

Appendix A

Technical Calculations

Existing Conditions

Appendix A-1: Intersection Operations

Technical Calculations

Existing Conditions

HCM Unsignalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	15	100	5	6	144	107	13	20	10	172	7	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	109	5	7	157	116	14	22	11	187	8	17
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total (vph)	16	114	7	157	116	47	212					
Volume Left (vph)	16	0	7	0	0	14	187					
Volume Right (vph)	0	5	0	0	116	11	17					
Hadj (s)	0.58	0.05	0.58	0.09	-0.61	0.01	0.21					
Departure Headway (s)	6.0	5.4	5.9	5.4	3.2	5.0	4.9					
Degree Utilization, x	0.03	0.17	0.01	0.24	0.10	0.06	0.29					
Capacity (veh/h)	568	628	574	631	1121	666	687					
Control Delay (s)	7.9	8.3	7.8	8.9	5.4	8.3	10.0					
Approach Delay (s)	8.3		7.4			8.3	10.0					
Approach LOS	A		A			A	A					
Intersection Summary												
Delay			8.4									
HCM Level of Service			A									
Intersection Capacity Utilization			36.7%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3368		1719	3148		1719	1810	1517	1719	1810	1517
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3368		1719	3148		1719	1810	1517	1719	1810	1517
Volume (vph)	49	271	36	96	147	143	43	143	64	217	238	48
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	295	39	104	160	155	47	155	70	236	259	52
RTOR Reduction (vph)	0	12	0	0	119	0	0	0	44	0	0	26
Lane Group Flow (vph)	53	322	0	104	196	0	47	155	26	236	259	26
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	2.7	13.6		7.9	18.8		3.3	29.9	29.9	13.9	40.5	40.5
Effective Green, g (s)	2.7	13.6		7.9	18.8		3.3	29.9	29.9	13.9	40.5	40.5
Actuated g/C Ratio	0.03	0.17		0.10	0.23		0.04	0.37	0.37	0.17	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	57	563		167	728		70	666	558	294	902	756
v/s Ratio Prot	0.03	c0.10		c0.06	0.06		0.03	0.09		c0.14	c0.14	
v/s Ratio Perm									0.02			0.02
v/c Ratio	0.93	0.57		0.62	0.27		0.67	0.23	0.05	0.80	0.29	0.03
Uniform Delay, d1	39.2	31.2		35.3	25.6		38.5	17.8	16.5	32.4	11.9	10.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	92.7	1.4		7.0	0.2		22.4	0.8	0.2	14.6	0.8	0.1
Delay (s)	131.9	32.6		42.3	25.8		60.9	18.6	16.7	46.9	12.7	10.5
Level of Service	F	C		D	C		E	B	B	D	B	B
Approach Delay (s)		46.2			29.9			25.4			27.3	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			32.1			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			81.3			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.5%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Conditions **PHF:** 1
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	17	19	112	4	26.0	C	--
	T	74	84	114	8	5.8	A	--
	R	18	19	100	3	2.9	A	--
	Subtotal	109	121	111	--	8.4	A	--
SB	L	1	1	100	1	65.6	E	--
	T	74	78	105	5	16.3	B	--
	R	9	10	111	3	10.3	B	--
	Subtotal	85	89	106	--	16.1	B	--
EB	L	5	5	100	2	42.7	D	--
	T	2	2	100	1	38.3	D	--
	R	17	20	118	4	8.5	A	--
	Subtotal	24	27	113	--	17.0	B	--
WB	L	35	40	114	7	28.7	C	--
	T	6	8	133	3	22.0	C	--
	R	3	4	133	2	7.2	A	--
	Subtotal	45	51	116	--	26.2	C	--
Total		262	288	110	--	14.8	B	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	36	39	108	4	24.0	C	--
	T	59	63	107	6	5.6	A	--
	Subtotal	96	102	106	--	12.6	B	--
SB	T	39	46	118	3	9.9	A	--
	R	87	103	117	7	6.4	A	--
	Subtotal	126	149	117	--	7.5	A	--
WB	L	11	12	120	2	24.6	C	--
	R	50	60	120	7	10.0	A	--
	Subtotal	60	71	118	--	12.4	B	--
Total		282	322	114	--	10.2	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Conditions **PHF:** 1
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	62	74	119	5	7.5	A	--
	R	27	29	107	3	3.1	A	--
	Subtotal	89	103	116	--	6.3	A	--
SB	L	21	23	115	4	31.3	C	--
	T	29	34	117	5	5.6	A	--
	Subtotal	50	56	112	--	15.9	B	--
EB	L	34	38	112	5	28.6	C	--
	T	0	2	--	0	32.4	C	--
	R	11	14	127	4	6.3	A	--
	Subtotal	46	54	117	--	22.9	C	--
Total		184	213	116	--	13.0	B	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Un-Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	0	1	--	0	6.4	A	--
	T	41	49	123	6	1.3	A	--
	Subtotal	41	50	122	--	1.4	A	--
SB	L	3	3	100	2	3.2	A	--
	T	25	29	116	4	1.2	A	--
	R	12	14	117	5	0.9	A	--
	Subtotal	41	46	115	--	1.3	A	--
EB	L	36	37	103	7	8.6	A	--
	T	0	1	--	0	7.1	A	--
	R	1	1	--	0	1.9	A	--
	Subtotal	37	39	105	--	8.4	A	--
WB	R	12	15	125	4	4.7	A	--
	Subtotal	12	15	125	--	4.7	A	--
Total		130	150	115	--	3.5	A	--

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

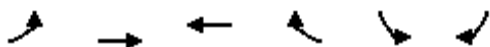
7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	45	11	7	4	12	30	9	81	3	14	49	31
Peak Hour Factor	0.83	0.83	0.83	0.55	0.55	0.55	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	54	13	8	7	22	55	12	104	4	18	63	40
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	76	84	119	121								
Volume Left (vph)	54	7	12	18								
Volume Right (vph)	8	55	4	40								
Hadj (s)	0.11	-0.34	0.08	-0.11								
Departure Headway (s)	4.7	4.2	4.5	4.3								
Degree Utilization, x	0.10	0.10	0.15	0.14								
Capacity (veh/h)	721	796	766	792								
Control Delay (s)	8.2	7.7	8.3	8.0								
Approach Delay (s)	8.2	7.7	8.3	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.0									
HCM Level of Service			A									
Intersection Capacity Utilization			24.8%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Ave

7/13/2010

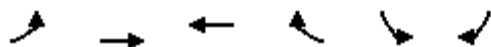


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	18	26	14	16	6	4
Peak Hour Factor	0.69	0.69	0.78	0.78	0.50	0.50
Hourly flow rate (vph)	26	38	18	21	12	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	38				118	28
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	38				118	28
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				99	99
cM capacity (veh/h)	1572				863	1047
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	64	38	20			
Volume Left	26	0	12			
Volume Right	0	21	8			
cSH	1572	1700	928			
Volume to Capacity	0.02	0.02	0.02			
Queue Length 95th (ft)	1	0	2			
Control Delay (s)	3.1	0.0	9.0			
Lane LOS	A		A			
Approach Delay (s)	3.1	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay		3.1				
Intersection Capacity Utilization		19.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

9: Woodward Ave & S. McKinley Ave

7/13/2010

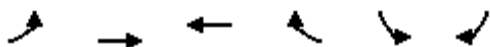


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↕	↕	↕
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	32	28	3	1	2
Peak Hour Factor	0.62	0.62	0.83	0.83	0.38	0.38
Hourly flow rate (vph)	0	52	34	4	3	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	37				85	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	37				85	34
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1573				916	1040
Direction, Lane #	EB 1	WB 1	WB 2	SB 1	SB 2	
Volume Total	52	34	4	3	5	
Volume Left	0	0	0	3	0	
Volume Right	0	0	4	0	5	
cSH	1573	1700	1700	916	1040	
Volume to Capacity	0.00	0.02	0.00	0.00	0.01	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	8.9	8.5	
Lane LOS				A	A	
Approach Delay (s)	0.0	0.0		8.6		
Approach LOS				A		
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

10: Woodward Ave & Galleria Dr

7/13/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↰↱		↰↱	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	2	31	29	25	20	2
Peak Hour Factor	0.55	0.55	0.79	0.79	0.69	0.69
Hourly flow rate (vph)	4	56	37	32	29	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	68				116	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	68				116	34
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1531				866	1031
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	4	56	24	44	32	
Volume Left	4	0	0	0	29	
Volume Right	0	0	0	32	3	
cSH	1531	1700	1700	1700	878	
Volume to Capacity	0.00	0.03	0.01	0.03	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	7.4	0.0	0.0	0.0	9.3	
Lane LOS	A				A	
Approach Delay (s)	0.4		0.0		9.3	
Approach LOS					A	
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			13.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	28	248	22	27	129	191	8	27	12	123	30	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	270	24	29	140	208	9	29	13	134	33	13
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total (vph)	30	293	29	140	208	51	179					
Volume Left (vph)	30	0	29	0	0	9	134					
Volume Right (vph)	0	24	0	0	208	13	13					
Hadj (s)	0.58	0.03	0.58	0.09	-0.61	-0.03	0.19					
Departure Headway (s)	6.0	5.4	6.1	5.6	3.2	5.4	5.4					
Degree Utilization, x	0.05	0.44	0.05	0.22	0.18	0.08	0.27					
Capacity (veh/h)	575	644	555	607	1121	592	612					
Control Delay (s)	8.1	11.4	8.2	9.0	5.7	8.9	10.4					
Approach Delay (s)	11.0		7.1			8.9	10.4					
Approach LOS	B		A			A	B					
Intersection Summary												
Delay			9.2									
HCM Level of Service			A									
Intersection Capacity Utilization			43.5%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3297		1719	3124		1719	1810	1517	1719	1810	1517
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3297		1719	3124		1719	1810	1517	1719	1810	1517
Volume (vph)	87	250	77	205	180	206	39	285	168	200	231	34
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	272	84	223	196	224	42	310	183	217	251	37
RTOR Reduction (vph)	0	34	0	0	166	0	0	0	121	0	0	20
Lane Group Flow (vph)	95	322	0	223	254	0	42	310	62	217	251	17
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.4	14.2		13.3	22.1		3.4	28.8	28.8	13.2	38.6	38.6
Effective Green, g (s)	5.4	14.2		13.3	22.1		3.4	28.8	28.8	13.2	38.6	38.6
Actuated g/C Ratio	0.06	0.17		0.16	0.26		0.04	0.34	0.34	0.15	0.45	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	109	548		267	807		68	610	511	265	817	685
v/s Ratio Prot	0.06	c0.10		c0.13	0.08		0.02	c0.17		c0.13	0.14	
v/s Ratio Perm									0.04			0.01
v/c Ratio	0.87	0.59		0.84	0.31		0.62	0.51	0.12	0.82	0.31	0.02
Uniform Delay, d1	39.7	32.9		35.0	25.6		40.4	22.7	19.6	35.0	14.9	13.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	48.3	1.6		19.7	0.2		15.5	3.0	0.5	17.6	1.0	0.1
Delay (s)	88.0	34.6		54.7	25.8		55.9	25.7	20.1	52.6	15.9	13.1
Level of Service	F	C		D	C		E	C	C	D	B	B
Approach Delay (s)		45.8			35.8			26.1			31.5	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			34.5			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			85.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			67.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Conditions **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	102	108	106	13	34.0	C	--
	T	126	138	110	11	11.4	B	--
	R	28	29	104	4	6.6	A	--
	Subtotal	255	275	108	--	19.7	B	--
SB	L	4	3	75	1	57.5	E	--
	T	109	113	105	16	36.7	D	--
	R	29	34	117	8	20.2	C	--
	Subtotal	141	150	106	--	33.4	C	--
EB	L	19	22	116	3	37.2	D	--
	T	7	7	117	2	37.4	D	--
	R	79	89	113	9	13.0	B	--
	Subtotal	105	118	113	--	18.8	B	--
WB	L	19	22	122	3	52.5	D	--
	T	6	6	100	3	32.9	C	--
	R	2	2	100	1	8.0	A	--
	Subtotal	26	30	115	--	45.2	D	--
Total		526	572	109	--	24.4	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	18	19	106	5	39.7	D	--
	T	173	195	113	13	14.1	B	--
	Subtotal	191	214	112	--	16.4	B	--
SB	T	143	160	113	14	14.5	B	--
	R	63	69	110	11	4.3	A	--
	Subtotal	206	229	111	--	11.4	B	--
WB	L	32	34	106	6	31.3	C	--
	R	81	84	104	7	24.3	C	--
	Subtotal	113	118	104	--	26.3	C	--
Total		510	561	110	--	16.4	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Conditions **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	69	87	126	6	37.8	D	--
	R	26	28	108	6	12.7	B	--
	Subtotal	95	115	121	--	31.7	C	--
SB	L	76	82	108	6	62.8	E	--
	T	98	102	104	8	28.2	C	--
	Subtotal	174	183	105	--	43.6	D	--
EB	L	123	134	110	10	60.0	E	--
	T	2	3	150	1	49.0	D	--
	R	42	47	112	5	13.9	B	--
	Subtotal	167	183	110	--	48.0	D	--
Total		436	481	110	--	42.5	D	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Un-Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	1	0	0	0	0.0	--	--
	T	50	56	112	6	1.5	A	--
	R	2	3	100	2	4.4	A	--
	Subtotal	52	59	112	--	1.6	A	--
SB	L	22	23	105	4	5.0	A	--
	T	70	77	109	5	1.9	A	--
	R	49	50	102	7	1.9	A	--
	Subtotal	140	149	106	--	2.4	A	--
EB	L	29	39	134	6	19.3	C	--
	T	0	1	--	0	15.2	C	--
	R	2	3	150	1	3.6	A	--
	Subtotal	32	42	131	--	18.2	C	--
WB	L	1	1	100	0	17.8	C	--
	T	1	1	--	1	20.2	C	--
	R	16	22	138	4	6.3	A	--
	Subtotal	17	24	141	--	7.6	A	--
Total		241	274	114	--	5.1	A	--

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

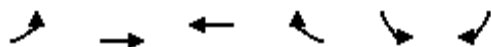
7/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	57	50	14	3	31	52	6	79	2	95	127	73
Peak Hour Factor	0.80	0.80	0.80	0.65	0.65	0.65	0.95	0.95	0.95	0.89	0.89	0.89
Hourly flow rate (vph)	71	62	18	5	48	80	6	83	2	107	143	82
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	151	132	92	331								
Volume Left (vph)	71	5	6	107								
Volume Right (vph)	18	80	2	82								
Hadj (s)	0.06	-0.32	0.08	-0.03								
Departure Headway (s)	5.2	4.9	5.2	4.7								
Degree Utilization, x	0.22	0.18	0.13	0.44								
Capacity (veh/h)	631	667	638	721								
Control Delay (s)	9.7	8.9	8.9	11.4								
Approach Delay (s)	9.7	8.9	8.9	11.4								
Approach LOS	A	A	A	B								
Intersection Summary												
Delay			10.2									
HCM Level of Service			B									
Intersection Capacity Utilization			43.0%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Ave

7/13/2010

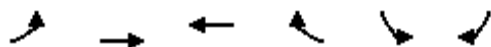


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	35	27	15	39	33
Peak Hour Factor	0.72	0.72	0.81	0.81	0.85	0.85
Hourly flow rate (vph)	22	49	33	19	46	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	52				136	43
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				136	43
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	96
cM capacity (veh/h)	1554				846	1028
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	71	52	85			
Volume Left	22	0	46			
Volume Right	0	19	39			
cSH	1554	1700	920			
Volume to Capacity	0.01	0.03	0.09			
Queue Length 95th (ft)	1	0	8			
Control Delay (s)	2.4	0.0	9.3			
Lane LOS	A		A			
Approach Delay (s)	2.4	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization		20.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

9: Woodward Ave & S. McKinley Ave

7/13/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↕	↕	↕
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	2	72	42	2	5	0
Peak Hour Factor	0.67	0.67	0.78	0.78	0.63	0.63
Hourly flow rate (vph)	3	107	54	3	8	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	56				167	54
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	56				167	54
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1548				822	1013
Direction, Lane #	EB 1	WB 1	WB 2	SB 1	SB 2	
Volume Total	110	54	3	8	0	
Volume Left	3	0	0	8	0	
Volume Right	0	0	3	0	0	
cSH	1548	1700	1700	822	1700	
Volume to Capacity	0.00	0.03	0.00	0.01	0.00	
Queue Length 95th (ft)	0	0	0	1	0	
Control Delay (s)	0.2	0.0	0.0	9.4	0.0	
Lane LOS	A			A	A	
Approach Delay (s)	0.2	0.0		9.4		
Approach LOS				A		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			15.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

10: Woodward Ave & Galleria Dr

7/13/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↰↱		↰↱	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	2	75	42	28	21	2
Peak Hour Factor	0.69	0.69	0.88	0.88	0.72	0.72
Hourly flow rate (vph)	3	109	48	32	29	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	80				178	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	80				178	40
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1516				793	1023
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	3	109	32	48	32	
Volume Left	3	0	0	0	29	
Volume Right	0	0	0	32	3	
cSH	1516	1700	1700	1700	809	
Volume to Capacity	0.00	0.06	0.02	0.03	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	7.4	0.0	0.0	0.0	9.6	
Lane LOS	A				A	
Approach Delay (s)	0.2		0.0		9.6	
Approach LOS					A	
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			13.9%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix A-2: Freeway Operations

Technical Calculations

Existing Conditions

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description _____

General Information

Flow Rate Calculation

Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcphpl)
1	I-5 Yosemite Avenue	AM	1,871	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,047
2	Yosemite Avenue to Airport Way	AM	1,834	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,027
3 SR 120 - EB	Aiport Way to Union Road	AM	1,843	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,032
4	I-5 Yosemite Avenue	PM	3,547	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,986
5	Yosemite Avenue to Airport Way	PM	3,472	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,944
6 SR 120 - EB	Aiport Way to Union Road	PM	3,222	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,804
7	Union Road to Airport Way	AM	2,791	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,562
8	Airport Way to Yosemite Avenue	AM	3,043	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,703
9 SR 120 - WB	Yosemite Avenue to I-5	AM	3,043	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,703
10	Union Road to Airport Way	PM	2,404	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,346
11	Airport Way to Yosemite Avenue	PM	2,277	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,275
12 SR 120 - WB	Yosemite Avenue to I-5	PM	2,357	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,319

**HCM 2000
Basic Freeway Segments
Capacity Analysis**

General Information		Speed Calculation								Results					
Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f _{lW}	R. Shoulder Width (ft)	f _{lC}	f _N	IC Density (per mi)	f _{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	18.1	C
2	Yosemite Avenue to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	17.7	B
3	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	17.8	B
4	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	56.6	35.1	E
5	Yosemite Avenue to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.0	34.1	D
6	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.8	31.2	D
7	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	26.9	D
8	Airport Way to Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	29.4	D
9	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	29.4	D
10	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	23.2	C
11	Airport Way to Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	22.0	C
12	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	22.7	C

Agency or Company _____
Date _____
Project Description Terra Ranch EIR

Fehr & Peers

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

On-Ramp Volume Adjustment

Freeway/ Direction			S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			Grade		Length	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
		On-ramp			L _{A1}	L _{A2}	L _{Aeff}	PHF	Terrain	%	(mi)							
2	SR 120 - EB	Airport Way	45.0	191	250	0	250	0.89	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	217
5	SR 120 - EB	Airport Way	45.0	416	250	0	250	0.92	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	457
8	SR 120 - WB	Airport Way	45.0	492	250	0	250	0.87	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	571
11	SR 120 - WB	Airport Way	45.0	325	250	0	250	0.93	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	353

