

TECHNICAL MEMORANDUM

TO: Paul Brinkman, Town Engineer

FROM: Lisa Slonus, PE, PTOE

DATE: October 31, 2018

SUBJECT: Traffic Evaluation
Loker Recreation Area
Wayland, MA

cc: G. Bolinger, B. Kunkel

As requested, Weston & Sampson has performed a traffic evaluation for the proposed recreation turf field at the Loker Recreation Area located along Commonwealth Road in Wayland, MA. The site driveway is located along Commonwealth Road about 600' east of Oak Street and Rice Road. A location map is attached, see Figure 1. An aerial of existing roadway conditions is also provided, see Figure 2 attached. The site, formerly occupied by a chemical company, was purchased by the Town and rehabbed as a recreation and conservation area. The Town has proposed to provide one recreational field with 50 parking spaces at this site. Access to existing trails and conservation areas will remain. Site access is proposed via the existing site driveway located on Commonwealth Road (Route 30). For the purposes of this evaluation, it is assumed that the field will be open for use in the year 2019.

This memorandum summarizes the efforts of the traffic assessment, which included field reconnaissance, a traffic-counting program, development of site generated traffic volumes, and operational analysis of the following Commonwealth Road intersections:

- Oak Street and Rice Road (signalized)
- Willowbrook Drive (unsignalized)
- Site Driveway (unsignalized)

Intersection analysis was conducted for the 2018 Existing conditions, 2019 No Build conditions, and 2019 Build conditions. The purpose of this analysis is to determine the traffic impact, if any, related to the new turf field site traffic volumes on the operational characteristics of Commonwealth Road (Route 30).

Existing Traffic Volumes

A traffic-counting program was conducted in March 2018, while schools were in session. Specifically automatic traffic recorder (ATR) counts were performed along Commonwealth Road and captured hourly, directional, typical weekday volumes and weekend volumes. Intersection turning movement counts (TMCs) were also conducted for the weekday evening commuter period (between 4 and 6PM) and Saturday morning and midday (8AM to 2PM). Because this site is not considered a weekday morning peak hour generator (between 7-9AM), TMC's were not performed during this period. The ATR and TMC results are attached. Based on MassDOT seasonal adjustment factors, these March traffic volumes are representative of average traffic volumes.

The peak hours experienced along Commonwealth Road was 5 to 6PM during the weekday evening commuter peak period, and 11:45 AM to 12:45 PM during the Saturday morning/midday. The existing peak hour traffic volumes are summarized in Figure 3, attached.

No Build Traffic Volumes

The field is anticipated to open for use in 2019. As a base for comparison to determine traffic impact, if any, of the proposed development on the surrounding roadway network, future traffic conditions for the year 2019 “no-build” conditions were developed. Specifically, the existing traffic volumes were increased by background growth. Background traffic volume growth represents the increase in traffic volumes over the course of time, unrelated to the proposed project. Growth occurs from developments within the immediate study vicinity, as well as regional traffic growth due to development and population increase outside the immediate vicinity of the project site. Based on discussions with the Town, there are no proposed/approved developments of significant size within the evaluation area. A conservative 2% background growth rate for one year was applied to the existing traffic volumes. The year 2019 No Build Traffic Volumes are summarized in Figure 4.

Site Traffic

Projected site traffic volumes were developed for the study periods based on anticipated field use. The anticipated field use was based on a sample programming schedule provided by the Town’s Recreation Department. The programming schedule takes into account current Wayland High School turf field use, field permits that are typically requested and denied due to lack of available field space in Town, and programming that could be introduced with a second turf field. During the weekday PM peak hour, the site is anticipated to generate a total of 62 trips (24 in/ 38 out) and 90 total trips (45 in / 45 out) during the Saturday peak hour.

The distribution of site traffic was developed based on population centers within the Town, surrounding roadway network, existing traffic patterns, and the site location (within the southeastern corner of the Town). The majority of the site traffic is anticipated to be oriented to and from the west via Commonwealth Road and the Commonwealth Road at Oak Street and Rice Road intersection. A small percentage of site traffic is anticipated to be oriented to and from the east via Commonwealth Road. Some of this anticipated westbound Commonwealth Road traffic is due to by-pass traffic from Rice Road to Mainstone Road, turning right onto Commonwealth Road. Figure 5 summarizes the trip distribution for buses and employee vehicles.

Figure 6 illustrates the site generated traffic volumes distributed through the evaluation intersections and at the site driveway.

Build Traffic Volumes

The site traffic volumes (Figure 4) were superimposed on the no build traffic volumes (Figure 5) to represent the traffic expected in the area after opening of the turf field. The build traffic volumes are summarized in Figure 7.

Operational Analysis and Results

The evaluation intersections were analyzed based on the Existing, No Build, and Build traffic conditions for the weekday PM and Saturday midday peak hours based on methodologies described in the attached, EXPLANATION OF INTERSECTION ANALYSIS METHODOLOGIES. The level of service (LOS) and capacity (v/c ratio) are summarized in Table 1 and the 95th percentile queues are summarized in Table 2. The analysis results are attached.

In summary, the signalized intersection of Commonwealth Road at Oak Street and Rice Road is currently operating at an overall LOS of F during the weekday PM peak hour, and will continue to operate at LOS F given the no build and build conditions. The movements/approaches contributing to this LOS are the Oak Street NB left/through movement and the Rice Road SB approach. The site traffic volumes will not impact operations of the NB left/through movement, no site traffic volumes will be added to this movement and the movement is using the maximum green time permitted by the signal timing. Delay will increase for the Rice Road SB approach, however, increases to queueing will be negligible.

In addition, we performed a similar analysis at the Willowbrook Development driveway at its intersection with Commonwealth Road. The analysis indicated that site traffic has negligible impact on the Commonwealth Road at Willowbrook Drive intersection. The LOS, capacity, and queues at critical movements at this unsignalized intersection remain unchanged with the increase of site traffic through the intersection. The critical movements at the site driveway will operate at acceptable LOS and minimal queues.

Table 1. Level of Service (Capacity) Summary						
Intersection / Approach	2018 Existing		2019 No Build		2019 Build	
	PM	SAT	PM	SAT	PM	SAT
<u>Commonwealth Rd at Oak Street and Rice Rd:</u>						
Commonwealth Rd EB: Left/Through/Right	B (0.77)	B (0.75)	B (0.78)	B (0.75)	C (0.79)	C (0.78)
Commonwealth Rd WB: Left	B (0.65)	A (0.28)	B (0.67)	A (0.29)	B (0.70)	A (0.31)
Through/Right	B (0.67)	A (0.44)	B (0.67)	A (0.45)	B (0.70)	A (0.48)
Oak St NB: Left/Through	F (2.15)	C (0.80)	F (2.23)	C (0.64)	F (2.20)	C (0.63)
Right	C (0.48)	B (0.32)	C (0.50)	B (0.33)	D (0.51)	B (0.35)
Rice Rd SB: Left/Through/Right	D (0.82)	C (0.54)	E (0.85)	C (0.74)	F (0.99)	D (0.83)
Overall Intersection:	F	B	F	B	F	B
<u>Commonwealth Rd at Site Driveway¹:</u>						
Commonwealth Rd EB: Left	-	-	-	-	B (0.04)	A (0.05)
Loker Driveway SB: Left/Right	-	-	-	-	D (0.20)	B (0.11)
<u>Commonwealth Rd at Willowbrook Dr¹:</u>						
Commonwealth Rd WB: Left	A (0.01)	A (0.01)	A (0.01)	A (0.01)	A (0.01)	A (0.01)
Willowbrook Dr NB: Left/Right	E (0.14)	C (0.07)	E (0.15)	C (0.08)	E (0.15)	C (0.08)

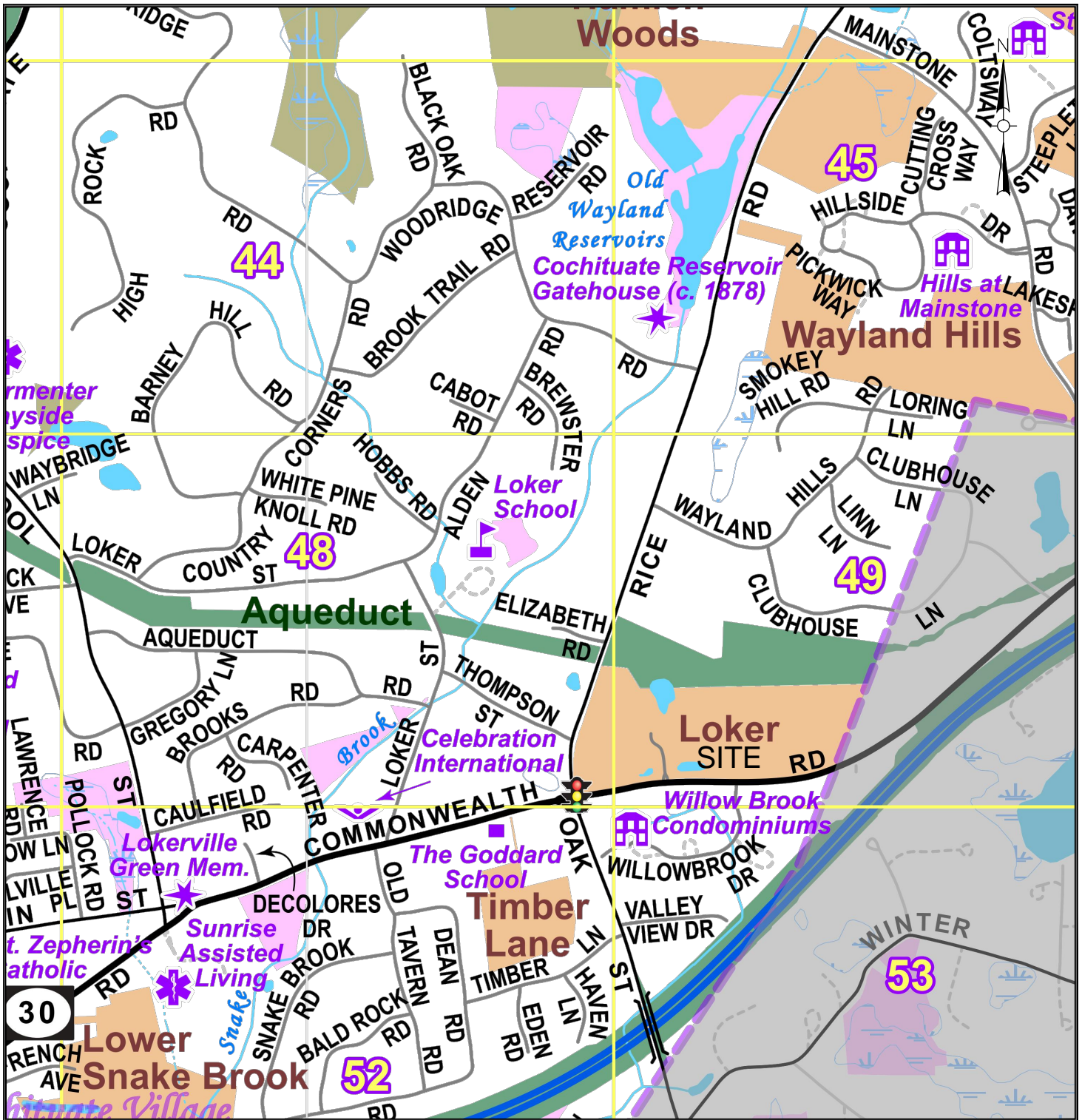
¹ Unsignalized intersection, results provided for critical movements only.

Table 2. 95 th Percentile Queue Summary, feet							
Intersection / Approach	Available Storage	2018 Existing		2019 No Build		2019 Build	
		PM	SAT	PM	SAT	PM	SAT
<u>Commonwealth Rd at Oak Street and Rice Rd:</u>							
Commonwealth Rd EB: Left/Through/Right		375	325	375	325	400	350
Commonwealth Rd WB: Left	75	125	50	125	50	125	50
Through/Right	580+	400	150	400	150	450	175
Oak St NB: Left/Through		575	150	575	175	575	175
Right	100	100	50	100	50	100	50
Rice Rd SB: Left/Through/Right		175	100	200	100	225	100
<u>Commonwealth Rd at Site Driveway¹:</u>							
Commonwealth Rd EB: Left	n/a	-	-	-	-	25	25
Loker Driveway SB: Left/Right	200+	-	-	-	-	25	25
<u>Commonwealth Rd at Willowbrook Dr¹:</u>							
Commonwealth Rd WB: Left	n/a	0	0	0	0	0	0
Willow Brook Dr NB: Left/Right	250	25	25	25	25	25	25

¹ Unsignalized intersection, results provided for critical movements only.

