

## TECHNICAL MEMORANDUM

To: L&F Bock Farm, LLC

From: Kevin Sitzman, P.E.  
Chad Baird

Date: May 27, 2016

Subject: Bock Farm – Traffic & Site Entrance Assessment

## EXECUTIVE SUMMARY

This memorandum is to summarize the traffic impacts of the proposed Bock Farm active adult community in Fairfax County, Virginia. The memorandum will present the existing conditions at the nearby intersections, as well as the impact of the additional traffic from the proposed development. A traffic study for the proposed development is not required by Fairfax County or VDOT, and is provided for informational purposes only.

The site is located in the Hybla Valley area of Fairfax County, near the intersection of Parkers Lane and Hinson Farm Road. The site is currently 72.5 acres zoned as PDH-5; the proposed zoning would be R-8. The proposed development will consist of 128 units, split among 4 buildings, located across Hinson Farm Road from the INOVA Mount Vernon Hospital. The proposed Bock Farm development would be accessed by one full-access driveway along Hinson Farm Road, directly across from a driveway for the INOVA hospital, converting a 3-legged intersection to a 4-legged intersection.

This memorandum will review the potential impact of the proposed development on the following locations:

- Hinson Farm Road & INOVA Access / Site Access – left and right turn lane warrants for site access
- Parkers Lane & Hinson Farm Road / Lynnfield Drive – Traffic Signal Warrant Analysis
- Sherwood Hall Lane & Parkers Lane – Capacity Analysis

Based on the results, one approach of the intersection of Sherwood Hall Lane and Parkers Lane currently operates below an acceptable level of service (LOS). It is recommended that the signal timings at the intersection of Sherwood Hall Lane and Parkers Lane be optimized to provide additional green time for the northbound approach. In addition, the peak hour volumes through the intersection of Hinson Farm Road and INOVA Access / Site Access do not meet the threshold to warrant turn lanes into the site. Finally, the eastbound approach at Parkers Lane and Hinson Farm Road will continue to operate at an unacceptable level of service. The future with development volumes do not meet the requirements to warrant a traffic signal. Of the possible solutions, the most economical solution would convert the two-way stop-controlled intersection to an all-way stop-controlled intersection, and installing left and right turn lanes to the northbound and southbound approaches.

## **DATA COLLECTION**

Gorove/Slade collected turning movement counts (TMCs) on Tuesday, April 19, 2016 for the following three intersections near the proposed development:

- Hinson Farm Road and INOVA Access / Proposed Site Access
- Parkers Lane and Hinson Farm Road / Lynnfield Drive
- Sherwood Hall Lane and Parkers Lane

TMCs were conducted during the morning and afternoon peak traffic periods – 6-10 AM and 3-7 PM. The average annual daily traffic (AADT) was calculated using the observed TMCs, and the k-factor values provided by VDOT. It should be noted that VDOT did not provide a k-factor for Hinson Farm Road; therefore, a k-factor of 0.085 was used. The observed TMCs and the measured AADT are shown in Figure 1.

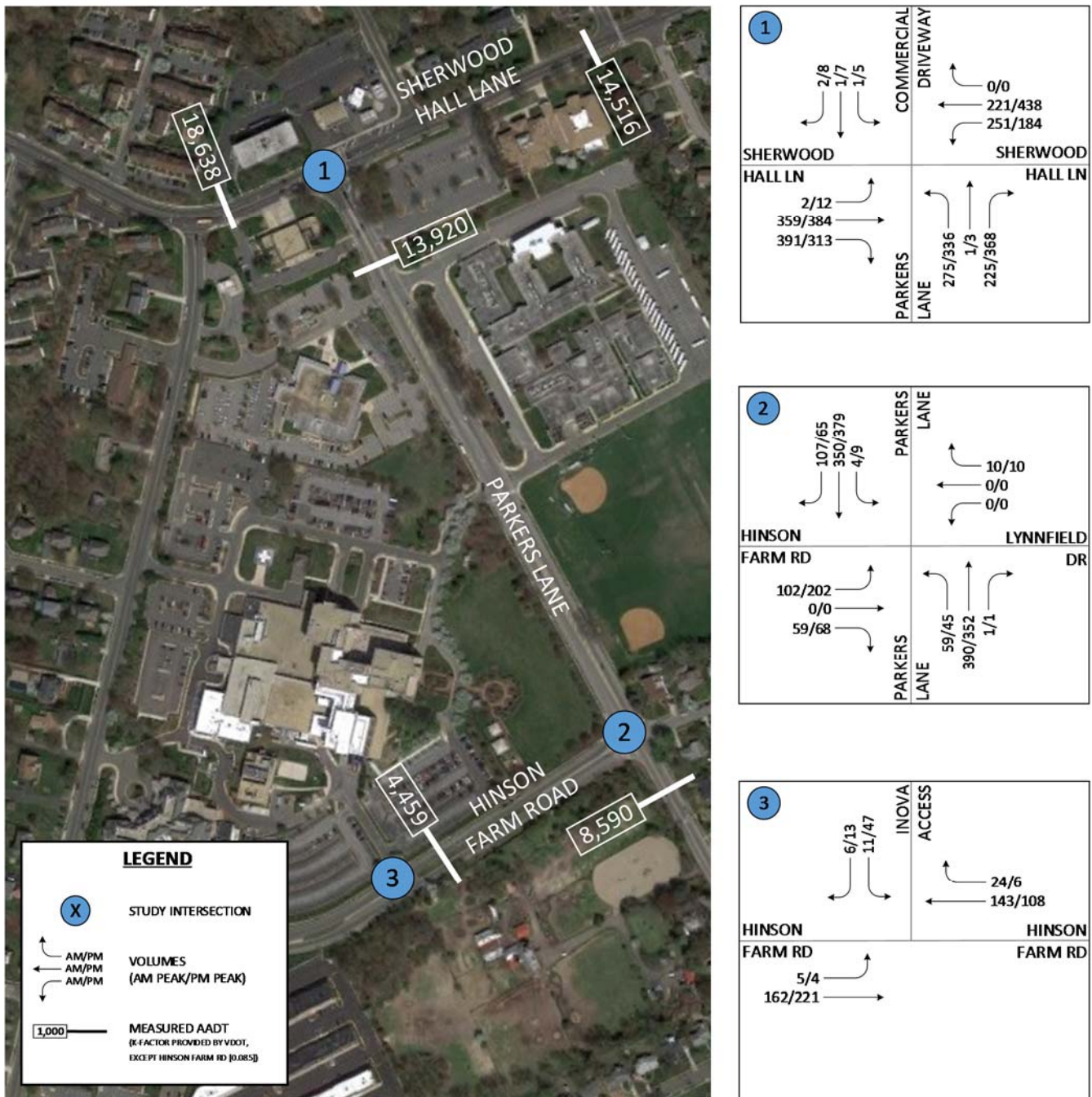


Figure 1: Existing (2016) Traffic Volumes

### EXISTING (2016) CAPACITY ANALYSIS

Capacity analyses were performed for the study intersections during the weekday morning and afternoon peak hours under existing conditions. Synchro Version 9.1 was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology for level of service and vehicular delay. SimTraffic was used to determine the vehicular queue lengths at the study intersections.

A heavy vehicle percentage of 2% was used for existing movements, and a default heavy vehicle percentage of 2% was used for any new movements. The existing peak hour factors (by approach) in the range of 0.85 to 1.00 were used in the analysis.

The results of the intersection capacity analyses are presented in Table 1, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. The 95<sup>th</sup> percentile and 50<sup>th</sup> percentile queue results for each intersection are also presented in Table 1, and are expressed in feet. The detailed analysis worksheets are included in the Appendix.

For the purposes of this analysis, it is desirable to achieve a level of service (LOS) of D or better for each lane group at the intersections. The capacity analysis results indicate that the northbound left-thru movement at the intersection of Sherwood Hall Lane and Parkers Lane currently operates below an acceptable level of service. Also, the capacity analysis results indicate that the eastbound left turn movement operates below an acceptable LOS under existing conditions. The levels of service for the existing conditions are shown in Figure 2.

**Table 1: Existing Conditions (2016) Capacity Analysis**

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak			
			LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue	LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue
1	Sherwood Hall Lane & Parkers Lane									
	<b>Overall Intersection (Signalized)</b>		<b>B</b>	<b>17.4</b>			<b>C</b>	<b>21.5</b>		
	<i>Eastbound Approach</i>		<i>B</i>	<i>11.6</i>			<i>C</i>	<i>28.0</i>		
	Eastbound Left	40	B	16.7	1	12	C	20.5	10	40
	Eastbound Thru		C	23.8	128	222	C	32.8	157	285
	Eastbound Right	255	A	0.4	60	153	C	22.4	49	167
	<i>Westbound Approach</i>		<i>B</i>	<i>10.1</i>			<i>B</i>	<i>15.5</i>		
	Westbound Left	75	B	11.3	69	106	B	15.1	68	112
	Westbound Thru/Right		A	8.8	70	163	B	15.6	144	271
	<i>Northbound Approach</i>		<i>C</i>	<i>32.8</i>			<i>C</i>	<i>20.4</i>		
	Northbound Left/Thru		<b>E</b>	<b>59.3</b>	151	241	D	42.1	163	261
	Northbound Right	250	A	0.2	30	123	A	0.4	72	194
	<i>Southbound Approach</i>		<i>C</i>	<i>25.6</i>	<i>3</i>	<i>18</i>	<i>B</i>	<i>19.5</i>	<i>13</i>	<i>40</i>
2	Parkers Lane & Hinson Farm Road / Lynnfield Drive									
	<b>Overall Intersection (Unsignalized – Two-Way Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>D</i>	<i>31.1</i>			<i>F</i>	<i>79.5</i>		
	Eastbound Left	220	<b>E</b>	<b>42.6</b>	48	87	<b>F</b>	<b>102.3</b>	83	151
	Eastbound Thru		C	21.2	1	9	A	0.0	2	41
	Eastbound Right	180	B	11.5	29	54	B	11.7	30	54
	<i>Westbound Approach</i>		<i>B</i>	<i>13.1</i>	<i>9</i>	<i>32</i>	<i>B</i>	<i>10.5</i>	<i>9</i>	<i>31</i>
	<i>Northbound Approach</i>		<i>A</i>	<i>1.1</i>	<i>26</i>	<i>73</i>	<i>A</i>	<i>8.5</i>	<i>18</i>	<i>59</i>
	<i>Southbound Approach</i>		<i>A</i>	<i>0.1</i>	<i>2</i>	<i>19</i>	<i>A</i>	<i>8.1</i>	<i>4</i>	<i>24</i>
3	Hinson Farm Road & INOVA Access Drive									
	<b>Overall Intersection (Unsignalized – Southbound Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>A</i>	<i>0.2</i>			<i>A</i>	<i>0.1</i>		
	Eastbound Left	130	A	7.6	1	8	A	7.5	0	6
	Eastbound Thru/Right		A	0.0	0	0	A	0.0	0	0
	<i>Westbound Approach</i>		<i>A</i>	<i>0.0</i>	<i>0</i>	<i>0</i>	<i>A</i>	<i>0.0</i>	<i>0</i>	<i>0</i>
	<i>Southbound Approach</i>		<i>B</i>	<i>10.5</i>	<i>13</i>	<i>38</i>	<i>B</i>	<i>11.3</i>	<i>29</i>	<i>52</i>

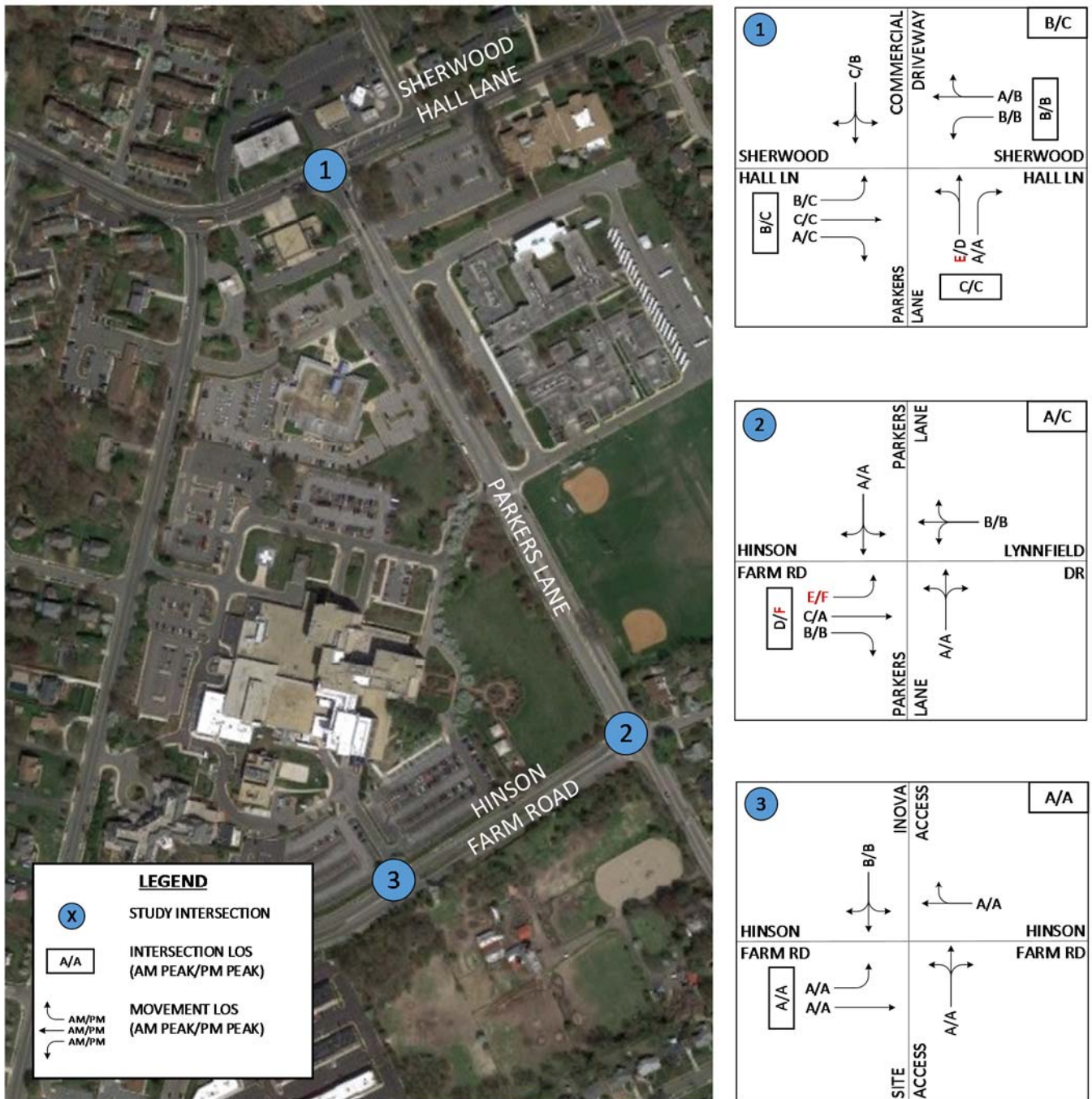


Figure 2: Existing (2016) Level of Service

### **FUTURE (2018) WITHOUT DEVELOPMENT CONDITIONS**

A background development within the area that was considered is the expansion at the INOVA Mount Vernon Hospital. The hospital broke ground in April 2012 on an expansion that included a 65,000 square foot patient tower and a 21,000 square foot addition to the emergency room. The patient tower was dedicated in December 2014; therefore any traffic generated by that portion of the expansion is included with the existing counts performed in 2016. The emergency room expansion is currently under construction, so the trips generated by the emergency room expansion were considered in the future with development analysis.

The surrounding area is well developed, with little space to add development and increase density. However, in order to provide a conservative analysis, a 0.5% growth rate was applied to movements along Sherwood Hall Lane and Parkers Lane to account for both regional traffic growth and the hospital expansion.

The future without development volumes are shown in Figure 3.