**HCM 2000
Merge Ramp Junctions
Capacity Analysis**

General Information

	Freeway/ Direction	On-ramp
2	SR 120 - EB	Airport Way
5	SR 120 - EB	Airport Way
8	SR 120 - WB	Airport Way
11	SR 120 - WB	Airport Way

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			v_{12}	
			25-2	25-3	1	2	3	P_{FM}	(pcph)
2	SR 120 - EB	Airport Way			0.585			1.000	1,850
5	SR 120 - EB	Airport Way			0.585			1.000	3,142
8	SR 120 - WB	Airport Way			0.585			1.000	2,856
11	SR 120 - WB	Airport Way			0.585			1.000	2,185

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction	On-ramp		V_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	V_R (pcph)	Max v_R (pcph)	LOS F?
2 SR 120 - EB	Airport Way		1,850	4,800	No	2,066	4,800	No	0	No	No	1,850	2,066	4,600	No	217	2,100	No
5 SR 120 - EB	Airport Way		3,142	4,800	No	3,598	4,800	No	0	No	No	3,142	3,598	4,600	No	457	2,100	No
8 SR 120 - WB	Airport Way		2,856	4,800	No	3,427	4,800	No	0	No	No	2,856	3,427	4,600	No	571	2,100	No
11 SR 120 - WB	Airport Way		2,185	4,800	No	2,538	4,800	No	0	No	No	2,185	2,538	4,600	No	353	2,100	No

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
2	SR 120 - EB	Airport Way	19.9	B	0.329	57.4	0.0	57.4
5	SR 120 - EB	Airport Way	31.8	D	0.441	54.9	0.0	54.9
8	SR 120 - WB	Airport Way	30.4	D	0.419	55.4	0.0	55.4
11	SR 120 - WB	Airport Way	23.5	C	0.348	57.0	0.0	57.0

HCM 2000

Diverge Ramp Junctions

Capacity Analysis

Jurisdiction	Caltrans
Analysis Year	Existing
Analyst	Fehr & Peers

Agency or Company _____
Date _____
Project Description Terra Ranch EIR

General Information				Freeway Data				Freeway Volume Adjustment										Effective	
Freeway/ Direction		Off-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane? Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Flow Rate v _p (pcph)
2	SR 120 - EB	Airport Way	AM	2	65.0	1,834	No	0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,053	2,053
5	SR 120 - EB	Airport Way	PM	2	65.0	3,472	No	0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,887	3,887
8	SR 120 - WB	Airport Way	AM	2	65.0	2,791	No	0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,125	3,125
11	SR 120 - WB	Airport Way	PM	2	65.0	2,404	No	0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,691	2,691

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Off-Ramp Data							Off-Ramp Volume Adjustment									
Freeway/ Direction	Off-ramp	Type	Lanes	S _{FR} (mph)	V _R (vph)	Decel Lane (ft)			PHF	Terrain	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)		
2	SR 120 - EB	Airport Way	Right	1	45.0	182	150	0	150	0.86	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	214	
5	SR 120 - EB	Airport Way	Right	1	45.0	666	150	0	150	0.9	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	747	
8	SR 120 - WB	Airport Way	Right	1	45.0	240	150	0	150	0.85	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	285	
11	SR 120 - WB	Airport Way	Right	1	45.0	452	150	0	150	0.95	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	481	

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

Freeway/ Direction			Off-ramp
2	SR 120 - EB	Airport Way	
5	SR 120 - EB	Airport Way	
8	SR 120 - WB	Airport Way	
11	SR 120 - WB	Airport Way	

HCM 2000 Diverge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation			
Freeway/ Direction			L_{EQ}		P_{FD}	v_{12}
		Off-ramp	25-13	25-14		(pcph)
2	SR 120 - EB	Airport Way			1.000	2,053
5	SR 120 - EB	Airport Way			1.000	3,887
8	SR 120 - WB	Airport Way			1.000	3,125
11	SR 120 - WB	Airport Way			1.000	2,691

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{Fi} (pcph)	Max V_{Fi} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $V_{12}/2$?	V_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	V_{FO} (pcph)	Max V_{FO} (pcph)	LOS F?	V_R (pcph)	Max V_R (pcph)	LOS F?
2 SR 120 - EB	Airport Way		2,053	4,800	No	0	No	No	2,053	4,400	No	1,840	4,800	No	214	2,100	No
5 SR 120 - EB	Airport Way		3,887	4,800	No	0	No	No	3,887	4,400	No	3,140	4,800	No	747	2,100	No
8 SR 120 - WB	Airport Way		3,125	4,800	No	0	No	No	3,125	4,400	No	2,840	4,800	No	285	2,100	No
11 SR 120 - WB	Airport Way		2,691	4,800	No	0	No	No	2,691	4,400	No	2,211	4,800	No	481	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction	Off-ramp		Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
2 SR 120 - EB	Airport Way		20.6	C	0.317	57.7	0.0	57.7
5 SR 120 - EB	Airport Way		36.3	E	0.365	56.6	0.0	56.6
8 SR 120 - WB	Airport Way		29.8	D	0.324	57.6	0.0	57.6
11 SR 120 - WB	Airport Way		26.0	C	0.341	57.2	0.0	57.2

Appendix B

Technical Calculations Existing Plus Project Conditions

Appendix B-1: Intersection Operations

Technical Calculations

Existing Plus Project Conditions

HCM Unsignalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	15	100	7	7	144	107	19	26	14	172	9	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	109	8	8	157	116	21	28	15	187	10	17
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total (vph)	16	116	8	157	116	64	214					
Volume Left (vph)	16	0	8	0	0	21	187					
Volume Right (vph)	0	8	0	0	116	15	17					
Hadj (s)	0.58	0.04	0.58	0.09	-0.61	0.01	0.21					
Departure Headway (s)	6.0	5.5	6.0	5.5	3.2	5.0	5.0					
Degree Utilization, x	0.03	0.18	0.01	0.24	0.10	0.09	0.30					
Capacity (veh/h)	560	620	567	623	1121	664	681					
Control Delay (s)	8.0	8.4	7.9	9.0	5.4	8.5	10.1					
Approach Delay (s)	8.4		7.5			8.5	10.1					
Approach LOS	A		A			A	B					
Intersection Summary												
Delay			8.5									
HCM Level of Service			A									
Intersection Capacity Utilization			36.8%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3369		1719	3149		1719	1810	1517	1719	1810	1517
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3369		1719	3149		1719	1810	1517	1719	1810	1517
Volume (vph)	51	273	36	98	148	143	43	151	72	217	241	48
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	297	39	107	161	155	47	164	78	236	262	52
RTOR Reduction (vph)	0	12	0	0	119	0	0	0	49	0	0	26
Lane Group Flow (vph)	55	324	0	107	197	0	47	164	29	236	262	26
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	2.7	13.6		8.0	18.9		3.3	29.9	29.9	13.9	40.5	40.5
Effective Green, g (s)	2.7	13.6		8.0	18.9		3.3	29.9	29.9	13.9	40.5	40.5
Actuated g/C Ratio	0.03	0.17		0.10	0.23		0.04	0.37	0.37	0.17	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	57	563		169	731		70	665	557	294	901	755
v/s Ratio Prot	0.03	c0.10		c0.06	0.06		0.03	0.09		c0.14	c0.14	
v/s Ratio Perm									0.02			0.02
v/c Ratio	0.96	0.58		0.63	0.27		0.67	0.25	0.05	0.80	0.29	0.03
Uniform Delay, d1	39.3	31.2		35.3	25.6		38.5	17.9	16.6	32.4	12.0	10.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	105.7	1.4		7.5	0.2		22.4	0.9	0.2	14.6	0.8	0.1
Delay (s)	145.0	32.7		42.8	25.8		61.0	18.8	16.8	47.0	12.8	10.5
Level of Service	F	C		D	C		E	B	B	D	B	B
Approach Delay (s)		48.5			30.1			25.1			27.3	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM Average Control Delay			32.6			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			81.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			61.6%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Project **PHF:** 1
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	20	18	90	4	28.0	C	--
	T	79	89	111	8	5.2	A	--
	R	19	22	122	5	2.2	A	--
	Subtotal	118	128	108	--	7.9	A	--
SB	L	1	2	200	1	39.9	D	--
	T	76	83	109	5	15.3	B	--
	R	9	10	111	2	8.9	A	--
	Subtotal	86	94	109	--	15.1	B	--
EB	L	5	5	100	2	30.6	C	--
	T	2	3	150	2	37.1	D	--
	R	18	18	100	6	8.8	A	--
	Subtotal	25	27	108	--	16.6	B	--
WB	L	36	35	97	5	29.2	C	--
	T	6	8	133	2	22.7	C	--
	R	3	3	100	1	6.7	A	--
	Subtotal	45	46	102	--	26.6	C	--
Total		273	296	108	--	13.9	B	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	51	53	104	6	27.7	C	--
	T	68	72	106	8	7.3	A	--
	Subtotal	120	125	104	--	16.0	B	--
SB	T	42	47	112	6	11.2	B	--
	R	87	101	116	9	7.3	A	--
	Subtotal	129	148	116	--	8.5	A	--
WB	L	14	20	143	5	26.7	C	--
	R	50	60	120	6	10.0	B	--
	Subtotal	64	80	125	--	14.2	B	--
Total		312	353	113	--	12.4	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Project **PHF:** 1
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	86	102	119	10	8.9	A	--
	R	40	45	113	6	3.9	A	--
	Subtotal	125	146	117	--	7.4	A	--
SB	L	21	23	115	5	31.7	C	--
	T	36	43	119	6	6.8	A	--
	Subtotal	56	66	118	--	15.5	B	--
EB	L	34	38	112	4	29.4	C	--
	T	0	1	--	1	47.1	D	--
	R	16	19	119	3	6.7	A	--
	Subtotal	50	57	114	--	22.2	C	--
Total		231	269	116	--	12.5	B	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Un-Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	0	0	--	0	0.0	--	--
	T	77	93	121	8	2.0	A	--
	Subtotal	77	93	121	--	2.0	A	--
SB	L	3	4	133	1	4.4	A	--
	T	36	44	122	6	1.2	A	--
	R	12	12	100	2	0.9	A	--
	Subtotal	51	60	118	--	1.3	A	--
EB	L	36	38	106	8	12.7	B	--
	T	0	1	--	1	18.9	C	--
	R	1	1	--	0	1.5	A	--
	Subtotal	37	40	108	--	12.6	B	--
WB	R	12	13	108	3	6.0	A	--
	Subtotal	12	13	108	--	6.0	A	--
Total		178	205	115	--	4.1	A	--

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

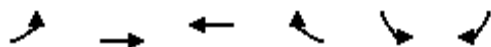
8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	191	41	13	4	21	30	11	81	3	14	49	74
Peak Hour Factor	0.83	0.83	0.83	0.55	0.55	0.55	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	230	49	16	7	38	55	14	104	4	18	63	95
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	295	100	122	176								
Volume Left (vph)	230	7	14	18								
Volume Right (vph)	16	55	4	95								
Hadj (s)	0.16	-0.28	0.08	-0.25								
Departure Headway (s)	5.0	4.8	5.2	4.8								
Degree Utilization, x	0.41	0.13	0.18	0.24								
Capacity (veh/h)	686	680	627	680								
Control Delay (s)	11.3	8.5	9.4	9.3								
Approach Delay (s)	11.3	8.5	9.4	9.3								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay			10.1									
HCM Level of Service			B									
Intersection Capacity Utilization			37.0%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Ave

8/13/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	18	26	14	32	11	4
Peak Hour Factor	0.69	0.69	0.78	0.78	0.50	0.50
Hourly flow rate (vph)	26	38	18	41	22	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	59				128	38
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	59				128	38
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	99
cM capacity (veh/h)	1545				851	1033
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	64	59	30			
Volume Left	26	0	22			
Volume Right	0	41	8			
cSH	1545	1700	893			
Volume to Capacity	0.02	0.03	0.03			
Queue Length 95th (ft)	1	0	3			
Control Delay (s)	3.1	0.0	9.2			
Lane LOS	A		A			
Approach Delay (s)	3.1	0.0	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			19.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

9: Woodward Ave & S. McKinley Ave

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	35	2	11	38	3	6	0	37	1	0	2
Peak Hour Factor	0.62	0.62	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.38	0.92	0.38
Hourly flow rate (vph)	0	56	2	12	46	4	7	0	40	3	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	49			59			132	131	58	166	128	46
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	49			59			132	131	58	166	128	46
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			99	100	96	100	100	99
cM capacity (veh/h)	1557			1545			830	754	1009	762	756	1024
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2		
Volume Total	0	59	12	46	4	7	0	40	3	5		
Volume Left	0	0	12	0	0	7	0	0	3	0		
Volume Right	0	2	0	0	4	0	0	40	0	5		
cSH	1700	1700	1545	1700	1700	830	1700	1009	762	1024		
Volume to Capacity	0.00	0.03	0.01	0.03	0.00	0.01	0.00	0.04	0.00	0.01		
Queue Length 95th (ft)	0	0	1	0	0	1	0	3	0	0		
Control Delay (s)	0.0	0.0	7.3	0.0	0.0	9.4	0.0	8.7	9.7	8.5		
Lane LOS			A			A	A	A	A	A		
Approach Delay (s)	0.0		1.4			8.8			8.9			
Approach LOS						A			A			
Intersection Summary												
Average Delay	3.3											
Intersection Capacity Utilization	18.9%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

10: Woodward Ave & Galleria Dr

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	2	68	3	43	40	25	10	0	147	20	0	2
Peak Hour Factor	0.55	0.55	0.92	0.92	0.79	0.79	0.92	0.92	0.92	0.69	0.92	0.69
Hourly flow rate (vph)	4	124	3	47	51	32	11	0	160	29	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	82			127			253	307	124	451	294	41
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	82			127			253	307	124	451	294	41
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			98	100	82	93	100	100
cM capacity (veh/h)	1513			1457			660	585	904	394	595	1021
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	4	124	3	47	34	49	171	32				
Volume Left	4	0	0	47	0	0	11	29				
Volume Right	0	0	3	0	0	32	160	3				
cSH	1513	1700	1700	1457	1700	1700	883	418				
Volume to Capacity	0.00	0.07	0.00	0.03	0.02	0.03	0.19	0.08				
Queue Length 95th (ft)	0	0	0	2	0	0	18	6				
Control Delay (s)	7.4	0.0	0.0	7.6	0.0	0.0	10.0	14.3				
Lane LOS	A			A			B	B				
Approach Delay (s)	0.2			2.7			10.0	14.3				
Approach LOS							B	B				
Intersection Summary												
Average Delay	5.5											
Intersection Capacity Utilization	25.1%			ICU Level of Service				A				
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	28	248	28	32	129	191	12	31	14	123	36	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	270	30	35	140	208	13	34	15	134	39	13
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total (vph)	30	300	35	140	208	62	186					
Volume Left (vph)	30	0	35	0	0	13	134					
Volume Right (vph)	0	30	0	0	208	15	13					
Hadj (s)	0.58	0.01	0.58	0.09	-0.61	-0.02	0.19					
Departure Headway (s)	6.0	5.5	6.2	5.7	3.2	5.5	5.5					
Degree Utilization, x	0.05	0.46	0.06	0.22	0.18	0.10	0.28					
Capacity (veh/h)	567	636	547	596	1121	584	605					
Control Delay (s)	8.2	11.8	8.4	9.1	5.7	9.1	10.7					
Approach Delay (s)	11.4		7.2			9.1	10.7					
Approach LOS	B		A			A	B					
Intersection Summary												
Delay			9.5									
HCM Level of Service			A									
Intersection Capacity Utilization			44.2%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

8/13/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3298		1719	3126		1719	1810	1517	1719	1810	1517
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3298		1719	3126		1719	1810	1517	1719	1810	1517
Volume (vph)	88	251	77	213	183	206	39	290	173	200	240	36
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	273	84	232	199	224	42	315	188	217	261	39
RTOR Reduction (vph)	0	34	0	0	166	0	0	0	125	0	0	21
Lane Group Flow (vph)	96	323	0	232	257	0	42	315	63	217	261	18
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.4	14.3		13.4	22.3		3.5	28.9	28.9	13.2	38.6	38.6
Effective Green, g (s)	5.4	14.3		13.4	22.3		3.5	28.9	28.9	13.2	38.6	38.6
Actuated g/C Ratio	0.06	0.17		0.16	0.26		0.04	0.34	0.34	0.15	0.45	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	108	550		268	812		70	610	511	264	814	682
v/s Ratio Prot	0.06	c0.10		c0.13	0.08		0.02	c0.17		c0.13	0.14	
v/s Ratio Perm									0.04			0.01
v/c Ratio	0.89	0.59		0.87	0.32		0.60	0.52	0.12	0.82	0.32	0.03
Uniform Delay, d1	39.9	33.0		35.3	25.6		40.5	22.8	19.7	35.2	15.2	13.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	52.5	1.6		24.0	0.2		13.1	3.1	0.5	18.3	1.0	0.1
Delay (s)	92.4	34.6		59.4	25.8		53.6	25.9	20.2	53.4	16.2	13.2
Level of Service	F	C		E	C		D	C	C	D	B	B
Approach Delay (s)		46.9			37.7			26.1			31.6	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			35.2			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			85.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			67.7%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Project **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	103	107	104	7	35.0	C	--
	T	129	145	113	15	11.1	B	--
	R	28	28	100	4	7.4	A	--
	Subtotal	260	280	108	--	19.8	B	--
SB	L	4	3	75	2	59.6	E	--
	T	114	124	109	15	40.8	D	--
	R	29	31	107	7	22.1	C	--
	Subtotal	147	158	108	--	37.5	D	--
EB	L	19	21	111	5	34.9	C	--
	T	7	7	117	4	35.4	D	--
	R	82	84	102	11	13.2	B	--
	Subtotal	108	111	103	--	18.5	B	--
WB	L	20	22	110	5	61.0	E	--
	T	6	6	100	2	39.6	D	--
	R	2	2	100	1	7.5	A	--
	Subtotal	27	31	115	--	52.4	D	--
Total		541	580	107	--	26.1	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	27	27	100	5	63.9	E	--
	T	179	194	109	11	14.4	B	--
	Subtotal	206	221	107	--	20.4	C	--
SB	T	152	173	114	10	17.5	B	--
	R	63	66	105	7	4.7	A	--
	Subtotal	215	239	111	--	13.9	B	--
WB	L	45	45	100	6	33.6	C	--
	R	81	85	105	9	24.1	C	--
	Subtotal	127	130	103	--	27.4	C	--
Total		548	589	107	--	19.3	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Project **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	83	100	120	5	51.5	D	--
	R	34	38	112	6	22.7	C	--
	Subtotal	117	138	118	--	43.5	D	--
SB	L	76	76	100	6	68.6	E	--
	T	121	126	104	10	34.9	C	--
	Subtotal	197	202	103	--	47.5	D	--
EB	L	123	132	108	7	56.7	E	--
	T	2	2	100	1	86.7	F	--
	R	58	64	110	11	20.3	C	--
	Subtotal	183	198	109	--	45.1	D	--
Total		497	538	108	--	45.6	D	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Un-Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	1	1	100	0	9.4	A	--
	T	72	84	117	8	1.9	A	--
	R	2	1	50	1	4.4	A	--
	Subtotal	74	86	116	--	2.1	A	--
SB	L	22	22	100	4	5.4	A	--
	T	109	121	111	10	2.4	A	--
	R	49	49	100	7	2.4	A	--
	Subtotal	179	192	107	--	2.7	A	--
EB	L	29	34	117	5	33.7	D	--
	T	0	1	--	0	50.3	F	--
	R	2	3	150	2	3.8	A	--
	Subtotal	32	39	119	--	31.6	D	--
WB	L	1	2	200	1	19.3	C	--
	T	1	1	--	0	18.9	C	--
	R	16	23	144	5	11.1	B	--
	Subtotal	17	26	153	--	12.0	B	--
Total		302	342	113	--	6.5	A	--