ATTACHMENTS

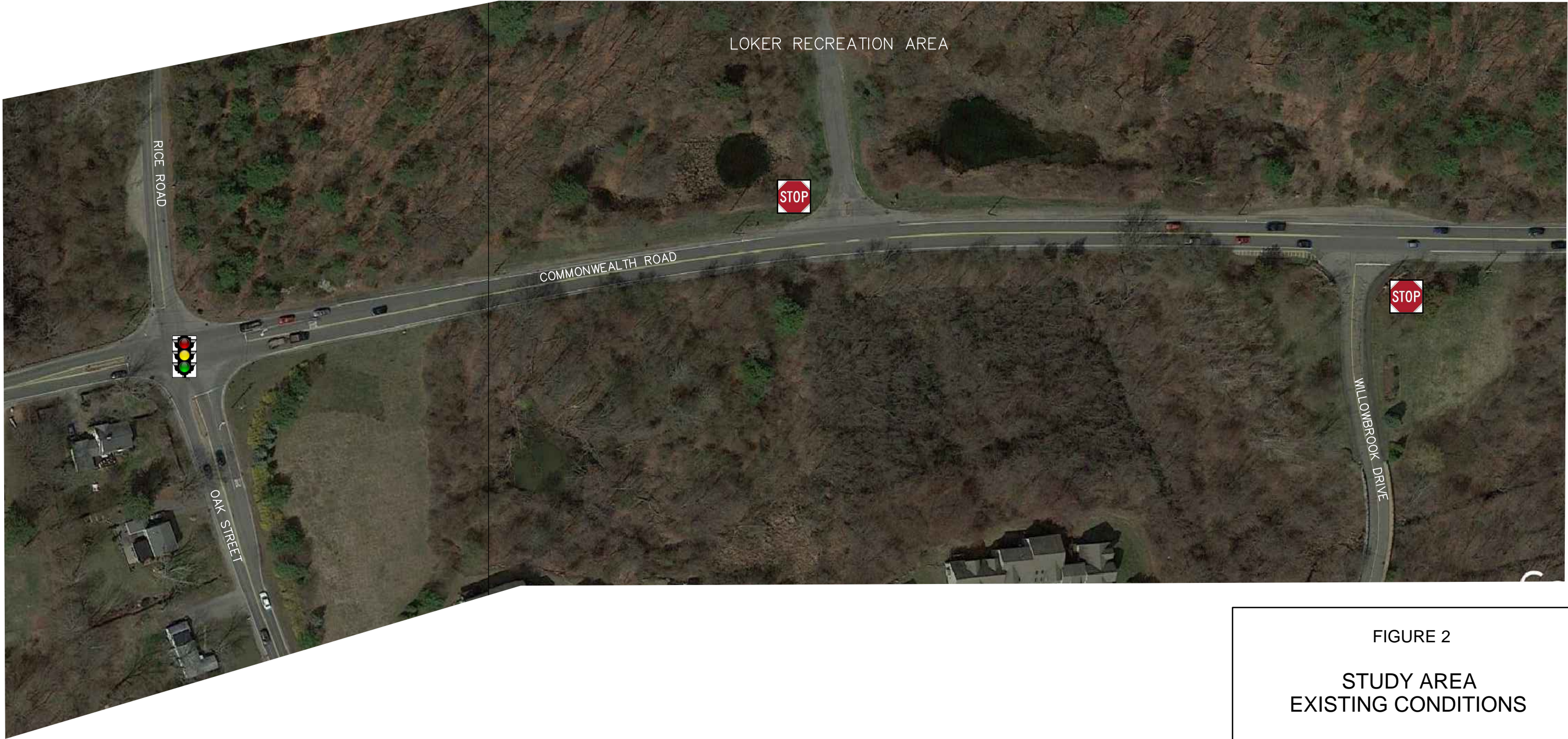
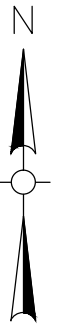
FIGURES



SCALE: 1"=1000'

