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January 14, 2015

MEMORANDUM TO: Stafford County Planning Commission

FROM: Jeffrey A. Harvey, AICP   
Director of Planning and Zoning

SUBJECT: ***RC1400159; Reclassification – Reserve at Woodstock Lane***

The applicant is requesting a reclassification from the B-2, Urban Commercial Zoning District, to the R-1, Suburban Residential Zoning District to allow for residential subdivision. The proposal is to develop a 40-lot residential subdivision on Assessor's Parcels 21-167 (portion) and 21-170 (portion). The area subject to the application totals 34.9 acres and the subject property is located at the intersection of Telegraph Road and Woodstock Lane, approximately 1,100 feet east of Jefferson Davis Highway (Route 1). The current zoning classification of B-2, Urban Commercial, provides for high-intensity commercial uses intended to serve retail sales and service, business and professional service needs at a regional or countywide scale, and could have a maximum potential of approximately 250,000 square feet of commercial development; the reclassification would result in residential development with a maximum density of 1.5 dwelling units per acre.

A public hearing on the application was conducted on November 12, 2014 and the related discussion was deferred to this meeting. The following additional information is provided to address concerns that were identified by the Planning Commission and the public during the public hearing.

1. Current state of the transportation network - According to the Capacity Analysis, dated October 7, 2014, submitted by the applicant (Attachment 1) a southbound left-turn lane is warranted on Route 1; currently, the left lane is operating as a combination left turn and through lane. The proposed development will account for approximately 10 percent of the AM peak hour traffic and 30 percent of PM peak hour traffic projected to make a left turn onto Woodstock Lane from Route 1.

The Virginia Department of Transportation (VDOT) completed an Intersection Safety Study, dated October 2, 2014 (Attachment 2) utilizing crash data from 2010-2012, which was reviewed for specific study intersections, including the intersection between Woodstock Lane and Route 1. The related conclusion of the safety study was consistent with the recommendation of the Capacity Analysis. The intersection currently experiences a pattern of southbound rear-end crashes and the construction of a left turn lane and signalization will mitigate this safety concern.



Additionally, the westbound approach to the intersection of Route 1 and Woodstock Lane is operating at a Level of Service (LOS) "F" during the AM and PM peak hour and both the eastbound and westbound approaches are failing at the intersection between Route 1 and Telegraph Road during the AM and PM peak hour. The VDOT safety study concludes that the LOS F condition is mainly due to lack of sufficient gaps within the volume on Route 1 for vehicles turning left to access the roadway from the minor approaches, which include Woodstock Lane and Telegraph Road.

The capacity analysis submitted by the applicant states that the current deficiencies of the intersections are existing and that the proposal is "generating an insignificant impact". However, the traffic generated by the proposed development will create additional delays and will add trips to these intersections, which are significantly over capacity (Attachment 3). Eighty percent of the trips generated by the proposed development will impact these intersections.

The Comprehensive Plan states that the LOS of the existing network should be maintained at LOS C or better and it is further stated that where LOS C cannot be attained, development applications will be evaluated by non-degradation and offsetting impact policies as described on Page 4-10 of the Comprehensive Plan:

*The Non-Degradation Policy requires applicants to ensure that the transportation system affected by the application performs no worse after the project is developed than it would otherwise. This approach is primarily a performance based approach which requires applicants to provide improvements or other guarantees to maintain certain performance levels. The Offsetting Impact Policy requires the applicant to contribute to transportation improvements proportional to the trips generated by the project and the amount of capacity required to accommodate those trips.*

Staff has noted that a cash contribution for transportation has not been included within the proffer statement. In order to be consistent with the Comprehensive Plan, it is recommended that the applicant consider the proffer guidelines recommendation of \$17,005 per residential unit, which would total \$680,200 for the proposal. Although this amount will not fully fund all of the necessary intersection improvements, it represents the proportionate share of the impacts to transportation facilities relative to the increase in residential units. Alternatively, the applicant may prepare a cost estimate for improvements that meet VDOT standards and proffer a proportionate amount, related to the vehicular trip generation rate of the proposed development, or construct the improvements as an in-kind contribution.