HCM Unsignalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

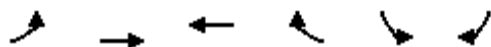
8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	145	68	18	3	63	52	13	79	2	95	127	229
Peak Hour Factor	0.80	0.80	0.80	0.65	0.65	0.65	0.95	0.95	0.95	0.89	0.89	0.89
Hourly flow rate (vph)	181	85	22	5	97	80	14	83	2	107	143	257
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	289	182	99	507								
Volume Left (vph)	181	5	14	107								
Volume Right (vph)	23	80	2	257								
Hadj (s)	0.11	-0.23	0.09	-0.21								
Departure Headway (s)	6.1	6.1	6.4	5.4								
Degree Utilization, x	0.49	0.31	0.18	0.75								
Capacity (veh/h)	542	517	485	507								
Control Delay (s)	14.9	11.7	10.8	22.9								
Approach Delay (s)	14.9	11.7	10.8	22.9								
Approach LOS	B	B	B	C								
Intersection Summary												
Delay			17.7									
HCM Level of Service			C									
Intersection Capacity Utilization			58.7%	ICU Level of Service	B							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Ave

8/13/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	35	27	25	56	33
Peak Hour Factor	0.72	0.72	0.81	0.81	0.85	0.85
Hourly flow rate (vph)	22	49	33	31	66	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	64				142	49
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	64				142	49
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	96
cM capacity (veh/h)	1538				839	1020
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	71	64	105			
Volume Left	22	0	66			
Volume Right	0	31	39			
cSH	1538	1700	898			
Volume to Capacity	0.01	0.04	0.12			
Queue Length 95th (ft)	1	0	10			
Control Delay (s)	2.4	0.0	9.5			
Lane LOS	A		A			
Approach Delay (s)	2.4	0.0	9.5			
Approach LOS			A			
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization		21.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

9: Woodward Ave & S. McKinley Ave

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	2	82	7	39	48	2	4	0	22	5	0	0
Peak Hour Factor	0.67	0.67	0.92	0.92	0.78	0.78	0.92	0.92	0.92	0.63	0.92	0.63
Hourly flow rate (vph)	3	122	8	42	62	3	4	0	24	8	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	64			130			278	281	126	299	282	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			130			278	281	126	299	282	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			99	100	97	99	100	100
cM capacity (veh/h)	1538			1455			658	608	924	622	607	1003
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2		
Volume Total	3	130	42	62	3	4	0	24	8	0		
Volume Left	3	0	42	0	0	4	0	0	8	0		
Volume Right	0	8	0	0	3	0	0	24	0	0		
cSH	1538	1700	1455	1700	1700	658	1700	924	622	1700		
Volume to Capacity	0.00	0.08	0.03	0.04	0.00	0.01	0.00	0.03	0.01	0.00		
Queue Length 95th (ft)	0	0	2	0	0	0	0	2	1	0		
Control Delay (s)	7.3	0.0	7.5	0.0	0.0	10.5	0.0	9.0	10.9	0.0		
Lane LOS	A		A			B	A	A	B	A		
Approach Delay (s)	0.2		3.0			9.2			10.9			
Approach LOS						A			B			
Intersection Summary												
Average Delay	2.5											
Intersection Capacity Utilization	20.0%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

10: Woodward Ave & Galleria Dr

8/13/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Volume (veh/h)	2	97	10	158	81	28	6	0	89	21	0	2
Peak Hour Factor	0.69	0.69	0.92	0.92	0.88	0.88	0.92	0.92	0.92	0.72	0.92	0.72
Hourly flow rate (vph)	3	141	11	172	92	32	7	0	97	29	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	124			151			539	614	141	695	609	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	124			151			539	614	141	695	609	62
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			88			98	100	89	89	100	100
cM capacity (veh/h)	1461			1427			385	356	882	265	359	990
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	3	141	11	172	61	62	103	32				
Volume Left	3	0	0	172	0	0	7	29				
Volume Right	0	0	11	0	0	32	97	3				
cSH	1461	1700	1700	1427	1700	1700	815	284				
Volume to Capacity	0.00	0.08	0.01	0.12	0.04	0.04	0.13	0.11				
Queue Length 95th (ft)	0	0	0	10	0	0	11	9				
Control Delay (s)	7.5	0.0	0.0	7.9	0.0	0.0	10.1	19.3				
Lane LOS	A			A			B	C				
Approach Delay (s)	0.1			4.6			10.1	19.3				
Approach LOS							B	C				
Intersection Summary												
Average Delay	5.2											
Intersection Capacity Utilization	30.0%			ICU Level of Service				A				
Analysis Period (min)	15											

Appendix B-2: Freeway Operations

Technical Calculations

Existing Plus Project Conditions

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description _____

General Information

Flow Rate Calculation

Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcphpl)
1	I-5 Yosemite Avenue	AM	1,889	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,057
2	Yosemite Avenue to Airport Way	AM	1,852	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,037
3 SR 120 - EB	Aiport Way to Union Road	AM	1,893	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,060
4	I-5 Yosemite Avenue	PM	3,611	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,021
5	Yosemite Avenue to Airport Way	PM	3,536	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,979
6 SR 120 - EB	Aiport Way to Union Road	PM	3,252	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,820
7	Union Road to Airport Way	AM	2,806	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,571
8	Airport Way to Yosemite Avenue	AM	3,103	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,737
9 SR 120 - WB	Yosemite Avenue to I-5	AM	3,103	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,737
10	Union Road to Airport Way	PM	2,458	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,376
11	Airport Way to Yosemite Avenue	PM	2,314	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,295
12 SR 120 - WB	Yosemite Avenue to I-5	PM	2,394	0.92	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,340

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information		Speed Calculation								Results					
Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f _{LV}	R. Shoulder Width (ft)	f _{LC}	f _N	IC Density (per mi)	f _{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	18.2	C
2	Yosemite Avenue to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	17.9	B
3	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	18.3	C
4	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	56.2	36.0	E
5	Yosemite Avenue to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	56.7	34.9	D
6	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.8	31.5	D
7	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	27.1	D
8	Airport Way to Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	30.0	D
9	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	30.0	D
10	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	23.7	C
11	Airport Way to Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	22.3	C
12	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	58.0	23.1	C

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Existing + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ramp Data			
Freeway/ Direction		On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane HOV Lane?	Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate V _P (pcph)	Type	Lanes
2	SR 120 - EB	Airport Way	AM	2	65.0	1,652	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,850	Right	1
5	SR 120 - EB	Airport Way	PM	2	65.0	2,806	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,142	Right	1
8	SR 120 - WB	Airport Way	AM	2	65.0	2,551	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,856	Right	1
11	SR 120 - WB	Airport Way	PM	2	65.0	1,952	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,185	Right	1

HCM 2000

Merge Ramp Junctions

Capacity Analysis

General Information

On-Ramp Volume Adjustment

Freeway/ Direction			S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			Grade		Length	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	
		On-ramp			L _{A1}	L _{A2}	L _{Aeff}	PHF	Terrain	%	(mi)							
2	SR 120 - EB	Airport Way	45.0	241	250	0	250	0.89	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	273
5	SR 120 - EB	Airport Way	45.0	446	250	0	250	0.92	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	490
8	SR 120 - WB	Airport Way	45.0	552	250	0	250	0.87	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	641
11	SR 120 - WB	Airport Way	45.0	362	250	0	250	0.93	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	393

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	On-ramp
2	SR 120 - EB	Airport Way
5	SR 120 - EB	Airport Way
8	SR 120 - WB	Airport Way
11	SR 120 - WB	Airport Way

HCM 2000 Merge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation						
	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			v_{12}	
			25-2	25-3	1	2	3	P_{FM}	(pcph)
2	SR 120 - EB	Airport Way			0.585			1.000	1,850
5	SR 120 - EB	Airport Way			0.585			1.000	3,142
8	SR 120 - WB	Airport Way			0.585			1.000	2,856
11	SR 120 - WB	Airport Way			0.585			1.000	2,185

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
Freeway/ Direction		On-ramp	v _{FI} (pcph)	Max v _{FI} (pcph)	LOS F?	v _{FO} (pcph)	Max v _{FO} (pcph)	LOS F?	v ₃ , v _{av34} (pcphpl)	v ₃ , v _{av34} > 2,700?	v ₃ , v _{av34} > 1.5*v ₁₂ /2?	v _{12a} (pcph)	v _{R12a} (pcph)	Max v _{R12a} (pcph)	LOS F?	v _R (pcph)	Max v _R (pcph)	LOS F?
2	SR 120 - EB	Airport Way	1,850	4,800	No	2,123	4,800	No	0	No	No	1,850	2,123	4,600	No	273	2,100	No
5	SR 120 - EB	Airport Way	3,142	4,800	No	3,631	4,800	No	0	No	No	3,142	3,631	4,600	No	490	2,100	No
8	SR 120 - WB	Airport Way	2,856	4,800	No	3,497	4,800	No	0	No	No	2,856	3,497	4,600	No	641	2,100	No
11	SR 120 - WB	Airport Way	2,185	4,800	No	2,579	4,800	No	0	No	No	2,185	2,579	4,600	No	393	2,100	No

HCM 2000

Merge Ramp Junctions

Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
2	SR 120 - EB	Airport Way	20.3	C	0.331	57.4	0.0	57.4
5	SR 120 - EB	Airport Way	32.0	D	0.446	54.7	0.0	54.7
8	SR 120 - WB	Airport Way	30.9	D	0.427	55.2	0.0	55.2
11	SR 120 - WB	Airport Way	23.8	C	0.350	57.0	0.0	57.0

HCM 2000

Diverge Ramp Junctions

Capacity Analysis

Jurisdiction	Caltrans
Analysis Year	Existing + Project
Analyst	Fehr & Peers

Agency or Company _____
Date _____
Project Description Terra Ranch EIR

General Information				Freeway Data				Freeway Volume Adjustment												Effective
Freeway/ Direction		Off-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Flow Rate v _p (pcph)
2	SR 120 - EB	Airport Way	AM	2	65.0	1,852	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,073	2,073
5	SR 120 - EB	Airport Way	PM	2	65.0	3,536	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,959	3,959
8	SR 120 - WB	Airport Way	AM	2	65.0	2,806	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,142	3,142
11	SR 120 - WB	Airport Way	PM	2	65.0	2,458	No		0.92	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,752	2,752

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Off-Ramp Data							Off-Ramp Volume Adjustment									
Freeway/ Direction	Off-ramp	Type	Lanes	S _{FR} (mph)	V _R (vph)	Decel Lane (ft)			PHF	Terrain	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)		
2	SR 120 - EB	Airport Way	Right	1	45.0	200	150	0	150	0.86	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	235	
5	SR 120 - EB	Airport Way	Right	1	45.0	730	150	0	150	0.9	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	819	
8	SR 120 - WB	Airport Way	Right	1	45.0	255	150	0	150	0.85	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	303	
11	SR 120 - WB	Airport Way	Right	1	45.0	506	150	0	150	0.95	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	538	

**HCM 2000
Diverge Ramp Junctions
Capacity Analysis**

General Information

Freeway/ Direction			Off-ramp
2	SR 120 - EB	Airport Way	
5	SR 120 - EB	Airport Way	
8	SR 120 - WB	Airport Way	
11	SR 120 - WB	Airport Way	

HCM 2000 Diverge Ramp Junctions Capacity Analysis

General Information			v_{12} Estimation			
Freeway/ Direction		Off-ramp	L_{EQ}		P_{FD}	v_{12} (pcph)
			25-13	25-14		
2	SR 120 - EB	Airport Way			1.000	2,073
5	SR 120 - EB	Airport Way			1.000	3,959
8	SR 120 - WB	Airport Way			1.000	3,142
11	SR 120 - WB	Airport Way			1.000	2,752

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks														
Freeway/ Direction	Off-ramp		V_{Fi} (pcph)	Max V_{Fi} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $V_{12}/2$?	V_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	V_{FO} (pcph)	Max V_{FO} (pcph)	LOS F?	V_R (pcph)	Max V_R (pcph)	LOS F?
2 SR 120 - EB	Airport Way		2,073	4,800	No	0	No	No	2,073	4,400	No	1,839	4,800	No	235	2,100	No
5 SR 120 - EB	Airport Way		3,959	4,800	No	0	No	No	3,959	4,400	No	3,140	4,800	No	819	2,100	No
8 SR 120 - WB	Airport Way		3,142	4,800	No	0	No	No	3,142	4,400	No	2,839	4,800	No	303	2,100	No
11 SR 120 - WB	Airport Way		2,752	4,800	No	0	No	No	2,752	4,400	No	2,214	4,800	No	538	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
2	SR 120 - EB	Airport Way	20.7	C	0.319	57.7	0.0	57.7
5	SR 120 - EB	Airport Way	36.9	E	0.372	56.5	0.0	56.5
8	SR 120 - WB	Airport Way	29.9	D	0.325	57.5	0.0	57.5
11	SR 120 - WB	Airport Way	26.6	C	0.346	57.0	0.0	57.0

Appendix C

Technical Calculations

Cumulative Conditions

Appendix C-1: Intersection Operations

Technical Calculations

Cumulative No Project Conditions

HCM Signalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Volume (vph)	20	160	29	387	260	110	88	194	40	200	588	110
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	165	30	399	268	113	91	200	41	206	606	113
RTOR Reduction (vph)	0	0	27	0	0	73	0	0	29	0	0	41
Lane Group Flow (vph)	21	165	3	399	268	40	91	200	12	206	606	72
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.7	9.9	9.9	24.8	32.0	32.0	5.6	27.1	27.1	12.6	34.1	34.1
Effective Green, g (s)	2.7	9.9	9.9	24.8	32.0	32.0	5.6	27.1	27.1	12.6	34.1	34.1
Actuated g/C Ratio	0.03	0.11	0.11	0.27	0.35	0.35	0.06	0.30	0.30	0.14	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	52	384	172	481	1241	555	109	553	470	244	696	591
v/s Ratio Prot	0.01	c0.05		c0.23	0.08		0.05	0.11		c0.12	c0.33	
v/s Ratio Perm			0.00			0.03			0.01			0.05
v/c Ratio	0.40	0.43	0.02	0.83	0.22	0.07	0.83	0.36	0.03	0.84	0.87	0.12
Uniform Delay, d1	43.1	37.6	35.9	30.8	20.4	19.4	41.9	24.9	22.3	37.9	26.1	18.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	0.8	0.0	11.3	0.1	0.1	39.6	0.4	0.0	22.5	11.5	0.1
Delay (s)	48.1	38.4	36.0	42.1	20.5	19.4	81.6	25.3	22.4	60.5	37.6	18.5
Level of Service	D	D	D	D	C	B	F	C	C	E	D	B
Approach Delay (s)		39.0			31.4			40.3			40.4	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			37.1				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			90.4				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			75.0%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.95		0.97	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	0.98		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3400	3451		3400	3322		3400	3419		3400	3220	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3400	3451		3400	3322		3400	3419		3400	3220	
Volume (vph)	75	385	40	99	319	150	50	497	87	290	409	409
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	77	397	41	102	329	155	52	512	90	299	422	422
RTOR Reduction (vph)	0	9	0	0	64	0	0	12	0	0	146	0
Lane Group Flow (vph)	77	429	0	102	420	0	52	590	0	299	698	0
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.8	15.9		6.2	16.3		3.2	32.5		11.8	41.1	
Effective Green, g (s)	5.8	15.9		6.2	16.3		3.2	32.5		11.8	41.1	
Actuated g/C Ratio	0.07	0.19		0.08	0.20		0.04	0.39		0.14	0.50	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	239	666		256	657		132	1349		487	1606	
v/s Ratio Prot	0.02	0.12		c0.03	c0.13		0.02	0.17		c0.09	c0.22	
v/s Ratio Perm												
v/c Ratio	0.32	0.64		0.40	0.64		0.39	0.44		0.61	0.43	
Uniform Delay, d1	36.4	30.6		36.3	30.3		38.7	18.3		33.2	13.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	2.1		1.0	2.0		1.9	1.0		2.3	0.9	
Delay (s)	37.2	32.8		37.3	32.4		40.6	19.3		35.5	14.1	
Level of Service	D	C		D	C		D	B		D	B	
Approach Delay (s)		33.5			33.3			21.0			19.7	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			25.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			82.4			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			63.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	154	117	76	10	30.5	C	--
	T	168	137	82	8	13.1	B	--
	R	92	72	78	9	9.2	A	--
	Subtotal	413	326	79	--	18.5	B	--
SB	L	31	30	97	5	49.0	D	--
	T	82	87	106	8	36.6	D	--
	R	21	18	86	4	6.4	A	--
	Subtotal	133	136	102	--	35.3	D	--
EB	L	8	9	100	2	37.5	D	--
	T	5	5	100	2	43.9	D	--
	R	67	60	90	9	47.0	D	--
	Subtotal	80	73	91	--	45.7	D	--
WB	L	67	58	87	13	108.2	F	--
	T	8	8	100	4	42.8	D	--
	R	15	14	93	3	16.6	B	--
	Subtotal	90	81	90	--	85.4	F	--
Total		716	616	86	--	34.2	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	139	88	63	10	186.2	F	--
	T	199	119	60	11	131.3	F	--
	Subtotal	338	207	61	--	154.6	F	--
SB	T	107	99	93	7	93.7	F	--
	R	108	105	96	16	14.0	B	--
	Subtotal	215	204	95	--	52.8	D	--
WB	L	30	30	100	7	94.1	F	--
	R	214	201	94	13	107.8	F	--
	Subtotal	244	231	95	--	106.1	F	--
Total		797	641	80	--	104.8	F	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	258	162	63	31	105.0	F	--
	R	95	62	65	9	16.6	B	--
	Subtotal	354	224	63	--	80.7	F	--
SB	L	49	45	92	7	73.4	E	--
	T	88	82	93	13	14.4	B	--
	Subtotal	137	127	93	--	35.4	D	--
EB	L	80	56	70	20	259.5	F	--
	R	23	17	74	7	61.8	E	--
	Subtotal	103	73	71	--	212.3	F	--
Total		594	424	71	--	89.8	F	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	3	1	33	1	459.4	F	--
	T	232	131	56	30	379.1	F	--
	R	5	3	60	2	353.2	F	--
	Subtotal	240	135	56	--	379.1	F	--
SB	L	34	30	88	5	61.7	E	--
	T	49	44	90	5	13.9	B	--
	R	28	25	89	7	3.7	A	--
	Subtotal	111	98	88	--	25.7	C	--
EB	L	57	31	54	15	431.3	F	--
	T	3	2	67	1	50.5	D	--
	R	3	3	100	1	5.3	A	--
	Subtotal	62	36	58	--	375.2	F	--
WB	L	5	4	80	1	92.7	F	--
	T	8	7	88	4	80.9	F	--
	R	64	57	89	11	121.7	F	--
	Subtotal	77	68	88	--	115.7	F	--
Total		491	337	69	--	222.2	F	--

