FEHR PEERS

Memorandum

Date: October 14, 2022

To: Paul Samaras, City of El Segundo

From: Alex Melaragno & Michael Kennedy, Fehr & Peers

Subject: **El Segundo Downtown Specific Plan Update: Intersection Operations Technical Study – Existing Conditions**

LB21-0042

Intersection Operations Technical Study – Existing Conditions

This memorandum presents the data collection and analysis methodology and results of the El Segundo Downtown Specific Plan Update (DSPU) Intersection Operations Technical Study for Existing Conditions. An intersection level of service (LOS) analysis was conducted for the following study intersections within the El Segundo Downtown Specific Plan area:

1. Main Street & Mariposa Avenue
2. Main Street & Grand Avenue
3. Main Street & El Segundo Boulevard

Data Collection & Methodology

To inform the LOS analysis, turning movement counts were conducted at the three study intersections between 7:00am and 10:00am and from 4:00pm to 7:00pm on Tuesday, May 24th, 2022. From these six-hour counts, an AM and PM peak hour was determined for each study intersection, and the counts from those hours were used for the LOS analysis. The observed counts are included as **Attachment A** to this memorandum. A field visit was also performed on July 8th, 2022, at which signal operations, lane geometry, and other factors that impact vehicular operations were observed and recorded. LOS calculations were performed using the Intersection Capacity Utilization (ICU) methodology for signalized intersections and the Highway Capacity

Manual (HCM) 6th Edition for unsignalized intersections. ICU calculation spreadsheets and HCM 6th edition reports are included as **Attachments B and C,** respectively, to this memorandum.

The City of El Segundo General Plan Circulation Element defines LOS according to **Table 1** for signalized intersections and **Table 2** for unsignalized intersections.

Table 1: Signalized Intersection Level of Service Definitions

Level of Service	Traffic Quality	Range of ICU
A	Low volume; high speeds; speed not restricted by other vehicles; all signal cycles clear with no vehicles waiting through more than one signal cycle.	0.00-0.60
B	Operating speed beginning to be affected by other traffic; between one and ten percent of the signal cycles have one or more vehicles which wait through more than one signal cycle during peak hour traffic periods.	0.61-0.70
C	Operating speeds and maneuverability closely controlled by other traffic, between 11 and 30 percent of the signal cycles have one or more vehicles which wait through more than one signal cycle during peak traffic periods; recommended ideal design standard.	0.71-0.80
D	Tolerable operating speeds; 31 to 70 percent of the signal cycles have one or more vehicles which wait through more than one signal cycle during peak traffic periods; often used as design standard in urban areas.	0.81-0.90
E	Capacity, the maximum traffic volume an intersection can accommodate; restricted speeds; 71 to 100 percent of the signal cycles have one or more vehicles which wait through more than one signal cycle during peak traffic periods.	0.91-1.00
F	Long queues of traffic; unstable flow; stoppages of long duration; traffic volume and traffic speed can drop to zero; traffic volume will be less than the volume which occurs at Level of Service "E."	Over 1.00

Source: City of El Segundo General Plan Circulation Element

Table 2: Unsignalized Intersection Level of Service Definitions

Level of Service	Average Control Delay (s/veh)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Source: City of El Segundo General Plan Circulation Element

Intersection Operations Results

All three of the study intersections were found to perform at an acceptable LOS of either A or B. **Table 3** presents the LOS, V/C, and ICU results for the signalized intersections, and LOS and delay results for the unsignalized intersection.

Table 3: Existing Intersection Operations

Int #	N-S Street	E-W Street	Control	Peak Hour	V/C[1]	ICU[2]	Average Delay (s)[3,4]	LOS
1	Main Street	Mariposa Avenue	Signal	AM	0.341	0.441	*N/A*	A
				PM	0.400	0.500	*N/A*	A
2	Main Street	Grand Avenue	Signal	AM	0.238	0.338	*N/A*	A
				PM	0.324	0.424	*N/A*	A
3	Main Street	El Segundo Boulevard	AWSC	AM	*N/A*	*N/A*	9.0	A
				PM	*N/A*	*N/A*	11.4	B

Source: Fehr & Peers, 2022
[1]V/C represents volume/capacity and is a component of ICU methodology for signalized intersections
[2] ICU represents the intersection capacity utilization of a signalized intersection
[4]Average delay is calculated using HCM 6th Edition methodology in the Synchro 11 software for unsignalized intersections
AWSC = All-way stop control