FIGURE 1
LOCATION MAP

LOKER RECREATION FIELD
WAYLAND, MA



LOKER RECREATION AREA

RICE ROAD

COMMONWEALTH ROAD

OAK STREET

WILLOWBROOK DRIVE

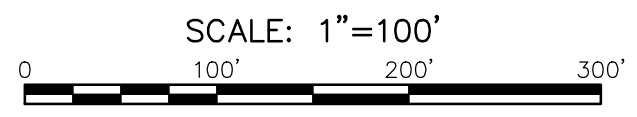


FIGURE 2
STUDY AREA
EXISTING CONDITIONS
WAYLAND, MA
Weston & SampsonSM

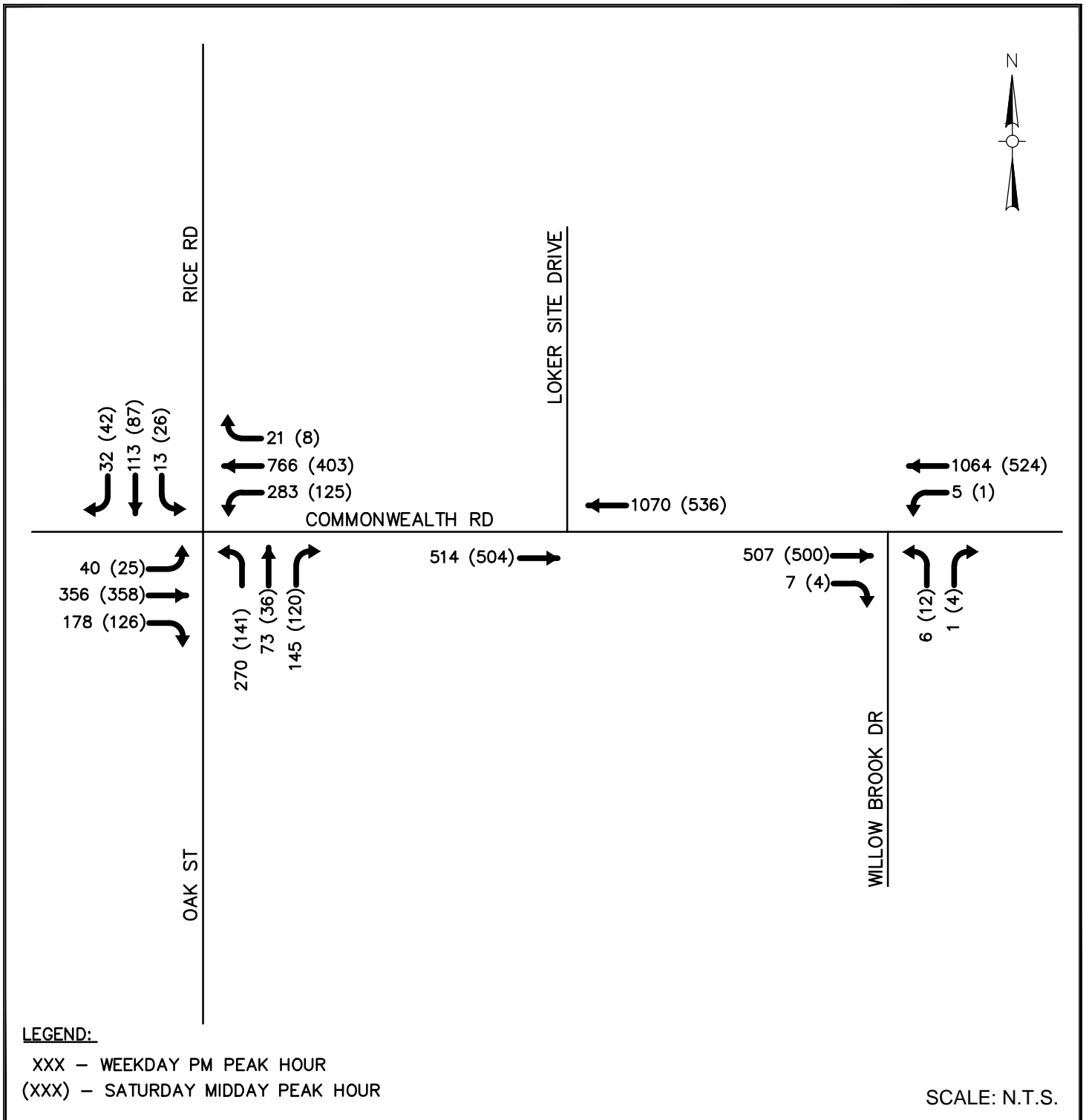


FIGURE 3
 2018 EXISTING
 PEAK HOUR TRAFFIC VOLUMES

LOKER RECREATION AREA
 WAYLAND, MA



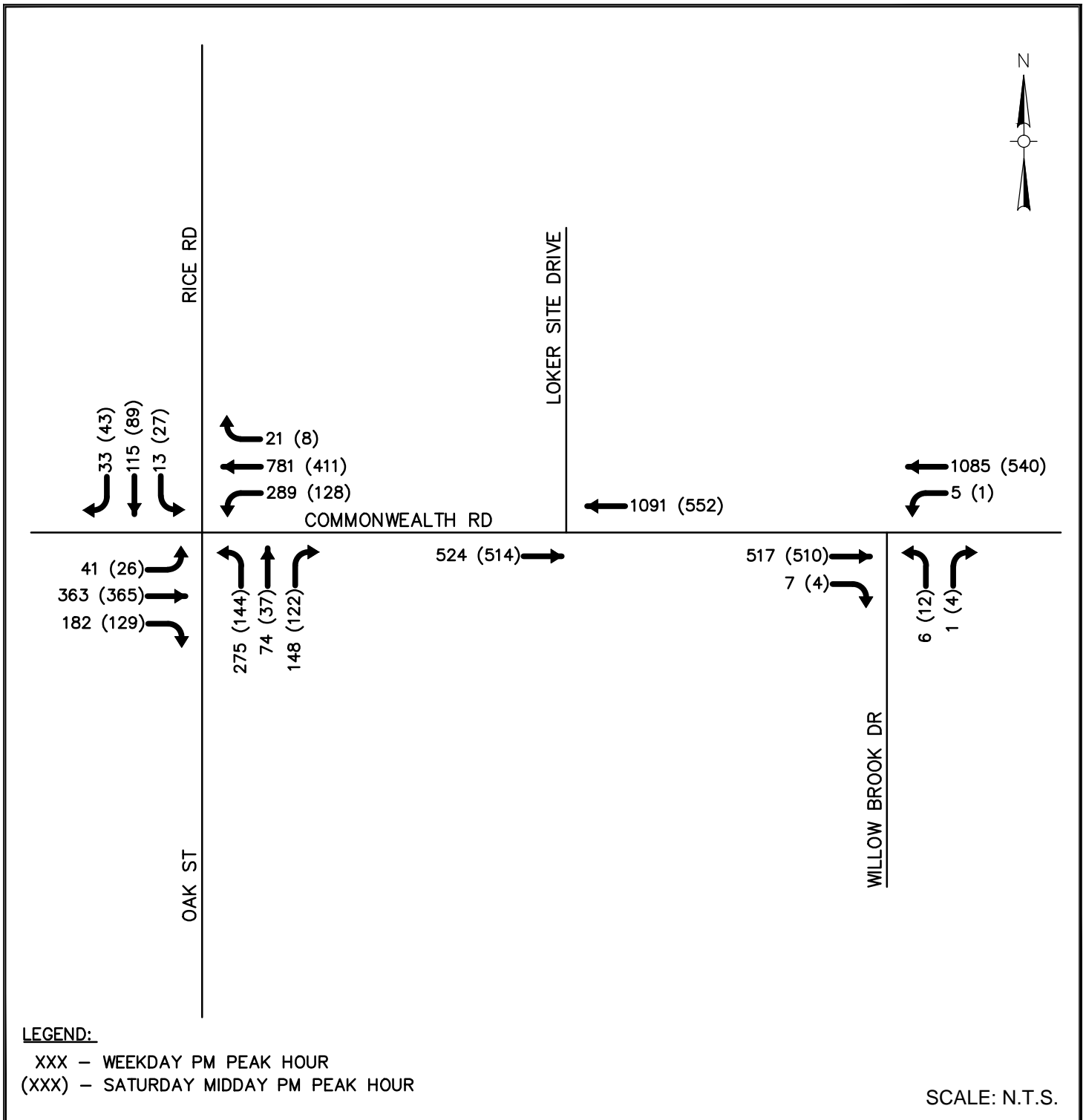


FIGURE 4
 2019 NO BUILD
 PEAK HOUR TRAFFIC VOLUMES
 LOKER RECREATION AREA
 WAYLAND, MA

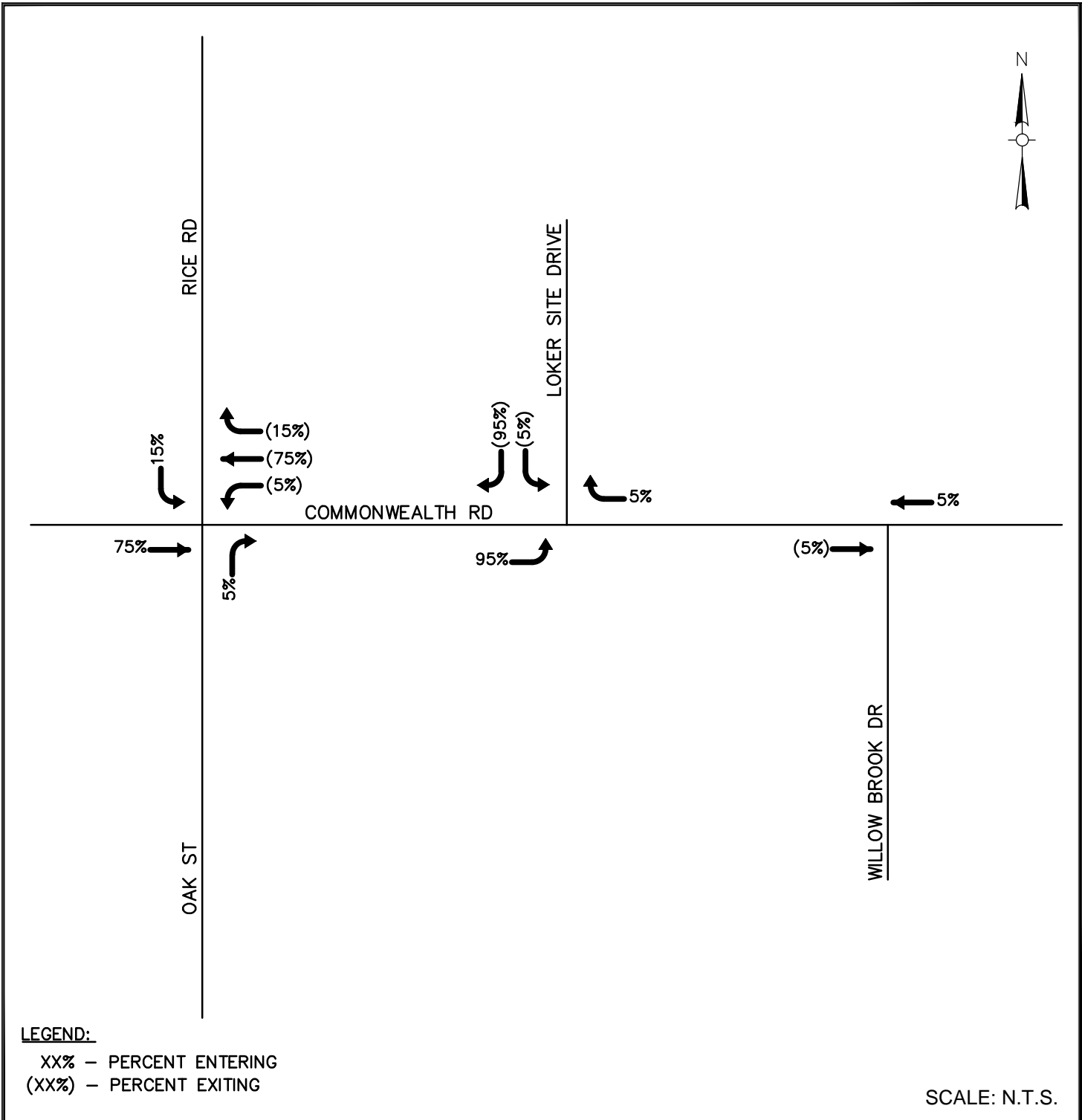
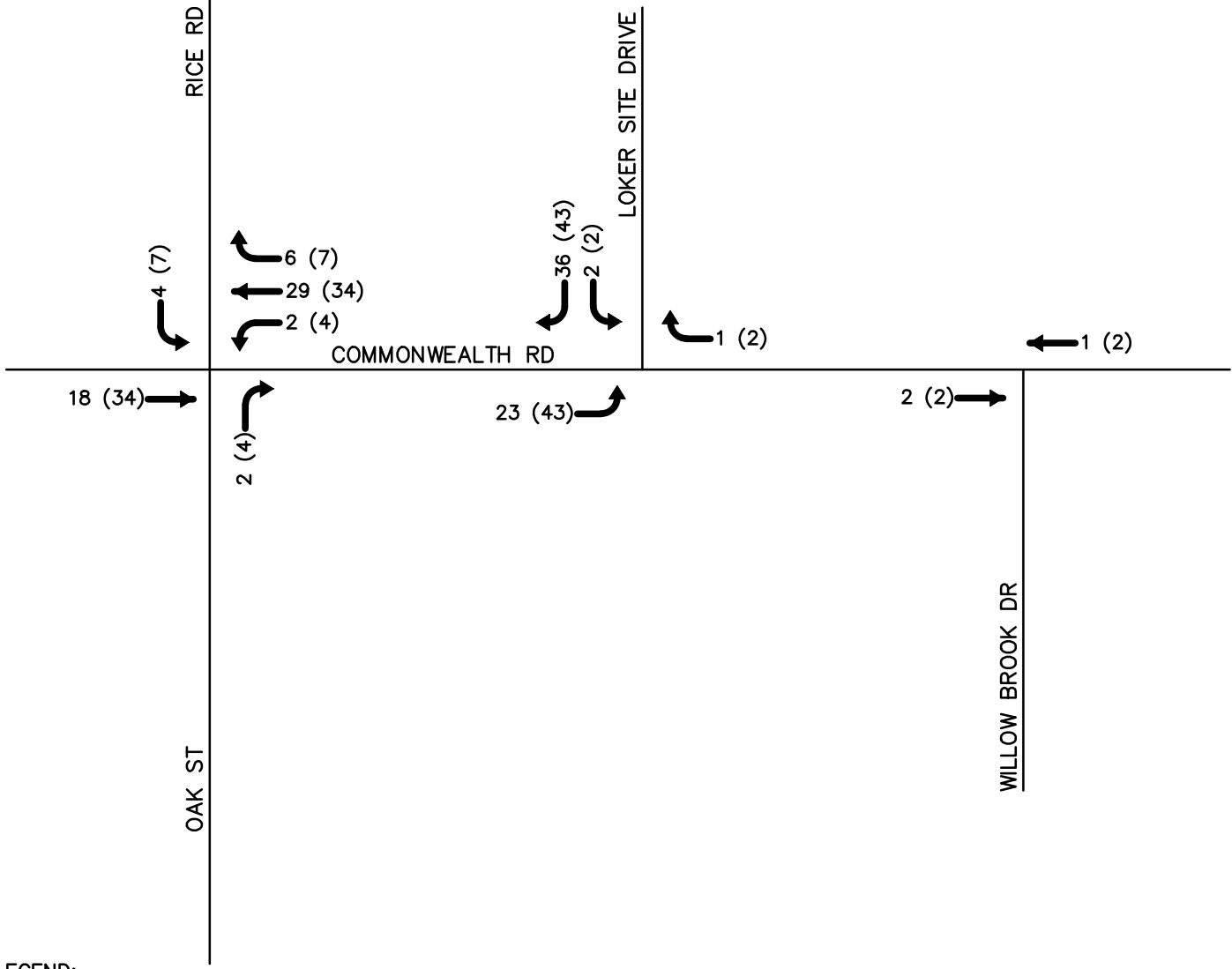
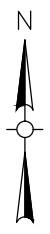


FIGURE 5

TRIP DISTRIBUTION

LOKER RECREATION AREA
 WAYLAND, MA





LEGEND:

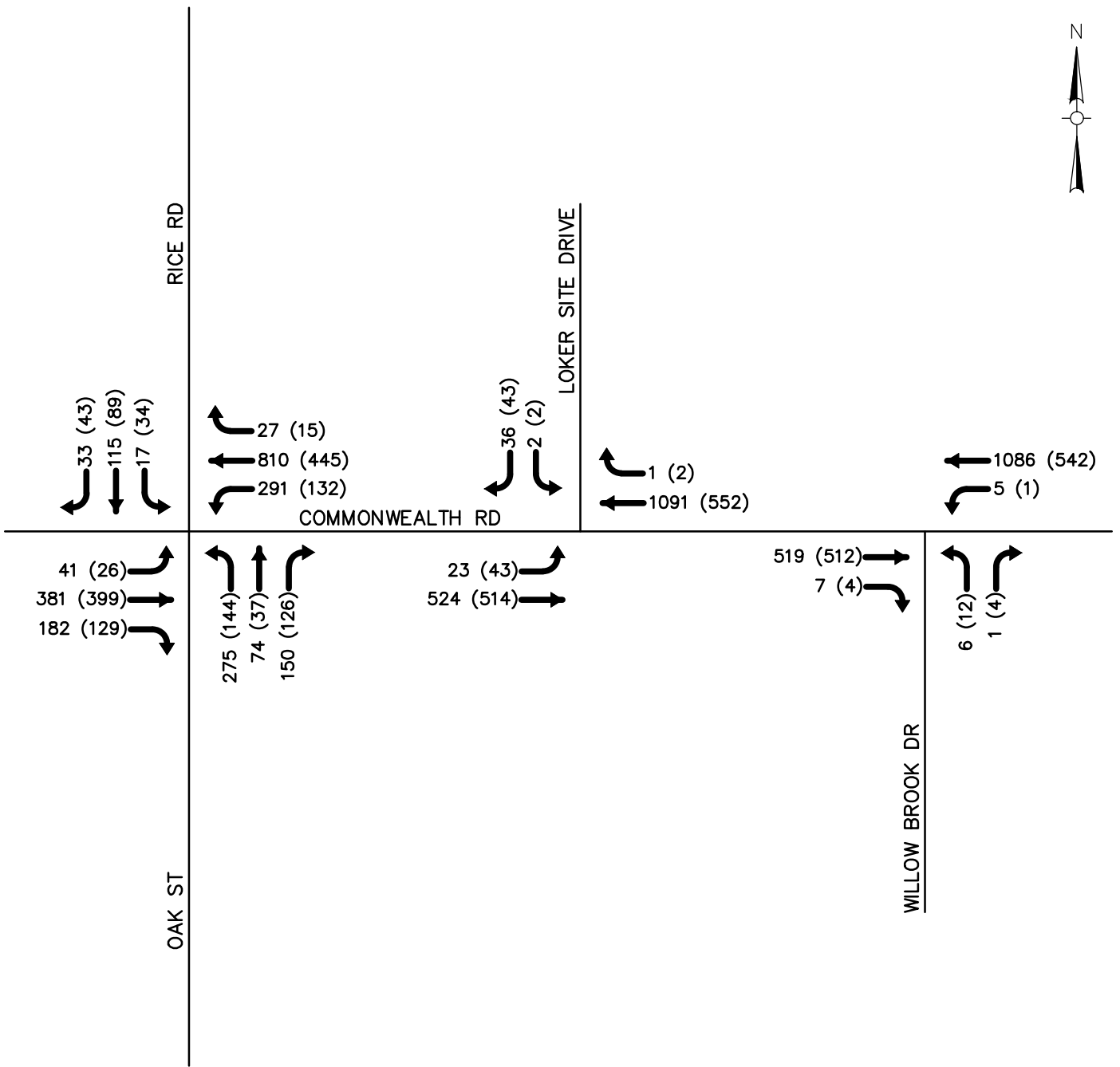
XX% - PERCENT ENTERING
(XX%) - PERCENT EXITING

SCALE: N.T.S.

FIGURE 6
SITE TRAFFIC VOLUMES

LOKER RECREATION AREA
WAYLAND, MA





LEGEND:

XXX - WEEKDAY PM PEAK HOUR
(XXX) - SATURDAY MIDDAY PEAK HOUR

SCALE: N.T.S.