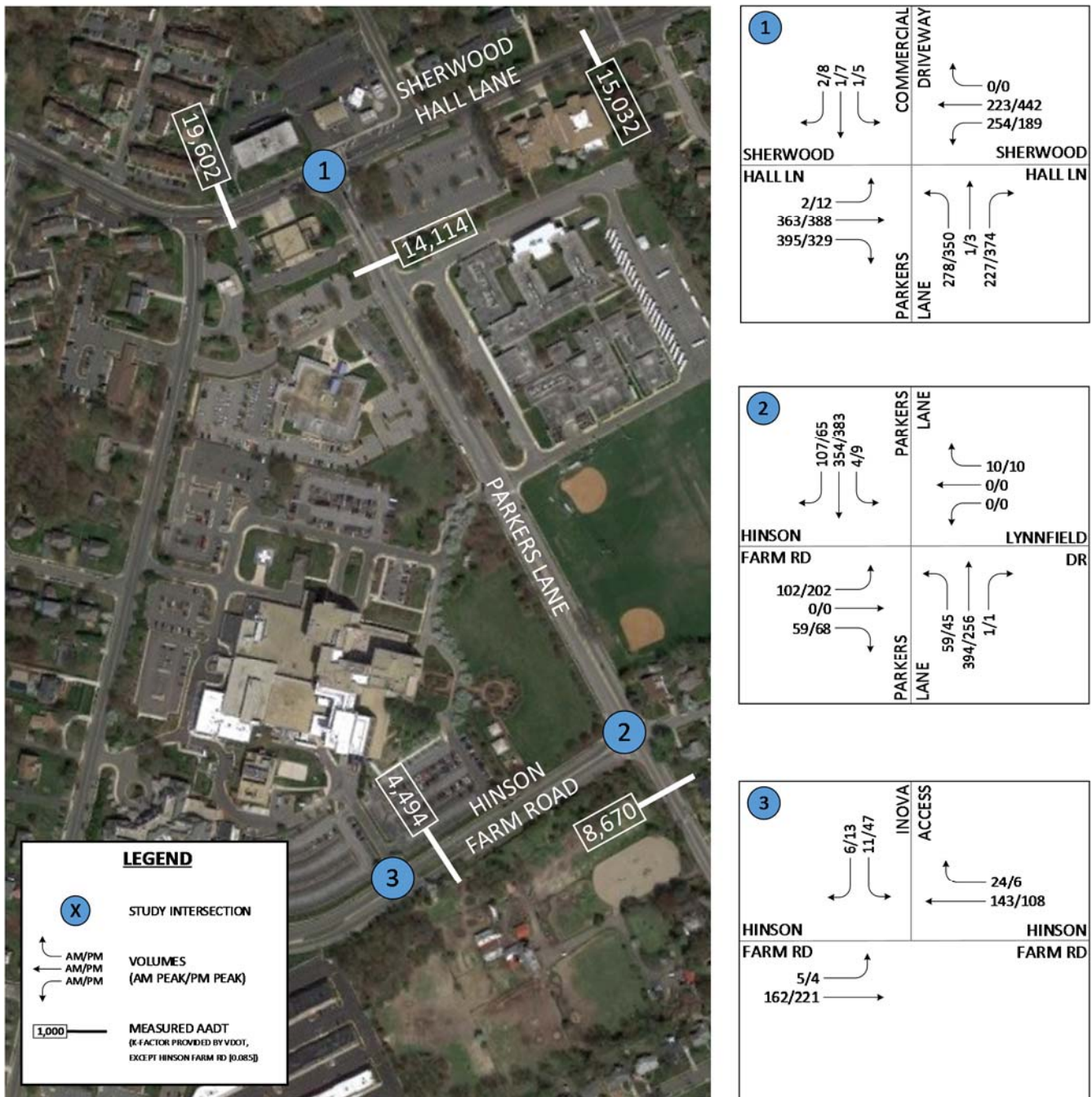


Figure 3: Future (2018) without Development Traffic Volumes

### FUTURE (2018) WITHOUT DEVELOPMENT CAPACITY ANALYSIS

Capacity analyses were performed for the study intersections during the weekday morning and afternoon peak hours under future without development conditions. Synchro Version 9.1 was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology for level of service and vehicular delay. SimTraffic was used to determine the vehicular queue lengths at the study intersections.

A heavy vehicle percentage of 2% was used for existing movements, and a default heavy vehicle percentage of 2% was used for any new movements. The existing peak hour factors (by approach) in the range of 0.85 to 1.00 were used in the analysis.

The results of the intersection capacity analyses are presented in Table 2, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. The 95<sup>th</sup> percentile and 50<sup>th</sup> percentile queue results for each intersection are also presented in Table 2, and are expressed in feet. The detailed analysis worksheets are included in the Appendix.

For the purposes of this analysis, it is desirable to achieve a level of service (LOS) of D or better for each lane group at the intersections. The capacity analysis results indicate that the movements that currently operate below an acceptable level of service continue to degrade under the future without development conditions. The levels of service for the future without development conditions are shown in Figure 4.

**Table 2: Future (2018) without Development Capacity Analysis**

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak			
			LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue	LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue
1	Sherwood Hall Lane & Parkers Lane									
	<b>Overall Intersection (Signalized)</b>		<b>B</b>	<b>17.6</b>			<b>C</b>	<b>21.8</b>		
	<i>Eastbound Approach</i>		<i>B</i>	<i>11.8</i>			<i>C</i>	<i>28.3</i>		
	Eastbound Left	40	B	16.7	1	10	C	20.6	9	38
	Eastbound Thru		C	24.1	131	224	C	33.4	154	271
	Eastbound Right	255	A	0.4	62	155	C	22.5	47	158
	<i>Westbound Approach</i>		<i>B</i>	<i>10.3</i>			<i>B</i>	<i>15.7</i>		
	Westbound Left	75	B	11.6	69	106	B	15.4	67	111
	Westbound Thru/Right		A	8.9	69	160	B	15.8	140	258
	<i>Northbound Approach</i>		<i>C</i>	<i>33.3</i>			<i>C</i>	<i>20.6</i>		
	Northbound Left/Thru		<b>E</b>	<b>60.2</b>	154	255	D	42.5	168	273
	Northbound Right	250	A	0.2	31	129	A	0.4	75	195
	<i>Southbound Approach</i>		<i>C</i>	<i>25.5</i>	<i>3</i>	<i>18</i>	<i>B</i>	<i>19.5</i>	<i>13</i>	<i>41</i>
2	Parkers Lane & Hinson Farm Road / Lynnfield Drive									
	<b>Overall Intersection (Unsignalized – Two-Way Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>D</i>	<i>31.8</i>			<i>F</i>	<i>50.5</i>		
	Eastbound Left	220	<b>E</b>	<b>43.7</b>	48	88	<b>F</b>	<b>63.7</b>	76	139
	Eastbound Thru		C	21.4	1	9	A	18.0	1	8
	Eastbound Right	180	B	11.5	29	54	B	11.7	30	52
	<i>Westbound Approach</i>		<i>B</i>	<i>13.1</i>	<i>10</i>	<i>33</i>	<i>B</i>	<i>11.5</i>	<i>10</i>	<i>33</i>
	<i>Northbound Approach</i>		<i>A</i>	<i>1.1</i>	<i>26</i>	<i>73</i>	<i>A</i>	<i>1.3</i>	<i>15</i>	<i>47</i>
	<i>Southbound Approach</i>		<i>A</i>	<i>0.1</i>	<i>3</i>	<i>20</i>	<i>A</i>	<i>0.2</i>	<i>2</i>	<i>16</i>
3	Hinson Farm Road & INOVA Access Drive									
	<b>Overall Intersection (Unsignalized – Southbound Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>A</i>	<i>0.2</i>			<i>A</i>	<i>0.1</i>		
	Eastbound Left	130	A	7.6	1	9	A	7.5	0	7
	Eastbound Thru/Right		A	0.0	0	0	A	0.0	0	0
	<i>Westbound Approach</i>		<i>A</i>	<i>0.0</i>	<i>0</i>	<i>0</i>	<i>A</i>	<i>0.0</i>	<i>0</i>	<i>0</i>
	<i>Southbound Approach</i>		<i>B</i>	<i>10.5</i>	<i>13</i>	<i>38</i>	<i>B</i>	<i>11.3</i>	<i>30</i>	<i>52</i>



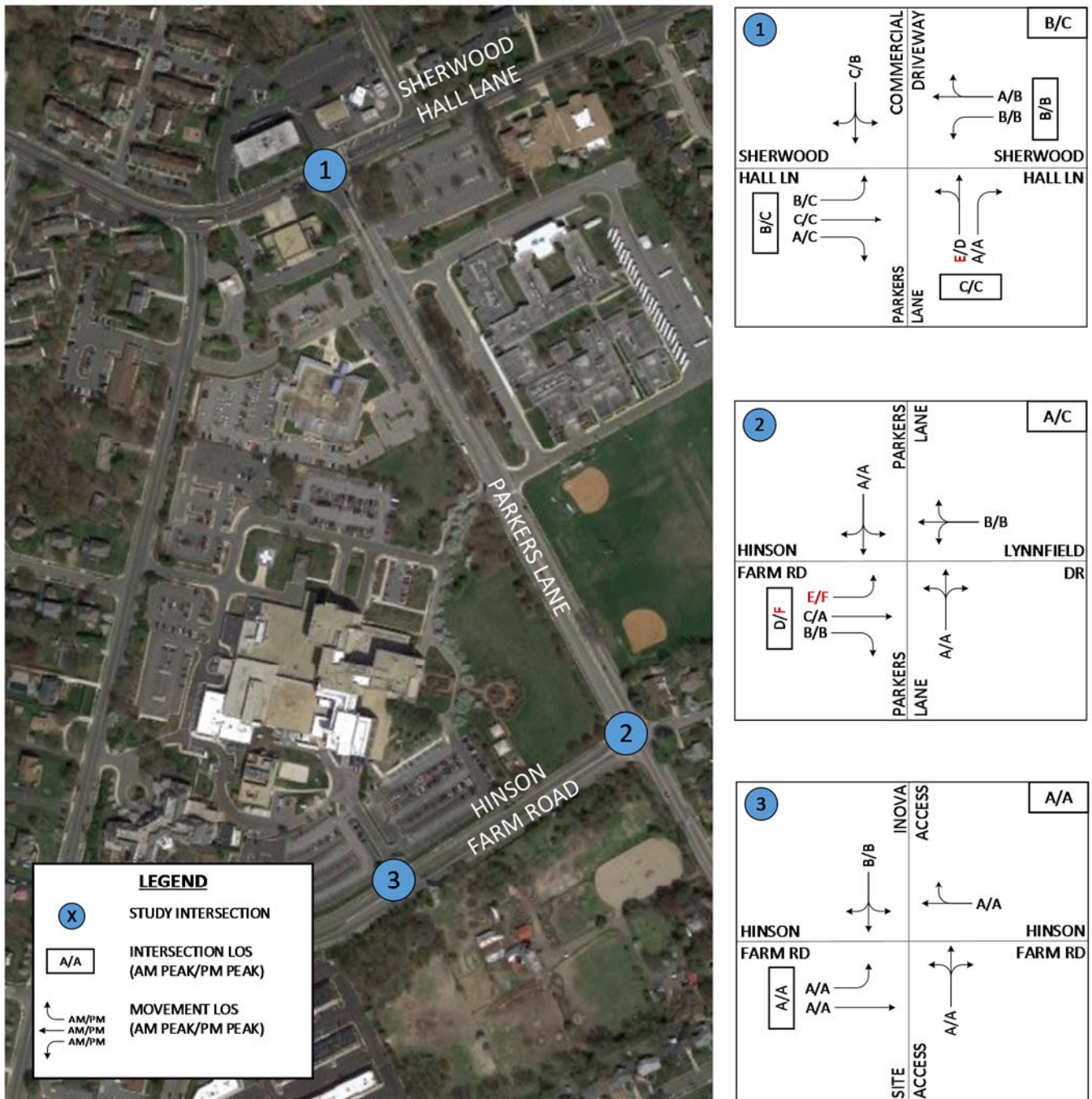


Figure 4: Future (2018) without Development Level of Service

**FUTURE (2018) WITH DEVELOPMENT CONDITIONS**

The proposed development will consist of 128 units, split among 4 buildings, located across Hinson Farm Road from the INOVA Mount Vernon Hospital. The proposed Bock Farm development would be accessed by one full-access driveway along Hinson Farm Road, directly across from a driveway for the INOVA hospital, converting a 3-legged intersection to a 4-legged intersection. The site layout and plan are shown in Figure 5 and Figure 6, respectively.

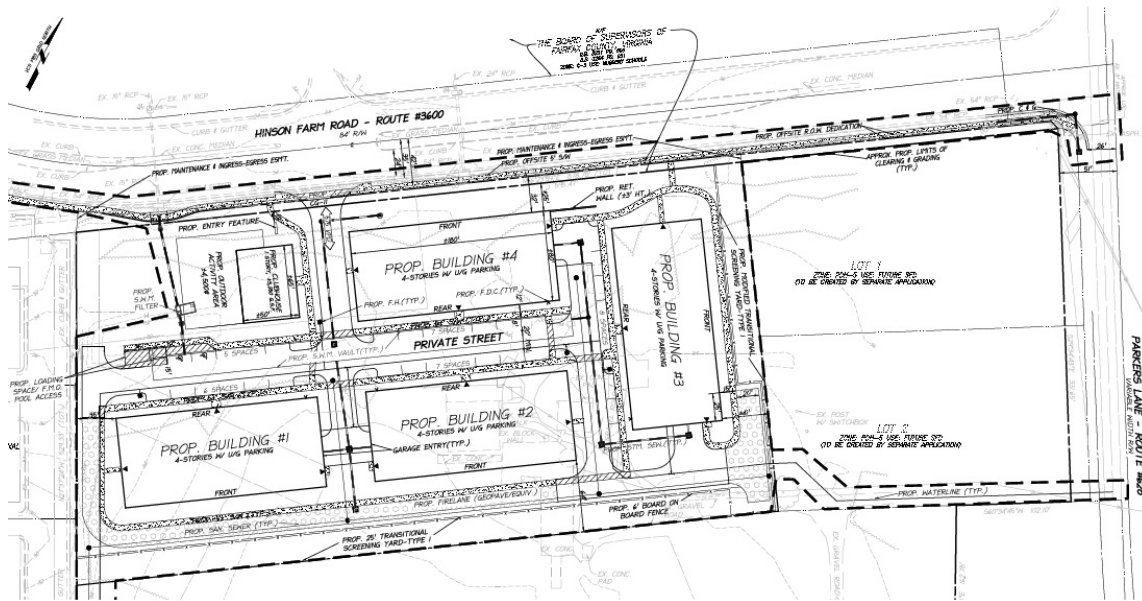


Figure 5: Bock Farm Development Site Layout

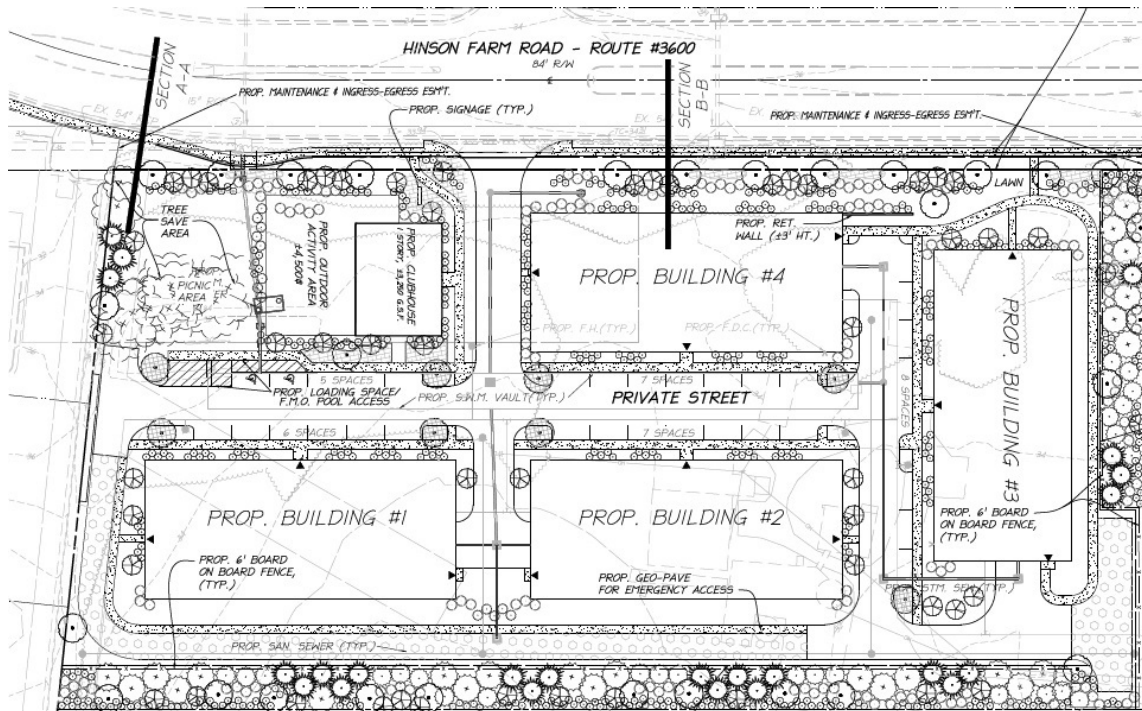


Figure 6: Bock Farm Development Site Plan

The trips associated with this planned development were calculated using the Institute of Transportation Engineers (ITE) Trip Generation, 9<sup>th</sup> Edition and are presented in Table 3.