Next Steps

Upon approval of the preferred El Segundo Downtown Specific Plan Update land use program and mobility improvements, an Intersection Operations Technical Study will be conducted for Cumulative Base and Cumulative plus Project scenarios. Cumulative Base traffic volumes will be estimated by applying a growth rate derived from the SCAG model and any known development projects proposed in the vicinity of the project identified by the City of El Segundo. Project distribution for the project area will be estimated using the SCAG model and reviewed with the City of El Segundo before embarking on project area analysis. Once an approved trip distribution pattern is identified, Fehr & Peers will use the pattern to estimate project traffic volumes at the study intersections. Mixed-use trip generation estimates prepared for the preferred land use plan in the DSPU phase will be assigned to the study intersections. These volumes will be added to the Cumulative Base traffic volumes to estimate with-project conditions.

Appendix

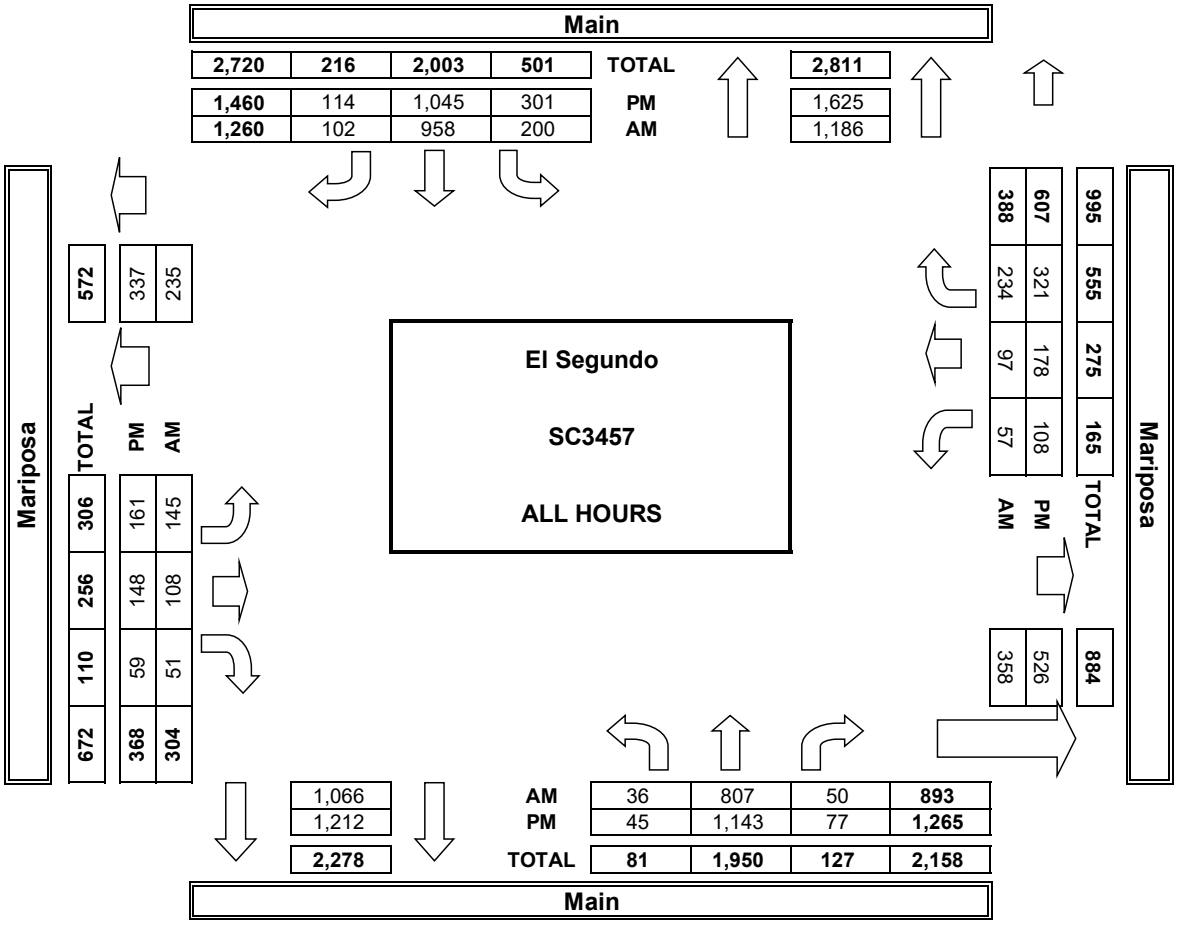
Attachment A – Observed Turning Movement Counts