FIGURE 7
YEAR 2023 BUILD
PEAK HOUR TRAFFIC VOLUMES

LOKER RECREATION AREA
WAYLAND, MA



TRAFFIC COUNTS

Accurate Counts

978-664-2565

Location : Commonwealth Avenue
 Location : West of Willow Brook Drive
 City/State: Wayland, MA

80076VL1

Start Time	3/19/2018		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	*	*	*	*	*	*	*	*	*	*	37	55	39	60	38	58
01:00	*	*	*	*	*	*	*	*	*	*	13	39	23	37	18	38
02:00	*	*	*	*	*	*	*	*	*	*	9	19	9	22	9	20
03:00	*	*	*	*	*	*	*	*	*	*	5	10	9	7	7	8
04:00	*	*	*	*	*	*	*	*	*	*	15	8	17	5	16	6
05:00	*	*	*	*	*	*	*	*	*	*	31	20	19	15	25	18
06:00	*	*	*	*	*	*	*	*	*	*	109	51	60	41	84	46
07:00	*	*	*	*	*	*	*	*	*	*	193	140	98	77	146	108
08:00	*	*	*	*	*	*	*	*	*	*	277	187	178	138	228	162
09:00	*	*	*	*	*	*	*	*	*	*	343	331	288	240	316	286
10:00	*	*	*	*	*	*	*	*	*	*	406	385	358	315	382	350
11:00	*	*	*	*	*	*	*	*	*	*	453	485	365	395	409	440
12:00 PM	*	*	*	*	*	*	*	*	*	*	471	521	422	497	446	509
01:00	*	*	*	*	*	*	*	*	*	*	470	511	420	517	445	514
02:00	*	*	*	*	*	*	*	*	*	*	479	525	392	498	436	512
03:00	*	*	*	*	*	*	*	*	*	*	503	502	384	458	444	480
04:00	*	*	*	*	*	*	*	*	*	*	423	416	461	403	442	410
05:00	*	*	*	*	*	*	*	*	*	*	449	421	445	342	447	382
06:00	*	*	*	*	*	*	*	*	*	*	361	292	347	253	354	272
07:00	*	*	*	*	*	*	*	*	*	*	269	255	222	213	246	234
08:00	*	*	*	*	*	*	*	*	*	*	202	195	158	177	180	186
09:00	*	*	*	*	*	*	*	*	*	*	196	158	104	151	150	154
10:00	*	*	*	*	*	*	*	*	*	*	128	161	60	72	94	116
11:00	*	*	*	*	*	*	*	*	*	*	76	102	37	41	56	72
Lane	0	0	0	0	0	0	0	0	0	0	5918	5789	4915	4974	5418	5381
Day	0	0	0	0	0	0	0	0	0	0	11707	11707	9889	9889	10799	10799
AM Peak	-	-	-	-	-	-	-	-	-	-	11:00	11:00	11:00	11:00	11:00	11:00
Vol.	-	-	-	-	-	-	-	-	-	-	453	485	365	395	409	440
PM Peak	-	-	-	-	-	-	-	-	-	-	15:00	14:00	16:00	13:00	17:00	13:00
Vol.	-	-	-	-	-	-	-	-	-	-	503	525	461	517	447	514

Accurate Counts

978-664-2565

Location : Commonwealth Avenue
 Location : West of Willow Brook Drive
 City/State: Wayland, MA

80076VL1

Start Time	3/26/2018		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	13	19	10	32	12	30	*	*	*	*	*	*	*	*	12	27
01:00	8	12	7	10	9	9	*	*	*	*	*	*	*	*	8	10
02:00	8	5	3	3	2	8	*	*	*	*	*	*	*	*	4	5
03:00	10	5	11	4	8	8	*	*	*	*	*	*	*	*	10	6
04:00	31	9	26	9	27	7	*	*	*	*	*	*	*	*	28	8
05:00	163	47	171	52	173	48	*	*	*	*	*	*	*	*	169	49
06:00	706	163	752	165	729	178	*	*	*	*	*	*	*	*	729	169
07:00	1063	309	1051	322	1052	309	*	*	*	*	*	*	*	*	1055	313
08:00	911	425	1029	411	928	437	*	*	*	*	*	*	*	*	956	424
09:00	698	358	748	396	677	409	*	*	*	*	*	*	*	*	708	388
10:00	417	351	619	389	478	346	*	*	*	*	*	*	*	*	505	362
11:00	373	360	386	414	484	425	*	*	*	*	*	*	*	*	414	400
12:00 PM	379	413	398	411	472	472	*	*	*	*	*	*	*	*	416	432
01:00	395	383	429	445	425	513	*	*	*	*	*	*	*	*	416	447
02:00	436	487	472	584	465	575	*	*	*	*	*	*	*	*	458	549
03:00	419	799	436	880	448	862	*	*	*	*	*	*	*	*	434	847
04:00	412	1010	393	1102	425	1030	*	*	*	*	*	*	*	*	410	1047
05:00	542	1069	457	1093	487	1028	*	*	*	*	*	*	*	*	495	1063
06:00	491	819	410	844	441	867	*	*	*	*	*	*	*	*	447	843
07:00	280	463	284	444	237	471	*	*	*	*	*	*	*	*	267	459
08:00	185	236	184	242	206	308	*	*	*	*	*	*	*	*	192	262
09:00	147	150	159	181	166	166	*	*	*	*	*	*	*	*	157	166
10:00	66	98	71	103	78	127	*	*	*	*	*	*	*	*	72	109
11:00	30	45	43	76	30	69	*	*	*	*	*	*	*	*	34	63
Lane	8183	8035	8549	8612	8459	8702	0	0	0	0	0	0	0	0	8396	8448
Day	16218		17161		17161		0	0	0	0	0	0	0	0	16844	
AM Peak	07:00	08:00	07:00	11:00	07:00	08:00	-	-	-	-	-	-	-	-	07:00	08:00
Vol.	1063	425	1051	414	1052	437	-	-	-	-	-	-	-	-	1055	424
PM Peak	17:00	17:00	14:00	16:00	17:00	16:00	-	-	-	-	-	-	-	-	17:00	17:00
Vol.	542	1069	472	1102	487	1030	-	-	-	-	-	-	-	-	495	1063

Comb. Total	16218	17161	17161	0	0	11707	9889	27643
ADT	ADT 14,427	AADT 14,427						

Accurate Counts

978-664-2565

N/S Street : Rice Road / Oak Street
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 18007601
 Site Code : 18007601
 Start Date : 3/28/2018
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Rice Rd From North			Commonwealth Ave From East			Oak St From South			Commonwealth Ave From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	2	29	7	67	179	3	64	15	37	9	61	41	514
04:15 PM	5	25	7	72	198	7	67	16	42	5	69	33	546
04:30 PM	2	36	6	69	176	6	51	18	40	6	82	33	525
04:45 PM	5	34	12	82	173	3	52	21	28	11	74	38	533
Total	14	124	32	290	726	19	234	70	147	31	286	145	2118
05:00 PM	0	19	6	85	176	2	72	20	50	11	81	48	570
05:15 PM	5	37	11	77	192	3	68	14	38	12	76	38	571
05:30 PM	6	28	8	58	178	10	64	17	30	7	113	55	574
05:45 PM	2	29	7	56	200	5	67	22	27	10	86	37	548
Total	13	113	32	276	746	20	271	73	145	40	356	178	2263
Grand Total	27	237	64	566	1472	39	505	143	292	71	642	323	4381
Apprch %	8.2	72.3	19.5	27.3	70.9	1.9	53.7	15.2	31.1	6.9	62	31.2	
Total %	0.6	5.4	1.5	12.9	33.6	0.9	11.5	3.3	6.7	1.6	14.7	7.4	
Cars	27	236	64	565	1469	39	503	142	292	71	641	319	4368
% Cars	100	99.6	100	99.8	99.8	100	99.6	99.3	100	100	99.8	98.8	99.7
Trucks	0	1	0	1	3	0	2	1	0	0	1	4	13
% Trucks	0	0.4	0	0.2	0.2	0	0.4	0.7	0	0	0.2	1.2	0.3

Accurate Counts

978-664-2565

N/S Street : Rice Road / Oak Street
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 18007601
 Site Code : 18007601
 Start Date : 3/28/2018
 Page No : 2

Start Time	Rice Rd From North				Commonwealth Ave From East				Oak St From South				Commonwealth Ave From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	19	6	25	85	176	2	263	72	20	50	142	11	81	48	140	570
05:15 PM	5	37	11	53	77	192	3	272	68	14	38	120	12	76	38	126	571
05:30 PM	6	28	8	42	58	178	10	246	64	17	30	111	7	113	55	175	574
05:45 PM	2	29	7	38	56	200	5	261	67	22	27	116	10	86	37	133	548
Total Volume	13	113	32	158	276	746	20	1042	271	73	145	489	40	356	178	574	2263
% App. Total	8.2	71.5	20.3		26.5	71.6	1.9		55.4	14.9	29.7		7	62	31		
PHF	.542	.764	.727	.745	.812	.933	.500	.958	.941	.830	.725	.861	.833	.788	.809	.820	.986
Cars	13	113	32	158	276	744	20	1040	270	73	145	488	40	356	176	572	2258
% Cars	100	100	100	100	100	99.7	100	99.8	99.6	100	100	99.8	100	100	98.9	99.7	99.8
Trucks	0	0	0	0	0	2	0	2	1	0	0	1	0	0	2	2	5
% Trucks	0	0	0	0	0	0.3	0	0.2	0.4	0	0	0.2	0	0	1.1	0.3	0.2

Accurate Counts

978-664-2565

N/S Street : Rice Road / Oak Street
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 180076S1
 Site Code : 180076S1
 Start Date : 3/24/2018
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Rice Rd From North			Commonwealth Ave From East			Oak St From South			Commonwealth Ave From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
08:00 AM	1	7	6	11	27	2	16	4	11	6	38	17	146
08:15 AM	4	14	8	10	36	1	12	8	14	4	44	20	175
08:30 AM	1	15	4	10	30	0	20	6	19	3	57	22	187
08:45 AM	3	21	8	16	43	1	18	3	21	5	63	20	222
Total	9	57	26	47	136	4	66	21	65	18	202	79	730
09:00 AM	2	7	8	16	43	2	26	7	30	6	56	28	231
09:15 AM	4	14	8	20	65	1	24	4	22	3	54	26	245
09:30 AM	5	16	10	20	70	0	30	2	21	8	53	25	260
09:45 AM	4	18	11	19	78	2	36	8	24	1	72	28	301
Total	15	55	37	75	256	5	116	21	97	18	235	107	1037
10:00 AM	5	17	7	24	78	0	42	12	19	7	61	23	295
10:15 AM	5	18	9	22	72	2	32	5	26	5	60	29	285
10:30 AM	6	6	4	20	62	1	34	8	23	7	84	24	279
10:45 AM	8	20	12	22	81	3	40	6	25	10	91	27	345
Total	24	61	32	88	293	6	148	31	93	29	296	103	1204
11:00 AM	8	12	11	30	91	4	26	13	18	8	88	30	339

Accurate Counts

978-664-2565

N/S Street : Rice Road / Oak Street
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 180076S1
 Site Code : 180076S1
 Start Date : 3/24/2018
 Page No : 2

Groups Printed- Cars - Trucks

Start Time	Rice Rd From North			Commonwealth Ave From East			Oak St From South			Commonwealth Ave From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
11:15 AM	6	22	11	18	105	2	51	11	31	7	77	29	370
11:30 AM	5	17	14	22	81	1	35	6	27	9	68	33	318
11:45 AM	4	21	10	25	101	3	33	8	34	3	96	35	373
Total	23	72	46	95	378	10	145	38	110	27	329	127	1400
12:00 PM	6	15	10	38	101	1	26	10	31	7	87	38	370
12:15 PM	5	24	8	35	91	1	49	8	27	10	80	33	371
12:30 PM	11	27	14	23	96	3	33	10	28	5	95	20	365
12:45 PM	6	17	8	39	95	1	31	11	31	7	73	32	351
Total	28	83	40	135	383	6	139	39	117	29	335	123	1457
01:00 PM	4	23	8	29	91	3	34	8	28	4	92	33	357
01:15 PM	2	21	10	24	96	4	38	3	24	10	103	23	358
01:30 PM	4	12	11	29	104	1	25	17	24	8	87	26	348
01:45 PM	1	24	21	30	99	1	49	15	24	4	82	22	372
Total	11	80	50	112	390	9	146	43	100	26	364	104	1435
Grand Total	110	408	231	552	1836	40	760	193	582	147	1761	643	7263
Apprch %	14.7	54.5	30.8	22.7	75.6	1.6	49.5	12.6	37.9	5.8	69	25.2	
Total %	1.5	5.6	3.2	7.6	25.3	0.6	10.5	2.7	8	2	24.2	8.9	
Cars	110	408	231	550	1833	39	760	193	581	146	1758	642	7251
% Cars	100	100	100	99.6	99.8	97.5	100	100	99.8	99.3	99.8	99.8	99.8
Trucks	0	0	0	2	3	1	0	0	1	1	3	1	12
% Trucks	0	0	0	0.4	0.2	2.5	0	0	0.2	0.7	0.2	0.2	0.2