**Table 3: Site Trip Generation – Bock Farm Development**

Land Use	ITE Code	Size	----- Week day -----							
			AM Peak Hour			PM Peak Hour			Daily	
			<i>In</i>	<i>Out</i>	<i>Total</i>	<i>In</i>	<i>Out</i>	<i>Total</i>	<i>Total</i>	
Senior Adult Housing – Attached	252	128	DU	10	16	26	18	15	33	403

A direction of approach was developed based on the surrounding roadway network and engineering judgment. This DOA was used to route the calculated site trips through the study intersections. Figure 7 illustrates the direction of approach and Figure 8 illustrates the site generated traffic assignments.

The site-generated volumes were added to the future without development volumes to determine the future with development volumes. The future with development volumes are shown in Figure 9.



Figure 7: Direction of Approach

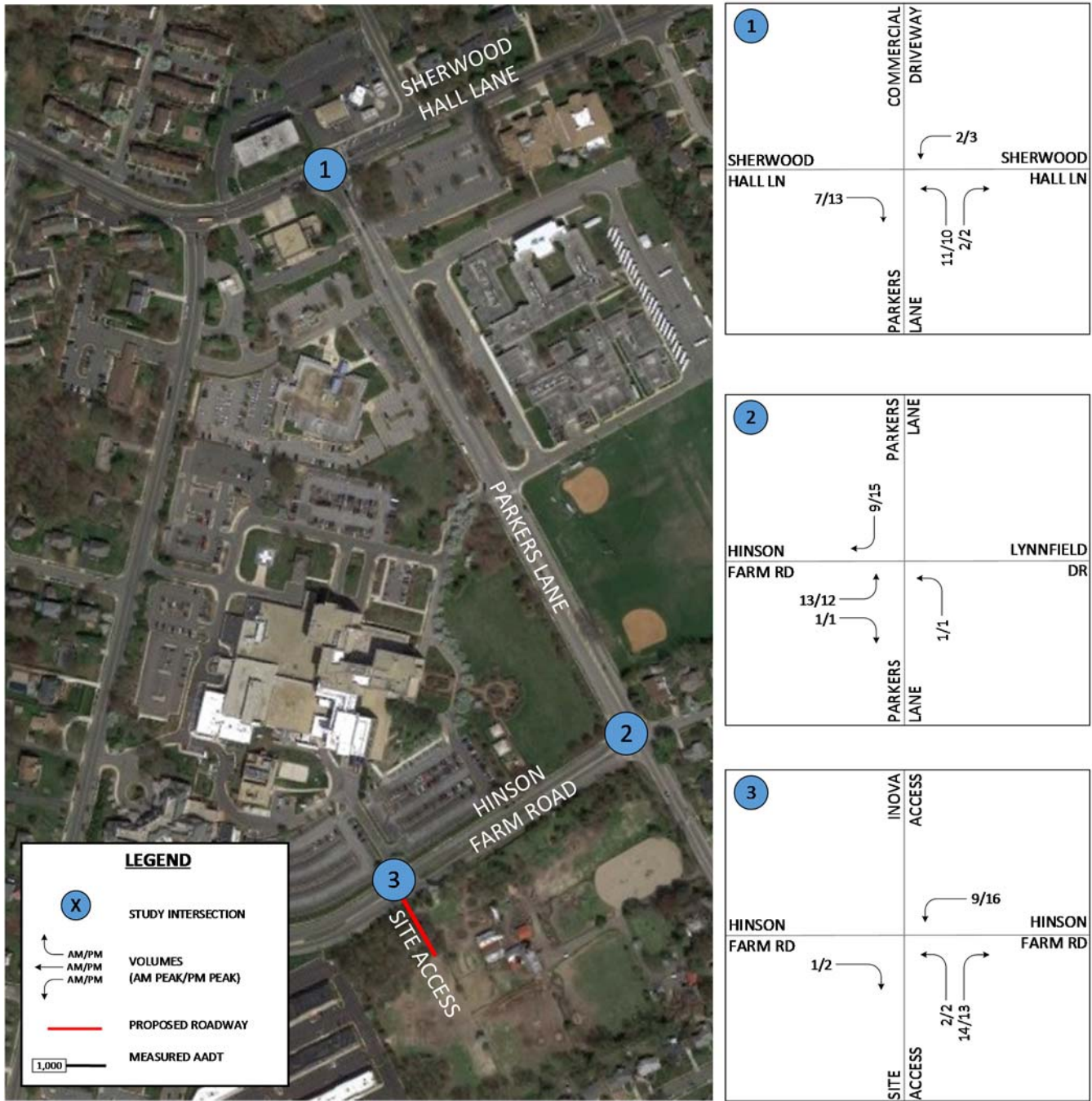


Figure 8: Site-Generated Trips

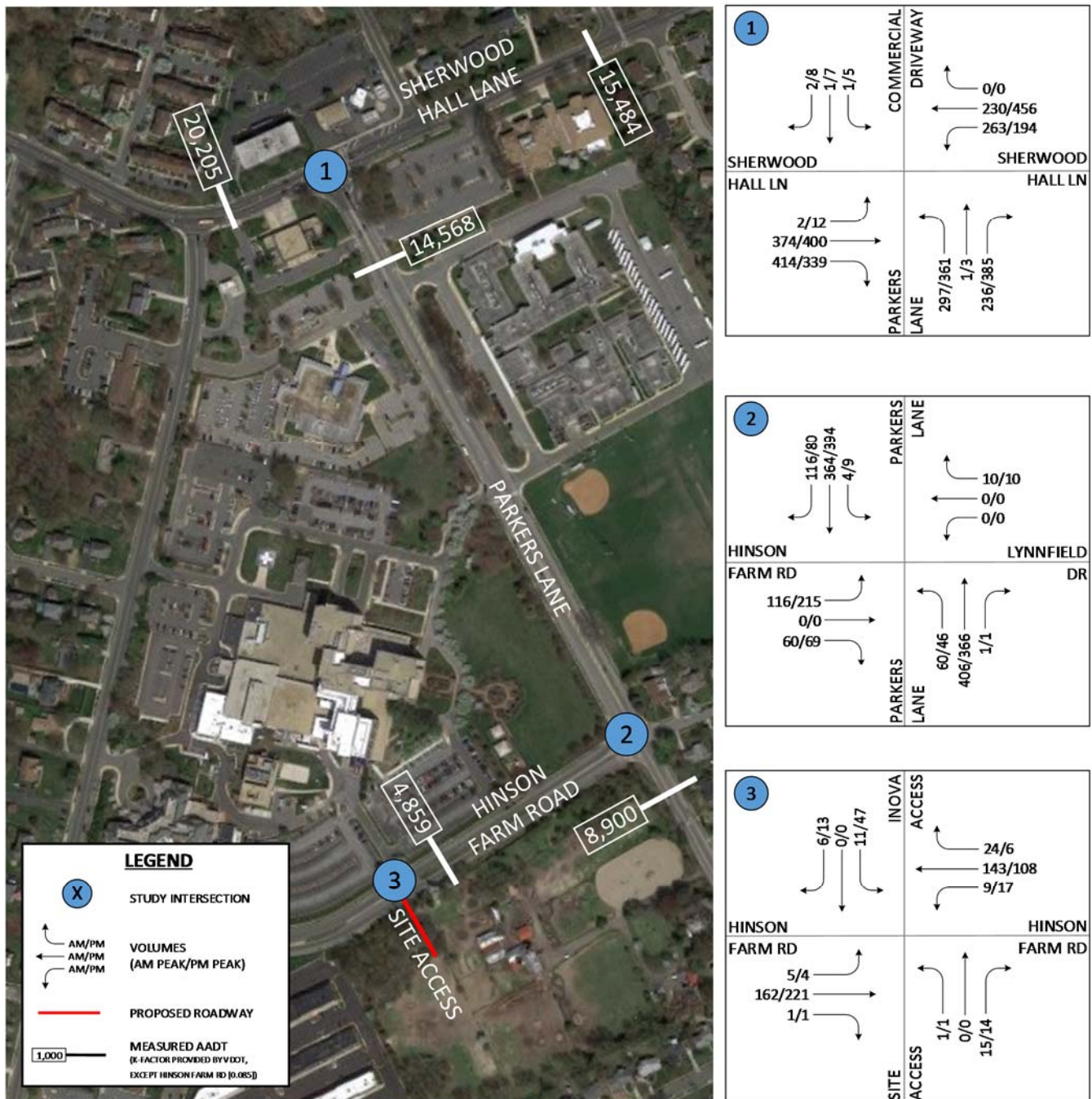


Figure 9: Future (2018) with Development Traffic Volumes

### FUTURE (2018) WITH DEVELOPMENT CAPACITY ANALYSIS

Capacity analyses were performed for the study intersections during the weekday morning and afternoon peak hours under future with development conditions. Synchro Version 9.1 was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology for level of service and vehicular delay. SimTraffic was used to determine the vehicular queue lengths at the study intersections.

A heavy vehicle percentage of 2% was used for existing movements, and a default heavy vehicle percentage of 2% was used for any new movements. The existing peak hour factors (by approach) in the range of 0.85 to 1.00 were used in the analysis.

The results of the intersection capacity analyses are presented in Table 4, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. The 95<sup>th</sup> percentile and 50<sup>th</sup> percentile queue results for each intersection are also presented in Table 4, and are expressed in feet. The detailed analysis worksheets are included in the Appendix.

For the purposes of this analysis, it is desirable to achieve a level of service (LOS) of D or better for each lane group at the intersections. The capacity analysis results indicate that the proposed development does not cause a degradation in the levels of service as compared to the future without development conditions. It should be noted that the proposed development will only increase traffic volumes by eight percent at the intersection of Hinson Farm Road and the Site Entrance; three percent at the intersection of Parkers Lane and Hinson Farm Road; and one percent at the intersection of Sherwood Hall Lane and Parkers Lane.

The northbound left-thru approach at the intersection of Sherwood Hall Lane and Parkers Lane can be improved during the morning peak hour by optimizing the signal timings. Several scenarios were studied to determine the best remedy to improve the unacceptable level of service for the eastbound approach at the intersection of Parkers Lane and Hinson Farm Road. The most economical solution would be to convert the intersection to an all-way stop-controlled intersection, and add left and right turn lanes by restriping the northbound and southbound approaches. This will improve the eastbound approach level of service to an acceptable level, without degrading the other movements below an LOS D. The levels of service for the future with development conditions with these recommended improvements are shown in Figure 10.

**Table 4: Future (2018) with Development Capacity Analysis**

No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak			
			LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue	LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue
1	Sherwood Hall Lane & Parkers Lane									
	<b>Overall Intersection (Signalized)</b>		<b>B</b>	<b>18.6</b>			<b>C</b>	<b>22.4</b>		
	<i>Eastbound Approach</i>		<i>B</i>	<i>11.9</i>			<i>C</i>	<i>28.9</i>		
	Eastbound Left	40	B	17.0	1	14	C	20.9	11	45
	Eastbound Thru		C	24.5	137	241	C	34.2	160	282
	Eastbound Right	255	A	0.4	67	170	C	22.9	53	174
	<i>Westbound Approach</i>		<i>B</i>	<i>10.5</i>			<i>B</i>	<i>16.2</i>		
	Westbound Left	75	B	11.8	69	107	B	16.1	72	115
	Westbound Thru/Right		A	9.0	72	164	B	16.2	150	276
	<i>Northbound Approach</i>		<i>D</i>	<i>35.9</i>			<i>C</i>	<i>21.3</i>		
	Northbound Left/Thru		<b>E</b>	<b>64.2</b>	159	254	D	43.5	169	270
	Northbound Right	250	A	0.2	32	128	A	0.4	74	194
	<i>Southbound Approach</i>		<i>C</i>	<i>25.3</i>	4	19	<i>B</i>	<i>19.1</i>	14	42
1	Sherwood Hall Lane & Parkers Lane – with Adjusted Signal Timings									
	<b>Overall Intersection (Signalized)</b>		<b>C</b>	<b>21.5</b>						
	<i>Eastbound Approach</i>		<i>C</i>	<i>24.7</i>						
	Eastbound Left	40	B	18.8	1	14				
	Eastbound Thru		C	27.8	151	279				
	Eastbound Right	255	C	22.0	80	202				
	<i>Westbound Approach</i>		<i>B</i>	<i>12.4</i>						
	Westbound Left	75	B	14.1	72	110				
	Westbound Thru/Right		B	10.4	80	178				
	<i>Northbound Approach</i>		<i>C</i>	<i>24.9</i>						
	Northbound Left/Thru		D	44.5	152	240				
	Northbound Right	250	A	0.2	26	101				
	<i>Southbound Approach</i>		<i>C</i>	<i>23.2</i>	4	19				



No.	Intersection (Movement)	Bay/ Link Length (feet)	AM Peak				PM Peak			
			LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue	LOS	Delay	50 <sup>th</sup> Queue	95 <sup>th</sup> Queue
2	Parkers Lane & Hinson Farm Road / Lynnfield Drive									
	<b>Overall Intersection (Unsignalized – Two-Way Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>E</i>	<i>37.8</i>				<i>F</i>	<i>104.2</i>	
	Eastbound Left	220	F	51.5	52	97	F	133.9	92	172
	Eastbound Thru		C	21.6	1	8	A	0.0	3	54
	Eastbound Right	180	B	11.6	29	52	B	11.8	30	55
	<i>Westbound Approach</i>		<i>B</i>	<i>13.2</i>	<i>10</i>	<i>33</i>	<i>B</i>	<i>12.6</i>	<i>10</i>	<i>32</i>
	<i>Northbound Approach</i>		<i>A</i>	<i>1.1</i>	<i>30</i>	<i>85</i>	<i>A</i>	<i>1.0</i>	<i>20</i>	<i>61</i>
	<i>Southbound Approach</i>		<i>A</i>	<i>0.1</i>	<i>3</i>	<i>19</i>	<i>A</i>	<i>0.2</i>	<i>5</i>	<i>29</i>
2	Parkers Lane & Hinson Farm Road / Lynnfield Drive									
	<b>Overall Intersection (Unsignalized – All-Way Stop Controlled w/ Major Approach Turn Lanes)</b>									
			<b>C</b>	<b>21.4</b>				<b>D</b>	<b>26.0</b>	
	<i>Eastbound Approach</i>		<i>B</i>	<i>12.1</i>				<i>C</i>	<i>16.3</i>	
	Eastbound Left	220	B	13.2	34	57	C	18.2	49	80
	Eastbound Thru		A	9.9	0	6	A	10.0	0	5
	Eastbound Right	180	B	10.1	19	39	B	10.3	20	40
	<i>Westbound Approach</i>		<i>B</i>	<i>10.4</i>	<i>7</i>	<i>24</i>	<i>B</i>	<i>10.9</i>	<i>7</i>	<i>23</i>
	<i>Northbound Approach</i>		<i>D</i>	<i>26.5</i>			<i>D</i>	<i>28.5</i>		
	Northbound Left	100	B	10.9	26	47	B	11.4	23	50
	Northbound Thru		D	28.9	63	101	D	30.8	63	111
	Northbound Right	100	A	8.6	1	8	A	9.3	1	9
	<i>Southbound Approach</i>		<i>C</i>	<i>20.2</i>			<i>D</i>	<i>30.2</i>		
	Southbound Left	100	A	9.9	3	17	B	10.5	7	28
	Southbound Thru		D	23.6	58	88	D	34.8	69	119
	Southbound Right	100	B	10.2	36	60	B	10.3	35	69
3	Hinson Farm Road & INOVA Access Drive									
	<b>Overall Intersection (Unsignalized – Southbound Stop Controlled)</b>									
	<i>Eastbound Approach</i>		<i>A</i>	<i>0.2</i>				<i>A</i>	<i>0.1</i>	
	Eastbound Left	130	A	7.6	1	9	A	7.5	0	3
	Eastbound Thru/Right		A	0.0	0	0	A	0.0	0	0
	<i>Westbound Approach</i>		<i>A</i>	<i>0.4</i>	<i>2</i>	<i>14</i>	<i>A</i>	<i>1.0</i>	<i>4</i>	<i>21</i>
	<i>Northbound Approach</i>		<i>A</i>	<i>9.5</i>	<i>11</i>	<i>35</i>	<i>A</i>	<i>9.9</i>	<i>13</i>	<i>37</i>
	<i>Southbound Approach</i>		<i>B</i>	<i>10.8</i>	<i>13</i>	<i>38</i>	<i>B</i>	<i>11.9</i>	<i>28</i>	<i>51</i>