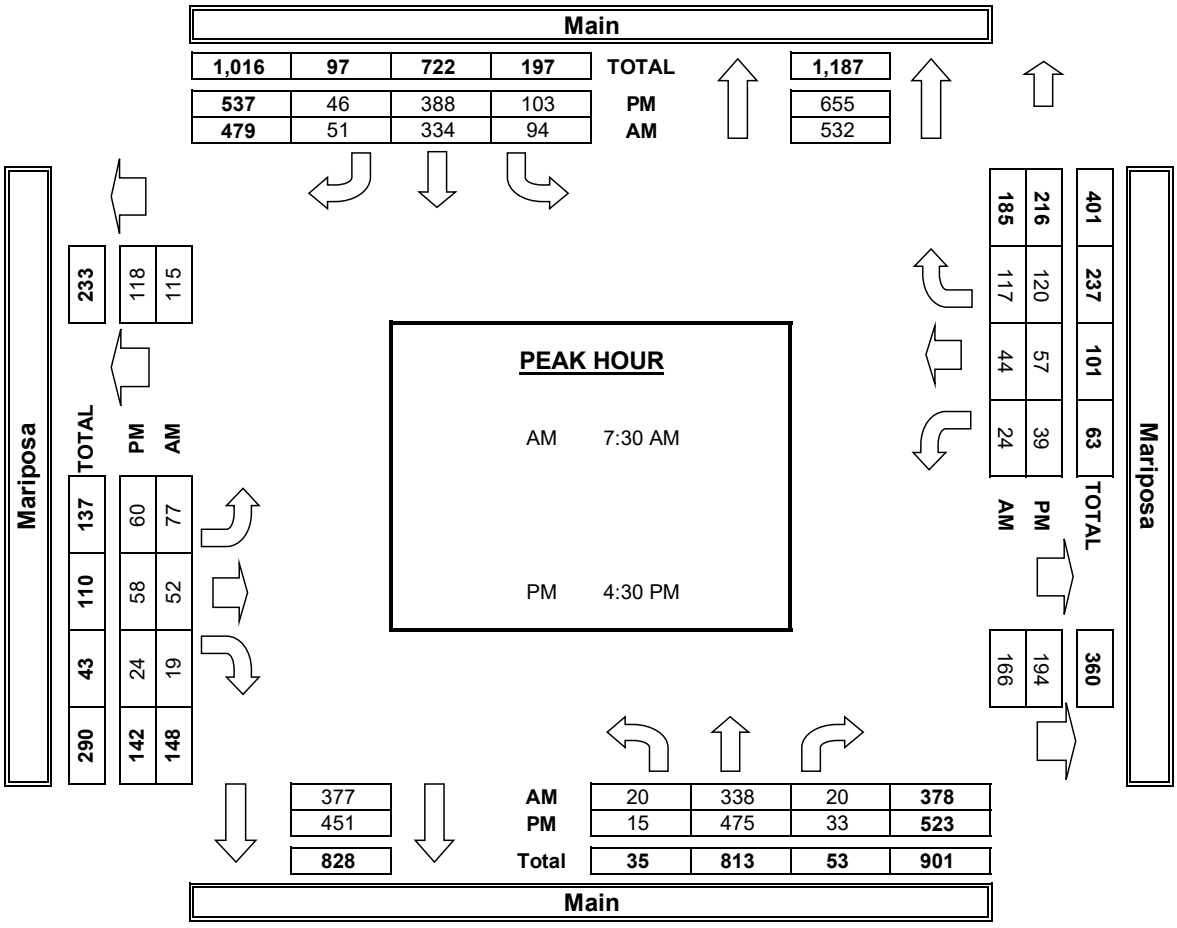
Attachment B – ICU Calculation Spreadsheets for Intersections #1 & 2

