

ADDENDUM LETTER

GRASSY CREEK MIXED USE DEVELOPMENT Knox County

TRAFFIC IMPACT STUDY

Prepared for :
MADDOX PROPERTIES

Prepared By:

**CDM
Smith**

June 11, 2018



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June 11, 2018

Mr. Steve K. Maddox
Maddox Properties
101 Dalton Place Way
Knoxville, Tennessee 37912

RE: GRASSY CREEK MIXED USE DEVELOPMENT ADDENDUM, KNOX COUNTY, TN

Dear Mr. Maddox:

CDM Smith has completed its evaluation of the revised accesses for the above referenced site reflecting the changes as follows:

1. Addition of a full access to the shopping center/grocery store uses opposite Kara Way on Malone Creek Road.
2. Addition of a full access for the high turnover sit-down restaurant to Kara Way.
3. Removal of the right-turn only access for the grocery store fuel pumps.
4. Added right-turn only access for the grocery store to and from Schaad Road.

Trips generated for the Grassy Creek Mixed Use development have been reassigned to reflect this access revisions. Revised projected 2022 traffic is illustrated in the revised **Figures 45-47**. Traffic reassignments associated with the access revisions noted above as 1,2, and 3 have minimal impacts on the site circulation and its access; whereas, the added right-turn access to and from Schaad Road noted above as 4 has a more significant impact on the projected traffic assignments. This right-turn access into Parcel 15 would require a right-turn lane. With this access from Schaad Road, the reassignment impacts the following movements:

- The southbound right-turn movement from Schaad Road to Maloney Creek Road would become reassigned as a southbound thru movement on Schaad Road.
- The left-turn ingress to the grocery store from Maloney Creek Road would be less desirable compared to the right-in from Schaad Road.

From the analyses of the revised 2022 projected traffic conditions, the access serving the grocery store use and the share access for parcels 8 and 9 is significantly improved with a reduction in the STOP controlled delay. The proposed intersection of Kara Way and the shopping center access with Maloney Creek Road should function with an acceptable LOS C.



The access from the high turnover sit-down restaurant (Parcel 10) should operate with very good levels of service as its generated trips are not significant and have minimal impacts on the adjacent roads. Access for Parcel 10 should experience a minimum LOS B. Revised **Table 7** presents the re-evaluation of the study intersections and parcel accesses.

Revised recommendations are as follows and are illustrated in revised **Figures 52-54**.

BUILDOUT and PHASE 1:

1. Construct a minimum 3-lane section with a minimum 60-foot right-of-way for the proposed Malone Creek Road connection between Schaad Road and Oak Ridge Highway, providing for site access as well as diverted traffic volumes.
2. Construct a minimum 2-lane section with a 50-foot right-of-way for the proposed Kara Way connection between Malone Creek Road and Oak Ridge Highway, providing for site accesses as well as diverted traffic volumes.
3. Signalize the proposed Malone Creek Road at its intersections with Oak Ridge Highway and Beaver Ridge Road.
 - o Construct westbound left-turn lane on Oak Ridge Highway at the Malone Creek Road site access with a minimum 100-foot storage.
 - o Construct eastbound right-turn lane on Oak Ridge Highway at the Malone Creek Road site access with the maximum length available without impacting the box culvert under Oak Ridge Highway. The concept plan shows that length to be about 75-foot at full 12-foot width.
 - o Construct separate northbound 200-foot left- and thru/right-turn lanes at the Malone Creek Road site access to Oak Ridge Highway with provision for a second 200-foot left-turn lane in the median for future expansion when TDOT completes the Oak Ridge Highway widening.
4. Signalize the proposed Malone Creek Road at its intersections with Schaad Road and Ball Camp Pike.
 - o Construct separate eastbound left-turn, thru, and right-turn lanes at the primary Malone Creek Road site access to Schaad Road (opposite Ball Camp Pike). The eastbound right-turn lane should be constructed at a minimum length of 200 feet.
 - o Construct a southbound 200-foot minimum right-turn lane on Schaad Road.
 - o Construct a 200-foot westbound left-thru lane on Ball Camp Pike with striping to reflect a developed right-turn lane on Ball Camp Pike in the location same as the existing right-turn lane in 2018.
 - o Extend the existing northbound left-turn lane on Schaad Road to provide a total length of 200-foot with a 100-foot taper.



5. Construct eastbound right-turn lane on Oak Ridge Highway at the Kara Way site accesses with a minimum of 50 feet storage. Possible design alternatives may consider a large turning radius to allow for a speed reduction while turning right. A right-turn taper can be provided for a minimum improvement.
6. Construct eastbound right-turn lane on Oak Ridge Highway at the site accesses to Parcels 3 & 4 with a minimum of 50 feet storage. Possible design alternatives may consider a large turning radius to allow for a speed reduction while turning right. A right-turn taper can be provided for a minimum improvement.
7. Construct eastbound right-turn lane on Oak Ridge Highway at the site accesses to Parcel 5 with a minimum of 50 feet storage. Possible design alternatives may consider a large turning radius to allow for a speed reduction while turning right. A right-turn taper can be provided for a minimum improvement.
8. Construct commercial driveway with a separate left- and right-turn lane egress from Parcel 5. The entering left-turning traffic would use the existing two-way left-turn lane on Oak Ridge Highway.
9. Construct southbound right-turn lane on Schaad Road at the site accesses to Parcel 15 with a minimum of 50 feet storage and 100-foot taper.
10. Construct commercial driveway entrance and exit with a shared left- and right-turn lane egress from Parcel 15. The entering left-turning traffic would use the existing left-turn lane on Schaad Road.
11. Construct commercial driveway entrance and exit egress from Parcel 6. The entering right-turning traffic would use the recommended (Number 14 below) right-turn lane on Schaad Road constructed by Knox County.
12. Construct southbound right-turn only lane on Ball Camp Pike (abandoned section southern end) at Ball Camp Pike. The westbound approach of Ball Camp Pike should provide a two-lane approach through this intersection to Schaad Road. Left-turns from Ball Camp Pike onto Ball Camp Pike (abandoned section southern end) should be restricted due to the existing intersection spacing and expected signal queue lengths on Ball Camp Pike.
13. Minimize landscaping, using low growing vegetation and signing at the accesses to insure safe sight distance is maintained.
14. Any roadway and site modifications should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, the Tennessee Department of Transportation, the Knox County Engineering and Public Works, and the City of Knoxville.



Mr. Steve K. Maddox
June 11, 2018
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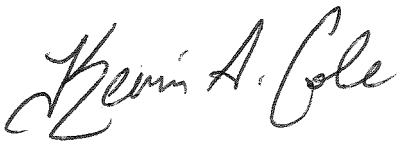
BACKGROUND CONDITIONS:

15. Modify Schaad Road at Oak Ridge Highway.
 - o Construct a northbound exclusive right-turn lane on Schaad Road at its intersection with Oak Ridge Highway, which is recommended to extend back to the Ball Camp Pike intersection.
 - o Modify lane arrow pavement marking on Schaad Road southbound at Oak Ridge Highway to permit through movements when Schaad Road extension is complete.
16. Relocate/replace the existing 40 MPH speed limit sign to the west of Beaver Ridge Road and Site Access signalized intersection.

Should you have any questions, please call me.

Sincerely,

CDM SMITH INC



Kevin A Cole, P.E.
Senior Transportation Engineer



- Enclosure
- Figure 45: 2022 Projected Traffic
 - Figure 46: 2022 Projected Driveway Traffic
 - Figure 47: 2022 Projected Internal Driveway Traffic
 - Table 7: 2022 Full Buildout Capacity and Levels of Service
 - Figure 52: Recommended Intersection Geometry and Traffic Control
 - Figure 53: Recommended Driveway Geometry and Traffic Control
 - Figure 54: Recommended Internal Intersection Geometry and Traffic Control
 - Figure 55: Concept Plan Access Types
 - Appendix
 - 2022 Buildout Conditions Synchro Analyses
 - 2022 Buildout Conditions Schaad Road Right-turn Access



2022 PROJECTED TRAFFIC Grassy Creek Mixed Use Development

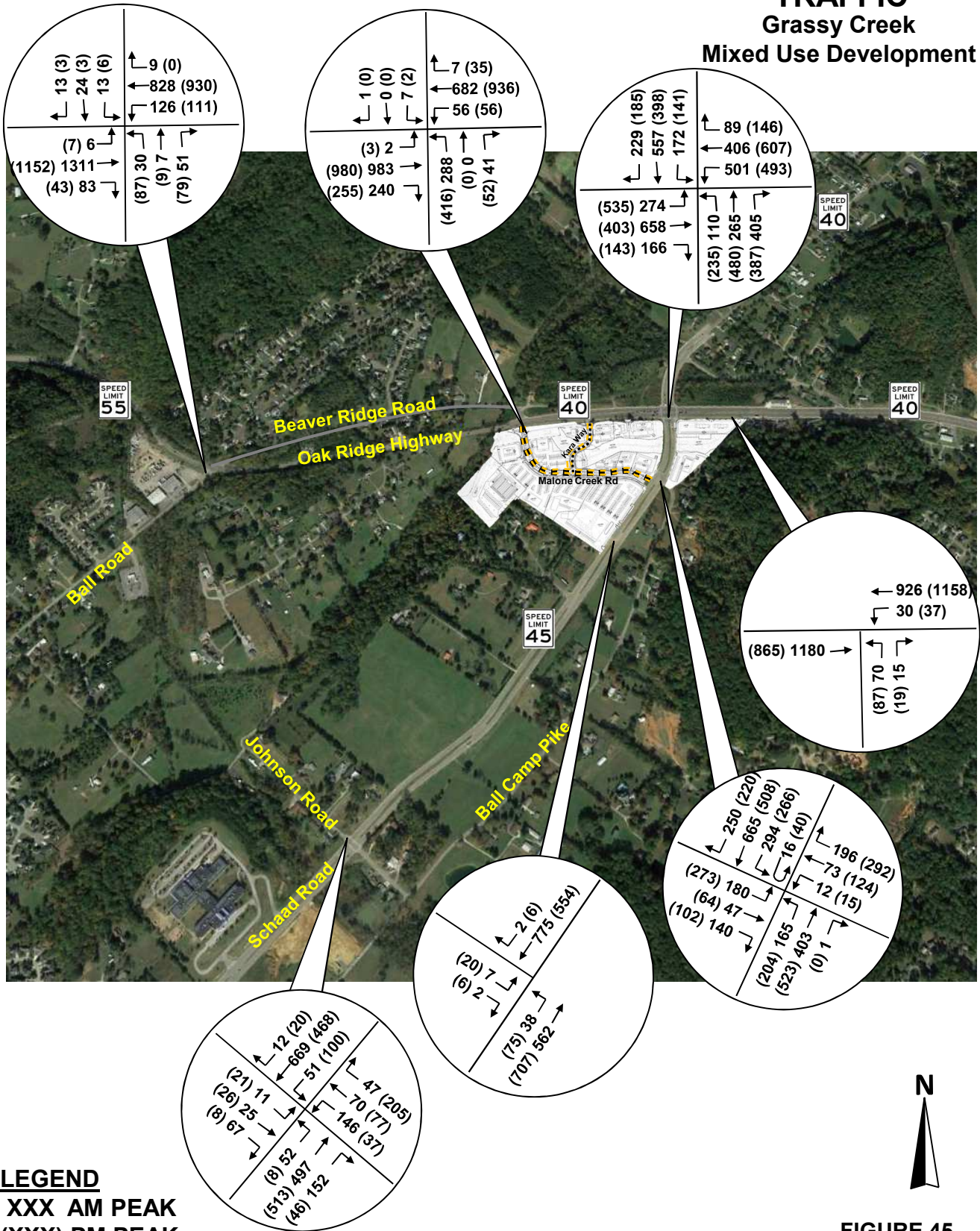
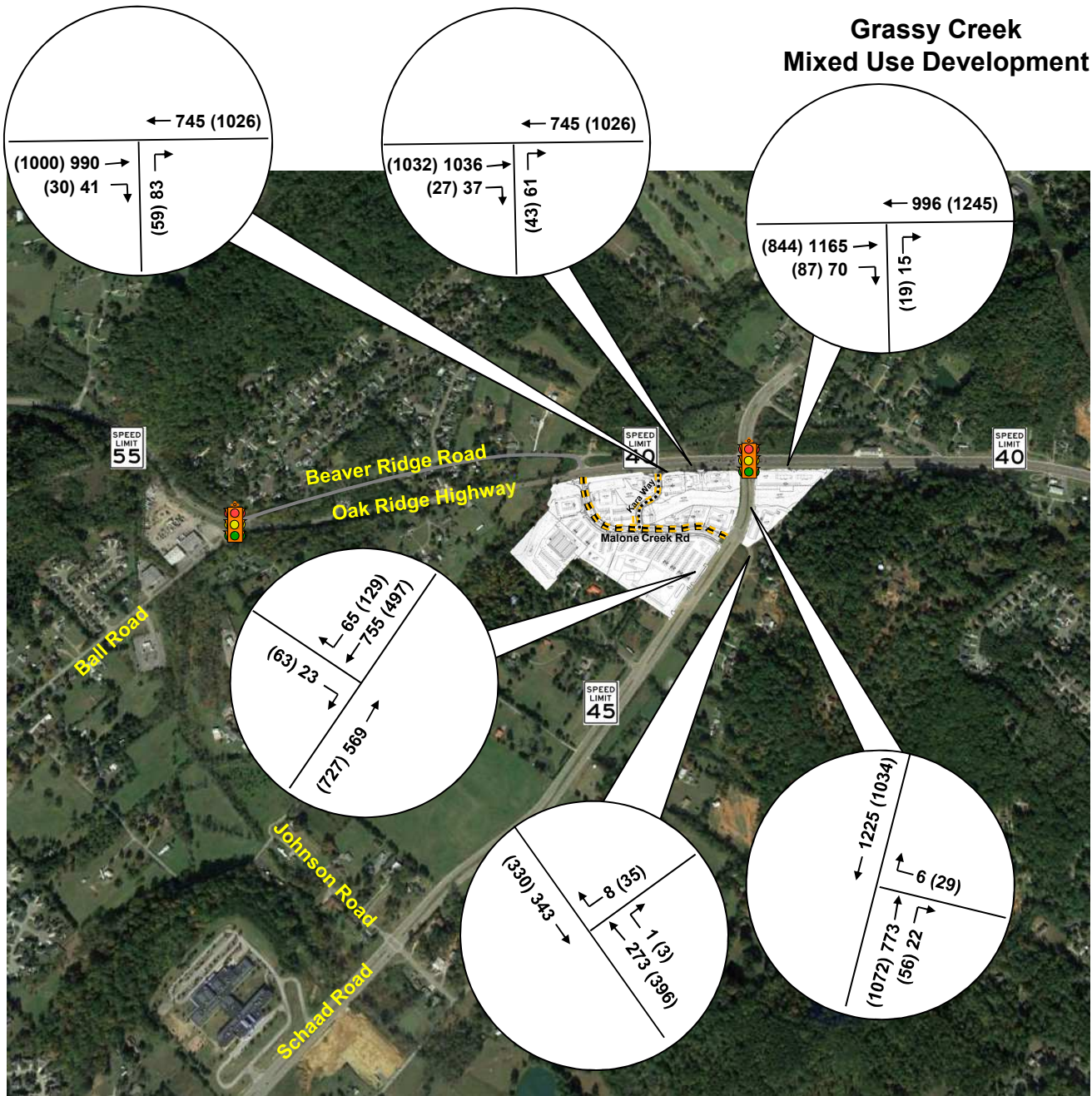