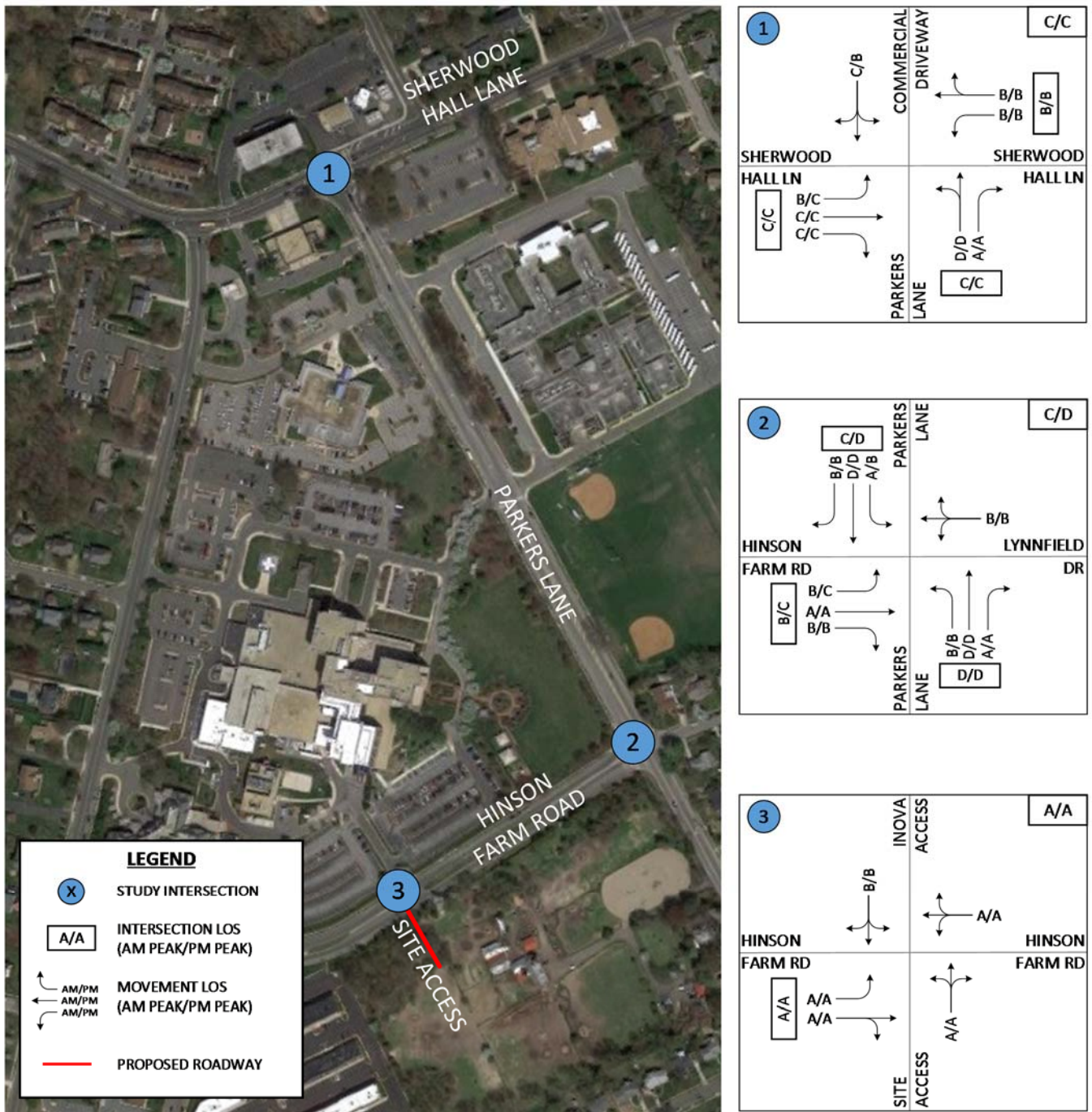
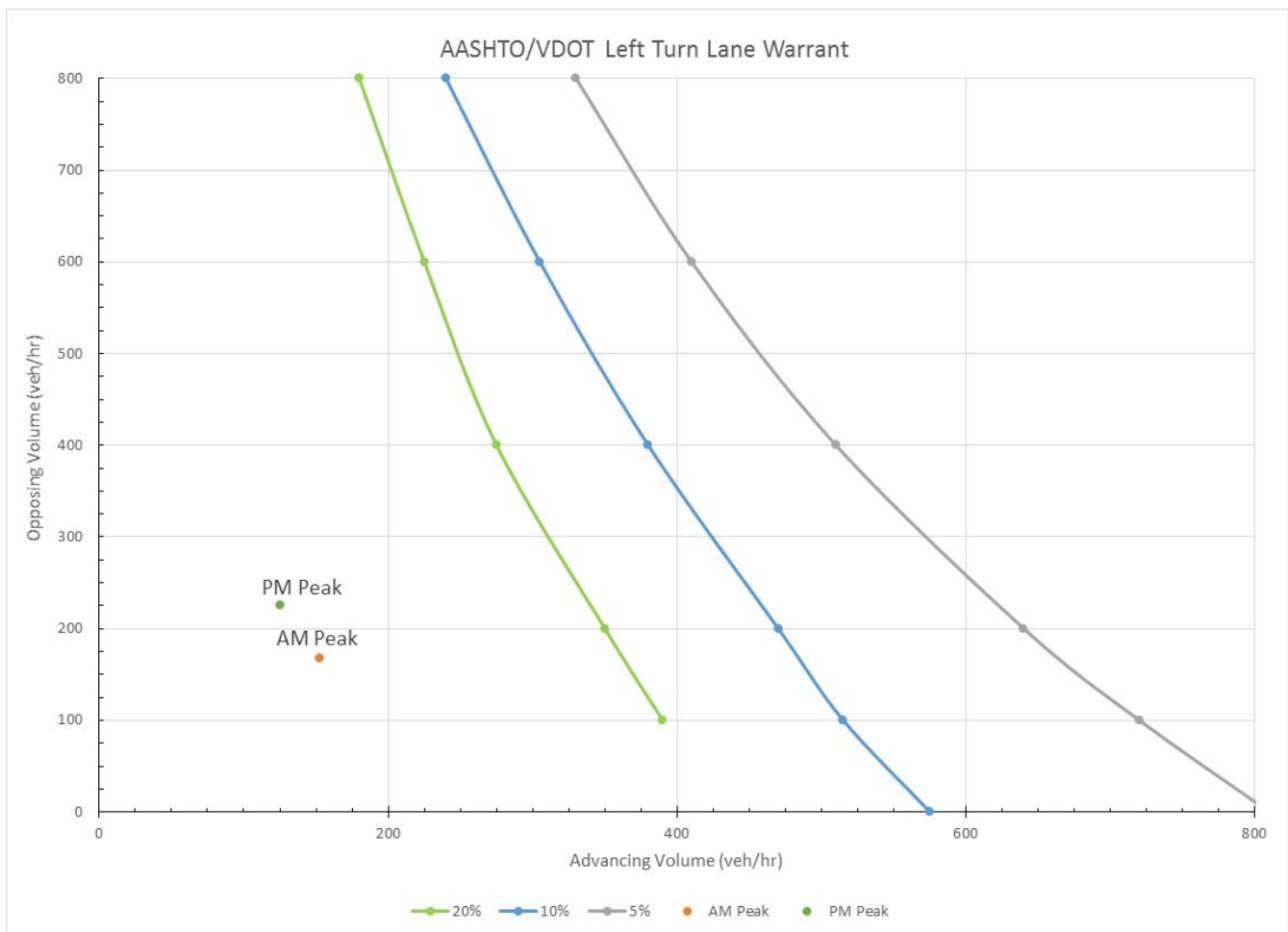


Figure 10: Future (2018) with Development Level of Service with Recommended Improvements

### SITE ACCESS TURN LANE WARRANTS

The future with development volumes for the intersection of Hinson Farm Road and INOVA Access / Site Access were evaluated to determine whether a westbound left turn lane would be warranted. The warrant is based on Table 3-1 of VDOT's Road Design Manual, Appendix F. The values of opposing volume vs. advancing volume were plotted on the same chart – effectively, combining Figures 3-5, 3-6, and 3-8 of VDOT's Road Design Manual, Appendix F on the same axes. The curves described in this paragraph, along with the morning and afternoon peak hour values, are shown in Figure 11.



**Figure 11: Left Turn Lane Warrant Volumes (Based on AASHTO and VDOT Warrants)**

The afternoon peak hour westbound left turns are less than 15% of the advancing volume; the morning peak hour westbound left turns are less than 7%. As Figure 11 shows, the peak hour eastbound and westbound volumes (opposing and advancing, respectively) are far below the 20% threshold to warrant a westbound left turn lane to the proposed site access.

The future with development volumes for the intersection of Hinson Farm Road and INOVA Access / Site Access were evaluated to determine whether an eastbound right turn lane would be warranted. The warrant is based on Figure 3-26 of VDOT's Road Design Manual, Appendix F. Based on VDOT turn lane warrant criteria, a radius only would be required for the eastbound right turn movement.

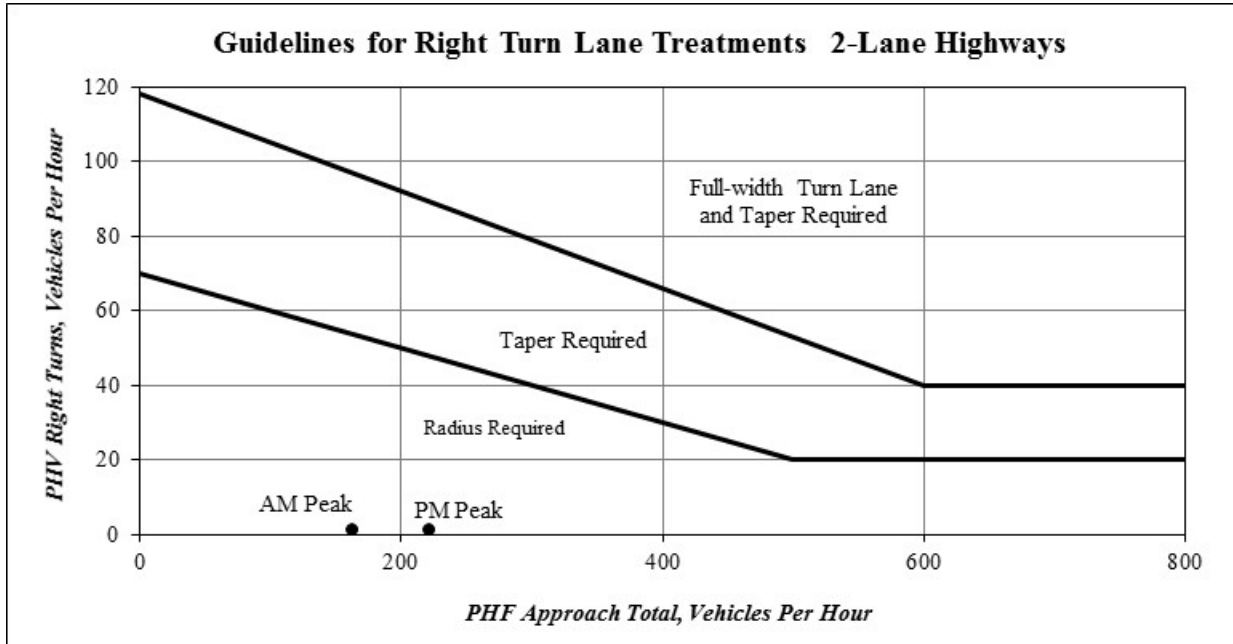


Figure 12: VDOT Road Design Manual, Figure 3-26, Guidelines for Right Turn Treatments – 2-Lane Highways

## CONCLUSION

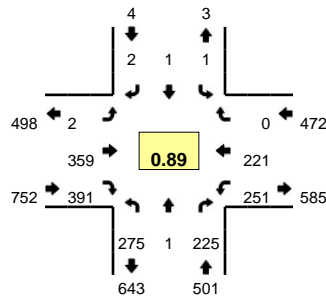
This memorandum summarizes the expected impact of the proposed Bock Farm active senior living community. The analysis presents the following conclusions:

- 1) Turn lanes along Hinson Farm Road into the proposed site (eastbound right and westbound left) are not warranted. The traffic volume entering the site is below the warrant threshold.
- 2) The eastbound left turn movement at the intersection of Parkers Lane and Hinson Farm Road / Lynnfield Drive currently operates at an unacceptable level of service. The suggested remediation would be installing additional stop signs to convert the intersection to an all-way stop-controlled intersection, and add left and right turn lanes by restriping the northbound and southbound approaches.
- 3) The northbound left-thru movement at the signalized intersection of Sherwood Hall Lane and Parkers Lane currently operates below an acceptable level of service. With the addition of the proposed development site traffic, it is recommended that the signal timings of the signalized intersection be optimized to provide additional northbound green time.

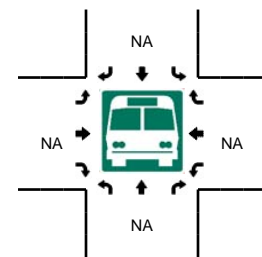
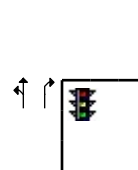
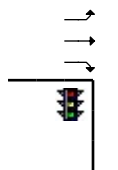
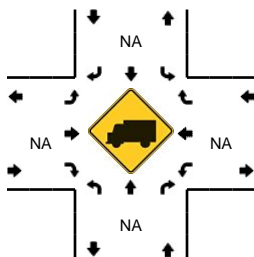
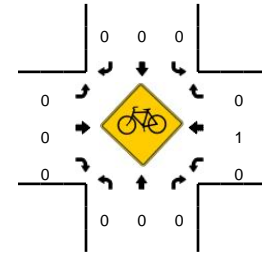
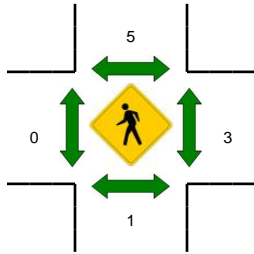
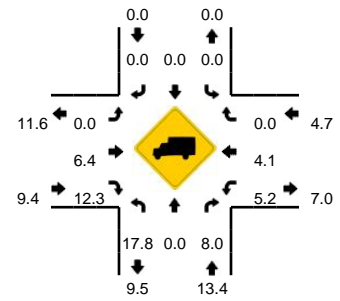
## **TECHNICAL APPENDIX**

**LOCATION:** Parkers Ln -- Sherwood Hall Ln  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780603  
**DATE:** Tue, Apr 19 2016