Attachment C – HCM 6th Edition Reports for Intersection #3

AimTD LLC

TURNING MOVEMENT COUNTS





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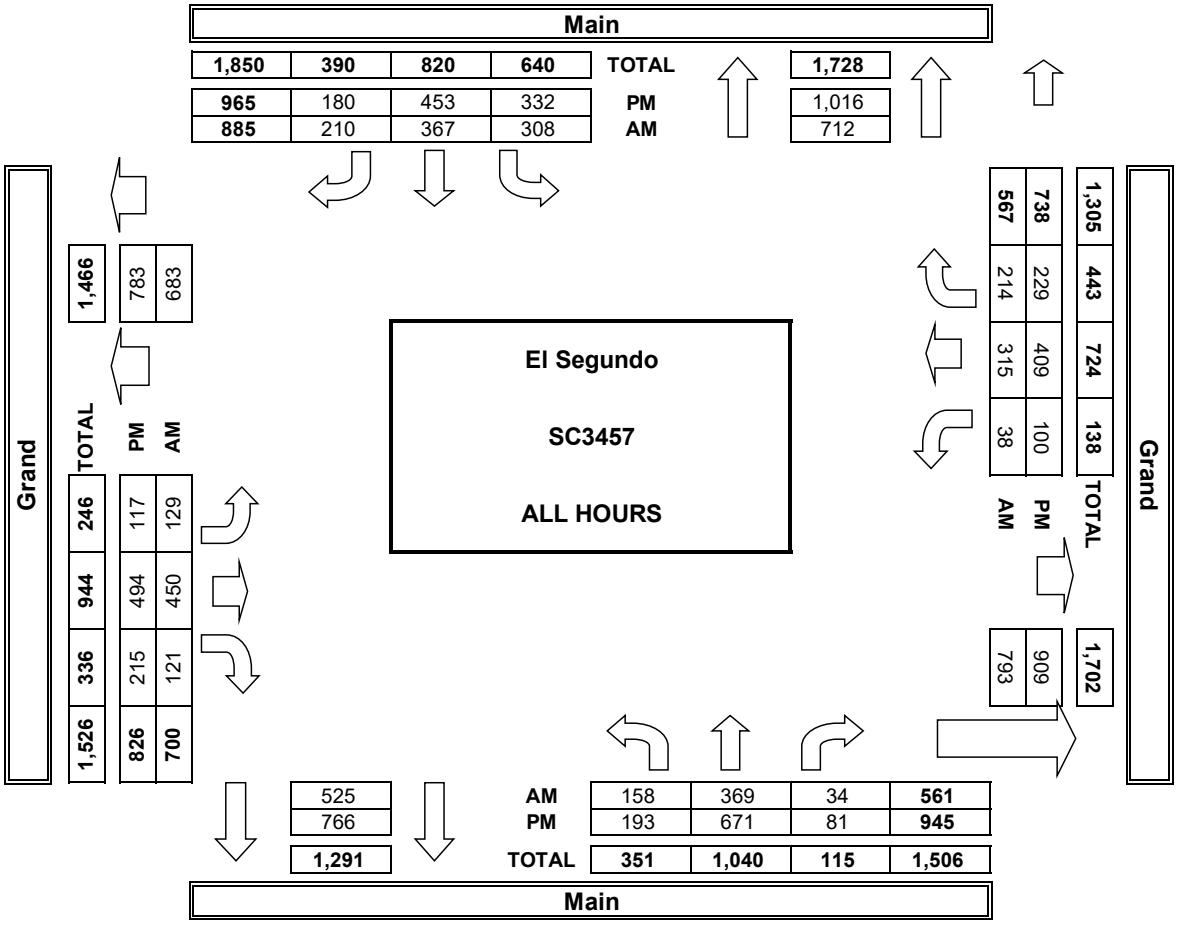
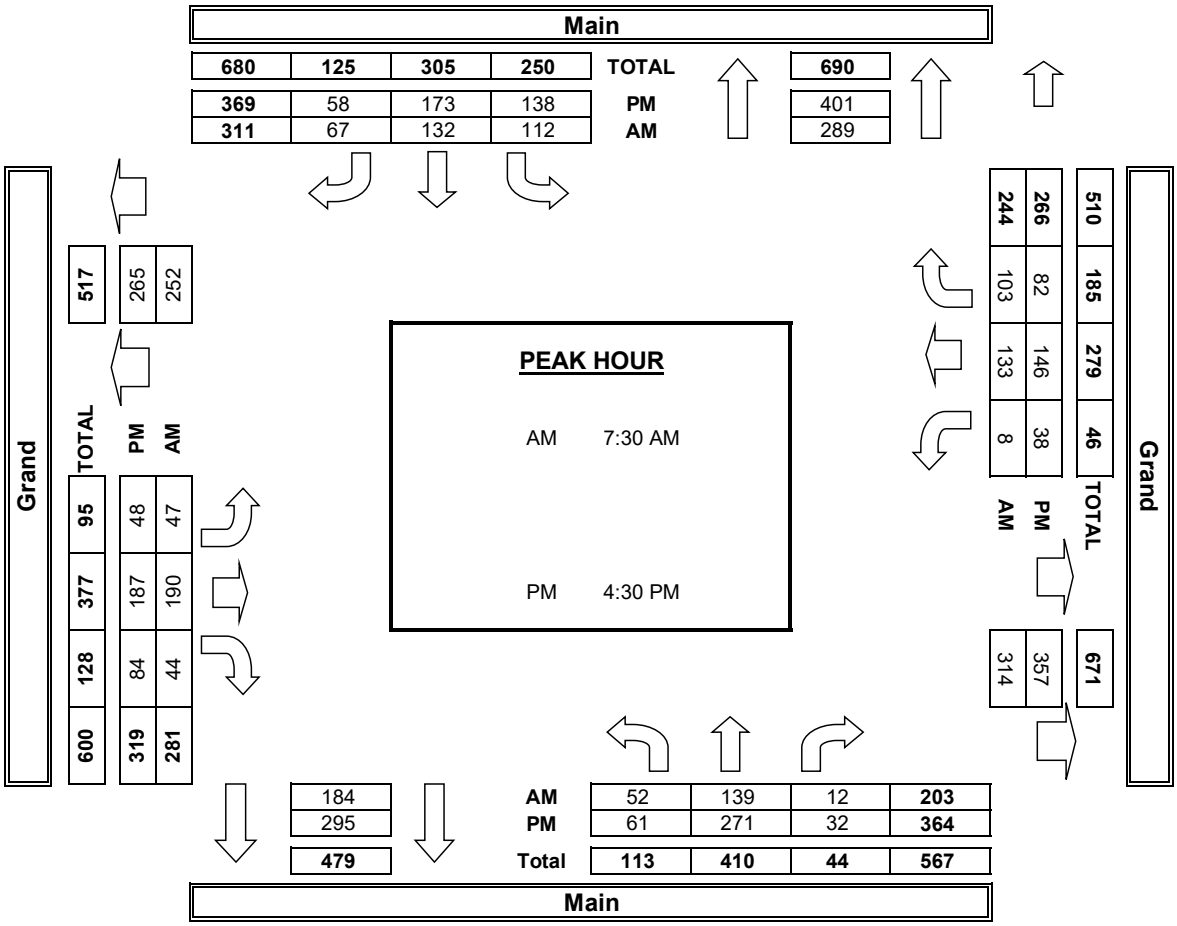
TURNING MOVEMENT COUNTS