Accurate Counts

978-664-2565

N/S Street : Willow Brook Drive
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 18007602
 Site Code : 18007602
 Start Date : 3/28/2018
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Commonwealth Ave From East		Willow Brook Dr From South		Commonwealth Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
04:00 PM	1	264	3	1	104	1	374
04:15 PM	1	277	1	0	112	3	394
04:30 PM	2	244	2	0	119	0	367
04:45 PM	0	263	2	0	108	3	376
Total	4	1048	8	1	443	7	1511
05:00 PM	1	271	0	0	121	2	395
05:15 PM	3	265	1	0	128	0	397
05:30 PM	1	265	3	1	150	2	422
05:45 PM	1	253	2	0	107	0	363
Total	6	1054	6	1	506	4	1577
Grand Total	10	2102	14	2	949	11	3088
Apprch %	0.5	99.5	87.5	12.5	98.9	1.1	
Total %	0.3	68.1	0.5	0.1	30.7	0.4	
Cars	10	2099	14	2	948	11	3084
% Cars	100	99.9	100	100	99.9	100	99.9
Trucks	0	3	0	0	1	0	4
% Trucks	0	0.1	0	0	0.1	0	0.1

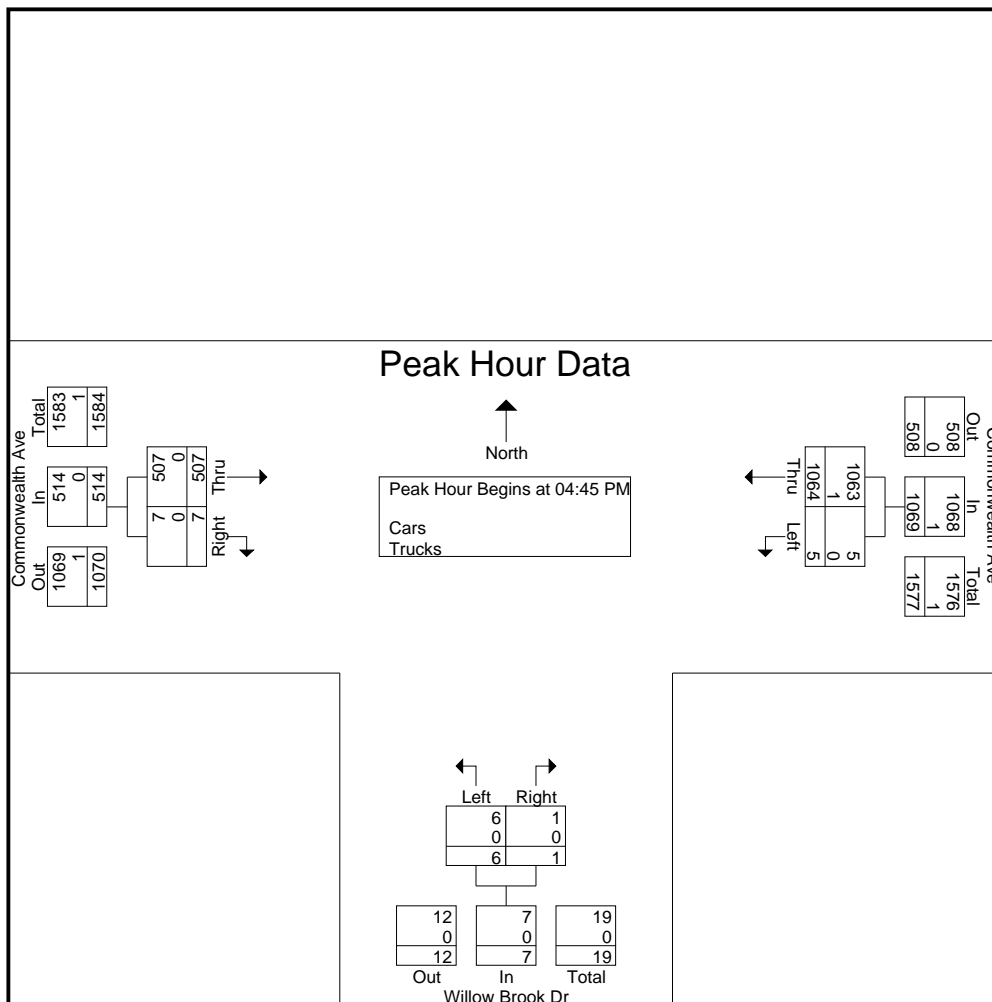
Accurate Counts

978-664-2565

N/S Street : Willow Brook Drive
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 18007602
 Site Code : 18007602
 Start Date : 3/28/2018
 Page No : 2

Start Time	Commonwealth Ave From East			Willow Brook Dr From South			Commonwealth Ave From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	0	263	263	2	0	2	108	3	111	376
05:00 PM	1	271	272	0	0	0	121	2	123	395
05:15 PM	3	265	268	1	0	1	128	0	128	397
05:30 PM	1	265	266	3	1	4	150	2	152	422
Total Volume	5	1064	1069	6	1	7	507	7	514	1590
% App. Total	0.5	99.5		85.7	14.3		98.6	1.4		
PHF	.417	.982	.983	.500	.250	.438	.845	.583	.845	.942
Cars	5	1063	1068	6	1	7	507	7	514	1589
% Cars	100	99.9	99.9	100	100	100	100	100	100	99.9
Trucks	0	1	1	0	0	0	0	0	0	1
% Trucks	0	0.1	0.1	0	0	0	0	0	0	0.1



Accurate Counts

978-664-2565

N/S Street : Willow Brook Drive
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 180076S2
 Site Code : 18007602
 Start Date : 3/24/2018
 Page No : 5

Groups Printed- Cars

Start Time	Commonwealth Ave From East		Willow Brook Dr From South		Commonwealth Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
08:00 AM	0	37	3	0	47	2	89
08:15 AM	0	43	4	1	60	1	109
08:30 AM	0	39	1	1	77	2	120
08:45 AM	0	58	0	0	82	1	141
Total	0	177	8	2	266	6	459
09:00 AM	1	56	2	1	89	0	149
09:15 AM	0	89	1	0	76	1	167
09:30 AM	1	86	4	0	74	4	169
09:45 AM	0	90	2	1	98	1	192
Total	2	321	9	2	337	6	677
10:00 AM	0	106	2	2	83	1	194
10:15 AM	1	94	1	0	87	1	184
10:30 AM	1	77	4	1	110	4	197
10:45 AM	0	100	3	1	119	0	223
Total	2	377	10	4	399	6	798
11:00 AM	0	135	1	0	114	3	253
11:15 AM	0	114	0	2	106	3	225
11:30 AM	1	114	0	0	99	1	215
11:45 AM	0	134	3	1	132	1	271
Total	1	497	4	3	451	8	964
12:00 PM	0	140	3	1	124	2	270
12:15 PM	0	122	3	0	107	0	232
12:30 PM	0	127	3	2	134	1	267
12:45 PM	1	141	1	1	108	4	256
Total	1	530	10	4	473	7	1025

Accurate Counts

978-664-2565

N/S Street : Willow Brook Drive
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 180076S2
 Site Code : 18007602
 Start Date : 3/24/2018
 Page No : 6

Groups Printed- Cars

Start Time	Commonwealth Ave From East		Willow Brook Dr From South		Commonwealth Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
01:00 PM	0	125	2	0	134	1	262
01:15 PM	0	125	1	0	121	5	252
01:30 PM	0	142	2	0	118	1	263
01:45 PM	2	130	2	1	106	1	242
Total	2	522	7	1	479	8	1019
Grand Total	8	2424	48	16	2405	41	4942
Apprch %	0.3	99.7	75	25	98.3	1.7	
Total %	0.2	49	1	0.3	48.7	0.8	

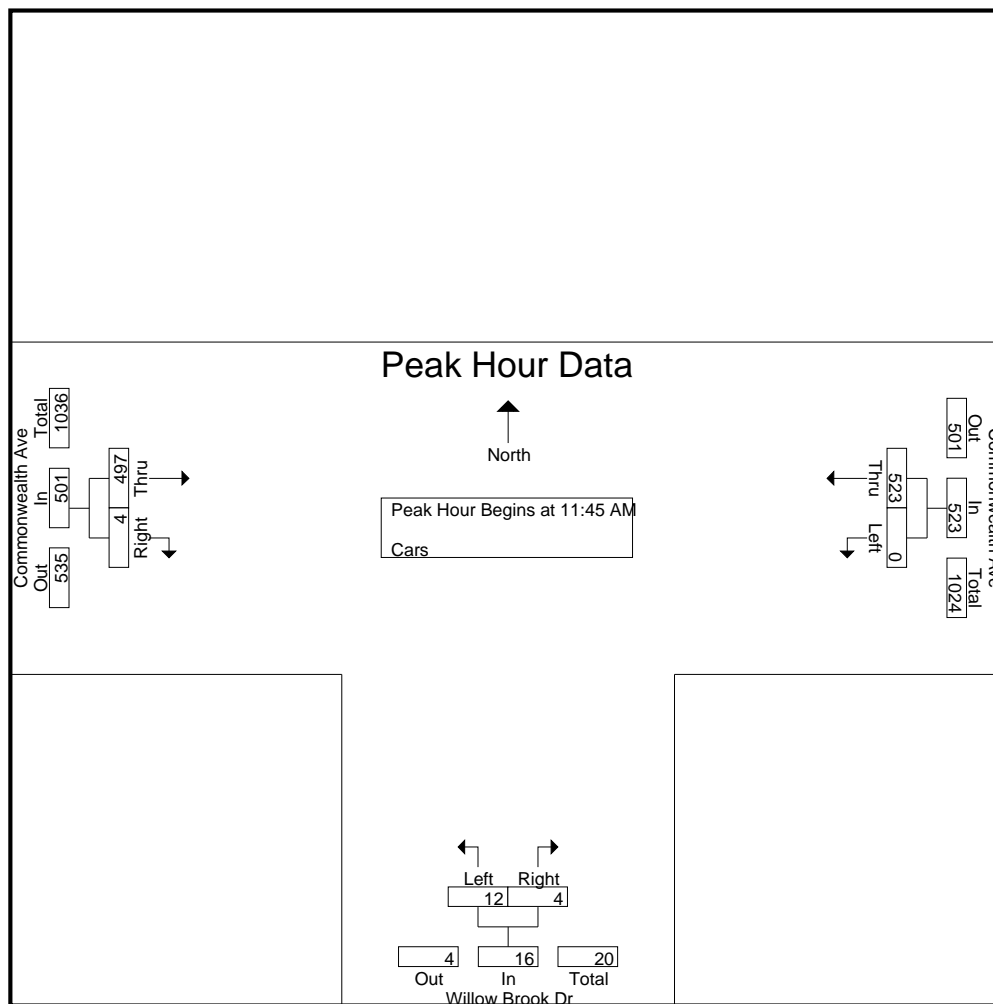
Accurate Counts

978-664-2565

N/S Street : Willow Brook Drive
 E/W Street : Commonwealth Avenue
 City/State : Wayland, MA
 Weather : Clear

File Name : 180076S2
 Site Code : 18007602
 Start Date : 3/24/2018
 Page No : 7

Start Time	Commonwealth Ave From East			Willow Brook Dr From South			Commonwealth Ave From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 08:00 AM to 01:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 11:45 AM										
11:45 AM	0	134	134	3	1	4	132	1	133	271
12:00 PM	0	140	140	3	1	4	124	2	126	270
12:15 PM	0	122	122	3	0	3	107	0	107	232
12:30 PM	0	127	127	3	2	5	134	1	135	267
Total Volume	0	523	523	12	4	16	497	4	501	1040
% App. Total	0	100		75	25		99.2	0.8		
PHF	.000	.934	.934	1.00	.500	.800	.927	.500	.928	.959



ANALYSIS

Methodology

EXPLANATION OF INTERSECTION ANALYSIS METHODOLOGIES

Operational analyses of the study intersection were completed using procedures in the Transportation Research Board's *Highway Capacity Manual, 2010 (HCM 2010)*. This is the usual methodology for the analysis of traffic conditions. The software program *Synchro 9* by TrafficWare (a nationally recognized computer software package for analyzing capacities, Levels of Service, and queueing) was used to perform the actual capacity and queue analyses.