**Peak-Hour: 7:00 AM -- 8:00 AM**  
**Peak 15-Min: 7:15 AM -- 7:30 AM**

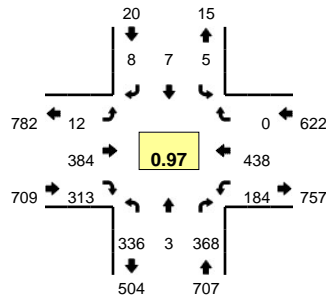


15-Min Count Period Beginning At	Parkers Ln (Northbound)				Parkers Ln (Southbound)				Sherwood Hall Ln (Eastbound)				Sherwood Hall Ln (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	12	0	24	0	0	0	1	0	0	55	34	0	25	19	0	0	170	
6:15 AM	13	0	15	0	0	0	0	0	1	65	44	0	33	22	0	0	193	
6:30 AM	34	0	30	0	0	1	0	0	0	59	58	0	35	26	0	0	243	
6:45 AM	36	0	34	0	0	1	0	0	1	76	97	0	69	33	0	0	347	953
7:00 AM	77	0	40	0	0	0	0	0	0	69	135	0	67	41	0	0	429	1212
7:15 AM	91	0	62	0	0	0	0	0	0	89	132	0	59	50	0	0	483	1502
7:30 AM	61	0	70	0	0	0	1	0	0	95	53	0	63	55	0	0	398	1657
7:45 AM	46	1	53	0	1	1	1	0	2	106	71	0	62	75	0	0	419	1729
8:00 AM	47	0	48	0	0	1	1	0	0	97	78	0	61	74	0	0	407	1707
8:15 AM	42	0	41	0	0	1	0	0	3	93	84	0	74	97	1	0	436	1660
8:30 AM	45	0	55	0	0	0	0	0	1	94	90	0	54	58	0	0	397	1659
8:45 AM	58	0	53	0	1	1	0	0	3	67	108	0	82	56	0	0	429	1669
9:00 AM	86	3	74	0	2	0	3	0	2	59	89	0	56	59	0	0	433	1695
9:15 AM	75	1	63	0	3	0	1	0	3	67	74	0	50	84	0	0	421	1680
9:30 AM	66	1	55	0	2	1	3	0	2	59	55	0	46	52	1	0	343	1626
9:45 AM	59	1	46	1	2	1	2	0	2	84	79	0	44	63	1	0	385	1582
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	364	0	248	0	0	0	0	0	0	356	528	0	236	200	0	0	1932	
Heavy Trucks	68	0	28	0	0	0	0	0	0	20	28	0	8	0	0	0	152	
Pedestrians	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	8	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
Railroad																		
Stopped Buses																		

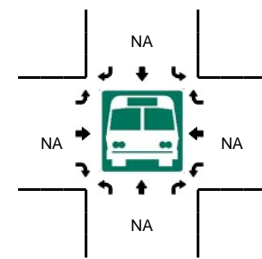
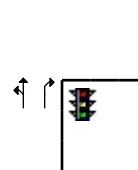
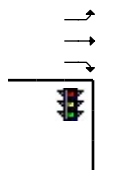
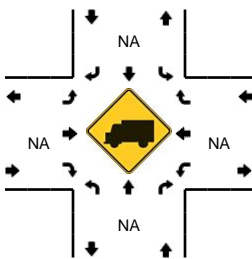
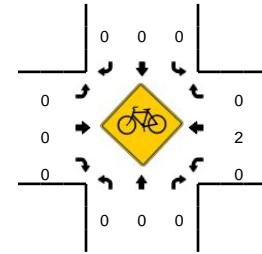
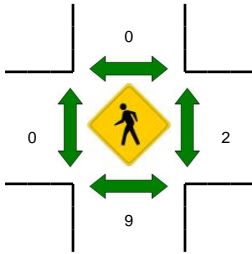
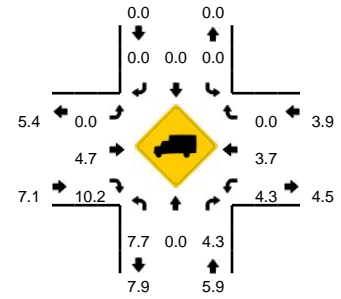
Comments:

**LOCATION:** Parkers Ln -- Sherwood Hall Ln  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780604  
**DATE:** Mon, Apr 18 2016



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**Peak 15-Min: 3:45 PM -- 4:00 PM**

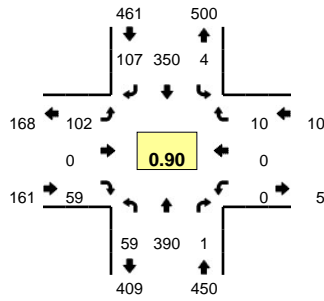


15-Min Count Period Beginning At	Parkers Ln (Northbound)				Parkers Ln (Southbound)				Sherwood Hall Ln (Eastbound)				Sherwood Hall Ln (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	75	2	71	0	2	0	4	0	2	81	61	0	53	124	1	0	476	
3:15 PM	73	0	63	0	0	0	3	0	3	92	90	0	50	116	0	0	490	
3:30 PM	85	0	94	0	1	1	2	0	5	91	79	0	43	121	0	0	522	
3:45 PM	98	1	99	0	2	2	2	0	1	106	73	0	50	96	0	0	530	2018
4:00 PM	80	2	112	0	2	4	1	0	3	95	71	0	41	105	0	0	516	2058
4:15 PM	70	3	82	0	0	0	0	0	0	117	55	0	39	115	0	0	481	2049
4:30 PM	65	0	80	0	0	1	1	0	2	90	96	0	45	114	0	0	494	2021
4:45 PM	72	0	55	0	3	1	1	0	0	99	65	0	40	103	0	0	439	1930
5:00 PM	71	3	85	0	0	2	5	0	2	103	60	0	43	101	2	0	477	1891
5:15 PM	66	1	82	0	0	2	1	0	1	106	74	0	43	124	0	0	500	1910
5:30 PM	74	0	70	0	2	1	3	0	1	102	79	0	45	127	1	0	505	1921
5:45 PM	55	1	79	0	0	0	1	0	0	85	73	0	45	130	0	0	469	1951
6:00 PM	68	0	51	0	2	2	3	0	5	109	69	0	53	129	2	0	493	1967
6:15 PM	54	0	57	0	1	0	2	0	1	90	62	0	35	140	0	0	442	1909
6:30 PM	40	0	53	0	0	2	0	0	1	84	40	0	59	139	0	0	418	1822
6:45 PM	48	0	49	0	0	0	1	0	2	76	70	0	49	124	0	0	419	1772
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	392	4	396	0	8	8	8	0	4	424	292	0	200	384	0	0	2120	
Heavy Trucks	28	0	8		0	0	0		0	20	28		8	24	0		116	
Pedestrians	4				0				0	0	0		0	0	0		4	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

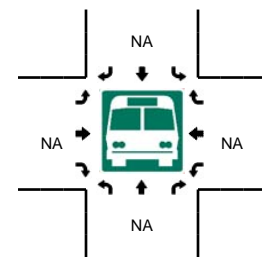
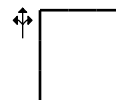
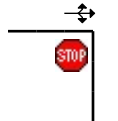
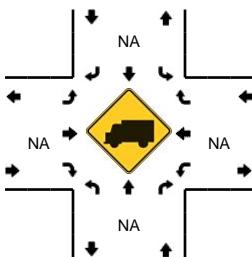
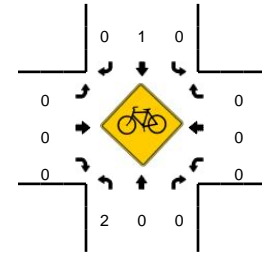
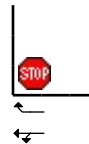
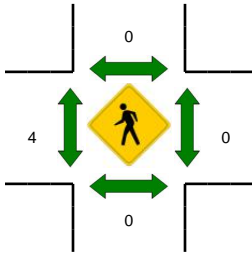
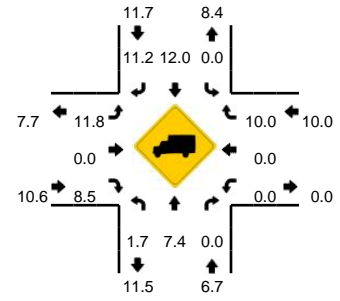
Comments:

**LOCATION:** Parkers Ln -- Hinson Farm Rd  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780601  
**DATE:** Tue, Apr 19 2016



**Peak-Hour: 8:30 AM -- 9:30 AM**  
**Peak 15-Min: 8:45 AM -- 9:00 AM**



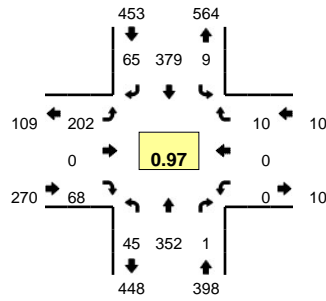
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	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	2	13	0	0	0	25	9	0	15	0	1	0	0	0	0	0	65	
6:15 AM	2	15	0	0	0	20	21	0	8	0	2	0	0	0	0	0	68	
6:30 AM	2	38	0	0	0	27	25	0	13	0	6	0	0	0	1	0	112	
6:45 AM	7	49	0	0	0	53	29	0	13	0	5	0	0	0	1	0	157	402
7:00 AM	12	68	0	0	0	82	37	0	19	0	11	0	1	0	2	0	232	569
7:15 AM	6	73	0	0	0	78	22	0	21	0	11	0	0	0	1	0	212	713
7:30 AM	4	76	0	0	0	54	32	0	29	0	9	0	0	0	5	0	209	810
7:45 AM	15	67	0	0	0	72	37	0	22	1	15	0	0	0	2	0	231	884
8:00 AM	10	70	0	0	0	71	36	0	15	0	7	0	0	0	0	0	209	861
8:15 AM	12	53	0	0	2	96	29	0	16	0	3	0	0	0	1	0	212	861
8:30 AM	12	74	0	0	0	90	24	0	30	0	7	1	0	0	3	0	241	893
8:45 AM	13	84	1	0	3	116	31	0	22	0	26	0	0	0	5	0	301	963
9:00 AM	22	127	0	0	1	78	28	0	30	0	13	0	0	0	1	0	300	1054
9:15 AM	12	105	0	0	0	66	24	0	18	0	13	1	0	0	1	0	240	1082
9:30 AM	9	75	0	0	0	58	26	0	37	0	13	0	0	0	3	0	221	1062
9:45 AM	18	59	1	0	0	76	22	0	27	1	7	2	1	0	1	0	215	976
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	52	336	4	0	12	464	124	0	88	0	104	0	0	0	20	0	1204	
Heavy Trucks	0	32	0	0	0	52	4	0	8	0	4	0	0	0	0	0	100	
Pedestrians	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	12	
Bicycles	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
Railroad																		
Stopped Buses																		

Comments:

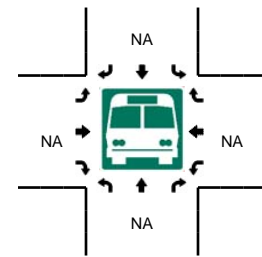
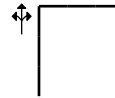
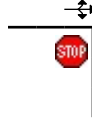
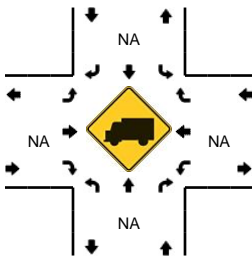
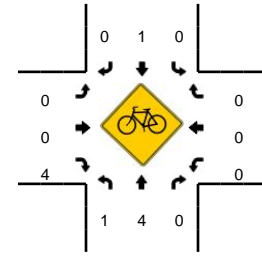
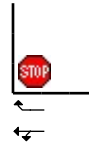
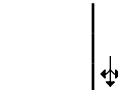
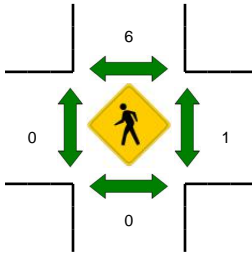
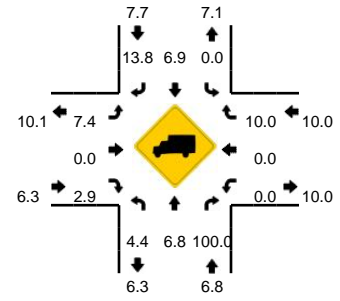


**LOCATION:** Parkers Ln -- Hinson Farm Rd  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780602  
**DATE:** Tue, Apr 19 2016



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**Peak 15-Min: 4:00 PM -- 4:15 PM**

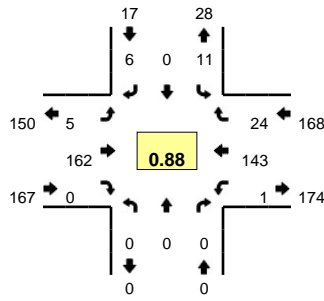


15-Min Count Period Beginning At	Parkers Ln (Northbound)				Parkers Ln (Southbound)				Hinson Farm Rd (Eastbound)				Hinson Farm Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	7	66	0	0	1	73	18	0	46	0	13	2	0	0	1	0	227	
3:15 PM	9	78	1	0	4	113	17	0	35	0	9	0	0	0	4	0	270	
3:30 PM	10	91	0	0	2	88	14	0	61	0	17	0	0	0	2	0	285	
3:45 PM	14	82	0	1	2	94	16	0	47	0	25	0	0	0	3	0	284	1066
4:00 PM	11	101	0	0	1	84	18	0	59	0	17	0	0	0	1	0	292	1131
4:15 PM	12	77	0	0	2	66	10	0	39	0	19	0	1	0	0	0	226	1087
4:30 PM	6	81	2	0	1	100	14	0	44	0	15	0	0	1	2	0	266	1068
4:45 PM	11	66	0	0	3	86	8	1	36	0	20	0	1	0	1	0	233	1017
5:00 PM	12	89	0	0	2	79	12	0	59	0	18	0	0	0	0	0	271	996
5:15 PM	9	81	0	0	0	95	10	1	30	1	12	0	1	0	1	0	241	1011
5:30 PM	6	86	0	0	0	88	14	0	27	0	15	0	0	0	1	0	237	982
5:45 PM	19	83	0	0	2	99	4	1	27	0	3	0	0	0	1	0	239	988
6:00 PM	7	77	0	0	4	78	19	0	25	1	14	0	0	0	3	0	228	945
6:15 PM	9	65	1	0	0	74	19	0	19	0	10	0	0	0	2	0	199	903
6:30 PM	5	61	0	0	3	65	17	0	14	0	4	0	0	0	1	0	170	836
6:45 PM	3	68	0	0	2	76	17	0	15	0	5	0	0	0	1	0	187	784
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	44	404	0	0	4	336	72	0	236	0	68	0	0	0	4	0	1168	
Heavy Trucks	4	40	0	0	0	8	12	0	8	0	4	0	0	0	0	0	76	
Pedestrians		0				12				0				0			12	
Bicycles	0	4	0		0	0	0		0	0	0		0	0	0		4	
Railroad																		
Stopped Buses																		

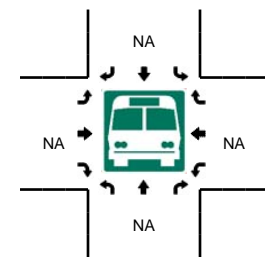
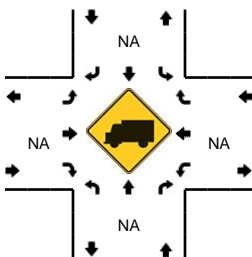
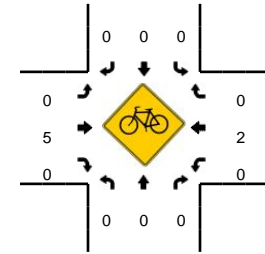
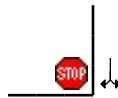
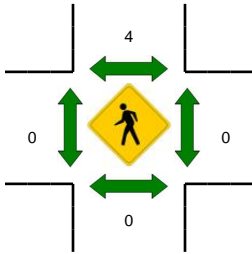
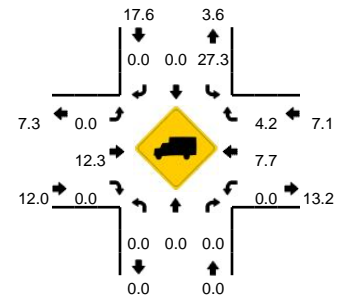
Comments:

**LOCATION:** INOVA Access -- Hinson Farm Rd  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780605  
**DATE:** Tue, Apr 19 2016