HCM Signalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.91		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1690		1770	1863	1583	1770	1839		1770	1845	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1690		1770	1863	1583	1770	1839		1770	1845	1583
Volume (vph)	22	18	30	10	14	470	30	440	10	70	120	32
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	23	19	31	10	14	485	31	454	10	72	124	33
RTOR Reduction (vph)	0	22	0	0	0	271	0	1	0	0	0	18
Lane Group Flow (vph)	23	28	0	10	14	214	31	463	0	72	124	15
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%	3%	2%
Turn Type	Prot			Prot		Perm	Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	2.7	16.3		0.9	14.5	14.5	1.9	22.1		3.1	23.3	26.0
Effective Green, g (s)	2.7	16.3		0.9	14.5	14.5	1.9	22.1		3.1	23.3	26.0
Actuated g/C Ratio	0.05	0.28		0.02	0.25	0.25	0.03	0.38		0.05	0.40	0.45
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	82	472		27	463	393	58	696		94	736	813
v/s Ratio Prot	c0.01	0.02		0.01	0.01		0.02	c0.25		c0.04	0.07	0.00
v/s Ratio Perm						c0.13						0.01
v/c Ratio	0.28	0.06		0.37	0.03	0.54	0.53	0.67		0.77	0.17	0.02
Uniform Delay, d1	26.9	15.4		28.5	16.6	19.1	27.8	15.1		27.3	11.3	9.1
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.9	0.1		8.4	0.0	1.5	9.1	2.4		30.4	0.1	0.0
Delay (s)	28.8	15.5		36.8	16.7	20.6	37.0	17.5		57.6	11.4	9.1
Level of Service	C	B		D	B	C	D	B		E	B	A
Approach Delay (s)		19.7			20.8			18.7			25.6	
Approach LOS		B			C			B			C	
Intersection Summary												
HCM Average Control Delay			20.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			58.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			66.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Avenue

8/26/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		0.97	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3524		3433	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3524		3433	3539
Volume (vph)	20	310	712	20	113	529
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	320	734	21	116	545
RTOR Reduction (vph)	0	239	2	0	0	0
Lane Group Flow (vph)	21	81	753	0	116	545
Turn Type	Perm			Prot		
Protected Phases	8		2		1	6
Permitted Phases	8					
Actuated Green, G (s)	9.8	9.8	18.9		3.9	26.8
Effective Green, g (s)	9.8	9.8	18.9		3.9	26.8
Actuated g/C Ratio	0.22	0.22	0.42		0.09	0.60
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	389	348	1493		300	2127
v/s Ratio Prot	0.01		c0.21		c0.03	0.15
v/s Ratio Perm	c0.05					
v/c Ratio	0.05	0.23	0.50		0.39	0.26
Uniform Delay, d1	13.7	14.3	9.4		19.2	4.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	0.3	0.3		0.8	0.1
Delay (s)	13.8	14.7	9.7		20.1	4.3
Level of Service	B	B	A		C	A
Approach Delay (s)	14.6		9.7			7.0
Approach LOS	B		A			A
Intersection Summary						
HCM Average Control Delay			9.6	HCM Level of Service		A
HCM Volume to Capacity ratio			0.41			
Actuated Cycle Length (s)			44.6	Sum of lost time (s)		12.0
Intersection Capacity Utilization			46.2%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 9: SR 120 WB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	106	97	92	13	4.3	A	--
	R	328	317	96	11	13.2	B	--
	Subtotal	434	413	95	--	11.1	B	--
SB	T	75	70	93	9	2.9	A	--
	R	5	5	100	2	1.2	A	--
	Subtotal	80	76	95	--	2.8	A	--
WB	L	31	31	100	7	12.4	B	--
	R	281	278	99	11	9.8	A	--
	Subtotal	312	309	99	--	10.0	B	--
Total		826	798	97	--	9.9	A	--

Intersection: 10: SR 120 EB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	325	308	95	16	9.3	A	--
	R	182	178	98	14	7.8	A	--
	Subtotal	507	485	96	--	8.7	A	--
SB	T	60	59	98	7	5.3	A	--
	R	46	44	96	6	3.3	A	--
	Subtotal	106	103	97	--	4.4	A	--
EB	L	108	104	96	12	18.0	B	--
	R	150	148	99	10	5.3	A	--
	Subtotal	259	252	97	--	10.5	B	--
Total		872	840	96	--	8.7	A	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 11: Atherton Drive & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	18	16	89	3	46.8	D	--
	T	242	230	95	13	33.7	C	--
	R	4	4	100	3	19.2	B	--
	Subtotal	263	250	95	--	34.3	C	--
SB	L	8	8	100	3	55.5	E	--
	T	122	122	100	9	27.5	C	--
	R	80	79	99	8	3.6	A	--
	Subtotal	210	208	99	--	19.5	B	--
EB	L	255	245	96	24	35.9	D	--
	T	8	8	100	3	21.3	C	--
	R	38	38	100	7	11.3	B	--
	Subtotal	301	291	97	--	32.3	C	--
WB	L	5	4	80	2	39.9	D	--
	T	10	10	100	3	43.1	D	--
	R	10	11	110	2	14.3	B	--
	Subtotal	26	25	96	--	30.2	C	--
Total		800	773	97	--	29.5	C	--

HCM Signalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Volume (vph)	100	260	28	99	240	200	9	756	534	130	324	30
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	103	268	29	102	247	206	9	779	551	134	334	31
RTOR Reduction (vph)	0	0	25	0	0	178	0	0	155	0	0	13
Lane Group Flow (vph)	103	268	4	102	247	28	9	779	396	134	334	18
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.1	12.5	12.5	8.1	12.5	12.5	1.2	44.9	44.9	9.4	53.1	53.1
Effective Green, g (s)	8.1	12.5	12.5	8.1	12.5	12.5	1.2	44.9	44.9	9.4	53.1	53.1
Actuated g/C Ratio	0.09	0.14	0.14	0.09	0.14	0.14	0.01	0.49	0.49	0.10	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	156	482	216	156	482	216	23	911	775	181	1078	916
v/s Ratio Prot	c0.06	c0.08		0.06	0.07		0.01	c0.42		c0.08	0.18	
v/s Ratio Perm			0.00			0.02			0.25			0.01
v/c Ratio	0.66	0.56	0.02	0.65	0.51	0.13	0.39	0.86	0.51	0.74	0.31	0.02
Uniform Delay, d1	40.1	36.6	33.9	40.0	36.4	34.4	44.5	20.2	15.6	39.6	9.6	8.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.0	1.4	0.0	9.5	0.9	0.3	10.7	7.9	0.6	15.0	0.2	0.0
Delay (s)	50.1	38.0	33.9	49.5	37.3	34.7	55.1	28.1	16.1	54.5	9.8	8.0
Level of Service	D	D	C	D	D	C	E	C	B	D	A	A
Approach Delay (s)		40.8			38.6			23.3			21.7	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay			28.6				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.9				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			73.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.95		0.97	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3400	3386		3400	3231		3400	3396		3400	3429	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3400	3386		3400	3231		3400	3396		3400	3429	
Volume (vph)	467	417	110	227	315	290	40	758	178	210	687	105
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	481	430	113	234	325	299	41	781	184	216	708	108
RTOR Reduction (vph)	0	26	0	0	109	0	0	19	0	0	11	0
Lane Group Flow (vph)	481	517	0	234	515	0	41	946	0	216	805	0
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	16.5	24.8		11.2	19.5		2.2	31.1		8.7	37.6	
Effective Green, g (s)	16.5	24.8		11.2	19.5		2.2	31.1		8.7	37.6	
Actuated g/C Ratio	0.18	0.27		0.12	0.21		0.02	0.34		0.09	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	611	915		415	686		81	1150		322	1404	
v/s Ratio Prot	c0.14	0.15		0.07	c0.16		0.01	c0.28		c0.06	0.23	
v/s Ratio Perm												
v/c Ratio	0.79	0.57		0.56	0.75		0.51	0.82		0.67	0.57	
Uniform Delay, d1	36.0	28.9		38.0	33.9		44.3	27.8		40.2	20.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	0.8		1.8	4.6		4.9	6.7		5.4	1.7	
Delay (s)	42.6	29.7		39.8	38.5		49.2	34.5		45.6	22.6	
Level of Service	D	C		D	D		D	C		D	C	
Approach Delay (s)		35.7			38.8			35.1			27.4	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay			34.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			91.8			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			77.7%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	195	146	75	12	41.5	D	--
	T	166	131	79	8	13.6	B	--
	R	77	57	74	8	8.9	A	--
	Subtotal	438	334	76	--	25.0	C	--
SB	L	31	10	32	3	789.0	F	--
	T	227	91	40	22	696.3	F	--
	R	31	15	48	4	431.5	F	--
	Subtotal	288	116	40	--	669.7	F	--
EB	L	26	7	27	2	1807.0	F	--
	T	8	2	25	1	2910.3	F	--
	R	226	52	23	14	3089.4	F	--
	Subtotal	259	61	24	--	2936.4	F	--
WB	L	148	25	17	9	5039.8	F	--
	T	10	1	10	1	5459.0	F	--
	R	57	8	14	4	4537.8	F	--
	Subtotal	215	34	16	--	4936.2	F	--
Total		1201	545	45	--	794.9	F	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	54	38	70	4	140.5	F	--
	T	265	208	78	13	45.5	D	--
	Subtotal	319	246	77	--	60.3	E	--
SB	T	469	132	28	13	95.3	F	--
	R	131	39	30	7	24.7	C	--
	Subtotal	601	171	28	--	79.2	E	--
WB	L	95	69	73	6	393.1	F	--
	R	173	120	69	12	369.1	F	--
	Subtotal	268	189	71	--	377.9	F	--
Total		1188	607	51	--	164.7	F	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	162	149	92	11	83.5	F	--
	R	71	67	94	5	16.1	B	--
	Subtotal	233	216	93	--	62.6	E	--
SB	L	258	95	37	7	182.7	F	--
	T	307	109	36	10	117.3	F	--
	Subtotal	564	205	36	--	147.7	F	--
EB	L	157	101	64	4	526.2	F	--
	R	124	85	69	12	348.4	F	--
	Subtotal	281	186	66	--	445.1	F	--
Total		1078	607	56	--	208.7	F	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	3	3	100	1	59.6	E	--
	T	96	95	99	8	52.6	D	--
	R	5	6	120	2	25.0	C	--
	Subtotal	104	104	100	--	51.4	D	--
SB	L	88	42	48	5	37.6	D	--
	T	271	126	46	13	19.2	B	--
	R	72	34	47	5	4.8	A	--
	Subtotal	430	201	47	--	20.6	C	--
EB	L	70	58	83	9	116.0	F	--
	T	5	6	120	2	40.7	D	--
	R	3	2	67	1	5.6	A	--
	Subtotal	77	66	86	--	106.0	F	--
WB	L	21	20	95	4	36.3	D	--
	T	28	30	107	4	28.9	C	--
	R	67	68	101	6	36.5	D	--
	Subtotal	116	118	102	--	34.6	C	--
Total		728	489	67	--	42.1	D	--

HCM Signalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

8/26/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1748		1770	1863	1583	1770	1831		1770	1845	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1748		1770	1863	1583	1770	1831		1770	1845	1583
Volume (vph)	43	57	40	30	46	180	40	180	10	600	490	50
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	44	59	41	31	47	186	41	186	10	619	505	52
RTOR Reduction (vph)	0	25	0	0	0	166	0	2	0	0	0	18
Lane Group Flow (vph)	44	75	0	31	47	20	41	194	0	619	505	34
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%	3%	2%
Turn Type	Prot			Prot		Perm	Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	5.6	10.6		4.0	9.0	9.0	4.1	16.5		34.7	47.1	52.7
Effective Green, g (s)	5.6	10.6		4.0	9.0	9.0	4.1	16.5		34.7	47.1	52.7
Actuated g/C Ratio	0.07	0.13		0.05	0.11	0.11	0.05	0.20		0.42	0.58	0.64
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	121	227		87	205	174	89	369		751	1062	1097
v/s Ratio Prot	c0.02	c0.04		0.02	0.03		0.02	0.11		c0.35	c0.27	0.00
v/s Ratio Perm						0.01						0.02
v/c Ratio	0.36	0.33		0.36	0.23	0.12	0.46	0.53		0.82	0.48	0.03
Uniform Delay, d1	36.4	32.4		37.7	33.2	32.8	37.8	29.2		20.9	10.1	5.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.9	0.9		2.5	0.6	0.3	3.7	1.4		7.3	0.3	0.0
Delay (s)	38.3	33.2		40.2	33.8	33.1	41.5	30.5		28.2	10.5	5.3
Level of Service	D	C		D	C	C	D	C		C	B	A
Approach Delay (s)		34.8			34.1			32.4			19.6	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			24.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			81.8			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			62.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Avenue

8/26/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		0.97	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3531		3433	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3531		3433	3539
Volume (vph)	10	214	599	10	388	726
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	221	618	10	400	748
RTOR Reduction (vph)	0	185	1	0	0	0
Lane Group Flow (vph)	10	36	627	0	400	748
Turn Type	Perm			Prot		
Protected Phases	8		2		1	6
Permitted Phases	8					
Actuated Green, G (s)	7.5	7.5	15.7		10.6	30.3
Effective Green, g (s)	7.5	7.5	15.7		10.6	30.3
Actuated g/C Ratio	0.16	0.16	0.34		0.23	0.66
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	290	259	1210		795	2341
v/s Ratio Prot	0.01		c0.18		c0.12	0.21
v/s Ratio Perm	c0.02					
v/c Ratio	0.03	0.14	0.52		0.50	0.32
Uniform Delay, d1	16.1	16.4	12.0		15.3	3.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.2	0.4		0.5	0.1
Delay (s)	16.2	16.6	12.4		15.8	3.4
Level of Service	B	B	B		B	A
Approach Delay (s)	16.6		12.4			7.7
Approach LOS	B		B			A
Intersection Summary						
HCM Average Control Delay			10.2	HCM Level of Service		B
HCM Volume to Capacity ratio			0.43			
Actuated Cycle Length (s)			45.8	Sum of lost time (s)		12.0
Intersection Capacity Utilization			41.3%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 9: SR 120 WB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	60	57	95	6	6.6	A	--
	R	244	241	99	13	8.4	A	--
	Subtotal	303	298	98	--	8.0	A	--
SB	T	206	206	100	12	20.7	C	--
	R	265	263	99	11	19.0	B	--
	Subtotal	471	469	100	--	19.7	B	--
WB	L	135	137	101	14	23.4	C	--
	R	80	85	105	13	4.4	A	--
	Subtotal	215	221	103	--	16.1	B	--
Total		989	988	100	--	15.4	B	--

Intersection: 10: SR 120 EB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	290	287	99	16	3.8	A	--
	R	56	56	100	9	2.9	A	--
	Subtotal	347	344	99	--	3.7	A	--
SB	T	137	139	101	8	4.1	A	--
	R	204	204	100	17	7.4	A	--
	Subtotal	341	344	101	--	6.0	A	--
EB	L	13	11	85	2	14.2	B	--
	R	409	351	86	11	73.4	E	--
	Subtotal	422	362	86	--	71.6	E	--
Total		1110	1050	95	--	27.9	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative No Project **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 11: Atherton Drive & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	38	39	100	8	41.9	D	--
	T	169	172	102	15	18.2	B	--
	R	2	2	100	2	7.6	A	--
	Subtotal	210	213	101	--	22.4	C	--
SB	L	8	7	88	2	45.0	D	--
	T	255	223	87	19	25.4	C	--
	R	284	257	90	12	10.0	B	--
	Subtotal	546	487	89	--	17.6	B	--
EB	L	170	165	97	11	32.6	C	--
	T	5	6	120	2	23.2	C	--
	R	25	27	108	7	13.7	B	--
	Subtotal	201	197	98	--	29.7	C	--
WB	L	7	7	100	3	35.5	D	--
	T	8	6	75	3	40.4	D	--
	R	8	9	100	3	6.1	A	--
	Subtotal	22	22	100	--	25.5	C	--
Total		979	918	94	--	21.5	C	--

Appendix C-2: Intersection Operations

Technical Calculations

Cumulative Plus Project Conditions

HCM Signalized Intersection Capacity Analysis

1: Yosemite Ave & McKinley Ave

8/30/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	3505	1568	1752	3505	1568	1752	1845	1568	1752	1845	1568
Volume (vph)	20	160	30	390	260	110	90	200	50	200	590	110
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	165	31	402	268	113	93	206	52	206	608	113
RTOR Reduction (vph)	0	0	28	0	0	73	0	0	36	0	0	41
Lane Group Flow (vph)	21	165	3	402	268	40	93	206	16	206	608	72
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.7	10.0	10.0	25.1	32.4	32.4	6.3	28.2	28.2	12.8	34.7	34.7
Effective Green, g (s)	2.7	10.0	10.0	25.1	32.4	32.4	6.3	28.2	28.2	12.8	34.7	34.7
Actuated g/C Ratio	0.03	0.11	0.11	0.27	0.35	0.35	0.07	0.31	0.31	0.14	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	51	381	170	477	1233	552	120	565	480	243	695	591
v/s Ratio Prot	0.01	c0.05		c0.23	0.08		0.05	0.11		c0.12	c0.33	
v/s Ratio Perm			0.00			0.03			0.01			0.05
v/c Ratio	0.41	0.43	0.02	0.84	0.22	0.07	0.78	0.36	0.03	0.85	0.87	0.12
Uniform Delay, d1	43.9	38.4	36.7	31.6	21.0	19.9	42.2	25.0	22.4	38.7	26.7	18.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.3	0.8	0.0	12.8	0.1	0.1	26.2	0.4	0.0	23.0	11.8	0.1
Delay (s)	49.2	39.2	36.7	44.4	21.0	19.9	68.4	25.4	22.4	61.7	38.5	18.8
Level of Service	D	D	D	D	C	B	E	C	C	E	D	B
Approach Delay (s)		39.8			32.9			36.3			41.3	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay			37.5				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			92.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			75.4%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Yosemite Ave & Airport Way

