas station with 12 fueling positions, convenient store (3,400 sq. ft), quick service restaurant (1,292 sq. ft) and automated carwash facility (2,295 sq. ft).

With consideration of pass-by and internal trips, the project has a NET trip generation of 59 inbound and 56 outbound trips in the AM peak hour, and 72 inbound and 67 outbound trips in the PM peak hour.

Pennsylvania Ave currently provides one lane in each direction between 6th Street and I-10 Freeway. The City of Beaumont plans to widen Pennsylvania Avenue between First Street and Sixth Street into a four-lane arterial. Upon project completion, all study intersections will maintain LOS D or better, except for the intersection of Pennsylvania Avenue and I-10 westbound off ramp in the PM peak hours. This intersection has a pre-existing condition of LOS E and is warranted for traffic signal under Existing Conditions as well as Cumulative Opening Year Plus Project Conditions; however, installing traffic signals appears to be a wasteful spending that contradicts with Caltrans' plan to remove the existing ramp and construct a new signalized intersection northerly on Pennsylvania Avenue for I-10 westbound ramps. The new ramps are expected to fully resolve the deficient level of services at the current I-10 westbound off ramp.

Therefore, the study recommends the following mitigation measures as interim solutions:

- Widen the I-10 Westbound Off Ramp at Pennsylvania Avenue to provide one exclusive left-turn lane and one exclusive right-turn lane

This subject intersection is expected to maintain acceptable level of services upon project completion. The project is expected to have no or less than significant traffic

impact with the proposed mitigation measures. The fair share contribution for the project is $13,411, based on 26.82% of the estimated improvement costs for the mitigation measure. However, it should be the sole discretion of the City of Beaumont and Caltrans whether to fund the interim solution with consideration of the ultimate plan of a new interchange.

The site provides a right-in-right-out access driveway on Pennsylvania Avenue. The study has the following recommendation for access control:

- Install STOP (R1-1) and Right Turn Only (R3-5R) signs along with pavement marking of a right-turn arrow for egress at the driveway.

The proposed gas station, car wash facility, and restaurant are local serving in nature as defined in the "Project Type Screening" listed in the "*WRCOG Recommended Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment*," dated March 2020. The project can be presumed to have a less than significant impact. A complete project-level VMT assessment is, therefore, not required.

INTRODUCTION

The purpose of this study is to evaluate traffic impact of the proposed development located at northwest corner of Pennsylvania Avenue and I-10 WB Off Ramp in the City of Beaumont. Vicinity map is shown in **Exhibit 1**.

Project site is currently unimproved and vacant. The proposed development includes a new gas station with 12 fueling positions, convenient store (3,400 sq. ft), quick service restaurant (1,292 sq. ft) and automated carwash facility (2,295 sq. ft). The proposed site plan is shown in **Exhibit 2**.

The project provides a single right-in-right-out access driveway and a new bus pad on Pennsylvania Avenue. The developer acknowledges that Caltrans is in the early planning stage for a new interchange at Pennsylvania Avenue that is expected to demolish the existing ramps and construct new westbound ramps at the north end of the project site. Caltrans has reviewed the location of the single access driveway and confirmed that the interchange project does not appear to present an immediate conflict with the proposed driveway. The subject correspondence from Caltrans can be found in **Appendix F**.

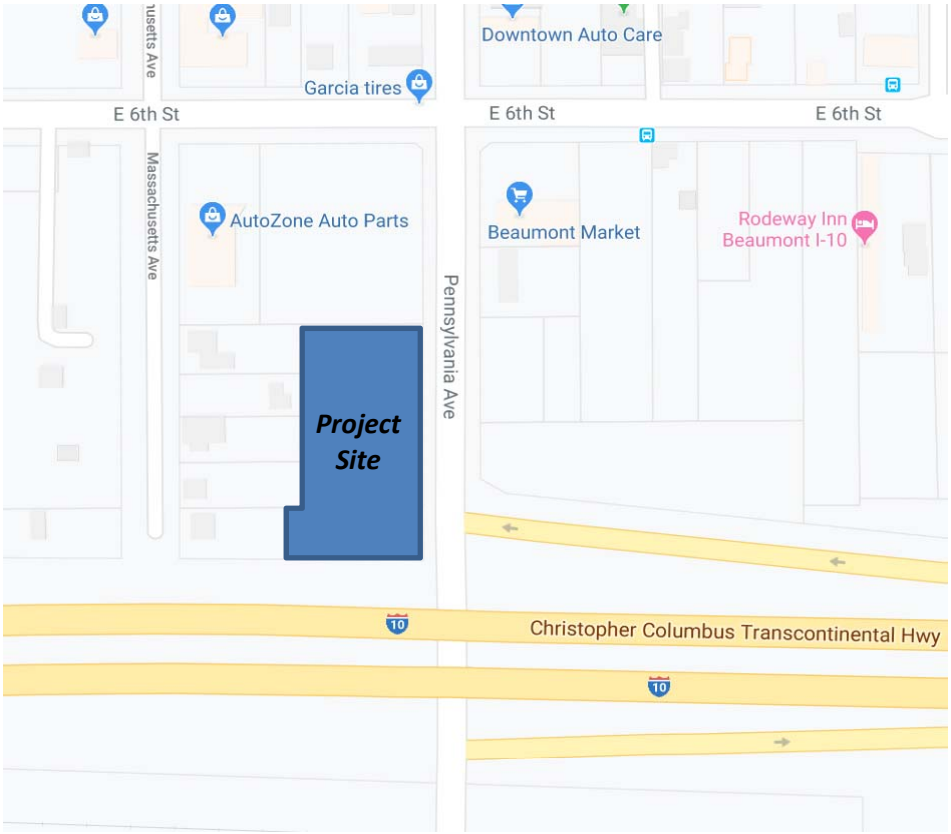
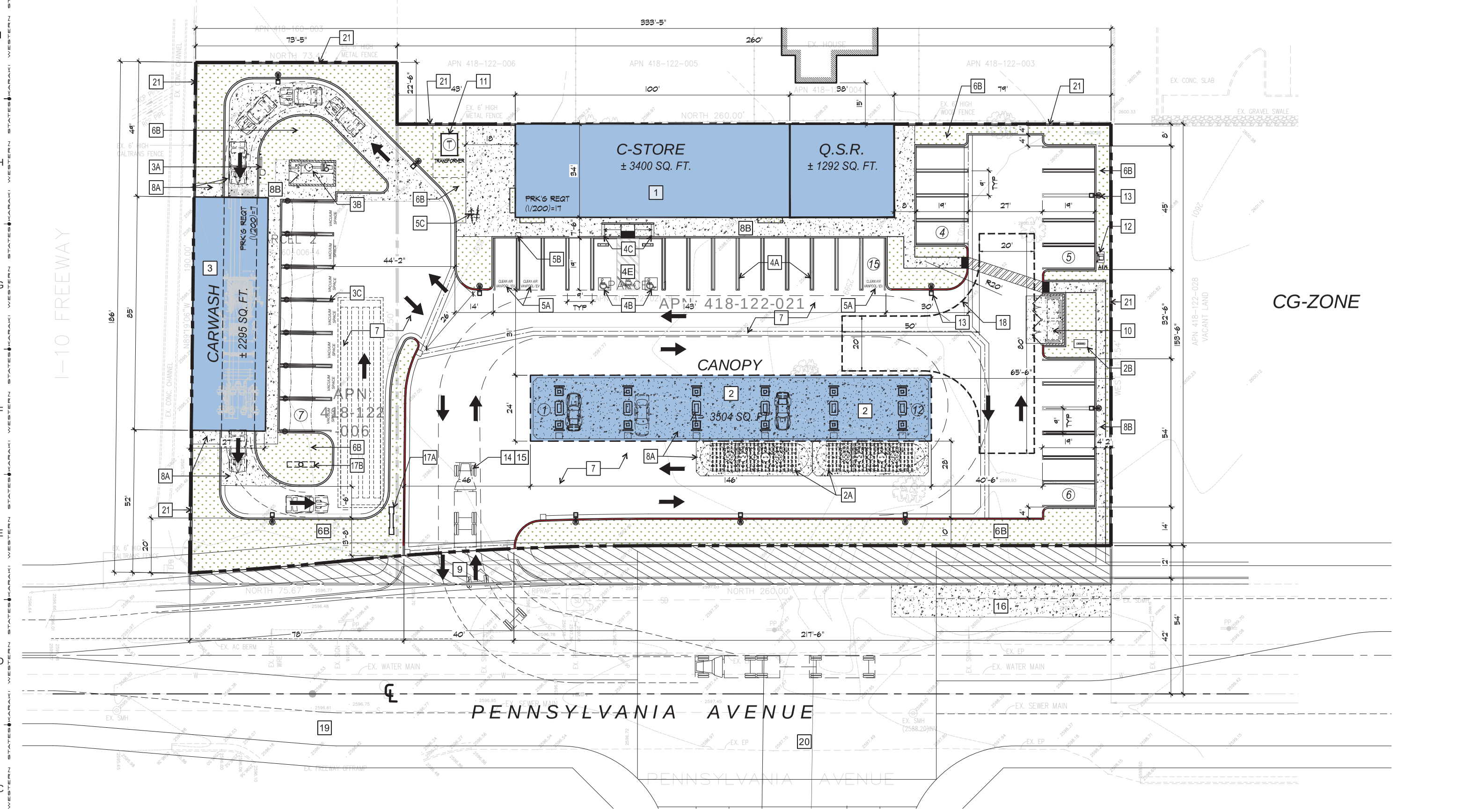


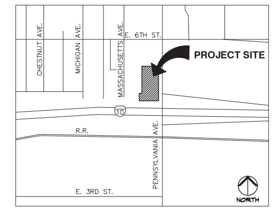
EXHIBIT 1. VICINITY MAP

No Scale



1 PROPOSED SITE PLAN
SCALE: 1" = 20'-0"

VICINITY MAP



LEGEND

- NO. OF PARKING SPACES
- ACCESSIBLE PARKING
- PROPERTY LINE
- ADA PATH OF TRAVEL
- CONCRETE PAVING AREA
- DECORATIVE PAVING AREA
- LANDSCAPED AREA
- DIRECTIONAL ARROW
- R.O.W. DEDICATION
- AREA LIGHTS
- WALL MOUNTED AREA LIGHTS
- (E) FIRE HYDRANT
- (E) SEWER MANHOLE
- (E) SEWER CLEANOUT
- (E) POWER POLE
- WM (E) WATER METER
- (E) SIGN

SITE KEYNOTES

1	CONVENIENCE STORE / QUICK SERVE RESTAURANT
2	GAS STATION CANOPY AND FUEL DISPENSERS
2A	UNDERGROUND STORAGE TANKS
2B	VENT RISER WITH CARBON VAPOR CANISTER
3	CARWASH BUILDING
3A	CARWASH PAY STATION
3B	CARWASH CENTRAL VACUUM EQ
3C	CARWASH VACUUM SPACES
4A	PARKING STRIPING AS PER CITY STANDARDS (WITH WHEELSTOP WHERE REQUIED)
4B	ACCESSIBLE PARKING STRIPING (WITH WHEELSTOP WHERE REQUIRED)
4C	ACCESSIBLE PARKING SIGN
4D	ADA ACCESSIBLE RAMP AND TRUNCATED DOME PAVER
4E	ADA ACCESSIBLE PATH STRIPING (5% MAX SLOPE / 2% MAX CROSS SLOPE)
5A	DESIGNATED CLEAN AIR VEHICLE PARKING
5B	ELECTRIC VEHICLE CHARGING POINT (FOR FUTURE E.V. CHARGING)
5C	BICYLE PARKING
6A	(E) LANDSCAPE TO REMAIN
6B	(N) LANDSCAPE WITH 6" CONCRETE CURB
7	ASPHALT PAVING
8A	CONCRETE PAVING
8B	CONCRETE SIDEWALK / CURB
9	(N) DRIVEWAY (PER CITY STANDARDS)
10	TRASH ENCLOSURE (PER CITY STANDARDS)
11	(N) TRANSFORMER PER SCE
12	AIR & WATER UNIT
13	AREA LIGHTS
14	FIRE TRUCK PATH OF TRAVEL
15	FUEL TANKER/TRASH TRUCK PATH OF TRAVEL
16	(N) BUS STOP PER CITY / D.O.T. STANDARD
17A	PROPOSED MONUMENT SIGN WITH PRICE SIGN (UNDER SEPARATE PERMIT)
17B	PROPOSED PYLON SIGN (UNDER SEPARATE PERMIT)
18	FIRE TRUCK HAMMERHEAD TURN LAYOUT
19	EXISTING OFF-RAMP
20	FUTURE RELOCATED ON/OFF-RAMP LOOP
21	(N) CMU FENCE

KARAKI WSe
WESTERN STATES ENGINEERING
A DESIGN-BUILD COMPANY
4887 E. LA PALMA STE. 707
ANAHEIM, CA 92807
TEL: (714)695-9300 FAX: (714)693-1002
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CONSULTANT/ SEALS

SUBMITTAL
NO. DESCRIPTION BY DATE
1
2
3
4

REVISIONS
NO. DESCRIPTION BY DATE

OWNER NAME & ADDRESS
JSJ PROPERTY HOLDINGS, LLC
9484 SHERWOOD DR.
RANCHO CUCAMONGA, CA 91737

PROJECT NAME & ADDRESS
GAS STATION
C-STORE / Q.S.R.
CARWASH
N.W.C. PENNSYLVANIA & I-10 FWY.
BEAUMONT, CA 92223

NOTE TO CONTRACTOR
CONTRACTOR TO VERIFY LOCATION AND DEPTH OF ALL UTILITIES ON-SITE AND OFF-SITE PRIOR TO START OF CONSTRUCTION.

DESIGNED BY: WS
DRAWN BY: WS
CHECKED BY: JK
PLOT DATE: 9.23.2021
SCALE: 1" = 20'-0"
SHEET TITLE
PROPOSED SITE PLAN

SHEET NUMBER
AS-1.0
JOB No E101320
CUP No PP2019-0209 CUP2019-0033

EXHIBIT 2. SITE PLAN

STUDY SCENARIOS

In compliance with the Western Riverside Council of Governments (WRCOG) "Recommended Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment," dated March 2020, and the scoping agreement approved by the City of Beaumont, this study has included the following study scenarios:

i. Existing Traffic
ii. Cumulative Opening (2023) without Project
iii. Cumulative Opening (2023) with Project

According to the scoping agreement approved by the City of Beaumont, the following intersections are included in this study:

1. Pennsylvania Avenue at 6th Street (Signal)
2. Pennsylvania Avenue at I-10 Westbound Off Ramp (Stop)
3. Pennsylvania Avenue at I-10 Eastbound On Ramp (Uncontrolled)

The level of service (LOS) analysis is performed using the SYNCHRO software with the methodologies prescribed in the Highway Capacity Manual, Sixth Edition. Levels of service for signalized and stop-controlled intersections are based on overall intersection delays. Intersection Capacity Utilization (ICU) method is used for the uncontrolled intersection #3. **Table 1** provides the definition for Levels of Service (LOS).

Table 1. LOS Definitions

LOS	Signalized Average Control Delay (sec/veh)	Unsignalized Average Control Delay (sec/veh)	General Description
A	0 - 10	0 - 10	Free Flow
B	> 10 - 20	> 10 - 15	Stable Flow (slight delays)
C	> 20 - 35	> 15 - 25	Stable Flow (acceptable delays)
D	> 35 - 55	> 25 - 35	Approaching Unstable Flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	> 55 - 80	> 35 - 50	Unstable Flow (intolerable delay)
F	> 80	> 50	Forced Flow (congested and queues fail to clear)

EXISTING CONDITIONS

Project site is situated on the west side of Pennsylvania Avenue just north of Interstate 10 Freeway and south of Sixth Street and in the City of Beaumont. Pennsylvania Avenue is classified as a north-south Major Highway in Beaumont's General Plan. It currently provides one lane in each direction in the project vicinity. The posted speed limit is 35 mph. The City plans to widen Pennsylvania Avenue between First Street and Sixth Street to two lanes in each direction with painted left-turn lanes in the middle.

Interstate 10 (I-10) is a major freeway running east-westerly through the City of Beaumont. Currently there is a westbound off ramp and an eastbound on ramp at Pennsylvania Avenue. The intersection of Pennsylvania Avenue at I-10 westbound off ramp is controlled by a STOP sign on the ramp approach. The intersection of Pennsylvania Avenue at I-10 eastbound on ramp is uncontrolled.