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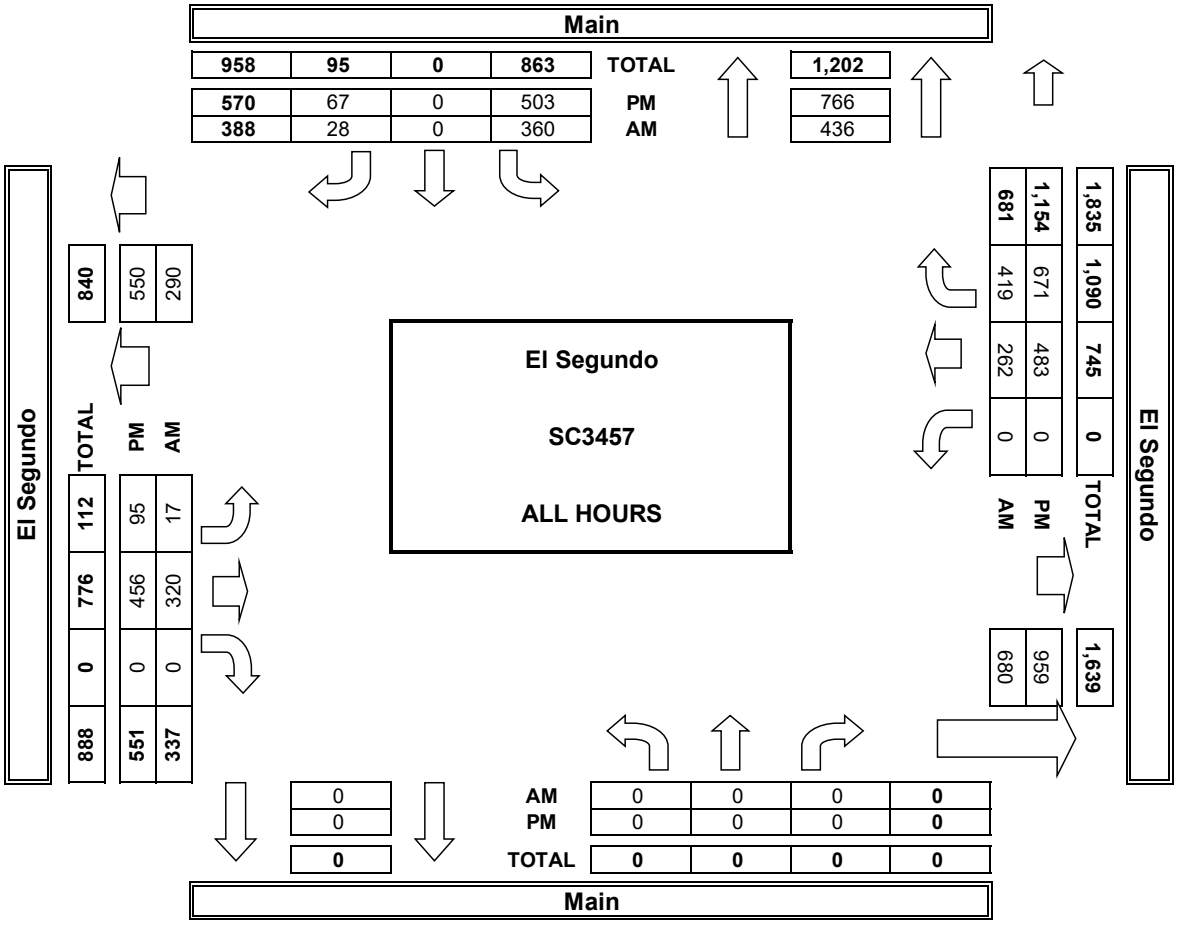
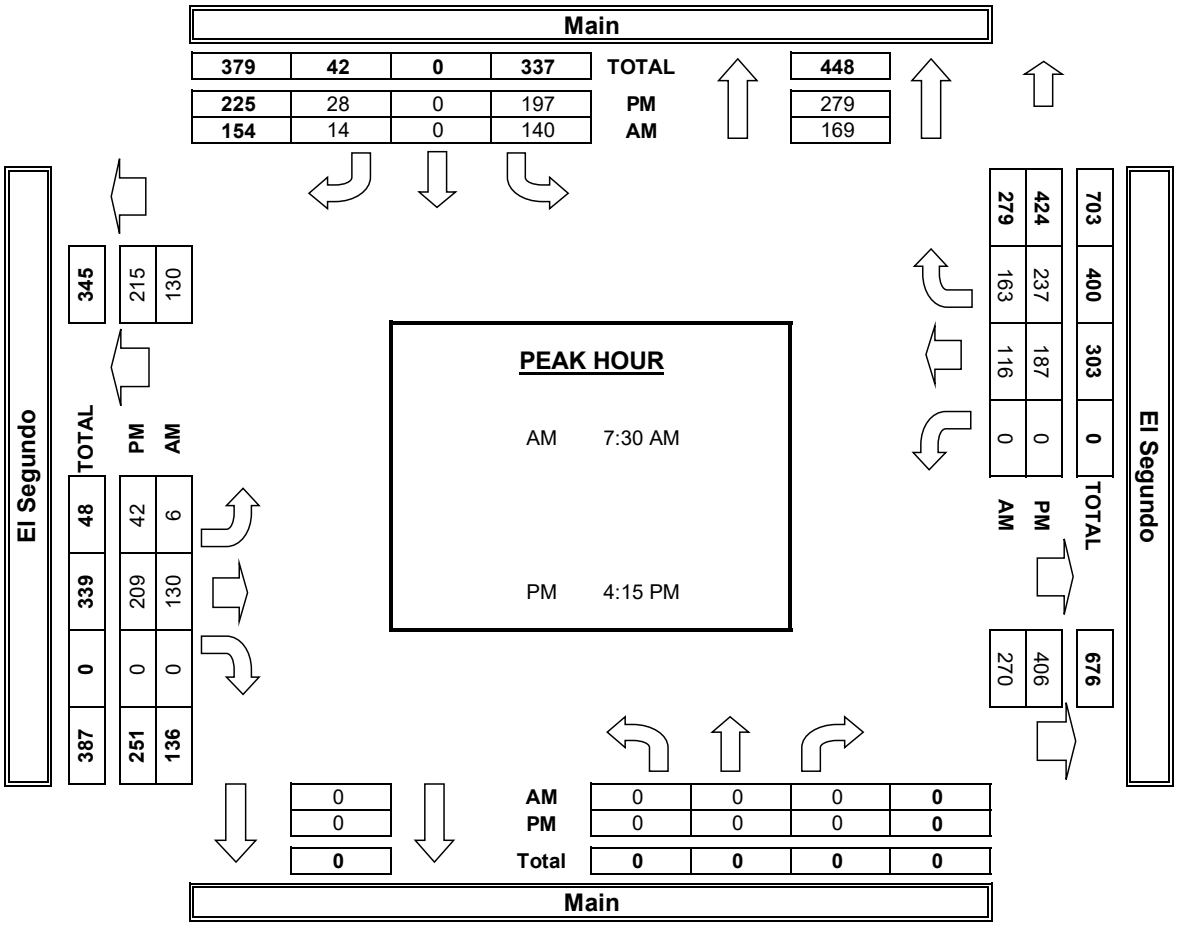
TURNING MOVEMENT COUNTS