8/30/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.95		0.97	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	0.98		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3400	3452		3400	3322		3400	3417		3400	3220	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3400	3452		3400	3322		3400	3417		3400	3220	
Volume (vph)	80	390	40	100	320	150	50	500	90	290	410	410
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	82	402	41	103	330	155	52	515	93	299	423	423
RTOR Reduction (vph)	0	9	0	0	64	0	0	13	0	0	147	0
Lane Group Flow (vph)	82	434	0	103	421	0	52	595	0	299	699	0
Confl. Peds. (#/hr)			2			2			2			2
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.9	15.9		6.3	16.3		3.2	32.5		11.8	41.1	
Effective Green, g (s)	5.9	15.9		6.3	16.3		3.2	32.5		11.8	41.1	
Actuated g/C Ratio	0.07	0.19		0.08	0.20		0.04	0.39		0.14	0.50	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	243	665		260	656		132	1346		486	1604	
v/s Ratio Prot	0.02	0.13		c0.03	c0.13		0.02	0.17		c0.09	c0.22	
v/s Ratio Perm												
v/c Ratio	0.34	0.65		0.40	0.64		0.39	0.44		0.62	0.44	
Uniform Delay, d1	36.4	30.8		36.3	30.4		38.7	18.3		33.2	13.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	2.3		1.0	2.2		1.9	1.1		2.3	0.9	
Delay (s)	37.3	33.1		37.3	32.6		40.6	19.4		35.5	14.1	
Level of Service	D	C		D	C		D	B		D	B	
Approach Delay (s)		33.7			33.4			21.1			19.7	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay			25.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			82.5			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			63.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	155	127	82	9	31.9	C	--
	T	170	135	79	10	12.2	B	--
	R	93	76	82	9	7.8	A	--
	Subtotal	418	337	81	--	18.6	B	--
SB	L	31	28	90	7	50.3	D	--
	T	82	80	98	7	33.0	C	--
	R	21	20	95	5	9.5	A	--
	Subtotal	134	128	96	--	33.0	C	--
EB	L	8	7	88	5	42.4	D	--
	T	5	5	100	2	49.4	D	--
	R	67	62	93	7	56.6	E	--
	Subtotal	80	74	93	--	54.8	D	--
WB	L	67	59	88	7	87.4	F	--
	T	8	9	113	3	36.4	D	--
	R	15	16	107	5	9.5	A	--
	Subtotal	90	84	93	--	67.2	E	--
Total		722	622	86	--	32.4	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	139	83	60	5	175.0	F	--
	T	204	127	62	10	123.5	F	--
	Subtotal	343	210	61	--	143.9	F	--
SB	T	108	95	88	5	99.2	F	--
	R	108	104	96	6	13.0	B	--
	Subtotal	216	199	92	--	54.2	D	--
WB	L	31	27	87	6	115.4	F	--
	R	214	204	95	9	126.5	F	--
	Subtotal	245	232	95	--	125.2	F	--
Total		804	641	80	--	109.3	F	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	263	165	63	30	99.5	F	--
	R	98	70	71	10	15.4	B	--
	Subtotal	361	235	65	--	74.4	E	--
SB	L	49	39	80	6	90.5	F	--
	T	90	84	93	10	15.0	B	--
	Subtotal	139	123	88	--	38.8	D	--
EB	L	80	62	78	25	333.2	F	--
	R	23	21	87	7	133.2	F	--
	Subtotal	103	82	80	--	283.5	F	--
Total		603	440	73	--	103.6	F	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	3	3	67	1	210.4	F	--
	T	240	148	62	27	381.6	F	--
	R	5	3	60	2	331.6	F	--
	Subtotal	247	154	62	--	377.8	F	--
SB	L	34	29	85	5	53.4	D	--
	T	52	49	94	8	15.3	B	--
	R	28	24	86	5	4.5	A	--
	Subtotal	113	102	90	--	23.4	C	--
EB	L	57	28	49	14	438.9	F	--
	T	3	2	67	1	67.8	E	--
	R	3	3	100	1	4.6	A	--
	Subtotal	62	33	53	--	375.7	F	--
WB	L	5	4	80	2	69.9	E	--
	T	8	6	75	3	64.6	E	--
	R	64	55	86	13	78.7	E	--
	Subtotal	77	65	84	--	76.9	E	--
Total		500	354	71	--	219.8	F	--

HCM Signalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

8/30/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1742		1770	1863	1583	1770	1839		1770	1845	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1742		1770	1863	1583	1770	1839		1770	1845	1583
Volume (vph)	50	40	30	10	20	470	30	440	10	70	120	40
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	41	31	10	21	485	31	454	10	72	124	41
RTOR Reduction (vph)	0	22	0	0	0	244	0	1	0	0	0	23
Lane Group Flow (vph)	52	50	0	10	21	241	31	463	0	72	124	18
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%	3%	2%
Turn Type	Prot			Prot		Perm	Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases						8						6
Actuated Green, G (s)	3.1	17.9		0.9	15.7	15.7	1.9	22.6		3.1	23.8	26.9
Effective Green, g (s)	3.1	17.9		0.9	15.7	15.7	1.9	22.6		3.1	23.8	26.9
Actuated g/C Ratio	0.05	0.30		0.01	0.26	0.26	0.03	0.37		0.05	0.39	0.44
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	91	515		26	483	411	56	687		91	726	809
v/s Ratio Prot	c0.03	0.03		0.01	0.01		0.02	c0.25		c0.04	0.07	0.00
v/s Ratio Perm						c0.15						0.01
v/c Ratio	0.57	0.10		0.38	0.04	0.59	0.55	0.67		0.79	0.17	0.02
Uniform Delay, d1	28.1	15.4		29.5	16.8	19.6	28.9	15.9		28.4	11.9	9.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.4	0.1		9.2	0.0	2.1	11.3	2.6		36.1	0.1	0.0
Delay (s)	36.4	15.5		38.7	16.8	21.7	40.2	18.5		64.5	12.0	9.4
Level of Service	D	B		D	B	C	D	B		E	B	A
Approach Delay (s)		24.3			21.8			19.9			27.5	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM Average Control Delay			22.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			60.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			66.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Woodward Ave & McKinley Avenue

8/30/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		0.97	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3526		3433	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3526		3433	3539
Volume (vph)	20	370	780	20	130	550
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	381	804	21	134	567
RTOR Reduction (vph)	0	223	2	0	0	0
Lane Group Flow (vph)	21	158	823	0	134	567
Turn Type	Perm			Prot		
Protected Phases	8		2		1	6
Permitted Phases	8					
Actuated Green, G (s)	10.9	10.9	18.5		3.8	26.3
Effective Green, g (s)	10.9	10.9	18.5		3.8	26.3
Actuated g/C Ratio	0.24	0.24	0.41		0.08	0.58
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	427	382	1443		289	2059
v/s Ratio Prot	0.01		c0.23		c0.04	0.16
v/s Ratio Perm	c0.10					
v/c Ratio	0.05	0.41	0.57		0.46	0.28
Uniform Delay, d1	13.2	14.5	10.3		19.7	4.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.7	0.5		1.2	0.1
Delay (s)	13.2	15.2	10.8		20.9	4.8
Level of Service	B	B	B		C	A
Approach Delay (s)	15.1		10.8			7.9
Approach LOS	B		B			A
Intersection Summary						
HCM Average Control Delay			10.6	HCM Level of Service		B
HCM Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			45.2	Sum of lost time (s)		12.0
Intersection Capacity Utilization			51.8%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 9: SR 120 WB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	113	109	96	9	4.5	A	--
	R	343	341	99	15	17.3	B	--
	Subtotal	456	450	99	--	14.2	B	--
SB	T	77	74	96	7	2.8	A	--
	R	5	6	120	2	1.3	A	--
	Subtotal	82	79	96	--	2.7	A	--
WB	L	34	31	91	4	12.4	B	--
	R	281	285	101	14	10.4	B	--
	Subtotal	314	316	101	--	10.6	B	--
Total		853	845	99	--	11.8	B	--

Intersection: 10: SR 120 EB Ramps & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	348	342	98	19	10.8	B	--
	R	191	184	96	13	8.4	A	--
	Subtotal	539	526	98	--	10.0	A	--
SB	T	64	59	91	5	5.0	A	--
	R	46	47	102	7	3.1	A	--
	Subtotal	111	105	95	--	4.2	A	--
EB	L	108	109	101	10	18.7	B	--
	R	155	158	102	9	5.3	A	--
	Subtotal	263	267	102	--	10.7	B	--
Total		912	898	98	--	9.5	A	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 11: Atherton Drive & McKinley Ave **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	18	17	94	5	60.1	E	--
	T	273	262	96	14	46.6	D	--
	R	5	5	100	2	25.8	C	--
	Subtotal	296	284	96	--	47.1	D	--
SB	L	8	7	88	2	62.6	E	--
	T	131	128	98	8	29.2	C	--
	R	80	80	100	8	3.5	A	--
	Subtotal	219	216	99	--	20.7	C	--
EB	L	255	251	98	18	60.9	E	--
	T	8	7	88	2	23.1	C	--
	R	39	42	108	7	12.7	B	--
	Subtotal	302	300	99	--	53.3	D	--
WB	L	5	4	80	2	43.5	D	--
	T	10	10	100	3	44.1	D	--
	R	10	9	90	4	16.6	B	--
	Subtotal	26	23	88	--	32.9	C	--
Total		843	822	98	--	42.0	D	--

Appendix C-3: Intersection Operations

Roundabout Analysis

Technical Calculations

Cumulative Plus Project Conditions

MOVEMENT SUMMARY

Site: 7. Woodward Ave & Airport Way

Cumulative Plus Project - AM Peak Hour
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Airport Way											
3L	L	31	2.0	0.469	15.9	LOS B	4.2	106.4	0.50	0.84	33.8
8T	T	454	3.0	0.470	9.6	LOS A	4.2	106.4	0.50	0.60	36.8
8R	R	10	2.0	0.469	11.0	LOS B	4.2	106.4	0.50	0.66	36.9
Approach		495	2.9	0.469	10.0	LOS B	4.2	106.4	0.50	0.62	36.6
East: Woodward Ave											
1L	L	10	2.0	0.736	28.4	LOS C	11.2	285.5	0.97	1.17	26.9
6T	T	21	2.0	0.764	18.6	LOS B	11.2	285.5	0.97	1.16	26.4
6R	R	485	2.0	0.762	20.3	LOS C	11.2	285.5	0.97	1.16	26.7
Approach		515	2.0	0.762	20.4	LOS C	11.2	285.5	0.97	1.16	26.7
North: Airport Way											
7L	L	72	2.0	0.199	13.6	LOS B	1.5	37.4	0.24	0.78	30.2
4T	T	124	3.0	0.199	7.2	LOS A	1.5	37.4	0.24	0.46	34.9
4R	R	41	2.0	0.199	6.1	LOS A	1.5	37.4	0.24	0.48	32.5
Approach		237	2.5	0.199	9.0	LOS B	1.5	37.4	0.24	0.56	33.0
West: Woodward Ave											
5L	L	52	2.0	0.130	12.9	LOS B	0.8	21.2	0.41	0.76	27.7
2T	T	41	2.0	0.130	6.2	LOS A	0.8	21.2	0.41	0.48	30.4
2R	R	31	2.0	0.130	8.1	LOS A	0.8	21.2	0.41	0.57	31.3
Approach		124	2.0	0.130	9.4	LOS B	0.8	21.2	0.41	0.62	29.4
All Vehicles		1371	2.4	0.764	13.7	LOS B	11.2	285.5	0.62	0.81	31.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout LOS Method: Same as Signalised Intersections.

Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: 7. Woodward Ave & Airport Way

Cumulative Plus Project - PM Peak Hour
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Airport Way											
3L	L	41	2.0	0.485	23.4	LOS C	4.5	116.3	0.91	1.04	29.0
8T	T	186	3.0	0.483	17.1	LOS B	4.5	116.3	0.91	1.00	31.6
8R	R	10	2.0	0.491	18.5	LOS B	4.5	116.3	0.91	1.01	31.9
Approach		237	2.8	0.483	18.3	LOS C	4.5	116.3	0.91	1.01	31.2
East: Woodward Ave											
1L	L	31	2.0	0.340	17.7	LOS B	2.7	69.0	0.61	0.83	32.2
6T	T	72	2.0	0.340	7.9	LOS A	2.7	69.0	0.61	0.63	32.7
6R	R	186	2.0	0.340	9.6	LOS A	2.7	69.0	0.61	0.69	32.9
Approach		289	2.0	0.340	10.0	LOS B	2.7	69.0	0.61	0.69	32.8
North: Airport Way											
7L	L	619	2.0	1.040	46.0	LOS D	57.4	1462.1	1.00	1.16	18.6
4T	T	505	3.0	1.039	39.6	LOS D	57.4	1462.1	1.00	1.16	20.4
4R	R	82	2.0	1.044	38.4	LOS D	57.4	1462.1	1.00	1.16	18.2
Approach		1206	2.4	1.040	42.8	LOS D	57.4	1462.1	1.00	1.16	19.3
West: Woodward Ave											
5L	L	62	2.0	0.736	50.4	LOS D	8.5	217.1	1.00	1.23	16.4
2T	T	72	2.0	0.736	43.7	LOS D	8.5	217.1	1.00	1.23	17.1
2R	R	41	2.0	0.736	45.6	LOS D	8.5	217.1	1.00	1.23	18.1
Approach		175	2.0	0.739	46.5	LOS D	8.5	217.1	1.00	1.23	17.1
All Vehicles		1907	2.4	1.044	35.1	LOS D	57.4	1462.1	0.93	1.08	21.2

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout LOS Method: Same as Signalised Intersections.

Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: 7. Woodward Ave & Airport Way

Cumulative Plus Project - AM Peak Hour
Two-Lane Roundabout (N-S)
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Airport Way											
3L	L	31	2.0	0.210	15.3	LOS B	1.5	37.3	0.37	0.84	33.9
8T	T	454	3.0	0.210	9.1	LOS A	1.5	37.5	0.37	0.56	37.7
8R	R	10	2.0	0.210	10.6	LOS B	1.5	37.5	0.37	0.64	37.5
Approach		495	2.9	0.210	9.5	LOS B	1.5	37.5	0.37	0.58	37.4
East: Woodward Ave											
1L	L	10	2.0	0.736	24.0	LOS C	8.1	205.1	0.83	1.11	28.9
6T	T	21	2.0	0.764	14.2	LOS B	8.1	205.1	0.83	1.03	29.1
6R	R	485	2.0	0.758	15.7	LOS B	8.1	205.1	0.83	1.05	29.3
Approach		515	2.0	0.758	15.8	LOS C	8.1	205.1	0.83	1.05	29.3
North: Airport Way											
7L	L	72	2.0	0.091	13.5	LOS B	0.6	15.3	0.21	0.73	30.1
4T	T	124	3.0	0.091	7.2	LOS A	0.6	15.4	0.21	0.46	35.1
4R	R	41	2.0	0.091	6.2	LOS A	0.6	15.4	0.21	0.51	32.6
Approach		237	2.5	0.091	8.9	LOS B	0.6	15.4	0.21	0.55	33.0
West: Woodward Ave											
5L	L	52	2.0	0.141	12.7	LOS B	0.7	18.3	0.36	0.78	27.8
2T	T	41	2.0	0.141	6.0	LOS A	0.7	18.3	0.36	0.49	30.7
2R	R	31	2.0	0.141	7.7	LOS A	0.7	18.3	0.36	0.57	31.5
Approach		124	2.0	0.141	9.2	LOS B	0.7	18.3	0.36	0.63	29.6
All Vehicles		1371	2.4	0.764	11.7	LOS B	8.1	205.1	0.51	0.75	32.5

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout LOS Method: Same as Signalised Intersections.

Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: 7. Woodward Ave & Airport Way

Cumulative Plus Project - PM Peak Hour
Two-Lane Roundabout (N-S)
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Airport Way											
3L	L	41	2.0	0.179	20.0	LOS B	1.3	34.2	0.76	0.90	30.7
8T	T	186	3.0	0.179	13.3	LOS B	1.4	35.9	0.76	0.80	34.7
8R	R	10	2.0	0.181	14.6	LOS B	1.4	35.9	0.76	0.82	35.2
Approach		237	2.8	0.179	14.6	LOS B	1.4	35.9	0.76	0.82	34.0
East: Woodward Ave											
1L	L	31	2.0	0.364	17.4	LOS B	2.3	59.1	0.53	0.87	32.4
6T	T	72	2.0	0.363	7.6	LOS A	2.3	59.1	0.53	0.61	33.2
6R	R	186	2.0	0.363	9.1	LOS A	2.3	59.1	0.53	0.70	33.3
Approach		289	2.0	0.363	9.6	LOS B	2.3	59.1	0.53	0.69	33.1
North: Airport Way											
7L	L	619	2.0	0.486	14.3	LOS B	4.7	118.6	0.46	0.67	29.2
4T	T	505	3.0	0.485	8.1	LOS A	4.7	118.6	0.48	0.55	33.7
4R	R	82	2.0	0.485	7.1	LOS A	4.6	117.9	0.48	0.59	31.6
Approach		1206	2.4	0.485	11.2	LOS B	4.7	118.6	0.47	0.62	31.1
West: Woodward Ave											
5L	L	62	2.0	0.387	18.4	LOS B	2.2	56.3	0.74	1.00	25.3
2T	T	72	2.0	0.386	11.8	LOS B	2.2	56.3	0.74	0.88	27.8
2R	R	41	2.0	0.385	13.5	LOS B	2.2	56.3	0.74	0.91	28.8
Approach		175	2.0	0.386	14.5	LOS B	2.2	56.3	0.74	0.93	27.1
All Vehicles		1907	2.4	0.486	11.7	LOS B	4.7	118.6	0.54	0.68	31.3

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout LOS Method: Same as Signalised Intersections.

Roundabout Capacity Model: SIDRA Standard.

Appendix C-4: Freeway Operations

Technical Calculations

Cumulative No Project Conditions

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description _____

General Information

Flow Rate Calculation

Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcphpl)
1	I-5 Yosemite Avenue	AM	4,004	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,126
2	Yosemite Avenue to McKinley Ave	AM	3,523	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,870
3	McKinley Ave to Airport Way	AM	3,406	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,808
4	SR 120 - EB Airport Way to Union Road	AM	3,566	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,893
5	I-5 Yosemite Avenue	PM	5,432	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,884
6	Yosemite Avenue to McKinley Ave	PM	5,568	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,956
7	McKinley Ave to Airport Way	PM	4,939	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,622
8	SR 120 - EB Airport Way to Union Road	PM	5,123	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,720
9	Union Road to Airport Way	AM	4,617	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,451
10	Airport Way to McKinley Ave	AM	4,630	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,458
11	McKinley Ave to Yosemite Ave	AM	4,712	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,502
12	SR 120 - WB Yosemite Avenue to I-5	AM	4,486	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,382
13	Union Road to Airport Way	PM	4,863	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,582
14	Airport Way to McKinley Ave	PM	4,624	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,455
15	McKinley Ave to Yosemite Ave	PM	5,695	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,024
16	SR 120 - WB Yosemite Avenue to I-5	PM	6,237	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,311

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information		Speed Calculation								Results					
Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f _{LW}	R. Shoulder Width (ft)	f _{LC}	f _N	IC Density (per mi)	f _{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	54.5	39.0	E
2	Yosemite Avenue to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.6	32.5	D
3	McKinley Ave to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.8	31.3	D
4	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.4	33.0	D
5	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
6	Yosemite Avenue to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
7	McKinley Ave to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
8	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
9	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
10	Airport Way to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
11	McKinley Ave to Yosemite Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
12	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
13	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
14	Airport Way to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
15	McKinley Ave to Yosemite Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
16	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ramp	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1 SR 120 - EB	McKinley Ave (loop ramp)	AM	2	65.0	2,520	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,676	Right
2 SR 120 - EB	McKinley Ave	AM	2	65.0	2,700	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,867	Right
3 SR 120 - EB	Airport Way	AM	2	65.0	3,006	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,192	Right
4 SR 120 - EB	McKinley Ave (loop ramp)	PM	2	65.0	3,930	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,173	Right
5 SR 120 - EB	McKinley Ave	PM	2	65.0	4,720	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,012	Right
6 SR 120 - EB	Airport Way	PM	2	65.0	3,849	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,087	Right
7 SR 120 - WB	Airport Way	AM	2	65.0	3,670	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,897	Right
8 SR 120 - WB	McKinley Ave (loop ramp)	AM	2	65.0	3,420	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,632	Right
9 SR 120 - WB	McKinley Ave	AM	2	65.0	4,692	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,982	Right
10 SR 120 - WB	Airport Way	PM	2	65.0	3,940	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,184	Right
11 SR 120 - WB	McKinley Ave (loop ramp)	PM	2	65.0	3,890	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,131	Right
12 SR 120 - WB	McKinley Ave	PM	2	65.0	4,665	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,954	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Input Data			On-Ramp Volume Adjustment												
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)
1 SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	180	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	187
2 SR 120 - EB	McKinley Ave	1	45.0	706	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	735
3 SR 120 - EB	Airport Way	1	45.0	560	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	583
4 SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	790	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	823
5 SR 120 - EB	McKinley Ave	1	45.0	219	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	228
6 SR 120 - EB	Airport Way	1	45.0	1,274	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,327
7 SR 120 - WB	Airport Way	1	45.0	960	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,000
8 SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	1,272	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,324
9 SR 120 - WB	McKinley Ave	1	45.0	20	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	21
10 SR 120 - WB	Airport Way	1	45.0	720	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	750
11 SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	945	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	984
12 SR 120 - WB	McKinley Ave	1	45.0	1,030	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,072

