



June 25, 2025

Mr. Dalton Horan  
Ventana Capital  
8678 Concord Centre Drive, Suite 200  
Englewood, CO 80112

**SUBJECT: CHAMBERS AND HESS – HORSE CREEK COMMERCIAL LOT 10, TRAFFIC COMPLIANCE LETTER (RICK ENGINEERING COMPANY JOB NUMBER D01173)**

Dear Mr. Dalton:

[INTRODUCTION/PROJECT DESCRIPTION](#)

This traffic compliance letter has been prepared to provide a trip generation comparison based on the proposed changes to Douglas 234, Filing No. 6 and identify compliance with the original approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020. The Horse Creek Commercial project proposes to construct 15,877 square feet of commercial development for retail use on a currently vacant 1.57-acre parcel on Lot 10 within the Chambers and Hess Development. The project proposes one full access driveway at Sliceroo Drive. On the same parcel, the approved TIS assumed 15,000 square feet of the General Office Building with similar site access characteristics. The project is located at the southeast corner of S. Chambers Road and S. Red Sky Drive in the Town of Parker, Colorado.

**Exhibit 1** shows the project vicinity map. **Exhibit 2** shows the project site plan.

[SITE TRIP GENERATION](#)

The project traffic volumes anticipated to be generated by the proposed development were estimated using the nationally published trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11<sup>th</sup> Edition. The project is anticipated to generate 900 daily weekday trips, of which 39 trips (23 inbound and 16 outbound) are anticipated to be generated during the AM peak hour, and 108 trips (54 inbound and 54 outbound) during the PM peak hour, bringing the total Chambers and Hess Development project trips to 10,091 daily weekday trips with 802 trips (424 inbound and 378 outbound) anticipated to be generated during the AM peak hour, and 960 trips (478 inbound and 482 outbound) during the PM peak hour. These trips account for internal capture trip reductions, as detailed in the approved TIS.

By comparison, the original TIS estimated a total of 9,371 daily weekday trips, with 804 AM peak hour trips (435 inbound and 369 outbound), and 875 PM peak hour trips (429 inbound and 446 outbound).

As shown in **Table 1** below, the proposed Horse Creek Commercial development project is expected to generate 720 additional daily weekday trips, 2 fewer AM peak hour trips and 85 additional PM peak hour trips compared to the original development analyzed in the approved TIS.

**TABLE 1  
PROJECT TRIP GENERATION SUMMARY**

LAND USE	QUANTITY	ITE Trip Gen. Code	ADT	AM PEAK HOUR			PM PEAK HOUR			
				VOLUMES			VOLUMES			
				IN	OUT	TOTAL	IN	OUT	TOTAL	
<b>ORIGINAL DEVELOPMENT PER TIS</b>										
Day Care Center	13	TSF	565	619	76	67	143	68	77	145
General Office Building	15	TSF	710	168	35	6	41	3	16	19
Pharmacy/Drugstore With a Drive-Through	12	TSF	881	1310	24	22	46	61	62	123
Drive-in Bank	3	TSF	912	324	14	10	24	26	26	51
Fast-Food Restaurant with Drive-Through	2.5	TSF	934	1177	51	49	100	43	39	82
Fast-Food Restaurant with Drive-Through	2	TSF	934	942	41	39	80	34	31	65
Coffee/Donut Shop with Drive-Through	2	TSF	937	1641	91	87	178	44	44	87
Quick Lubrication Vehicle Shop	3	TSF	941	209	13	4	17	11	15	26
Automobile Care Center <sup>1</sup>	6	TSF	942	See	9	5	14	12	14	26
Gasoline/Service Station with Convenience Market	16	VFP	945	3,134	106	101	207	114	110	224
Automated Car Wash <sup>2</sup>	1	CWT	948	See Footnote <sup>2</sup>			39	39	78	
Sub Total				9,524	460	390	850	455	473	926
Internal Capture				74	21	17	38	23	22	44
External Walk, Bike				79	4	4	8	3	4	7
<b>TOTAL PROJECT TRIPS</b>				<b>9,371</b>	<b>435</b>	<b>369</b>	<b>804</b>	<b>429</b>	<b>446</b>	<b>875</b>
<b>PROPOSED DEVELOPMENT</b>										
Day Care Center <sup>3</sup>	13	TSF	565	619	76	67	143	68	77	145
Strip Retail Plaza (<40K) <sup>4,5</sup>	15.88	TSF	822	900	23	16	39	54	54	108
Pharmacy/Drugstore With a Drive-Through	12	TSF	881	1310	24	22	46	61	62	123
Drive-in Bank	3	TSF	912	324	14	10	24	26	26	51
Fast-Food Restaurant with Drive-Through	2.5	TSF	934	1177	51	49	100	43	39	82
Fast-Food Restaurant with Drive-Through	2	TSF	934	942	41	39	80	34	31	65
Coffee/Donut Shop with Drive-Through	2	TSF	937	1641	91	87	178	44	44	87
Quick Lubrication Vehicle Shop	3	TSF	941	209	13	4	17	11	15	26
Automobile Care Center <sup>1</sup>	6	TSF	942	See	9	5	14	12	14	26
Gasoline/Service Station with Convenience Market <sup>3</sup>	16	VFP	945	3,134	106	101	207	114	110	224
Automated Car Wash <sup>2,3</sup>	1	CWT	948	See Footnote <sup>2</sup>			39	39	78	
Sub Total				10,256	448	400	848	506	511	1,015
Internal Capture				80	20	18	38	25	24	50
External Walk, Bike				85	4	4	8	3	4	7
<b>TOTAL PROJECT TRIPS</b>				<b>10,091</b>	<b>424</b>	<b>378</b>	<b>802</b>	<b>478</b>	<b>482</b>	<b>960</b>
<b>TOTAL NET NEW PROJECT TRIPS</b>				<b>720</b>	<b>-11</b>	<b>9</b>	<b>-2</b>	<b>48</b>	<b>36</b>	<b>85</b>

Source : *Fehr and Peers MXD + Methodology and Validation Technical Memorandum, Dated May 06, 2020* - with revisions based on Town's Comments on July 16, 2020, and further coordination with the Town on August 7, 2020

TSF = Thousand Square Feet

VFP = Vehicle Fueling Position

CWT = Car Wash Tunnels

<sup>1</sup>ITE Trip Generation Manual does not publish Weekday Daily Trips for Auto Care Centers. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

<sup>2</sup>ITE Trip Generation Manual does not publish Weekday Daily Trips or AM peak hour for Automated Car Wash. Instead, weekend

<sup>3</sup>Built as of May 2025

<sup>4</sup>Proposed Development on Lot 10 in lieu of a General Office Building

<sup>5</sup>ITE Trip Generation 11th Edition

## COMPARISON TO APPROVED TIS

Since the proposed project is expected to exceed the estimated project trips in the original TIS, a Level of Service (LOS) analysis was conducted to assess whether these additional trips would adversely affect the surrounding intersections and roadways.

While the characteristics of most of the study intersections have stayed the same, the following study intersection has changed since the original TIS was conducted:

### S. Chambers Road / S. Red Sky Drive

#### Original 2020 Conditions:

A three-legged, unsignalized intersection with stop control on the westbound approach, consisting of the following lane configurations:

- Northbound: Two through lanes and an exclusive right-turn lane
  - Southbound: Three through lanes and an exclusive left-turn lane
  - Westbound: Exclusive left-turn and right-turn lanes
- Proposed improvements listed in the TIS - *Install a traffic signal as warranted in the existing scenario. The traffic signal will help mitigate this intersection to operate at an acceptable level of service (LOS C or better). To further mitigate queuing for the long-term scenario with project conditions, install an additional westbound left turn lane at this intersection.*

#### Current 2025 Conditions:

A three-legged, **signalized** intersection with updated lane configurations:

- Northbound: Two through lanes and an exclusive right-turn lane
- Southbound: **Two** through lanes and an exclusive left-turn lane
- Westbound: **Two** left-turn lanes and an exclusive right-turn lane

With the improvements already implemented in current conditions and utilizing the same trip distribution assumptions from the “Short-Term (2021)” scenario in the original TIS, the updated project trips were redistributed to the same study intersections.

**Exhibit 3** illustrates the revised traffic volumes including the Horse Creek Commercial development.

Based on the updated Synchro analysis, all studied intersections are projected to operate at the same or improved LOS compared to the original TIS.