FIGURE 45

2022 PROJECTED DRIVEWAY TRAFFIC

Grassy Creek Mixed Use Development

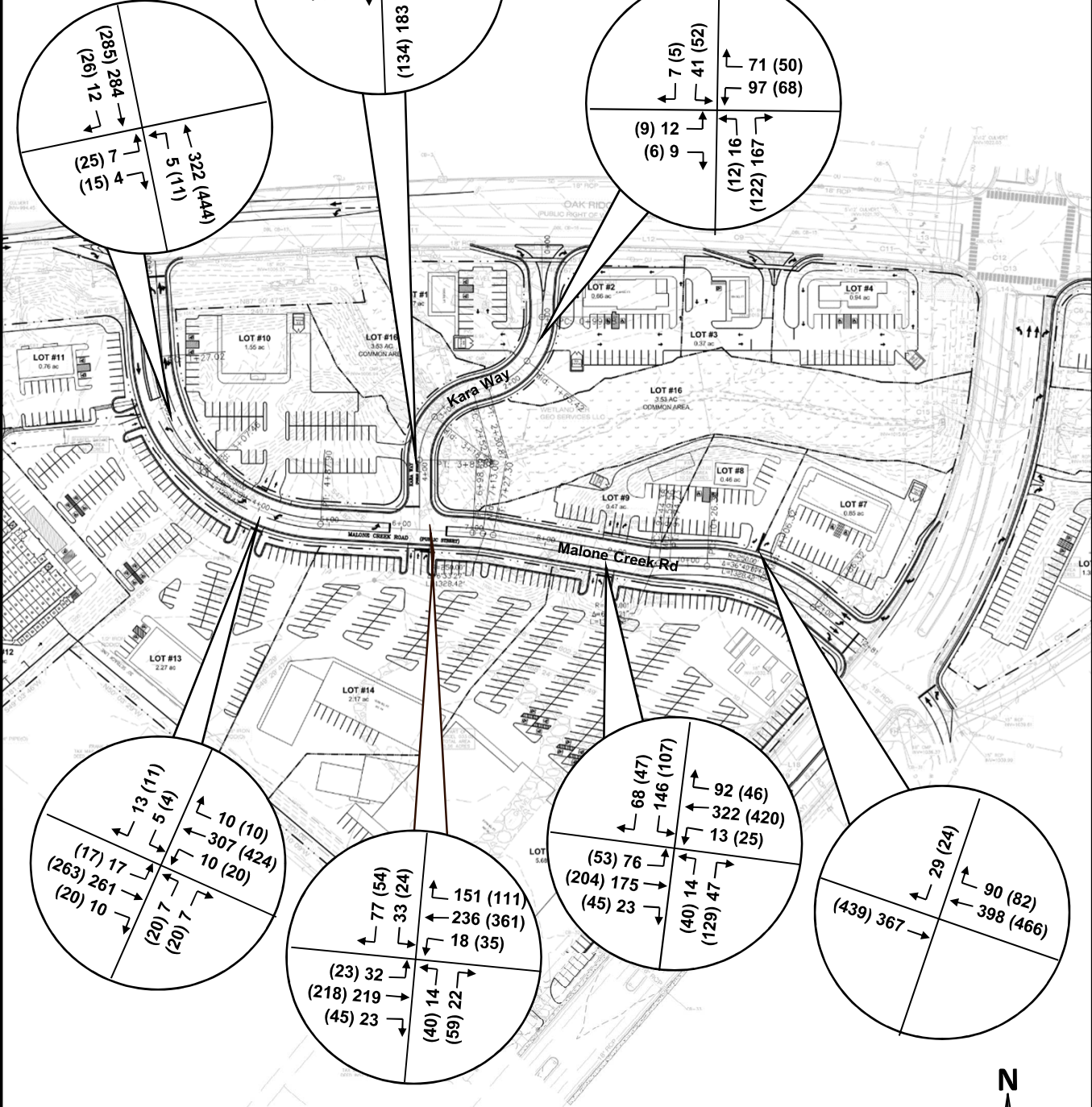


LEGEND
 XXX AM PEAK
 (XXX) PM PEAK



FIGURE 46

2022 PROJECTED INTERNAL DRIVEWAY TRAFFIC Grassy Creek Mixed Use Development



LEGEND
 XXX AM PEAK
 (XXX) PM PEAK



FIGURE 47

**TABLE 7
2022 FULL BUILDOUT CAPACITY AND LEVEL OF SERVICE**

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	V/C	DELAY	LOS
Oak Ridge Highway at Ball Road/Beaver Ridge Road	SIGNAL	AM			
		PM			
Optimized Cycle & Splits	<i>SIGNAL</i>	<i>AM</i>	--	18.0	<i>B</i>
	<i>Mitigation</i>	<i>PM</i>	--	14.4	<i>B</i>
Oak Ridge Highway at Beaver Ridge Road/Malone Creek Road	STOP	AM	0.10 / 4.60	48.2 / >1000	E / F
	SB / NB	PM	0.27 / >5	176.0 / >1000	F / F
Signalize Malone Creek Road and Install Signal Coordination	<i>SIGNAL</i>	<i>AM</i>	--	8.2	<i>A</i>
	<i>Mitigation</i>	<i>PM</i>	--	16.6	<i>B</i>
Oak Ridge Highway at Schaad Road	SIGNAL	AM			
		PM			
Optimized Cycle & Splits	<i>SIGNAL</i>	<i>AM</i>			
	<i>Mitigation</i>	<i>PM</i>			
Add NB Right-turn Lane on Schaad Rd	<i>SIGNAL</i>	<i>AM</i>	--	55.4	<i>E</i>
	<i>Mitigation</i>	<i>PM</i>	--	55.0	<i>E</i>
Add NB Right-turn Lane on Schaad Rd without Malone Creek Rd	<i>SIGNAL</i>	<i>AM</i>			
	<i>Mitigation</i>	<i>PM</i>			
Schaad Road at Ball Camp Pike/Malone Creek Road	STOP	AM	>5 / 2.69	>1000 / >1000	F / F
	WB / EB-L	PM	>5 / 4.35	>1000 / >1000	F / F
Signalize Malone Creek Road and Add Right-turn Lanes on 3 approaches	<i>SIGNAL</i>	<i>AM</i>	--	26.2	<i>C</i>
	<i>Mitigation</i>	<i>PM</i>	--	33.3	<i>C</i>
Schaad Road at Johnson Road	STOP	AM	1.96 / 0.78	558.1 / 87.4	F / F
	WB / EB	PM	0.96 / 0.66	77.9 / 102.4	F / F
Oak Ridge Highway at Parcel 5	STOP	AM	0.49 / 0.04	47.8 / 14.0	E / B
	NB-L/NB-R	PM	0.47 / 0.04	37.6 / 11.9	E / B
Schaad Road at Parcel 13/14/15 Rear Access	STOP	AM	0.05 / 0.05	24.8 / 9.8	C / A
	EB/NB-L	PM	0.14 / 0.09	24.8 / 9.1	C / A
Oak Ridge Highway at Kara Way (Parcel 1/2 Right-In/Out)	STOP	AM	0.19	14.0	B
	Rt In/Out	PM	0.13	13.6	B
Oak Ridge Highway at Parcel 3/4 Right-In/Out Driveway	STOP	AM	0.14	13.9	B
	Rt In/Out	PM	0.10	13.5	B
Oak Ridge Highway at Parcel 5 Right-In/Out Driveway	STOP	AM	0.04	13.9	B
	Rt In/Out	PM	0.04	11.8	B
Schaad Road at Parcel 6 Right-In/Out Driveway	STOP	AM	0.01	12.3	B
	Rt In/Out	PM	0.08	15.0	C
Malone Creek Road at Parcel 11/12	STOP	AM	0.02 / 0.00	11.4 / 7.9	B / A
	EB/NB-L	PM	0.08 / 0.01	12.5 / 8.0	B / A
Malone Creek Road at Parcel 10/13	STOP	AM	0.03 / 0.04	12.9 / 11.8	B / B
	NB/SB	PM	0.11 / 0.04	15.3 / 13.4	C / B
Malone Creek Road at Kara Way/Parcel 14	STOP	AM	0.10 / 0.24	14.6 / 14.4	B / B
	NB/SB	PM	0.30 / 0.23	18.0 / 16.8	C / C
Malone Creek Road at Parcel 9/8/15	STOP	AM	0.13 / 0.62	12.7 / 39.2	B / E
	NB/SB-L	PM	0.38 / 0.64	16.9 / 55.0	E / F
Malone Creek Road at Parcel 7/8	STOP	AM	0.05	11.5	B
	Rt In/Out	PM	0.05	12.1	B
Kara Way at Parcel 1/2	STOP	AM	0.03 / 0.03	9.8 / 7.7	A / A
	EB-L/SB-L	PM	0.02 / 0.15	9.4 / 9.9	A / A
Kara Way at Parcel 10	STOP	AM	0.01 / 0.01	8.9 / 0.0	A / A
	WB/NB-L	PM	0.01 / 0.01	8.7 / 0.0	A / A
Ball Camp Pike at Ball Camp Pike southern end	STOP	AM	0.01	9.9	A
	WB-R	PM	0.06	11.1	B

Note: Average vehicle delay estimated in seconds. STOP control analyses presented by total minor approaches.

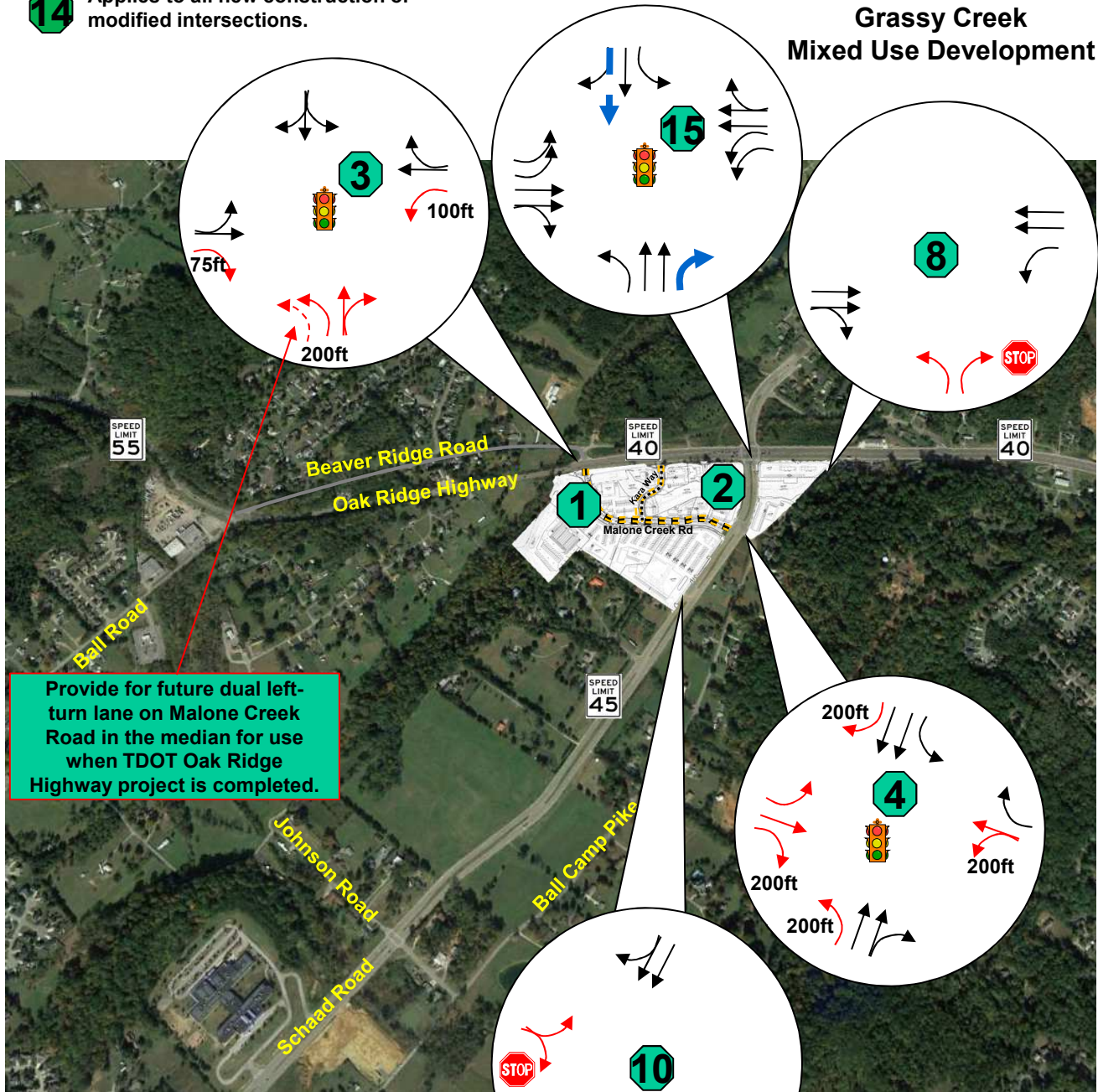
Indicates Completed Knox County and TDOT Road Projects.

RECOMMENDED INTERSECTION GEOMETRY AND TRAFFIC CONTROL

Grassy Creek Mixed Use Development

13 Maintain Sight Distance.

14 Applies to all new construction or modified intersections.



Provide for future dual left-turn lane on Malone Creek Road in the median for use when TDOT Oak Ridge Highway project is completed.

LEGEND





-  Existing Turning Movement
-  Proposed Turning Movement
-  Modified Pavement Marking
-  Traffic Control Device



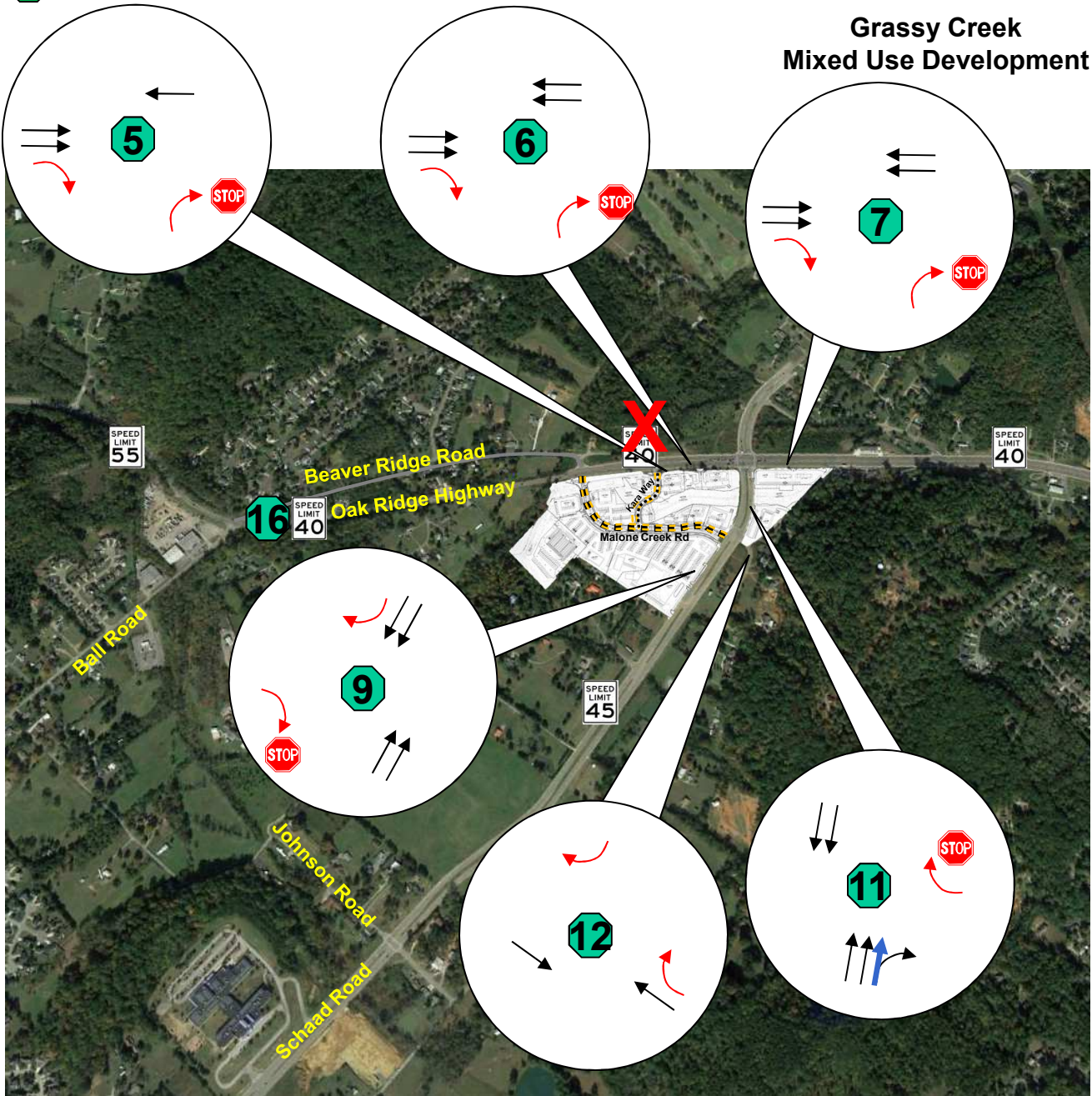
FIGURE 52

13 Maintain Sight Distance.

14 Applies to all new construction or modified intersections.

RECOMMENDED DRIVEWAY GEOMETRY AND TRAFFIC CONTROL

Grassy Creek Mixed Use Development



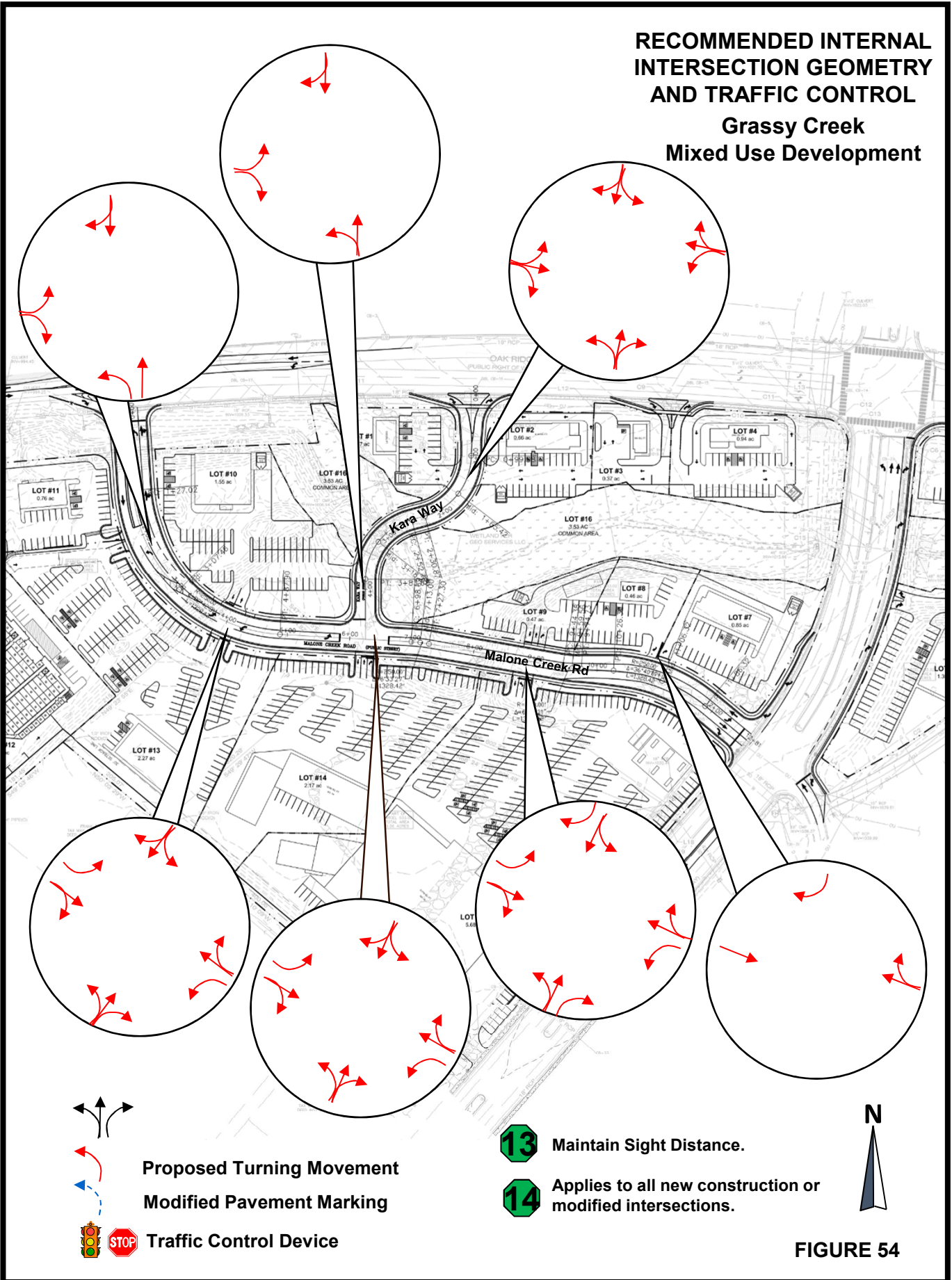
- Existing Turning Movement
- Proposed Turning Movement
- Modified Pavement Marking
- Traffic Control Device



FIGURE 53

RECOMMENDED INTERNAL INTERSECTION GEOMETRY AND TRAFFIC CONTROL

Grassy Creek Mixed Use Development



Proposed Turning Movement

Modified Pavement Marking

Traffic Control Device



Maintain Sight Distance.