Project Title: El Segundo DSP
Intersection: 1 - Main St & Mariposa Ave
Description: Existing

Thru Lane:	1600 vph	N-S Split Phase :	N
Left Lane:	1600 vph	E-W Split Phase :	N
Double Lt Penalty:	20 %	Lost Time (% of cycle) :	10
ITS:	0 %	V/C Round Off (decs.) :	3
OLA Movements :			
FF Movements:			

Date/Time: AM PEAK HOUR

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	0.00	51	0	0.000	N-S(1):	0.177 *
	TH	2.00	334	1,600	0.150	N-S(2):	0.163
	LT	0.00	94	1,600	0.059 *	E-W(1):	0.108
Westbound	RT	0.00	117	0	0.000	E-W(2):	0.164 *
	TH	1.00	44	1,600	0.116 *		
	LT	0.00	24	1,600	0.015	V/C:	0.341
Northbound	RT	0.00	20	0	0.000	Lost Time:	0.100
	TH	2.00	338	1,600	0.118 *	ITS:	0.000
	LT	0.00	20	1,600	0.013		
Eastbound	RT	0.00	19	0	0.000	ICU:	0.441
	TH	1.00	52	1,600	0.093		
	LT	0.00	77	1,600	0.048 *	LOS:	A

Date/Time: PM PEAK HOUR

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C	ICU ANALYSIS	
Southbound	RT	0.00	46	0	0.000	N-S(1):	0.227 *
	TH	2.00	388	1,600	0.168	N-S(2):	0.177
	LT	0.00	103	1,600	0.064 *	E-W(1):	0.113
Westbound	RT	0.00	120	0	0.000	E-W(2):	0.173 *
	TH	1.00	57	1,600	0.135 *		
	LT	0.00	39	1,600	0.024	V/C:	0.400
Northbound	RT	0.00	33	0	0.000	Lost Time:	0.100
	TH	2.00	475	1,600	0.163 *	ITS:	0.000
	LT	0.00	15	1,600	0.009		
Eastbound	RT	0.00	24	0	0.000	ICU:	0.500
	TH	1.00	58	1,600	0.089		
	LT	0.00	60	1,600	0.038 *	LOS:	A

* - Denotes critical movement

Project Title: El Segundo DSP
Intersection: 2 - Main St & Grand Ave
Description: Existing

Thru Lane:	1600 vph	N-S Split Phase :	N
Left Lane:	1600 vph	E-W Split Phase :	N
Double Lt Penalty:	20 %	Lost Time (% of cycle) :	10
ITS:	0 %	V/C Round Off (decs.) :	3
OLA Movements :			
FF Movements:			