Operating conditions at intersections are evaluated in terms of Levels of Service (LOS). LOS are letter grades, LOS A being the best and LOS F being the worst, quantified by average control delay. Control delay includes the amount of time a driver experiences being stopped at the intersection, as well as, start-up lost time, and time moving up in the queue at the intersection.

For signalized intersections, the LOS is reported for the entire intersection, as well as, for each approach and individual movements. The HCM 2010 LOS criteria for signalized intersections is summarized below:

HCM 2010 Signalized Intersection LOS Criteria	
LOS	Control Delay (seconds per vehicle)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

LOS A through D are generally considered to be adequate peak hour operations at a signalized intersection. LOS E and F are typically incurred when one or more movements at the intersection are operating over capacity. When the volume to capacity ration (v/c) is equal to or greater than 1.0, LOS is also considered F.

For two-way STOP controlled unsignalized intersections, the LOS is evaluated for the minor street approach(es) and for the left turns from the major street. The major street through and right turning traffic is assumed to have no delay since the movement is free-flow with no traffic control. At all-way STOP controlled intersections, LOS is reported similar to signalized intersections. That is, for the intersection as a whole, as well as for each approach and individual movements.

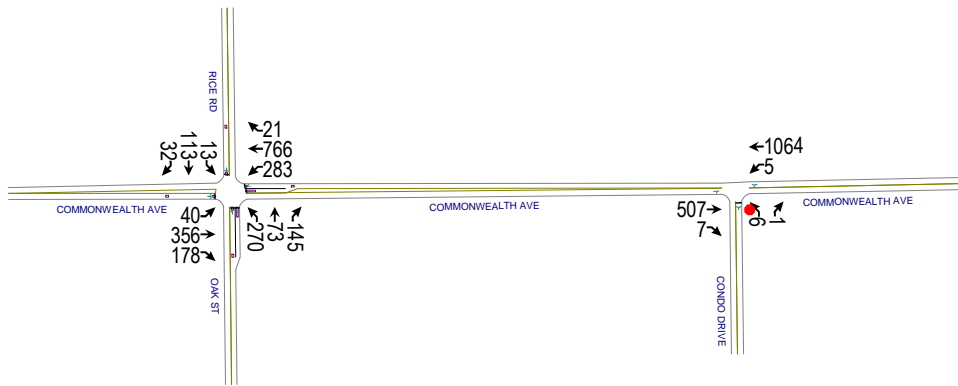
The HCM 2010 LOS criteria for unsignalized intersections is summarized below:

HCM 2010 Unsignalized Intersection LOS Criteria	
LOS	Control Delay (seconds per vehicle)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Inadequate Levels of Service for minor street approaches to unsignalized intersections is not uncommon, as the major street traffic flow is continuous. When the volume to capacity ration (v/c) is equal to or greater than 1.0, LOS is also considered F.

Synchro output also includes 50th percentile (or average) queue lengths, as well as, 95th percentile queues (occurring 5 percent of the time or less). Calculations for these queues take into account rate of arriving vehicles, red time (at signalized intersections), saturation flow rate, lane arrangement and lane usage. The 95th percentile queue is the queue length that would be experienced by 5 percent of stopped vehicles at non-signalized intersections, or during 5 percent of signal cycles at a signalized intersection. The 95th percentile queue is often used to determine storage needs for auxiliary lanes, while the 50th percentile queue is more representative of what the average motorist will experience.

Existing Conditions



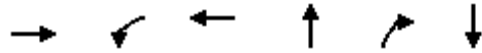
LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

EXIST
PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	356	178	283	766	21	270	73	145	13	113	32
Future Volume (veh/h)	40	356	178	283	766	21	270	73	145	13	113	32
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	49	434	217	295	798	22	314	85	169	17	151	43
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.82	0.82	0.82	0.96	0.96	0.96	0.86	0.86	0.86	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	82	556	267	453	1197	33	161	24	351	44	169	43
Arrive On Green	0.52	0.52	0.52	0.08	0.66	0.66	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	74	1070	514	1720	1822	50	384	104	1535	0	738	189
Grp Volume(v), veh/h	700	0	0	295	0	820	399	0	169	211	0	0
Grp Sat Flow(s),veh/h/ln	1658	0	0	1720	0	1872	488	0	1535	928	0	0
Q Serve(g_s), s	14.2	0.0	0.0	6.8	0.0	23.4	0.0	0.0	8.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	29.6	0.0	0.0	6.8	0.0	23.4	20.0	0.0	8.3	20.0	0.0	0.0
Prop In Lane	0.07		0.31	1.00		0.03	0.79		1.00	0.08		0.20
Lane Grp Cap(c), veh/h	905	0	0	453	0	1230	185	0	351	257	0	0
V/C Ratio(X)	0.77	0.00	0.00	0.65	0.00	0.67	2.15	0.00	0.48	0.82	0.00	0.00
Avail Cap(c_a), veh/h	1134	0	0	453	0	1499	185	0	351	257	0	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	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	8.1	0.0	9.2	37.7	0.0	29.2	30.0	0.0	0.0
Incr Delay (d2), s/veh	2.6	0.0	0.0	3.3	0.0	0.8	537.2	0.0	4.7	24.8	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	14.3	0.0	0.0	3.5	0.0	12.1	32.1	0.0	4.0	6.2	0.0	0.0
LnGrp Delay(d),s/veh	19.5	0.0	0.0	11.3	0.0	10.0	574.9	0.0	33.9	54.7	0.0	0.0
LnGrp LOS	B			B		B	F		C	D		
Approach Vol, veh/h		700			1115			568			211	
Approach Delay, s/veh		19.5			10.4			413.9			54.7	
Approach LOS		B			B			F			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		25.0	12.0	50.4		25.0		62.4				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		20.0	7.0	58.0		20.0		70.0				
Max Q Clear Time (g_c+I1), s		22.0	8.8	31.6		22.0		25.4				
Green Ext Time (p_c), s		0.0	0.0	13.8		0.0		17.5				
Intersection Summary												
HCM 2010 Ctrl Delay			104.8									
HCM 2010 LOS			F									

LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

EXIST
PM PEAK



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	700	295	820	399	169	211
v/c Ratio	0.88	0.75	0.75	1.62	0.39	0.64
Control Delay	30.4	20.4	15.1	324.7	17.6	39.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	20.4	15.1	324.7	17.6	39.9
Queue Length 50th (ft)	287	60	256	~297	30	90
Queue Length 95th (ft)	360	#102	382	#552	95	164
Internal Link Dist (ft)	362		938	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	1185	394	1501	246	428	330
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.75	0.55	1.62	0.39	0.64

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

LOKER
7: CONDO DRIVE & COMMONWEALTH AVE

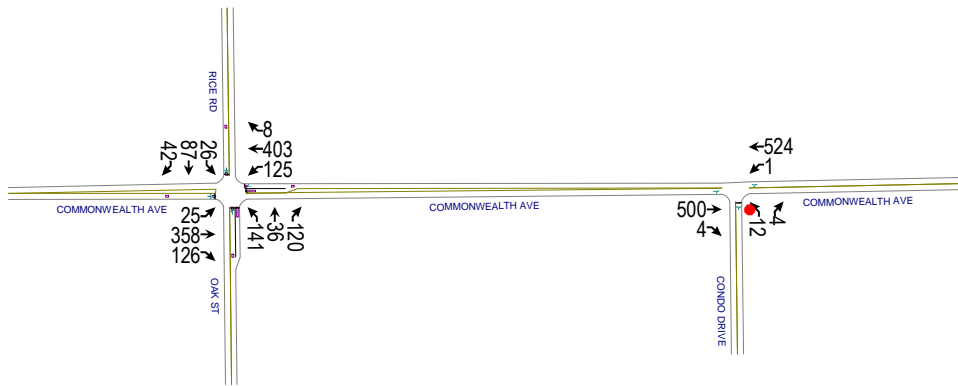
EXIST
PM PEAK

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	507	7	5	1064	6	1
Future Vol, veh/h	507	7	5	1064	6	1
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	85	85	98	98	44	44
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	596	8	5	1086	14	2

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	605	0	1697
Stage 1	-	-	-	-	601
Stage 2	-	-	-	-	1096
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	973	-	102
Stage 1	-	-	-	-	547
Stage 2	-	-	-	-	320
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	973	-	101
Mov Cap-2 Maneuver	-	-	-	-	101
Stage 1	-	-	-	-	547
Stage 2	-	-	-	-	316

Approach	EB	WB	NB
HCM Control Delay, s	0	0	41.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	114	-	-	973	-
HCM Lane V/C Ratio	0.14	-	-	0.005	-
HCM Control Delay (s)	41.6	-	-	8.7	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-



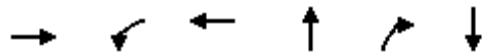
LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

EXIST
SAT PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	358	126	125	403	8	141	36	120	26	87	42
Future Volume (veh/h)	25	358	126	125	403	8	141	36	120	26	87	42
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	26	377	133	136	438	9	160	41	136	35	116	56
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.88	0.88	0.88	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	84	474	161	483	993	20	309	66	423	93	207	83
Arrive On Green	0.37	0.37	0.37	0.08	0.54	0.54	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	40	1287	438	1720	1837	38	688	241	1535	57	750	299
Grp Volume(v), veh/h	536	0	0	136	0	447	201	0	136	207	0	0
Grp Sat Flow(s),veh/h/ln	1764	0	0	1720	0	1875	929	0	1535	1106	0	0
Q Serve(g_s), s	4.4	0.0	0.0	2.4	0.0	7.8	0.0	0.0	3.8	0.8	0.0	0.0
Cycle Q Clear(g_c), s	14.8	0.0	0.0	2.4	0.0	7.8	12.3	0.0	3.8	12.7	0.0	0.0
Prop In Lane	0.05		0.25	1.00		0.02	0.80		1.00	0.17		0.27
Lane Grp Cap(c), veh/h	719	0	0	483	0	1013	375	0	423	382	0	0
V/C Ratio(X)	0.75	0.00	0.00	0.28	0.00	0.44	0.54	0.00	0.32	0.54	0.00	0.00
Avail Cap(c_a), veh/h	813	0	0	567	0	1206	375	0	423	382	0	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	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.5	0.0	0.0	7.8	0.0	7.5	18.4	0.0	15.7	16.4	0.0	0.0
Incr Delay (d2), s/veh	3.3	0.0	0.0	0.3	0.0	0.3	5.4	0.0	2.0	5.4	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	7.8	0.0	0.0	1.1	0.0	4.1	3.4	0.0	1.8	3.1	0.0	0.0
LnGrp Delay(d),s/veh	18.8	0.0	0.0	8.1	0.0	7.8	23.8	0.0	17.7	21.9	0.0	0.0
LnGrp LOS	B			A		A	C		B	C		
Approach Vol, veh/h		536			583			337			207	
Approach Delay, s/veh		18.8			7.9			21.3			21.9	
Approach LOS		B			A			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		20.0	9.4	25.0		20.0		34.4				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		15.0	7.0	23.0		15.0		35.0				
Max Q Clear Time (g_c+I1), s		14.3	4.4	16.8		14.7		9.8				
Green Ext Time (p_c), s		0.2	0.1	3.2		0.1		7.3				
Intersection Summary												
HCM 2010 Ctrl Delay				15.9								
HCM 2010 LOS				B								

LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

EXIST
SAT PEAK



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	536	136	447	201	136	207
v/c Ratio	0.82	0.36	0.49	0.60	0.27	0.43
Control Delay	28.0	8.6	9.5	29.9	5.8	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	8.6	9.5	29.9	5.8	19.4
Queue Length 50th (ft)	154	20	79	66	0	54
Queue Length 95th (ft)	#306	40	134	#147	34	86
Internal Link Dist (ft)	362		938	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	789	389	1171	337	509	482
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.35	0.38	0.60	0.27	0.43