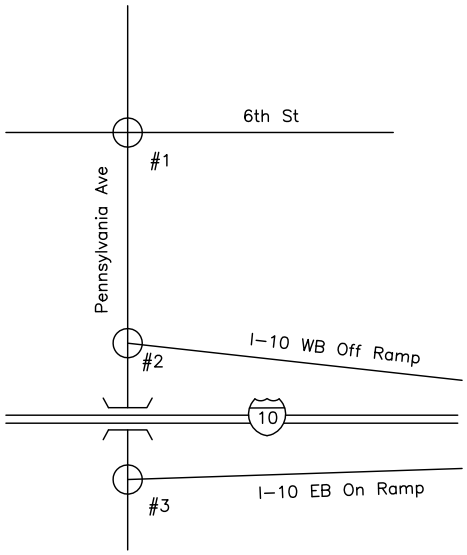
Caltrans has been collaborating with the City of Beaumont to develop a long-term plan to construct a new Pennsylvania Avenue interchange for I-10 westbound on and off ramps with a new signalized intersection. However, the City of Beaumont agreed that such improvements are in early planning stages and should be excluded from the traffic analysis of this study.

Traffic counts of AM and PM peak hour turning movements were collected on Wednesday, August 7, 2019 for the following intersections:

1. Pennsylvania Avenue at Sixth Street
2. Pennsylvania Avenue at I-10 Westbound Off Ramp
3. Pennsylvania Avenue at I-10 Eastbound On Ramp

Lane configuration and traffic volume at the study intersections are shown in **Exhibit 3**.

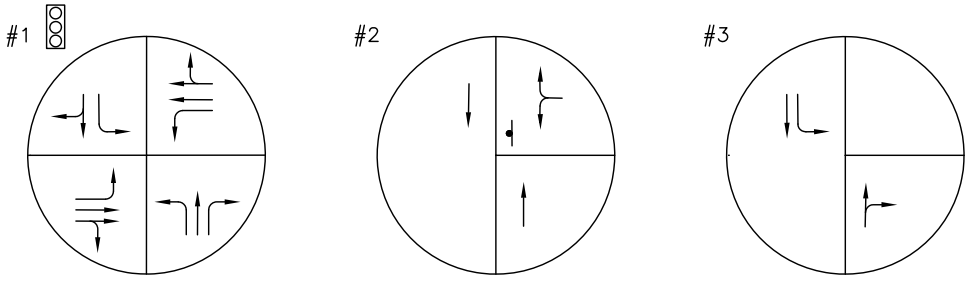
NORTH
NOT TO SCALE



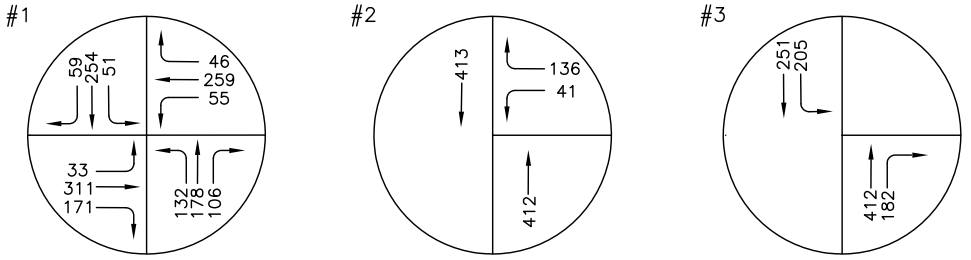
LEGEND:

- INTERSECTION
- TRAFFIC SIGNAL
- STOP SIGN

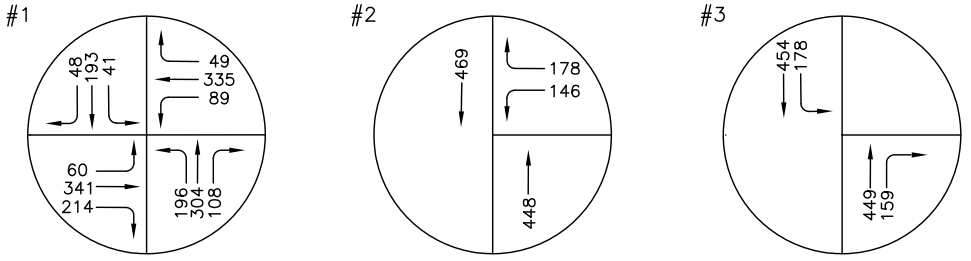
LANE CONFIGURATION



AM PEAK



PM PEAK



EXISTING LANE CONFIGURATION AND TRAFFIC VOLUMES

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 3

Levels of service for existing conditions are shown in **Table 2**. For existing conditions, all study intersections currently operate at LOS C or better during AM and PM peak hours, except the following location:

- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS E for the PM peak hour

Complete traffic data can be found in **Appendix B**. The analysis worksheets can be found in **Appendix C**.

Table 2. Existing Conditions

No.	Intersection	Control Type	AM Peak Hour		PM Peak Hour	
			LOS	Delay/ ICU	LOS	Delay/ ICU
1	Pennsylvania Ave at Sixth St	TS	B	16.6	B	18.0
2	Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	17.5	E	49.9
3	Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.508	A	0.504

Note: TS = Traffic Signal; TWSC = Two-way stop control; Delay in seconds

TRIP GENERATION

Passenger vehicle trips are estimated using the rates and methodologies outlined in *"Trip Generation"*, 10th Edition, published by the Institute of Transportation Engineers (ITE). Applicable trip generation rates are shown in **Table 3**.

Table 3. Generation Rate

Land Use (ITE Code)	Unit	Daily	AM Peak Hour			PM Peak Hour		
			Rate	In	Out	Rate	In	Out
Gas Station with Convenience Store (945)	Veh. Fueling Position	205.36	12.47	51%	49%	13.99	51%	49%
High-Turnover (Sit-Down) Restaurant (932)	1000 Sq. Ft.	112.18	9.94	55%	45%	9.77	62%	38%
Automated Carwash (948)[1]	1000 Sq. Ft.	142	6.31	50%	50%	14.2	50%	50%

Based on the approved scoping agreement, the study applies a 35% pass-by and internal trip reduction. The project has a NET trip generation of 59 inbound and 56 outbound trips in the AM peak hour, and 72 inbound and 67 outbound trips in the PM peak hour. The projected trips associated with the project are provided in **Table 4**.

Table 4. Project Trip Generation

Land Use	Unit	Quantity	AM Peak Hour			PM Peak Hour			Daily
			Total	In	Out	Total	In	Out	
Gas Station with Convenience Store (945)	Veh Fueling Position	12	150	77	73	168	86	82	2,464
High-Turnover (Sit-Down) Restaurant (932)	1000 Sq. Ft.	1.292	13	7	6	13	8	5	145
Automated Carwash(948)	1000 Sq. Ft.	2.295	14	7	7	33	17	16	326
Trip Generation (without Pass-By Consideration)			**177**	91	86	**214**	111	103	**2,935**
Pass-By and Internal Trip Deduction		35%	-62	-32	-30	-75	-39	-36	-1,027
NET Trip Generation			**115**	59	56	**139**	72	67	**1,908**

[1] Daily and AM peak hour volumes derived from SANDBAG's "Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region"

TRIP DISTRIBUTION

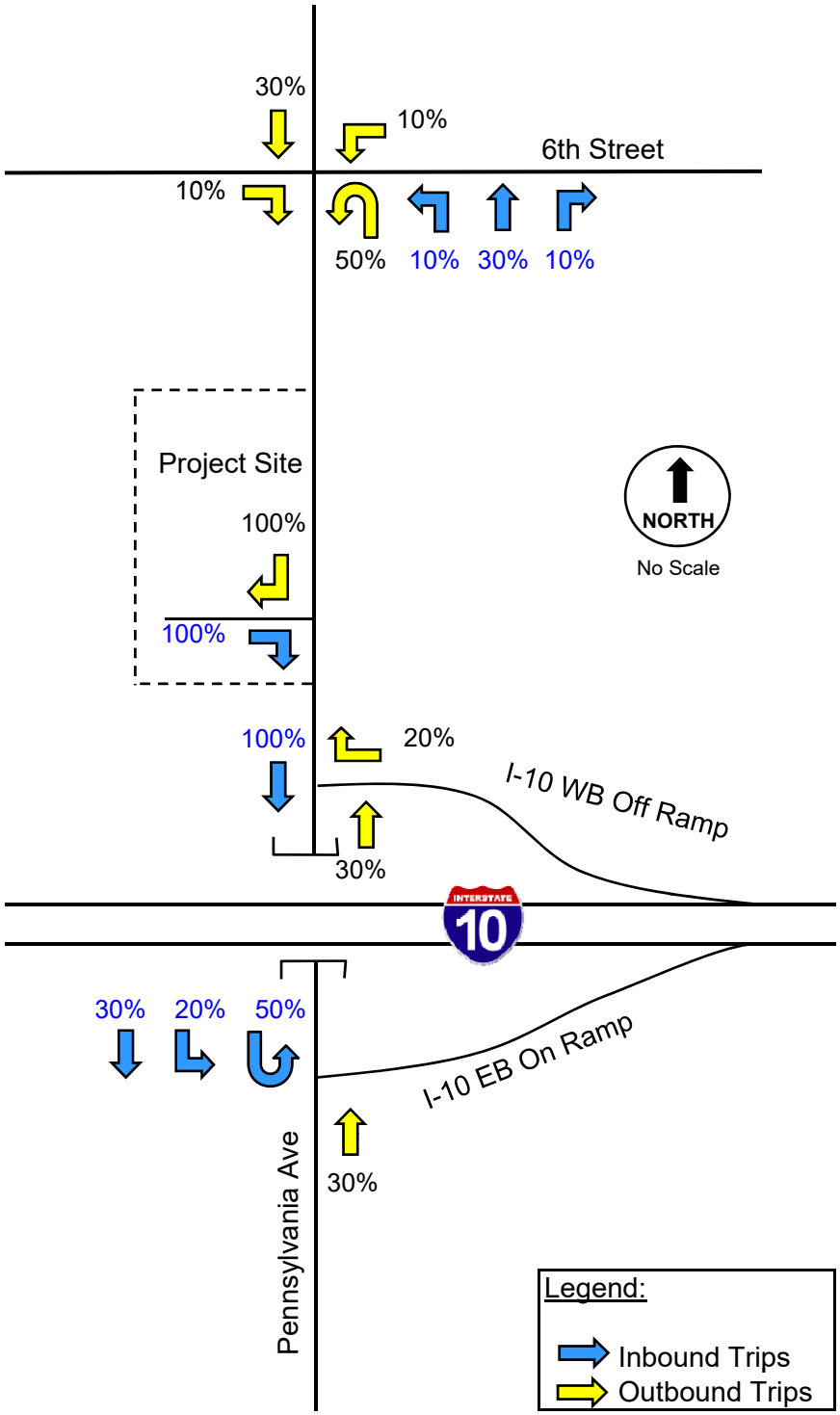
Trip distribution represents the directional orientation of traffic to and from the proposed project. Directional orientation is largely influenced by the geographical location of the site, among many other factors. The trip distribution pattern for the project is illustrated on **Exhibit 4**.

As discussed in the *INTRODUCTION*, the project driveway will allow right-in-right-out only in order to prevent blockage to the freeway off-ramp traffic.

TRAFFIC ASSIGNMENT

The traffic assignment to and from the site has been based upon the results of trip generation, trip distribution, and access layouts. **Exhibit 5** illustrates the traffic assignment of the proposed project in the AM and PM peak hour, respectively.

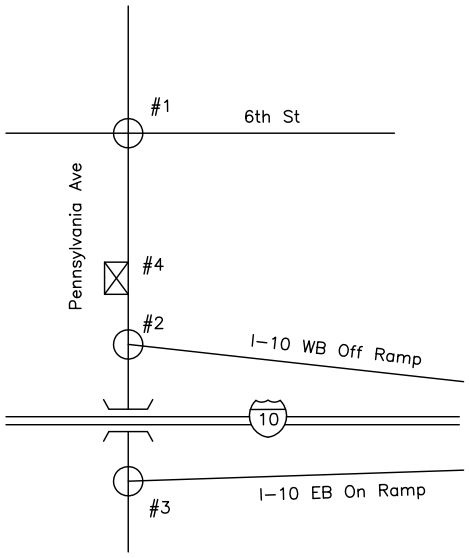
EXHIBIT 4. TRIP DISTRIBUTION



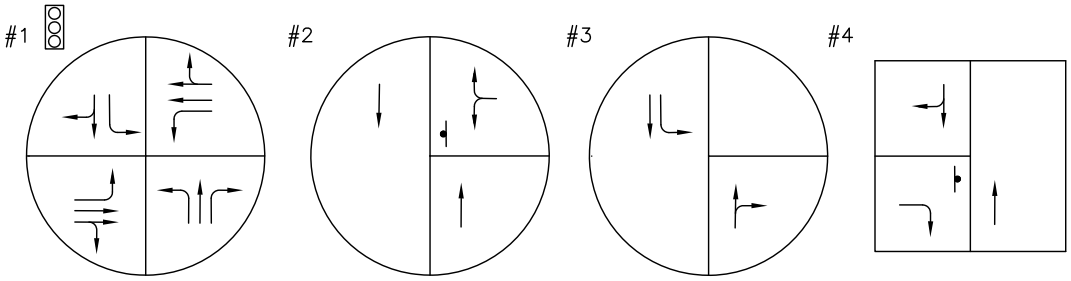
NORTH
NOT TO SCALE

LEGEND:

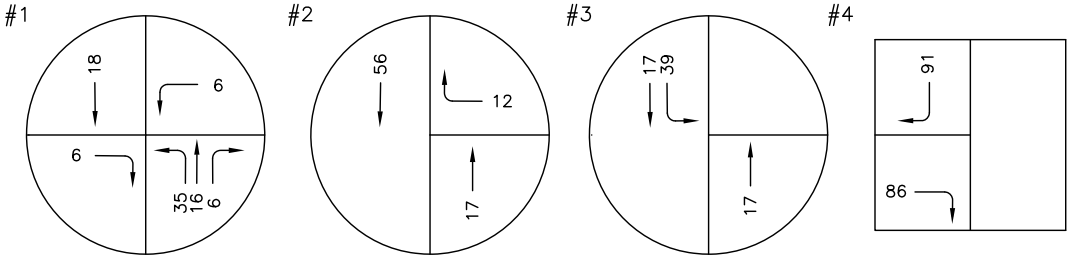
- INTERSECTION
- TRAFFIC SIGNAL
- STOP SIGN
- DRIVEWAY



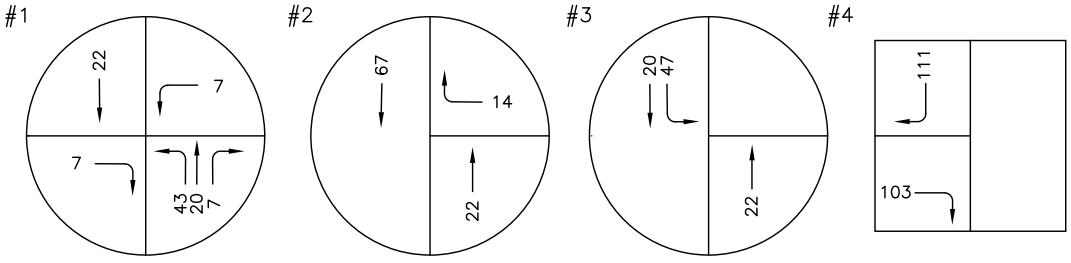
LANE CONFIGURATION



AM PEAK



PM PEAK



TRAFFIC ASSIGNMENT

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 5

EXISTING PLUS PROJECT CONDITIONS

Exhibit 6 illustrates the proposed lane configurations and existing traffic volumes plus project trips. The level of services and delays are shown in **Table 5**. The analysis worksheets can be found in **Appendix C**. In this scenario, all study intersections will maintain acceptable LOS C or better during AM and PM peak hours except for the following intersection:

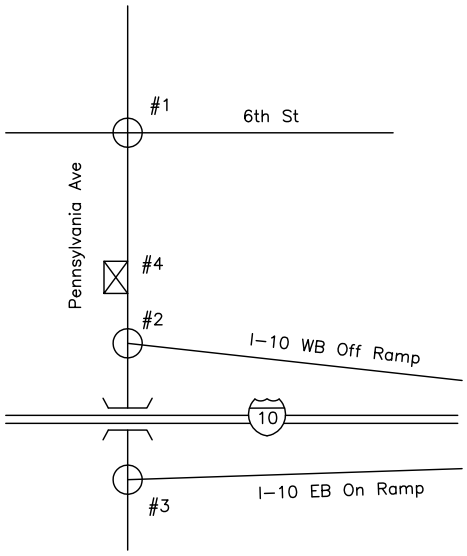
- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS F for the PM peak hour