Applies to all new construction or modified intersections.



FIGURE 54

CONCEPT PLAN ACCESS TYPES

Grassy Creek Mixed Use Development

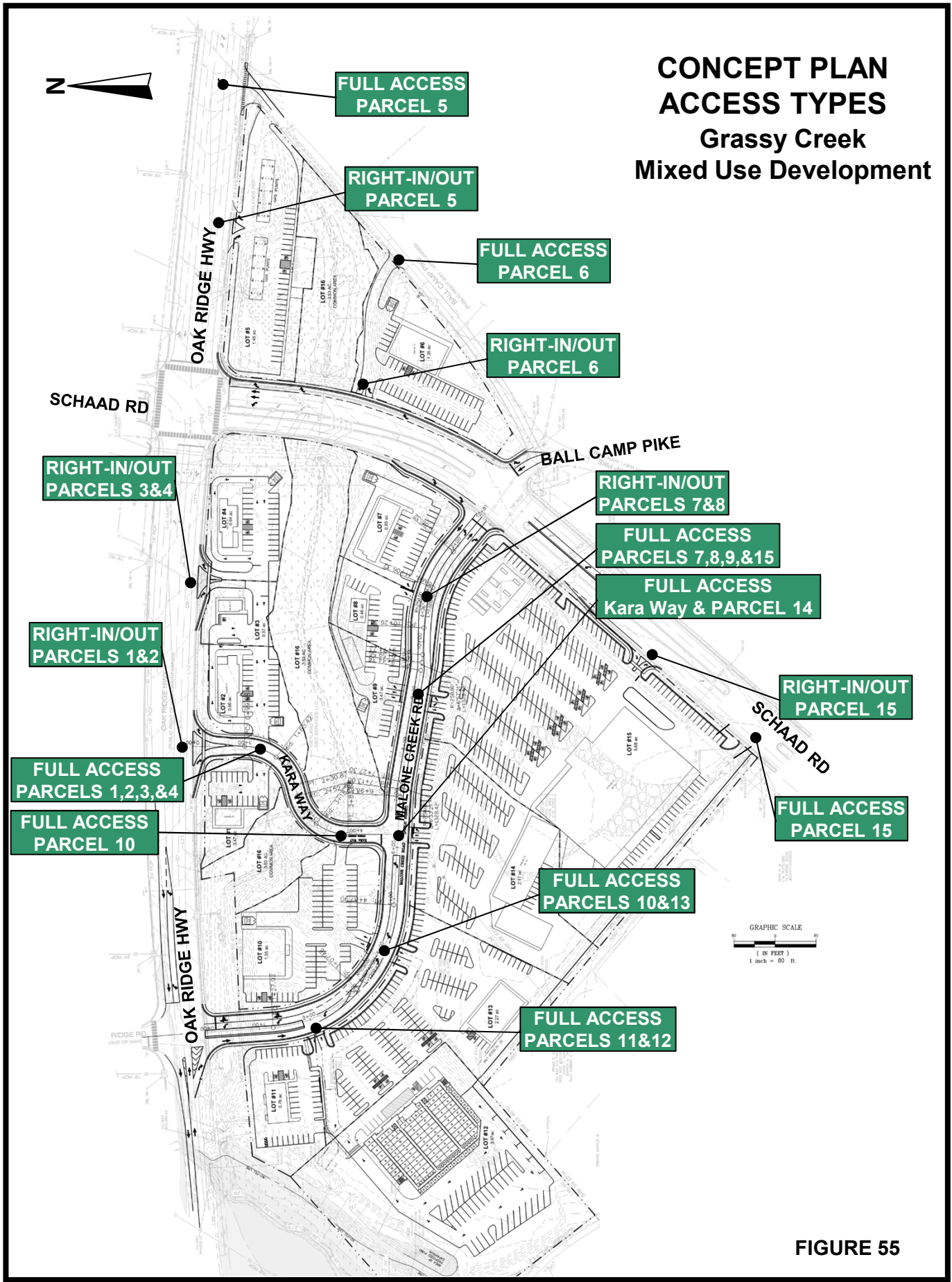


FIGURE 55

APPENDIX

**SYNCHRO
ANALYSIS**

HCM REPORTS

2022

**IMPROVED NETWORK
AM PEAK HOUR**

OPTIMIZED TIMING

**WITH
MALONE CREEK ROAD**

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	0	9	97	0	71	16	0	167	34	0	7
Future Vol, veh/h	12	0	9	97	0	71	16	0	167	34	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	0	10	105	0	77	17	0	182	37	0	8

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	242	294	4	208	207	91	8	0	0	182	0	0
Stage 1	78	78	-	125	125	-	-	-	-	-	-	-
Stage 2	164	216	-	83	82	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	712	617	1080	749	690	967	1612	-	-	1393	-	-
Stage 1	931	830	-	879	792	-	-	-	-	-	-	-
Stage 2	838	724	-	925	827	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	636	593	1080	721	663	967	1612	-	-	1393	-	-
Mov Cap-2 Maneuver	636	593	-	721	663	-	-	-	-	-	-	-
Stage 1	920	808	-	868	782	-	-	-	-	-	-	-
Stage 2	762	715	-	892	805	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		10.8		0.6		6.3	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1612	-	-	772	808	1393	-
HCM Lane V/C Ratio	0.011	-	-	0.03	0.226	0.027	-
HCM Control Delay (s)	7.3	0	-	9.8	10.8	7.7	0
HCM Lane LOS	A	A	-	A	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	0.9	0.1	-

Timings
101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

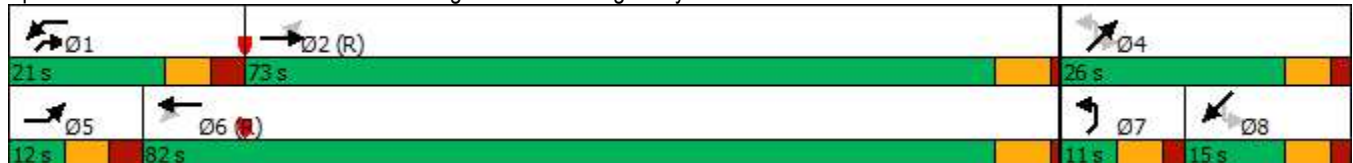


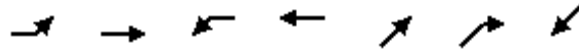
Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT
Lane Configurations	↖	↗	↖	↗		↖	↗		↖
Traffic Volume (vph)	6	1311	126	828	30	7	51	13	24
Future Volume (vph)	6	1311	126	828	30	7	51	13	24
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA
Protected Phases	5	2	1	6	7	4	1		8
Permitted Phases	2		6		4		4	8	
Detector Phase	5	2	1	6	7	4	1	8	8
Switch Phase									
Minimum Initial (s)	5.0	25.0	5.0	25.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	12.0	31.0	12.0	31.0	11.0	14.0	12.0	14.0	14.0
Total Split (s)	12.0	73.0	21.0	82.0	11.0	26.0	21.0	15.0	15.0
Total Split (%)	10.0%	60.8%	17.5%	68.3%	9.2%	21.7%	17.5%	12.5%	12.5%
Yellow Time (s)	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	3.0	1.0	2.0	2.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	7.0	6.0		6.0	7.0		6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead		Lead	Lag	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max	Max
Act Effct Green (s)	76.2	72.2	87.0	85.6		20.0	34.8		20.0
Actuated g/C Ratio	0.64	0.60	0.72	0.71		0.17	0.29		0.17
v/c Ratio	0.02	0.72	0.59	0.36		0.17	0.11		0.19
Control Delay	5.5	19.6	26.8	8.6		45.2	14.6		39.0
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.5	19.6	26.8	8.6		45.2	14.6		39.0
LOS	A	B	C	A		D	B		D
Approach Delay		19.5		11.0		27.7			39.0
Approach LOS		B		B		C			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 36 (30%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 16.9
 Intersection Capacity Utilization 71.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy



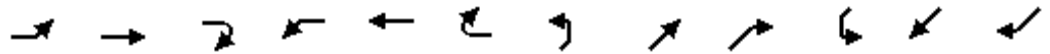


Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWT
Lane Group Flow (vph)	7	1515	137	910	41	55	54
v/c Ratio	0.02	0.72	0.59	0.36	0.17	0.11	0.19
Control Delay	5.5	19.6	26.8	8.6	45.2	14.6	39.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.5	19.6	26.8	8.6	45.2	14.6	39.0
Queue Length 50th (ft)	1	397	38	133	28	11	29
Queue Length 95th (ft)	5	544	m89	m174	62	41	m66
Internal Link Dist (ft)		5331		2497	2027		1029
Turn Bay Length (ft)	150		200			100	
Base Capacity (vph)	416	2114	305	2519	235	551	286
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.72	0.45	0.36	0.17	0.10	0.19

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2022 Buildout AM FINAL (SCHAAD/RT/ORH)
 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	6	1311	83	126	828	9	30	7	51	13	24	13
Future Volume (vph)	6	1311	83	126	828	9	30	7	51	13	24	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	3508		1770	3533			1791	1583		1775	
Flt Permitted	0.31	1.00		0.09	1.00			0.76	1.00		0.93	
Satd. Flow (perm)	578	3508		161	3533			1413	1583		1667	
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)	7	1425	90	137	900	10	33	8	55	14	26	14
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	27	0	9	0
Lane Group Flow (vph)	7	1511	0	137	909	0	0	41	28	0	45	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	73.2	72.2		88.0	80.0			20.0	28.8		20.0	
Effective Green, g (s)	73.2	72.2		88.0	80.0			20.0	28.8		20.0	
Actuated g/C Ratio	0.61	0.60		0.73	0.67			0.17	0.24		0.17	
Clearance Time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			3.0	2.0		3.0	
Lane Grp Cap (vph)	362	2110		236	2355			235	379		277	
v/s Ratio Prot	0.00	c0.43		c0.04	0.26				0.01			
v/s Ratio Perm	0.01			0.38				c0.03	0.01		0.03	
v/c Ratio	0.02	0.72		0.58	0.39			0.17	0.07		0.16	
Uniform Delay, d1	9.2	16.7		15.8	9.0			42.9	35.3		42.8	
Progression Factor	1.00	1.00		1.84	1.15			1.00	1.00		1.04	
Incremental Delay, d2	0.0	2.1		2.1	0.4			0.4	0.0		1.2	
Delay (s)	9.2	18.8		31.1	10.8			43.3	35.3		45.8	
Level of Service	A	B		C	B			D	D		D	
Approach Delay (s)		18.8			13.5			38.7			45.8	
Approach LOS		B			B			D			D	

Intersection Summary

HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Edition methodology does not support a perm + prot left-turn type from a shared lane. Left-turn bay is needed for phases 7.

Intersection

Int Delay, s/veh 218.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑		↘	↗			↕	
Traffic Vol, veh/h	2	983	240	56	682	7	288	0	41	7	0	1
Future Vol, veh/h	2	983	240	56	682	7	288	0	41	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	250	150	-	-	200	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	1068	261	61	741	8	313	0	45	8	0	1

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	749	0	0	1329
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.14	-	-	4.14
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.22	-	-	2.22
Pot Cap-1 Maneuver	856	-	-	515
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	856	-	-	515
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1	\$ 1528.8	48.2
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	68	491	856	-	-	515	-	-	92
HCM Lane V/C Ratio	4.604	0.091	0.003	-	-	0.118	-	-	0.095
HCM Control Delay (s)	\$ 1744.6	13.1	9.2	-	-	12.9	-	-	48.2
HCM Lane LOS	F	B	A	-	-	B	-	-	E
HCM 95th %tile Q(veh)	34.1	0.3	0	-	-	0.4	-	-	0.3

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Timings
103: Schaad Rd & Oak Ridge Hwy

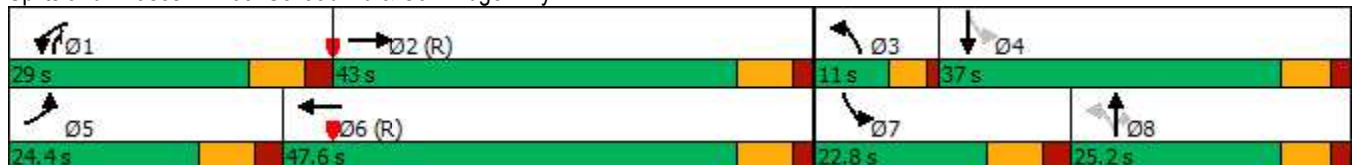


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↖	↗↗	↖↖	↗↗	↖	↗↗	↗	↖	↗↗
Traffic Volume (vph)	274	658	501	406	110	265	405	172	557
Future Volume (vph)	274	658	501	406	110	265	405	172	557
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	pm+ov	pm+pt	NA
Protected Phases	5	2	1	6	3	8	1	7	4
Permitted Phases					8		8	4	
Detector Phase	5	2	1	6	3	8	1	7	4
Switch Phase									
Minimum Initial (s)	6.0	20.0	6.0	20.0	5.0	15.0	6.0	6.0	15.0
Minimum Split (s)	13.5	27.0	13.5	27.0	9.5	21.5	13.5	13.5	21.5
Total Split (s)	24.4	43.0	29.0	47.6	11.0	25.2	29.0	22.8	37.0
Total Split (%)	20.3%	35.8%	24.2%	39.7%	9.2%	21.0%	24.2%	19.0%	30.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	4.5	5.0	5.0	4.5
All-Red Time (s)	2.5	2.0	2.5	2.0	1.0	2.0	2.5	2.5	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.0	7.5	7.0	4.5	6.5	7.5	7.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	None	Max
Act Effct Green (s)	14.3	36.6	20.9	43.2	29.5	21.0	48.5	40.1	30.5
Actuated g/C Ratio	0.12	0.30	0.17	0.36	0.25	0.18	0.40	0.33	0.25
v/c Ratio	0.73	0.84	0.91	0.43	0.74	0.47	0.61	0.54	0.95
Control Delay	61.6	32.4	69.1	29.4	56.4	47.9	22.8	35.8	62.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	32.4	69.1	29.4	56.4	47.9	22.8	35.8	62.2
LOS	E	C	E	C	E	D	C	D	E
Approach Delay		39.7		49.4		36.1			57.5
Approach LOS		D		D		D			E

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 118 (98%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 45.9
 Intersection LOS: D
 Intersection Capacity Utilization 87.8%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 103: Schaad Rd & Oak Ridge Hwy



Queues

103: Schaad Rd & Oak Ridge Hwy



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	298	895	545	538	120	288	440	187	854
v/c Ratio	0.73	0.84	0.91	0.43	0.74	0.47	0.61	0.54	0.95
Control Delay	61.6	32.4	69.1	29.4	56.4	47.9	22.8	35.8	62.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	32.4	69.1	29.4	56.4	47.9	22.8	35.8	62.2
Queue Length 50th (ft)	101	336	214	157	63	107	178	107	326
Queue Length 95th (ft)	148	#423	#309	215	#140	155	297	169	#457
Internal Link Dist (ft)		267		278		348			506
Turn Bay Length (ft)	175		400		200			250	
Base Capacity (vph)	483	1064	615	1254	163	619	732	370	897
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.84	0.89	0.43	0.74	0.47	0.60	0.51	0.95

Intersection Summary

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

HCM 6th Signalized Intersection Summary
103: Schaad Rd & Oak Ridge Hwy

2022 Buildout AM FINAL (SCHAAD/RT/ORH)

Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↔		↔↔	↕↔		↔	↕↕	↔	↔	↕↔	
Traffic Volume (veh/h)	274	658	166	501	406	89	110	265	405	172	557	229
Future Volume (veh/h)	274	658	166	501	406	89	110	265	405	172	557	229
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	298	715	180	545	441	97	120	288	440	187	605	249
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	357	862	217	597	1090	238	163	654	566	318	624	257
Arrive On Green	0.10	0.31	0.31	0.17	0.38	0.38	0.05	0.18	0.18	0.10	0.25	0.25
Sat Flow, veh/h	3456	2812	708	3456	2900	633	1781	3554	1585	1781	2456	1010
Grp Volume(v), veh/h	298	452	443	545	269	269	120	288	440	187	438	416
Grp Sat Flow(s),veh/h/ln	1728	1777	1743	1728	1777	1756	1781	1777	1585	1781	1777	1689
Q Serve(g_s), s	10.2	28.4	28.4	18.6	13.4	13.6	6.5	8.6	22.1	9.9	29.2	29.3
Cycle Q Clear(g_c), s	10.2	28.4	28.4	18.6	13.4	13.6	6.5	8.6	22.1	9.9	29.2	29.3
Prop In Lane	1.00		0.41	1.00		0.36	1.00		1.00	1.00		0.60
Lane Grp Cap(c), veh/h	357	544	534	597	668	660	163	654	566	318	452	429
V/C Ratio(X)	0.83	0.83	0.83	0.91	0.40	0.41	0.74	0.44	0.78	0.59	0.97	0.97
Avail Cap(c_a), veh/h	487	544	534	619	668	660	163	654	566	369	452	429
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.8	38.7	38.7	48.7	27.5	27.6	39.6	43.5	34.4	33.5	44.3	44.3
Incr Delay (d2), s/veh	6.7	13.7	13.9	17.1	1.8	1.9	16.0	2.1	10.1	0.8	35.3	36.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	13.8	13.6	9.3	5.9	5.9	3.5	3.9	12.5	4.2	16.9	16.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.5	52.4	52.6	65.9	29.3	29.5	55.5	45.6	44.5	34.2	79.5	80.9
LnGrp LOS	E	D	D	E	C	C	E	D	D	C	E	F
Approach Vol, veh/h		1193			1083			848			1041	
Approach Delay, s/veh		54.3			47.8			46.4			72.0	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	28.2	43.8	11.0	37.0	19.9	52.1	19.4	28.6				
Change Period (Y+Rc), s	7.5	7.0	4.5	6.5	7.5	7.0	7.5	6.5				
Max Green Setting (Gmax), s	21.5	36.0	6.5	30.5	16.9	40.6	15.3	18.7				
Max Q Clear Time (g_c+I1), s	20.6	30.4	8.5	31.3	12.2	15.6	11.9	10.6				
Green Ext Time (p_c), s	0.1	3.6	0.0	0.0	0.2	6.1	0.1	1.1				