**Tables 2 and 3** provide a detailed comparison of the LOS results for the intersections and roadway segments.

**TABLE 2  
INTERSECTION OPERATIONS COMPARISON**

#	INTERSECTION	CONTROL	DIR.	ORIGINAL TIS (Short Term 2021 + Project Scenario with General Office Building on Lot 10)				Short Term Scenario + project with Proposed Horse Creek on Lot 10			
				AM Peak		PM Peak		AM Peak		PM Peak	
				DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>
1	S. Chambers Rd/E. Hess Rd	(S)	Overall	34.1	C	18.0	B	33.1	C	18.4	B
2	S. Chambers Rd/S. Red Sky Dr	(OWSC)	WB-L	>50	F	>50	F	-	-	-	-
			WB-R	23.9	C	10.6	B	-	-	-	-
			SB-L	16.5	C	9.1	A	-	-	-	-
	<i>With Recommended Improvements - Signal<sup>3</sup></i>	(S)	Overall	24.7	C	18.9	B	13.4	B	7.9	A
3	S. Red Sky Dr/S. Swift Fox Way	(R)	Overall	5.2	A	5.2	A	9.6	A	5.6	A
4	E. Hess Rd/Firefly Ln	(OWSC)	EB-L	19.5	C	9.5	A	19.4	C	10.8	B
			SB-LR	>50	F	>50	F	>50	F	>50	F
			<i>With Recommended Improvements - Signal (By Others)</i>	(S)	Overall	7.4	A	5.9	A	7.4	A
5	E. Hess Rd/Project Dwy	(OWSC)	SB-R	40.8	E	17.8	C	40.8	E	18.6	C
6	S. Red Sky Dr/Project Dwy	N/A	EB-R	-	-	-	-	*	*	*	*

Footnotes:

Results calculated utilizing the methodologies described in Chapters 19, 20, 21, and 22 in the 6th edition of the HCM .

<sup>1</sup> Delay is measured in seconds per vehicle.

<sup>2</sup> Level of Service

<sup>3</sup> The installation of a traffic signal, recommended as an improvement in the original 2020 study, has since been implemented.

(S)=Signalized, (TWSC)=Two-Way Stop Controlled, (R)=Roundabout.

NB=Northbound, WB=Westbound, etc.

L=Left-turn movement, R= Right-turn movement, LT=Left-Through lane, LTR=Left-Through-Right lane , etc.

\* No conflicting movements. No Delays to report

**TABLE 3  
ROADWAY SEGMENT OPERATIONS COMPARISON**

ROADWAY SEGMENT	ULTIMATE ROADWAY CLASSIFICATION	ULTIMATE CAPACITY (LOS D) <sup>1</sup>	FUNCTIONAL CLASSIFICATION	CAPACITY (LOS D) <sup>1</sup>	ORIGINAL TIS (Short Term 2021 + Project Scenario with General Office Building on Lot 10)			Short Term Scenario + project with Proposed Horse Creek on Lot 10		
					ADT	V/C	LOS	ADT	V/C	LOS
S. Chambers Road between S. Red Sky Drive and E. Hess Road	Principal Arterial (6L)	55,000	Arterial (4L)	40,000	18,670	0.47	A	18,845	0.471	A
E. Hess Road between S. Chambers Road and Firefly Lane	Arterial (4L)	40,000	Arterial (4L)	40,000	30,215	0.76	C	30,655	0.766	C
S. Red Sky Drive east of S. Chambers Road	Residential Collector (2L)	12,000	Residential Collector (2L)	12,000	6,715	0.56	A	7,110	0.593	A
<b>Footnote:</b>										
<sup>1</sup> Source: Douglas County 2040 Transportation Plan <i>Table 4, Recommended Traffic Volume Thresholds</i> Dated June 2019										

CONCLUSIONS/RECOMMENDATIONS

Although the proposed project is expected to generate more trips than estimated in the original TIS, the Level of Service analysis shows that it does not result in additional impacts to the study intersections or roadway segments. As such, the project is anticipated to have similar effects on the surrounding transportation network and is therefore considered to be in conformance with the approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020.

Should you have any questions, please contact either Aida Edgington or me at (619) 291-0707.

Sincerely,

RICK ENGINEERING COMPANY



Brian R. Stephenson, PE, PTOE  
Associate Principal



*Attachments*

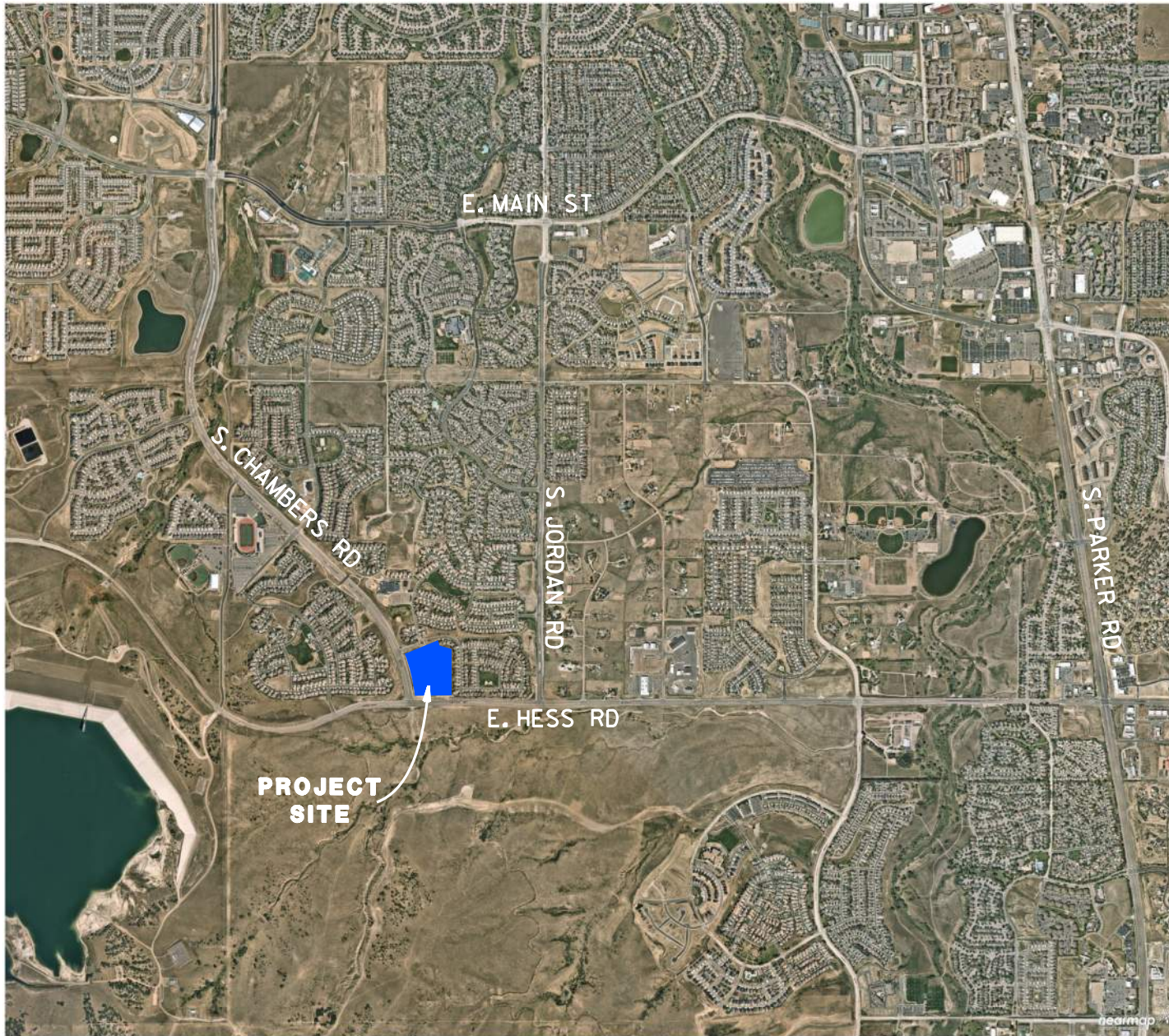
**Exhibit 1** Project vicinity map.