**Peak-Hour: 8:45 AM -- 9:45 AM**  
**Peak 15-Min: 8:45 AM -- 9:00 AM**

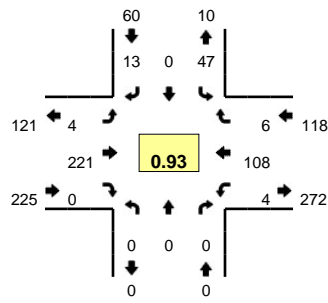


15-Min Count Period Beginning At	INOVA Access (Northbound)				INOVA Access (Southbound)				Hinson Farm Rd (Eastbound)				Hinson Farm Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	1	0	0	0	1	15	0	0	0	8	1	0	26	
6:15 AM	0	0	0	0	2	0	0	0	1	7	0	0	0	13	10	0	33	
6:30 AM	0	0	0	0	4	0	1	0	1	18	0	0	0	15	8	0	47	
6:45 AM	0	0	0	0	0	0	0	0	1	18	0	0	0	15	18	0	52	158
7:00 AM	0	0	0	0	2	0	0	0	0	30	0	0	0	28	15	3	78	210
7:15 AM	0	0	0	0	2	0	1	0	0	33	0	0	0	16	10	0	62	239
7:30 AM	0	0	0	0	5	0	0	0	0	28	0	0	0	20	11	2	66	258
7:45 AM	0	0	0	0	10	0	0	0	2	29	0	0	0	38	12	1	92	298
8:00 AM	0	0	0	0	1	0	1	0	2	21	0	0	0	37	9	0	71	291
8:15 AM	0	0	0	0	3	0	0	0	2	17	0	0	0	31	9	2	64	293
8:30 AM	0	0	0	0	1	0	2	0	1	37	0	0	0	28	8	1	78	305
8:45 AM	0	0	0	0	5	0	2	0	2	46	0	1	0	38	6	0	100	313
9:00 AM	0	0	0	0	1	0	1	0	2	38	0	0	0	43	6	1	92	334
9:15 AM	0	0	0	0	1	0	0	0	0	31	0	0	0	31	7	0	70	340
9:30 AM	0	0	0	0	4	0	3	0	0	47	0	0	0	31	5	0	90	352
9:45 AM	0	0	0	0	3	0	2	0	2	37	0	1	0	34	6	1	86	338
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	0	0	0	0	20	0	8	0	8	184	0	4	0	152	24	0	400	
Heavy Trucks	0	0	0	0	8	0	0	0	0	8	0	0	0	4	0	0	20	
Pedestrians						12				0				0			12	
Bicycles	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5	
Railroad																		
Stopped Buses																		

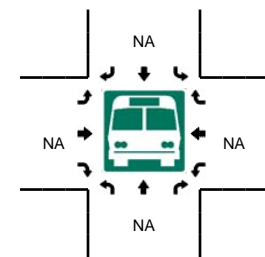
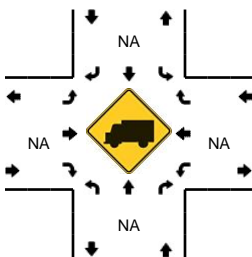
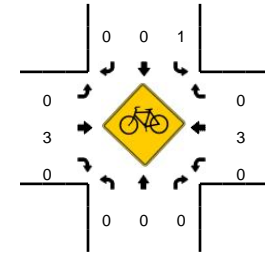
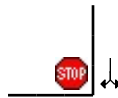
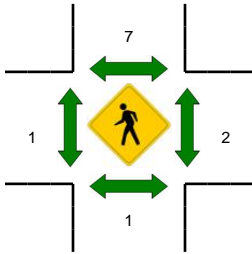
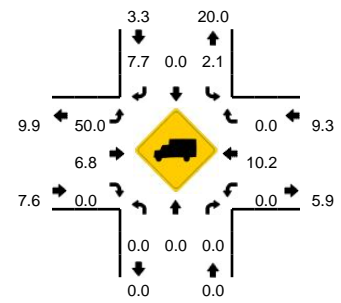
Comments:

**LOCATION:** INOVA Access -- Hinson Farm Rd  
**CITY/STATE:** Alexandria, VA

**QC JOB #:** 13780606  
**DATE:** Tue, Apr 19 2016



**Peak-Hour: 3:15 PM -- 4:15 PM**  
**Peak 15-Min: 4:00 PM -- 4:15 PM**



15-Min Count Period Beginning At	INOVA Access (Northbound)				INOVA Access (Southbound)				Hinson Farm Rd (Eastbound)				Hinson Farm Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:00 PM	0	0	0	0	13	0	3	0	0	48	0	0	0	25	3	1	93	
3:15 PM	0	0	0	0	8	0	5	0	3	47	0	0	0	25	3	0	91	
3:30 PM	0	0	0	0	21	0	4	0	1	48	0	0	0	25	2	2	103	
3:45 PM	0	0	0	0	9	0	2	0	0	57	0	0	0	30	1	2	101	388
4:00 PM	0	0	0	0	9	0	2	0	0	69	0	0	0	28	0	0	108	403
4:15 PM	0	0	0	0	12	0	3	0	0	44	0	0	0	22	1	1	83	395
4:30 PM	0	0	0	0	9	0	3	0	0	49	0	0	0	17	2	1	81	373
4:45 PM	0	0	0	0	12	0	2	0	2	43	0	0	0	18	2	1	80	352
5:00 PM	0	0	0	0	13	0	3	0	1	60	0	0	0	22	1	1	101	345
5:15 PM	0	0	0	0	8	0	3	0	2	31	0	0	0	17	1	1	63	325
5:30 PM	0	0	0	0	6	0	2	0	1	37	0	0	0	18	1	4	69	313
5:45 PM	0	0	0	0	6	0	3	0	1	16	0	0	0	22	1	0	49	282
6:00 PM	0	0	0	0	6	0	2	0	0	32	0	0	0	27	0	2	69	250
6:15 PM	0	0	0	0	4	0	0	0	1	26	0	0	0	25	3	0	59	246
6:30 PM	0	0	0	0	2	0	1	0	0	16	0	0	0	15	3	1	38	215
6:45 PM	0	0	0	0	6	0	2	0	2	15	0	0	0	13	9	0	47	213
<b>Peak 15-Min Flowrates</b>	<b>Northbound</b>				<b>Southbound</b>				<b>Eastbound</b>				<b>Westbound</b>				<b>Total</b>	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	36	0	8	0	0	276	0	0	0	112	0	0	432	
Heavy Trucks	0	0	0	0	0	0	0	0	0	12	0	0	0	16	0	0	28	
Pedestrians	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	8	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	
Railroad																		
Stopped Buses																		

Comments:

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/6/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	359	391	251	221	0	275	1	225	1	1	2
Future Volume (vph)	2	359	391	251	221	0	275	1	225	1	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863			1774	1583		1716	
Flt Permitted	0.61	1.00	1.00	0.34	1.00			0.72	1.00		0.93	
Satd. Flow (perm)	1135	1863	1583	636	1863			1350	1583		1613	
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)	2	390	425	273	240	0	299	1	245	1	1	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	2	390	425	273	240	0	0	300	245	0	2	0
Turn Type	Perm	NA	Free	pm+pt	NA		Perm	NA	Free	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		Free	6			4		Free	8		
Actuated Green, G (s)	35.3	35.3	90.0	53.8	53.8			22.2	90.0		22.2	
Effective Green, g (s)	35.3	35.3	90.0	53.8	53.8			22.2	90.0		22.2	
Actuated g/C Ratio	0.39	0.39	1.00	0.60	0.60			0.25	1.00		0.25	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	445	730	1583	525	1113			333	1583		397	
v/s Ratio Prot		0.21		c0.07	0.13							
v/s Ratio Perm	0.00		0.27	c0.24				c0.22	0.15		0.00	
v/c Ratio	0.00	0.53	0.27	0.52	0.22			0.90	0.15		0.01	
Uniform Delay, d1	16.7	21.0	0.0	10.4	8.4			32.8	0.0		25.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	2.8	0.4	0.9	0.4			26.5	0.2		0.0	
Delay (s)	16.7	23.8	0.4	11.3	8.8			59.3	0.2		25.6	
Level of Service	B	C	A	B	A			E	A		C	
Approach Delay (s)		11.6			10.1			32.8			25.6	
Approach LOS		B			B			C			C	

### Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

**Intersection**

Int Delay, s/veh 5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	102	1	59	1	1	10	59	390	1	4	350	107
Future Vol, veh/h	102	1	59	1	1	10	59	390	1	4	350	107
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	225	-	185	-	-	-	-	-	-	-	-	-
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	111	1	64	1	1	11	64	424	1	4	380	116

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1006	1000	439	1001	1058	424	497	0	0	425	0	0
Stage 1	447	447	-	553	553	-	-	-	-	-	-	-
Stage 2	559	553	-	448	505	-	-	-	-	-	-	-
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	220	243	618	222	225	630	1067	-	-	1134	-	-
Stage 1	591	573	-	517	514	-	-	-	-	-	-	-
Stage 2	513	514	-	590	540	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	202	223	618	186	206	630	1067	-	-	1134	-	-
Mov Cap-2 Maneuver	202	223	-	186	206	-	-	-	-	-	-	-
Stage 1	544	570	-	476	473	-	-	-	-	-	-	-
Stage 2	463	473	-	525	537	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.1	13.1	1.1	0.1
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1067	-	-	202	223	618	460	1134	-	-
HCM Lane V/C Ratio	0.06	-	-	0.549	0.005	0.104	0.028	0.004	-	-
HCM Control Delay (s)	8.6	0	-	42.6	21.2	11.5	13.1	8.2	0	-
HCM Lane LOS	A	A	-	E	C	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2.9	0	0.3	0.1	0	-	-

**Intersection**

Int Delay, s/veh 0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	162	0	0	143	24	0	0	0	11	0	6
Future Vol, veh/h	5	162	0	0	143	24	0	0	0	11	0	6
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	-	-	-	-	-	-	-	-	-	-	-
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	5	176	0	0	155	26	0	0	0	12	0	7

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	182	0	0	176	0	0	359	369	176	355	355	168
Stage 1	-	-	-	-	-	-	187	187	-	168	168	-
Stage 2	-	-	-	-	-	-	172	182	-	187	187	-
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	1393	-	-	1400	-	-	596	560	867	600	571	876
Stage 1	-	-	-	-	-	-	815	745	-	834	759	-
Stage 2	-	-	-	-	-	-	830	749	-	815	745	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1393	-	-	1400	-	-	590	558	867	598	569	876
Mov Cap-2 Maneuver	-	-	-	-	-	-	590	558	-	598	569	-
Stage 1	-	-	-	-	-	-	812	742	-	831	759	-
Stage 2	-	-	-	-	-	-	824	749	-	812	742	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	0	10.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1393	-	-	1400	-	-	673
HCM Lane V/C Ratio	-	0.004	-	-	-	-	-	0.027
HCM Control Delay (s)	0	7.6	-	-	0	-	-	10.5
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.1

Queuing and Blocking Report  
Baseline

5/6/2016

Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	18	265	226	99	219	278	211	29
Average Queue (ft)	1	128	60	69	70	151	30	3
95th Queue (ft)	12	222	153	106	163	241	123	18
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		255	75			250	
Storage Blk Time (%)	0	33	0	8	3	1	0	
Queuing Penalty (veh)	0	128	0	18	8	1	0	

Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	110	18	63	33	104	39
Average Queue (ft)	48	1	29	9	26	2
95th Queue (ft)	87	9	54	32	73	19
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	16	36
Average Queue (ft)	1	13
95th Queue (ft)	8	38
Link Distance (ft)		245
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 156

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/6/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	384	313	184	438	0	336	3	368	5	7	8
Future Volume (vph)	12	384	313	184	438	0	336	3	368	5	7	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1863			1775	1583		1740	
Flt Permitted	0.49	1.00	1.00	0.25	1.00			0.71	1.00		0.91	
Satd. Flow (perm)	914	1863	1583	464	1863			1326	1583		1610	
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)	13	417	340	200	476	0	365	3	400	5	8	9
RTOR Reduction (vph)	0	0	233	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	13	417	107	200	476	0	0	368	400	0	16	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Free	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6			4		Free	8		
Actuated Green, G (s)	26.8	26.8	26.8	43.3	43.3			27.7	85.0		27.7	
Effective Green, g (s)	26.8	26.8	26.8	43.3	43.3			27.7	85.0		27.7	
Actuated g/C Ratio	0.32	0.32	0.32	0.51	0.51			0.33	1.00		0.33	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	288	587	499	382	949			432	1583		524	
v/s Ratio Prot		c0.22		0.06	c0.26							
v/s Ratio Perm	0.01		0.07	0.21				c0.28	0.25		0.01	
v/c Ratio	0.05	0.71	0.21	0.52	0.50			0.85	0.25		0.03	
Uniform Delay, d1	20.2	25.7	21.4	13.8	13.7			26.7	0.0		19.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	7.1	1.0	1.3	1.9			15.4	0.4		0.0	
Delay (s)	20.5	32.8	22.4	15.1	15.6			42.1	0.4		19.5	
Level of Service	C	C	C	B	B			D	A		B	
Approach Delay (s)		28.0			15.5			20.4			19.5	
Approach LOS		C			B			C			B	

### Intersection Summary

HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



**Intersection**

Int Delay, s/veh 19.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	202	0	68	0	0	10	45	352	1	9	379	65
Future Vol, veh/h	202	0	68	0	0	10	45	352	1	9	379	65
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	225	-	185	-	-	-	-	-	-	-	-	-
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	220	0	74	0	0	11	49	383	1	10	412	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	953	949	447	948	983	383	483	0	0	384	0	0
Stage 1	467	467	-	481	481	-	-	-	-	-	-	-
Stage 2	486	482	-	467	502	-	-	-	-	-	-	-
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	239	260	612	241	249	664	1080	-	-	1174	-	-
Stage 1	576	562	-	566	554	-	-	-	-	-	-	-
Stage 2	563	553	-	576	542	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	223	242	612	201	232	664	1080	-	-	1174	-	-
Mov Cap-2 Maneuver	223	242	-	201	232	-	-	-	-	-	-	-
Stage 1	543	555	-	533	522	-	-	-	-	-	-	-
Stage 2	522	521	-	500	535	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	79.5	10.5	1	0.2
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1080	-	-	223	-	612	664	1174	-	-
HCM Lane V/C Ratio	0.045	-	-	0.985	-	0.121	0.016	0.008	-	-
HCM Control Delay (s)	8.5	0	-	102.3	0	11.7	10.5	8.1	0	-
HCM Lane LOS	A	A	-	F	A	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	8.9	-	0.4	0.1	0	-	-

HCM 2010 TWSC  
 3: Site Access/INOVA Access & Hinson Farm Rd

5/6/2016

**Intersection**

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	4	221	0	0	108	6	0	0	0	47	0	13
Future Vol, veh/h	4	221	0	0	108	6	0	0	0	47	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	100	-	-	-	-	-	-	-	-	-	-	-
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	4	240	0	0	117	7	0	0	0	51	0	14

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	124	0	0	240	0	0	377	373	240	370	370	121
Stage 1	-	-	-	-	-	-	249	249	-	121	121	-
Stage 2	-	-	-	-	-	-	128	124	-	249	249	-
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	1463	-	-	1327	-	-	580	557	799	587	560	930
Stage 1	-	-	-	-	-	-	755	701	-	883	796	-
Stage 2	-	-	-	-	-	-	876	793	-	755	701	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1463	-	-	1327	-	-	570	555	799	586	558	930
Mov Cap-2 Maneuver	-	-	-	-	-	-	570	555	-	586	558	-
Stage 1	-	-	-	-	-	-	753	699	-	881	796	-
Stage 2	-	-	-	-	-	-	863	793	-	753	699	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	11.3
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1463	-	-	1327	-	-	637
HCM Lane V/C Ratio	-	0.003	-	-	-	-	-	0.102
HCM Control Delay (s)	0	7.5	-	-	0	-	-	11.3
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

# Queuing and Blocking Report

## Baseline

5/6/2016

### Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	61	366	244	100	326	322	268	48
Average Queue (ft)	10	157	49	68	144	163	72	13
95th Queue (ft)	40	285	167	112	271	261	194	40
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		225	75			250	
Storage Blk Time (%)	0	37	0	7	17	1	0	
Queuing Penalty (veh)	3	121	0	30	31	3	0	

### Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	187	30	64	31	96	49
Average Queue (ft)	83	2	30	9	18	4
95th Queue (ft)	151	41	54	31	59	24
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)	0					
Queuing Penalty (veh)	0					

### Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	12	60
Average Queue (ft)	0	29
95th Queue (ft)	6	52
Link Distance (ft)		245
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