Intersection Summary

HCM 6th Ctrl Delay	55.4
HCM 6th LOS	E

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	1180	0	30	926	70	15
Future Vol, veh/h	1180	0	30	926	70	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1283	0	33	1007	76	16

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1283	0	1853
Stage 1	-	-	-	-	1283
Stage 2	-	-	-	-	570
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	537	-	~66
Stage 1	-	-	-	-	224
Stage 2	-	-	-	-	529
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	537	-	~62
Mov Cap-2 Maneuver	-	-	-	-	157
Stage 1	-	-	-	-	210
Stage 2	-	-	-	-	529

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	41.8
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	157	417	-	-	537	-
HCM Lane V/C Ratio	0.485	0.039	-	-	0.061	-
HCM Control Delay (s)	47.8	14	-	-	12.1	-
HCM Lane LOS	E	B	-	-	B	-
HCM 95th %tile Q(veh)	2.3	0.1	-	-	0.2	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection													
Int Delay, s/veh	2.1												
Movement	NBL	NBT	NBR	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↖	↗			↖	↗		↖	↗	↖		↗	
Traffic Vol, veh/h	165	403	1	16	294	665	250	180	47	140	12	73	196
Future Vol, veh/h	165	403	1	16	294	665	250	180	47	140	12	73	196
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	-	100	-	-	175	-	175	-	-	-
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	179	438	1	17	320	723	272	196	51	152	13	79	213

Major/Minor	Major1	Major2	Minor2	Minor1
Conflicting Flow All	995	0	0	439
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.14	-	-	6.44
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.22	-	-	2.52
Pot Cap-1 Maneuver	691	-	-	757
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	691	-	-	1064
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	3.5	2.5		
HCM LOS			-	-

Minor Lane/Major Mvmt	NBL	NBT	NBRNWLn1	SELn1	SELn2	SELn3	SBL	SBT	SBR
Capacity (veh/h)	691	-	-	-	19	518	1064	-	-
HCM Lane V/C Ratio	0.26	-	-	-	2.689	0.294	0.317	-	-
HCM Control Delay (s)	12	-	-	-	\$ 1185.7	14.8	9.9	-	-
HCM Lane LOS	B	-	-	-	F	B	A	-	-
HCM 95th %tile Q(veh)	1	-	-	-	6.8	1.2	1.4	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 0.1

Movement WBL WBR SEL SET NWT NWR

Lane Configurations		↗		↑	↘	
Traffic Vol, veh/h	0	8	0	343	273	1
Future Vol, veh/h	0	8	0	343	273	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	0	373	297	1

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	-	298	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	741	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	741	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach WB SE NW

HCM Control Delay, s	9.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt NWT NWRWBLn1 SET

Capacity (veh/h)	-	-	741	-
HCM Lane V/C Ratio	-	-	0.012	-
HCM Control Delay (s)	-	-	9.9	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	0	-

Intersection												
Int Delay, s/veh	57.9											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕		↗	↘		↗	↕		↗	↕	
Traffic Vol, veh/h	11	25	67	146	70	47	52	497	152	51	669	12
Future Vol, veh/h	11	25	67	146	70	47	52	497	152	51	669	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	27	73	159	76	51	57	540	165	55	727	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1266	1663	370	1224	1587	353	740	0	0	705	0	0
Stage 1	844	844	-	737	737	-	-	-	-	-	-	-
Stage 2	422	819	-	487	850	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	126	96	627	~ 135	107	643	862	-	-	889	-	-
Stage 1	324	377	-	376	423	-	-	-	-	-	-	-
Stage 2	580	388	-	531	375	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	35	84	627	~ 81	94	643	862	-	-	889	-	-
Mov Cap-2 Maneuver	35	84	-	~ 81	94	-	-	-	-	-	-	-
Stage 1	303	354	-	351	395	-	-	-	-	-	-	-
Stage 2	403	362	-	406	352	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	87.4	\$ 358.2	0.7	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	NWLn2	SELn1	SWL	SWT	SWR
Capacity (veh/h)	862	-	-	81	143	143	889	-
HCM Lane V/C Ratio	0.066	-	-	1.959	0.889	0.783	0.062	-
HCM Control Delay (s)	9.5	-	-	\$ 558.1	108.7	87.4	9.3	-
HCM Lane LOS	A	-	-	F	F	F	A	-
HCM 95th %tile Q(veh)	0.2	-	-	14	6	4.8	0.2	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection							
Int Delay, s/veh	0.4						
Movement	SEL	SER	NEL	NET	SWU	SWT	SWR
Lane Configurations							
Traffic Vol, veh/h	7	2	38	562	0	775	2
Future Vol, veh/h	7	2	38	562	0	775	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	150	-	100	-	-
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	8	2	41	611	0	842	2

Major/Minor	Minor2	Major1	Major2				
Conflicting Flow All	1231	422	844	0	611	-	0
Stage 1	843	-	-	-	-	-	-
Stage 2	388	-	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	6.44	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	2.52	-	-
Pot Cap-1 Maneuver	170	580	788	-	589	-	-
Stage 1	382	-	-	-	-	-	-
Stage 2	655	-	-	-	-	-	-
Platoon blocked, %				-	-	-	-
Mov Cap-1 Maneuver	161	580	788	-	589	-	-
Mov Cap-2 Maneuver	161	-	-	-	-	-	-
Stage 1	362	-	-	-	-	-	-
Stage 2	655	-	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	24.8	0.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWU	SWT	SWR
Capacity (veh/h)	788	-	192	589	-	-
HCM Lane V/C Ratio	0.052	-	0.051	-	-	-
HCM Control Delay (s)	9.8	-	24.8	0	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	0	-	-

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1036	37	0	745	0	61
Future Vol, veh/h	1036	37	0	745	0	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Yield
Storage Length	-	50	-	-	-	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	1126	40	0	810	0	66

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	470	-	-
HCM Lane V/C Ratio	0.141	-	-
HCM Control Delay (s)	13.9	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.5	-	-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	990	41	0	745	0	83
Future Vol, veh/h	990	41	0	745	0	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Yield
Storage Length	-	75	-	-	-	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	1076	45	0	810	0	90

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	488	-	-
HCM Lane V/C Ratio	0.185	-	-
HCM Control Delay (s)	14	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.7	-	-

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↑↑↑	↗ ↑↑↑			↑↑
Traffic Vol, veh/h	0	6	773	22	0	1225
Future Vol, veh/h	0	6	773	22	0	1225
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	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	7	840	24	0	1332

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	420	0	-	-	-
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	497	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	497	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 497	-
HCM Lane V/C Ratio	- 0.013	-
HCM Control Delay (s)	- 12.3	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1165	70	0	996	0	15
Future Vol, veh/h	1165	70	0	996	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	75	-	-	-	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	1266	76	0	1083	0	16

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	422	-	-
HCM Lane V/C Ratio	0.039	-	-
HCM Control Delay (s)	13.9	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		Y	↑	↑	
Traffic Vol, veh/h	7	4	5	322	284	12
Future Vol, veh/h	7	4	5	322	284	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
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	8	4	5	350	309	13

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	676	316	322	0	-	0
Stage 1	316	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	419	724	1238	-	-	-
Stage 1	739	-	-	-	-	-
Stage 2	706	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	417	724	1238	-	-	-
Mov Cap-2 Maneuver	518	-	-	-	-	-
Stage 1	736	-	-	-	-	-
Stage 2	706	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.4	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1238	-	578	-	-
HCM Lane V/C Ratio	0.004	-	0.021	-	-
HCM Control Delay (s)	7.9	-	11.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Traffic Vol, veh/h	17	261	10	10	307	10	7	0	7	5	0	13
Future Vol, veh/h	17	261	10	10	307	10	7	0	7	5	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	25	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	284	11	11	334	11	8	0	8	5	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	345	0	0	295	0	0	695	693	290	692	693	340
Stage 1	-	-	-	-	-	-	326	326	-	362	362	-
Stage 2	-	-	-	-	-	-	369	367	-	330	331	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1214	-	-	1266	-	-	357	367	749	358	367	702
Stage 1	-	-	-	-	-	-	687	648	-	657	625	-
Stage 2	-	-	-	-	-	-	651	622	-	683	645	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1214	-	-	1266	-	-	343	358	749	348	358	702
Mov Cap-2 Maneuver	-	-	-	-	-	-	343	358	-	348	358	-
Stage 1	-	-	-	-	-	-	677	638	-	647	619	-
Stage 2	-	-	-	-	-	-	632	616	-	666	635	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.2			12.9			11.8		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	471	1214	-	-	1266	-	-	547
HCM Lane V/C Ratio	0.032	0.015	-	-	0.009	-	-	0.036
HCM Control Delay (s)	12.9	8	-	-	7.9	-	-	11.8
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷			↕			↕	
Traffic Vol, veh/h	32	219	23	18	236	151	14	5	22	33	5	77
Future Vol, veh/h	32	219	23	18	236	151	14	5	22	33	5	77
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	238	25	20	257	164	15	5	24	36	5	84

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	421	0	0	263	0	0	745	782	251	714	712	339
Stage 1	-	-	-	-	-	-	321	321	-	379	379	-
Stage 2	-	-	-	-	-	-	424	461	-	335	333	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1138	-	-	1301	-	-	330	326	788	346	358	703
Stage 1	-	-	-	-	-	-	691	652	-	643	615	-
Stage 2	-	-	-	-	-	-	608	565	-	679	644	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1138	-	-	1301	-	-	277	311	788	319	342	703
Mov Cap-2 Maneuver	-	-	-	-	-	-	277	311	-	319	342	-
Stage 1	-	-	-	-	-	-	670	632	-	623	606	-
Stage 2	-	-	-	-	-	-	523	557	-	633	624	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1			0.3			14.2			14.5		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	434	1138	-	-	1301	-	-	505
HCM Lane V/C Ratio	0.103	0.031	-	-	0.015	-	-	0.248
HCM Control Delay (s)	14.2	8.3	-	-	7.8	-	-	14.5
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	1

Intersection												
Int Delay, s/veh	8.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	76	175	23	13	322	92	14	0	47	146	0	68
Future Vol, veh/h	76	175	23	13	322	92	14	0	47	146	0	68
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	83	190	25	14	350	100	15	0	51	159	0	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	450	0	0	215	0	0	834	847	203	822	809	400
Stage 1	-	-	-	-	-	-	369	369	-	428	428	-
Stage 2	-	-	-	-	-	-	465	478	-	394	381	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1110	-	-	1355	-	-	288	299	838	293	314	650
Stage 1	-	-	-	-	-	-	651	621	-	605	585	-
Stage 2	-	-	-	-	-	-	578	556	-	631	613	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1110	-	-	1355	-	-	239	274	838	257	288	650
Mov Cap-2 Maneuver	-	-	-	-	-	-	239	274	-	257	288	-
Stage 1	-	-	-	-	-	-	602	574	-	560	579	-
Stage 2	-	-	-	-	-	-	507	550	-	548	567	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.4			0.2			12.7			30.3		
HCM LOS							B			D		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	532	1110	-	-	1355	-	-	257	650
HCM Lane V/C Ratio	0.125	0.074	-	-	0.01	-	-	0.617	0.114
HCM Control Delay (s)	12.7	8.5	-	-	7.7	-	-	39.2	11.2
HCM Lane LOS	B	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.4	0.2	-	-	0	-	-	3.7	0.4

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	367	398	90	0	29
Future Vol, veh/h	0	367	398	90	0	29
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	399	433	98	0	32

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 482
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.22
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.318
Pot Cap-1 Maneuver	0	-	- 0 584
Stage 1	0	-	- 0 -
Stage 2	0	-	- 0 -
Platoon blocked, %	-	-	- - -
Mov Cap-1 Maneuver	-	-	- - 584
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

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

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	584
HCM Lane V/C Ratio	-	-	-	0.054
HCM Control Delay (s)	-	-	-	11.5
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	0	183	106	0
Future Vol, veh/h	0	5	0	183	106	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	0	199	115	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	314	115	115	0	0
Stage 1	115	-	-	-	-
Stage 2	199	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	679	937	1474	-	-
Stage 1	910	-	-	-	-
Stage 2	835	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	679	937	1474	-	-
Mov Cap-2 Maneuver	679	-	-	-	-
Stage 1	910	-	-	-	-
Stage 2	835	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1474	-	937	-	-
HCM Lane V/C Ratio	-	-	0.006	-	-
HCM Control Delay (s)	0	-	8.9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

MITIGATION

Timings

101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

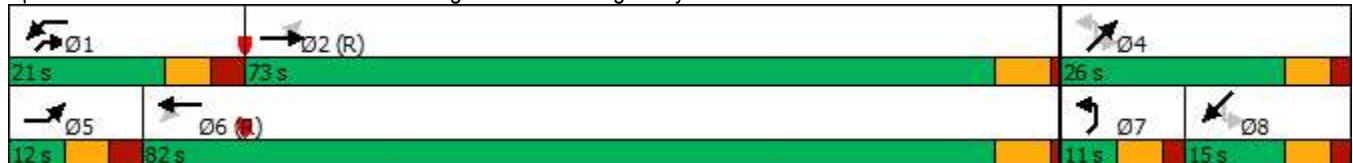


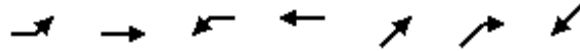
Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT
Lane Configurations	↔	↕	↔	↕		↕	↕		↕
Traffic Volume (vph)	6	1311	126	828	30	7	51	13	24
Future Volume (vph)	6	1311	126	828	30	7	51	13	24
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA
Protected Phases	5	2	1	6	7	4	1		8
Permitted Phases	2		6		4		4	8	
Detector Phase	5	2	1	6	7	4	1	8	8
Switch Phase									
Minimum Initial (s)	5.0	25.0	5.0	25.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	12.0	31.0	12.0	31.0	11.0	14.0	12.0	14.0	14.0
Total Split (s)	12.0	73.0	21.0	82.0	11.0	26.0	21.0	15.0	15.0
Total Split (%)	10.0%	60.8%	17.5%	68.3%	9.2%	21.7%	17.5%	12.5%	12.5%
Yellow Time (s)	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	3.0	1.0	2.0	2.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	7.0	6.0		6.0	7.0		6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead		Lead	Lag	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max	Max
Act Effct Green (s)	76.2	72.2	87.0	85.6		20.0	34.8		20.0
Actuated g/C Ratio	0.64	0.60	0.72	0.71		0.17	0.29		0.17
v/c Ratio	0.02	0.72	0.59	0.36		0.17	0.11		0.19
Control Delay	5.5	19.6	25.3	3.5		45.2	14.6		37.0
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.5	19.6	25.3	3.5		45.2	14.6		37.0
LOS	A	B	C	A		D	B		D
Approach Delay		19.5		6.4		27.7			37.0
Approach LOS		B		A		C			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 79 (66%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 15.1
 Intersection LOS: B
 Intersection Capacity Utilization 71.1%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

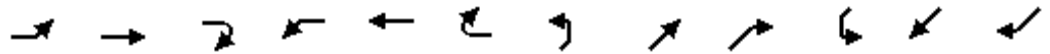




Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWT
Lane Group Flow (vph)	7	1515	137	910	41	55	54
v/c Ratio	0.02	0.72	0.59	0.36	0.17	0.11	0.19
Control Delay	5.5	19.6	25.3	3.5	45.2	14.6	37.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.5	19.6	25.3	3.5	45.2	14.6	37.0
Queue Length 50th (ft)	1	397	18	20	28	11	29
Queue Length 95th (ft)	5	544	75	171	62	41	63
Internal Link Dist (ft)		5331		2497	2027		1029
Turn Bay Length (ft)	150		200			100	
Base Capacity (vph)	416	2114	305	2519	235	551	286
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.72	0.45	0.36	0.17	0.10	0.19

Intersection Summary

HCM Signalized Intersection Capacity Analysis 2022 Buildout AM MIT FINAL (SCHAAD/RT/ORH)
 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	6	1311	83	126	828	9	30	7	51	13	24	13
Future Volume (vph)	6	1311	83	126	828	9	30	7	51	13	24	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)	1770	3508		1770	3533			1791	1583		1775	
Flt Permitted	0.31	1.00		0.09	1.00			0.76	1.00		0.93	
Satd. Flow (perm)	578	3508		161	3533			1413	1583		1667	
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)	7	1425	90	137	900	10	33	8	55	14	26	14
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	27	0	9	0
Lane Group Flow (vph)	7	1511	0	137	909	0	0	41	28	0	45	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	73.2	72.2		88.0	80.0			20.0	28.8		20.0	
Effective Green, g (s)	73.2	72.2		88.0	80.0			20.0	28.8		20.0	
Actuated g/C Ratio	0.61	0.60		0.73	0.67			0.17	0.24		0.17	
Clearance Time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			3.0	2.0		3.0	
Lane Grp Cap (vph)	362	2110		236	2355			235	379		277	
v/s Ratio Prot	0.00	c0.43		c0.04	0.26				0.01			
v/s Ratio Perm	0.01			0.38				c0.03	0.01		0.03	
v/c Ratio	0.02	0.72		0.58	0.39			0.17	0.07		0.16	
Uniform Delay, d1	9.2	16.7		15.8	9.0			42.9	35.3		42.8	
Progression Factor	1.00	1.00		1.65	0.44			1.00	1.00		0.98	
Incremental Delay, d2	0.0	2.1		2.2	0.5			0.4	0.0		1.3	
Delay (s)	9.2	18.8		28.2	4.4			43.3	35.3		43.4	
Level of Service	A	B		C	A			D	D		D	
Approach Delay (s)		18.8			7.5			38.7			43.4	
Approach LOS		B			A			D			D	

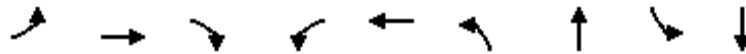
Intersection Summary		
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.64	B
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	71.1%	25.0
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM 6th Edition methodology does not support a perm + prot left-turn type from a shared lane. Left-turn bay is needed for phases 7.