**Exhibit 2** Project site plan.

**Exhibit 3** Short Term Background + Project Traffic Volumes.

**Appendix A** contains intersection capacity analysis results.

**Appendix B** contains excerpts from approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020.

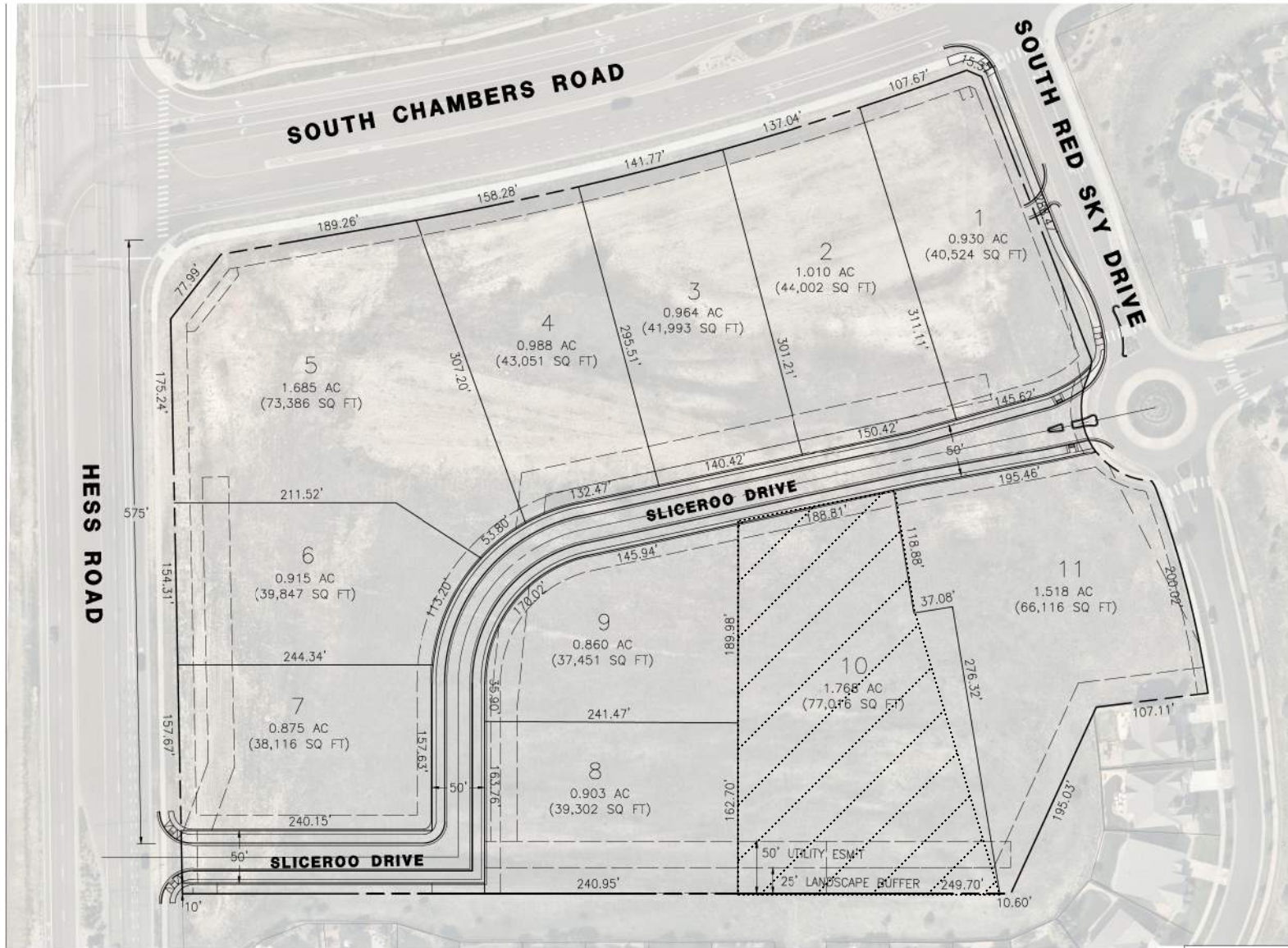


**PROJECT  
SITE**

N  
↑  
○  
↓  
NOT TO SCALE



**EXHIBIT 1**  
VICINITY MAP  
CHAMBERS AND HESS DEVELOPMENT

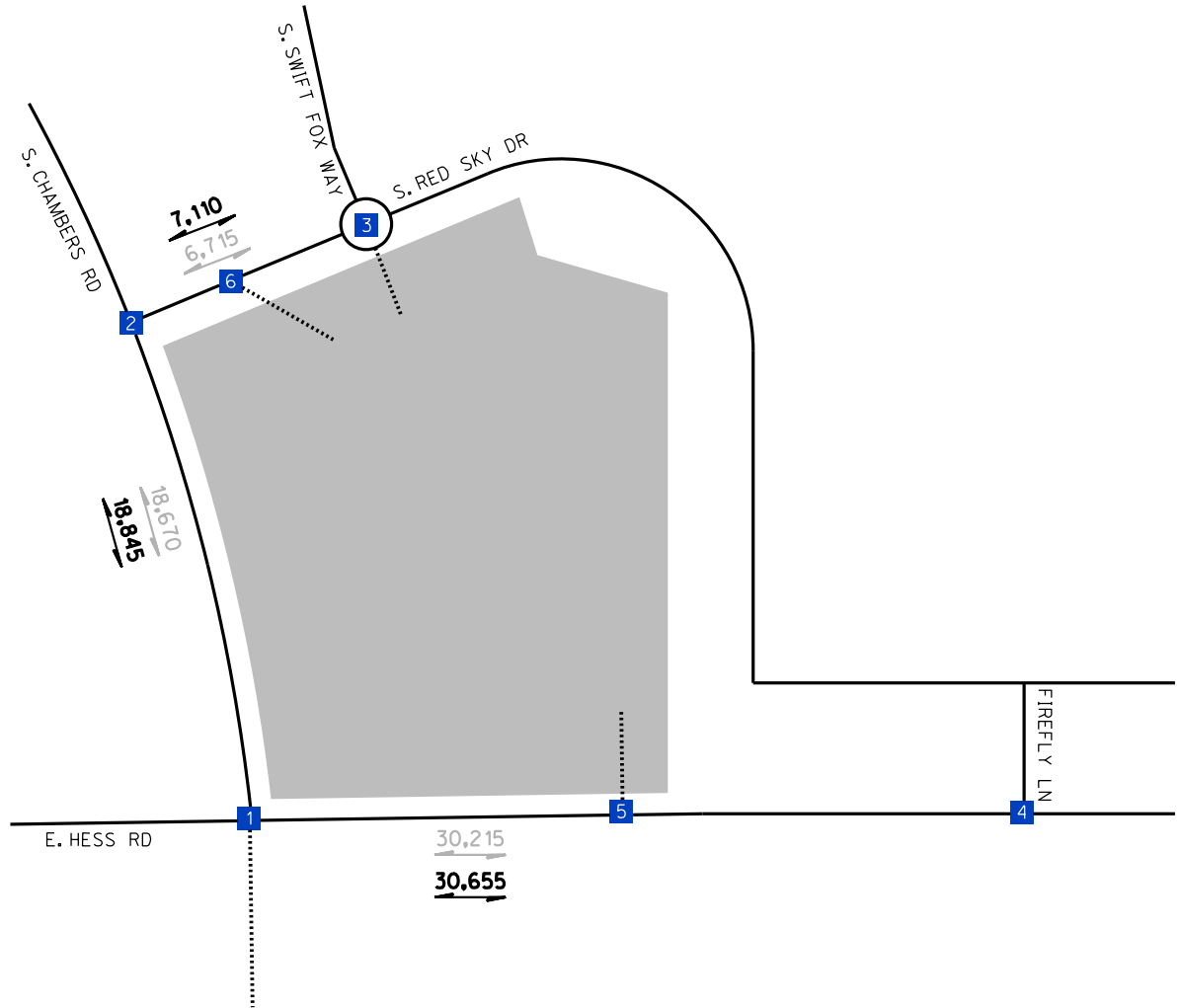
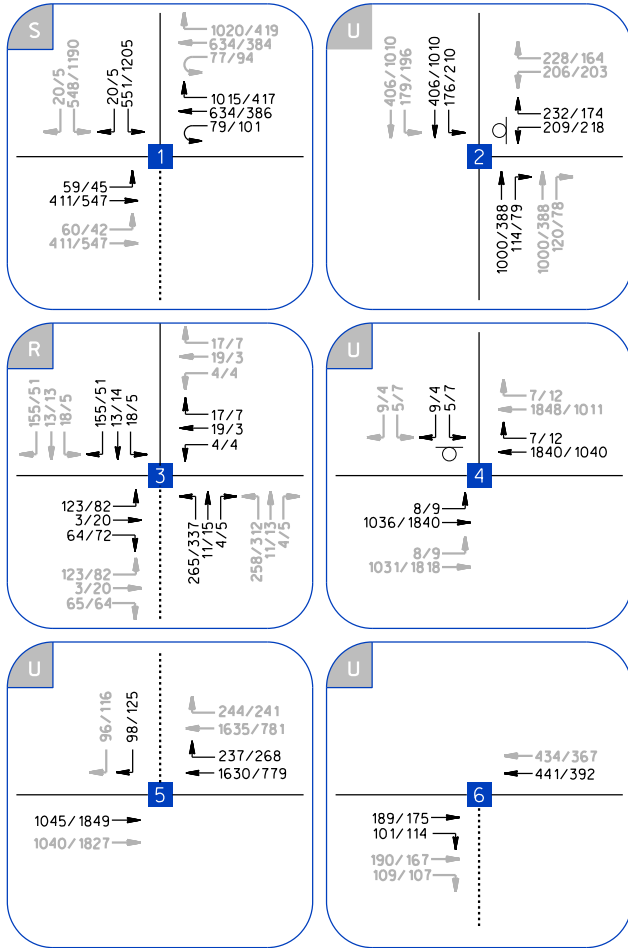