The School Division has also expressed concern with the functional operation of the intersections in the vicinity of the proposal, stating:

The School Division pressed the County several years ago to widen Woodstock Lane and have a signal installed at Woodstock and Route 1 to assist buses to gain access to Route 1. Right now they must access (ingress and egress Widewater Elementary School and Shirley Heim Middle School) via the north Telegraph/Route 1 interchange because it is the only one that has a signal. The southern entrance near the cross is not a safe option either.

The subject was identified in the staff report as a negative finding and staff has recommended that the applicant proffer one or more of the following options:

- a) Full transportation proffers, as recommended within the proffer guidelines, to address transportation facility impacts.
- b) Preparation of a cost estimate for improvements which meets VDOT standards and proffer a proportionate amount related to the vehicular trip generation rate of the proposed development.
- c) Construction of improvements as an in-kind contribution.

The applicant has not included transportation proffers or proposed capital projects within the proffer statement, although the proffer statement has been revised to include the following:

Notwithstanding anything to the contrary within this section 3 of the proffer statement, in the event section 3(a) Cash Proffer is unable to be applied to the Aquia Harbor Rescue Squad Company 9, the \$730,000 dollars of cash proffers shall be applied to Schools and/or Transportation Capital Improvements within the Griffis-Widewater District.

- 2. Additional buffering between Lot 28 and the stream channel to the south - The applicant has not submitted a response. Lot 28 is 350 square feet larger than the minimum area required by Code of 8,000 square feet; it is possible to reduce the lot width and/or provide additional landscaping to help mitigate the impacts of the increased impervious area resulting from development activities. Staff supports any increase in vegetation because of the potential mitigation this provides to any increase in impervious area and resulting affects to the quantity and quality of run-off. Potential impacts of an increase in volume and to water quality will be mitigated as required via the stormwater management plan which is required to be submitted with future development plans.
- 3. School Impacts - The proffer statement did not include school proffers and requested comment from the Schools Division regarding potential impacts. The School Division stated that there would be an impact as Widewater Elementary School is over capacity and Shirley Heim Middle School is approaching capacity, although it is anticipated that the redistricting process will achieve a utilization rate of between 85 – 90% at the forecasted 2019 – 2020 school year.
- 4. Comparison of existing by-right and proposed reclassification development impacts - The Commission requested a land use inventory evaluation of reclassification from commercial zoning to residential zoning. Table 1 below identifies the impact of the reclassification to the land use inventory with regard to the B-2 and R-1 districts.

Table 1: Current Land Use Inventory

	Total Area	Developed	Undeveloped
<b>B-2 District</b>			
Current Inventory	115 acres	44% (50.5 acres)	56% (64.5 acres)
Post-reclassification	80.1 acres	63% (50.5 acres)	37% (29.6 acres)
<b>R-1 District</b>			
Current Inventory	865 acres	88% (757 acres)	12% (108 acres)
Post-reclassification	899.99 acres	84% (757 acres)	16% (142.90 acres)

The site contains approximately 13.6 acres of buildable area. The B-2 Zoning District development regulations support approximately 250,000 square feet of commercial development in this site. In summary, the land use inventory of undeveloped land within the B-2 Zoning District will be significantly reduced by 54 percent, from 64.5 acres to 29.6 acres, as a result of the reclassification. However, there is a significant amount of land in the direct vicinity of the site that is within the B-2 Zoning District and the undeveloped area within the R-1 Zoning District currently totals 12 percent; the projected increased to 16 percent as a result of the reclassification is supported by the future land use plan and the anticipated demand for dwelling units related to projected growth in the County.

Table 2 below compares the impacts to public facilities between the current and proposed zoning districts.