Timings

102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy

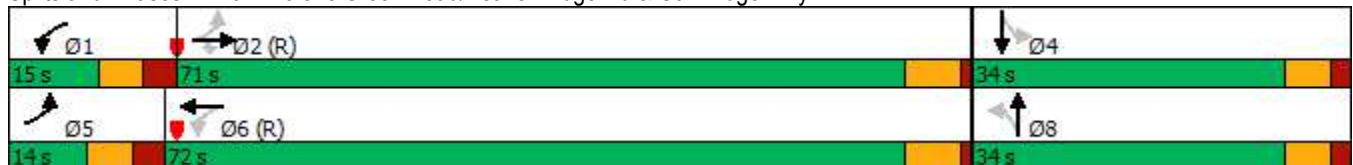


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↘	↖	↗	↖	↗	↘	↖
Traffic Volume (vph)	2	983	240	56	682	288	0	7	0
Future Volume (vph)	2	983	240	56	682	288	0	7	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2		1	6		8		4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	8	8	4	4
Switch Phase									
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0	8.0	8.0	8.0	8.0
Minimum Split (s)	12.0	31.0	31.0	12.0	31.0	24.0	24.0	24.0	24.0
Total Split (s)	14.0	71.0	71.0	15.0	72.0	34.0	34.0	34.0	34.0
Total Split (%)	11.7%	59.2%	59.2%	12.5%	60.0%	28.3%	28.3%	28.3%	28.3%
Yellow Time (s)	4.0	5.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	1.0	3.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	6.0	7.0	6.0	6.0	6.0		6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag				
Lead-Lag Optimize?									
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	72.1	68.6	68.6	78.1	77.5	28.0	28.0		28.0
Actuated g/C Ratio	0.60	0.57	0.57	0.65	0.65	0.23	0.23		0.23
v/c Ratio	0.00	0.53	0.26	0.20	0.33	0.49	0.09		0.02
Control Delay	5.0	6.5	0.5	6.4	6.9	42.0	0.3		0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	5.0	6.5	0.5	6.4	6.9	42.0	0.3		0.6
LOS	A	A	A	A	A	D	A		A
Approach Delay		5.3			6.9		36.7		0.6
Approach LOS		A			A		D		A

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 100 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 10.3
 Intersection Capacity Utilization 55.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy





Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	2	1068	261	61	749	313	45	9
v/c Ratio	0.00	0.53	0.26	0.20	0.33	0.49	0.09	0.02
Control Delay	5.0	6.5	0.5	6.4	6.9	42.0	0.3	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	6.5	0.5	6.4	6.9	42.0	0.3	0.6
Queue Length 50th (ft)	0	62	0	10	77	109	0	0
Queue Length 95th (ft)	m0	74	m5	m20	m171	154	0	m1
Internal Link Dist (ft)		2497			474		157	88
Turn Bay Length (ft)	100		250	150		200		
Base Capacity (vph)	465	2024	1017	316	2280	634	505	434
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.53	0.26	0.19	0.33	0.49	0.09	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary 2022 Buildout AM MIT FINAL (SCHAAD/RT/ORH)
 102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑	↗	↖	↑↑		↖↗	↖			↕	
Traffic Volume (veh/h)	2	983	240	56	682	7	288	0	41	7	0	1
Future Volume (veh/h)	2	983	240	56	682	7	288	0	41	7	0	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2	1068	261	61	741	8	313	0	45	8	0	1
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	457	2033	907	360	2181	24	778	0	370	316	3	33
Arrive On Green	0.01	1.00	1.00	0.05	0.81	0.81	0.23	0.00	0.23	0.47	0.00	0.47
Sat Flow, veh/h	1781	3554	1585	1781	3601	39	2748	0	1585	1111	15	141
Grp Volume(v), veh/h	2	1068	261	61	366	383	313	0	45	9	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1863	1374	0	1585	1266	0	0
Q Serve(g_s), s	0.1	0.0	0.0	1.7	6.6	6.6	8.2	0.0	2.7	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	1.7	6.6	6.6	11.0	0.0	2.7	2.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		1.00	0.89		0.11
Lane Grp Cap(c), veh/h	457	2033	907	360	1076	1129	778	0	370	352	0	0
V/C Ratio(X)	0.00	0.53	0.29	0.17	0.34	0.34	0.40	0.00	0.12	0.03	0.00	0.00
Avail Cap(c_a), veh/h	556	2033	907	415	1076	1129	778	0	370	352	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.33	1.33	1.33	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	0.66	0.66	0.66	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.9	0.0	0.0	9.4	5.2	5.2	39.3	0.0	36.3	25.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.6	0.5	0.2	0.9	0.8	1.6	0.0	0.7	0.1	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.1	0.6	2.1	2.2	4.1	0.0	1.1	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	0.6	0.5	9.6	6.1	6.1	40.8	0.0	37.0	25.1	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	D	A	D	C	A	A
Approach Vol, veh/h		1331			810			358				9
Approach Delay, s/veh		0.6			6.3			40.3				25.1
Approach LOS		A			A			D				C
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.3	74.7		34.0	7.3	78.7		34.0				
Change Period (Y+Rc), s	7.0	6.0		6.0	7.0	6.0		6.0				
Max Green Setting (Gmax), s	8.0	65.0		28.0	7.0	66.0		28.0				
Max Q Clear Time (g_c+I1), s	3.7	2.0		4.8	2.1	8.6		13.0				
Green Ext Time (p_c), s	0.0	9.7		0.0	0.0	4.5		1.2				
Intersection Summary												
HCM 6th Ctrl Delay				8.2								
HCM 6th LOS				A								

Timings
103: Schaad Rd & Oak Ridge Hwy



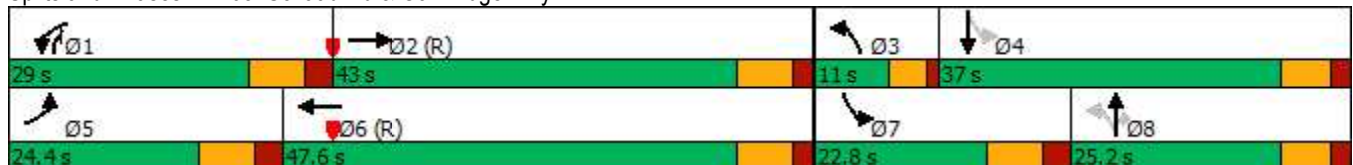
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↖	↗↗	↖↖	↗↗	↖	↗↗	↗	↖	↗↗
Traffic Volume (vph)	274	658	501	406	110	265	405	172	557
Future Volume (vph)	274	658	501	406	110	265	405	172	557
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	pm+ov	pm+pt	NA
Protected Phases	5	2	1	6	3	8	1	7	4
Permitted Phases					8		8	4	
Detector Phase	5	2	1	6	3	8	1	7	4
Switch Phase									
Minimum Initial (s)	6.0	20.0	6.0	20.0	5.0	15.0	6.0	6.0	15.0
Minimum Split (s)	13.5	27.0	13.5	27.0	9.5	21.5	13.5	13.5	21.5
Total Split (s)	24.4	43.0	29.0	47.6	11.0	25.2	29.0	22.8	37.0
Total Split (%)	20.3%	35.8%	24.2%	39.7%	9.2%	21.0%	24.2%	19.0%	30.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	4.5	5.0	5.0	4.5
All-Red Time (s)	2.5	2.0	2.5	2.0	1.0	2.0	2.5	2.5	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.0	7.5	7.0	4.5	6.5	7.5	7.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	C-Max	None	C-Max	None	Max	None	None	Max
Act Effct Green (s)	14.3	36.6	20.9	43.2	29.5	21.0	48.5	40.1	30.5
Actuated g/C Ratio	0.12	0.30	0.17	0.36	0.25	0.18	0.40	0.33	0.25
v/c Ratio	0.73	0.84	0.91	0.43	0.74	0.47	0.61	0.54	0.95
Control Delay	78.6	29.6	69.1	29.4	63.4	54.7	21.4	35.8	62.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.6	29.6	69.1	29.4	63.4	54.7	21.4	35.8	62.2
LOS	E	C	E	C	E	D	C	D	E
Approach Delay		41.9		49.4		38.7			57.5
Approach LOS		D		D		D			E

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 16 (13%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 47.1
 Intersection Capacity Utilization 87.8%
 Analysis Period (min) 15

Intersection LOS: D
 ICU Level of Service E

Splits and Phases: 103: Schaad Rd & Oak Ridge Hwy





Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	298	895	545	538	120	288	440	187	854
v/c Ratio	0.73	0.84	0.91	0.43	0.74	0.47	0.61	0.54	0.95
Control Delay	78.6	29.6	69.1	29.4	63.4	54.7	21.4	35.8	62.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.6	29.6	69.1	29.4	63.4	54.7	21.4	35.8	62.2
Queue Length 50th (ft)	112	318	214	157	80	116	142	107	326
Queue Length 95th (ft)	154	#368	#309	215	#187	173	240	169	#457
Internal Link Dist (ft)		267		278		348			506
Turn Bay Length (ft)	175		400		200			250	
Base Capacity (vph)	483	1064	615	1254	163	619	732	370	897
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.84	0.89	0.43	0.74	0.47	0.60	0.51	0.95

Intersection Summary

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

HCM 6th Signalized Intersection Summary 2022 Buildout AM MIT FINAL (SCHAAD/RT/ORH)
 103: Schaad Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↔		↔↔	↕↔		↔	↕↕	↔	↔	↕↔	
Traffic Volume (veh/h)	274	658	166	501	406	89	110	265	405	172	557	229
Future Volume (veh/h)	274	658	166	501	406	89	110	265	405	172	557	229
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	298	715	180	545	441	97	120	288	440	187	605	249
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	361	862	217	597	1087	237	163	654	566	318	624	257
Arrive On Green	0.03	0.10	0.10	0.17	0.37	0.37	0.05	0.18	0.18	0.10	0.25	0.25
Sat Flow, veh/h	3456	2812	708	3456	2900	633	1781	3554	1585	1781	2456	1010
Grp Volume(v), veh/h	298	452	443	545	269	269	120	288	440	187	438	416
Grp Sat Flow(s),veh/h/ln	1728	1777	1743	1728	1777	1756	1781	1777	1585	1781	1777	1689
Q Serve(g_s), s	10.3	29.9	29.9	18.6	13.4	13.6	6.5	8.6	22.1	9.9	29.2	29.3
Cycle Q Clear(g_c), s	10.3	29.9	29.9	18.6	13.4	13.6	6.5	8.6	22.1	9.9	29.2	29.3
Prop In Lane	1.00		0.41	1.00		0.36	1.00		1.00	1.00		0.60
Lane Grp Cap(c), veh/h	361	544	534	597	666	658	163	654	566	318	452	429
V/C Ratio(X)	0.83	0.83	0.83	0.91	0.40	0.41	0.74	0.44	0.78	0.59	0.97	0.97
Avail Cap(c_a), veh/h	487	544	534	619	666	658	163	654	566	369	452	429
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.9	50.9	50.9	48.7	27.6	27.7	39.6	43.5	34.4	33.5	44.3	44.3
Incr Delay (d2), s/veh	6.3	13.7	13.9	17.1	1.8	1.9	16.0	2.1	10.1	0.8	35.3	36.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	16.2	16.0	9.3	5.9	5.9	3.5	3.9	12.5	4.2	16.9	16.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.2	64.5	64.8	65.9	29.5	29.6	55.5	45.6	44.5	34.2	79.5	80.9
LnGrp LOS	E	E	E	E	C	C	E	D	D	C	E	F
Approach Vol, veh/h		1193			1083			848			1041	
Approach Delay, s/veh		64.3			47.8			46.4			72.0	
Approach LOS		E			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	28.2	43.8	11.0	37.0	20.0	52.0	19.4	28.6				
Change Period (Y+Rc), s	7.5	7.0	4.5	6.5	7.5	7.0	7.5	6.5				
Max Green Setting (Gmax), s	21.5	36.0	6.5	30.5	16.9	40.6	15.3	18.7				
Max Q Clear Time (g_c+I1), s	20.6	31.9	8.5	31.3	12.3	15.6	11.9	10.6				
Green Ext Time (p_c), s	0.1	2.7	0.0	0.0	0.2	6.1	0.1	1.1				
Intersection Summary												
HCM 6th Ctrl Delay			58.3									
HCM 6th LOS			E									

Timings

2022 Buildout AM MIT FINAL (SCHAAD/RT/ORH)

105: Schaad Rd & Ball Camp Pk/Malone Creek Road

Grassy Creek Center TIS

Lane Group	NBL	NBT	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	165	403	16	294	665	250	180	47	140	12	73	196
Future Volume (vph)	165	403	16	294	665	250	180	47	140	12	73	196
Turn Type	pm+pt	NA	pm+pt	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Prot
Protected Phases	3	8	7	7	4		5	2			6	6
Permitted Phases	8		4	4		4	2		2	6		
Detector Phase	3	8	7	7	4	4	5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	25.0	5.0	5.0	25.0	25.0	5.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	31.0	11.0	11.0	31.0	31.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	21.0	36.0	33.0	33.0	48.0	48.0	16.0	51.0	51.0	35.0	35.0	35.0
Total Split (%)	17.5%	30.0%	27.5%	27.5%	40.0%	40.0%	13.3%	42.5%	42.5%	29.2%	29.2%	29.2%
Yellow Time (s)	4.0	5.0	4.0	4.0	5.0	5.0	3.5	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	1.0	2.0	2.0	1.0	1.0	1.0	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	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	4.5	6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead			Lag	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	58.2	47.0		69.9	53.4	53.4	38.8	37.3	37.3		21.3	21.3
Actuated g/C Ratio	0.48	0.39		0.58	0.44	0.44	0.32	0.31	0.31		0.18	0.18
v/c Ratio	0.44	0.32		0.58	0.46	0.32	0.47	0.09	0.25		0.29	0.76
Control Delay	17.1	28.5		11.4	10.4	0.9	30.8	25.4	4.0		43.4	63.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	17.1	28.5		11.4	10.4	0.9	30.8	25.4	4.0		43.4	63.3
LOS	B	C		B	B	A	C	C	A		D	E
Approach Delay		25.2			8.7			19.9			57.3	
Approach LOS		C			A			B			E	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 106 (88%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 19.8

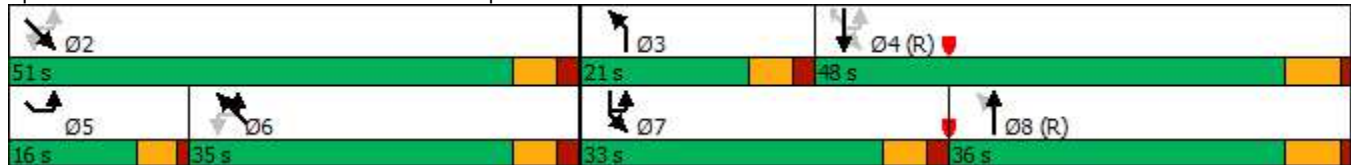
Intersection LOS: B

Intersection Capacity Utilization 80.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 105: Schaad Rd & Ball Camp Pk/Malone Creek Road


























Lane Group	NBL	NBT	SBL	SBT	SBR	SEL	SET	SER	NWT	NWR
Lane Group Flow (vph)	179	439	337	723	272	196	51	152	92	213
v/c Ratio	0.44	0.32	0.58	0.46	0.32	0.47	0.09	0.25	0.29	0.76
Control Delay	17.1	28.5	11.4	10.4	0.9	30.8	25.4	4.0	43.4	63.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	28.5	11.4	10.4	0.9	30.8	25.4	4.0	43.4	63.3
Queue Length 50th (ft)	60	122	58	53	0	102	24	1	62	158
Queue Length 95th (ft)	112	203	m75	m175	m17	141	46	27	104	228
Internal Link Dist (ft)		333		128			205		33	
Turn Bay Length (ft)	200		100			175		175		
Base Capacity (vph)	465	1385	666	1576	855	413	698	688	431	382
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.32	0.51	0.46	0.32	0.47	0.07	0.22	0.21	0.56

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary 2022 Buildout AM MIT FINAL (SCHAAD/RT/ORH)
 105: Schaad Rd & Ball Camp Pk/Malone Creek Road Grassy Creek Center TIS

												
Movement	NBL	NBT	NBR	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT
Lane Configurations												
Traffic Volume (veh/h)	165	403	1	16	294	665	250	180	47	140	12	73
Future Volume (veh/h)	165	403	1	16	294	665	250	180	47	140	12	73
Initial Q (Qb), veh	0	0	0		0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00		1.00		1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No				No			No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870		1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	179	438	1		320	723	272	196	51	152	13	79
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
Percent Heavy Veh, %	2	2	2		2	2	2	2	2	2	2	2
Cap, veh/h	392	1618	4		618	1739	775	352	539	457	53	260
Arrive On Green	0.07	0.44	0.44		0.12	0.49	0.49	0.10	0.29	0.29	0.16	0.16
Sat Flow, veh/h	1781	3637	8		1781	3554	1585	1781	1870	1585	123	1675
Grp Volume(v), veh/h	179	214	225		320	723	272	196	51	152	92	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1869		1781	1777	1585	1781	1870	1585	1798	0
Q Serve(g_s), s	6.5	9.1	9.1		11.2	15.7	12.7	10.9	2.4	9.1	0.0	0.0
Cycle Q Clear(g_c), s	6.5	9.1	9.1		11.2	15.7	12.7	10.9	2.4	9.1	5.2	0.0
Prop In Lane	1.00		0.00		1.00		1.00	1.00		1.00	0.14	
Lane Grp Cap(c), veh/h	392	790	831		618	1739	775	352	539	457	313	0
V/C Ratio(X)	0.46	0.27	0.27		0.52	0.42	0.35	0.56	0.09	0.33	0.29	0.00
Avail Cap(c_a), veh/h	486	790	831		811	1739	775	352	701	594	463	0
HCM Platoon Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.2	21.0	21.0		14.0	19.7	18.9	36.4	31.2	33.6	45.0	0.0
Incr Delay (d2), s/veh	0.8	0.8	0.8		0.7	0.7	1.2	1.9	0.1	0.4	0.5	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	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	3.8	4.0		4.3	6.3	4.7	4.9	1.1	3.4	2.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.0	21.9	21.8		14.7	20.4	20.1	38.4	31.3	34.0	45.6	0.0
LnGrp LOS	B	C	C		B	C	C	D	C	C	D	A
Approach Vol, veh/h		618				1315			399			305
Approach Delay, s/veh		20.4				19.0			35.8			56.7
Approach LOS		C				B			D			E
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		40.6	14.7	64.7	16.0	24.6	20.0	59.4				
Change Period (Y+Rc), s		6.0	6.0	6.0	4.5	6.0	6.0	6.0				
Max Green Setting (Gmax), s		45.0	15.0	42.0	11.5	29.0	27.0	30.0				
Max Q Clear Time (g_c+I1), s		11.1	8.5	17.7	12.9	17.7	13.2	11.1				
Green Ext Time (p_c), s		0.8	0.2	5.7	0.0	0.9	0.8	2.1				
Intersection Summary												
HCM 6th Ctrl Delay			26.2									
HCM 6th LOS			C									
Notes												
User approved ignoring U-Turning movement.												