Table 5. Existing plus Project Conditions

No.	Intersection	Control Type	AM Peak Hour		PM Peak Hour	
			LOS	Delay / ICU	LOS	Delay / ICU
1	Pennsylvania Ave at Sixth St	TS	B	16.9	B	18.5
2	Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	19.1	F	73.7
3	Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.538	A	0.548
4	Project Driveway A on Pennsylvania Ave	TWSC	B	13.2	B	14.9

Note: TS = Traffic Signal; TWSC = Two-way stop control; Delay in seconds

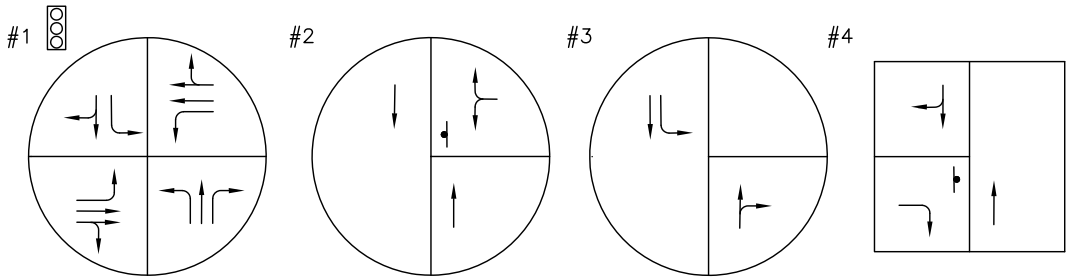
NORTH
NOT TO SCALE



LEGEND:

- INTERSECTION
- TRAFFIC SIGNAL
- STOP SIGN
- DRIVEWAY

LANE CONFIGURATION



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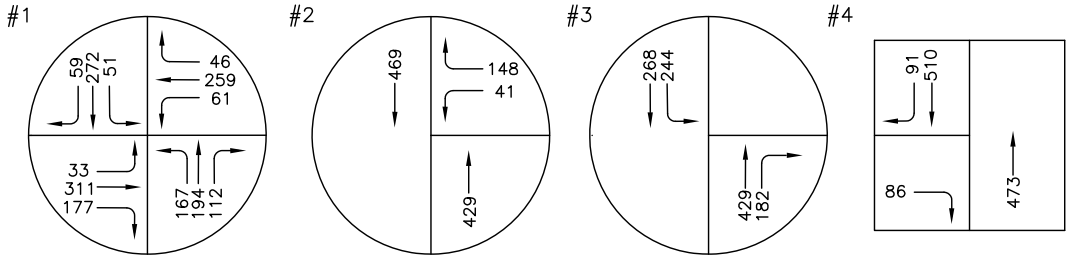
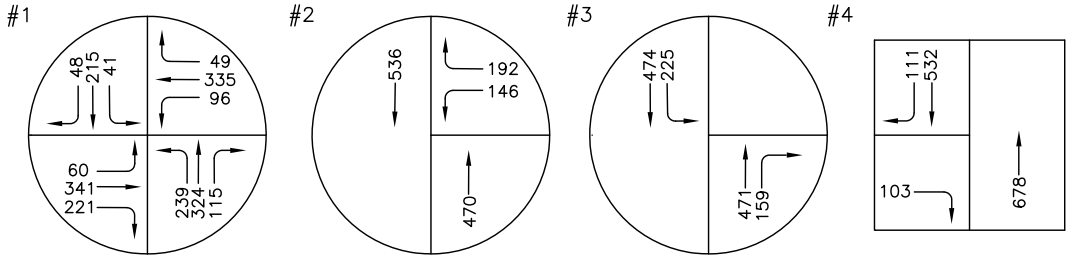


PM PEAK



EXISTING PLUS PROJECT TRAFFIC VOLUMES

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 6

CUMULATIVE DEVELOPMENTS

Based on the information provided by the City's Planning Department, cumulative developments listed in **Table 6** are taken into consideration for analysis of the opening year conditions.

Exhibit 7 illustrates the locations of the cumulative developments. **Exhibit 8** shows the traffic generated by these cumulative developments at study intersections.

Table 6. Summary of Cumulative Developments

No.	Project Name	Description
1	San Gorgnio Village	975 seat movie theatre and 85,750 sq. ft. mixed commercial land use
2	Beaumont Shopping Center	46,100 sq. ft. mixed commercial land use
3	8th St & Highland Springs Retail	Super Mart with 12 fueling positions and 3,500 sq. ft. fast food restaurant with drive-through
4	Butterfield Specific Plan – Phase 1	1,394 swelling unit residential, 549,000 sq. ft. commercial retail, 402 dwelling unit condo/townhouse (200,000 sq. ft. each), 200,000 sq. ft. school, and 18-hole golf course

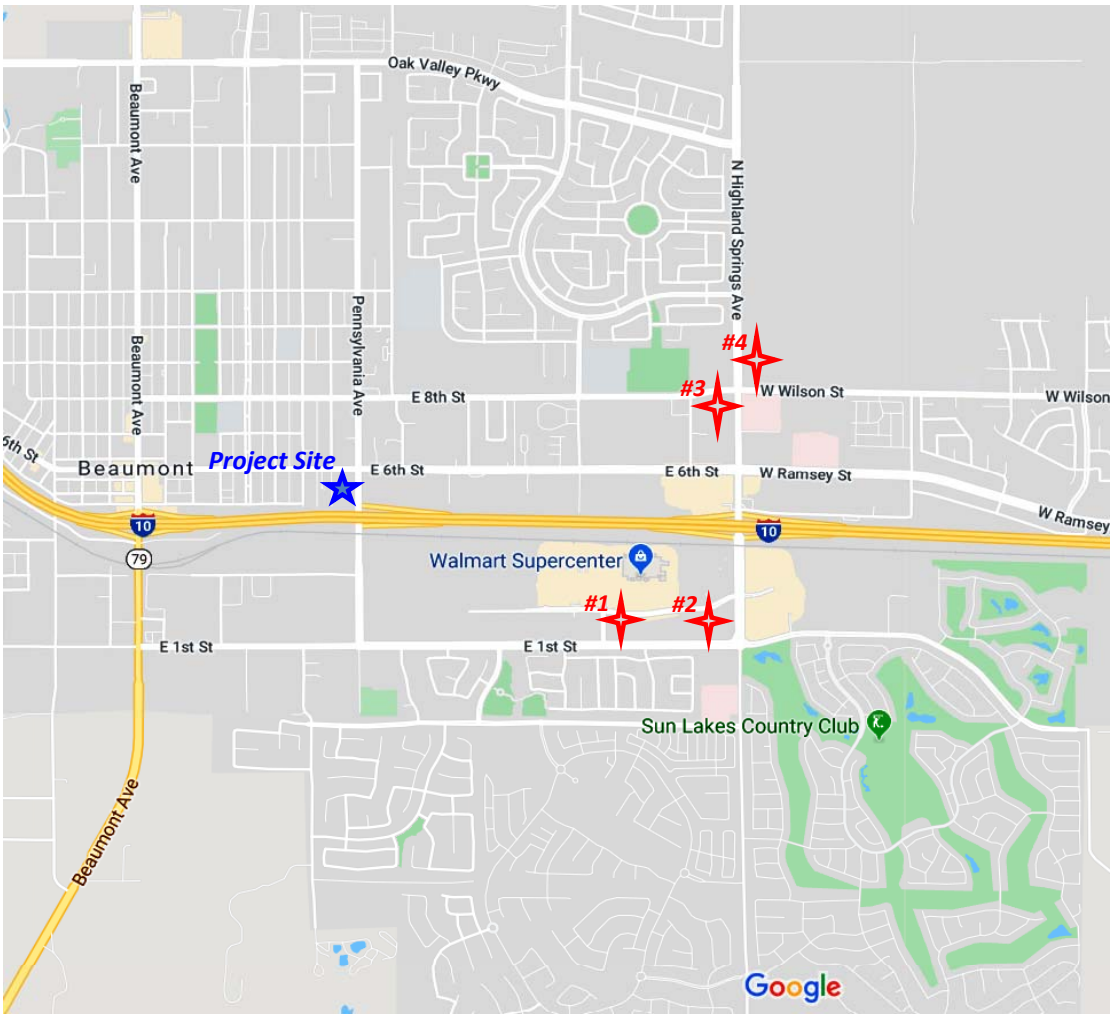
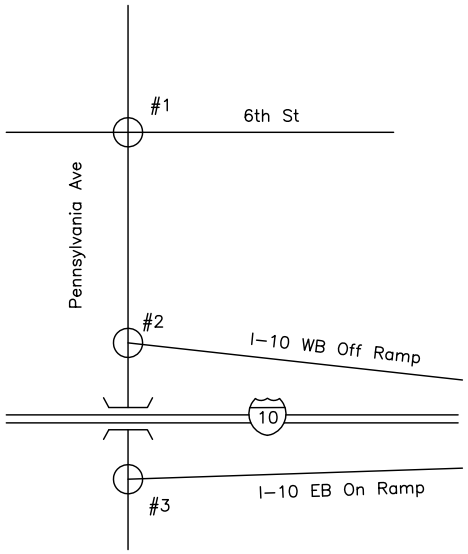


EXHIBIT 7. LOCATION OF OTHER DEVELOPMENTS

Not to Scale

NORTH

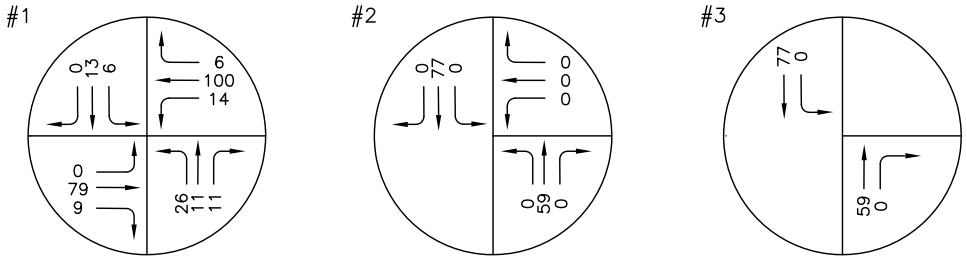
NORTH
NOT TO SCALE



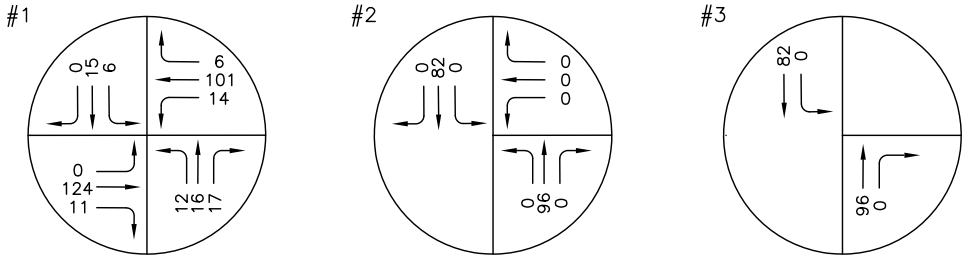
LEGEND:

- INTERSECTION
- TRAFFIC SIGNAL
- STOP SIGN

AM PEAK



PM PEAK



CUMULATIVE DEVELOPMENTS
TRAFFIC VOLUMES

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 8

CUMULATIVE OPENING YEAR (2023) WITHOUT PROJECT

This study scenario assumes completion of the proposed widening of Pennsylvania Avenue. Lane configuration and traffic volumes for this scenario are illustrated in **Exhibit 9**.

Although a future on and off ramp and intersection improvements are being developed and evaluated by Caltrans, it is unlikely that construction can be completed prior to the project completion. The intersection layout and lane configuration have not been finalized at the time of this study. Therefore, such future improvements will not be included in this scenario.

As shown in **Table 7**, the study intersections remain operating at acceptable LOS C or better during AM and PM peak hours, except for the following location:

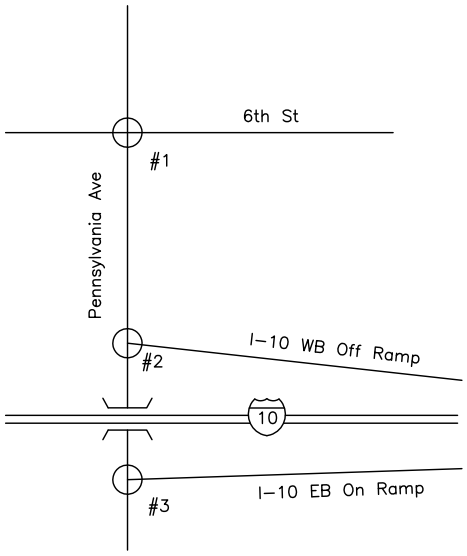
- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS F for the PM peak hour

Table 7. Cumulative Opening Year (2023) without Project

No.	Intersection	Control Type	AM Peak Hour		PM Peak Hour	
			LOS	Delay / ICU	LOS	Delay / ICU
1	Pennsylvania Ave at Sixth St	TS	B	18.4	C	20.3
2	Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	16.1	F	57.7
3	Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.392	A	0.436

Note: TS = Traffic Signal; TWSC = Two-way stop control; Delay in seconds

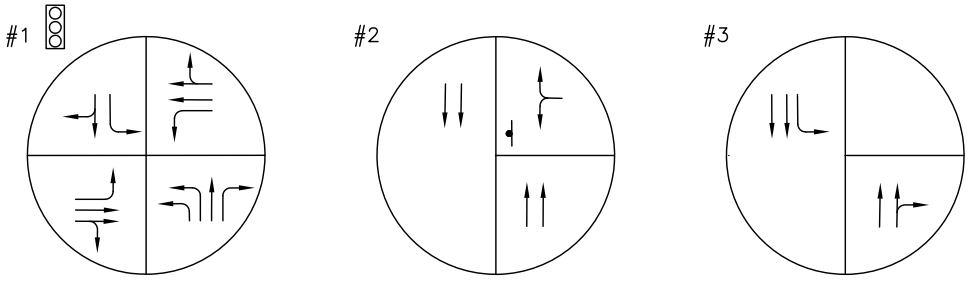
NORTH
NOT TO SCALE



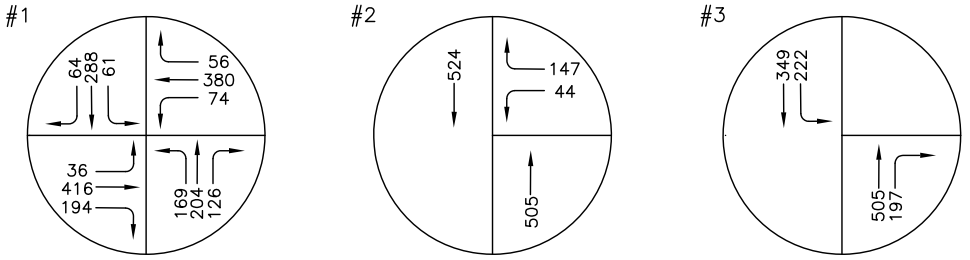
LEGEND:

- INTERSECTION
- TRAFFIC SIGNAL
- STOP SIGN

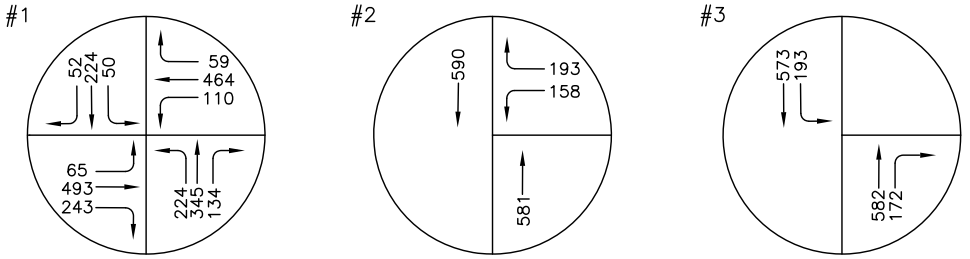
LANE CONFIGURATION



AM PEAK



PM PEAK



CUMMULATIVE OPENING YEAR (2023) WITHOUT PROJECT TRAFFIC VOLUMES

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 9

CUMULATIVE OPENING YEAR (2023) PLUS PROJECT

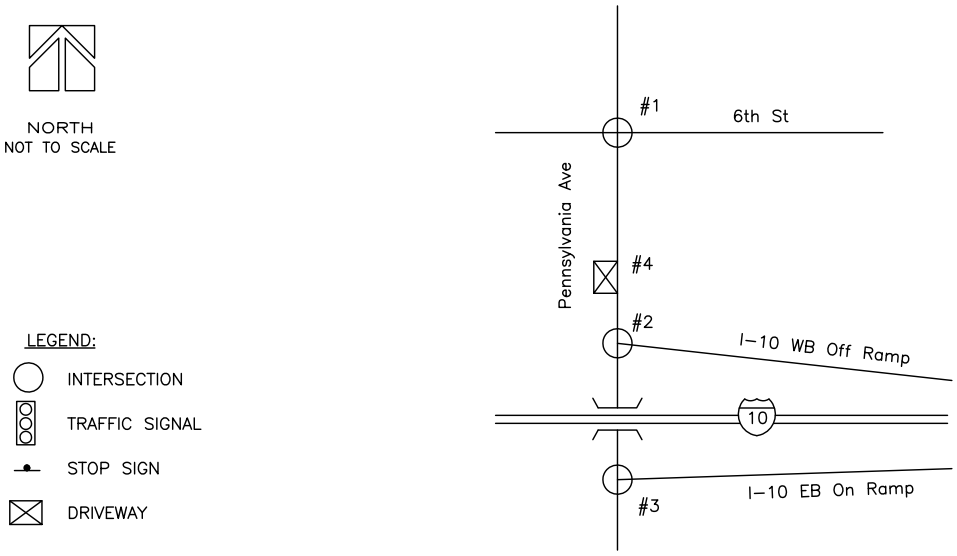
Traffic volumes for the project opening year with cumulative developments plus project traffic are illustrated in **Exhibit 10**. The new lane configurations discussed in previous paragraphs have been reflected in this scenario. As shown in **Table 8**, the study intersections remain operating at acceptable LOS C or better during the AM and PM peak hours, except the following location:

- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS F for the PM peak hour

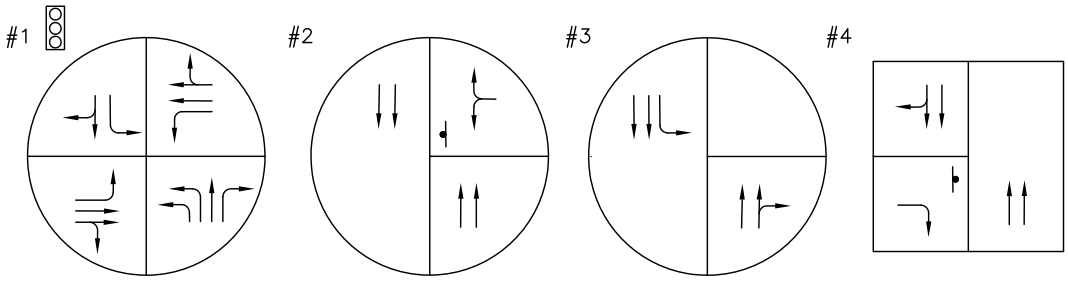
Table 8. Cumulative Opening Year (2023) plus Project

No.	Intersection	Control Type	AM Peak Hour		PM Peak Hour	
			LOS	Delay / ICU	LOS	Delay / ICU
1	Pennsylvania Ave at Sixth St	TS	B	19.2	C	21.4
2	Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	17.1	F	77.9
3	Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.419	A	0.463
4	Project Driveway on Pennsylvania Ave	TWSC	B	11.7	B	11.5

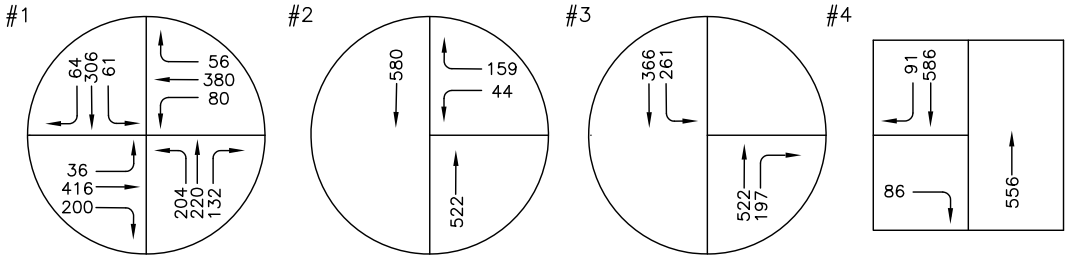
Note: TS = Traffic Signal; TWSC = Two-way stop control; Delay in seconds



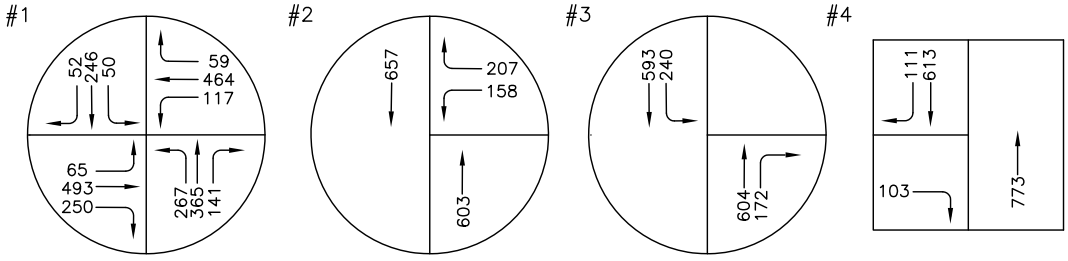
LANE CONFIGURATION



AM PEAK



PM PEAK



CUMMULATIVE OPENING YEAR (2023) PLUS PROJECT TRAFFIC VOLUMES

New Gas Station
Pennsylvania Ave at Future I-10 WB Ramps

K2 TRAFFIC ENGINEERING

EXHIBIT 10

THRESHOLD OF SIGNIFICANT IMPACT

According to the Western Riverside Council of Governments (WRCOG) Intersection General Plan Consistency Requirements, the following criteria should be applied when identifying operational deficiency for signalized intersections:

- Any signalized study intersection operating at an acceptable LOS D or better without project traffic in which the addition of project traffic causes the intersection to degrade to a LOS E or F shall identify improvements to improve operations to LOS D or better.
- Any signalized study intersection that is operating at LOS E or F without project traffic where the project increases delay by 5.0 or more seconds shall identify improvements to offset the increase in delay.

The following criteria should be applied when identifying operational deficiency for unsignalized intersections:

a) The addition of project related traffic causes the intersection to degrade from an acceptable LOS D or better to LOS E or F

OR

b) The project adds 5.0 seconds or more of delay to an intersection that is already projected to operate without project traffic at a LOS E or F

AND

c) The intersection meets the peak hour traffic signal warrant after the addition of project traffic

If the conditions above are satisfied, improvements should be identified that achieve the following:

- LOS D or better for case a) or to pre project LOS and delay for case b)

For existing conditions, the significant levels of project traffic impact are shown in **Table 9**. All intersections operate at LOS C or better with the addition of project traffic, except for the following intersection:

- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS F for the PM peak hour

Table 9. Project Impact Analysis - Existing Conditions

Intersection	Control Type	W/O Project		With Project			Delay Increase	Significant Impact
		LOS	Delay	LOS	Delay	Target LOS		
AM PEAK								
1. Pennsylvania Ave at Sixth St	TS	B	16.6	B	16.9	D (OK)	-	No
2. Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	17.5	C	19.1	D (OK)	-	No
3. Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.508	A	0.538	D (OK)	-	No
PM PEAK								
1. Pennsylvania Ave at Sixth St	TS	B	18.0	B	18.5	D (OK)	-	No
2. Pennsylvania Ave at I-10 WB Off Ramp	**TWSC**	**E**	**49.9**	**F**	**73.7**	**D**	**23.8 (>5)**	**Yes**
3. Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.504	A	0.548	D (OK)	-	No

Upon the cumulative opening year (2023), the significant levels of project traffic impact are shown in **Table 10**. All intersections operate at LOS C or better with the addition of project traffic except for the following location:

- Pennsylvania Avenue at I-10 Westbound Off Ramp: LOS F for the PM peak hour

Table 10. Project Impact Analysis - Cumulative Opening Year (2023)

Intersection	Control Type	W/O Project		With Project			Delay Increase	Significant Impact
		LOS	Delay	LOS	Delay	Target LOS		
AM PEAK								
1. Pennsylvania Ave at Sixth St	TS	B	18.4	B	19.2	D (OK)	-	No
2. Pennsylvania Ave at I-10 WB Off Ramp	TWSC	C	16.1	C	17.1	D (OK)	-	No
3. Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.392	A	0.419	D (OK)	-	No
PM PEAK								
1. Pennsylvania Ave at Sixth St	TS	C	20.3	C	21.4	D (OK)	-	No
2. Pennsylvania Ave at I-10 WB Off Ramp	**TWSC**	**F**	**57.7**	**F**	**77.9**	**D**	**20.2 (>5)**	**Yes**
3. Pennsylvania Ave at I-10 EB On Ramp	N/A	A	0.436	A	0.463	D (OK)	-	No

SIGNAL WARRANT

The intersection (#2) of I-10 westbound off ramp and Pennsylvania Avenue is currently controlled by a STOP sign posted for the off-ramp approach. This intersection is warranted for traffic signal under Existing Conditions as well as Cumulative Opening Year Plus Project Conditions. Worksheets of traffic signal warrant analysis are shown in **Appendix D**.

However, installing traffic signals appears to be a wasteful spending that contradicts with Caltrans' plan to remove the existing ramp and construct a new signalized intersection northerly on Pennsylvania Avenue. The new ramps are expected to fully resolve the deficient level of services at the current I-10 westbound off ramp.

MITIGATION MEASURES

Caltrans has been collaborating with the City of Beaumont to develop a plan to remove the existing ramps and construct a new signalized intersection northerly on Pennsylvania Avenue for I-10 westbound ramps. The new ramps are expected to fully resolve the deficient level of services at the current I-10 westbound off ramp. Therefore, the project recommends the following mitigation measures as interim solutions:

- Widen the I-10 Westbound Off Ramp at Pennsylvania Avenue to provide one exclusive left-turn lane and one exclusive right-turn lane of 200 feet long

The subject intersection is expected to maintain acceptable level of services, as shown in **Table 11**. The project is expected to have no or less than significant traffic impact with the proposed mitigation measures.

Table 11. Project Impact Analysis - Mitigation Measure

#2. Pennsylvania Ave a I-10 WB Off Ramp	Control Type	Cumulative Year (2023) plus Project		Target LOS
		LOS	Delay	
AM Peak Hour	TWSC	B	13.9	D (OK)
PM Peak Hour	TWSC	D	26.8	D (OK)

FAIR SHARE CONTRIBUTION

The fair share contribution represents the percentage of construction cost that the proposed development is expected to contribute toward the aforementioned mitigation measures. The fair share contribution is calculated based on the sum of project trips in the PM peak hour at the subject location for the Cumulative Opening Year Conditions as a percentage of project trips and total traffic minus the existing traffic during the same period, as shown in **Table 12**.

Table 12. Calculation of Fair Share Contribution

Formula	(a)	(b)	(c)	(d) = (a) / [(b)-(c)]	(e)	(f) = (e)x(d)
Location	Project Traffic	Total Traffic	Existing Traffic	% of Project Contribution	Construction Fee Estimate	Project Contribution
#2. Pennsylvania Ave at I-10 WB Off Ramp	103	1,625	1,241	**26.82%**	$50,000	**$13,411**

The fair share contribution for the project is $13,411, based on 26.82% of the estimated improvement costs for the mitigation measure, as shown in **Appendix E**. However, it should be the sole discretion of the City of Beaumont and Caltrans whether to fund the interim solution with consideration of the ultimate plan of a new interchange.

SITE ACCESS

Site access will be adequately served by a right-in-right-out access driveway on Pennsylvania Avenue. The study has the following recommendation for access control:

- Install STOP (R1-1) and Right Turn Only (R3-5R) signs along with pavement marking of a right-turn arrow for egress at the driveway.

ON-SITE CIRCULATION

On-site circulation appears efficient and safe without unnecessary bottlenecks. The site plan is subject to review and final approval by the Fire Department, Planning Department and Traffic Engineer.

VEHICLE MILES TRAVELED (VMT) ASSESSMENT

For the purpose of Senate Bill (SB) 743 compliance, a Vehicle Miles Traveled (VMT) assessment should be conducted for land use projects that have the potential to increase the average VMT per service population compared to the WRCOG region. A set of initial screening tools has been developed to identify projects with presumably less VMT impact and eliminate the requirement for a full project-level assessment.

The proposed gas station, car wash facility, and restaurant are local serving in nature as defined in the "Project Type Screening" listed in the "*WRCOG Recommended Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment*," dated March 2020. The project can be presumed to have a less than significant impact. A complete project-level VMT assessment is, therefore, not required.

APPENDIX A
SCOPING AGREEMENT

MINAGAR & ASSOCIATES, INC.
ITS - Traffic/Civil/Electrical Engineering - Transportation Planning - Homeland Security - CEM

July 29, 2019

Mr. Gull Nawaz
Assistant Engineer
Public Works Department
City of Beaumont
550 E. 6th Street
Beaumont, CA 92223

Re: **TO#45, PW2019-0356: 1st Review of "Pennsylvania Ave Gas Station" Gas Station at NWC of Pennsylvania Ave & I-10 Freeway WB Off-Ramp Parkway TIA Scoping Agreement Scope (May 1, 2019)**

Dear Gull,

The proposed scope of work for the subject project has been reviewed. We have the following comments:

While the applicant can proceed with commencing the Traffic Impact Study and the field data collection since the City has accepted the methodology and assumptions with regard to the Item E, Other Jurisdiction Impact Impacts of Exhibit B, Scoping Agreement: Since the proposed project is within the one-mile jurisdiction of Caltrans D-8 (ie, I-10 Freeway Ramps at Pennsylvania Ave.), it is the sole responsibility of the project applicant to obtain Caltrans concurrence on this proposed project. The City is not responsible for addressing any issues arising from the potential impact of the subject project on the State's transportation system except to ensure that they agree with the results of the this Traffic Impact Study.

Should you have any questions, pl. advise. I can be contacted more conveniently via e-mail at minagarf@minagarinc.com or via telephone, (949)707-1199, Ext. 2#.

Thank you.

Sincerely,

MINAGAR & ASSOCIATES, INC.
(A California Corporation)

Fred Minagar, MS, RCE, PE, FITE
Principal/City Traffic Engineer

Exhibit B

SCOPING AGREEMENT FOR TRAFFIC IMPACT STUDY

This letter acknowledges the Riverside County Transportation Department requirements for traffic impact analysis of the following project. The analysis must follow the Riverside County Transportation Department Traffic Study Guidelines dated February 2005.

Case No. (i.e. TR, PM, CUP, PP)
Related Cases -
SP No. *Provide SP No. and list of other approved or active projects within the SP.*
EIR No.
GPA No.
CZ No.
Project Name: Proposed Service Station with C-Store, Restaurant & Carwash
Project Address: NWC of Pennsylvania Ave & I-10 WB Off Ramp, Beaumont, CA 92223
Project Description: New gas station (18 fueling stations) with a convenient store of 3,830 SF, a quick service restaurant of 1,570 SF, and a carwash facility of 3,000 SF

	Consultant	Developer
Name:	Kay Hsu, PE, TE, K2 Traffic Engineering, Inc.	JSJ Property Holding, LLC
Address:	1442 Irvine Blvd, Suite 210	9484 Sherwood Dr
	Tustin, CA 92780	Rancho Cucamonga, CA 91737
Telephone:	714-832-2116	626-224-4636
Email:	kay@k2traffic.com	Jas_Sondh@hotmail.com

A. Trip Generation Source: (ITE 7th Edition or other) ITE 10th Edition

Current GP Land Use	*Provide General Plan Land Use Designation (e.g.: MDR, CR, etc)* General Commercial	Proposed Land Use	General Commercial
Current Zoning	CG	Proposed Zoning	CG

Current Trip Generation	In	Out	Total	Proposed Trip Generation In	Out	Total
AM Trips	0	0	0	86	82	168
PM Trips	0	0	0	104	98	202

Internal Trip Allowance ☒ Yes ☐ No (10% % Trip Discount) See Exhibit 1
Pass-By Trip Allowance ☒ Yes ☐ No (25% % Trip Discount)

A passby trip discount of 25% is allowed for appropriate land uses. The passby trips at adjacent study area intersections and project driveways shall be indicated on a report figure.

B. Trip Geographic Distribution: (attach exhibit for detailed assignment) N 15 % S 10 % E 50 % W 25 % See Exhibit 2

C. Background Traffic

Project Build-out Year: 2021 Annual Ambient Growth Rate: 2 %
Phase Year(s) n/a
Other area projects to be analyzed: 1. San Gorgonio Village Commercial Development
2. CenterPoint Commercial Development
Model/Forecast methodology n/a

D. Study intersections: *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments from other agencies.)*

1. Pennsylvania Ave at 6th St
2. Pennsylvania Ave at I-10 WB Ramps
3. Pennsylvania Ave at I-10 EB Ramps
4.
5.
6.
7.
8.
9.
10.