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	On-ramp
1	SR 120 - EB	McKinley Ave (loop ramp)
2	SR 120 - EB	McKinley Ave
3	SR 120 - EB	Airport Way
4	SR 120 - EB	McKinley Ave (loop ramp)
5	SR 120 - EB	McKinley Ave
6	SR 120 - EB	Airport Way
7	SR 120 - WB	Airport Way
8	SR 120 - WB	McKinley Ave (loop ramp)
9	SR 120 - WB	McKinley Ave
10	SR 120 - WB	Airport Way
11	SR 120 - WB	McKinley Ave (loop ramp)
12	SR 120 - WB	McKinley Ave

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation					
Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	v_{12} (pcph)
		25-2	25-3	1	2	3		
1 SR 120 - EB	McKinley Ave (loop ramp)			0.582			1.000	2,676
2 SR 120 - EB	McKinley Ave			0.585			1.000	2,867
3 SR 120 - EB	Airport Way			0.585			1.000	3,192
4 SR 120 - EB	McKinley Ave (loop ramp)			0.582			1.000	4,173
5 SR 120 - EB	McKinley Ave			0.585			1.000	5,012
6 SR 120 - EB	Airport Way			0.585			1.000	4,087
7 SR 120 - WB	Airport Way			0.585			1.000	3,897
8 SR 120 - WB	McKinley Ave (loop ramp)			0.582			1.000	3,632
9 SR 120 - WB	McKinley Ave			0.585			1.000	4,982
10 SR 120 - WB	Airport Way			0.585			1.000	4,184
11 SR 120 - WB	McKinley Ave (loop ramp)			0.582			1.000	4,131
12 SR 120 - WB	McKinley Ave			0.585			1.000	4,954

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction			Capacity Checks			Capacity Checks			Capacity Checks			Capacity Checks			Capacity Checks			Capacity Checks		
		On-ramp	V _{FI} (pcph)	Max V _{FI} (pcph)	LOS F?	V _{FO} (pcph)	Max V _{FO} (pcph)	LOS F?	V ₃ , V _{av34} (pcphpl)	V ₃ , V _{av34} > 2,700?	V ₃ , V _{av34} > 1.5*V ₁₂ /2?	V _{12a} (pcph)	V _{R12a} (pcph)	Max V _{R12a} (pcph)	LOS F?	V _R (pcph)	Max V _R (pcph)	LOS F?		
1	SR 120 - EB	McKinley Ave (loop ramp)	2,676	4,800	No	2,863	4,800	No	0	No	No	2,676	2,863	4,600	No	187	2,100	No		
2	SR 120 - EB	McKinley Ave	2,867	4,800	No	3,602	4,800	No	0	No	No	2,867	3,602	4,600	No	735	2,100	No		
3	SR 120 - EB	Airport Way	3,192	4,800	No	3,775	4,800	No	0	No	No	3,192	3,775	4,600	No	583	2,100	No		
4	SR 120 - EB	McKinley Ave (loop ramp)	4,173	4,800	No	4,996	4,800	Yes	0	No	No	4,173	4,996	4,600	Yes	823	2,100	No		
5	SR 120 - EB	McKinley Ave	5,012	4,800	Yes	5,240	4,800	Yes	0	No	No	5,012	5,240	4,600	Yes	228	2,100	No		
6	SR 120 - EB	Airport Way	4,087	4,800	No	5,414	4,800	Yes	0	No	No	4,087	5,414	4,600	Yes	1,327	2,100	No		
7	SR 120 - WB	Airport Way	3,897	4,800	No	4,897	4,800	Yes	0	No	No	3,897	4,897	4,600	Yes	1,000	2,100	No		
8	SR 120 - WB	McKinley Ave (loop ramp)	3,632	4,800	No	4,956	4,800	Yes	0	No	No	3,632	4,956	4,600	Yes	1,324	2,100	No		
9	SR 120 - WB	McKinley Ave	4,982	4,800	Yes	5,003	4,800	Yes	0	No	No	4,982	5,003	4,600	Yes	21	2,100	No		
10	SR 120 - WB	Airport Way	4,184	4,800	No	4,933	4,800	Yes	0	No	No	4,184	4,933	4,600	Yes	750	2,100	No		
11	SR 120 - WB	McKinley Ave (loop ramp)	4,131	4,800	No	5,115	4,800	Yes	0	No	No	4,131	5,115	4,600	Yes	984	2,100	No		
12	SR 120 - WB	McKinley Ave	4,954	4,800	Yes	6,026	4,800	Yes	0	No	No	4,954	6,026	4,600	Yes	1,072	2,100	No		

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	SR 120 - EB	McKinley Ave (loop ramp)	26.8	C	0.376	56.4	0.0	56.4
2	SR 120 - EB	McKinley Ave	31.7	D	0.442	54.8	0.0	54.8
3	SR 120 - EB	Airport Way	33.1	D	0.469	54.2	0.0	54.2
4	SR 120 - EB	McKinley Ave (loop ramp)	-	F	0.884	44.7	0.0	44.7
5	SR 120 - EB	McKinley Ave	-	F	1.034	41.2	0.0	41.2
6	SR 120 - EB	Airport Way	-	F	1.174	38.0	0.0	38.0
7	SR 120 - WB	Airport Way	-	F	0.820	46.1	0.0	46.1
8	SR 120 - WB	McKinley Ave (loop ramp)	-	F	0.861	45.2	0.0	45.2
9	SR 120 - WB	McKinley Ave	-	F	0.879	44.8	0.0	44.8
10	SR 120 - WB	Airport Way	-	F	0.840	45.7	0.0	45.7
11	SR 120 - WB	McKinley Ave (loop ramp)	-	F	0.957	43.0	0.0	43.0
12	SR 120 - WB	McKinley Ave	-	F	1.913	21.0	0.0	21.0

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative
 Analyst Fehr & Peers

Agency or Company _____
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 Project Description Terra Ranch EIR

General Information

Freeway Data

Freeway Volume Adjustment

Effective

Freeway/ Direction			Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Flow Rate v _p (pcph)
2	SR 120 - EB	McKinley Ave	AM	2	65.0	3,523	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,741	3,741
2	SR 120 - EB	Airport Way	AM	2	65.0	3,406	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,617	3,617
2	SR 120 - EB	McKinley Ave	PM	2	65.0	5,568	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,912	5,912
5	SR 120 - EB	Airport Way	PM	2	65.0	4,939	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,245	5,245
8	SR 120 - WB	Airport Way	AM	2	65.0	4,617	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,903	4,903
2	SR 120 - WB	McKinley Ave	AM	2	65.0	4,630	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,916	4,916
11	SR 120 - WB	Airport Way	PM	2	65.0	4,863	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,164	5,164
2	SR 120 - WB	McKinley Ave	PM	2	65.0	4,624	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,910	4,910

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Off-Ramp Data							Off-Ramp Volume Adjustment									
Freeway/ Direction	Off-ramp	Type	Lanes	S _{FR} (mph)	V _R (vph)	Decel Lane (ft)			PHF	Terrain	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)		
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,003	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,044	
2	SR 120 - EB	Airport Way	Right	1	45.0	400	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	416	
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,638	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,706	
5	SR 120 - EB	Airport Way	Right	1	45.0	1,090	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,135	
8	SR 120 - WB	Airport Way	Right	1	45.0	947	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	986	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	1,210	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,260	
11	SR 120 - WB	Airport Way	Right	1	45.0	1,039	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,082	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	834	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	868	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	Off-ramp
2	SR 120 - EB	McKinley Ave
2	SR 120 - EB	Airport Way
2	SR 120 - EB	McKinley Ave
5	SR 120 - EB	Airport Way
8	SR 120 - WB	Airport Way
2	SR 120 - WB	McKinley Ave
11	SR 120 - WB	Airport Way
2	SR 120 - WB	McKinley Ave

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation			
	Freeway/ Direction	Off-ramp	L_{EQ}		P_{FD}	v_{12} (pcph)
			25-13	25-14		
2	SR 120 - EB	McKinley Ave			1.000	3,741
2	SR 120 - EB	Airport Way			1.000	3,617
2	SR 120 - EB	McKinley Ave			1.000	5,912
5	SR 120 - EB	Airport Way			1.000	5,245
8	SR 120 - WB	Airport Way			1.000	4,903
2	SR 120 - WB	McKinley Ave			1.000	4,916
11	SR 120 - WB	Airport Way			1.000	5,164
2	SR 120 - WB	McKinley Ave			1.000	4,910

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction			V _{Fi} (pcph)	Max V _{Fi} (pcph)	LOS F?	V ₃ , V _{av34} (pcphpl)	V ₃ , V _{av34} > 2,700?	V ₃ , V _{av34} > 1.5*V ₁₂ /2?	V _{12a} (pcph)	Max V ₁₂ (pcph)	LOS F?	V _{FO} (pcph)	Max V _{FO} (pcph)	LOS F?	V _R (pcph)	Max V _R (pcph)	LOS F?
2	SR 120 - EB	McKinley Ave	3,741	4,800	No	0	No	No	3,741	4,400	No	2,697	4,800	No	1,044	2,100	No
2	SR 120 - EB	Airport Way	3,617	4,800	No	0	No	No	3,617	4,400	No	3,200	4,800	No	416	2,100	No
2	SR 120 - EB	McKinley Ave	5,912	4,800	Yes	0	No	No	5,912	4,400	Yes	4,207	4,800	No	1,706	2,100	No
5	SR 120 - EB	Airport Way	5,245	4,800	Yes	0	No	No	5,245	4,400	Yes	4,110	4,800	No	1,135	2,100	No
8	SR 120 - WB	Airport Way	4,903	4,800	Yes	0	No	No	4,903	4,400	Yes	3,917	4,800	No	986	2,100	No
2	SR 120 - WB	McKinley Ave	4,916	4,800	Yes	0	No	No	4,916	4,400	Yes	3,656	4,800	No	1,260	2,100	No
11	SR 120 - WB	Airport Way	5,164	4,800	Yes	0	No	No	5,164	4,400	Yes	4,082	4,800	No	1,082	2,100	No
2	SR 120 - WB	McKinley Ave	4,910	4,800	Yes	0	No	No	4,910	4,400	Yes	4,042	4,800	No	868	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)	
2 SR 120 - EB	McKinley Ave	35.1	E	0.392	56.0	0.0	56.0	
2 SR 120 - EB	Airport Way	34.0	D	0.335	57.3	0.0	57.3	
2 SR 120 - EB	McKinley Ave	-	F	0.451	54.6	0.0	54.6	
5 SR 120 - EB	Airport Way	-	F	0.400	55.8	0.0	55.8	
8 SR 120 - WB	Airport Way	-	F	0.387	56.1	0.0	56.1	
2 SR 120 - WB	McKinley Ave	-	F	0.411	55.5	0.0	55.5	
11 SR 120 - WB	Airport Way	-	F	0.395	55.9	0.0	55.9	
2 SR 120 - WB	McKinley Ave	-	F	0.376	56.3	0.0	56.3	

Appendix C-5: Freeway Operations

Technical Calculations

Cumulative Plus Project Conditions

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description _____

General Information

Flow Rate Calculation

Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcphpl)
1	I-5 Yosemite Avenue	AM	4,020	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,134
2	Yosemite Avenue to McKinley Ave	AM	3,540	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,879
3	McKinley Ave to Airport Way	AM	3,440	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,826
4	SR 120 - EB Airport Way to Union Road	AM	3,610	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,917
5	I-5 Yosemite Avenue	PM	5,490	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,915
6	Yosemite Avenue to McKinley Ave	PM	5,630	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,989
7	McKinley Ave to Airport Way	PM	4,960	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,633
8	SR 120 - EB Airport Way to Union Road	PM	5,150	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,734
9	Union Road to Airport Way	AM	4,640	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,464
10	Airport Way to McKinley Ave	AM	4,650	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,469
11	McKinley Ave to Yosemite Ave	AM	4,780	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,538
12	SR 120 - WB Yosemite Avenue to I-5	AM	4,550	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,416
13	Union Road to Airport Way	PM	5,000	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,655
14	Airport Way to McKinley Ave	PM	4,670	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,479
15	McKinley Ave to Yosemite Ave	PM	5,810	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,085
16	SR 120 - WB Yosemite Avenue to I-5	PM	6,350	0.97	2	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,371

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information		Speed Calculation								Results					
Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f _{LW}	R. Shoulder Width (ft)	f _{LC}	f _N	IC Density (per mi)	f _{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	54.3	39.3	E
2	Yosemite Avenue to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.5	32.7	D
3	McKinley Ave to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.8	31.6	D
4	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	57.3	33.5	D
5	I-5 Yosemite Avenue	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
6	Yosemite Avenue to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
7	McKinley Ave to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
8	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
9	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
10	Airport Way to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
11	McKinley Ave to Yosemite Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
12	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
13	Union Road to Airport Way	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
14	Airport Way to McKinley Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
15	McKinley Ave to Yosemite Ave	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F
16	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	4.5	1	2.5	58.0		58.0	-	-	F

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information				Freeway Data				Freeway Volume Adjustment										On-Ramp	
Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Type
1 SR 120 - EB	McKinley Ave (loop ramp)	AM	2	65.0	2,520	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,676	Right
2 SR 120 - EB	McKinley Ave	AM	2	65.0	2,700	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,867	Right
3 SR 120 - EB	Airport Way	AM	2	65.0	3,040	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,228	Right
4 SR 120 - EB	McKinley Ave (loop ramp)	PM	2	65.0	3,930	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,173	Right
5 SR 120 - EB	McKinley Ave	PM	2	65.0	4,720	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,012	Right
6 SR 120 - EB	Airport Way	PM	2	65.0	3,870	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,109	Right
7 SR 120 - WB	Airport Way	AM	2	65.0	3,690	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,918	Right
8 SR 120 - WB	McKinley Ave (loop ramp)	AM	2	65.0	3,430	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,642	Right
9 SR 120 - WB	McKinley Ave	AM	2	65.0	4,760	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,054	Right
10 SR 120 - WB	Airport Way	PM	2	65.0	3,950	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,194	Right
11 SR 120 - WB	McKinley Ave (loop ramp)	PM	2	65.0	3,800	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,035	Right
12 SR 120 - WB	McKinley Ave	PM	2	65.0	4,780	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,076	Right

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Input Data			On-Ramp Volume Adjustment												
Freeway/ Direction	On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)
1 SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	180	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	187
2 SR 120 - EB	McKinley Ave	1	45.0	740	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	771
3 SR 120 - EB	Airport Way	1	45.0	570	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	594
4 SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	790	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	823
5 SR 120 - EB	McKinley Ave	1	45.0	240	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	250
6 SR 120 - EB	Airport Way	1	45.0	1,280	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,333
7 SR 120 - WB	Airport Way	1	45.0	960	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,000
8 SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	1,330	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,385
9 SR 120 - WB	McKinley Ave	1	45.0	20	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	21
10 SR 120 - WB	Airport Way	1	45.0	720	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	750
11 SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	980	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,020
12 SR 120 - WB	McKinley Ave	1	45.0	1,030	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,072

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	On-ramp
1	SR 120 - EB	McKinley Ave (loop ramp)
2	SR 120 - EB	McKinley Ave
3	SR 120 - EB	Airport Way
4	SR 120 - EB	McKinley Ave (loop ramp)
5	SR 120 - EB	McKinley Ave
6	SR 120 - EB	Airport Way
7	SR 120 - WB	Airport Way
8	SR 120 - WB	McKinley Ave (loop ramp)
9	SR 120 - WB	McKinley Ave
10	SR 120 - WB	Airport Way
11	SR 120 - WB	McKinley Ave (loop ramp)
12	SR 120 - WB	McKinley Ave

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation					
Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	v_{12} (pcph)
		25-2	25-3	1	2	3		
1 SR 120 - EB	McKinley Ave (loop ramp)			0.582			1.000	2,676
2 SR 120 - EB	McKinley Ave			0.585			1.000	2,867
3 SR 120 - EB	Airport Way			0.585			1.000	3,228
4 SR 120 - EB	McKinley Ave (loop ramp)			0.582			1.000	4,173
5 SR 120 - EB	McKinley Ave			0.585			1.000	5,012
6 SR 120 - EB	Airport Way			0.585			1.000	4,109
7 SR 120 - WB	Airport Way			0.585			1.000	3,918
8 SR 120 - WB	McKinley Ave (loop ramp)			0.582			1.000	3,642
9 SR 120 - WB	McKinley Ave			0.585			1.000	5,054
10 SR 120 - WB	Airport Way			0.585			1.000	4,194
11 SR 120 - WB	McKinley Ave (loop ramp)			0.582			1.000	4,035
12 SR 120 - WB	McKinley Ave			0.585			1.000	5,076

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction			Capacity Checks			Capacity Checks			Capacity Checks			Capacity Checks			Capacity Checks			
		On-ramp	V _{FI} (pcph)	Max V _{FI} (pcph)	LOS F?	V _{FO} (pcph)	Max V _{FO} (pcph)	LOS F?	V ₃ , V _{av34} (pcphpl)	V ₃ , V _{av34} > 2,700?	V ₃ , V _{av34} > 1.5*v ₁₂ /2?	V _{12a} (pcph)	V _{R12a} (pcph)	Max V _{R12a} (pcph)	LOS F?	V _R (pcph)	Max V _R (pcph)	LOS F?
1	SR 120 - EB	McKinley Ave (loop ramp)	2,676	4,800	No	2,863	4,800	No	0	No	No	2,676	2,863	4,600	No	187	2,100	No
2	SR 120 - EB	McKinley Ave	2,867	4,800	No	3,638	4,800	No	0	No	No	2,867	3,638	4,600	No	771	2,100	No
3	SR 120 - EB	Airport Way	3,228	4,800	No	3,822	4,800	No	0	No	No	3,228	3,822	4,600	No	594	2,100	No
4	SR 120 - EB	McKinley Ave (loop ramp)	4,173	4,800	No	4,996	4,800	Yes	0	No	No	4,173	4,996	4,600	Yes	823	2,100	No
5	SR 120 - EB	McKinley Ave	5,012	4,800	Yes	5,262	4,800	Yes	0	No	No	5,012	5,262	4,600	Yes	250	2,100	No
6	SR 120 - EB	Airport Way	4,109	4,800	No	5,442	4,800	Yes	0	No	No	4,109	5,442	4,600	Yes	1,333	2,100	No
7	SR 120 - WB	Airport Way	3,918	4,800	No	4,918	4,800	Yes	0	No	No	3,918	4,918	4,600	Yes	1,000	2,100	No
8	SR 120 - WB	McKinley Ave (loop ramp)	3,642	4,800	No	5,027	4,800	Yes	0	No	No	3,642	5,027	4,600	Yes	1,385	2,100	No
9	SR 120 - WB	McKinley Ave	5,054	4,800	Yes	5,075	4,800	Yes	0	No	No	5,054	5,075	4,600	Yes	21	2,100	No
10	SR 120 - WB	Airport Way	4,194	4,800	No	4,944	4,800	Yes	0	No	No	4,194	4,944	4,600	Yes	750	2,100	No
11	SR 120 - WB	McKinley Ave (loop ramp)	4,035	4,800	No	5,055	4,800	Yes	0	No	No	4,035	5,055	4,600	Yes	1,020	2,100	No
12	SR 120 - WB	McKinley Ave	5,076	4,800	Yes	6,148	4,800	Yes	0	No	No	5,076	6,148	4,600	Yes	1,072	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	SR 120 - EB	McKinley Ave (loop ramp)	26.8	C	0.376	56.4	0.0	56.4
2	SR 120 - EB	McKinley Ave	31.9	D	0.447	54.7	0.0	54.7
3	SR 120 - EB	Airport Way	33.4	D	0.477	54.0	0.0	54.0
4	SR 120 - EB	McKinley Ave (loop ramp)	-	F	0.884	44.7	0.0	44.7
5	SR 120 - EB	McKinley Ave	-	F	1.051	40.8	0.0	40.8
6	SR 120 - EB	Airport Way	-	F	1.199	37.4	0.0	37.4
7	SR 120 - WB	Airport Way	-	F	0.832	45.9	0.0	45.9
8	SR 120 - WB	McKinley Ave (loop ramp)	-	F	0.902	44.3	0.0	44.3
9	SR 120 - WB	McKinley Ave	-	F	0.923	43.8	0.0	43.8
10	SR 120 - WB	Airport Way	-	F	0.846	45.5	0.0	45.5
11	SR 120 - WB	McKinley Ave (loop ramp)	-	F	0.919	43.9	0.0	43.9
12	SR 120 - WB	McKinley Ave	-	F	2.123	16.2	0.0	16.2