Movement	NWR
Lane Configurations	7
Traffic Volume (veh/h)	196
Future Volume (veh/h)	196
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	1.00
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1870
Adj Flow Rate, veh/h	213
Peak Hour Factor	0.92
Percent Heavy Veh, %	2
Cap, veh/h	246
Arrive On Green	0.16
Sat Flow, veh/h	1585
Grp Volume(v), veh/h	213
Grp Sat Flow(s),veh/h/ln	1585
Q Serve(g_s), s	15.7
Cycle Q Clear(g_c), s	15.7
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	246
V/C Ratio(X)	0.87
Avail Cap(c_a), veh/h	383
HCM Platoon Ratio	1.00
Upstream Filter(l)	1.00
Uniform Delay (d), s/veh	49.5
Incr Delay (d2), s/veh	12.0
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	6.9
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	61.5
LnGrp LOS	E
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

2022

**IMPROVED NETWORK
PM PEAK HOUR**

OPTIMIZED TIMING

**WITH
MALONE CREEK ROAD**

Intersection												
Int Delay, s/veh	5.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	0	6	68	0	50	12	0	122	25	0	5
Future Vol, veh/h	9	0	6	68	0	50	12	0	122	25	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	0	7	74	0	54	13	0	133	27	0	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	177	216	3	153	152	67	5	0	0	133	0	0
Stage 1	57	57	-	93	93	-	-	-	-	-	-	-
Stage 2	120	159	-	60	59	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	785	682	1081	814	740	997	1616	-	-	1452	-	-
Stage 1	955	847	-	914	818	-	-	-	-	-	-	-
Stage 2	884	766	-	951	846	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	726	663	1081	792	719	997	1616	-	-	1452	-	-
Mov Cap-2 Maneuver	726	663	-	792	719	-	-	-	-	-	-	-
Stage 1	946	831	-	906	811	-	-	-	-	-	-	-
Stage 2	828	759	-	927	830	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	9.4		9.9		0.6		6.3			
HCM LOS	A		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1616	-	-	836	868	1452	-	-
HCM Lane V/C Ratio	0.008	-	-	0.02	0.148	0.019	-	-
HCM Control Delay (s)	7.2	0	-	9.4	9.9	7.5	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.5	0.1	-	-

Timings
101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

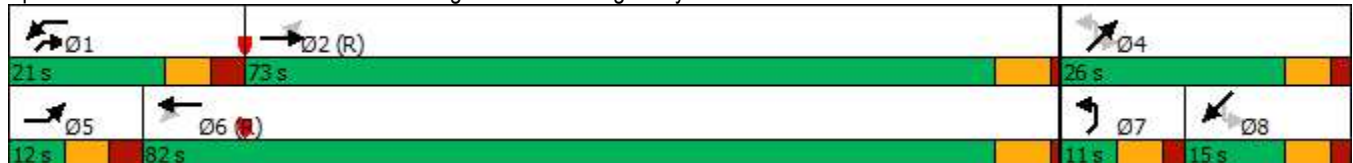


Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT
Lane Configurations	↖	↗	↖	↗		↖	↗		↗
Traffic Volume (vph)	7	1152	111	930	87	9	79	6	3
Future Volume (vph)	7	1152	111	930	87	9	79	6	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA
Protected Phases	5	2	1	6	7	4	1		8
Permitted Phases	2		6		4		4	8	
Detector Phase	5	2	1	6	7	4	1	8	8
Switch Phase									
Minimum Initial (s)	5.0	25.0	5.0	25.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	12.0	31.0	12.0	31.0	11.0	14.0	12.0	14.0	14.0
Total Split (s)	12.0	73.0	21.0	82.0	11.0	26.0	21.0	15.0	15.0
Total Split (%)	10.0%	60.8%	17.5%	68.3%	9.2%	21.7%	17.5%	12.5%	12.5%
Yellow Time (s)	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	3.0	1.0	2.0	2.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	7.0	6.0		6.0	7.0		6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead		Lead	Lag	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max	Max
Act Effct Green (s)	78.1	74.1	86.3	85.6		20.0	32.9		20.0
Actuated g/C Ratio	0.65	0.62	0.72	0.71		0.17	0.27		0.17
v/c Ratio	0.02	0.60	0.44	0.40		0.46	0.18		0.05
Control Delay	5.1	15.4	11.3	6.5		52.5	15.4		29.3
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.1	15.4	11.3	6.5		52.5	15.4		29.3
LOS	A	B	B	A		D	B		C
Approach Delay		15.4		7.0		35.8			29.3
Approach LOS		B		A		D			C

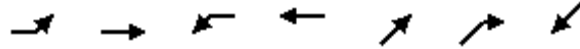
Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 36 (30%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 13.3
 Intersection Capacity Utilization 64.0%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy



Queues
101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

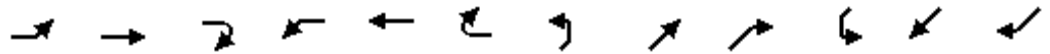


Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWT
Lane Group Flow (vph)	8	1299	121	1011	105	86	13
v/c Ratio	0.02	0.60	0.44	0.40	0.46	0.18	0.05
Control Delay	5.1	15.4	11.3	6.5	52.5	15.4	29.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	15.4	11.3	6.5	52.5	15.4	29.3
Queue Length 50th (ft)	2	298	23	112	74	18	6
Queue Length 95th (ft)	6	378	m32	m162	133	58	m8
Internal Link Dist (ft)		5331		2497	2027		1029
Turn Bay Length (ft)	150		200			100	
Base Capacity (vph)	374	2176	362	2524	228	563	263
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.60	0.33	0.40	0.46	0.15	0.05

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2022 Buildout PM FINAL (SCHAAD/RT/ORH)
 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	7	1152	43	111	930	0	87	9	79	6	3	3
Future Volume (vph)	7	1152	43	111	930	0	87	9	79	6	3	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)	1770	3520		1770	3539			1782	1583		1757	
Flt Permitted	0.26	1.00		0.14	1.00			0.74	1.00		0.87	
Satd. Flow (perm)	493	3520		257	3539			1373	1583		1565	
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)	8	1252	47	121	1011	0	95	10	86	7	3	3
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	42	0	3	0
Lane Group Flow (vph)	8	1297	0	121	1011	0	0	105	44	0	11	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	75.1	74.1		86.9	80.0			20.0	26.9		20.0	
Effective Green, g (s)	75.1	74.1		86.9	80.0			20.0	26.9		20.0	
Actuated g/C Ratio	0.63	0.62		0.72	0.67			0.17	0.22		0.17	
Clearance Time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			3.0	2.0		3.0	
Lane Grp Cap (vph)	319	2173		273	2359			228	354		260	
v/s Ratio Prot	0.00	c0.37		c0.03	c0.29				0.01			
v/s Ratio Perm	0.02			0.30				c0.08	0.02		0.01	
v/c Ratio	0.03	0.60		0.44	0.43			0.46	0.12		0.04	
Uniform Delay, d1	8.5	13.9		9.6	9.3			45.1	37.2		41.9	
Progression Factor	1.00	1.00		1.42	0.82			1.00	1.00		0.82	
Incremental Delay, d2	0.0	1.2		0.3	0.5			1.5	0.1		0.2	
Delay (s)	8.6	15.1		14.0	8.1			46.6	37.2		34.4	
Level of Service	A	B		B	A			D	D		C	
Approach Delay (s)		15.1			8.7			42.4			34.4	
Approach LOS		B			A			D			C	

Intersection Summary		
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.60	B
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	64.0%	25.0
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM 6th Edition methodology does not support a perm + prot left-turn type from a shared lane. Left-turn bay is needed for phases 7.

Intersection

Int Delay, s/veh 644.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑		↘	↗			↕	
Traffic Vol, veh/h	3	980	255	56	936	35	416	5	52	2	5	0
Future Vol, veh/h	3	980	255	56	936	35	416	5	52	2	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	250	150	-	-	200	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1065	277	61	1017	38	452	5	57	2	5	0

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	1055	0	0	1342
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.14	-	-	4.14
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.22	-	-	2.22
Pot Cap-1 Maneuver	656	-	-	509
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	656	-	-	509
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	\$ 3735.4	176
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	45	233	656	-	-	509	-	-	28
HCM Lane V/C Ratio	10.048	0.266	0.005	-	-	0.12	-	-	0.272
HCM Control Delay (s)	\$ 4243.7	26	10.5	-	-	13	-	-	176
HCM Lane LOS	F	D	B	-	-	B	-	-	F
HCM 95th %tile Q(veh)	54	1	0	-	-	0.4	-	-	0.8

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Timings
103: Schaad Rd & Oak Ridge Hwy

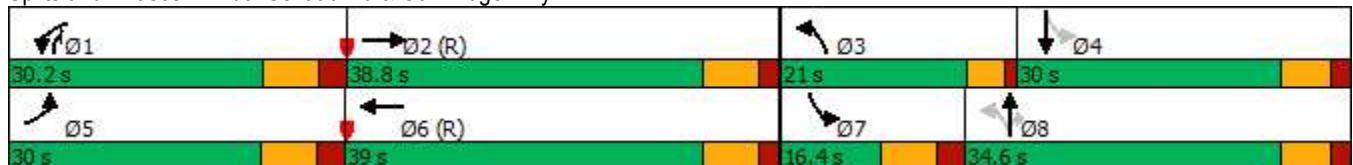


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↖	↕↖	↖↖	↕↖	↖	↕↕	↖	↖	↕↖
Traffic Volume (vph)	535	403	493	607	235	480	387	141	398
Future Volume (vph)	535	403	493	607	235	480	387	141	398
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	pm+ov	pm+pt	NA
Protected Phases	5	2	1	6	3	8	1	7	4
Permitted Phases					8		8	4	
Detector Phase	5	2	1	6	3	8	1	7	4
Switch Phase									
Minimum Initial (s)	6.0	20.0	6.0	20.0	5.0	15.0	6.0	6.0	15.0
Minimum Split (s)	13.5	27.0	13.5	27.0	9.5	21.5	13.5	13.5	21.5
Total Split (s)	30.0	38.8	30.2	39.0	21.0	34.6	30.2	16.4	30.0
Total Split (%)	25.0%	32.3%	25.2%	32.5%	17.5%	28.8%	25.2%	13.7%	25.0%
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	4.5	5.0	5.0	4.5
All-Red Time (s)	2.5	2.0	2.5	2.0	1.0	2.0	2.5	2.5	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.0	7.5	7.0	4.5	6.5	7.5	7.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	None	Max
Act Effct Green (s)	22.0	33.1	21.4	32.5	46.1	28.4	56.3	31.8	24.2
Actuated g/C Ratio	0.18	0.28	0.18	0.27	0.38	0.24	0.47	0.26	0.20
v/c Ratio	0.93	0.61	0.88	0.86	0.85	0.62	0.51	0.61	0.88
Control Delay	58.9	28.0	64.2	51.2	55.1	45.7	16.0	39.6	57.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	28.0	64.2	51.2	55.1	45.7	16.0	39.6	57.0
LOS	E	C	E	D	E	D	B	D	E
Approach Delay		43.3		56.4		37.3			53.6
Approach LOS		D		E		D			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 47.4
 Intersection LOS: D
 Intersection Capacity Utilization 87.9%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 103: Schaad Rd & Oak Ridge Hwy



Queues
103: Schaad Rd & Oak Ridge Hwy



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	582	593	536	819	255	522	421	153	634
v/c Ratio	0.93	0.61	0.88	0.86	0.85	0.62	0.51	0.61	0.88
Control Delay	58.9	28.0	64.2	51.2	55.1	45.7	16.0	39.6	57.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	28.0	64.2	51.2	55.1	45.7	16.0	39.6	57.0
Queue Length 50th (ft)	213	201	207	312	141	193	132	82	233
Queue Length 95th (ft)	#321	265	#287	#418	m#273	m252	m220	135	#340
Internal Link Dist (ft)		267		278		348			506
Turn Bay Length (ft)	175		400		200			250	
Base Capacity (vph)	643	966	649	948	309	837	840	257	723
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.61	0.83	0.86	0.83	0.62	0.50	0.60	0.88

Intersection Summary

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





























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary
 103: Schaad Rd & Oak Ridge Hwy

2022 Buildout PM FINAL (SCHAAD/RT/ORH)

Grassy Creek Center TIS

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 		 	 			 			 	
Traffic Volume (veh/h)	535	403	143	493	607	146	235	480	387	141	398	185
Future Volume (veh/h)	535	403	143	493	607	146	235	480	387	141	398	185
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	582	438	155	536	660	159	255	522	421	153	433	201
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	633	729	256	593	770	185	308	832	643	253	486	224
Arrive On Green	0.18	0.28	0.28	0.17	0.27	0.27	0.13	0.23	0.23	0.07	0.21	0.21
Sat Flow, veh/h	3456	2580	905	3456	2841	684	1781	3554	1585	1781	2364	1087
Grp Volume(v), veh/h	582	300	293	536	413	406	255	522	421	153	324	310
Grp Sat Flow(s),veh/h/ln	1728	1777	1708	1728	1777	1747	1781	1777	1585	1781	1777	1675
Q Serve(g_s), s	19.9	17.5	17.8	18.2	26.5	26.5	13.2	15.8	25.8	8.1	21.3	21.6
Cycle Q Clear(g_c), s	19.9	17.5	17.8	18.2	26.5	26.5	13.2	15.8	25.8	8.1	21.3	21.6
Prop In Lane	1.00		0.53	1.00		0.39	1.00		1.00	1.00		0.65
Lane Grp Cap(c), veh/h	633	502	483	593	482	474	308	832	643	253	366	345
V/C Ratio(X)	0.92	0.60	0.61	0.90	0.86	0.86	0.83	0.63	0.65	0.60	0.89	0.90
Avail Cap(c_a), veh/h	648	502	483	654	482	474	325	832	643	253	366	345
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.2	37.2	37.3	48.7	41.5	41.5	33.0	41.2	28.9	34.9	46.3	46.4
Incr Delay (d2), s/veh	17.8	5.2	5.6	14.3	17.5	17.9	15.6	3.6	5.1	2.9	25.7	28.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	8.0	7.8	8.9	13.6	13.4	6.8	7.1	10.2	3.7	11.8	11.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.0	42.4	42.8	63.1	59.1	59.5	48.6	44.8	34.0	37.8	72.0	74.9
LnGrp LOS	E	D	D	E	E	E	D	D	C	D	E	E
Approach Vol, veh/h		1175			1355			1198			787	
Approach Delay, s/veh		54.2			60.8			41.8			66.5	
Approach LOS		D			E			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	28.1	40.9	19.8	31.2	29.5	39.5	16.4	34.6				
Change Period (Y+Rc), s	7.5	7.0	4.5	6.5	7.5	7.0	7.5	6.5				
Max Green Setting (Gmax), s	22.7	31.8	16.5	23.5	22.5	32.0	8.9	28.1				
Max Q Clear Time (g_c+I1), s	20.2	19.8	15.2	23.6	21.9	28.5	10.1	17.8				
Green Ext Time (p_c), s	0.3	4.4	0.1	0.0	0.1	2.3	0.0	3.2				
Intersection Summary												
HCM 6th Ctrl Delay			55.0									
HCM 6th LOS			E									

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	865	0	37	1158	87	19
Future Vol, veh/h	865	0	37	1158	87	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	940	0	40	1259	95	21

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	940	0	1650 470
Stage 1	-	-	-	-	940 -
Stage 2	-	-	-	-	710 -
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	-	-	725	-	~ 90 540
Stage 1	-	-	-	-	340 -
Stage 2	-	-	-	-	448 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	725	-	~ 85 540
Mov Cap-2 Maneuver	-	-	-	-	202 -
Stage 1	-	-	-	-	321 -
Stage 2	-	-	-	-	448 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	33
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	202	540	-	-	725	-
HCM Lane V/C Ratio	0.468	0.038	-	-	0.055	-
HCM Control Delay (s)	37.6	11.9	-	-	10.3	-
HCM Lane LOS	E	B	-	-	B	-
HCM 95th %tile Q(veh)	2.3	0.1	-	-	0.2	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection													
Int Delay, s/veh	2.3												
Movement	NBL	NBT	NBR	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↖	↖↗			↖	↖↗		↖	↖	↖		↖↗	
Traffic Vol, veh/h	204	523	0	40	266	508	220	273	64	102	15	124	292
Future Vol, veh/h	204	523	0	40	266	508	220	273	64	102	15	124	292
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	-	100	-	-	175	-	175	-	-	-
Veh in Median Storage, #	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	222	568	0	43	289	552	239	297	70	111	16	135	317

Major/Minor	Major1	Major2	Minor2	Minor1
Conflicting Flow All	791	0	0	568
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.14	-	-	6.44
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.22	-	-	2.52
Pot Cap-1 Maneuver	825	-	-	627
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	825	-	-	818
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	NB	SB	SE	NW
HCM Control Delay, s	3.1	3.7		
HCM LOS			-	-