*Table 2: Comparison of Impacts to Public Facilities*

Facility	B-2 By-Right	Proposal	Delta	Comments
Transportation	11,700 VPD*	453 VPD*	-11,247 VPD 96%	Failing intersection; safety concerns
Stormwater Management	13.5 acres of impervious area	5 acres impervious area	-13 acres	
Schools	0	52 students	+52 students	Schools are near or at capacity
Parks & Recreation	0	2.08 acres	+2.08 acres	
Proffer valuation	0	\$1,280,000	+\$1,280,000	Fire & Rescue Parks & Recreation

*\*Vehicles Per Day*

The potential impacts to Parks and Recreation, Schools, Libraries and General Government facilities will increase as a result of the proposal; the potential impacts to Transportation and Stormwater Management facilities will decrease. The proffer statement addresses the impacts to Fire and Rescue and Parks and Recreation facilities in the form of cash proffers that are significantly higher than the recommendations within the guidelines. However, the impacts to School, Library and General Government facilities are not mitigated; the proffer guidelines recommend \$40,664 for Libraries, 28,965 for General Government, and \$1,142,700 for Schools. Although the impact to transportation facilities is lessened, the impacts of the proposal are not mitigated, as discussed earlier.

Additionally, the fiscal impact to the General Fund for Schools is identified as \$5,011 per student in the fiscal impact analysis submitted by the applicant. The proposed development will generate 52 students, utilizing the new neighborhoods generation rate; this equals a negative fiscal impact

of \$260,000 to the General Fund. Chapter 5 of the Comprehensive Plan identifies an overall capital cost to the County of \$75,539 per single-family unit (2011). The fiscal impact analysis identifies a net fiscal benefit to the County of \$103,390 for the proposed development, or \$2,584.75 per unit.

The evaluation supports the change in land use from commercial to residential in this area; however, the potential impacts of the increase in dwelling units, as identified, should be mitigated through proffers, in-kind dedication and/or construction of capital facilities for a positive fiscal result for the County.

5. Summary of past reclassification cases in which the zoning district was amended from commercial to residential - There have been four such reclassifications approved over the past ten years:
  - a. Abberly - A proposal to reclassify from B-2, Urban Commercial and B-3, Office to R-3, Urban Residential - High Density Zoning District on Assessor's Parcels 39-16L, and portions of 39-16, 39-16B, 39-16H and 39-16J, consisting of 22.70 acres, located on the west side of Old Potomac Church Road, approximately 2,000 feet south of Hospital Center Boulevard, within the Aquia Election District.
  - b. Jackson Family - A proposed reclassification from B-2, Urban Commercial to R-1, Suburban Residential on Assessor's Parcel 12-5 consisting of 2.66 acres, located on the north side of Telegraph Road approximately 800 feet west of Jefferson Davis Highway within the Griffis-Widewater Election District.
  - c. Fox Chase Commons - A proposed amendment to proffered conditions on Assessor's Parcel 45-217 and reclassification from B-1, Convenience Commercial to R-3, Urban Residential, High Density Zoning District on Assessor's Parcel 45-217A, consisting of a combined 9.08 acres, located on the east side of Jefferson Davis Highway, approximately 700 feet north of Manning Drive within the Falmouth Election District.
  - d. Brookfield - A proposed reclassification from B-1, Convenience Commercial to R-1, Suburban Residential Zoning District to allow the utilization of the property for residential use on Assessor's Parcel 54D-3-1-6 consisting of 0.66 acres, located on the west side of Hoyt Street approximately 200 feet north of White Oak Road within the George Washington District.
6. Buffering between the southern portion of the proposed development and existing residential homes, specifically in the area of Lots 28 through 37 which abut Open Space Parcel A - Staff recommends a proffer to the effect that Open Space Parcel A shall not be cleared. The proffer statement has not been modified in response.
7. Buffer around the Brent Family Cemetery - The Federal Code of Regulations, Section 43 CFR 2653.5 – Cemetery sites and historical places, states that “For historical places, the boundaries shall include an area encompassing the actual site with a reasonable buffer zone of not more than 330 feet”. The proposal is in accordance with the federal regulation, as the cemetery is designated as a County Historic District and, consequently, there is an encompassing 200-foot buffer. Additionally, the closest points of the proposed development to the cemetery are Lot 9, at 470 feet, and Lot 27, at 320 feet.