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information

Freeway Data

Freeway Volume Adjustment

Effective

Freeway/ Direction			Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane	Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Flow Rate v _p (pcph)
2	SR 120 - EB	McKinley Ave	AM	2	65.0	3,540	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,759	3,759
2	SR 120 - EB	Airport Way	AM	2	65.0	3,440	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,653	3,653
2	SR 120 - EB	McKinley Ave	PM	2	65.0	5,630	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,978	5,978
5	SR 120 - EB	Airport Way	PM	2	65.0	4,960	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,267	5,267
8	SR 120 - WB	Airport Way	AM	2	65.0	4,640	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,927	4,927
2	SR 120 - WB	McKinley Ave	AM	2	65.0	4,650	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,938	4,938
11	SR 120 - WB	Airport Way	PM	2	65.0	5,000	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,309	5,309
2	SR 120 - WB	McKinley Ave	PM	2	65.0	4,670	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,959	4,959

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Off-Ramp Data							Off-Ramp Volume Adjustment									
Freeway/ Direction	Off-ramp	Type	Lanes	S _{FR} (mph)	V _R (vph)	Decel Lane (ft)			PHF	Terrain	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)		
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,020	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,062	
2	SR 120 - EB	Airport Way	Right	1	45.0	400	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	416	
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,700	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,770	
5	SR 120 - EB	Airport Way	Right	1	45.0	1,090	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,135	
8	SR 120 - WB	Airport Way	Right	1	45.0	950	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	989	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	1,220	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,270	
11	SR 120 - WB	Airport Way	Right	1	45.0	1,050	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,093	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	870	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	906	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	Off-ramp
2	SR 120 - EB	McKinley Ave
2	SR 120 - EB	Airport Way
2	SR 120 - EB	McKinley Ave
5	SR 120 - EB	Airport Way
8	SR 120 - WB	Airport Way
2	SR 120 - WB	McKinley Ave
11	SR 120 - WB	Airport Way
2	SR 120 - WB	McKinley Ave

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation			
	Freeway/ Direction	Off-ramp	L_{EQ}		P_{FD}	v_{12} (pcph)
			25-13	25-14		
2	SR 120 - EB	McKinley Ave			1.000	3,759
2	SR 120 - EB	Airport Way			1.000	3,653
2	SR 120 - EB	McKinley Ave			1.000	5,978
5	SR 120 - EB	Airport Way			1.000	5,267
8	SR 120 - WB	Airport Way			1.000	4,927
2	SR 120 - WB	McKinley Ave			1.000	4,938
11	SR 120 - WB	Airport Way			1.000	5,309
2	SR 120 - WB	McKinley Ave			1.000	4,959

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction			V _{Fi} (pcph)	Max V _{Fi} (pcph)	LOS F?	V ₃ , V _{av34} (pcphpl)	V ₃ , V _{av34} > 2,700?	V ₃ , V _{av34} > 1.5*v ₁₂ /2?	V _{12a} (pcph)	Max V ₁₂ (pcph)	LOS F?	V _{FO} (pcph)	Max V _{FO} (pcph)	LOS F?	V _R (pcph)	Max V _R (pcph)	LOS F?
2	SR 120 - EB	McKinley Ave	3,759	4,800	No	0	No	No	3,759	4,400	No	2,697	4,800	No	1,062	2,100	No
2	SR 120 - EB	Airport Way	3,653	4,800	No	0	No	No	3,653	4,400	No	3,236	4,800	No	416	2,100	No
2	SR 120 - EB	McKinley Ave	5,978	4,800	Yes	0	No	No	5,978	4,400	Yes	4,208	4,800	No	1,770	2,100	No
5	SR 120 - EB	Airport Way	5,267	4,800	Yes	0	No	No	5,267	4,400	Yes	4,132	4,800	No	1,135	2,100	No
8	SR 120 - WB	Airport Way	4,927	4,800	Yes	0	No	No	4,927	4,400	Yes	3,938	4,800	No	989	2,100	No
2	SR 120 - WB	McKinley Ave	4,938	4,800	Yes	0	No	No	4,938	4,400	Yes	3,667	4,800	No	1,270	2,100	No
11	SR 120 - WB	Airport Way	5,309	4,800	Yes	0	No	No	5,309	4,400	Yes	4,216	4,800	No	1,093	2,100	No
2	SR 120 - WB	McKinley Ave	4,959	4,800	Yes	0	No	No	4,959	4,400	Yes	4,053	4,800	No	906	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)	
2 SR 120 - EB	McKinley Ave	35.2	E	0.394	55.9	0.0	55.9	
2 SR 120 - EB	Airport Way	34.3	D	0.335	57.3	0.0	57.3	
2 SR 120 - EB	McKinley Ave	-	F	0.457	54.5	0.0	54.5	
5 SR 120 - EB	Airport Way	-	F	0.400	55.8	0.0	55.8	
8 SR 120 - WB	Airport Way	-	F	0.387	56.1	0.0	56.1	
2 SR 120 - WB	McKinley Ave	-	F	0.412	55.5	0.0	55.5	
11 SR 120 - WB	Airport Way	-	F	0.396	55.9	0.0	55.9	
2 SR 120 - WB	McKinley Ave	-	F	0.380	56.3	0.0	56.3	

Appendix D

Technical Calculations

Existing Plus Pending Projects Conditions

Appendix D-1: Intersection Operations

Technical Calculations

Existing Plus Pending Projects – 50% Buildout

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Pending Projects - 50% Buildout **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	108	115	106	10	37.7	D	--
	T	134	144	107	4	11.3	B	--
	R	30	29	97	5	6.4	A	--
	Subtotal	272	287	106	--	21.4	C	--
SB	L	4	3	75	1	54.8	D	--
	T	123	128	104	8	44.2	D	--
	R	29	35	121	6	21.2	C	--
	Subtotal	156	165	106	--	39.6	D	--
EB	L	19	22	116	4	40.9	D	--
	T	7	8	133	3	33.5	C	--
	R	90	91	101	10	13.4	B	--
	Subtotal	116	121	104	--	19.7	B	--
WB	L	22	24	109	2	70.9	E	--
	T	6	7	117	2	45.1	D	--
	R	2	2	100	1	7.4	A	--
	Subtotal	30	32	107	--	61.7	E	--
Total		573	606	106	--	28.2	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	38	39	103	6	77.0	E	--
	T	191	202	106	8	17.4	B	--
	Subtotal	229	241	106	--	27.0	C	--
SB	T	172	182	106	11	21.7	C	--
	R	63	66	105	8	4.9	A	--
	Subtotal	235	248	106	--	17.3	B	--
WB	L	66	70	106	11	57.4	E	--
	R	81	86	106	12	36.0	D	--
	Subtotal	148	157	106	--	45.6	D	--
Total		611	645	106	--	27.8	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Pending Projects - 50% Buildout **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	106	122	115	9	79.6	E	--
	R	46	51	111	9	8.4	A	--
	Subtotal	152	173	114	--	58.4	E	--
SB	L	76	75	97	6	56.8	E	--
	T	162	168	104	14	32.2	C	--
	Subtotal	238	243	102	--	39.7	D	--
EB	L	123	128	105	9	87.9	F	--
	T	2	2	100	1	99.4	F	--
	R	85	89	105	9	36.9	D	--
	Subtotal	210	219	104	--	67.2	E	--
Total		600	635	106	--	54.3	D	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	1	1	100	1	35.2	D	--
	T	107	122	114	13	18.2	B	--
	R	2	2	100	1	7.0	A	--
	Subtotal	109	125	115	--	18.3	B	--
SB	L	22	24	109	5	30.5	C	--
	T	177	186	105	14	11.4	B	--
	R	49	51	102	7	4.3	A	--
	Subtotal	247	260	105	--	11.8	B	--
EB	L	29	38	131	8	33.6	C	--
	T	0	1	--	1	41.9	D	--
	R	2	3	150	1	12.5	B	--
	Subtotal	32	43	134	--	32.2	C	--
WB	L	1	2	200	1	26.9	C	--
	T	1	2	--	1	28.8	C	--
	R	16	19	119	5	4.8	A	--
	Subtotal	17	23	129	--	8.2	A	--
Total		405	450	111	--	15.3	B	--

HCM Signalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

9/2/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1817		1770	1800		1770	1784		1770	1810	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1817		1770	1800		1770	1784		1770	1810	1583
Volume (vph)	249	137	27	24	181	52	27	116	15	95	190	438
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95	0.95	0.90	0.90	0.90
Adj. Flow (vph)	286	157	31	28	208	60	28	122	16	106	211	487
RTOR Reduction (vph)	0	8	0	0	12	0	0	5	0	0	0	205
Lane Group Flow (vph)	286	180	0	28	256	0	28	133	0	106	211	282
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	17.1	27.4		2.4	12.7		2.0	13.8		5.0	16.8	33.9
Effective Green, g (s)	17.1	27.4		2.4	12.7		2.0	13.8		5.0	16.8	33.9
Actuated g/C Ratio	0.26	0.42		0.04	0.20		0.03	0.21		0.08	0.26	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	469	771		66	354		55	381		137	471	929
v/s Ratio Prot	c0.16	0.10		0.02	c0.14		0.02	0.07		c0.06	c0.12	0.08
v/s Ratio Perm												0.10
v/c Ratio	0.61	0.23		0.42	0.72		0.51	0.35		0.77	0.45	0.30
Uniform Delay, d1	20.8	11.9		30.4	24.3		30.8	21.6		29.2	20.0	8.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.3	0.2		4.3	7.1		7.2	0.6		23.3	0.7	0.2
Delay (s)	23.1	12.0		34.8	31.4		38.0	22.1		52.6	20.7	8.9
Level of Service	C	B		C	C		D	C		D	C	A
Approach Delay (s)		18.7			31.7			24.8			17.7	
Approach LOS		B			C			C			B	
Intersection Summary												
HCM Average Control Delay			21.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			64.6			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			53.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix D-2: Intersection Operations

Technical Calculations

Existing Plus Pending Projects – 100% Buildout

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Pending Projects - 100% Buildout **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	115	105	91	7	60.4	E	--
	T	142	139	98	8	26.5	C	--
	R	32	30	94	6	18.6	B	--
	Subtotal	289	274	95	--	38.6	D	--
SB	L	4	3	75	1	280.6	F	--
	T	137	119	87	10	223.6	F	--
	R	29	24	83	6	168.5	F	--
	Subtotal	170	145	85	--	215.9	F	--
EB	L	19	18	95	3	44.6	D	--
	T	7	7	117	3	39.9	D	--
	R	102	113	111	12	58.0	E	--
	Subtotal	127	138	109	--	55.3	E	--
WB	L	26	18	69	7	289.5	F	--
	T	6	5	67	3	93.1	F	--
	R	2	2	100	2	44.4	D	--
	Subtotal	34	25	74	--	229.3	F	--
Total		620	582	94	--	94.9	F	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	58	53	91	5	74.6	E	--
	T	208	213	102	11	30.2	C	--
	Subtotal	266	266	100	--	39.1	D	--
SB	T	202	197	98	9	34.2	C	--
	R	63	60	95	7	10.3	B	--
	Subtotal	265	257	97	--	28.7	C	--
WB	L	101	79	77	6	298.4	F	--
	R	81	64	79	11	204.7	F	--
	Subtotal	182	143	79	--	256.3	F	--
Total		712	666	94	--	81.6	F	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Existing Plus Pending Projects - 100% Buildout **PHF:** 1
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	143	163	113	9	68.3	E	--
	R	66	66	100	11	9.3	A	--
	Subtotal	209	229	110	--	51.2	D	--
SB	L	76	62	82	4	115.6	F	--
	T	226	194	86	12	64.5	E	--
	Subtotal	302	255	84	--	76.8	E	--
EB	L	123	119	98	4	130.7	F	--
	T	2	2	100	2	126.2	F	--
	R	128	119	93	12	133.0	F	--
	Subtotal	252	241	96	--	131.8	F	--
Total		763	725	95	--	87.0	F	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	1	2	200	1	54.9	D	--
	T	164	175	107	12	24.7	C	--
	R	2	2	100	0	11.4	B	--
	Subtotal	166	179	108	--	24.8	C	--
SB	L	22	18	82	4	51.5	D	--
	T	284	251	88	11	17.6	B	--
	R	49	41	84	6	7.3	A	--
	Subtotal	354	310	88	--	18.2	B	--
EB	L	29	34	117	5	65.8	E	--
	T	0	1	--	0	37.4	D	--
	R	2	3	150	1	20.7	C	--
	Subtotal	32	39	119	--	61.1	E	--
WB	L	1	2	200	1	19.9	B	--
	T	1	1	--	1	38.1	D	--
	R	16	22	138	5	7.6	A	--
	Subtotal	17	25	147	--	10.1	B	--
Total		569	552	97	--	23.0	C	--

HCM Signalized Intersection Capacity Analysis

7: Woodward Ave & Airport Way

9/2/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1820		1770	1825		1770	1777		1770	1810	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1820		1770	1825		1770	1777		1770	1810	1583
Volume (vph)	440	223	40	45	331	52	47	152	27	95	252	803
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95	0.95	0.90	0.90	0.90
Adj. Flow (vph)	506	256	46	52	380	60	49	160	28	106	280	892
RTOR Reduction (vph)	0	6	0	0	6	0	0	7	0	0	0	105
Lane Group Flow (vph)	506	296	0	52	434	0	49	181	0	106	280	787
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	27.4	45.0		5.3	22.9		4.0	15.6		7.0	18.6	46.0
Effective Green, g (s)	27.4	45.0		5.3	22.9		4.0	15.6		7.0	18.6	46.0
Actuated g/C Ratio	0.31	0.51		0.06	0.26		0.04	0.18		0.08	0.21	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	546	921		106	470		80	312		139	379	890
v/s Ratio Prot	c0.29	0.16		0.03	c0.24		0.03	0.10		c0.06	0.15	c0.27
v/s Ratio Perm												0.22
v/c Ratio	0.93	0.32		0.49	0.92		0.61	0.58		0.76	0.74	0.88
Uniform Delay, d1	29.8	12.9		40.5	32.1		41.7	33.6		40.1	32.9	19.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	21.9	0.2		3.5	23.8		13.1	2.6		21.6	7.4	10.4
Delay (s)	51.6	13.1		44.0	56.0		54.8	36.2		61.7	40.2	29.5
Level of Service	D	B		D	E		D	D		E	D	C
Approach Delay (s)		37.3			54.7			40.1			34.5	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay			39.3			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			88.9			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			83.6%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix E

Technical Calculations

Cumulative Plus Project with Mitigations

Appendix E-1: Intersection Operations

Technical Calculations

Cumulative Plus Project with Mitigations

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project w/ Mitigations **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	155	158	102	15	36.8	D	--
	T	170	174	102	13	15.8	B	--
	R	93	91	98	8	5.7	A	--
	Subtotal	418	422	101	--	21.5	C	--
SB	L	31	28	90	6	44.0	D	--
	T	82	84	102	10	25.6	C	--
	R	21	20	95	4	13.2	B	--
	Subtotal	134	132	99	--	27.6	C	--
EB	L	8	7	88	3	40.4	D	--
	T	5	5	100	2	36.5	D	--
	R	67	67	100	6	8.0	A	--
	Subtotal	80	79	99	--	12.8	B	--
WB	L	67	59	88	7	37.8	D	--
	T	8	6	75	2	32.0	C	--
	R	15	17	113	4	11.6	B	--
	Subtotal	90	82	91	--	32.1	C	--
Total		722	715	99	--	22.8	C	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	204	204	100	15	13.8	B	--
	R	139	134	96	18	5.7	A	--
	Subtotal	343	339	99	--	10.6	B	--
SB	T	108	105	97	8	8.6	A	--
	R	108	110	102	8	2.8	A	--
	Subtotal	216	215	100	--	5.6	A	--
WB	L	31	31	100	5	20.2	C	--
	R	214	214	100	14	16.6	B	--
	Subtotal	245	245	100	--	17.0	B	--
Total		804	799	99	--	11.2	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project w/ Mitigations **PHF:** 0.97
TOD: AM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	263	264	100	16	10.8	B	--
	R	98	99	101	14	7.3	A	--
	Subtotal	361	363	101	--	9.8	A	--
SB	T	90	87	97	9	6.0	A	--
	R	49	47	96	6	2.5	A	--
	Subtotal	139	134	96	--	4.7	A	--
EB	L	80	82	103	11	24.1	C	--
	R	23	25	109	5	4.6	A	--
	Subtotal	103	107	104	--	19.5	B	--
Total		603	604	100	--	10.4	B	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	3	2	67	1	55.5	E	--
	T	240	235	98	17	30.6	C	--
	R	5	6	120	2	24.4	C	--
	Subtotal	247	242	98	--	30.6	C	--
SB	L	34	33	97	3	38.5	D	--
	T	52	53	100	6	10.5	B	--
	R	28	26	93	6	3.1	A	--
	Subtotal	113	111	98	--	17.0	B	--
EB	L	57	57	100	8	37.7	D	--
	T	3	3	100	1	27.2	C	--
	R	3	3	100	1	4.2	A	--
	Subtotal	62	62	100	--	35.7	D	--
WB	L	5	5	100	2	43.8	D	--
	T	8	8	100	3	30.9	C	--
	R	64	64	100	4	18.3	B	--
	Subtotal	77	77	100	--	21.1	C	--
Total		500	492	98	--	26.7	C	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project w/ Mitigations **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 3: Daniels St & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	196	187	95	13	68.7	E	--
	T	168	174	104	13	32.8	C	--
	R	77	78	101	14	9.5	A	--
	Subtotal	441	439	100	--	43.9	D	--
SB	L	31	34	110	6	66.0	E	--
	T	229	230	100	15	56.9	E	--
	R	31	31	100	4	22.7	C	--
	Subtotal	291	295	101	--	54.3	D	--
EB	L	26	26	100	6	55.7	E	--
	T	8	8	100	3	58.1	E	--
	R	227	215	95	18	25.1	C	--
	Subtotal	260	249	96	--	29.4	C	--
WB	L	149	150	101	9	87.1	F	--
	T	10	10	100	2	78.2	E	--
	R	57	57	100	8	57.1	E	--
	Subtotal	216	217	100	--	78.8	E	--
Total		1209	1200	99	--	49.8	D	--