NOT TO SCALE

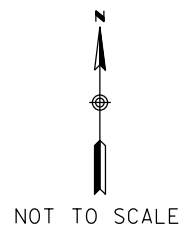


**EXHIBIT 2**  
PROJECT SITE PLAN

CHAMBERS AND HESS DEVELOPMENT



AM/PM = PEAK HOUR VOLUMES  
 ORIGINAL 2020 TIA  
X,XXX = TWO-WAY ADT  
 ORIGINAL 2020 TIA



### EXHIBIT 3

SHORT-TERM (2021) TOTAL (BACKGROUND + PROJECT W/HORSE CREEK)  
 TRAFFIC VOLUMES  
 CHAMBERS AND HESS DEVELOPMENT

**LEGEND**

AM/PM=PEAK HOUR VOLUMES

X,XXX =TWO-WAY ADT

**1** =INTERSECTION NUMBER

=PROJECT SITE

= FUTURE ROAD/DRIVEWAY

## **APPENDIX A**

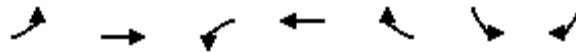
### **INTERSECTION CAPACITY ANALYSIS RESULTS**

Timings

Short-Term Background + Proj with Lot 10 Changes - AM

1: E. Hess Rd & S. Chambers Rd.

06/26/2025

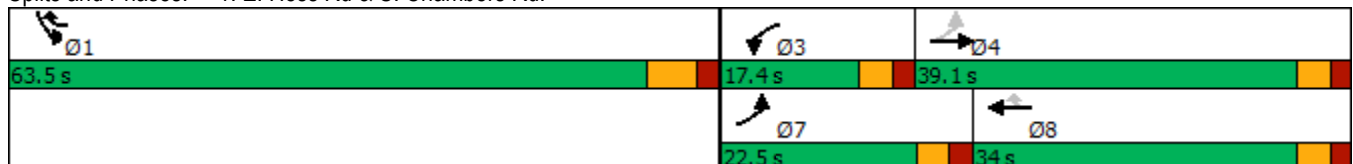


Lane Group	EBL	EBT	WBL	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗↗	↘	↔	↖	↘↘	↗
Traffic Volume (vph)	59	411	79	634	1015	551	20
Future Volume (vph)	59	411	79	634	1015	551	20
Turn Type	pm+pt	NA	Prot	NA	pm+ov	Prot	Free
Protected Phases	7	4	3	8	1	1	
Permitted Phases	4				8		Free
Detector Phase	7	4	3	8	1	1	
Switch Phase							
Minimum Initial (s)	11.0	15.0	5.0	15.0	15.0	15.0	
Minimum Split (s)	22.5	21.5	16.5	21.5	21.5	21.5	
Total Split (s)	22.5	39.1	17.4	34.0	63.5	63.5	
Total Split (%)	18.8%	32.6%	14.5%	28.3%	52.9%	52.9%	
Yellow Time (s)	3.0	3.0	3.0	3.0	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	6.5	6.5	
Lead/Lag	Lead	Lag	Lead	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None	
Act Effct Green (s)	31.2	22.9	9.5	21.9	56.6	26.8	73.6
Actuated g/C Ratio	0.42	0.31	0.13	0.30	0.77	0.36	1.00
v/c Ratio	0.16	0.41	0.38	0.65	0.79	0.48	0.01
Control Delay	15.1	25.0	41.3	29.1	6.9	19.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.1	25.0	41.3	29.1	6.9	19.7	0.0
LOS	B	C	D	C	A	B	A
Approach Delay		23.8		16.6			
Approach LOS		C		B			

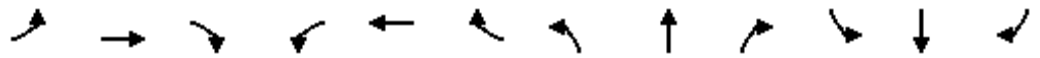
Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 73.6  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 18.3  
 Intersection LOS: B  
 Intersection Capacity Utilization 81.6%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 1: E. Hess Rd & S. Chambers Rd.



HCM 6th Signalized Intersection Summary - Term Background + Proj with Lot 10 Changes - AM  
 1: E. Hess Rd & S. Chambers Rd. 06/26/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗↗		↖	↗↗	↖				↖↖		↖
Traffic Volume (veh/h)	59	411	0	79	634	1015	0	0	0	551	0	20
Future Volume (veh/h)	59	411	0	79	634	1015	0	0	0	551	0	20
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	0	1870	1870	1870				1870	0	1870
Adj Flow Rate, veh/h	64	447	0	86	689	1103				599	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	2	2	0	2	2	2				2	0	2
Cap, veh/h	383	1658	0	112	1475	1015				778	0	
Arrive On Green	0.11	0.47	0.00	0.06	0.42	0.42				0.23	0.00	0.00
Sat Flow, veh/h	1781	3647	0	1781	3554	1585				3456	0	1585
Grp Volume(v), veh/h	64	447	0	86	689	1103				599	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	0	1781	1777	1585				1728	0	1585
Q Serve(g_s), s	1.2	5.2	0.0	3.2	9.5	22.6				10.9	0.0	0.0
Cycle Q Clear(g_c), s	1.2	5.2	0.0	3.2	9.5	22.6				10.9	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	383	1658	0	112	1475	1015				778	0	
V/C Ratio(X)	0.17	0.27	0.00	0.77	0.47	1.09				0.77	0.00	
Avail Cap(c_a), veh/h	643	1803	0	329	1533	1041				2931	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	8.5	10.9	0.0	31.0	14.3	3.3				24.4	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.0	10.5	0.2	54.8				1.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.7	0.0	1.6	3.2	18.6				4.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.7	11.0	0.0	41.5	14.5	58.1				26.0	0.0	0.0
LnGrp LOS	A	B	A	D	B	F				C	A	
Approach Vol, veh/h		511			1878						599	
Approach Delay, s/veh		10.7			41.4						26.0	
Approach LOS		B			D						C	
Timer - Assigned Phs			3	4		6	7	8				
Phs Duration (G+Y+Rc), s			9.2	36.4		21.6	12.7	32.9				
Change Period (Y+Rc), s			5.0	5.0		6.5	5.0	5.0				
Max Green Setting (Gmax), s			12.4	34.1		57.0	17.5	29.0				
Max Q Clear Time (g_c+I1), s			5.2	7.2		12.9	3.2	24.6				
Green Ext Time (p_c), s			0.1	2.7		2.2	0.1	3.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			33.1									
HCM 6th LOS			C									
<b>Notes</b>												
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.												

Timings

Short-Term Background + Proj with Lot 10 Changes - AM

2: S. Chambers Rd. & S. Red Sky Dr.

06/26/2025



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖ ↗	↖	↖ ↗	↖	↖	↖ ↗
Traffic Volume (vph)	209	232	1000	114	176	406
Future Volume (vph)	209	232	1000	114	176	406
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	7		2		1	6
Permitted Phases		8		2	6	
Detector Phase	7	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	33.7	33.7	11.3	45.0
Total Split (%)	25.0%	25.0%	37.4%	37.4%	12.6%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	C-Min	C-Min	None	C-Min
Act Effct Green (s)	11.7	8.0	39.5	39.5	56.8	56.8
Actuated g/C Ratio	0.13	0.09	0.44	0.44	0.63	0.63
v/c Ratio	0.55	0.70	0.76	0.17	0.61	0.21
Control Delay	41.1	15.1	27.2	4.5	22.9	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.1	15.1	27.2	4.5	22.9	8.3
LOS	D	B	C	A	C	A
Approach Delay	27.4		24.9			12.7
Approach LOS	C		C			B

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 11.3 (13%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 22.1

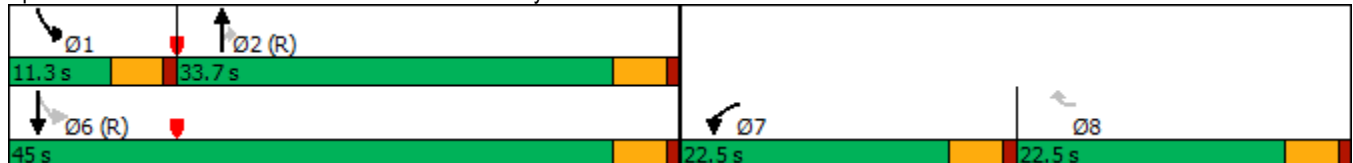
Intersection LOS: C

Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: S. Chambers Rd. & S. Red Sky Dr.