### Network Summary

Network wide Queuing Penalty: 188

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	363	395	254	223	1	278	1	227	1	1	2
Future Volume (vph)	2	363	395	254	223	1	278	1	227	1	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1774	1583		1716	
Flt Permitted	0.61	1.00	1.00	0.34	1.00			0.72	1.00		0.93	
Satd. Flow (perm)	1132	1863	1583	626	1862			1350	1583		1612	
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)	2	395	429	276	242	1	302	1	247	1	1	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	2	395	429	276	243	0	0	303	247	0	2	0
Turn Type	Perm	NA	Free	pm+pt	NA			Perm	NA	Free	Perm	NA
Protected Phases		2		1	6				4			8
Permitted Phases	2		Free	6			4		Free	8		
Actuated Green, G (s)	35.2	35.2	90.0	53.7	53.7			22.3	90.0		22.3	
Effective Green, g (s)	35.2	35.2	90.0	53.7	53.7			22.3	90.0		22.3	
Actuated g/C Ratio	0.39	0.39	1.00	0.60	0.60			0.25	1.00		0.25	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	442	728	1583	519	1110			334	1583		399	
v/s Ratio Prot		0.21		c0.07	0.13							
v/s Ratio Perm	0.00		0.27	c0.25				c0.22	0.16		0.00	
v/c Ratio	0.00	0.54	0.27	0.53	0.22			0.91	0.16		0.01	
Uniform Delay, d1	16.7	21.2	0.0	10.5	8.4			32.8	0.0		25.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	2.9	0.4	1.1	0.5			27.4	0.2		0.0	
Delay (s)	16.7	24.1	0.4	11.6	8.9			60.2	0.2		25.5	
Level of Service	B	C	A	B	A			E	A		C	
Approach Delay (s)		11.8			10.3			33.3			25.5	
Approach LOS		B			B			C			C	

### Intersection Summary

HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

**Intersection**

Int Delay, s/veh 5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	102	1	59	1	1	10	59	394	1	4	354	107
Future Vol, veh/h	102	1	59	1	1	10	59	394	1	4	354	107
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	225	-	185	-	-	-	-	-	-	-	-	-
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	111	1	64	1	1	11	64	428	1	4	385	116

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1015	1010	443	1009	1067	429	501	0	0	429	0	0
Stage 1	452	452	-	557	557	-	-	-	-	-	-	-
Stage 2	563	558	-	452	510	-	-	-	-	-	-	-
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	217	240	615	219	222	626	1063	-	-	1130	-	-
Stage 1	587	570	-	515	512	-	-	-	-	-	-	-
Stage 2	511	512	-	587	538	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	199	220	615	183	203	626	1063	-	-	1130	-	-
Mov Cap-2 Maneuver	199	220	-	183	203	-	-	-	-	-	-	-
Stage 1	541	567	-	474	472	-	-	-	-	-	-	-
Stage 2	461	472	-	522	535	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.8	13.1	1.1	0.1
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1063	-	-	199	220	615	455	1130	-	-
HCM Lane V/C Ratio	0.06	-	-	0.557	0.005	0.104	0.029	0.004	-	-
HCM Control Delay (s)	8.6	0	-	43.7	21.4	11.5	13.1	8.2	0	-
HCM Lane LOS	A	A	-	E	C	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	3	0	0.3	0.1	0	-	-

HCM 2010 TWSC  
 3: Site Access/INOVA Access & Hinson Farm Rd

5/20/2016

**Intersection**

Int Delay, s/veh 0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	162	0	0	143	24	0	0	0	11	0	6
Future Vol, veh/h	5	162	0	0	143	24	0	0	0	11	0	6
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	-	-	-	-	-	-	-	-	-	-	-
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	5	176	0	0	155	26	0	0	0	12	0	7

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	182	0	0	176	0	0	359	369	176	355	355	168
Stage 1	-	-	-	-	-	-	187	187	-	168	168	-
Stage 2	-	-	-	-	-	-	172	182	-	187	187	-
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	1393	-	-	1400	-	-	596	560	867	600	571	876
Stage 1	-	-	-	-	-	-	815	745	-	834	759	-
Stage 2	-	-	-	-	-	-	830	749	-	815	745	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1393	-	-	1400	-	-	590	558	867	598	569	876
Mov Cap-2 Maneuver	-	-	-	-	-	-	590	558	-	598	569	-
Stage 1	-	-	-	-	-	-	812	742	-	831	759	-
Stage 2	-	-	-	-	-	-	824	749	-	812	742	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	0	10.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1393	-	-	1400	-	-	673
HCM Lane V/C Ratio	-	0.004	-	-	-	-	-	0.027
HCM Control Delay (s)	0	7.6	-	-	0	-	-	10.5
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.1

Queuing and Blocking Report  
Baseline

5/20/2016

Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	15	264	217	99	216	298	212	28
Average Queue (ft)	1	131	62	69	69	154	31	3
95th Queue (ft)	10	224	155	106	160	255	129	18
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		255	75			250	
Storage Blk Time (%)	0	33	0	8	4	1	0	
Queuing Penalty (veh)	0	132	0	18	9	2	0	

Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	112	17	62	36	100	44
Average Queue (ft)	48	1	29	10	26	3
95th Queue (ft)	88	9	54	33	73	20
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	17	36
Average Queue (ft)	1	13
95th Queue (ft)	9	38
Link Distance (ft)		245
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 161

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	388	316	186	442	1	339	3	372	5	7	8
Future Volume (vph)	12	388	316	186	442	1	339	3	372	5	7	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1775	1583		1740	
Flt Permitted	0.49	1.00	1.00	0.24	1.00			0.71	1.00		0.91	
Satd. Flow (perm)	910	1863	1583	452	1862			1326	1583		1610	
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)	13	422	343	202	480	1	368	3	404	5	8	9
RTOR Reduction (vph)	0	0	235	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	13	422	108	202	481	0	0	371	404	0	16	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Free	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6			4		Free	8		
Actuated Green, G (s)	26.7	26.7	26.7	43.2	43.2			27.8	85.0		27.8	
Effective Green, g (s)	26.7	26.7	26.7	43.2	43.2			27.8	85.0		27.8	
Actuated g/C Ratio	0.31	0.31	0.31	0.51	0.51			0.33	1.00		0.33	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	285	585	497	377	946			433	1583		526	
v/s Ratio Prot		c0.23		0.06	c0.26							
v/s Ratio Perm	0.01		0.07	0.21				c0.28	0.26		0.01	
v/c Ratio	0.05	0.72	0.22	0.54	0.51			0.86	0.26		0.03	
Uniform Delay, d1	20.3	25.9	21.5	14.0	13.9			26.7	0.0		19.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	7.5	1.0	1.5	2.0			15.8	0.4		0.0	
Delay (s)	20.6	33.4	22.5	15.4	15.8			42.5	0.4		19.5	
Level of Service	C	C	C	B	B			D	A		B	
Approach Delay (s)		28.3			15.7			20.6			19.5	
Approach LOS		C			B			C			B	

### Intersection Summary

HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



**Intersection**

Int Delay, s/veh 13.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	202	1	68	1	1	10	45	256	1	9	383	65
Future Vol, veh/h	202	1	68	1	1	10	45	256	1	9	383	65
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	225	-	185	-	-	-	-	-	-	-	-	-
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	220	1	74	1	1	11	49	278	1	10	416	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	854	848	452	849	884	279	487	0	0	279	0	0
Stage 1	471	471	-	377	377	-	-	-	-	-	-	-
Stage 2	383	377	-	472	507	-	-	-	-	-	-	-
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	279	298	608	281	284	760	1076	-	-	1284	-	-
Stage 1	573	560	-	644	616	-	-	-	-	-	-	-
Stage 2	640	616	-	573	539	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	261	279	608	234	266	760	1076	-	-	1284	-	-
Mov Cap-2 Maneuver	261	279	-	234	266	-	-	-	-	-	-	-
Stage 1	542	554	-	609	583	-	-	-	-	-	-	-
Stage 2	596	583	-	497	533	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	50.5	11.5	1.3	0.2
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1076	-	-	261	279	608	566	1284	-	-
HCM Lane V/C Ratio	0.045	-	-	0.841	0.004	0.122	0.023	0.008	-	-
HCM Control Delay (s)	8.5	0	-	63.7	18	11.7	11.5	7.8	0	-
HCM Lane LOS	A	A	-	F	C	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	6.8	0	0.4	0.1	0	-	-

**Intersection**

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	4	221	0	0	108	6	0	0	0	47	0	13
Future Vol, veh/h	4	221	0	0	108	6	0	0	0	47	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	100	-	-	-	-	-	-	-	-	-	-	-
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	4	240	0	0	117	7	0	0	0	51	0	14

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	124	0	240	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	2.218	-
Pot Cap-1 Maneuver	1463	-	1327	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1463	-	1327	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	11.3
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1463	-	-	1327	-	-	637
HCM Lane V/C Ratio	-	0.003	-	-	-	-	-	0.102
HCM Control Delay (s)	0	7.5	-	-	0	-	-	11.3
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.3

# Queuing and Blocking Report

## Baseline

5/20/2016

### Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	56	340	238	100	301	342	251	50
Average Queue (ft)	9	154	47	67	140	168	75	13
95th Queue (ft)	38	271	158	111	258	273	195	41
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)		0						
Queuing Penalty (veh)		0						
Storage Bay Dist (ft)	40		225	75			250	
Storage Blk Time (%)	0	38	0	6	17	1	0	
Queuing Penalty (veh)	2	125	0	28	31	4	0	

### Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	172	17	60	31	73	32
Average Queue (ft)	76	1	30	10	15	2
95th Queue (ft)	139	8	52	33	47	16
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)	0					
Queuing Penalty (veh)	0					

### Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	13	58
Average Queue (ft)	0	30
95th Queue (ft)	7	52
Link Distance (ft)		245
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

### Network Summary

Network wide Queuing Penalty: 190

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	363	402	256	223	1	289	1	229	1	1	2
Future Volume (vph)	2	363	402	256	223	1	289	1	229	1	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	4.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1774	1583		1716	
Flt Permitted	0.61	1.00	1.00	0.33	1.00			0.72	1.00		0.93	
Satd. Flow (perm)	1132	1863	1583	619	1862			1350	1583		1611	
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)	2	395	437	278	242	1	314	1	249	1	1	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	2	395	437	278	243	0	0	315	249	0	3	0
Turn Type	Perm	NA	Free	pm+pt	NA			Perm	NA	Free	Perm	NA
Protected Phases		2		1	6				4			8
Permitted Phases	2		Free	6			4		Free	8		
Actuated Green, G (s)	34.8	34.8	90.0	53.4	53.4			22.6	90.0		22.6	
Effective Green, g (s)	34.8	34.8	90.0	53.4	53.4			22.6	90.0		22.6	
Actuated g/C Ratio	0.39	0.39	1.00	0.59	0.59			0.25	1.00		0.25	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	437	720	1583	515	1104			339	1583		404	
v/s Ratio Prot		0.21		c0.07	0.13							
v/s Ratio Perm	0.00		0.28	c0.25				c0.23	0.16		0.00	
v/c Ratio	0.00	0.55	0.28	0.54	0.22			0.93	0.16		0.01	
Uniform Delay, d1	17.0	21.5	0.0	10.7	8.6			32.9	0.0		25.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	3.0	0.4	1.1	0.5			31.2	0.2		0.0	
Delay (s)	17.0	24.5	0.4	11.8	9.0			64.2	0.2		25.3	
Level of Service	B	C	A	B	A			E	A		C	
Approach Delay (s)		11.9			10.5			35.9			25.3	
Approach LOS		B			B			D			C	

### Intersection Summary

HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

**Intersection**

Int Delay, s/veh 6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	116	1	60	1	1	10	60	394	1	4	354	116
Future Vol, veh/h	116	1	60	1	1	10	60	394	1	4	354	116
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	225	-	185	-	-	-	-	-	-	-	-	-
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	126	1	65	1	1	11	65	428	1	4	385	126

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1022	1017	448	1016	1079	429	511	0	0	429	0	0
Stage 1	457	457	-	559	559	-	-	-	-	-	-	-
Stage 2	565	560	-	457	520	-	-	-	-	-	-	-
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	214	238	611	216	218	626	1054	-	-	1130	-	-
Stage 1	583	568	-	513	511	-	-	-	-	-	-	-
Stage 2	510	511	-	583	532	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	196	218	611	180	199	626	1054	-	-	1130	-	-
Mov Cap-2 Maneuver	196	218	-	180	199	-	-	-	-	-	-	-
Stage 1	536	565	-	471	470	-	-	-	-	-	-	-
Stage 2	459	470	-	517	529	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	37.8	13.2	1.1	0.1
HCM LOS	E	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1054	-	-	196	218	611	452	1130	-	-
HCM Lane V/C Ratio	0.062	-	-	0.643	0.005	0.107	0.029	0.004	-	-
HCM Control Delay (s)	8.6	0	-	51.5	21.6	11.6	13.2	8.2	0	-
HCM Lane LOS	A	A	-	F	C	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	3.8	0	0.4	0.1	0	-	-

HCM 2010 TWSC  
 3: Site Access/INOVA Access & Hinson Farm Rd

5/20/2016

**Intersection**

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	162	0	9	143	24	2	0	14	11	0	6
Future Vol, veh/h	5	162	0	9	143	24	2	0	14	11	0	6
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	-	-	-	-	-	-	-	-	-	-	-
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	5	176	0	10	155	26	2	0	15	12	0	7

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	182	0	0	176	0	0	378	388	176	383	375	168
Stage 1	-	-	-	-	-	-	187	187	-	188	188	-
Stage 2	-	-	-	-	-	-	191	201	-	195	187	-
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	1393	-	-	1400	-	-	580	547	867	575	556	876
Stage 1	-	-	-	-	-	-	815	745	-	814	745	-
Stage 2	-	-	-	-	-	-	811	735	-	807	745	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1393	-	-	1400	-	-	571	541	867	560	550	876
Mov Cap-2 Maneuver	-	-	-	-	-	-	571	541	-	560	550	-
Stage 1	-	-	-	-	-	-	812	742	-	811	739	-
Stage 2	-	-	-	-	-	-	799	729	-	790	742	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.4	9.5	10.8
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	814	1393	-	-	1400	-	-	642
HCM Lane V/C Ratio	0.021	0.004	-	-	0.007	-	-	0.029
HCM Control Delay (s)	9.5	7.6	-	-	7.6	0	-	10.8
HCM Lane LOS	A	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

## Queuing and Blocking Report Baseline

5/20/2016

### Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	23	294	238	99	209	288	222	31
Average Queue (ft)	1	137	67	69	72	159	32	4
95th Queue (ft)	14	241	170	107	164	254	128	19
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		255	75			250	
Storage Blk Time (%)	0	34	0	10	4	1	0	
Queuing Penalty (veh)	0	137	0	21	10	2	0	

### Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	120	12	61	35	119	37
Average Queue (ft)	52	1	29	10	30	3
95th Queue (ft)	97	8	52	33	85	19
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)						
Queuing Penalty (veh)						

### Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	16	28	34	39
Average Queue (ft)	1	2	11	13
95th Queue (ft)	9	14	35	38
Link Distance (ft)		644	240	245
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

### Network Summary

Network wide Queuing Penalty: 171

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	388	329	189	442	1	350	3	374	5	7	8
Future Volume (vph)	12	388	329	189	442	1	350	3	374	5	7	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1775	1583		1740	
Flt Permitted	0.49	1.00	1.00	0.24	1.00			0.71	1.00		0.91	
Satd. Flow (perm)	910	1863	1583	442	1862			1326	1583		1608	
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)	13	422	358	205	480	1	380	3	407	5	8	9
RTOR Reduction (vph)	0	0	247	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	13	422	111	205	481	0	0	383	407	0	16	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Free	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6			4		Free	8		
Actuated Green, G (s)	26.3	26.3	26.3	42.7	42.7			28.3	85.0		28.3	
Effective Green, g (s)	26.3	26.3	26.3	42.7	42.7			28.3	85.0		28.3	
Actuated g/C Ratio	0.31	0.31	0.31	0.50	0.50			0.33	1.00		0.33	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	281	576	489	368	935			441	1583		535	
v/s Ratio Prot		c0.23		0.06	c0.26							
v/s Ratio Perm	0.01		0.07	0.22				c0.29	0.26		0.01	
v/c Ratio	0.05	0.73	0.23	0.56	0.51			0.87	0.26		0.03	
Uniform Delay, d1	20.6	26.2	21.8	14.3	14.2			26.6	0.0		19.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	8.0	1.1	1.8	2.0			16.9	0.4		0.0	
Delay (s)	20.9	34.2	22.9	16.1	16.2			43.5	0.4		19.1	
Level of Service	C	C	C	B	B			D	A		B	
Approach Delay (s)		28.9			16.2			21.3			19.1	
Approach LOS		C			B			C			B	