Date/Time: AM PEAK HOUR

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C		ICU ANALYSIS	
Southbound	RT	0.00	67	0	0.000		N-S(1):	0.133 *
	TH	2.00	132	1,600	0.097		N-S(2):	0.130
	LT	0.00	112	1,600	0.070	*	E-W(1):	0.093
Westbound	RT	0.00	103	0	0.000		E-W(2):	0.105 *
	TH	2.00	133	1,600	0.076	*		
	LT	0.00	8	1,600	0.005		V/C:	0.238
Northbound	RT	0.00	12	0	0.000		Lost Time:	0.100
	TH	2.00	139	1,600	0.063	*	ITS:	0.000
	LT	0.00	52	1,600	0.033			
Eastbound	RT	0.00	44	0	0.000		ICU:	0.338
	TH	2.00	190	1,600	0.088			
	LT	0.00	47	1,600	0.029	*	LOS:	A

Date/Time: PM PEAK HOUR

APPROACH	MVMT	LANES	VOLUME	CAPACITY	V/C		ICU ANALYSIS	
Southbound	RT	0.00	58	0	0.000		N-S(1):	0.200 *
	TH	2.00	173	1,600	0.115		N-S(2):	0.153
	LT	0.00	138	1,600	0.086	*	E-W(1):	0.124 *
Westbound	RT	0.00	82	0	0.000		E-W(2):	0.113
	TH	2.00	146	1,600	0.083			
	LT	0.00	38	1,600	0.024	*	V/C:	0.324
Northbound	RT	0.00	32	0	0.000		Lost Time:	0.100
	TH	2.00	271	1,600	0.114	*	ITS:	0.000
	LT	0.00	61	1,600	0.038			
Eastbound	RT	0.00	84	0	0.000		ICU:	0.424
	TH	2.00	187	1,600	0.100	*		
	LT	0.00	48	1,600	0.030		LOS:	A

* - Denotes critical movement

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	6	130	116	163	140	14
Future Vol, veh/h	6	130	116	163	140	14
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	134	120	168	144	14
Number of Lanes	0	1	1	1	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	9.4	8.5	9.6
HCM LOS	A	A	A

Lane	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	4%	0%	0%	100%	77%
Vol Thru, %	96%	100%	0%	0%	0%
Vol Right, %	0%	0%	100%	0%	23%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	136	116	163	93	61
LT Vol	6	0	0	93	47
Through Vol	130	116	0	0	0
RT Vol	0	0	163	0	14
Lane Flow Rate	140	120	168	96	63
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.199	0.171	0.207	0.161	0.1
Departure Headway (Hd)	5.105	5.135	4.431	6.014	5.735
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	701	698	808	595	623
Service Time	3.146	2.868	2.164	3.766	3.488
HCM Lane V/C Ratio	0.2	0.172	0.208	0.161	0.101
HCM Control Delay	9.4	8.9	8.3	9.9	9.1
HCM Lane LOS	A	A	A	A	A
HCM 95th-tile Q	0.7	0.6	0.8	0.6	0.3

Intersection	
Intersection Delay, s/veh	11.4
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	42	209	187	237	197	28
Future Vol, veh/h	42	209	187	237	197	28
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	222	199	252	210	30
Number of Lanes	0	1	1	1	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	12.8	10.6	11.4
HCM LOS	B	B	B

Lane	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	17%	0%	0%	100%	70%
Vol Thru, %	83%	100%	0%	0%	0%
Vol Right, %	0%	0%	100%	0%	30%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	251	187	237	131	94
LT Vol	42	0	0	131	66
Through Vol	209	187	0	0	0
RT Vol	0	0	237	0	28
Lane Flow Rate	267	199	252	140	100
Geometry Grp	4	7	7	7	7
Degree of Util (X)	0.421	0.314	0.349	0.264	0.178
Departure Headway (Hd)	5.679	5.685	4.977	6.811	6.447
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	636	637	726	528	557
Service Time	3.703	3.385	2.677	4.54	4.177
HCM Lane V/C Ratio	0.42	0.312	0.347	0.265	0.18
HCM Control Delay	12.8	11	10.3	12	10.6
HCM Lane LOS	B	B	B	B	B
HCM 95th-tile Q	2.1	1.3	1.6	1.1	0.6