HCM 6th Signalized Intersection Summary - Term Background + Proj with Lot 10 Changes - AM  
 2: S. Chambers Rd. & S. Red Sky Dr. 06/26/2025



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶	↶	↕↕	↷	↶	↕↕
Traffic Volume (veh/h)	209	232	1000	114	176	406
Future Volume (veh/h)	209	232	1000	114	176	406
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	246	273	1176	134	207	478
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	665	305	2107	940	359	2514
Arrive On Green	0.19	0.19	0.59	0.59	0.06	0.71
Sat Flow, veh/h	3456	1585	3647	1585	1781	3647
Grp Volume(v), veh/h	246	273	1176	134	207	478
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1777
Q Serve(g_s), s	5.6	15.1	18.1	3.4	3.8	4.1
Cycle Q Clear(g_c), s	5.6	15.1	18.1	3.4	3.8	4.1
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	665	305	2107	940	359	2514
V/C Ratio(X)	0.37	0.89	0.56	0.14	0.58	0.19
Avail Cap(c_a), veh/h	691	317	2107	940	379	2514
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.57	0.57	1.00	1.00
Uniform Delay (d), s/veh	31.6	35.4	11.2	8.1	9.7	4.4
Incr Delay (d2), s/veh	0.3	25.5	0.6	0.2	1.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	7.9	6.6	1.1	1.4	1.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	31.9	60.9	11.8	8.3	11.6	4.6
LnGrp LOS	C	E	B	A	B	A
Approach Vol, veh/h	519		1310			685
Approach Delay, s/veh	47.2		11.4			6.7
Approach LOS	D		B			A
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	10.3	57.9		21.8		68.2
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	6.8	29.2		18.0		40.5
Max Q Clear Time (g_c+I1), s	5.8	20.1		17.1		6.1
Green Ext Time (p_c), s	0.1	5.6		0.2		3.5
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			17.5			
HCM 6th LOS			B			

Intersection				
Intersection Delay, s/veh	9.6			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	380	80	560	372
Demand Flow Rate, veh/h	388	82	571	380
Vehicles Circulating, veh/h	72	814	294	588
Vehicles Exiting, veh/h	896	51	166	308
Ped Vol Crossing Leg, #/h	16	16	0	1
Ped Cap Adj	0.998	0.998	1.000	1.000
Approach Delay, s/veh	5.6	7.8	10.8	12.1
Approach LOS	A	A	B	B
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	388	82	571	380
Cap Entry Lane, veh/h	1282	602	1022	758
Entry HV Adj Factor	0.979	0.978	0.980	0.980
Flow Entry, veh/h	380	80	560	372
Cap Entry, veh/h	1253	587	1002	742
V/C Ratio	0.303	0.137	0.559	0.502
Control Delay, s/veh	5.6	7.8	10.8	12.1
LOS	A	A	B	B
95th %tile Queue, veh	1	0	4	3

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	1036	1840	7	5	9
Future Vol, veh/h	8	1036	1840	7	5	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	215	-	-	215	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	1177	2091	8	6	10

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	2099	0	-	0	2698 1046
Stage 1	-	-	-	-	2091 -
Stage 2	-	-	-	-	607 -
Critical Hdwy	4.14	-	-	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	2.22	-	-	-	3.52 3.32
Pot Cap-1 Maneuver	259	-	-	-	17 225
Stage 1	-	-	-	-	81 -
Stage 2	-	-	-	-	507 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	259	-	-	-	16 225
Mov Cap-2 Maneuver	-	-	-	-	16 -
Stage 1	-	-	-	-	78 -
Stage 2	-	-	-	-	507 -

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	145.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	259	-	-	-	40
HCM Lane V/C Ratio	0.035	-	-	-	0.398
HCM Control Delay (s)	19.4	-	-	-	145.2
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	1.4

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑			↑
Traffic Vol, veh/h	0	1045	1630	237	0	98
Future Vol, veh/h	0	1045	1630	237	0	98
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1136	1772	258	0	107

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 1015
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.92
Pot Cap-1 Maneuver	0	-	- 0 203
Stage 1	0	-	- 0 -
Stage 2	0	-	- 0 -
Platoon blocked, %	-	-	- - -
Mov Cap-1 Maneuver	-	-	- - 203
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	40.8
HCM LOS			E

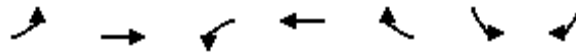
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	203
HCM Lane V/C Ratio	-	-	-	0.525
HCM Control Delay (s)	-	-	-	40.8
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	2.7

Timings

Short-Term Background + Proj with Lot 10 Changes - PM

1: E. Hess Rd & S. Chambers Rd.

06/26/2025

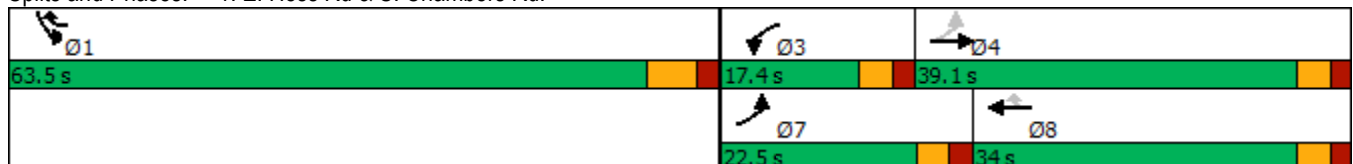


Lane Group	EBL	EBT	WBL	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗↗	↖	↗↗	↖	↖↖	↖
Traffic Volume (vph)	45	547	101	386	417	1205	5
Future Volume (vph)	45	547	101	386	417	1205	5
Turn Type	pm+pt	NA	Prot	NA	pm+ov	Prot	Free
Protected Phases	7	4	3	8	1	1	
Permitted Phases	4				8		Free
Detector Phase	7	4	3	8	1	1	
Switch Phase							
Minimum Initial (s)	11.0	15.0	5.0	15.0	15.0	15.0	
Minimum Split (s)	22.5	21.5	16.5	21.5	21.5	21.5	
Total Split (s)	22.5	39.1	17.4	34.0	63.5	63.5	
Total Split (%)	18.8%	32.6%	14.5%	28.3%	52.9%	52.9%	
Yellow Time (s)	3.0	3.0	3.0	3.0	4.5	4.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	6.5	6.5	
Lead/Lag	Lead	Lag	Lead	Lag			
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None	
Act Effct Green (s)	30.4	22.2	10.5	25.9	77.2	42.3	88.8
Actuated g/C Ratio	0.34	0.25	0.12	0.29	0.87	0.48	1.00
v/c Ratio	0.11	0.65	0.50	0.39	0.31	0.78	0.00
Control Delay	19.6	36.2	52.1	29.6	0.8	24.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	36.2	52.1	29.6	0.8	24.5	0.0
LOS	B	D	D	C	A	C	A
Approach Delay		34.9		18.8			
Approach LOS		C		B			

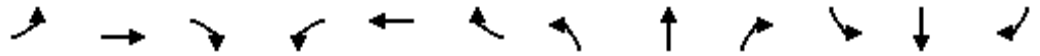
Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 88.8	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 24.8	Intersection LOS: C
Intersection Capacity Utilization 67.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: E. Hess Rd & S. Chambers Rd.



HCM 6th Signalized Intersection Summary - Term Background + Proj with Lot 10 Changes - PM  
 1: E. Hess Rd & S. Chambers Rd. 06/26/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖				↖	↗	↖
Traffic Volume (veh/h)	45	547	0	101	386	417	0	0	0	1205	0	5
Future Volume (veh/h)	45	547	0	101	386	417	0	0	0	1205	0	5
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	0	1870	1870	1870				1870	0	1870
Adj Flow Rate, veh/h	47	576	0	106	406	439				1268	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	2	2	0	2	2	2				2	0	2
Cap, veh/h	355	851	0	138	787	1048				1518	0	
Arrive On Green	0.10	0.24	0.00	0.08	0.22	0.22				0.44	0.00	0.00
Sat Flow, veh/h	1781	3647	0	1781	3554	1585				3456	0	1585
Grp Volume(v), veh/h	47	576	0	106	406	439				1268	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	0	1781	1777	1585				1728	0	1585
Q Serve(g_s), s	1.3	10.0	0.0	4.0	6.8	4.4				22.0	0.0	0.0
Cycle Q Clear(g_c), s	1.3	10.0	0.0	4.0	6.8	4.4				22.0	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00				1.00		1.00
Lane Grp Cap(c), veh/h	355	851	0	138	787	1048				1518	0	
V/C Ratio(X)	0.13	0.68	0.00	0.77	0.52	0.42				0.84	0.00	
Avail Cap(c_a), veh/h	646	1790	0	326	1522	1375				2910	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	16.6	23.4	0.0	30.6	23.2	1.3				16.8	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.9	0.0	8.7	0.5	0.3				1.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.8	0.0	1.9	2.6	1.3				7.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.8	24.3	0.0	39.3	23.7	1.6				18.1	0.0	0.0
LnGrp LOS	B	C	A	D	C	A				B	A	
Approach Vol, veh/h		623			951						1268	
Approach Delay, s/veh		23.7			15.2						18.1	
Approach LOS		C			B						B	
Timer - Assigned Phs			3	4		6	7	8				
Phs Duration (G+Y+Rc), s			10.2	21.2		36.2	11.5	20.0				
Change Period (Y+Rc), s			5.0	5.0		6.5	5.0	5.0				
Max Green Setting (Gmax), s			12.4	34.1		57.0	17.5	29.0				
Max Q Clear Time (g_c+I1), s			6.0	12.0		24.0	3.3	8.8				
Green Ext Time (p_c), s			0.1	3.5		5.7	0.1	3.9				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			18.4									
HCM 6th LOS			B									
<b>Notes</b>												
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.												