Intersection Summary

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

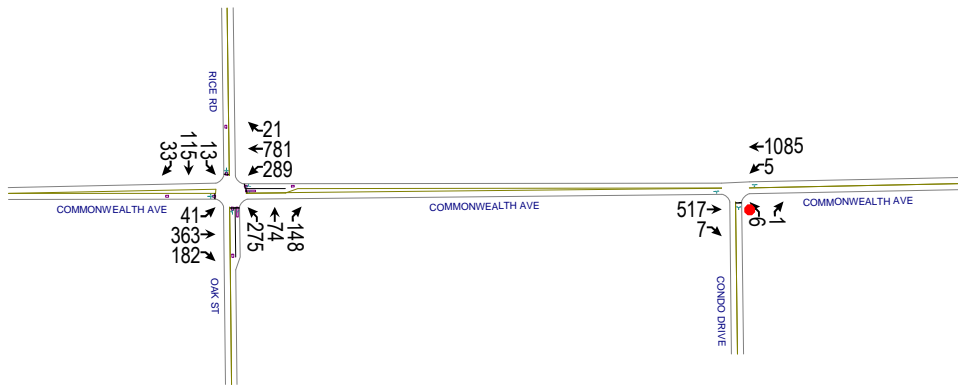
Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	500	4	1	524	12	4
Future Vol, veh/h	500	4	1	524	12	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	94	94	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	538	4	1	557	15	5

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	542	0	1100
Stage 1	-	-	-	-	540
Stage 2	-	-	-	-	560
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1027	-	235
Stage 1	-	-	-	-	584
Stage 2	-	-	-	-	572
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1027	-	235
Mov Cap-2 Maneuver	-	-	-	-	235
Stage 1	-	-	-	-	584
Stage 2	-	-	-	-	571

Approach	EB	WB	NB
HCM Control Delay, s	0	0	19.2
HCM LOS			C



















Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	274	-	-	1027	-
HCM Lane V/C Ratio	0.073	-	-	0.001	-
HCM Control Delay (s)	19.2	-	-	8.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

No Build Conditions



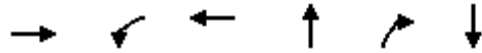
LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

NO BUILD
PM PEAK

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	363	182	289	781	21	275	74	148	13	115	33
Future Volume (veh/h)	41	363	182	289	781	21	275	74	148	13	115	33
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	50	443	222	301	814	22	320	86	172	17	153	44
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.82	0.82	0.82	0.96	0.96	0.96	0.86	0.86	0.86	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	82	561	270	446	1207	33	159	23	346	44	165	43
Arrive On Green	0.53	0.53	0.53	0.08	0.66	0.66	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	74	1066	513	1720	1823	49	383	103	1535	0	733	190
Grp Volume(v), veh/h	715	0	0	301	0	836	406	0	172	214	0	0
Grp Sat Flow(s),veh/h/ln	1654	0	0	1720	0	1872	486	0	1535	922	0	0
Q Serve(g_s), s	15.4	0.0	0.0	7.0	0.0	24.2	0.0	0.0	8.7	0.0	0.0	0.0
Cycle Q Clear(g_c), s	30.9	0.0	0.0	7.0	0.0	24.2	20.0	0.0	8.7	20.0	0.0	0.0
Prop In Lane	0.07		0.31	1.00		0.03	0.79		1.00	0.08		0.21
Lane Grp Cap(c), veh/h	914	0	0	446	0	1239	182	0	346	252	0	0
V/C Ratio(X)	0.78	0.00	0.00	0.67	0.00	0.67	2.23	0.00	0.50	0.85	0.00	0.00
Avail Cap(c_a), veh/h	1116	0	0	446	0	1478	182	0	346	252	0	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	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	8.3	0.0	9.2	38.3	0.0	30.0	30.7	0.0	0.0
Incr Delay (d2), s/veh	3.0	0.0	0.0	4.0	0.0	1.0	570.3	0.0	5.0	28.5	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	15.1	0.0	0.0	3.7	0.0	12.6	33.3	0.0	4.1	6.6	0.0	0.0
LnGrp Delay(d),s/veh	19.9	0.0	0.0	12.3	0.0	10.1	608.6	0.0	35.0	59.2	0.0	0.0
LnGrp LOS	B			B		B	F		C	E		
Approach Vol, veh/h		715			1137			578			214	
Approach Delay, s/veh		19.9			10.7			437.9			59.2	
Approach LOS		B			B			F			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		25.0	12.0	51.7		25.0		63.7				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		20.0	7.0	58.0		20.0		70.0				
Max Q Clear Time (g_c+I1), s		22.0	9.0	32.9		22.0		26.2				
Green Ext Time (p_c), s		0.0	0.0	13.8		0.0		18.0				
Intersection Summary												
HCM 2010 Ctrl Delay				110.5								
HCM 2010 LOS				F								

LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

NO BUILD
PM PEAK



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	715	301	836	406	172	214
v/c Ratio	0.88	0.77	0.76	1.71	0.41	0.69
Control Delay	31.3	21.8	15.4	360.5	18.2	43.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.3	21.8	15.4	360.5	18.2	43.4
Queue Length 50th (ft)	299	62	266	~314	32	95
Queue Length 95th (ft)	374	#110	396	#564	98	#181
Internal Link Dist (ft)	362		938	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	1168	393	1487	238	424	312
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.77	0.56	1.71	0.41	0.69

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

LOKER
7: CONDO DRIVE & COMMONWEALTH AVE

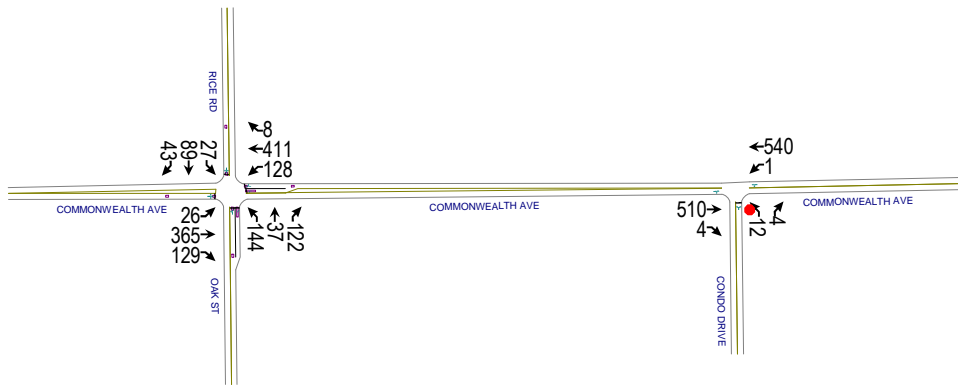
NO BUILD
PM PEAK

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	517	7	5	1085	6	1
Future Vol, veh/h	517	7	5	1085	6	1
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	85	85	98	98	44	44
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	608	8	5	1107	14	2

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	616	0	1729
Stage 1	-	-	-	-	612
Stage 2	-	-	-	-	1117
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	964	-	97
Stage 1	-	-	-	-	541
Stage 2	-	-	-	-	313
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	964	-	96
Mov Cap-2 Maneuver	-	-	-	-	96
Stage 1	-	-	-	-	541
Stage 2	-	-	-	-	309



















Approach	EB	WB	NB
HCM Control Delay, s	0	0	44
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	108	-	-	964	-
HCM Lane V/C Ratio	0.147	-	-	0.005	-
HCM Control Delay (s)	44	-	-	8.8	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-



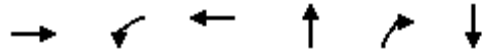
LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

NO BUILD
SAT PEAK

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	365	129	128	411	8	144	37	122	27	89	43
Future Volume (veh/h)	26	365	129	128	411	8	144	37	122	27	89	43
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	27	384	136	139	447	9	164	42	139	36	119	57
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.88	0.88	0.88	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	84	477	163	479	999	20	266	56	420	77	152	56
Arrive On Green	0.37	0.37	0.37	0.08	0.54	0.54	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	41	1283	438	1720	1838	37	541	203	1535	0	555	204
Grp Volume(v), veh/h	547	0	0	139	0	456	206	0	139	212	0	0
Grp Sat Flow(s),veh/h/ln	1763	0	0	1720	0	1875	744	0	1535	760	0	0
Q Serve(g_s), s	4.8	0.0	0.0	2.5	0.0	8.0	0.0	0.0	4.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	15.3	0.0	0.0	2.5	0.0	8.0	15.0	0.0	4.0	15.0	0.0	0.0
Prop In Lane	0.05		0.25	1.00		0.02	0.80		1.00	0.17		0.27
Lane Grp Cap(c), veh/h	725	0	0	479	0	1019	322	0	420	285	0	0
V/C Ratio(X)	0.75	0.00	0.00	0.29	0.00	0.45	0.64	0.00	0.33	0.74	0.00	0.00
Avail Cap(c_a), veh/h	807	0	0	561	0	1198	322	0	420	285	0	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	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.5	0.0	0.0	7.8	0.0	7.5	19.6	0.0	15.9	17.1	0.0	0.0
Incr Delay (d2), s/veh	3.7	0.0	0.0	0.3	0.0	0.3	9.4	0.0	2.1	16.1	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	8.2	0.0	0.0	1.2	0.0	4.1	3.9	0.0	1.9	3.9	0.0	0.0
LnGrp Delay(d),s/veh	19.2	0.0	0.0	8.1	0.0	7.8	29.0	0.0	18.0	33.2	0.0	0.0
LnGrp LOS	B			A		A	C		B	C		
Approach Vol, veh/h		547			595			345			212	
Approach Delay, s/veh		19.2			7.9			24.6			33.2	
Approach LOS		B			A			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		20.0	9.4	25.4		20.0		34.8				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		15.0	7.0	23.0		15.0		35.0				
Max Q Clear Time (g_c+I1), s		17.0	4.5	17.3		17.0		10.0				
Green Ext Time (p_c), s		0.0	0.1	3.1		0.0		7.5				
Intersection Summary												
HCM 2010 Ctrl Delay			18.1									
HCM 2010 LOS			B									

LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

NO BUILD
SAT PEAK



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	547	139	456	206	139	212
v/c Ratio	0.84	0.37	0.50	0.62	0.27	0.44
Control Delay	29.0	8.7	9.6	31.4	5.8	19.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	8.7	9.6	31.4	5.8	19.8
Queue Length 50th (ft)	159	20	81	68	0	56
Queue Length 95th (ft)	#317	41	138	#153	34	88
Internal Link Dist (ft)	362		938	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	783	388	1165	331	509	478
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.36	0.39	0.62	0.27	0.44

Intersection Summary

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

LOKER
7: CONDO DRIVE & COMMONWEALTH AVE

NO BUILD
SAT PEAK

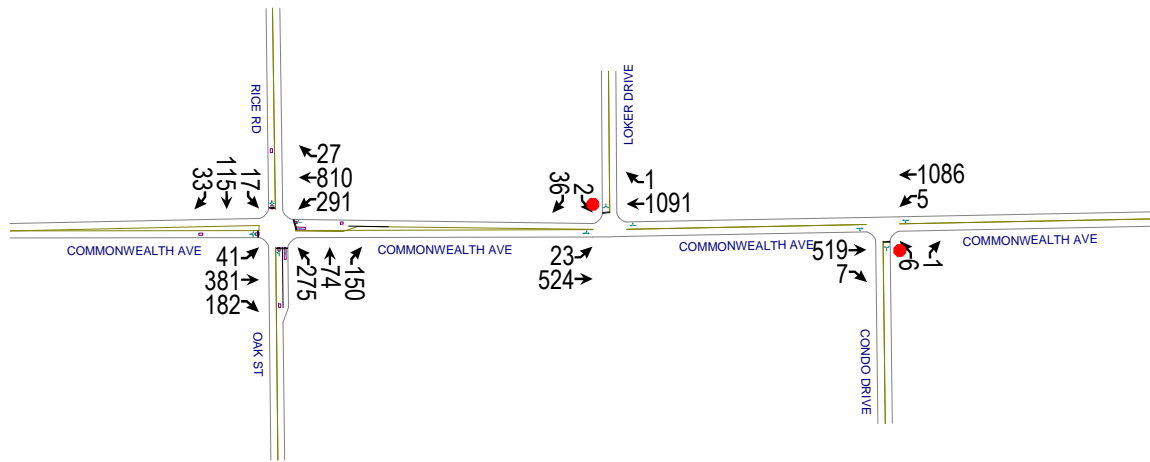
Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	510	4	1	540	12	4
Future Vol, veh/h	510	4	1	540	12	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	94	94	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	548	4	1	574	15	5