E. Study Roadway Segments: *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments from other agencies.)*

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

E. Other Jurisdictional Impacts

Is this project within a City's Sphere of Influence or one-mile radius of City boundaries? ☐ Yes ☒ No

If so, name of City Jurisdiction: n/a

F. Site Plan (please attach reduced copy) See Exhibit 3

G. Specific issues to be addressed in the Study (in addition to the standard analysis described in the Guideline) (To be filled out by Transportation Department)
(NOTE: If the traffic study states that "a traffic signal is warranted" (or "a traffic signal appears to be warranted," or similar statement) at an existing unsignalized intersection under existing conditions, 8-hour approach traffic volume information must be submitted in addition to the peak hourly turning movement counts for that intersection.)

Proposed street widening of Pennsylvania Ave and I-10 Ramps reconfiguration should be examined in the future condition.

H. Existing Conditions

Traffic count data must be new or recent. Provide traffic count dates if using other than new counts.
Date of counts New counts

***NOTE* Traffic Study Submittal Form and appropriate fee must be submitted with, or prior to submittal of this form. Transportation Department staff will not process the Scoping Agreement prior to receipt of the fee.**

Recommended by:

Consultant's Representative — Date: 5/1/2019

Approved Scoping Agreement:

City of Beaumont — Date

Scoping Agreement Submitted on 5/1/2019

Revised on 7/11/2019

EXHIBIT 1. TRIP GENERATION

TABLE A1. TRIP GENERATION RATE (ITE)

LAND USE	UNIT	Daily	AM Peak			PM Peak		
			Total	IN	OUT	Total	IN	OUT
Gas Station with Convenience Store (945)	Veh Fueling Station	205.36	12.47	51%	49%	13.99	51%	49%
High-Turnover(Sit-Down) Restaurant (932)	1000 Sq. Ft.	112.18	9.94	55%	45%	9.77	62%	38%
Automated Carwash (948)*	1000 Sq. Ft.	142	6.31	50%	50%	14.2	50%	50%

Source: Trip Generation Manual, 10th Edition

* Daily and AM peak hour volumes derived from SANDAG's "Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region"

TABLE A2. TRIP GENERATION

LAND USE	UNIT	Quantity	AM Peak			PM Peak			Daily
			Total	IN	OUT	Total	IN	OUT	
Gas Station with Convenience Store (945)	Veh Fueling Station	18	224	114	110	252	129	123	3696
High-Turnover(Sit-Down) Restaurant (932)	1000 Sq. Ft.	1.57	16	9	7	15	9	6	176
Automated Carwash (948)*	1000 Sq. Ft.	3.0	19	10	9	43	22	21	426
Trip Generation (without Pass-By Consideration)			**259**	133	126	**310**	160	150	**4298**
Pass-By and Internal Trip Deduction		35%	-91	-47	-44	-109	-56	-53	-1504
NET Trip Generation			**168**	86	82	**202**	104	98	**2794**

APPENDIX B
TURNING MOVEMENT COUNT DATA

INTERSECTION TURNING MOVEMENT COUNTS

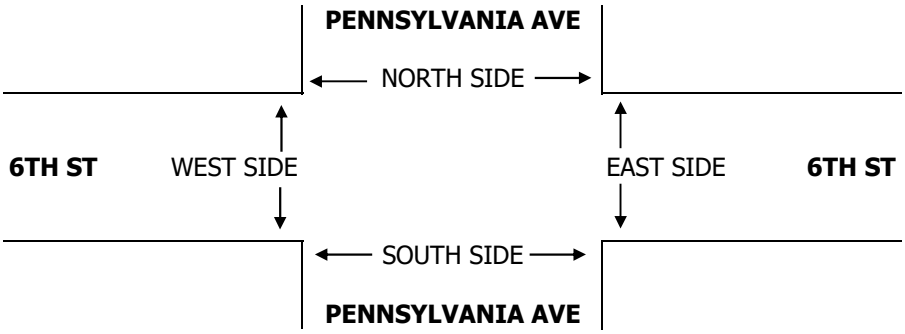
PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

DATE:	LOCATION:	BEAUMONT	PROJECT #:	
8/7/19	NORTH & SOUTH:	PENNSYLVANIA AVE	LOCATION #:	1
WEDNESDAY	EAST & WEST:	6TH ST	CONTROL:	SIGNAL

NOTES:

AM / PM / MD / OTHER / OTHER — ▲ N, ◄ W, E ►, S ▼

		NORTHBOUND PENNSYLVANIA AVE			SOUTHBOUND PENNSYLVANIA AVE			EASTBOUND 6TH ST			WESTBOUND 6TH ST			
	LANES:	NL 1	NT 1	NR 1	SL 1	ST 1	SR 0	EL 1	ET 2	ER 0	WL 1	WT 2	WR 0	TOTAL
AM	7:00 AM	43	66	13	4	55	17	3	42	18	16	53	7	337
	7:15 AM	37	72	14	3	58	24	9	49	31	7	38	11	353
	7:30 AM	31	78	19	14	57	9	2	59	33	7	73	5	387
	7:45 AM	53	77	29	15	64	11	8	82	38	14	60	12	463
	8:00 AM	32	39	18	14	54	14	7	75	49	12	64	11	389
	8:15 AM	19	26	25	11	59	16	8	81	39	9	52	13	358
	8:30 AM	28	36	34	11	77	18	10	73	45	20	83	10	445
	8:45 AM	30	29	13	16	67	13	8	69	38	14	72	5	374
	VOLUMES	273	423	165	88	491	122	55	530	291	99	495	74	3,106
	APPROACH %	32%	49%	19%	13%	70%	17%	6%	61%	33%	15%	74%	11%	
	APP/DEPART	861	/	552	701	/	881	876	/	783	668	/	890	0
	BEGIN PEAK HR		7:45 AM											
	VOLUMES	132	178	106	51	254	59	33	311	171	55	259	46	1,655
	APPROACH %	32%	43%	25%	14%	70%	16%	6%	60%	33%	15%	72%	13%	
	PEAK HR FACTOR		0.654			0.858			0.983			0.796		0.894
	APP/DEPART	416	/	257	364	/	480	515	/	468	360	/	450	0
PM	4:00 PM	48	90	30	13	53	13	12	96	59	23	82	10	529
	4:15 PM	41	61	25	8	46	15	16	98	48	21	105	13	497
	4:30 PM	50	71	28	9	56	14	16	74	48	24	69	11	470
	4:45 PM	57	82	25	11	38	6	16	73	59	21	79	15	482
	5:00 PM	56	64	22	14	34	11	14	77	42	26	81	10	451
	5:15 PM	50	72	29	16	44	10	16	94	48	32	108	20	539
	5:30 PM	53	88	19	8	37	8	13	75	39	31	64	15	450
	5:45 PM	39	72	25	10	39	10	16	74	68	16	73	11	453
	VOLUMES	394	600	203	89	347	87	119	661	411	194	661	105	3,871
	APPROACH %	33%	50%	17%	17%	66%	17%	10%	55%	35%	20%	69%	11%	
	APP/DEPART	1,197	/	824	523	/	952	1,191	/	953	960	/	1,142	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	196	304	108	41	193	48	60	341	214	89	335	49	1,978
	APPROACH %	32%	50%	18%	15%	68%	17%	10%	55%	35%	19%	71%	10%	
	PEAK HR FACTOR		0.905			0.892			0.921			0.851		0.935
	APP/DEPART	608	/	413	282	/	496	615	/	490	473	/	579	0



INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

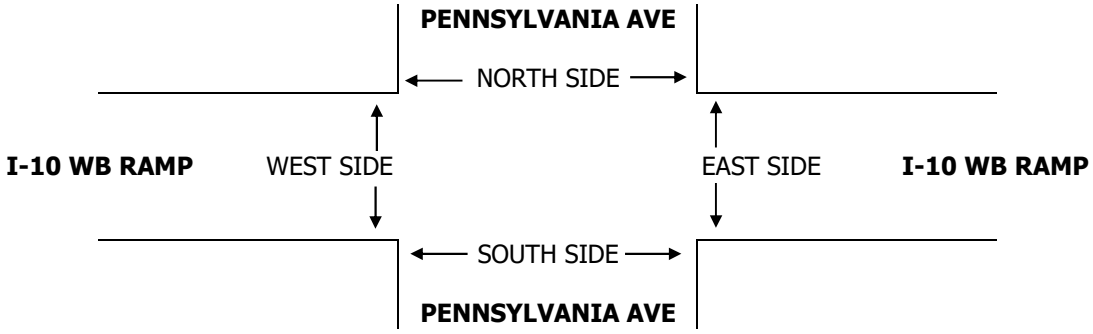
DATE:	LOCATION:	BEAUMONT	PROJECT #:	
8/7/19	NORTH & SOUTH:	PENNSYLVANIA AVE	LOCATION #:	2
WEDNESDAY	EAST & WEST:	I-10 WB RAMP	CONTROL:	1-WAY STOP: WB

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND PENNSYLVANIA AVE			SOUTHBOUND PENNSYLVANIA AVE			EASTBOUND I-10 WB RAMP			WESTBOUND I-10 WB RAMP			
	LANES:	NL X	NT 1	NR X	SL X	ST 1	SR X	EL X	ET X	ER X	WL 0	WT 1	WR 0	TOTAL
AM	7:00 AM		101			96					10		27	234
	7:15 AM		95			96					7		31	229
	7:30 AM		103			103					8		43	257
	7:45 AM		113			118					16		35	282
	8:00 AM		63			105					7		17	192
	8:15 AM		63			119					12		19	213
	8:30 AM		85			143					9		19	256
	8:45 AM		50			116					11		25	202
	VOLUMES	0	673	0	0	896	0	0	0	0	80	0	216	1,865
	APPROACH %	0%	100%	0%	0%	100%	0%	0%	0%	0%	27%	0%	73%	
	APP/DEPART	673	/	889	896	/	976	0	/	0	296	/	0	0
	BEGIN PEAK HR		7:00 AM											
	VOLUMES	0	412	0	0	413	0	0	0	0	41	0	136	1,002
	APPROACH %	0%	100%	0%	0%	100%	0%	0%	0%	0%	23%	0%	77%	
	PEAK HR FACTOR		0.912			0.875			0.000			0.868		0.888
	APP/DEPART	412	/	548	413	/	454	0	/	0	177	/	0	0
PM	4:00 PM		119			140					35		44	338
	4:15 PM		92			108					28		38	266
	4:30 PM		105			138					35		50	328
	4:45 PM		126			113					27		42	308
	5:00 PM		104			102					39		44	289
	5:15 PM		113			116					45		42	316
	5:30 PM		109			123					39		53	324
	5:45 PM		107			121					36		44	308
	VOLUMES	0	875	0	0	961	0	0	0	0	284	0	357	2,477
	APPROACH %	0%	100%	0%	0%	100%	0%	0%	0%	0%	44%	0%	56%	
	APP/DEPART	875	/	1,232	961	/	1,245	0	/	0	641	/	0	0
	BEGIN PEAK HR		4:30 PM											
	VOLUMES	0	448	0	0	469	0	0	0	0	146	0	178	1,241
	APPROACH %	0%	100%	0%	0%	100%	0%	0%	0%	0%	45%	0%	55%	
	PEAK HR FACTOR		0.889			0.850			0.000			0.931		0.946
	APP/DEPART	448	/	626	469	/	615	0	/	0	324	/	0	0



INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA SERVICES

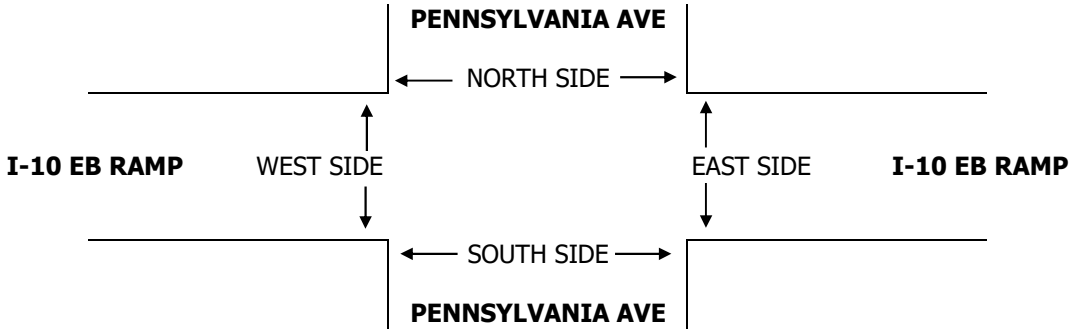
DATE:	LOCATION:	BEAUMONT	PROJECT #:	
8/7/19	NORTH & SOUTH:	PENNSYLVANIA AVE	LOCATION #:	3
WEDNESDAY	EAST & WEST:	I-10 EB RAMP	CONTROL:	UNCONTROLLED

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND PENNSYLVANIA AVE			SOUTHBOUND PENNSYLVANIA AVE			EASTBOUND I-10 EB RAMP			WESTBOUND I-10 EB RAMP			
	LANES:	NL X	NT 1	NR 0	SL 1	ST 1	SR X	EL X	ET X	ER X	WL X	WT X	WR X	TOTAL
AM	7:00 AM		98	33	46	58								235
	7:15 AM		93	42	53	55								243
	7:30 AM		99	45	46	67								257
	7:45 AM		122	62	60	71								315
	8:00 AM		67	33	44	73								217
	8:15 AM		59	54	57	72								242
	8:30 AM		83	35	56	90								264
	8:45 AM		52	46	53	76								227
	VOLUMES	0	673	350	415	562	0	0	0	0	0	0	0	2,000
	APPROACH %	0%	66%	34%	42%	58%	0%	0%	0%	0%	0%	0%	0%	
	APP/DEPART	1,023	/	673	977	/	562	0	/	765	0	/	0	0
	BEGIN PEAK HR		7:00 AM											
	VOLUMES	0	412	182	205	251	0	0	0	0	0	0	0	1,050
	APPROACH %	0%	69%	31%	45%	55%	0%	0%	0%	0%	0%	0%	0%	
	PEAK HR FACTOR		0.807			0.870			0.000			0.000		0.833
	APP/DEPART	594	/	412	456	/	251	0	/	387	0	/	0	0
PM	4:00 PM		125	37	47	119								328
	4:15 PM		97	47	41	101								286
	4:30 PM		131	37	43	136								347
	4:45 PM		96	38	47	98								279
	5:00 PM		94	26	42	92								254
	5:15 PM		117	40	41	114								312
	5:30 PM		121	41	45	122								329
	5:45 PM		108	24	46	110								288
	VOLUMES	0	889	290	352	892	0	0	0	0	0	0	0	2,423
	APPROACH %	0%	75%	25%	28%	72%	0%	0%	0%	0%	0%	0%	0%	
	APP/DEPART	1,179	/	889	1,244	/	892	0	/	642	0	/	0	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	0	449	159	178	454	0	0	0	0	0	0	0	1,240
	APPROACH %	0%	74%	26%	28%	72%	0%	0%	0%	0%	0%	0%	0%	
	PEAK HR FACTOR		0.905			0.883			0.000			0.000		0.893
	APP/DEPART	608	/	449	632	/	454	0	/	337	0	/	0	0



APPENDIX C
LEVEL OF SERVICE ANALYSIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	311	171	55	259	46	132	178	106	51	254	59
Future Volume (veh/h)	33	311	171	55	259	46	132	178	106	51	254	59
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	37	349	192	62	291	52	148	200	119	57	285	66
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	70	494	267	99	718	127	490	888	755	568	698	162
Arrive On Green	0.04	0.22	0.22	0.06	0.24	0.24	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1774	2221	1200	1774	3008	531	1026	1863	1583	1056	1464	339
Grp Volume(v), veh/h	37	277	264	62	170	173	148	200	119	57	0	351
Grp Sat Flow(s),veh/h/ln	1774	1770	1651	1774	1770	1769	1026	1863	1583	1056	0	1803
Q Serve(g_s), s	1.1	7.9	8.1	1.9	4.4	4.5	6.0	3.5	2.3	1.8	0.0	7.0
Cycle Q Clear(g_c), s	1.1	7.9	8.1	1.9	4.4	4.5	13.0	3.5	2.3	5.3	0.0	7.0
Prop In Lane	1.00		0.73	1.00		0.30	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	70	393	367	99	422	422	490	888	755	568	0	859
V/C Ratio(X)	0.53	0.70	0.72	0.63	0.40	0.41	0.30	0.23	0.16	0.10	0.00	0.41
Avail Cap(c_a), veh/h	165	582	543	165	582	582	490	888	755	568	0	859
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	19.7	19.8	25.4	17.6	17.7	13.6	8.4	8.1	10.0	0.0	9.4
Incr Delay (d2), s/veh	6.2	2.3	2.7	6.4	0.6	0.6	1.6	0.6	0.4	0.4	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	4.1	3.9	1.1	2.2	2.3	1.9	1.9	1.1	0.6	0.0	3.8
LnGrp Delay(d),s/veh	32.1	22.0	22.5	31.8	18.2	18.3	15.2	9.0	8.6	10.3	0.0	10.8
LnGrp LOS	C	C	C	C	B	B	B	A	A	B		B
Approach Vol, veh/h		578			405			467			408	
Approach Delay, s/veh		22.9			20.3			10.9			10.7	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		30.7	7.6	16.7		30.7	6.7	17.6
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.3	5.1	18.1		18.3	5.1	18.1
Max Q Clear Time (g_c+I1), s		15.0	3.9	10.1		9.0	3.1	6.5
Green Ext Time (p_c), s		0.7	0.0	2.1		1.6	0.0	1.5