Timings

Short-Term Background + Proj with Lot 10 Changes - PM

2: S. Chambers Rd. & S. Red Sky Dr.

06/26/2025

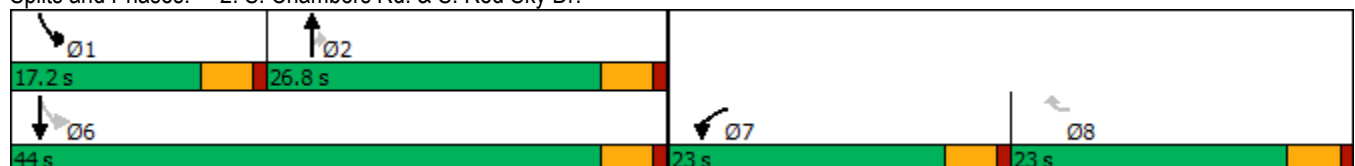


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↙	↙	↕↕	↘	↙	↕↕
Traffic Volume (vph)	218	174	388	79	210	1010
Future Volume (vph)	218	174	388	79	210	1010
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	7		2		1	6
Permitted Phases		8		2	6	
Detector Phase	7	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	23.0	23.0	26.8	26.8	17.2	44.0
Total Split (%)	25.6%	25.6%	29.8%	29.8%	19.1%	48.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	Min	Min	None	Min
Act Effct Green (s)	9.5	6.9	13.0	13.0	27.4	27.4
Actuated g/C Ratio	0.16	0.12	0.23	0.23	0.47	0.47
v/c Ratio	0.40	0.52	0.50	0.19	0.44	0.62
Control Delay	25.5	11.1	22.5	6.9	12.5	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.5	11.1	22.5	6.9	12.5	13.4
LOS	C	B	C	A	B	B
Approach Delay	19.1		19.9			13.2
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 57.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.62  
 Intersection Signal Delay: 15.9  
 Intersection LOS: B  
 Intersection Capacity Utilization 41.6%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 2: S. Chambers Rd. & S. Red Sky Dr.



HCM 6th Signalized Intersection Summary - Term Background + Proj with Lot 10 Changes - PM  
 2: S. Chambers Rd. & S. Red Sky Dr. 06/26/2025



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶	↶	↕↕	↷	↶	↕↕
Traffic Volume (veh/h)	218	174	388	79	210	1010
Future Volume (veh/h)	218	174	388	79	210	1010
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	225	179	400	81	216	1041
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	671	308	936	417	608	1889
Arrive On Green	0.19	0.19	0.26	0.26	0.13	0.53
Sat Flow, veh/h	3456	1585	3647	1585	1781	3647
Grp Volume(v), veh/h	225	179	400	81	216	1041
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	1781	1777
Q Serve(g_s), s	1.8	3.4	3.1	1.3	2.5	6.4
Cycle Q Clear(g_c), s	1.8	3.4	3.1	1.3	2.5	6.4
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	671	308	936	417	608	1889
V/C Ratio(X)	0.34	0.58	0.43	0.19	0.36	0.55
Avail Cap(c_a), veh/h	1948	894	2415	1077	1064	4278
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.4	12.0	10.0	9.4	6.1	5.1
Incr Delay (d2), s/veh	0.3	1.7	0.3	0.2	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	1.0	0.9	0.4	0.6	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	11.7	13.7	10.3	9.6	6.4	5.3
LnGrp LOS	B	B	B	A	A	A
Approach Vol, veh/h	404		481			1257
Approach Delay, s/veh	12.6		10.2			5.5
Approach LOS	B		B			A
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	8.8	13.1		10.9		21.9
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	12.7	22.3		18.5		39.5
Max Q Clear Time (g_c+I1), s	4.5	5.1		5.4		8.4
Green Ext Time (p_c), s	0.4	2.7		1.2		9.1
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			7.9			
HCM 6th LOS			A			

Intersection				
Intersection Delay, s/veh	5.6			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	210	17	430	84
Demand Flow Rate, veh/h	214	17	438	85
Vehicles Circulating, veh/h	28	533	131	423
Vehicles Exiting, veh/h	480	36	111	127
Ped Vol Crossing Leg, #/h	16	16	0	1
Ped Cap Adj	0.998	0.998	1.000	1.000
Approach Delay, s/veh	4.1	4.7	6.6	5.0
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	214	17	438	85
Cap Entry Lane, veh/h	1341	801	1207	896
Entry HV Adj Factor	0.979	0.995	0.981	0.984
Flow Entry, veh/h	210	17	430	84
Cap Entry, veh/h	1310	796	1184	882
V/C Ratio	0.160	0.021	0.363	0.095
Control Delay, s/veh	4.1	4.7	6.6	5.0
LOS	A	A	A	A
95th %tile Queue, veh	1	0	2	0

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↑	↘	
Traffic Vol, veh/h	9	1840	1040	12	7	4
Future Vol, veh/h	9	1840	1040	12	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	215	-	-	215	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	1937	1095	13	7	4

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1108	0	-	0	2082 548
Stage 1	-	-	-	-	1095 -
Stage 2	-	-	-	-	987 -
Critical Hdwy	4.14	-	-	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	2.22	-	-	-	3.52 3.32
Pot Cap-1 Maneuver	626	-	-	-	46 480
Stage 1	-	-	-	-	282 -
Stage 2	-	-	-	-	322 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	626	-	-	-	45 480
Mov Cap-2 Maneuver	-	-	-	-	45 -
Stage 1	-	-	-	-	278 -
Stage 2	-	-	-	-	322 -

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	69.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	626	-	-	-	67
HCM Lane V/C Ratio	0.015	-	-	-	0.173
HCM Control Delay (s)	10.8	-	-	-	69.6
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑			↑
Traffic Vol, veh/h	0	1849	779	268	0	125
Future Vol, veh/h	0	1849	779	268	0	125
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2010	847	291	0	136

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

Approach	EB	WB	SB
HCM Control Delay, s	0	0	18.6
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	399
HCM Lane V/C Ratio	-	-	-	0.341
HCM Control Delay (s)	-	-	-	18.6
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	1.5

**APPENDIX B**

**CHAMBERS AND HESS DEVELOPMENT**

**TRAFFIC IMPACT STUDY, SEPTEMBER 14, 2020**

**CHAMBERS AND HESS DEVELOPMENT**

**TRAFFIC IMPACT STUDY (TIS)**

**TOWN OF PARKER, CO**

**SEPTEMBER 14, 2020**

**JOB NUMBER: 18633**

**RICK**

**RICK ENGINEERING COMPANY**



[rickengineering.com](http://rickengineering.com)

**CHAMBERS AND HESS DEVELOPMENT  
TRAFFIC IMPACT STUDY (TIS)  
TOWN OF PARKER, CO**

**ORIGINAL JANUARY 23, 2020  
REVISED SEPTEMBER 14, 2020**

**PREPARED FOR:  
VENTANA CAPITAL  
9801 EAST EASTER AVENUE  
CENTENNIAL, CO 80112**



*Brian R. Stephens*

**PREPARED BY:**

## **1.0- INTRODUCTION AND PROJECT DESCRIPTION**

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### **1.1- INTRODUCTION**

The following Traffic Impact Study (TIS) has been prepared to determine any traffic related impacts within the project area intersections and roadways due to the proposed Chambers and Hess Development, based on the Town of Parker's Traffic Impact Study Guidelines outlined within the Town's Roadway Design and Construction Manual Section 5. The project is located on the northeast corner of S. Chambers Road and E. Hess Road in the Town of Parker, Colorado.