Minor Lane/Major Mvmt	NBL	NBT	NBRNWLn1	SELn1	SELn2	SELn3	SBL	SBT	SBR
Capacity (veh/h)	825	-	-	-	16	603	818	-	-
HCM Lane V/C Ratio	0.269	-	-	-	4.348	0.184	0.407	-	-
HCM Control Delay (s)	11	-	-	-	\$ 1987.1	12.3	12.4	-	-
HCM Lane LOS	B	-	-	-	F	B	B	-	-
HCM 95th %tile Q(veh)	1.1	-	-	-	9.5	0.7	2	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations		↗		↑	↘	
Traffic Vol, veh/h	0	35	0	330	396	3
Future Vol, veh/h	0	35	0	330	396	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	38	0	359	430	3

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	432	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-
Pot Cap-1 Maneuver	0	624	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	624	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	SE	NW
HCM Control Delay, s	11.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NWT	NWRWBLn1	SET
Capacity (veh/h)	-	-	624
HCM Lane V/C Ratio	-	-	0.061
HCM Control Delay (s)	-	-	11.1
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.2

Intersection												
Int Delay, s/veh	19.8											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕		↗	↘		↗	↕		↗	↕	
Traffic Vol, veh/h	21	26	8	37	77	205	8	513	46	100	468	20
Future Vol, veh/h	21	26	8	37	77	205	8	513	46	100	468	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	28	9	40	84	223	9	558	50	109	509	22

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1077	1364	266	1088	1350	304	531	0	0	608	0	0
Stage 1	738	738	-	601	601	-	-	-	-	-	-	-
Stage 2	339	626	-	487	749	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	173	146	732	170	149	692	1033	-	-	966	-	-
Stage 1	376	422	-	454	488	-	-	-	-	-	-	-
Stage 2	649	475	-	531	417	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	53	128	732	127	131	692	1033	-	-	966	-	-
Mov Cap-2 Maneuver	53	128	-	127	131	-	-	-	-	-	-	-
Stage 1	373	374	-	450	484	-	-	-	-	-	-	-
Stage 2	361	471	-	430	370	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	102.4		74.2		0.1		1.6	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	NWLn2	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1033	-	-	127	319	90	966	-
HCM Lane V/C Ratio	0.008	-	-	0.317	0.961	0.664	0.113	-
HCM Control Delay (s)	8.5	-	-	46	77.9	102.4	9.2	-
HCM Lane LOS	A	-	-	E	F	F	A	-
HCM 95th %tile Q(veh)	0	-	-	1.2	10	3.2	0.4	-

Intersection							
Int Delay, s/veh	1						
Movement	SEL	SER	NEL	NET	SWU	SWT	SWR
Lane Configurations							
Traffic Vol, veh/h	20	6	75	707	0	554	6
Future Vol, veh/h	20	6	75	707	0	554	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	150	-	100	-	-
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	22	7	82	768	0	602	7

Major/Minor	Minor2	Major1	Major2				
Conflicting Flow All	1154	305	609	0	768	-	0
Stage 1	606	-	-	-	-	-	-
Stage 2	548	-	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	6.44	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	2.52	-	-
Pot Cap-1 Maneuver	190	691	966	-	467	-	-
Stage 1	507	-	-	-	-	-	-
Stage 2	543	-	-	-	-	-	-
Platoon blocked, %				-	-	-	-
Mov Cap-1 Maneuver	174	691	966	-	467	-	-
Mov Cap-2 Maneuver	174	-	-	-	-	-	-
Stage 1	464	-	-	-	-	-	-
Stage 2	543	-	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	24.8	0.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NEL	NET SELn1	SWU	SWT	SWR
Capacity (veh/h)	966	-	210	467	-
HCM Lane V/C Ratio	0.084	-	0.135	-	-
HCM Control Delay (s)	9.1	-	24.8	0	-
HCM Lane LOS	A	-	C	A	-
HCM 95th %tile Q(veh)	0.3	-	0.5	0	-

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1032	27	0	1026	0	43
Future Vol, veh/h	1032	27	0	1026	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Yield
Storage Length	-	50	-	-	-	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	1122	29	0	1115	0	47

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	471	-	-
HCM Lane V/C Ratio	0.099	-	-
HCM Control Delay (s)	13.5	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.3	-	-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1000	30	0	1026	0	59
Future Vol, veh/h	1000	30	0	1026	0	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Yield
Storage Length	-	75	-	-	-	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	1087	33	0	1115	0	64

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	483	-	-
HCM Lane V/C Ratio	0.133	-	-
HCM Control Delay (s)	13.6	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.5	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↑↑↑	↑↑↑			↑↑
Traffic Vol, veh/h	0	29	1072	56	0	1034
Future Vol, veh/h	0	29	1072	56	0	1034
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	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	32	1165	61	0	1124

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	583	0	-	-	-
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	390	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	390	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 390	-
HCM Lane V/C Ratio	- 0.081	-
HCM Control Delay (s)	- 15	-
HCM Lane LOS	- C	-
HCM 95th %tile Q(veh)	- 0.3	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	844	87	0	1245	0	19
Future Vol, veh/h	844	87	0	1245	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	75	-	-	-	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	917	95	0	1353	0	21

Major/Minor	Major1	Major2	Minor1
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	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	549	-	-
HCM Lane V/C Ratio	0.038	-	-
HCM Control Delay (s)	11.8	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	15	11	444	285	26
Future Vol, veh/h	25	15	11	444	285	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
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	27	16	12	483	310	28

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	831	324	338	0	-	0
Stage 1	324	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	340	717	1221	-	-	-
Stage 1	733	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	337	717	1221	-	-	-
Mov Cap-2 Maneuver	449	-	-	-	-	-
Stage 1	726	-	-	-	-	-
Stage 2	605	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1221	-	522	-	-
HCM Lane V/C Ratio	0.01	-	0.083	-	-
HCM Control Delay (s)	8	-	12.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Traffic Vol, veh/h	17	263	20	20	424	10	20	0	20	4	0	11
Future Vol, veh/h	17	263	20	20	424	10	20	0	20	4	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	25	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	286	22	22	461	11	22	0	22	4	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	472	0	0	308	0	0	850	849	297	855	855	467
Stage 1	-	-	-	-	-	-	333	333	-	511	511	-
Stage 2	-	-	-	-	-	-	517	516	-	344	344	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1090	-	-	1253	-	-	280	298	742	278	296	596
Stage 1	-	-	-	-	-	-	681	644	-	545	537	-
Stage 2	-	-	-	-	-	-	541	534	-	671	637	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1090	-	-	1253	-	-	267	288	742	263	286	596
Mov Cap-2 Maneuver	-	-	-	-	-	-	267	288	-	263	286	-
Stage 1	-	-	-	-	-	-	669	633	-	536	527	-
Stage 2	-	-	-	-	-	-	521	524	-	641	626	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.3			15.3			13.4		
HCM LOS							C			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	393	1090	-	-	1253	-	-	446
HCM Lane V/C Ratio	0.111	0.017	-	-	0.017	-	-	0.037
HCM Control Delay (s)	15.3	8.4	-	-	7.9	-	-	13.4
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0.1	-	-	0.1

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Traffic Vol, veh/h	23	218	45	35	361	111	40	5	59	24	5	54
Future Vol, veh/h	23	218	45	35	361	111	40	5	59	24	5	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	237	49	38	392	121	43	5	64	26	5	59

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	513	0	0	286	0	0	873	901	262	875	865	453
Stage 1	-	-	-	-	-	-	312	312	-	529	529	-
Stage 2	-	-	-	-	-	-	561	589	-	346	336	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1052	-	-	1276	-	-	271	278	777	270	292	607
Stage 1	-	-	-	-	-	-	699	658	-	533	527	-
Stage 2	-	-	-	-	-	-	512	495	-	670	642	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1052	-	-	1276	-	-	231	263	777	234	277	607
Mov Cap-2 Maneuver	-	-	-	-	-	-	231	263	-	234	277	-
Stage 1	-	-	-	-	-	-	682	642	-	520	511	-
Stage 2	-	-	-	-	-	-	444	480	-	595	627	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.5			18			16.8		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	388	1052	-	-	1276	-	-	396
HCM Lane V/C Ratio	0.291	0.024	-	-	0.03	-	-	0.228
HCM Control Delay (s)	18	8.5	-	-	7.9	-	-	16.8
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.2	0.1	-	-	0.1	-	-	0.9

Intersection												
Int Delay, s/veh	8.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	204	45	25	420	46	40	0	129	107	0	47
Future Vol, veh/h	53	204	45	25	420	46	40	0	129	107	0	47
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	58	222	49	27	457	50	43	0	140	116	0	51

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	507	0	0	271	0	0	925	924	247	969	923	482
Stage 1	-	-	-	-	-	-	363	363	-	536	536	-
Stage 2	-	-	-	-	-	-	562	561	-	433	387	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1058	-	-	1292	-	-	250	269	792	233	270	584
Stage 1	-	-	-	-	-	-	656	625	-	529	523	-
Stage 2	-	-	-	-	-	-	512	510	-	601	610	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1058	-	-	1292	-	-	215	249	792	181	250	584
Mov Cap-2 Maneuver	-	-	-	-	-	-	215	249	-	181	250	-
Stage 1	-	-	-	-	-	-	620	591	-	500	512	-
Stage 2	-	-	-	-	-	-	457	499	-	467	576	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.5			0.4			16.9			41.8		
HCM LOS							C			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	484	1058	-	-	1292	-	-	181	584
HCM Lane V/C Ratio	0.38	0.054	-	-	0.021	-	-	0.643	0.087
HCM Control Delay (s)	16.9	8.6	-	-	7.8	-	-	55	11.8
HCM Lane LOS	C	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	1.8	0.2	-	-	0.1	-	-	3.7	0.3

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	439	466	82	0	24
Future Vol, veh/h	0	439	466	82	0	24
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	477	507	89	0	26

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	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	533
HCM Lane V/C Ratio	-	-	-	0.049
HCM Control Delay (s)	-	-	-	12.1
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	134	75	0
Future Vol, veh/h	0	4	0	134	75	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	4	0	146	82	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	228	82	82	0	0
Stage 1	82	-	-	-	-
Stage 2	146	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	760	978	1515	-	-
Stage 1	941	-	-	-	-
Stage 2	881	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	760	978	1515	-	-
Mov Cap-2 Maneuver	760	-	-	-	-
Stage 1	941	-	-	-	-
Stage 2	881	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1515	-	978	-	-
HCM Lane V/C Ratio	-	-	0.004	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

MITIGATION

Timings

101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy

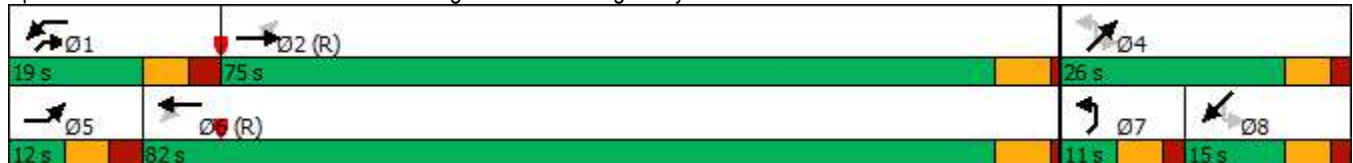


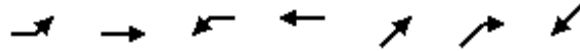
Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT
Lane Configurations	↖	↕	↖	↕		↗	↗		↕
Traffic Volume (vph)	7	1152	111	930	87	9	79	6	3
Future Volume (vph)	7	1152	111	930	87	9	79	6	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+ov	Perm	NA
Protected Phases	5	2	1	6	7	4	1		8
Permitted Phases	2		6		4		4	8	
Detector Phase	5	2	1	6	7	4	1	8	8
Switch Phase									
Minimum Initial (s)	5.0	25.0	5.0	25.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	12.0	31.0	12.0	31.0	11.0	14.0	12.0	14.0	14.0
Total Split (s)	12.0	75.0	19.0	82.0	11.0	26.0	19.0	15.0	15.0
Total Split (%)	10.0%	62.5%	15.8%	68.3%	9.2%	21.7%	15.8%	12.5%	12.5%
Yellow Time (s)	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	3.0	1.0	2.0	2.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	7.0	6.0		6.0	7.0		6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead		Lead	Lag	Lag
Lead-Lag Optimize?					Yes				
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max	Max
Act Effct Green (s)	78.1	74.1	86.3	85.6		20.0	32.9		20.0
Actuated g/C Ratio	0.65	0.62	0.72	0.71		0.17	0.27		0.17
v/c Ratio	0.02	0.60	0.44	0.40		0.46	0.18		0.05
Control Delay	5.1	15.4	8.3	5.4		52.5	13.8		42.0
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.1	15.4	8.3	5.4		52.5	13.8		42.0
LOS	A	B	A	A		D	B		D
Approach Delay		15.4		5.7		35.1			42.0
Approach LOS		B		A		D			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 91 (76%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 12.8
 Intersection LOS: B
 Intersection Capacity Utilization 64.0%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy



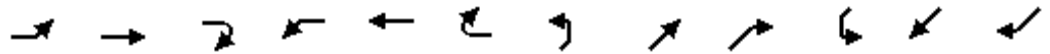


Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWT
Lane Group Flow (vph)	8	1299	121	1011	105	86	13
v/c Ratio	0.02	0.60	0.44	0.40	0.46	0.18	0.05
Control Delay	5.1	15.4	8.3	5.4	52.5	13.8	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	15.4	8.3	5.4	52.5	13.8	42.0
Queue Length 50th (ft)	2	298	5	35	74	15	5
Queue Length 95th (ft)	6	378	52	293	133	55	m13
Internal Link Dist (ft)		5331		2497	2027		1029
Turn Bay Length (ft)	150		200			100	
Base Capacity (vph)	374	2176	337	2524	228	541	263
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.60	0.36	0.40	0.46	0.16	0.05

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2022 Buildout PM MIT FINAL (SCHAAD/RT/ORH)
 101: Ball Rd/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	7	1152	43	111	930	0	87	9	79	6	3	3
Future Volume (vph)	7	1152	43	111	930	0	87	9	79	6	3	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)	1770	3520		1770	3539			1782	1583		1757	
Flt Permitted	0.26	1.00		0.14	1.00			0.74	1.00		0.87	
Satd. Flow (perm)	493	3520		257	3539			1373	1583		1565	
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)	8	1252	47	121	1011	0	95	10	86	7	3	3
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	46	0	3	0
Lane Group Flow (vph)	8	1297	0	121	1011	0	0	105	40	0	11	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	Perm	NA	
Protected Phases	5	2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	75.1	74.1		86.9	80.0			20.0	26.9		20.0	
Effective Green, g (s)	75.1	74.1		86.9	80.0			20.0	26.9		20.0	
Actuated g/C Ratio	0.63	0.62		0.72	0.67			0.17	0.22		0.17	
Clearance Time (s)	7.0	6.0		7.0	6.0			6.0	7.0		6.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			3.0	2.0		3.0	
Lane Grp Cap (vph)	319	2173		273	2359			228	354		260	
v/s Ratio Prot	0.00	c0.37		c0.03	c0.29				0.01			
v/s Ratio Perm	0.02			0.30				c0.08	0.02		0.01	
v/c Ratio	0.03	0.60		0.44	0.43			0.46	0.11		0.04	
Uniform Delay, d1	8.5	13.9		9.6	9.3			45.1	37.1		41.9	
Progression Factor	1.00	1.00		0.76	0.67			1.00	1.00		1.17	
Incremental Delay, d2	0.0	1.2		0.4	0.5			1.5	0.1		0.3	
Delay (s)	8.6	15.1		7.7	6.8			46.6	37.1		49.2	
Level of Service	A	B		A	A			D	D		D	
Approach Delay (s)		15.1			6.9			42.3			49.2	
Approach LOS		B			A			D			D	

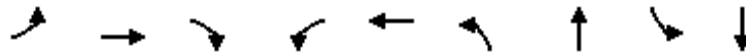
Intersection Summary		
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.60	B
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	64.0%	25.0
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM 6th Edition methodology does not support a perm + prot left-turn type from a shared lane. Left-turn bay is needed for phases 7.