Intersection Summary	
HCM 2010 Ctrl Delay	16.6
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	41	136	412	0	0	413
Future Vol, veh/h	41	136	412	0	0	413
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	153	463	0	0	464

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	927	463	0	-	-	-
Stage 1	463	-	-	-	-	-
Stage 2	464	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	298	599	-	0	0	-
Stage 1	634	-	-	0	0	-
Stage 2	633	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	298	599	-	-	-	-
Mov Cap-2 Maneuver	298	-	-	-	-	-
Stage 1	634	-	-	-	-	-
Stage 2	633	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.5	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	485	-
HCM Lane V/C Ratio	-	0.41	-
HCM Control Delay (s)	-	17.5	-
HCM Lane LOS	-	C	-
HCM 95th %tile Q(veh)	-	2	-

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	412	182	205	251	41	136	412	413		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	10.2			10.2			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	594	0	205	251	177	0	412	413		
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Factor (vph)	0.95	0.85	0.95	1.00	0.87	0.85	1.00	1.00		
Saturated Flow (vph)	1813	0	1805	1900	1662	0	1900	1900		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	39.3	0.0	13.6	15.9	12.8	0.0	26.0	26.1		
Adj Reference Time (s)	43.3	0.0	17.6	19.9	16.8	0.0	30.0	30.1		
Volume per cycle, 90th			10.2	12.1	2.9		18.5			
Volume to Storage			1.0	1.2	0.3		1.8			
Isolated Timings (s)	61.0				46.9					

Timing Options										
Leading Option (s)		90.2								
Lagging Option (s)	OK	61.0								
Lead-Lag Option (s)	OK	61.0								

Interchange Summary				
Intersection Capacity Utilization	50.8%	ICU Level of Service	A	

Reference Times and Phasing Options do not represent an optimized timing plan.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	311	177	61	259	46	167	194	112	51	272	59
Future Volume (veh/h)	33	311	177	61	259	46	167	194	112	51	272	59
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	37	349	199	69	291	52	188	218	126	57	306	66
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	70	492	275	105	736	130	466	877	745	544	699	151
Arrive On Green	0.04	0.22	0.22	0.06	0.24	0.24	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1774	2190	1226	1774	3008	531	1006	1863	1583	1032	1486	320
Grp Volume(v), veh/h	37	281	267	69	170	173	188	218	126	57	0	372
Grp Sat Flow(s),veh/h/ln	1774	1770	1646	1774	1770	1769	1006	1863	1583	1032	0	1806
Q Serve(g_s), s	1.1	8.0	8.3	2.1	4.4	4.5	8.4	3.9	2.5	1.9	0.0	7.6
Cycle Q Clear(g_c), s	1.1	8.0	8.3	2.1	4.4	4.5	16.0	3.9	2.5	5.8	0.0	7.6
Prop In Lane	1.00		0.74	1.00		0.30	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	70	397	370	105	433	433	466	877	745	544	0	850
V/C Ratio(X)	0.53	0.71	0.72	0.66	0.39	0.40	0.40	0.25	0.17	0.10	0.00	0.44
Avail Cap(c_a), veh/h	165	582	542	165	582	582	466	877	745	544	0	850
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	19.7	19.7	25.3	17.4	17.4	15.0	8.7	8.4	10.5	0.0	9.7
Incr Delay (d2), s/veh	6.2	2.3	2.7	6.8	0.6	0.6	2.6	0.7	0.5	0.4	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	4.2	4.0	1.2	2.2	2.3	2.6	2.1	1.2	0.6	0.0	4.1
LnGrp Delay(d),s/veh	32.1	22.0	22.4	32.1	17.9	18.0	17.6	9.4	8.9	10.8	0.0	11.3
LnGrp LOS	C	C	C	C	B	B	B	A	A	B		B
Approach Vol, veh/h		585			412			532			429	
Approach Delay, s/veh		22.8			20.3			12.2			11.3	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		30.4	7.8	16.9		30.4	6.7	18.0
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.3	5.1	18.1		18.3	5.1	18.1
Max Q Clear Time (g_c+I1), s		18.0	4.1	10.3		9.6	3.1	6.5
Green Ext Time (p_c), s		0.1	0.0	2.1		1.7	0.0	1.5

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	41	148	429	0	0	469
Future Vol, veh/h	41	148	429	0	0	469
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	166	482	0	0	527

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1009	482	0	-	-	-
Stage 1	482	-	-	-	-	-
Stage 2	527	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	266	584	-	0	0	-
Stage 1	621	-	-	0	0	-
Stage 2	592	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	266	584	-	-	-	-
Mov Cap-2 Maneuver	266	-	-	-	-	-
Stage 1	621	-	-	-	-	-
Stage 2	592	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	464	-
HCM Lane V/C Ratio	-	0.458	-
HCM Control Delay (s)	-	19.1	-
HCM Lane LOS	-	C	-
HCM 95th %tile Q(veh)	-	2.4	-

Diamond Interchange Capacity Utilization
3: Pennsylvania Ave & I-10 EB ON Ramp

09/30/2021

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	429	182	244	268	41	148	429	469		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	10.2			10.2			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	611	0	244	268	189	0	429	469		
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Factor (vph)	0.96	0.85	0.95	1.00	0.87	0.85	1.00	1.00		
Saturated Flow (vph)	1815	0	1805	1900	1659	0	1900	1900		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	40.4	0.0	16.2	16.9	13.7	0.0	27.1	29.6		
Adj Reference Time (s)	44.4	0.0	20.2	20.9	17.7	0.0	31.1	33.6		
Volume per cycle, 90th			11.8	12.8	2.9		19.1			
Volume to Storage			1.2	1.3	0.3		1.9			
Isolated Timings (s)	64.6				51.3					

Timing Options		
Leading Option (s)		95.7
Lagging Option (s)	NA	
Lead-Lag Option (s)	OK	64.6

Interchange Summary			
Intersection Capacity Utilization	53.8%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	86	0	473	510	0
Future Vol, veh/h	0	86	0	473	510	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	93	0	514	554	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	554	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	532	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	532	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	532	-	-
HCM Lane V/C Ratio	-	0.176	-	-
HCM Control Delay (s)	-	13.2	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.6	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	416	194	74	380	56	169	204	126	61	288	64
Future Volume (veh/h)	36	416	194	74	380	56	169	204	126	61	288	64
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	40	467	218	83	427	63	190	229	142	69	324	72
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	74	613	284	116	882	129	394	1516	678	522	633	141
Arrive On Green	0.04	0.26	0.26	0.07	0.28	0.28	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1774	2350	1090	1774	3098	454	984	3539	1583	1007	1477	328
Grp Volume(v), veh/h	40	351	334	83	243	247	190	229	142	69	0	396
Grp Sat Flow(s),veh/h/ln	1774	1770	1670	1774	1770	1783	984	1770	1583	1007	0	1805
Q Serve(g_s), s	1.2	10.1	10.2	2.5	6.3	6.3	9.6	2.2	3.1	2.5	0.0	8.8
Cycle Q Clear(g_c), s	1.2	10.1	10.2	2.5	6.3	6.3	18.5	2.2	3.1	4.6	0.0	8.8
Prop In Lane	1.00		0.65	1.00		0.25	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	74	462	436	116	504	507	394	1516	678	522	0	773
V/C Ratio(X)	0.54	0.76	0.77	0.72	0.48	0.49	0.48	0.15	0.21	0.13	0.00	0.51
Avail Cap(c_a), veh/h	165	582	550	165	582	587	394	1516	678	522	0	773
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.8	18.7	18.8	25.2	16.3	16.3	18.3	9.6	9.9	11.0	0.0	11.5
Incr Delay (d2), s/veh	6.1	4.5	5.0	8.2	0.7	0.7	4.2	0.2	0.7	0.5	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	5.4	5.2	1.5	3.1	3.2	3.0	1.1	1.5	0.8	0.0	4.9
LnGrp Delay(d),s/veh	31.9	23.2	23.8	33.4	17.0	17.1	22.4	9.8	10.6	11.6	0.0	13.9
LnGrp LOS	C	C	C	C	B	B	C	A	B	B		B
Approach Vol, veh/h		725			573			561			465	
Approach Delay, s/veh		23.9			19.4			14.3			13.6	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		28.1	8.1	18.8		28.1	6.8	20.2
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.3	5.1	18.1		18.3	5.1	18.1
Max Q Clear Time (g_c+I1), s		20.5	4.5	12.2		10.8	3.2	8.3
Green Ext Time (p_c), s		0.0	0.0	2.2		1.7	0.0	2.1

Intersection Summary	
HCM 2010 Ctrl Delay	18.4
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	147	505	0	0	524
Future Vol, veh/h	44	147	505	0	0	524
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	165	567	0	0	589

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	862	284	0	-	-	-
Stage 1	567	-	-	-	-	-
Stage 2	295	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	294	713	-	0	0	-
Stage 1	531	-	-	0	0	-
Stage 2	730	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	294	713	-	-	-	-
Mov Cap-2 Maneuver	294	-	-	-	-	-
Stage 1	531	-	-	-	-	-
Stage 2	730	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	537	-
HCM Lane V/C Ratio	-	0.4	-
HCM Control Delay (s)	-	16.1	-
HCM Lane LOS	-	C	-
HCM 95th %tile Q(veh)	-	1.9	-

Diamond Interchange Capacity Utilization
3: Pennsylvania Ave & I-10 EB ON Ramp

09/30/2021

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	505	197	222	349	44	147	505	524		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	20.4			20.4			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	702	0	222	349	191	0	505	524		
Lane Utilization Factor	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95		
Turning Factor (vph)	0.96	0.85	0.95	1.00	0.87	0.85	1.00	1.00		
Saturated Flow (vph)	3465	0	1805	3618	1661	0	3618	3618		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	24.3	0.0	14.8	11.6	13.8	0.0	16.8	17.4		
Adj Reference Time (s)	28.3	0.0	18.8	15.6	17.8	0.0	20.8	21.4		
Volume per cycle, 90th			10.9	16.0	3.0		22.1			
Volume to Storage			1.1	0.8	0.1		1.1			
Isolated Timings (s)	47.1				39.2					

Timing Options		
Leading Option (s)		67.5
Lagging Option (s)	NA	
Lead-Lag Option (s)	OK	47.1

Interchange Summary			
Intersection Capacity Utilization	39.2%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	416	200	80	380	56	204	220	132	61	306	64
Future Volume (veh/h)	36	416	200	80	380	56	204	220	132	61	306	64
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	40	467	225	90	427	63	229	247	148	69	344	72
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	74	611	292	120	896	131	374	1500	671	506	633	133
Arrive On Green	0.04	0.26	0.26	0.07	0.29	0.29	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	1774	2324	1112	1774	3098	454	966	3539	1583	985	1495	313
Grp Volume(v), veh/h	40	355	337	90	243	247	229	247	148	69	0	416
Grp Sat Flow(s),veh/h/ln	1774	1770	1666	1774	1770	1783	966	1770	1583	985	0	1808
Q Serve(g_s), s	1.2	10.2	10.3	2.7	6.2	6.3	12.8	2.4	3.3	2.6	0.0	9.5
Cycle Q Clear(g_c), s	1.2	10.2	10.3	2.7	6.2	6.3	22.3	2.4	3.3	4.9	0.0	9.5
Prop In Lane	1.00		0.67	1.00		0.25	1.00		1.00	1.00		0.17
Lane Grp Cap(c), veh/h	74	465	438	120	512	516	374	1500	671	506	0	766
V/C Ratio(X)	0.54	0.76	0.77	0.75	0.47	0.48	0.61	0.16	0.22	0.14	0.00	0.54
Avail Cap(c_a), veh/h	165	582	548	165	582	587	374	1500	671	506	0	766
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.8	18.7	18.7	25.2	16.1	16.1	20.2	9.8	10.1	11.3	0.0	11.9
Incr Delay (d2), s/veh	6.1	4.6	5.2	11.6	0.7	0.7	7.3	0.2	0.8	0.6	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	5.5	5.3	1.7	3.1	3.2	4.1	1.2	1.6	0.8	0.0	5.2
LnGrp Delay(d),s/veh	31.9	23.3	23.9	36.8	16.8	16.8	27.5	10.1	10.8	11.9	0.0	14.6
LnGrp LOS	C	C	C	D	B	B	C	B	B	B		B
Approach Vol, veh/h		732			580			624			485	
Approach Delay, s/veh		24.1			19.9			16.6			14.2	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		27.8	8.2	19.0		27.8	6.8	20.4
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.3	5.1	18.1		18.3	5.1	18.1
Max Q Clear Time (g_c+I1), s		24.3	4.7	12.3		11.5	3.2	8.3
Green Ext Time (p_c), s		0.0	0.0	2.2		1.7	0.0	2.1

Intersection Summary	
HCM 2010 Ctrl Delay	19.2
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	159	522	0	0	580
Future Vol, veh/h	44	159	522	0	0	580
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	179	587	0	0	652

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	913	294	0	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	326	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	273	702	-	0	0	-
Stage 1	519	-	-	0	0	-
Stage 2	704	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	273	702	-	-	-	-
Mov Cap-2 Maneuver	273	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	704	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	524	-
HCM Lane V/C Ratio	-	0.435	-
HCM Control Delay (s)	-	17.1	-
HCM Lane LOS	-	C	-
HCM 95th %tile Q(veh)	-	2.2	-

Diamond Interchange Capacity Utilization
3: Pennsylvania Ave & I-10 EB ON Ramp

09/30/2021

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	522	197	261	366	44	159	522	580		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	20.4			20.4			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	719	0	261	366	203	0	522	580		
Lane Utilization Factor	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95		
Turning Factor (vph)	0.96	0.85	0.95	1.00	0.87	0.85	1.00	1.00		
Saturated Flow (vph)	3469	0	1805	3618	1659	0	3618	3618		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	24.9	0.0	17.4	12.1	14.7	0.0	17.3	19.2		
Adj Reference Time (s)	28.9	0.0	21.4	16.1	18.7	0.0	21.3	23.2		
Volume per cycle, 90th			12.5	16.7	3.0		22.7			
Volume to Storage			1.2	0.8	0.1		1.1			
Isolated Timings (s)	50.2				41.9					

Timing Options										
Leading Option (s)		70.8								
Lagging Option (s)	NA									
Lead-Lag Option (s)	OK	50.2								

Interchange Summary				
Intersection Capacity Utilization	41.9%	ICU Level of Service	A	

Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	86	0	556	586	91
Future Vol, veh/h	0	86	0	556	586	91
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	93	0	604	637	99

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	368	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	629	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	629	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	629	-	-
HCM Lane V/C Ratio	-	0.149	-	-
HCM Control Delay (s)	-	11.7	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.5	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	159	522	0	0	580
Future Vol, veh/h	44	159	522	0	0	580
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	179	587	0	0	652