**Exhibit 1** shows the project vicinity map.

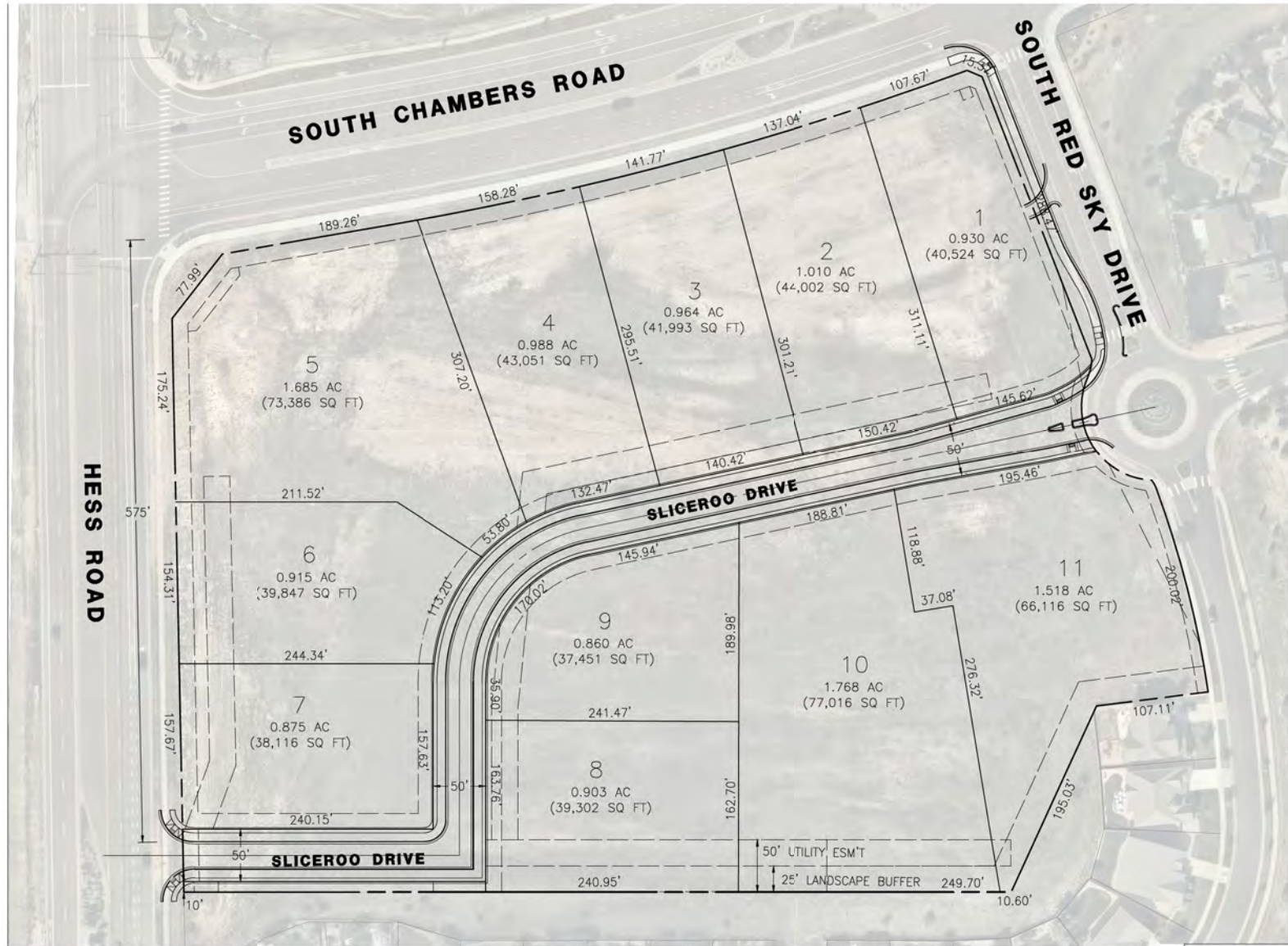
### **1.2- PROJECT DESCRIPTION**

In coordination with the Town of Parker, Rick Engineering Company (RICK) developed the scope of the TIS, including the project study area, project trip generation rates, and trip distribution assumptions. The project proposes to construct a commercial development on a currently vacant 14 acre parcel, consisting of fast food restaurants, a gas station with convenience store, auto care center, quick lubrication shop, a car wash, a pharmacy/drug store, a drive-in bank, a general office building, and a day care center. The project proposes one full and one right-in only access at S. Red Sky Drive, and one right-in/right-out access at E. Hess Road. The Project opening year is assumed to be in 2021 and with no phasing of development.

**Exhibit 2** shows the project site plan.

The intersections and roadways within the project were analyzed for the following scenarios:

- Existing (2019)
- Opening Year (2021) without Project (Short-Term Background)
- Opening Year (2021) with Project (Short-Term Background + Project)
- Project Design Year (20 years from project opening) without Project (Long-Term Background)
- Project Design Year (20 years from project opening) with Project (Long-Term Background + Project)



NOT TO SCALE



**EXHIBIT 2**  
PROJECT SITE PLAN

CHAMBERS AND HESS DEVELOPMENT

### 3.0- PROPOSED CONDITIONS

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The following is a brief description of the proposed Project characteristics such as intended access points and geometric layouts of the roadways being proposed. As illustrated in Exhibit 2, the project proposes three access points; one at S. Red Sky Drive, one at S. Chambers Road and one at E. Hess Road.

S. Red Sky Drive/S. Swift Fox Way-Future Project Dwy intersection will provide northerly access to the project, with a proposed fourth driveway at the existing roundabout and a yield control for the northbound approach matching the southbound, eastbound and westbound approaches. Lane configurations for this intersection are described under the short-term and long-term conditions sections within this report.

E. Hess Road/Future Project Dwy intersection will provide the southerly access to the project and is proposed as right-in/right-out intersection with stop control for the southbound approach. Lane configurations for this intersection are described under the short-term and long-term conditions sections within this report.

S. Red Sky Drive/Future Project Dwy intersection will provide the northerly right-in only access to the project, just west of the existing roundabout, with the following lane configurations; one shared through-right turn lane for the eastbound approach; and one through lane for the westbound approach.

#### 3.1- PROJECT TRIP GENERATION

The project traffic volumes generated by the proposed development were estimated using the nationally published trip generation rates from the Institute of Transportation Engineers (ITE), Trip Generation Manual, 10<sup>th</sup> Edition. The project is anticipated to generate a total of 9,371 daily weekday trips, of which 804 trips (435 inbound and 369 outbound) are anticipated to be generated during the AM peak hour, and 875 trips (429 inbound and 446 outbound) during the PM peak hour. These trips account for internal captures and bicycle and pedestrian modes trip reductions, as explained in a supplementary study conducted by Fehr and Peers for this project *MXD + Methodology and Validation Technical Memorandum, Dated May 06, 2020*. **Appendix D** contains this report.

**Table 3** summarizes the calculated trips generated by the project, provided by Fehr and Peers and minor edits made upon further coordination with Town Staff.

#### 3.2- PROJECT TRIP DISTRIBUTION

The project traffic distribution was estimated based on the site's proximity to the nearby major roadways, existing and future traffic patterns, adjacent land uses, as well as further coordination with the Town's staff. Based on the information contained within the Town of Parker's Transportation Plan, the various roadways and intersections analyzed are planned to be improved by the year 2035. With the anticipated improvements to the network circulation, it is important for the project distribution to accurately represent the study year conditions, for both short-term and long-term conditions. Consistent with the Anthology Traffic Study, once the fourth leg of Chambers Road at Hess Road intersection is built, traffic patterns are assumed to shift in the long-term. Some of the westbound right-turn traffic volumes from Hess Road, traveling north on Chambers Road, are assumed to shift and originate from the new southern Chambers Road leg. Due to the large increase in traffic volumes anticipated along