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*January 14, 2015*

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The Board has requested for the following information related to proposed monetary proffers to be included in future staff reports:

Total Units	40
By-Right Units	0
New Development Units	40
Proposed Proffers Per Unit	\$32,000
Proffers per Unit for New Development Units	\$32,000
Current Guidelines Recommendation	\$47,630
Draft Guidelines with Debt Service Credit	\$33,942
Draft Guidelines with By-right Credit Only	\$33,942
Draft Guidelines with Debt Service Credit and By-right Credit for Total Units	\$33,942

The time limit for the Planning Commission to make a recommendation is February 10, 2015.

JAH:ehe

Attachments (3)

## Technical MEMORANDUM

To: Carl Bernstein

From: Chad A. Baird  
Nick Alexandrow

Date: October 7, 2014

Subject: Capacity Analysis & Left Turn Warrant – Reserve at Woodstock Lane – Stafford, VA  
RC1400159; CUP1400160, Reclassification and Conditional Use Permit

## INTRODUCTION

The following memorandum presents a capacity analysis conducted for the intersection of Telegraph Road (Route 637) and Woodstock Lane (Route 639) in Stafford County, Virginia, revised to incorporate comment from Stafford County. This capacity analysis is in support of the proposed Reserve at Woodstock Lane development, located at the intersection of Telegraph Road and Woodstock Lane. The proposed site is currently two adjacent plots totaling approximately 86 acres: 27 acres are zoned commercial, and 59 acres are wetlands. The proposal consists of rezoning and subdividing the properties for the construction of 40 single-family detached homes. The proposed development is shown in Figure 1.



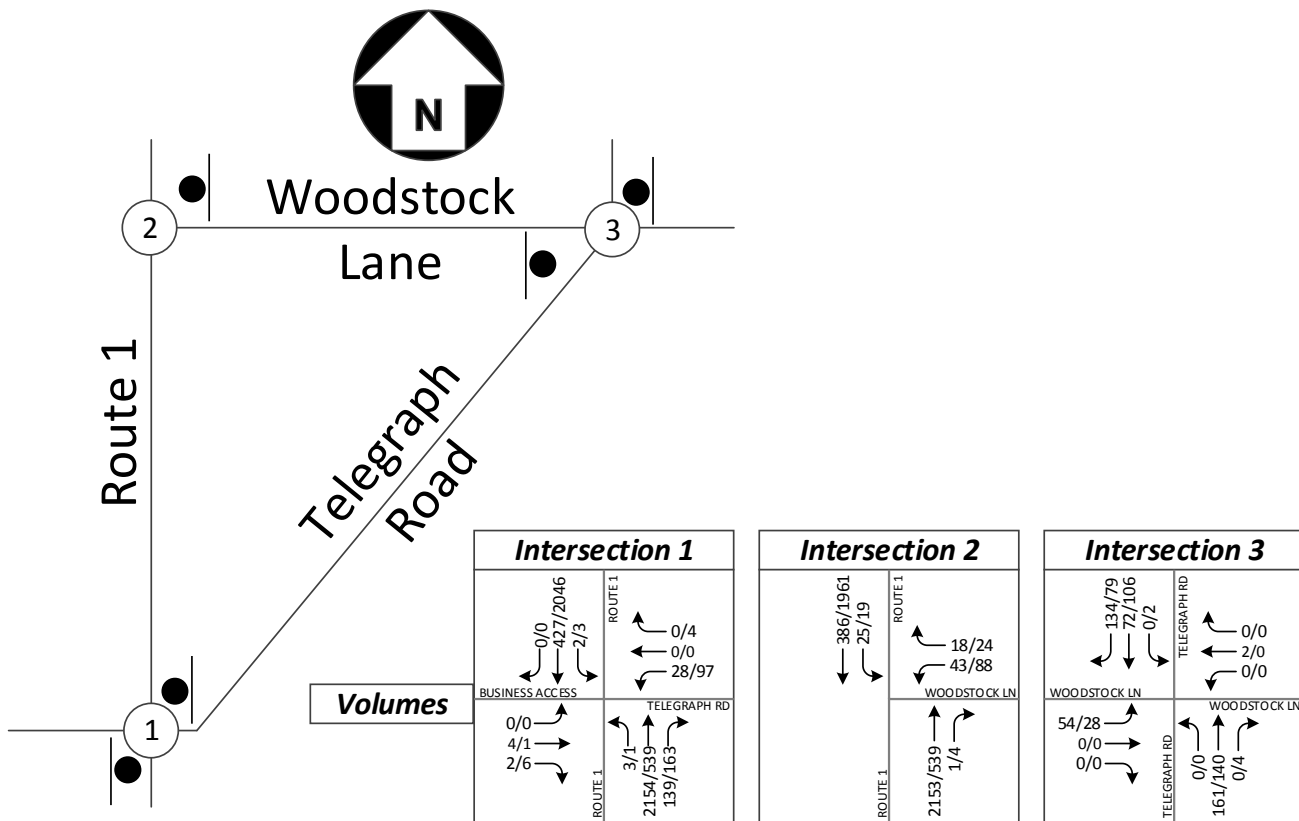
Figure 1: Proposed Development and Surrounding Roads