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	913	294	0	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	326	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	273	702	-	0	0	-
Stage 1	519	-	-	0	0	-
Stage 2	704	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	273	702	-	-	-	-
Mov Cap-2 Maneuver	273	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	704	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	273	702	-
HCM Lane V/C Ratio	-	0.181	0.254	-
HCM Control Delay (s)	-	21.1	11.9	-
HCM Lane LOS	-	C	B	-
HCM 95th %tile Q(veh)	-	0.6	1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	341	214	89	335	49	196	304	108	41	193	48
Future Volume (veh/h)	60	341	214	89	335	49	196	304	108	41	193	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	64	363	228	95	356	52	209	323	115	44	205	51
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	101	499	308	123	776	112	529	834	709	445	645	160
Arrive On Green	0.06	0.24	0.24	0.07	0.25	0.25	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	1774	2103	1300	1774	3103	450	1119	1863	1583	947	1441	358
Grp Volume(v), veh/h	64	305	286	95	202	206	209	323	115	44	0	256
Grp Sat Flow(s),veh/h/ln	1774	1770	1633	1774	1770	1783	1119	1863	1583	947	0	1799
Q Serve(g_s), s	1.9	8.7	8.9	2.9	5.3	5.4	8.1	6.4	2.4	1.8	0.0	5.0
Cycle Q Clear(g_c), s	1.9	8.7	8.9	2.9	5.3	5.4	13.2	6.4	2.4	8.2	0.0	5.0
Prop In Lane	1.00		0.80	1.00		0.25	1.00		1.00	1.00		0.20
Lane Grp Cap(c), veh/h	101	420	388	123	443	446	529	834	709	445	0	806
V/C Ratio(X)	0.64	0.73	0.74	0.77	0.46	0.46	0.39	0.39	0.16	0.10	0.00	0.32
Avail Cap(c_a), veh/h	161	579	535	171	589	593	529	834	709	445	0	806
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	19.3	19.4	25.2	17.5	17.5	14.0	10.1	9.0	12.9	0.0	9.8
Incr Delay (d2), s/veh	6.5	2.8	3.5	13.1	0.7	0.7	2.2	1.4	0.5	0.4	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	4.6	4.4	1.9	2.7	2.7	2.8	3.5	1.1	0.5	0.0	2.7
LnGrp Delay(d),s/veh	31.9	22.2	22.9	38.2	18.2	18.2	16.2	11.5	9.5	13.3	0.0	10.8
LnGrp LOS	C	C	C	D	B	B	B	B	A	B		B
Approach Vol, veh/h		655			503			647			300	
Approach Delay, s/veh		23.4			22.0			12.7			11.2	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		29.1	8.3	17.5		29.1	7.6	18.3
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.2	5.3	18.0		18.2	5.0	18.3
Max Q Clear Time (g_c+I1), s		15.2	4.9	10.9		10.2	3.9	7.4
Green Ext Time (p_c), s		1.0	0.0	2.1		1.0	0.0	1.8

Intersection Summary	
HCM 2010 Ctrl Delay	18.0
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	13

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	146	178	448	0	0	469
Future Vol, veh/h	146	178	448	0	0	469
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	154	187	472	0	0	494

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	966	472	0	-	-	-
Stage 1	472	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	282	592	-	0	0	-
Stage 1	628	-	-	0	0	-
Stage 2	613	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	282	592	-	-	-	-
Mov Cap-2 Maneuver	282	-	-	-	-	-
Stage 1	628	-	-	-	-	-
Stage 2	613	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	49.9	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	396	-
HCM Lane V/C Ratio	-	0.861	-
HCM Control Delay (s)	-	49.9	-
HCM Lane LOS	-	E	-
HCM 95th %tile Q(veh)	-	8.4	-

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	449	159	178	454	146	178	448	469		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	10.2			10.2			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	608	0	178	454	324	0	448	469		
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Factor (vph)	0.96	0.85	0.95	1.00	0.90	0.85	1.00	1.00		
Saturated Flow (vph)	1825	0	1805	1900	1704	0	1900	1900		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	40.0	0.0	11.8	28.7	22.8	0.0	28.3	29.6		
Adj Reference Time (s)	44.0	0.0	15.8	32.7	26.8	0.0	32.3	33.6		
Volume per cycle, 90th			9.1	20.1	7.7		19.9			
Volume to Storage			0.9	2.0	0.8		1.9			
Isolated Timings (s)	59.8				60.4					

Timing Options		
Leading Option (s)		104.4
Lagging Option (s)	OK	60.4
Lead-Lag Option (s)	OK	60.4

Interchange Summary			
Intersection Capacity Utilization	50.4%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	341	221	96	335	49	239	324	115	41	215	48
Future Volume (veh/h)	60	341	221	96	335	49	239	324	115	41	215	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	64	363	235	102	356	52	254	345	122	44	229	51
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	101	497	317	130	795	115	502	823	699	421	652	145
Arrive On Green	0.06	0.24	0.24	0.07	0.26	0.26	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	1774	2076	1323	1774	3103	450	1095	1863	1583	922	1476	329
Grp Volume(v), veh/h	64	309	289	102	202	206	254	345	122	44	0	280
Grp Sat Flow(s),veh/h/ln	1774	1770	1629	1774	1770	1783	1095	1863	1583	922	0	1805
Q Serve(g_s), s	1.9	8.8	9.0	3.1	5.3	5.4	11.0	7.0	2.6	1.9	0.0	5.6
Cycle Q Clear(g_c), s	1.9	8.8	9.0	3.1	5.3	5.4	16.6	7.0	2.6	8.9	0.0	5.6
Prop In Lane	1.00		0.81	1.00		0.25	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	101	424	390	130	453	457	502	823	699	421	0	797
V/C Ratio(X)	0.64	0.73	0.74	0.78	0.45	0.45	0.51	0.42	0.17	0.10	0.00	0.35
Avail Cap(c_a), veh/h	161	579	533	171	589	593	502	823	699	421	0	797
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	19.3	19.3	25.1	17.2	17.2	15.6	10.5	9.3	13.6	0.0	10.1
Incr Delay (d2), s/veh	6.5	3.0	3.6	15.8	0.7	0.7	3.6	1.6	0.5	0.5	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	4.6	4.4	2.1	2.7	2.7	3.8	3.9	1.2	0.5	0.0	3.1
LnGrp Delay(d),s/veh	31.9	22.2	23.0	40.9	17.9	17.9	19.2	12.1	9.8	14.1	0.0	11.4
LnGrp LOS	C	C	C	D	B	B	B	B	A	B		B
Approach Vol, veh/h		662			510			721			324	
Approach Delay, s/veh		23.5			22.5			14.2			11.7	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		28.8	8.5	17.7		28.8	7.6	18.6
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.2	5.3	18.0		18.2	5.0	18.3
Max Q Clear Time (g_c+I1), s		18.6	5.1	11.0		10.9	3.9	7.4
Green Ext Time (p_c), s		0.0	0.0	2.1		1.1	0.0	1.8

Intersection Summary	
HCM 2010 Ctrl Delay	18.5
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	18.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	146	192	470	0	0	536
Future Vol, veh/h	146	192	470	0	0	536
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	154	202	495	0	0	564

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1059	495	0	-	-	-
Stage 1	495	-	-	-	-	-
Stage 2	564	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	249	575	-	0	0	-
Stage 1	613	-	-	0	0	-
Stage 2	569	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	249	575	-	-	-	-
Mov Cap-2 Maneuver	249	-	-	-	-	-
Stage 1	613	-	-	-	-	-
Stage 2	569	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	73.7	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	367	-
HCM Lane V/C Ratio	-	0.969	-
HCM Control Delay (s)	-	73.7	-
HCM Lane LOS	-	F	-
HCM 95th %tile Q(veh)	-	10.9	-

Diamond Interchange Capacity Utilization
3: Pennsylvania Ave & I-10 EB ON Ramp

09/30/2021

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	471	159	225	474	146	192	470	536		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	10.2			10.2			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	630	0	225	474	338	0	470	536		
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Factor (vph)	0.96	0.85	0.95	1.00	0.90	0.85	1.00	1.00		
Saturated Flow (vph)	1828	0	1805	1900	1701	0	1900	1900		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	41.4	0.0	15.0	29.9	23.9	0.0	29.7	33.9		
Adj Reference Time (s)	45.4	0.0	19.0	33.9	27.9	0.0	33.7	37.9		
Volume per cycle, 90th			11.0	20.9	7.7		20.7			
Volume to Storage			1.1	2.0	0.8		2.0			
Isolated Timings (s)	64.3				65.7					

Timing Options		
Leading Option (s)		111.1
Lagging Option (s)	NA	
Lead-Lag Option (s)	OK	65.7

Interchange Summary			
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	103	0	678	532	111
Future Vol, veh/h	0	103	0	678	532	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	112	0	737	578	121

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	639	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	476	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	476	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	476	-	-
HCM Lane V/C Ratio	-	0.235	-	-
HCM Control Delay (s)	-	14.9	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.9	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	493	243	110	464	59	224	345	134	50	224	52
Future Volume (veh/h)	65	493	243	110	464	59	224	345	134	50	224	52
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	69	524	259	117	494	63	238	367	143	53	238	55
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	105	653	322	149	976	124	420	1367	612	410	566	131
Arrive On Green	0.06	0.28	0.28	0.08	0.31	0.31	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	1774	2299	1133	1774	3160	401	1082	3539	1583	886	1465	338
Grp Volume(v), veh/h	69	403	380	117	276	281	238	367	143	53	0	293
Grp Sat Flow(s),veh/h/ln	1774	1770	1663	1774	1770	1792	1082	1770	1583	886	0	1803
Q Serve(g_s), s	2.1	11.6	11.7	3.6	7.0	7.1	11.4	3.9	3.4	2.4	0.0	6.5
Cycle Q Clear(g_c), s	2.1	11.6	11.7	3.6	7.0	7.1	17.9	3.9	3.4	6.3	0.0	6.5
Prop In Lane	1.00		0.68	1.00		0.22	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	105	503	472	149	547	554	420	1367	612	410	0	697
V/C Ratio(X)	0.66	0.80	0.80	0.78	0.50	0.51	0.57	0.27	0.23	0.13	0.00	0.42
Avail Cap(c_a), veh/h	161	579	544	171	589	596	420	1367	612	410	0	697
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	18.3	18.3	24.7	15.6	15.6	18.9	11.6	11.4	13.7	0.0	12.4
Incr Delay (d2), s/veh	6.8	7.0	7.6	18.6	0.7	0.7	5.5	0.5	0.9	0.6	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	6.6	6.3	2.5	3.5	3.6	4.0	2.0	1.6	0.7	0.0	3.6
LnGrp Delay(d),s/veh	32.1	25.3	25.9	43.3	16.3	16.3	24.4	12.0	12.3	14.4	0.0	14.2
LnGrp LOS	C	C	C	D	B	B	C	B	B	B		B
Approach Vol, veh/h		852			674			748			346	
Approach Delay, s/veh		26.1			21.0			16.0			14.2	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		25.7	9.1	20.1		25.7	7.8	21.5
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.2	5.3	18.0		18.2	5.0	18.3
Max Q Clear Time (g_c+I1), s		19.9	5.6	13.7		8.5	4.1	9.1
Green Ext Time (p_c), s		0.0	0.0	2.0		1.4	0.0	2.3

Intersection Summary	
HCM 2010 Ctrl Delay	20.3
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	13.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	158	193	581	0	0	590
Future Vol, veh/h	158	193	581	0	0	590
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	166	203	612	0	0	621

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	923	306	0	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	311	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	269	690	-	0	0	-
Stage 1	504	-	-	0	0	-
Stage 2	716	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	269	690	-	-	-	-
Mov Cap-2 Maneuver	269	-	-	-	-	-
Stage 1	504	-	-	-	-	-
Stage 2	716	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	57.7	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	405	-
HCM Lane V/C Ratio	-	0.912	-
HCM Control Delay (s)	-	57.7	-
HCM Lane LOS	-	F	-
HCM 95th %tile Q(veh)	-	9.8	-

Diamond Interchange Capacity Utilization
3: Pennsylvania Ave & I-10 EB ON Ramp

09/30/2021

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	582	172	193	573	158	193	581	590		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	20.4			20.4			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	754	0	193	573	351	0	581	590		
Lane Utilization Factor	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95		
Turning Factor (vph)	0.97	0.85	0.95	1.00	0.90	0.85	1.00	1.00		
Saturated Flow (vph)	3494	0	1805	3618	1704	0	3618	3618		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	25.9	0.0	12.8	19.0	24.7	0.0	19.3	19.6		
Adj Reference Time (s)	29.9	0.0	16.8	23.0	28.7	0.0	23.3	23.6		
Volume per cycle, 90th			9.7	24.7	8.2		25.0			
Volume to Storage			0.9	1.2	0.4		1.2			
Isolated Timings (s)	46.7				52.3					

Timing Options		
Leading Option (s)		82.2
Lagging Option (s)	OK	52.3
Lead-Lag Option (s)	OK	52.3

Interchange Summary			
Intersection Capacity Utilization	43.6%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	493	250	117	464	59	267	365	141	50	246	52
Future Volume (veh/h)	65	493	250	117	464	59	267	365	141	50	246	52
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	69	524	266	124	494	63	284	388	150	53	262	55
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	105	651	329	158	997	127	393	1344	601	393	567	119
Arrive On Green	0.06	0.29	0.29	0.09	0.32	0.32	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1774	2277	1152	1774	3160	401	1058	3539	1583	864	1494	314
Grp Volume(v), veh/h	69	407	383	124	276	281	284	388	150	53	0	317
Grp Sat Flow(s),veh/h/ln	1774	1770	1659	1774	1770	1792	1058	1770	1583	864	0	1807
Q Serve(g_s), s	2.1	11.7	11.8	3.8	6.9	7.0	13.6	4.2	3.6	2.5	0.0	7.3
Cycle Q Clear(g_c), s	2.1	11.7	11.8	3.8	6.9	7.0	20.9	4.2	3.6	6.7	0.0	7.3
Prop In Lane	1.00		0.69	1.00		0.22	1.00		1.00	1.00		0.17
Lane Grp Cap(c), veh/h	105	506	474	158	558	566	393	1344	601	393	0	686
V/C Ratio(X)	0.66	0.80	0.81	0.78	0.49	0.50	0.72	0.29	0.25	0.13	0.00	0.46
Avail Cap(c_a), veh/h	161	579	543	171	589	596	393	1344	601	393	0	686
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	18.2	18.2	24.5	15.3	15.3	21.2	11.9	11.7	14.2	0.0	12.8
Incr Delay (d2), s/veh	6.8	7.2	7.9	19.7	0.7	0.7	11.0	0.5	1.0	0.7	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	6.7	6.4	2.7	3.5	3.5	5.5	2.1	1.7	0.7	0.0	4.0
LnGrp Delay(d),s/veh	32.1	25.4	26.1	44.2	15.9	16.0	32.2	12.4	12.7	14.9	0.0	15.1
LnGrp LOS	C	C	C	D	B	B	C	B	B	B		B
Approach Vol, veh/h		859			681			822			370	
Approach Delay, s/veh		26.3			21.1			19.3			15.0	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		25.4	9.4	20.2		25.4	7.8	21.9
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.2	5.3	18.0		18.2	5.0	18.3
Max Q Clear Time (g_c+I1), s		22.9	5.8	13.8		9.3	4.1	9.0
Green Ext Time (p_c), s		0.0	0.0	1.9		1.5	0.0	2.3

Intersection Summary	
HCM 2010 Ctrl Delay	21.4
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	17.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	158	207	603	0	0	657
Future Vol, veh/h	158	207	603	0	0	657
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	166	218	635	0	0	692

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	981	318	0	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	247	678	-	0	0	-
Stage 1	490	-	-	0	0	-
Stage 2	688	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	247	678	-	-	-	-
Mov Cap-2 Maneuver	247	-	-	-	-	-
Stage 1	490	-	-	-	-	-
Stage 2	688	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	77.9	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	386	-
HCM Lane V/C Ratio	-	0.995	-
HCM Control Delay (s)	-	77.9	-
HCM Lane LOS	-	F	-
HCM 95th %tile Q(veh)	-	11.9	-

Movement	NBT	NBR	SBL	SBT	WBL	WBR	NBT	SBT		
Node	0	0	0	0	0	0	0	0		
Lane Configurations										
Volume (vph)	604	172	240	593	158	207	603	657		
Pedestrians										
Ped Button										
Pedestrian Timing (s)										
Free Right		No				No				
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Space			10.2	20.4			20.4			
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Refr Cycle Length (s)										
Travel Time (s)	7.6		120	120	120	120	120	120	120	120
Volume Combined (vph)	776	0	240	593	365	0	603	657		
Lane Utilization Factor	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95		
Turning Factor (vph)	0.97	0.85	0.95	1.00	0.90	0.85	1.00	1.00		
Saturated Flow (vph)	3497	0	1805	3618	1701	0	3618	3618		
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pedestrian Frequency (%)	0.00			0.00	0.00		0.00	0.00		
Reference Time (s)	26.6	0.0	16.0	19.7	25.8	0.0	20.0	21.8		
Adj Reference Time (s)	30.6	0.0	20.0	23.7	29.8	0.0	24.0	25.8		
Volume per cycle, 90th			11.6	25.5	8.2		25.8			
Volume to Storage			1.1	1.2	0.4		1.3			
Isolated Timings (s)	50.6				55.5					

Timing Options		
Leading Option (s)		86.2
Lagging Option (s)	NA	
Lead-Lag Option (s)	OK	55.5

Interchange Summary			
Intersection Capacity Utilization	46.3%	ICU Level of Service	A

Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	103	0	773	613	0
Future Vol, veh/h	0	103	0	773	613	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	112	0	840	666	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	333	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	663	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	663	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	663	-	-
HCM Lane V/C Ratio	-	0.169	-	-
HCM Control Delay (s)	-	11.5	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.6	-	-

Intersection	
Int Delay, s/veh	6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	158	207	603	0	0	657
Future Vol, veh/h	158	207	603	0	0	657
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	166	218	635	0	0	692

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	981	318	0	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	-	-
Pot Cap-1 Maneuver	247	678	-	0	0	-
Stage 1	490	-	-	0	0	-
Stage 2	688	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	247	678	-	-	-	-
Mov Cap-2 Maneuver	247	-	-	-	-	-
Stage 1	490	-	-	-	-	-
Stage 2	688	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.8	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	247	678	-
HCM Lane V/C Ratio	-	0.673	0.321	-
HCM Control Delay (s)	-	45.2	12.8	-
HCM Lane LOS	-	E	B	-
HCM 95th %tile Q(veh)	-	4.3	1.4	-

APPENDIX D
TRAFFIC SIGNAL WARRANT ANALYSIS

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

DIST	CO	RTE	PM

COUNT DATE 8/7/2019
CALC ET DATE 8/6/2021
CHK KH DATE 8/6/2021

Major St: Pennsylvania Ave — Critical Approach Speed 35 mph
Minor St: I-10 WB Ramp — Critical Approach Speed 35 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐
or
In built up area of isolated community of < 10,000 population..... ☐ **RURAL (R)**

☒ **URBAN (U)**

INTERSECTION #2 EXISTING CONDITIONS
MAJOR ST: Pennsylvania Ave
MINOR ST: I-10 WB Ramp
Warrant 3: Peak Hour - SATISFIED

WARRANT 3 - Peak Hour **SATISFIED YES ☒ NO ☐**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☒ NO ☐**
(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☒ No ☐	1) 49.9 sec/veh delay * 324 veh (WB PM) / 3600 sec/veh = 4.5 veh-hr > 4 veh-hr
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐	2) 324 vph > 100 vph
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐	3) Total Entering 1002 vph > 650 vph

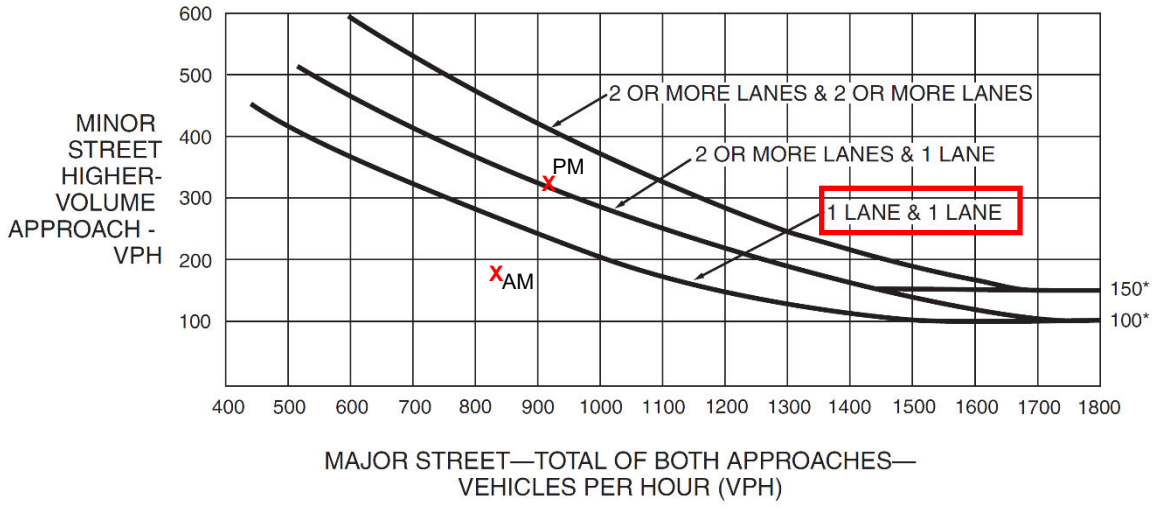
PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	AM One	AM 2 or More	PM Hour
Both Approaches - Major Street	825		917
Higher Approach - Minor Street	177		324

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☒ No ☐	PM Peak Hour Only
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐	

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

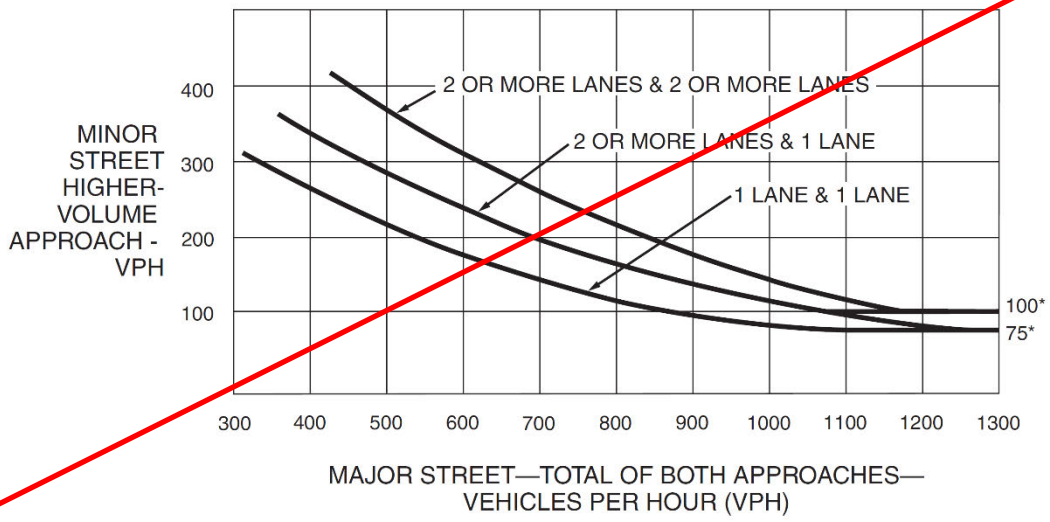
Figure 4C-3. Warrant 3, Peak Hour



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

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

				COUNT DATE	8/7/2019
				CALC ET	DATE 8/6/2021
DIST	CO	RTE	PM	CHK KH	DATE 8/6/2021

Major St: Pennsylvania Ave — Critical Approach Speed 35 mph
Minor St: I-10 WB Ramp — Critical Approach Speed 35 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐
or
In built up area of isolated community of < 10,000 population..... ☐ **RURAL (R)**

☒ **URBAN (U)**

INTERSECTION #2 CUMULATIVE OPENING WITH PROJECT
MAJOR ST: Pennsylvania Ave
MINOR ST: I-10 WB Ramp
Warrant 3: Peak Hour - SATISFIED

WARRANT 3 - Peak Hour **SATISFIED YES ☒ NO ☐**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☒ NO ☐**
(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☒ No ☐	1)77.9 sec/veh delay * 365 (WB PM) / 3600 sec/veh = 7.9 veh-hr > 4 veh-hr
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒ No ☐	2) 365 vph > 100 vph
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐	3) Total Entering 1625 vph > 650 vph

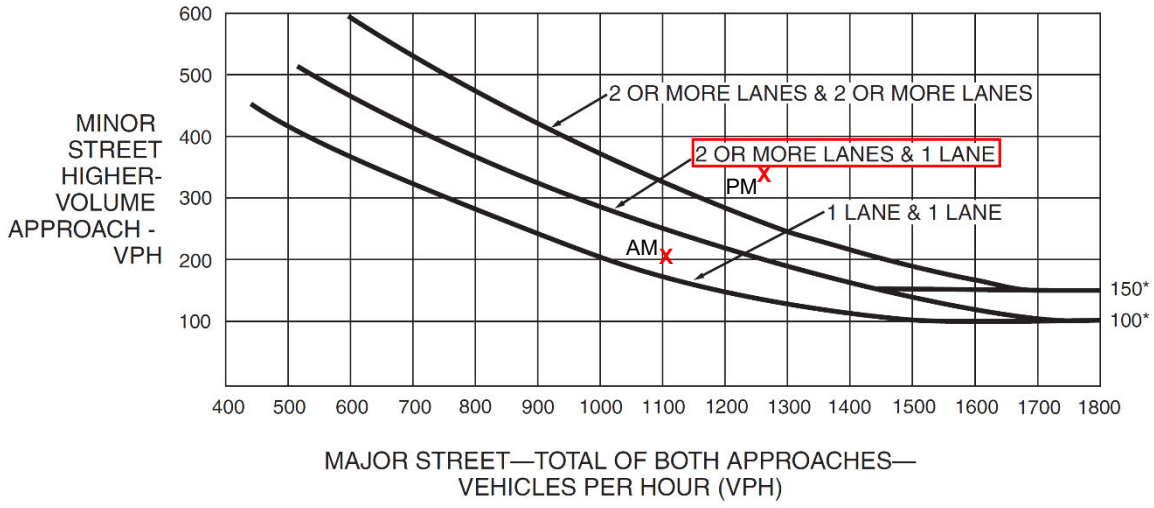
PART B **SATISFIED YES ☒ NO ☐**

APPROACH LANES	AM One	AM 2 or More	PM Hour
Both Approaches - Major Street	1102		1260
Higher Approach - Minor Street	203		365

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☒ No ☐
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

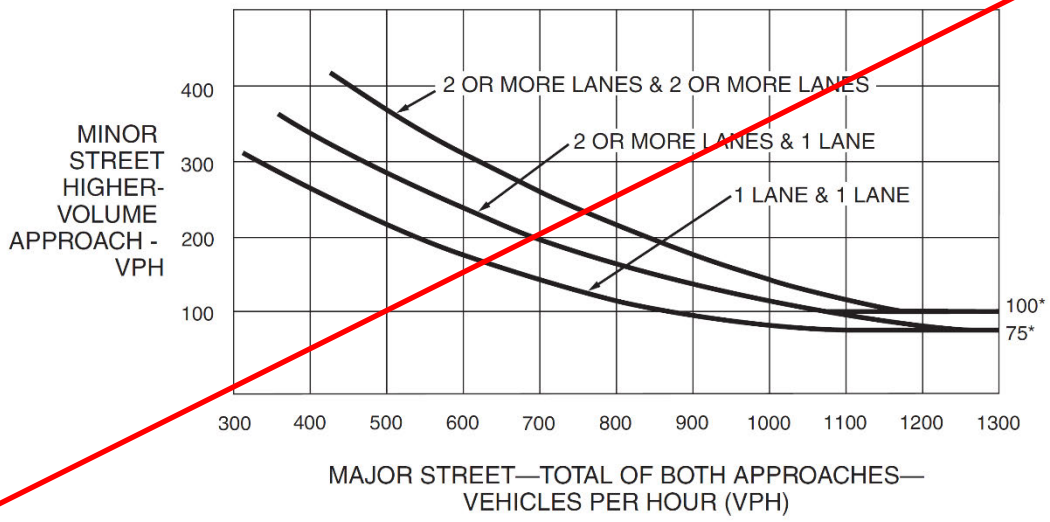
Figure 4C-3. Warrant 3, Peak Hour



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

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

APPENDIX E
COST ESTIMATES

Engineering Estimates

Project ***Pennsylvania Ave Gas Station, Beaumont*** *2/26/2020*

Location ***I-10 WB Off-Ramp*** *checked by:* *K. Hsu*

Description *Addition of an exclusive Westbound Right-Turn Lane* *calculated by:* *G.L.*

No.	Quantity	Items	Unit	Unit Price	Amount
1	580	Remove and Haul Away Asphalt Concrete Pavement	LF	$4.00	$2,320.00
2	468	AC Planing	SY	$3.00	$1,404.00
3	4,250	6"AC/6"CAB	SF	$16.00	$68,000.00
4	6	Relocate Existing Street Sign and Post	EA	$102.00	$612.00
5	580	Install Pavement Marking	LF	$2.50	$1,450.00
				SUBTOTAL	$73,800
				CONTINGENCY 15%	$11,100
				TOTAL COST:	$84,900

Prepared by K2 Traffic Engineering, Inc.

APPENDIX F
CALTRANS CORRESPONDENCE

DEPARTMENT OF TRANSPORTATION
OFFICE OF LOCAL DEVELOPMENT &
INTERGOVERNMENTAL REVIEW
DISTRICT 8, PLANNING
464 W. 4TH STREET, 6TH FLOOR MS-725
SAN BERNARDINO, CA 92401
MAIN (909) 383-4561
PHONE (909) 806-3923
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

March 12, 2021

File No.: RIV-10-PM 8.205
C/S: Pennsylvania Avenue
Case No: PP2019-0209, CUPs2019-0033 & 0034

Ms. Carole Kendrick
Senior Planner
City of Beaumont
550 E. 6th Street
Beaumont, CA 92223

Dear Ms. Kendrick

SUBJECT: Pennsylvania Avenue Gas Station, Car Wash & Market

The California Department of Transportation (Caltrans, District 8) has completed the review of the Site Plan provided by Mr. Joseph Karaki with Karaki WS Consulting, plotted on December 20, 2020. On a 1.33-acre site located on the west side of Pennsylvania Avenue just north of Interstate 10 (I-10,) this Plan now depicts a revised layout that includes a gas island with canopy, (3,504 sf,) a convenience store with quick serve restaurant, (4,692 sf,) and a carwash (1,809 sf). (APNs 418-122-021 & 418-160-006.) This revised site plan also now features a single 40-foot wide driveway centered approximately 98 feet from the southerly site property line.

As the owner and operator or the State Highway System (SHS,) it is our responsibility to coordinate and consult with local jurisdictions when a proposed development may impact our facilities. As a responsible agency as defined by the California Environmental Quality Act (CEQA,) it is also our responsibility to make recommendations to offset associated impacts arising with proposed development. Although this Pennsylvania Avenue Market proposal is under the jurisdiction of the City of Beaumont, due to the potential impact to Interstate 10 (I-10,) it is also subject to the policies and regulations that govern the SHS. In this regard we offer the following information resulting from our review of the December 2020 revised site plan.

1. This revised site plan was prepared in response to our concerns with future access control requirements associated with the I-10/ Pennsylvania Avenue Interchange Project currently in development. (EA 1H870.) Currently, this Interchange Project does not appear to present an immediate conflict with the revised driveway configuration as now proposed since:
    a. The single driveway now proposed reduces the opportunity for future access control conflicts; and
    b. At its new location, this revised driveway may be beyond the limits of future access control design requirements.

2. It is during future Interchange Project development activity that the possibility of any identified access control conflicts will be resolved. As typical with Highway Improvement Projects, resolution will attempt implementation of standards in compliance with the Caltrans Highway Design Manual in a manner that is as collaborative and equitable as possible to all parties involved.
3. Caltrans Encroachment Permit application submittal requirements have been recently updated to include new plan review procedures that are intended to speed permit issuance wherever feasible. Implementation of Caltrans' Encroachment Permits Office Process (EPOP) or the Project Delivery Quality Management Assessment Process (QMAP) will be determined when an encroachment permit application is submitted for review. This application package should include:
    a. Preparation of traffic impact analysis that addresses operational changes that are undertaken within the nearby I-10 right-of-way (R/W) adjacent to the existing eastbound and westbound off-ramps.
        i. Traffic signal warrant analysis may be required to assess the need to signalize the existing off-ramps.
        ii. Synchro analysis to assess signal timing requirements for such ramp signals.
        iii. Traffic data used in traffic analysis should not exceed a 2-year collection date.
    b. Site grading and/or drainage plans or studies if resulting impacts associated with this construction activity are determined to impact nearby I-10 facilities.
    c. Copies of approved conditions of site development and certified environmental documentation for the development proposal.
4. For information regarding Encroachment Permit application and submittal requirements including information of the EPOP and QMAP permit review process enhancements, contact:

Caltrans Office of Encroachment Permits
464 West 4th Street, 6th Floor, MS 619
San Bernardino, CA 92401-1400
(909) 383-4526

http://dot.ca.gov/programs/traffic-operations/ep

Thank you for providing Caltrans District 8 an opportunity to offer our comments addressing the revised Pennsylvania Avenue Gas Station/Market/Restaurant/Car Wash development proposal. In the event this site plan is later revised again, please note that these comments may require updating. Please forward updated plans to this Office for additional review if this later becomes necessary.

If you have any questions regarding this letter, please contact Talvin L. Dennis at (909) 806-3957 or at Talvin.l.dennis@dot.ca.gov for assistance.

Sincerely,

Rosa F. Clark

ROSA F. CLARK
Office Chief
Local Development/Intergovernmental Review (LD/IGR)