**TABLE 3  
PROJECT TRIP GENERATION SUMMARY  
CHAMBERS AND HESS DEVELOPMENT**

LAND USE	QUANTITY		ITE Trip Gen. 10th Edition Code	ADT	AM PEAK HOUR			PM PEAK HOUR		
					VOLUMES			VOLUMES		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Day Care Center	13	TSF	565	619	76	67	143	68	77	145
General Office Building	15	TSF	710	168	35	6	41	3	16	19
Pharmacy/Drugstore With a Drive-Through Window	12	TSF	881	1310	24	22	46	61	62	123
Drive-in Bank	3	TSF	912	324	14	10	24	26	26	51
Fast-Food Restaurant with Drive-Through Window	2.5	TSF	934	1177	51	49	100	43	39	82
Fast-Food Restaurant with Drive-Through Window	2	TSF	934	942	41	39	80	34	31	65
Coffee/Donut Shop with Drive-Through Window	2	TSF	937	1641	91	87	178	44	44	87
Quick Lubrication Vehicle Shop	3	TSF	941	209	13	4	17	11	15	26
Automobile Care Center <sup>1</sup>	6	TSF	942	See Footnote 1	9	5	14	12	14	26
Gasoline/Service Station with Convenience Market	16	VFP	945	3134	106	101	207	114	110	224
Automated Car Wash <sup>2</sup>	1	CWT	948	See Footnote 2			39	39	78	
Sub Total				9,524	460	390	850	455	473	926
Internal Capture				74	21	17	38	23	22	44
External Walk, Bike				79	4	4	8	3	4	7
<b>TOTAL NET NEW PROJECT TRIPS</b>				<b>9,371</b>	<b>435</b>	<b>369</b>	<b>804</b>	<b>429</b>	<b>446</b>	<b>875</b>

Source : *Fehr and Peers MXD + Methodology and Validation Technical Memorandum, Dated May 06, 2020* - with revisions based on Town's Comments on July 16, 2020, and further coordination with the Town on August 7, 2020

TSF = Thousand Square Feet

VFP = Vehicle Fueling Position

CWT = Car Wash Tunnels

<sup>1</sup>ITE Trip Generation Manual does not publish Weekday Daily Trips for Auto Care Centers. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

<sup>2</sup>ITE Trip Generation Manual does not publish Weekday Daily Trips or AM peak hour for Automated Car Wash. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.



**TABLE 4  
SHORT-TERM (2021) INTERSECTION OPERATIONS SUMMARY  
CHAMBERS AND HESS DEVELOPMENT**

#	INTERSECTION	CONTROL	DIR.	BACKGROUND (2021)				TOTAL <sup>3</sup> (2021)			
				AM Peak		PM Peak		AM Peak		PM Peak	
				DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>	DELAY <sup>1</sup>	LOS <sup>2</sup>
1	S. Chambers Rd/E. Hess Rd	(S)	Overall	27.5	C	13.6	B	34.1	C	18.0	B
2	S. Chambers Rd/S. Red Sky Dr	(OWSC)	WB-L	>50	F	19.6	C	>50	F	>50	F
			WB-R	16.5	C	9.6	A	23.9	C	10.6	B
			SB-L	12.4	B	8.4	A	16.5	C	9.1	A
			<i>With Recommended Improvements - Signal</i>	(S)	Overall	-	-	-	-	24.7	C
3	S. Red Sky Dr/S. Swift Fox Way	(R)	Overall	3.8	A	3.3	A	5.2	A	5.2	A
4	E. Hess Rd/Firefly Ln	(OWSC)	EB-L	15.9	C	9.5	A	19.5	C	10.7	B
			SB-LR	>50	F	47.0	E	>50	F	>50	F
			<i>With Recommended Improvements - Signal (By Others)</i>	(S)	Overall	-	-	-	-	7.4	A
5	E. Hess Rd/Project Dwy	(OWSC)	SB-R	-	-	-	-	40.8	E	17.8	C
6	S. Red Sky Dr/Project Dwy	N/A	EB-R	-	-	-	-	*	*	*	*

Footnotes:

Results calculated utilizing the methodologies described in Chapters 19, 20, 21, and 22 in the 6th edition of the HCM .

1) Delay is measured in seconds per vehicle.

2) Level of Service

3) Total= 2021 with Project Traffic Operations

(S)=Signalized, (TWSC)=Two-Way Stop Controlled, (AWSC)=All-Way Stop Controlled, (R)=Roundabout.

NB=Northbound, WB=Westbound, etc.

L=Left-turn movement, R= Right-turn movement, LT=Left-Through lane, LTR=Left-Through-Right lane , etc.

\* No conflicting movements. No Delays to report

**TABLE 5  
SHORT-TERM (2021) ROADWAY SEGMENT OPERATIONS  
CHAMBERS AND HESS DEVELOPMENT**

ROADWAY SEGMENT	ULTIMATE ROADWAY CLASSIFICATION	ULTIMATE CAPACITY (LOS D) <sup>1</sup>	FUNCTIONAL CLASSIFICATION	CAPACITY (LOS D) <sup>1</sup>	BACKGROUND (2021)			TOTAL (2021)		
					ADT	V/C	LOS	ADT	V/C	LOS
S. Chambers Road between S. Red Sky Drive and E. Hess Road	Principal Arterial (6L)	55,000	Arterial (4L)	40,000	16,325	0.41	A	18,670	0.467	A
E. Hess Road between S. Chambers Road and Firefly Lane	Arterial (4L)	40,000	Arterial (4L)	40,000	24,500	0.61	B	30,215	0.755	C
S. Red Sky Drive east of S. Chambers Road	Residential Collector (2L)	12,000	Residential Collector (2L)	12,000	1,560	0.13	A	6,715	0.560	A

**Footnote:**

<sup>1</sup> Source: Douglas County 2040 Transportation Plan *Table 4, Recommended Traffic Volume Thresholds* Dated June 2019

for all movements and the closely spaced intersections (less than half a mile) along the corridor in long-term conditions, the green time allowed for each movement is limited and the 40 second minimum bandwidth is unachievable. Based on the results, the long-term scenarios showed bandwidth between 22 – 56 seconds.

**Appendix H** contains the time space diagrams.

## 5.6 SAFETY

The traffic pattern proposed with this project presents few safety hazards. This project proposes three access locations, as mentioned in the previous sections where the entrances have approach grades meeting the Town’s criteria and will be constructed with standard pedestrian crossings with appropriate signage and markings. In addition, each intersection has been reviewed for appropriate sight distance. Conflicts are also minimized at the driveways along Hess Road and S. Red Sky Drive, as the driveways are proposed to be right-in/right-out onto Hess Road and right-in only onto S. Red Sky Drive, with less conflict points than a full-access intersection. These movements typically cause few traffic incidents, and therefore, are not anticipated to have any significant or unusual safety concerns at these driveways. The S. Red Sky Dr. access will connect to the existing roundabout. Roundabouts are by nature safer than a standard four-way intersection due to reduced conflict points and a reduction in the severity of conflicts in the intersection. Additionally, the project proposes to install a traffic signal and an additional westbound left turn lane to mitigate the S. Chambers Road and S. Red Sky Drive intersection in the future. This will invariably improve the safety of traffic movements at the S. Red Sky Drive and S. Chambers Road intersection. As a result, it is assumed that this project will improve the overall safety of the traffic patterns in this area in the future.

## 6.0- CONCLUSION AND MITIGATIONS/RECOMMENDATIONS

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Based on the analysis and results contained within this report, the traffic study evaluated any potential traffic impacts due to the proposed construction of the Chambers and Hess Development. In coordination with the Town of Parker, the study analyzed the nearby intersections and roadways based on the operational capabilities for the different study scenarios with and without the project generated traffic.

Recommendations are made in accordance with the Town of Parker’s benchmark for overall intersection to operate at LOS C or better for each peak period of every study year and that no approach or movement of an intersection shall fall below LOS E, and maintaining LOS D for all roadway segments. Based on the traffic generated by the project, and access roads requirements for the project site, the following are recommendations at the study area intersections and roadway segments:

- S. Chambers Road/E. Hess Road – Modify the traffic signal to allow for westbound U-turn movements for the short-term scenario, until the ultimate four-legged intersection is installed (by others) in the future. However, due to the high volumes proposed by the near-by Anthology development assumed to be opened by 2041; this intersection operates at LOS F. The recommendations provided by the Anthology study to install free-right turns for the westbound and eastbound directions have minimal improvements to the level of service and the intersection is anticipated to continue to operate at LOS F in the long-term.

- S. Chambers Road/S. Red Sky Drive - Install a traffic signal as warranted in the existing scenario. The traffic signal will help mitigate this intersection to operate at an acceptable level of service (LOS C or better). To further mitigate queuing for the long-term scenario with project conditions, install an additional westbound left turn lane at this intersection.
- S. Red Sky Drive/S. Swift Fox Way-Future Project Dwy - Install a yield controlled fourth-leg to provide a full northerly project access driveway at the existing roundabout, with a shared left-through-right lane for the northbound approach.
- E. Hess Road/Future Project Dwy – Install a right-in/right-out driveway with stop control for the southbound approach to provide a southerly access to the project.
- S. Red Sky Drive/ Future Project Dwy - Install a right-in only driveway along S. Red Sky Drive to provide a secondary northerly access to the project, west of the existing roundabout. This will also alleviate project trips from the roundabout.

The following are additional monitoring and coordination recommendations related to the nearby study area intersections to be installed by others:

- E. Hess Road/Fire Fly Lane – the installation of a traffic signal would mitigate this intersection to operate at acceptable levels of service.