**CAPACITY ANALYSIS**

Turning movement counts (TMCs) were performed at nearby intersections during morning and afternoon peak times on two occasions:

- Telegraph Road and Woodstock Lane counts were performed Wednesday, June 11, 2014, and
- Route 1 and Woodstock Lane, and Route 1 and Telegraph Road counts were performed on Thursday, September 25, 2014.

Existing turning movements at the subject intersections are shown in Figure 2, and the full turning movement counts are included in Appendix A.



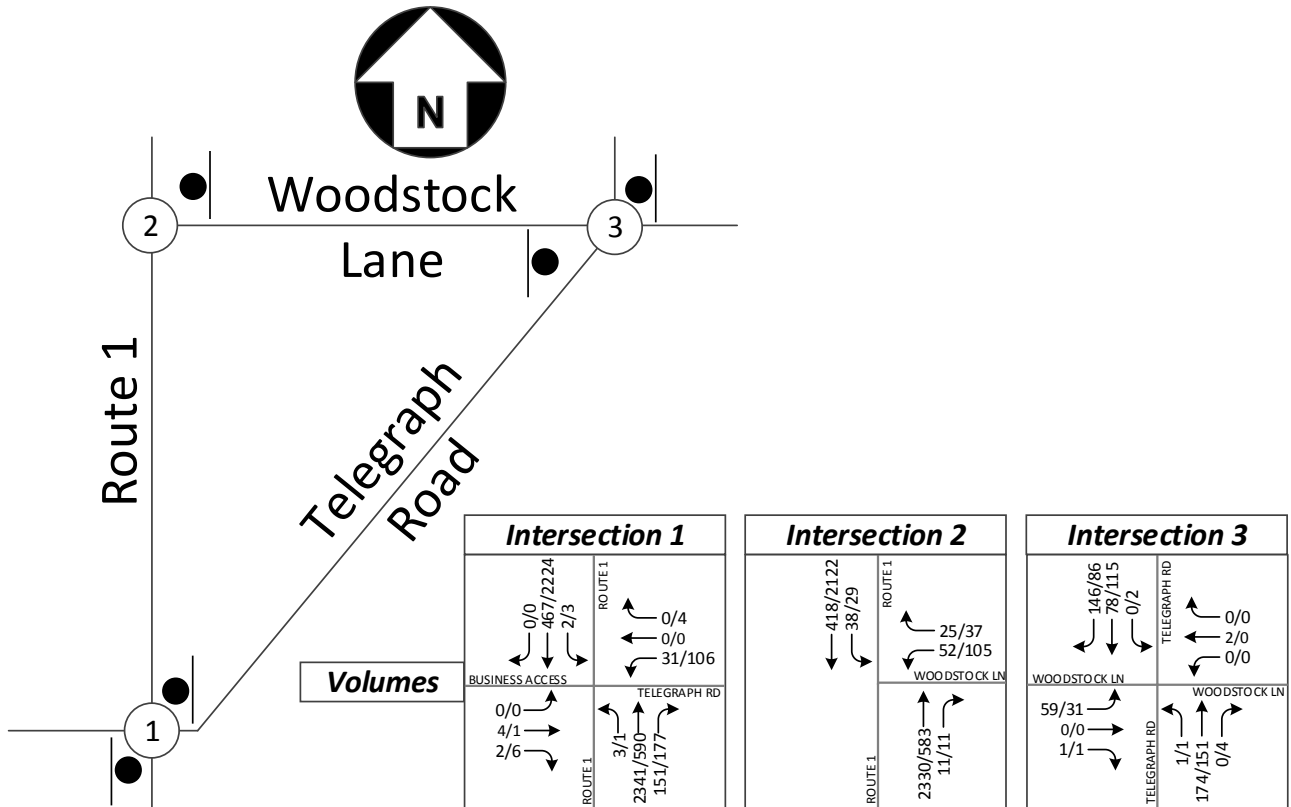
**Figure 2: Existing (2014) Volumes**

The future without development volumes were projected based on an inherent growth factor of 2% annually over 4 years. In addition, the trips generated by an approved hotel development located in the southwest corner of Telegraph Road and Woodstock Lane were included in the future without development volumes. Trip information for the hotel is shown in Table 1. The future without development projected volumes are shown in Figure 3. The Synchro reports are included in Appendix B.



**Table 1: Background Hotel Development Trip Generation**

Land Use	ITE Code	Size	----- Week day -----							
			AM Peak Hour			PM Peak Hour			Daily Total	