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	553	0	1128
Stage 1	-	-	-	-	551
Stage 2	-	-	-	-	577
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1017	-	226
Stage 1	-	-	-	-	577
Stage 2	-	-	-	-	562
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1017	-	226
Mov Cap-2 Maneuver	-	-	-	-	226
Stage 1	-	-	-	-	577
Stage 2	-	-	-	-	561

Approach	EB	WB	NB
HCM Control Delay, s	0	0	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	264	-	-	1017	-
HCM Lane V/C Ratio	0.076	-	-	0.001	-
HCM Control Delay (s)	19.8	-	-	8.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

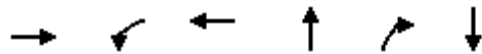
Build Conditions



LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

BUILD
PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	381	182	291	810	27	275	74	150	17	115	33
Future Volume (veh/h)	41	381	182	291	810	27	275	74	150	17	115	33
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	50	465	222	303	844	28	320	86	174	23	153	44
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.82	0.82	0.82	0.96	0.96	0.96	0.86	0.86	0.86	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	81	580	267	436	1211	40	160	24	339	44	142	36
Arrive On Green	0.54	0.54	0.54	0.08	0.67	0.67	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	72	1083	498	1720	1811	60	404	109	1535	0	645	161
Grp Volume(v), veh/h	737	0	0	303	0	872	406	0	174	220	0	0
Grp Sat Flow(s),veh/h/ln	1653	0	0	1720	0	1871	513	0	1535	806	0	0
Q Serve(g_s), s	16.7	0.0	0.0	7.0	0.0	26.2	0.0	0.0	9.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	32.7	0.0	0.0	7.0	0.0	26.2	20.0	0.0	9.0	20.0	0.0	0.0
Prop In Lane	0.07		0.30	1.00		0.03	0.79		1.00	0.10		0.20
Lane Grp Cap(c), veh/h	929	0	0	436	0	1251	184	0	339	222	0	0
V/C Ratio(X)	0.79	0.00	0.00	0.70	0.00	0.70	2.20	0.00	0.51	0.99	0.00	0.00
Avail Cap(c_a), veh/h	1095	0	0	436	0	1446	184	0	339	222	0	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	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	8.7	0.0	9.3	39.1	0.0	31.0	32.7	0.0	0.0
Incr Delay (d2), s/veh	3.5	0.0	0.0	4.8	0.0	1.2	558.2	0.0	5.5	58.1	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	15.8	0.0	0.0	3.8	0.0	13.8	33.1	0.0	4.3	9.0	0.0	0.0
LnGrp Delay(d),s/veh	20.4	0.0	0.0	13.5	0.0	10.5	597.4	0.0	36.4	90.8	0.0	0.0
LnGrp LOS	C			B		B	F		D	F		
Approach Vol, veh/h		737			1175			580			220	
Approach Delay, s/veh		20.4			11.3			429.1			90.8	
Approach LOS		C			B			F			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		25.0	12.0	53.5		25.0		65.5				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		20.0	7.0	58.0		20.0		70.0				
Max Q Clear Time (g_c+I1), s		22.0	9.0	34.7		22.0		28.2				
Green Ext Time (p_c), s		0.0	0.0	13.9		0.0		18.9				
Intersection Summary												
HCM 2010 Ctrl Delay			109.6									
HCM 2010 LOS			F									



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	737	303	872	406	174	220
v/c Ratio	0.90	0.77	0.78	1.79	0.42	0.83
Control Delay	32.5	22.4	16.2	397.0	18.7	59.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.5	22.4	16.2	397.0	18.7	59.9
Queue Length 50th (ft)	319	62	289	~329	34	107
Queue Length 95th (ft)	398	#116	435	#567	99	#214
Internal Link Dist (ft)	362		580	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	1138	391	1459	227	418	264
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.77	0.60	1.79	0.42	0.83

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

LOKER
9: COMMONWEALTH AVE & LOKER DRIVE

BUILD
PM PEAK

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↑		↕	
Traffic Vol, veh/h	23	524	1091	1	2	36
Future Vol, veh/h	23	524	1091	1	2	36
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	25	570	1186	1	2	39

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1187	0	-	0	1806 1186
Stage 1	-	-	-	-	1186 -
Stage 2	-	-	-	-	620 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	588	-	-	-	87 230
Stage 1	-	-	-	-	290 -
Stage 2	-	-	-	-	536 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	588	-	-	-	82 230
Mov Cap-2 Maneuver	-	-	-	-	82 -
Stage 1	-	-	-	-	290 -
Stage 2	-	-	-	-	503 -

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	26.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	588	-	-	-	210
HCM Lane V/C Ratio	0.043	-	-	-	0.197
HCM Control Delay (s)	11.4	0	-	-	26.3
HCM Lane LOS	B	A	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7

LOKER
7: CONDO DRIVE & COMMONWEALTH AVE

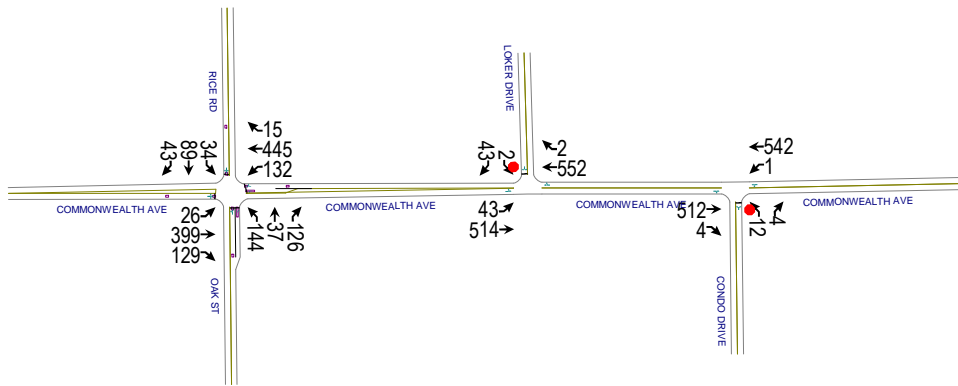
BUILD
PM PEAK

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	519	7	5	1086	6	1
Future Vol, veh/h	519	7	5	1086	6	1
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	85	85	98	98	44	44
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	611	8	5	1108	14	2

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	619	0	1733 615
Stage 1	-	-	-	-	615 -
Stage 2	-	-	-	-	1118 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	961	-	97 491
Stage 1	-	-	-	-	539 -
Stage 2	-	-	-	-	312 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	961	-	96 491
Mov Cap-2 Maneuver	-	-	-	-	96 -
Stage 1	-	-	-	-	539 -
Stage 2	-	-	-	-	308 -



















Approach	EB	WB	NB
HCM Control Delay, s	0	0	44
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	108	-	-	961	-
HCM Lane V/C Ratio	0.147	-	-	0.005	-
HCM Control Delay (s)	44	-	-	8.8	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-



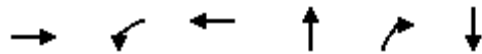
LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

BUILD
SAT PEAK

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	399	129	132	445	15	144	37	126	34	89	43
Future Volume (veh/h)	26	399	129	132	445	15	144	37	126	34	89	43
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1806	1881	1900	1900	1881	1806	1900	1881	1900
Adj Flow Rate, veh/h	27	420	136	143	484	16	164	42	143	45	119	57
Adj No. of Lanes	0	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.88	0.88	0.88	0.75	0.75	0.75
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	82	503	158	462	1000	33	268	56	413	79	137	48
Arrive On Green	0.38	0.38	0.38	0.08	0.55	0.55	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	39	1316	412	1720	1811	60	567	210	1535	6	511	180
Grp Volume(v), veh/h	583	0	0	143	0	500	206	0	143	221	0	0
Grp Sat Flow(s),veh/h/ln	1767	0	0	1720	0	1871	777	0	1535	698	0	0
Q Serve(g_s), s	5.8	0.0	0.0	2.5	0.0	9.1	0.0	0.0	4.2	0.3	0.0	0.0
Cycle Q Clear(g_c), s	16.8	0.0	0.0	2.5	0.0	9.1	14.7	0.0	4.2	15.0	0.0	0.0
Prop In Lane	0.05		0.23	1.00		0.03	0.80		1.00	0.20		0.26
Lane Grp Cap(c), veh/h	744	0	0	462	0	1033	325	0	413	265	0	0
V/C Ratio(X)	0.78	0.00	0.00	0.31	0.00	0.48	0.63	0.00	0.35	0.83	0.00	0.00
Avail Cap(c_a), veh/h	794	0	0	540	0	1173	325	0	413	265	0	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	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.7	0.0	0.0	7.7	0.0	7.6	19.9	0.0	16.5	18.0	0.0	0.0
Incr Delay (d2), s/veh	4.9	0.0	0.0	0.4	0.0	0.4	9.1	0.0	2.3	25.4	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	9.1	0.0	0.0	1.2	0.0	4.7	3.9	0.0	2.0	5.2	0.0	0.0
LnGrp Delay(d),s/veh	20.6	0.0	0.0	8.0	0.0	8.0	29.1	0.0	18.8	43.4	0.0	0.0
LnGrp LOS	C			A		A	C		B	D		
Approach Vol, veh/h		583			643			349			221	
Approach Delay, s/veh		20.6			8.0			24.8			43.4	
Approach LOS		C			A			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6		8				
Phs Duration (G+Y+Rc), s		20.0	9.5	26.4		20.0		35.8				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s		15.0	7.0	23.0		15.0		35.0				
Max Q Clear Time (g_c+I1), s		16.7	4.5	18.8		17.0		11.1				
Green Ext Time (p_c), s		0.0	0.1	2.6		0.0		8.1				
Intersection Summary												
HCM 2010 Ctrl Delay			19.7									
HCM 2010 LOS			B									

LOKER
1: OAK ST/RICE RD & COMMONWEALTH AVE

BUILD
SAT PEAK



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	583	143	500	206	143	221
v/c Ratio	0.86	0.38	0.53	0.65	0.28	0.48
Control Delay	31.4	8.9	10.1	33.5	5.8	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.4	8.9	10.1	33.5	5.8	21.0
Queue Length 50th (ft)	176	21	91	68	0	60
Queue Length 95th (ft)	#350	42	156	#156	35	93
Internal Link Dist (ft)	362		580	307		286
Turn Bay Length (ft)		75			100	
Base Capacity (vph)	769	382	1139	316	504	459
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.37	0.44	0.65	0.28	0.48

Intersection Summary

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

LOKER
9: COMMONWEALTH AVE & LOKER DRIVE

BUILD
SAT PEAK

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	43	514	552	2	2	43
Future Vol, veh/h	43	514	552	2	2	43
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	47	559	600	2	2	47

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	602	0	-	0	1253 601
Stage 1	-	-	-	-	601 -
Stage 2	-	-	-	-	652 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	975	-	-	-	190 500
Stage 1	-	-	-	-	547 -
Stage 2	-	-	-	-	518 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	975	-	-	-	177 500
Mov Cap-2 Maneuver	-	-	-	-	177 -
Stage 1	-	-	-	-	547 -
Stage 2	-	-	-	-	482 -

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	975	-	-	-	462
HCM Lane V/C Ratio	0.048	-	-	-	0.106
HCM Control Delay (s)	8.9	0	-	-	13.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.4

LOKER
7: CONDO DRIVE & COMMONWEALTH AVE

BUILD
SAT PEAK

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔		↔
Traffic Vol, veh/h	512	4	1	542	12	4
Future Vol, veh/h	512	4	1	542	12	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	94	94	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	551	4	1	577	15	5

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	555	0	1132
Stage 1	-	-	-	-	553
Stage 2	-	-	-	-	579
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1015	-	225
Stage 1	-	-	-	-	576
Stage 2	-	-	-	-	560
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1015	-	225
Mov Cap-2 Maneuver	-	-	-	-	225
Stage 1	-	-	-	-	576
Stage 2	-	-	-	-	559

Approach	EB	WB	NB
HCM Control Delay, s	0	0	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	263	-	-	1015	-
HCM Lane V/C Ratio	0.076	-	-	0.001	-
HCM Control Delay (s)	19.8	-	-	8.6	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-