### Intersection Summary

HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



**Intersection**

Int Delay, s/veh 25.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	215	0	69	1	1	10	46	356	1	9	383	80
Future Vol, veh/h	215	0	69	1	1	10	46	356	1	9	383	80
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	225	-	185	-	-	-	-	-	-	-	-	-
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	234	0	75	1	1	11	50	387	1	10	416	87

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	972	967	460	967	1011	388	503	0	0	388	0	0
Stage 1	479	479	-	488	488	-	-	-	-	-	-	-
Stage 2	493	488	-	479	523	-	-	-	-	-	-	-
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	~ 232	254	601	234	240	660	1061	-	-	1170	-	-
Stage 1	568	555	-	561	550	-	-	-	-	-	-	-
Stage 2	558	550	-	568	530	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	~ 215	236	601	194	223	660	1061	-	-	1170	-	-
Mov Cap-2 Maneuver	~ 215	236	-	194	223	-	-	-	-	-	-	-
Stage 1	534	548	-	527	517	-	-	-	-	-	-	-
Stage 2	515	517	-	491	524	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	104.2	12.6	1	0.2
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1061	-	-	215	-	601	484	1170	-	-
HCM Lane V/C Ratio	0.047	-	-	1.087	-	0.125	0.027	0.008	-	-
HCM Control Delay (s)	8.6	0	-	133.9	0	11.8	12.6	8.1	0	-
HCM Lane LOS	A	A	-	F	A	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	10.6	-	0.4	0.1	0	-	-

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

**Intersection**

Int Delay, s/veh 2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	4	221	2	16	108	6	2	0	14	47	0	13
Future Vol, veh/h	4	221	2	16	108	6	2	0	14	47	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	100	-	-	-	-	-	-	-	-	-	-	-
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	4	240	2	17	117	7	2	0	15	51	0	14

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	124	0	0	242	0	0	413	409	241	413	406	121
Stage 1	-	-	-	-	-	-	250	250	-	155	155	-
Stage 2	-	-	-	-	-	-	163	159	-	258	251	-
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	1463	-	-	1324	-	-	549	532	798	549	534	930
Stage 1	-	-	-	-	-	-	754	700	-	847	769	-
Stage 2	-	-	-	-	-	-	839	766	-	747	699	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1463	-	-	1324	-	-	534	523	798	532	525	930
Mov Cap-2 Maneuver	-	-	-	-	-	-	534	523	-	532	525	-
Stage 1	-	-	-	-	-	-	752	698	-	845	758	-
Stage 2	-	-	-	-	-	-	815	755	-	731	697	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1	9.9	11.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	752	1463	-	-	1324	-	-	586
HCM Lane V/C Ratio	0.023	0.003	-	-	0.013	-	-	0.111
HCM Control Delay (s)	9.9	7.5	-	-	7.8	0	-	11.9
HCM Lane LOS	A	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

# Queuing and Blocking Report

## Baseline

5/20/2016

### Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	61	353	249	100	320	322	264	52
Average Queue (ft)	11	160	53	72	150	169	74	14
95th Queue (ft)	45	282	174	115	276	270	194	42
Link Distance (ft)		783			692	1569		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		225	75			250	
Storage Blk Time (%)	1	39	0	8	17	1	0	
Queuing Penalty (veh)	5	134	0	37	33	4	0	

### Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LTR
Maximum Queue (ft)	197	57	61	33	94	53
Average Queue (ft)	92	3	30	10	20	5
95th Queue (ft)	172	54	55	32	61	29
Link Distance (ft)		644		566	520	1569
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225		185			
Storage Blk Time (%)	1					
Queuing Penalty (veh)	1					

### Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	4	35	32	55
Average Queue (ft)	0	4	13	28
95th Queue (ft)	3	21	37	51
Link Distance (ft)		644	240	245
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

### Network Summary

Network wide Queuing Penalty: 215

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	363	402	256	223	1	289	1	229	1	1	2
Future Volume (vph)	2	363	402	256	223	1	289	1	229	1	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1774	1583		1716	
Flt Permitted	0.61	1.00	1.00	0.31	1.00			0.72	1.00		0.93	
Satd. Flow (perm)	1132	1863	1583	572	1862			1350	1583		1622	
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)	2	395	437	278	242	1	314	1	249	1	1	2
RTOR Reduction (vph)	0	0	282	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	2	395	155	278	243	0	0	315	249	0	3	0
Turn Type	Perm	NA	Perm	pm+pt	NA			Perm	NA	Free	Perm	NA
Protected Phases		2		1	6				4			8
Permitted Phases	2		2	6			4		Free	8		
Actuated Green, G (s)	31.9	31.9	31.9	50.6	50.6			25.4	90.0		25.4	
Effective Green, g (s)	31.9	31.9	31.9	50.6	50.6			25.4	90.0		25.4	
Actuated g/C Ratio	0.35	0.35	0.35	0.56	0.56			0.28	1.00		0.28	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	401	660	561	477	1046			381	1583		457	
v/s Ratio Prot		0.21		c0.08	0.13							
v/s Ratio Perm	0.00		0.10	c0.25				c0.23	0.16		0.00	
v/c Ratio	0.00	0.60	0.28	0.58	0.23			0.83	0.16		0.01	
Uniform Delay, d1	18.8	23.8	20.8	12.3	9.9			30.2	0.0		23.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	4.0	1.2	1.8	0.5			14.3	0.2		0.0	
Delay (s)	18.8	27.8	22.0	14.1	10.4			44.5	0.2		23.2	
Level of Service	B	C	C	B	B			D	A		C	
Approach Delay (s)		24.7			12.4			24.9			23.2	
Approach LOS		C			B			C			C	

### Intersection Summary

HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

**Intersection**

Intersection Delay, s/veh21.4

Intersection LOS C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	116	1	60	0	1	1	10	0	60	394	1	0	4	354	116
Future Vol, veh/h	0	116	1	60	0	1	1	10	0	60	394	1	0	4	354	116
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	126	1	65	0	1	1	11	0	65	428	1	0	4	385	126
Number of Lanes	0	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	1	3
HCM Control Delay	12.1	10.4	26.5	20.2
HCM LOS	B	B	D	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	0%	8%	100%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%	8%	0%	100%	0%
Vol Right, %	0%	0%	100%	0%	0%	100%	83%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	394	1	116	1	60	12	4	354	116
LT Vol	60	0	0	116	0	0	1	4	0	0
Through Vol	0	394	0	0	1	0	1	0	354	0
RT Vol	0	0	1	0	0	60	10	0	0	116
Lane Flow Rate	65	428	1	126	1	65	13	4	385	126
Geometry Grp	8	8	8	7	7	7	8	8	8	8
Degree of Util (X)	0.128	0.78	0.002	0.267	0.002	0.116	0.027	0.009	0.703	0.206
Departure Headway (Hd)	7.059	6.554	5.848	7.632	7.129	6.423	7.503	7.084	6.58	5.873
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	505	548	608	469	499	554	480	503	546	608
Service Time	4.832	4.327	3.62	5.412	4.908	4.202	5.203	4.858	4.353	3.646
HCM Lane V/C Ratio	0.129	0.781	0.002	0.269	0.002	0.117	0.027	0.008	0.705	0.207
HCM Control Delay	10.9	28.9	8.6	13.2	9.9	10.1	10.4	9.9	23.6	10.2
HCM Lane LOS	B	D	A	B	A	B	B	A	C	B
HCM 95th-tile Q	0.4	7.2	0	1.1	0	0.4	0.1	0	5.6	0.8

HCM 2010 TWSC  
 3: Site Access/INOVA Access & Hinson Farm Rd

5/20/2016

**Intersection**

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	162	1	9	143	24	2	0	14	11	0	6
Future Vol, veh/h	5	162	1	9	143	24	2	0	14	11	0	6
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	-	-	-	-	-	-	-	-	-	-	-
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	5	176	1	10	155	26	2	0	15	12	0	7

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	182	0	0	177	0	0	379	389	177	383	376	168
Stage 1	-	-	-	-	-	-	188	188	-	188	188	-
Stage 2	-	-	-	-	-	-	191	201	-	195	188	-
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	1393	-	-	1399	-	-	579	546	866	575	555	876
Stage 1	-	-	-	-	-	-	814	745	-	814	745	-
Stage 2	-	-	-	-	-	-	811	735	-	807	745	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1393	-	-	1399	-	-	570	540	866	560	549	876
Mov Cap-2 Maneuver	-	-	-	-	-	-	570	540	-	560	549	-
Stage 1	-	-	-	-	-	-	811	742	-	811	739	-
Stage 2	-	-	-	-	-	-	799	729	-	790	742	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.4	9.5	10.8
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	813	1393	-	-	1399	-	-	642
HCM Lane V/C Ratio	0.021	0.004	-	-	0.007	-	-	0.029
HCM Control Delay (s)	9.5	7.6	-	-	7.6	0	-	10.8
HCM Lane LOS	A	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Queuing and Blocking Report  
Baseline

5/20/2016

Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	24	346	245	99	236	278	183	31
Average Queue (ft)	1	151	80	72	80	152	26	4
95th Queue (ft)	14	279	202	110	178	240	101	19
Link Distance (ft)		777			686	1568		601
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	40		225	75			250	
Storage Blk Time (%)	0	37	0	11	5	1	0	
Queuing Penalty (veh)	0	150	1	25	12	1	0	

Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	LTR	L	T	R	L	T	R
Maximum Queue (ft)	70	9	51	27	61	130	16	26	110	82
Average Queue (ft)	34	0	19	7	26	63	1	3	58	36
95th Queue (ft)	57	6	39	24	47	101	8	17	88	60
Link Distance (ft)		625		545		521			1568	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		185		100		100	100		100
Storage Blk Time (%)						1			0	0
Queuing Penalty (veh)						1			0	0

Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	19	26	34	37
Average Queue (ft)	1	2	11	13
95th Queue (ft)	8	13	35	37
Link Distance (ft)		625	240	245
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 191

# HCM Signalized Intersection Capacity Analysis

## 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

5/20/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	388	329	189	442	1	350	3	374	5	7	8
Future Volume (vph)	12	388	329	189	442	1	350	3	374	5	7	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0			7.0	4.0		7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)	1770	1863	1583	1770	1862			1775	1583		1740	
Flt Permitted	0.49	1.00	1.00	0.24	1.00			0.71	1.00		0.91	
Satd. Flow (perm)	910	1863	1583	442	1862			1326	1583		1608	
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)	13	422	358	205	480	1	380	3	407	5	8	9
RTOR Reduction (vph)	0	0	247	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	13	422	111	205	481	0	0	383	407	0	16	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Free	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6			4		Free	8		
Actuated Green, G (s)	26.3	26.3	26.3	42.7	42.7			28.3	85.0		28.3	
Effective Green, g (s)	26.3	26.3	26.3	42.7	42.7			28.3	85.0		28.3	
Actuated g/C Ratio	0.31	0.31	0.31	0.50	0.50			0.33	1.00		0.33	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0			7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	281	576	489	368	935			441	1583		535	
v/s Ratio Prot		c0.23		0.06	c0.26							
v/s Ratio Perm	0.01		0.07	0.22				c0.29	0.26		0.01	
v/c Ratio	0.05	0.73	0.23	0.56	0.51			0.87	0.26		0.03	
Uniform Delay, d1	20.6	26.2	21.8	14.3	14.2			26.6	0.0		19.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	8.0	1.1	1.8	2.0			16.9	0.4		0.0	
Delay (s)	20.9	34.2	22.9	16.1	16.2			43.5	0.4		19.1	
Level of Service	C	C	C	B	B			D	A		B	
Approach Delay (s)		28.9			16.2			21.3			19.1	
Approach LOS		C			B			C			B	

### Intersection Summary

HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



**Intersection**

Intersection Delay, s/veh	26
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	215	1	69	0	1	1	10	0	46	356	1	0	9	383	80
Future Vol, veh/h	0	215	1	69	0	1	1	10	0	46	356	1	0	9	383	80
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	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	234	1	75	0	1	1	11	0	50	387	1	0	10	416	87
Number of Lanes	0	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	1	3
HCM Control Delay	16.3	10.9	28.5	30.2
HCM LOS	C	B	D	D

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	100%	0%	0%	8%	100%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%	8%	0%	100%	0%
Vol Right, %	0%	0%	100%	0%	0%	100%	83%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	46	356	1	215	1	69	12	9	383	80
LT Vol	46	0	0	215	0	0	1	9	0	0
Through Vol	0	356	0	0	1	0	1	0	383	0
RT Vol	0	0	1	0	0	69	10	0	0	80
Lane Flow Rate	50	387	1	234	1	75	13	10	416	87
Geometry Grp	8	8	8	7	7	7	8	8	8	8
Degree of Util (X)	0.107	0.776	0.002	0.505	0.002	0.137	0.029	0.021	0.821	0.154
Departure Headway (Hd)	7.724	7.216	6.504	7.777	7.273	6.566	7.925	7.604	7.096	6.385
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	465	503	550	465	493	547	451	471	512	562
Service Time	5.463	4.955	4.243	5.514	5.009	4.302	5.68	5.342	4.834	4.123
HCM Lane V/C Ratio	0.108	0.769	0.002	0.503	0.002	0.137	0.029	0.021	0.813	0.155
HCM Control Delay	11.4	30.8	9.3	18.2	10	10.3	10.9	10.5	34.8	10.3
HCM Lane LOS	B	D	A	C	A	B	B	B	D	B
HCM 95th-tile Q	0.4	6.9	0	2.8	0	0.5	0.1	0.1	8	0.5

HCM 2010 TWSC  
 3: Site Access/INOVA Access & Hinson Farm Rd

5/20/2016

**Intersection**

Int Delay, s/veh 2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	4	221	2	16	108	6	2	0	14	47	0	13
Future Vol, veh/h	4	221	2	16	108	6	2	0	14	47	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	100	-	-	-	-	-	-	-	-	-	-	-
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	4	240	2	17	117	7	2	0	15	51	0	14

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	124	0	0	242	0	0	413	409	241	413	406	121
Stage 1	-	-	-	-	-	-	250	250	-	155	155	-
Stage 2	-	-	-	-	-	-	163	159	-	258	251	-
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	1463	-	-	1324	-	-	549	532	798	549	534	930
Stage 1	-	-	-	-	-	-	754	700	-	847	769	-
Stage 2	-	-	-	-	-	-	839	766	-	747	699	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1463	-	-	1324	-	-	534	523	798	532	525	930
Mov Cap-2 Maneuver	-	-	-	-	-	-	534	523	-	532	525	-
Stage 1	-	-	-	-	-	-	752	698	-	845	758	-
Stage 2	-	-	-	-	-	-	815	755	-	731	697	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1	9.9	11.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	752	1463	-	-	1324	-	-	586
HCM Lane V/C Ratio	0.023	0.003	-	-	0.013	-	-	0.111
HCM Control Delay (s)	9.9	7.5	-	-	7.8	0	-	11.9
HCM Lane LOS	A	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Queuing and Blocking Report  
Baseline

5/20/2016

Intersection: 1: Parkers Ln/Commercial Driveway & Sherwood Hall Ln

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	60	373	239	100	318	326	268	54
Average Queue (ft)	10	162	54	72	148	170	75	14
95th Queue (ft)	43	297	178	114	274	266	193	42
Link Distance (ft)		777			686	1568		601
Upstream Blk Time (%)		0						
Queuing Penalty (veh)		0						
Storage Bay Dist (ft)	40		225	75			250	
Storage Blk Time (%)	1	40	0	8	18	1	0	
Queuing Penalty (veh)	5	136	0	36	33	4	0	

Intersection: 2: Parkers Ln & Hinson Farm Rd/Lynnfield Dr

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	LTR	L	T	R	L	T	R
Maximum Queue (ft)	98	10	49	24	63	144	17	36	159	99
Average Queue (ft)	49	0	20	7	23	63	1	7	69	35
95th Queue (ft)	80	5	40	23	50	111	9	28	119	69
Link Distance (ft)		625		545		521			1568	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		185		100		100	100		100
Storage Blk Time (%)						1			1	0
Queuing Penalty (veh)						1			1	0

Intersection: 3: Site Access/INOVA Access & Hinson Farm Rd

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	7	33	32	56
Average Queue (ft)	0	3	12	28
95th Queue (ft)	4	18	37	51
Link Distance (ft)		625	240	245
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 217