Intersection: 4: SR 120 WB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	268	278	104	14	18.1	B	--
	R	54	54	100	7	6.2	A	--
	Subtotal	322	332	103	--	16.1	B	--
SB	T	474	467	99	19	17.1	B	--
	R	131	129	98	13	4.6	A	--
	Subtotal	606	596	98	--	14.4	B	--
WB	L	98	101	102	10	23.4	C	--
	R	173	171	99	12	19.1	B	--
	Subtotal	271	271	100	--	20.7	C	--
Total		1198	1199	100	--	16.3	B	--

SIMTRAFFIC LEVEL OF SERVICE REPORT Including Upstream Delays

Project: Terra Ranch EIR **HCM:** 2000
Scenario: Cumulative Plus Project w/ Mitigations **PHF:** 0.97
TOD: PM Peak Hr **Analysis Period:** 15 Minutes **# of Runs:** 10

Intersection: 5: SR 120 EB Ramps & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	T	165	169	102	12	13.8	B	--
	R	72	70	97	8	3.8	A	--
	Subtotal	237	239	101	--	10.9	B	--
SB	T	314	311	99	21	16.8	B	--
	R	258	247	96	18	10.4	B	--
	Subtotal	572	559	98	--	14.0	B	--
EB	L	157	165	105	12	25.4	C	--
	R	124	124	100	9	15.5	B	--
	Subtotal	281	290	103	--	21.2	C	--
Total		1090	1087	100	--	15.2	B	--

Intersection: 6: Atherton Drive & Airport Way **Type:** Signalized

Approach	Movement	Demand Volume	Volume Served			Delay/Veh (sec)		
			Avg	%	Std Dev	Avg	LOS	Std Dev
NB	L	3	2	67	1	48.1	D	--
	T	101	100	99	10	27.8	C	--
	R	5	6	120	2	21.0	C	--
	Subtotal	108	108	100	--	27.9	C	--
SB	L	88	88	100	14	34.0	C	--
	T	278	277	100	18	19.8	B	--
	R	72	74	103	10	8.4	A	--
	Subtotal	438	438	100	--	20.7	C	--
EB	L	70	69	99	10	36.6	D	--
	T	5	6	120	2	30.2	C	--
	R	3	3	100	2	9.5	A	--
	Subtotal	77	78	101	--	35.1	D	--
WB	L	21	20	95	6	31.7	C	--
	T	28	27	93	6	30.4	C	--
	R	67	71	106	7	10.2	B	--
	Subtotal	116	118	102	--	18.4	B	--
Total		740	742	100	--	22.9	C	--

Appendix E-2: Freeway Operations

Technical Calculations

Cumulative Plus Project with Mitigations

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description _____

General Information

Flow Rate Calculation

Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane? HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcphpl)
1	I-5 Yosemite Avenue	AM	4,020	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,423
2	Yosemite Avenue to McKinley Ave	AM	3,540	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,253
3	McKinley Ave to Airport Way	AM	3,440	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,218
4	SR 120 - EB Airport Way to Union Road	AM	3,610	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,278
5	I-5 Yosemite Avenue	PM	5,490	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,943
6	Yosemite Avenue to McKinley Ave	PM	5,630	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,993
7	McKinley Ave to Airport Way	PM	4,960	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,756
8	SR 120 - EB Airport Way to Union Road	PM	5,150	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,823
9	Union Road to Airport Way	AM	4,640	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,642
10	Airport Way to McKinley Ave	AM	4,650	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,646
11	McKinley Ave to Yosemite Ave	AM	4,780	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,692
12	SR 120 - WB Yosemite Avenue to I-5	AM	4,550	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,610
13	Union Road to Airport Way	PM	5,000	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,770
14	Airport Way to McKinley Ave	PM	4,670	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	1,653
15	McKinley Ave to Yosemite Ave	PM	5,810	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,056
16	SR 120 - WB Yosemite Avenue to I-5	PM	6,350	0.97	3	No	0	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,248

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information		Speed Calculation								Results					
Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f _{LW}	R. Shoulder Width (ft)	f _{LC}	f _N	IC Density (per mi)	f _{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	I-5 Yosemite Avenue	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	23.9	C
2	Yosemite Avenue to McKinley Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	21.1	C
3	McKinley Ave to Airport Way	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	20.5	C
4	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	21.5	C
5	I-5 Yosemite Avenue	65	12	0	6	0	3	1	2.5	59.5		59.5	58.2	33.4	D
6	Yosemite Avenue to McKinley Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	57.7	34.6	D
7	McKinley Ave to Airport Way	65	12	0	6	0	3	1	2.5	59.5		59.5	59.4	29.6	D
8	SR 120 - EB Airport Way to Union Road	65	12	0	6	0	3	1	2.5	59.5		59.5	59.1	30.8	D
9	Union Road to Airport Way	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	27.6	D
10	Airport Way to McKinley Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	27.7	D
11	McKinley Ave to Yosemite Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	28.4	D
12	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	27.1	D
13	Union Road to Airport Way	65	12	0	6	0	3	1	2.5	59.5		59.5	59.3	29.8	D
14	Airport Way to McKinley Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	59.5	27.8	D
15	McKinley Ave to Yosemite Ave	65	12	0	6	0	3	1	2.5	59.5		59.5	56.7	36.2	E
16	SR 120 - WB Yosemite Avenue to I-5	65	12	0	6	0	3	1	2.5	59.5		59.5	52.5	42.8	E

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information

Freeway Data

Freeway Volume Adjustment

On-Ramp

Freeway/ Direction			Analysis Time Period		S _{FF} (mph)	V (vph)	HOV Lane		PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %		RV %	E _T	E _R	f _{HV}	f _P	Flow Rate		Type
		On-ramp			Lanes		HOV Lane?	Volume					v _p (pcph)									
1	SR 120 - EB	McKinley Ave (loop ramp)	AM		3	65.0	2,520	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,676	Right		
2	SR 120 - EB	McKinley Ave	AM		3	65.0	2,700	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	2,867	Right		
3	SR 120 - EB	Airport Way	AM		3	65.0	3,040	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,228	Right		
4	SR 120 - EB	McKinley Ave (loop ramp)	PM		3	65.0	3,930	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,173	Right		
5	SR 120 - EB	McKinley Ave	PM		3	65.0	4,720	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,012	Right		
6	SR 120 - EB	Airport Way	PM		3	65.0	3,870	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,109	Right		
7	SR 120 - WB	Airport Way	AM		3	65.0	3,690	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,918	Right		
8	SR 120 - WB	McKinley Ave (loop ramp)	AM		3	65.0	3,430	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,642	Right		
9	SR 120 - WB	McKinley Ave	AM		3	65.0	4,760	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,054	Right		
10	SR 120 - WB	Airport Way	PM		3	65.0	3,950	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,194	Right		
11	SR 120 - WB	McKinley Ave (loop ramp)	PM		3	65.0	3,800	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,035	Right		
12	SR 120 - WB	McKinley Ave	PM		3	65.0	4,780	No	0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,076	Right		

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			ip Data						On-Ramp Volume Adjustment										
Freeway/ Direction		On-ramp	Lanes	S _{FR} (mph)	V _R (vph)	Accel Lane (ft)			Grade		Length	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)	
						L _{A1}	L _{A2}	L _{Aeff}	PHF	Terrain	%	(mi)							
1	SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	180	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	187
2	SR 120 - EB	McKinley Ave	1	45.0	740	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	771
3	SR 120 - EB	Airport Way	1	45.0	570	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	594
4	SR 120 - EB	McKinley Ave (loop ramp)	1	45.0	790	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	823
5	SR 120 - EB	McKinley Ave	1	45.0	240	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	250
6	SR 120 - EB	Airport Way	1	45.0	1,280	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,333
7	SR 120 - WB	Airport Way	1	45.0	960	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,000
8	SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	1,330	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,385
9	SR 120 - WB	McKinley Ave	1	45.0	20	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	21
10	SR 120 - WB	Airport Way	1	45.0	720	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	750
11	SR 120 - WB	McKinley Ave (loop ramp)	1	45.0	980	150	0	150	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,020
12	SR 120 - WB	McKinley Ave	1	45.0	1,030	250	0	250	0.97	Level			2.0%	0.0%	1.5	1.2	0.99	1.00	1,072

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

	Freeway/ Direction	On-ramp	
1	SR 120 - EB	McKinley Ave (loop ramp)	
2	SR 120 - EB	McKinley Ave	
3	SR 120 - EB	Airport Way	
4	SR 120 - EB	McKinley Ave (loop ramp)	
5	SR 120 - EB	McKinley Ave	
6	SR 120 - EB	Airport Way	
7	SR 120 - WB	Airport Way	
8	SR 120 - WB	McKinley Ave (loop ramp)	
9	SR 120 - WB	McKinley Ave	
10	SR 120 - WB	Airport Way	
11	SR 120 - WB	McKinley Ave (loop ramp)	
12	SR 120 - WB	McKinley Ave	

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

v_{12} Estimation

	Freeway/ Direction	On-ramp	L_{EQ}		P_{FM} Equations			P_{FM}	v_{12} (pcph)
			25-2	25-3	1	2	3		
1	SR 120 - EB	McKinley Ave (loop ramp)			0.582			0.582	1,557
2	SR 120 - EB	McKinley Ave			0.585			0.585	1,676
3	SR 120 - EB	Airport Way			0.585			0.585	1,887
4	SR 120 - EB	McKinley Ave (loop ramp)			0.582			0.582	2,427
5	SR 120 - EB	McKinley Ave			0.585			0.585	2,929
6	SR 120 - EB	Airport Way			0.585			0.585	2,402
7	SR 120 - WB	Airport Way			0.585			0.585	2,290
8	SR 120 - WB	McKinley Ave (loop ramp)			0.582			0.582	2,119
9	SR 120 - WB	McKinley Ave			0.585			0.585	2,954
10	SR 120 - WB	Airport Way			0.585			0.585	2,452
11	SR 120 - WB	McKinley Ave (loop ramp)			0.582			0.582	2,347
12	SR 120 - WB	McKinley Ave			0.585			0.585	2,967

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction On-ramp			V_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	V_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} > 1.5* $v_{12}/2$?	V_{12a} (pcph)	V_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	V_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 120 - EB	McKinley Ave (loop ramp)	2,676	7,200	No	2,863	7,200	No	1,119	No	No	1,557	1,744	4,600	No	187	2,100	No
2	SR 120 - EB	McKinley Ave	2,867	7,200	No	3,638	7,200	No	1,191	No	No	1,676	2,446	4,600	No	771	2,100	No
3	SR 120 - EB	Airport Way	3,228	7,200	No	3,822	7,200	No	1,341	No	No	1,887	2,480	4,600	No	594	2,100	No
4	SR 120 - EB	McKinley Ave (loop ramp)	4,173	7,200	No	4,996	7,200	No	1,746	No	No	2,427	3,250	4,600	No	823	2,100	No
5	SR 120 - EB	McKinley Ave	5,012	7,200	No	5,262	7,200	No	2,082	No	No	2,929	3,179	4,600	No	250	2,100	No
6	SR 120 - EB	Airport Way	4,109	7,200	No	5,442	7,200	No	1,707	No	No	2,402	3,735	4,600	No	1,333	2,100	No
7	SR 120 - WB	Airport Way	3,918	7,200	No	4,918	7,200	No	1,628	No	No	2,290	3,290	4,600	No	1,000	2,100	No
8	SR 120 - WB	McKinley Ave (loop ramp)	3,642	7,200	No	5,027	7,200	No	1,524	No	No	2,119	3,503	4,600	No	1,385	2,100	No
9	SR 120 - WB	McKinley Ave	5,054	7,200	No	5,075	7,200	No	2,100	No	No	2,954	2,975	4,600	No	21	2,100	No
10	SR 120 - WB	Airport Way	4,194	7,200	No	4,944	7,200	No	1,743	No	No	2,452	3,201	4,600	No	750	2,100	No
11	SR 120 - WB	McKinley Ave (loop ramp)	4,035	7,200	No	5,055	7,200	No	1,688	No	No	2,347	3,368	4,600	No	1,020	2,100	No
12	SR 120 - WB	McKinley Ave	5,076	7,200	No	6,148	7,200	No	2,109	No	No	2,967	4,039	4,600	No	1,072	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
1	SR 120 - EB	McKinley Ave (loop ramp)	18.1	B	0.330	57.4	62.8	59.4
2	SR 120 - EB	McKinley Ave	22.6	C	0.344	57.1	62.5	58.8
3	SR 120 - EB	Airport Way	23.0	C	0.345	57.1	62.0	58.7
4	SR 120 - EB	McKinley Ave (loop ramp)	29.5	D	0.408	55.6	60.5	57.2
5	SR 120 - EB	McKinley Ave	28.6	D	0.392	56.0	59.3	57.2
6	SR 120 - EB	Airport Way	32.4	D	0.462	54.4	60.7	56.2
7	SR 120 - WB	Airport Way	29.1	D	0.403	55.7	60.9	57.4
8	SR 120 - WB	McKinley Ave (loop ramp)	31.2	D	0.437	54.9	61.3	56.7
9	SR 120 - WB	McKinley Ave	27.1	C	0.375	56.4	59.2	57.5
10	SR 120 - WB	Airport Way	28.5	D	0.394	55.9	60.5	57.5
11	SR 120 - WB	McKinley Ave (loop ramp)	30.3	D	0.421	55.3	60.7	57.0
12	SR 120 - WB	McKinley Ave	34.9	D	0.520	53.0	59.2	55.0

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
 Analysis Year Cumulative + Project
 Analyst Fehr & Peers

Agency or Company _____
 Date _____
 Project Description Terra Ranch EIR

General Information

Freeway Data

Freeway Volume Adjustment

Effective

Freeway/ Direction			Analysis Time Period	Lanes	S _{FF} (mph)	V (vph)	HOV Lane? HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _p (pcph)	Flow Rate v _p (pcph)
2	SR 120 - EB	McKinley Ave	AM	3	65.0	3,540	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,759	3,759
2	SR 120 - EB	Airport Way	AM	3	65.0	3,440	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	3,653	3,653
2	SR 120 - EB	McKinley Ave	PM	3	65.0	5,630	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,978	5,978
5	SR 120 - EB	Airport Way	PM	3	65.0	4,960	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,267	5,267
8	SR 120 - WB	Airport Way	AM	3	65.0	4,640	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,927	4,927
2	SR 120 - WB	McKinley Ave	AM	3	65.0	4,650	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,938	4,938
11	SR 120 - WB	Airport Way	PM	3	65.0	5,000	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	5,309	5,309
2	SR 120 - WB	McKinley Ave	PM	3	65.0	4,670	No		0.97	Level			6.0%	0.0%	1.5	1.2	0.97	1.00	4,959	4,959

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Off-Ramp Data							Off-Ramp Volume Adjustment									
Freeway/ Direction	Off-ramp	Type	Lanes	S _{FR} (mph)	V _R (vph)	Decel Lane (ft)			PHF	Terrain	Truck/ Bus %	RV %	E _T	E _R	f _{HV}	f _P	Flow Rate v _P (pcph)		
						L _{D1}	L _{D2}	L _{Deff}											
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,020	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,062	
2	SR 120 - EB	Airport Way	Right	1	45.0	400	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	416	
2	SR 120 - EB	McKinley Ave	Right	1	45.0	1,700	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,770	
5	SR 120 - EB	Airport Way	Right	1	45.0	1,090	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,135	
8	SR 120 - WB	Airport Way	Right	1	45.0	950	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	989	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	1,220	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,270	
11	SR 120 - WB	Airport Way	Right	1	45.0	1,050	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	1,093	
2	SR 120 - WB	McKinley Ave	Right	1	45.0	870	150	0	150	0.97	Level	2.0%	0.0%	1.5	1.2	0.99	1.00	906	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

Freeway/ Direction		Off-ramp	
2	SR 120 - EB	McKinley Ave	
2	SR 120 - EB	Airport Way	
2	SR 120 - EB	McKinley Ave	
5	SR 120 - EB	Airport Way	
8	SR 120 - WB	Airport Way	
2	SR 120 - WB	McKinley Ave	
11	SR 120 - WB	Airport Way	
2	SR 120 - WB	McKinley Ave	

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			v_{12} Estimation		
	Freeway/ Direction	Off-ramp	L_{EQ}		v_{12} (pcph)
			25-13	25-14	
2	SR 120 - EB	McKinley Ave			0.617 2,727
2	SR 120 - EB	Airport Way			0.650 2,519
2	SR 120 - EB	McKinley Ave			0.529 3,997
5	SR 120 - EB	Airport Way			0.576 3,515
8	SR 120 - WB	Airport Way			0.591 3,318
2	SR 120 - WB	McKinley Ave			0.578 3,390
11	SR 120 - WB	Airport Way			0.577 3,526
2	SR 120 - WB	McKinley Ave			0.594 3,315

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information

Capacity Checks

Freeway/ Direction			V _{Fi} (pcph)	Max v _{Fi} (pcph)	LOS F?	V ₃ , V _{av34} (pcphpl)	V ₃ , V _{av34} > 2,700?	V ₃ , V _{av34} > 1.5*v ₁₂ /2?	V _{12a} (pcph)	Max v ₁₂ (pcph)	LOS F?	V _{FO} (pcph)	Max v _{FO} (pcph)	LOS F?	V _R (pcph)	Max v _R (pcph)	LOS F?
2	SR 120 - EB	McKinley Ave	3,759	7,200	No	1,032	No	No	2,727	4,400	No	2,697	7,200	No	1,062	2,100	No
2	SR 120 - EB	Airport Way	3,653	7,200	No	1,134	No	No	2,519	4,400	No	3,236	7,200	No	416	2,100	No
2	SR 120 - EB	McKinley Ave	5,978	7,200	No	1,982	No	No	3,997	4,400	No	4,208	7,200	No	1,770	2,100	No
5	SR 120 - EB	Airport Way	5,267	7,200	No	1,751	No	No	3,515	4,400	No	4,132	7,200	No	1,135	2,100	No
8	SR 120 - WB	Airport Way	4,927	7,200	No	1,609	No	No	3,318	4,400	No	3,938	7,200	No	989	2,100	No
2	SR 120 - WB	McKinley Ave	4,938	7,200	No	1,547	No	No	3,390	4,400	No	3,667	7,200	No	1,270	2,100	No
11	SR 120 - WB	Airport Way	5,309	7,200	No	1,783	No	No	3,526	4,400	No	4,216	7,200	No	1,093	2,100	No
2	SR 120 - WB	McKinley Ave	4,959	7,200	No	1,644	No	No	3,315	4,400	No	4,053	7,200	No	906	2,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
Freeway/ Direction		Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D _S	Inf. Area S _R (mph)	Out Lns. S _O (mph)	All vehs. S (mph)
2	SR 120 - EB	McKinley Ave	26.4	C	0.394	55.9	71.2	59.4
2	SR 120 - EB	Airport Way	24.6	C	0.335	57.3	70.8	60.9
2	SR 120 - EB	McKinley Ave	37.3	E	0.457	54.5	67.5	58.2
5	SR 120 - EB	Airport Way	33.1	D	0.400	55.8	68.4	59.4
8	SR 120 - WB	Airport Way	31.4	D	0.387	56.1	68.9	59.7
2	SR 120 - WB	McKinley Ave	32.1	D	0.412	55.5	69.2	59.2
11	SR 120 - WB	Airport Way	33.2	D	0.396	55.9	68.2	59.5
2	SR 120 - WB	McKinley Ave	31.4	D	0.380	56.3	68.8	59.9