Timings

102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy

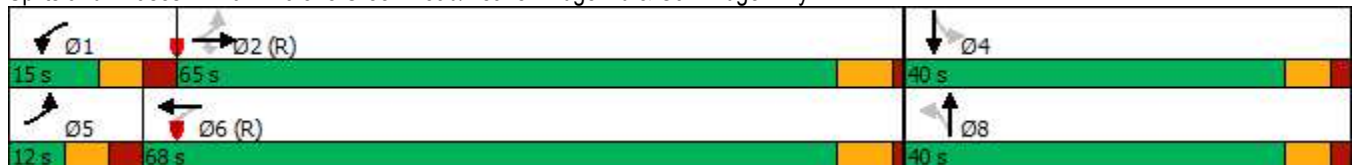


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↘	↖	↗	↖	↗	↘	↖
Traffic Volume (vph)	3	980	255	56	936	416	5	2	5
Future Volume (vph)	3	980	255	56	936	416	5	2	5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2		1	6		8		4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	8	8	4	4
Switch Phase									
Minimum Initial (s)	5.0	25.0	25.0	5.0	25.0	8.0	8.0	8.0	8.0
Minimum Split (s)	12.0	31.0	31.0	12.0	31.0	24.0	24.0	24.0	24.0
Total Split (s)	12.0	65.0	65.0	15.0	68.0	40.0	40.0	40.0	40.0
Total Split (%)	10.0%	54.2%	54.2%	12.5%	56.7%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	4.0	5.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	1.0	1.0	3.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	7.0	6.0	6.0	7.0	6.0	6.0	6.0		6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag				
Lead-Lag Optimize?									
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	65.5	62.5	62.5	72.2	71.6	34.0	34.0		34.0
Actuated g/C Ratio	0.55	0.52	0.52	0.60	0.60	0.28	0.28		0.28
v/c Ratio	0.01	0.58	0.29	0.23	0.50	0.59	0.13		0.01
Control Delay	5.7	9.9	0.7	9.7	12.4	42.3	12.3		50.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	5.7	9.9	0.7	9.7	12.4	42.3	12.3		50.8
LOS	A	A	A	A	B	D	B		D
Approach Delay		8.0			12.3		38.7		50.8
Approach LOS		A			B		D		D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 15.0
 Intersection LOS: B
 Intersection Capacity Utilization 65.6%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy





Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	3	1065	277	61	1055	452	62	7
v/c Ratio	0.01	0.58	0.29	0.23	0.50	0.59	0.13	0.01
Control Delay	5.7	9.9	0.7	9.7	12.4	42.3	12.3	50.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.7	9.9	0.7	9.7	12.4	42.3	12.3	50.8
Queue Length 50th (ft)	0	94	1	16	191	155	8	5
Queue Length 95th (ft)	m1	121	5	m21	m231	215	44	m14
Internal Link Dist (ft)		2497			474		157	88
Turn Bay Length (ft)	100		250	150		200		
Base Capacity (vph)	273	1843	957	282	2103	770	495	507
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.58	0.29	0.22	0.50	0.59	0.13	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary 2022 Buildout PM MIT FINAL (SCHAAD/RT/ORH)
 102: Malone Creek Road/Beaver Ridge Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑	↖	↗	↑↑		↗↖	↑			↕	
Traffic Volume (veh/h)	3	980	255	56	936	35	416	5	52	2	5	0
Future Volume (veh/h)	3	980	255	56	936	35	416	5	52	2	5	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	1065	277	61	1017	38	452	5	57	2	5	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	346	1855	828	254	1937	72	897	37	418	155	368	0
Arrive On Green	0.00	0.52	0.52	0.07	1.00	1.00	0.28	0.28	0.28	0.38	0.38	0.00
Sat Flow, veh/h	1781	3554	1585	1781	3493	131	2738	129	1475	410	1299	0
Grp Volume(v), veh/h	3	1065	277	61	517	538	452	0	62	7	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1847	1369	0	1605	1708	0	0
Q Serve(g_s), s	0.1	24.5	12.1	1.9	0.0	0.0	16.6	0.0	3.5	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	24.5	12.1	1.9	0.0	0.0	16.9	0.0	3.5	0.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.07	1.00		0.92	0.29		0.00
Lane Grp Cap(c), veh/h	346	1855	828	254	985	1024	897	0	455	523	0	0
V/C Ratio(X)	0.01	0.57	0.33	0.24	0.53	0.53	0.50	0.00	0.14	0.01	0.00	0.00
Avail Cap(c_a), veh/h	413	1855	828	308	985	1024	897	0	455	523	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.33	1.33	1.33
Upstream Filter(I)	0.80	0.80	0.80	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.5	19.6	16.6	14.5	0.0	0.0	36.8	0.0	32.1	26.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.9	0.5	2.0	1.9	2.0	0.0	0.6	0.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.3	4.2	0.7	0.5	0.5	5.9	0.0	1.4	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.5	20.6	17.5	15.0	2.0	1.9	38.9	0.0	32.7	26.9	0.0	0.0
LnGrp LOS	B	C	B	B	A	A	D	A	C	C	A	A
Approach Vol, veh/h		1345			1116			514				7
Approach Delay, s/veh		19.9			2.7			38.1				26.9
Approach LOS		B			A			D				C
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.3	68.7		40.0	7.5	72.5		40.0				
Change Period (Y+Rc), s	7.0	6.0		6.0	7.0	6.0		6.0				
Max Green Setting (Gmax), s	8.0	59.0		34.0	5.0	62.0		34.0				
Max Q Clear Time (g_c+I1), s	3.9	26.5		2.3	2.1	2.0		18.9				
Green Ext Time (p_c), s	0.0	9.0		0.0	0.0	7.3		1.8				
Intersection Summary												
HCM 6th Ctrl Delay				16.6								
HCM 6th LOS				B								

Timings
103: Schaad Rd & Oak Ridge Hwy

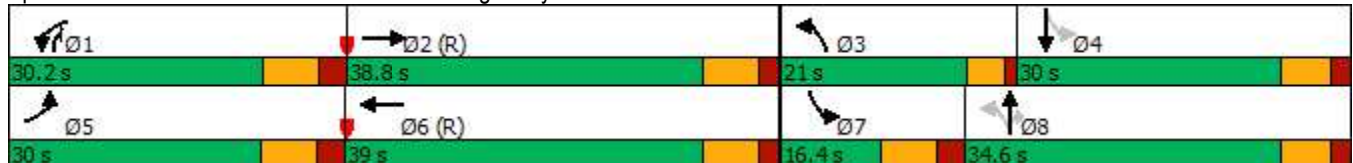


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖↗	↕	↖↗	↕	↖	↕↕	↖	↖	↕↕
Traffic Volume (vph)	535	403	493	607	235	480	387	141	398
Future Volume (vph)	535	403	493	607	235	480	387	141	398
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	pm+ov	pm+pt	NA
Protected Phases	5	2	1	6	3	8	1	7	4
Permitted Phases					8		8	4	
Detector Phase	5	2	1	6	3	8	1	7	4
Switch Phase									
Minimum Initial (s)	6.0	20.0	6.0	20.0	5.0	15.0	6.0	6.0	15.0
Minimum Split (s)	13.5	27.0	13.5	27.0	9.5	21.5	13.5	13.5	21.5
Total Split (s)	30.0	38.8	30.2	39.0	21.0	34.6	30.2	16.4	30.0
Total Split (%)	25.0%	32.3%	25.2%	32.5%	17.5%	28.8%	25.2%	13.7%	25.0%
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	4.5	5.0	5.0	4.5
All-Red Time (s)	2.5	2.0	2.5	2.0	1.0	2.0	2.5	2.5	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.0	7.5	7.0	4.5	6.5	7.5	7.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	C-Max	None	C-Max	None	Max	None	None	Max
Act Effct Green (s)	22.0	33.1	21.4	32.5	46.1	28.4	56.3	31.8	24.2
Actuated g/C Ratio	0.18	0.28	0.18	0.27	0.38	0.24	0.47	0.26	0.20
v/c Ratio	0.93	0.61	0.88	0.86	0.85	0.62	0.51	0.61	0.88
Control Delay	88.5	27.6	64.2	51.2	50.1	36.2	23.6	39.6	57.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.5	27.6	64.2	51.2	50.1	36.2	23.6	39.6	57.0
LOS	F	C	E	D	D	D	C	D	E
Approach Delay		57.8		56.4		34.7			53.6
Approach LOS		E		E		C			D

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 12 (10%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 50.5
 Intersection LOS: D
 Intersection Capacity Utilization 87.9%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 103: Schaad Rd & Oak Ridge Hwy





Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	582	593	536	819	255	522	421	153	634
v/c Ratio	0.93	0.61	0.88	0.86	0.85	0.62	0.51	0.61	0.88
Control Delay	88.5	27.6	64.2	51.2	50.1	36.2	23.6	39.6	57.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.5	27.6	64.2	51.2	50.1	36.2	23.6	39.6	57.0
Queue Length 50th (ft)	247	76	207	312	134	178	228	82	233
Queue Length 95th (ft)	#340	141	#287	#418	m#276	242	339	135	#340
Internal Link Dist (ft)		267		278		348			506
Turn Bay Length (ft)	175		400		200			250	
Base Capacity (vph)	643	966	649	948	309	837	840	257	723
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.61	0.83	0.86	0.83	0.62	0.50	0.60	0.88

Intersection Summary

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

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.























HCM 6th Signalized Intersection Summary 2022 Buildout PM MIT FINAL (SCHAAD/RT/ORH)
 103: Schaad Rd & Oak Ridge Hwy Grassy Creek Center TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	535	403	143	493	607	146	235	480	387	141	398	185
Future Volume (veh/h)	535	403	143	493	607	146	235	480	387	141	398	185
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	582	438	155	536	660	159	255	522	421	153	433	201
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	627	729	256	593	775	187	308	832	643	253	486	224
Arrive On Green	0.30	0.47	0.47	0.17	0.27	0.27	0.13	0.23	0.23	0.07	0.21	0.21
Sat Flow, veh/h	3456	2580	905	3456	2841	684	1781	3554	1585	1781	2364	1087
Grp Volume(v), veh/h	582	300	293	536	413	406	255	522	421	153	324	310
Grp Sat Flow(s),veh/h/ln	1728	1777	1708	1728	1777	1747	1781	1777	1585	1781	1777	1675
Q Serve(g_s), s	19.6	14.9	15.2	18.2	26.4	26.4	13.2	15.8	25.8	8.1	21.3	21.6
Cycle Q Clear(g_c), s	19.6	14.9	15.2	18.2	26.4	26.4	13.2	15.8	25.8	8.1	21.3	21.6
Prop In Lane	1.00		0.53	1.00		0.39	1.00		1.00	1.00		0.65
Lane Grp Cap(c), veh/h	627	502	483	593	485	477	308	832	643	253	366	345
V/C Ratio(X)	0.93	0.60	0.61	0.90	0.85	0.85	0.83	0.63	0.65	0.60	0.89	0.90
Avail Cap(c_a), veh/h	648	502	483	654	485	477	325	832	643	253	366	345
HCM Platoon Ratio	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.1	26.7	26.7	48.7	41.3	41.3	33.0	41.2	28.9	34.9	46.3	46.4
Incr Delay (d2), s/veh	19.1	5.2	5.6	14.3	16.9	17.3	15.6	3.6	5.1	2.9	25.7	28.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	5.8	5.7	8.9	13.5	13.4	6.8	7.1	10.2	3.7	11.8	11.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.2	31.9	32.3	63.1	58.3	58.6	48.6	44.8	34.0	37.8	72.0	74.9
LnGrp LOS	E	C	C	E	E	E	D	D	C	D	E	E
Approach Vol, veh/h		1175			1355			1198			787	
Approach Delay, s/veh		46.0			60.3			41.8			66.5	
Approach LOS		D			E			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	28.1	40.9	19.8	31.2	29.3	39.7	16.4	34.6				
Change Period (Y+Rc), s	7.5	7.0	4.5	6.5	7.5	7.0	7.5	6.5				
Max Green Setting (Gmax), s	22.7	31.8	16.5	23.5	22.5	32.0	8.9	28.1				
Max Q Clear Time (g_c+I1), s	20.2	17.2	15.2	23.6	21.6	28.4	10.1	17.8				
Green Ext Time (p_c), s	0.3	5.0	0.1	0.0	0.2	2.3	0.0	3.2				
Intersection Summary												
HCM 6th Ctrl Delay			52.8									
HCM 6th LOS			D									

Timings

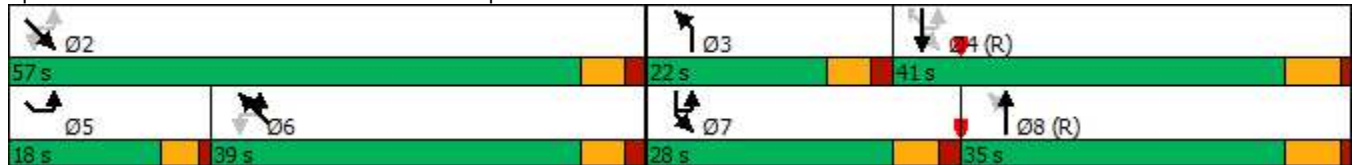
105: Schaad Rd & Ball Camp Pk/Malone Creek Road

												
Lane Group	NBL	NBT	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	204	523	40	266	508	220	273	64	102	15	124	292
Future Volume (vph)	204	523	40	266	508	220	273	64	102	15	124	292
Turn Type	pm+pt	NA	pm+pt	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Prot
Protected Phases	3	8	7	7	4		5	2			6	6
Permitted Phases	8		4	4		4	2		2	6		
Detector Phase	3	8	7	7	4	4	5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	25.0	5.0	5.0	25.0	25.0	5.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	31.0	11.0	11.0	31.0	31.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	22.0	35.0	28.0	28.0	41.0	41.0	18.0	57.0	57.0	39.0	39.0	39.0
Total Split (%)	18.3%	29.2%	23.3%	23.3%	34.2%	34.2%	15.0%	47.5%	47.5%	32.5%	32.5%	32.5%
Yellow Time (s)	4.0	5.0	4.0	4.0	5.0	5.0	3.5	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	1.0	2.0	2.0	1.0	1.0	1.0	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	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	4.5	6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead			Lag	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max	None	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	50.7	37.4		60.9	42.5	42.5	47.7	46.2	46.2		28.2	28.2
Actuated g/C Ratio	0.42	0.31		0.51	0.35	0.35	0.40	0.38	0.38		0.24	0.24
v/c Ratio	0.52	0.52		0.73	0.44	0.33	0.63	0.10	0.16		0.36	0.85
Control Delay	22.7	37.8		16.6	19.3	6.5	28.4	19.3	2.6		39.7	64.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	22.7	37.8		16.6	19.3	6.5	28.4	19.3	2.6		39.7	64.9
LOS	C	D		B	B	A	C	B	A		D	E
Approach Delay		33.6			15.8			21.1			56.8	
Approach LOS		C			B			C			E	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 6 (5%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 28.3
 Intersection LOS: C
 Intersection Capacity Utilization 91.0%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 105: Schaad Rd & Ball Camp Pk/Malone Creek Road


























Lane Group	NBL	NBT	SBL	SBT	SBR	SEL	SET	SER	NWT	NWR
Lane Group Flow (vph)	222	568	332	552	239	297	70	111	151	317
v/c Ratio	0.52	0.52	0.73	0.44	0.33	0.63	0.10	0.16	0.36	0.85
Control Delay	22.7	37.8	16.6	19.3	6.5	28.4	19.3	2.6	39.7	64.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	37.8	16.6	19.3	6.5	28.4	19.3	2.6	39.7	64.9
Queue Length 50th (ft)	94	195	89	168	30	150	30	1	97	233
Queue Length 95th (ft)	155	273	m137	m267	m71	206	53	22	153	331
Internal Link Dist (ft)		333		128			205		33	
Turn Bay Length (ft)	200		100			175		175		
Base Capacity (vph)	468	1101	495	1253	715	475	791	736	495	435
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.52	0.67	0.44	0.33	0.63	0.09	0.15	0.31	0.73

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary 2022 Buildout PM MIT FINAL (SCHAAD/RT/ORH)
 105: Schaad Rd & Ball Camp Pk/Malone Creek Road Grassy Creek Center TIS

												
Movement	NBL	NBT	NBR	SBU	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT
Lane Configurations												
Traffic Volume (veh/h)	204	523	0	40	266	508	220	273	64	102	15	124
Future Volume (veh/h)	204	523	0	40	266	508	220	273	64	102	15	124
Initial Q (Qb), veh	0	0	0		0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00		1.00		1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No				No			No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870		1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	222	568	0		289	552	239	297	70	111	16	135
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
Percent Heavy Veh, %	2	2	2		2	2	2	2	2	2	2	2
Cap, veh/h	416	1268	0		475	1358	606	404	694	589	54	381
Arrive On Green	0.10	0.36	0.00		0.12	0.38	0.38	0.11	0.37	0.37	0.22	0.22
Sat Flow, veh/h	1781	3647	0		1781	3554	1585	1781	1870	1585	95	1722
Grp Volume(v), veh/h	222	568	0		289	552	239	297	70	111	151	0
Grp Sat Flow(s),veh/h/ln	1781	1777	0		1781	1777	1585	1781	1870	1585	1818	0
Q Serve(g_s), s	9.3	14.7	0.0		12.1	13.6	13.2	13.5	2.9	5.7	0.0	0.0
Cycle Q Clear(g_c), s	9.3	14.7	0.0		12.1	13.6	13.2	13.5	2.9	5.7	8.2	0.0
Prop In Lane	1.00		0.00		1.00		1.00	1.00		1.00	0.11	
Lane Grp Cap(c), veh/h	416	1268	0		475	1358	606	404	694	589	435	0
V/C Ratio(X)	0.53	0.45	0.00		0.61	0.41	0.39	0.74	0.10	0.19	0.35	0.00
Avail Cap(c_a), veh/h	482	1268	0		584	1358	606	404	795	674	530	0
HCM Platoon Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.2	29.5	0.0		20.8	27.1	27.0	32.4	24.6	25.5	39.6	0.0
Incr Delay (d2), s/veh	1.1	1.1	0.0		1.3	0.9	1.9	6.8	0.1	0.2	0.5	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	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	6.2	0.0		4.9	5.7	5.1	7.4	1.3	2.1	3.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.2	30.7	0.0		22.1	28.0	28.9	39.3	24.7	25.7	40.1	0.0
LnGrp LOS	C	C	A		C	C	C	D	C	C	D	A
Approach Vol, veh/h		790				1080			478			468
Approach Delay, s/veh		28.3				26.6			34.0			56.7
Approach LOS		C				C			C			E
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		50.6	17.6	51.9	18.0	32.6	20.6	48.8				
Change Period (Y+Rc), s		6.0	6.0	6.0	4.5	6.0	6.0	6.0				
Max Green Setting (Gmax), s		51.0	16.0	35.0	13.5	33.0	22.0	29.0				
Max Q Clear Time (g_c+I1), s		7.7	11.3	15.6	15.5	25.4	14.1	16.7				
Green Ext Time (p_c), s		0.8	0.2	4.0	0.0	1.2	0.5	2.7				
Intersection Summary												
HCM 6th Ctrl Delay			33.3									
HCM 6th LOS			C									
Notes												
User approved ignoring U-Turning movement.												



Movement	NWR
Lane Configurations	7
Traffic Volume (veh/h)	292
Future Volume (veh/h)	292
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	1.00
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1870
Adj Flow Rate, veh/h	317
Peak Hour Factor	0.92
Percent Heavy Veh, %	2
Cap, veh/h	351
Arrive On Green	0.22
Sat Flow, veh/h	1585
Grp Volume(v), veh/h	317
Grp Sat Flow(s),veh/h/ln	1585
Q Serve(g_s), s	23.4
Cycle Q Clear(g_c), s	23.4
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	351
V/C Ratio(X)	0.90
Avail Cap(c_a), veh/h	436
HCM Platoon Ratio	1.00
Upstream Filter(l)	1.00
Uniform Delay (d), s/veh	45.5
Incr Delay (d2), s/veh	19.1
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	10.7
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	64.6
LnGrp LOS	E
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

**Schaad Road
Right-turn
Access**

Proposed Schaad Right-Turn Access

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes
300 - 349 350 - 399			Yes	Yes	Yes	Yes
400 - 449 450 - 499		Yes	Yes	Yes	Yes	Yes
500 - 549 550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49						
AM 50 - 99 65vph/755vph				Yes	Yes	Yes
PM 100 - 149 129vph/497vph			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.



**CDM
Smith**