			In	Out	Total	In	Out	Total		
<b>Planned Commercial</b>										
All Suites Hotel	311	72 Occupied Rooms	10	28	38	29	17	46	452	
<b>Overall Total New External Trips</b>			<b>10</b>	<b>28</b>	<b>38</b>	<b>29</b>	<b>17</b>	<b>46</b>	<b>452</b>	



**Figure 3: Future without Development (2018) Volumes**

**The volumes generated by the proposed development, shown in**

Table 22, were based on the methodology outlined in the Institute of Transportation Engineers' (ITE) Trip Generation, 9<sup>th</sup> Edition publication. The site-generated trip distribution, shown in Figure 4, was determined through engineering judgment. The future with development volumes were projected by adding the future without development volumes to the site-generated peak hour trips. These projected volumes are shown in Figure 5.

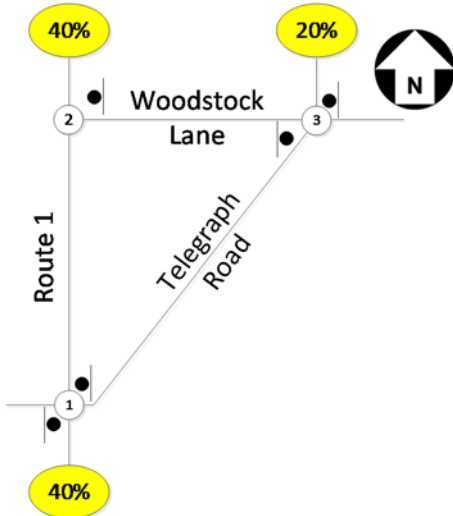


Figure 4: Site-Generated Trip Distribution

Table 2: Trip Generation Table - Reserve at Woodstock Lane

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>
<b>Proposed Residential</b>									
Single-Family Detached Housing	210	40 DU	10	28	38	29	17	46	452
<b>Overall Total New External Trips</b>			<b>10</b>	<b>28</b>	<b>38</b>	<b>29</b>	<b>17</b>	<b>46</b>	<b>452</b>

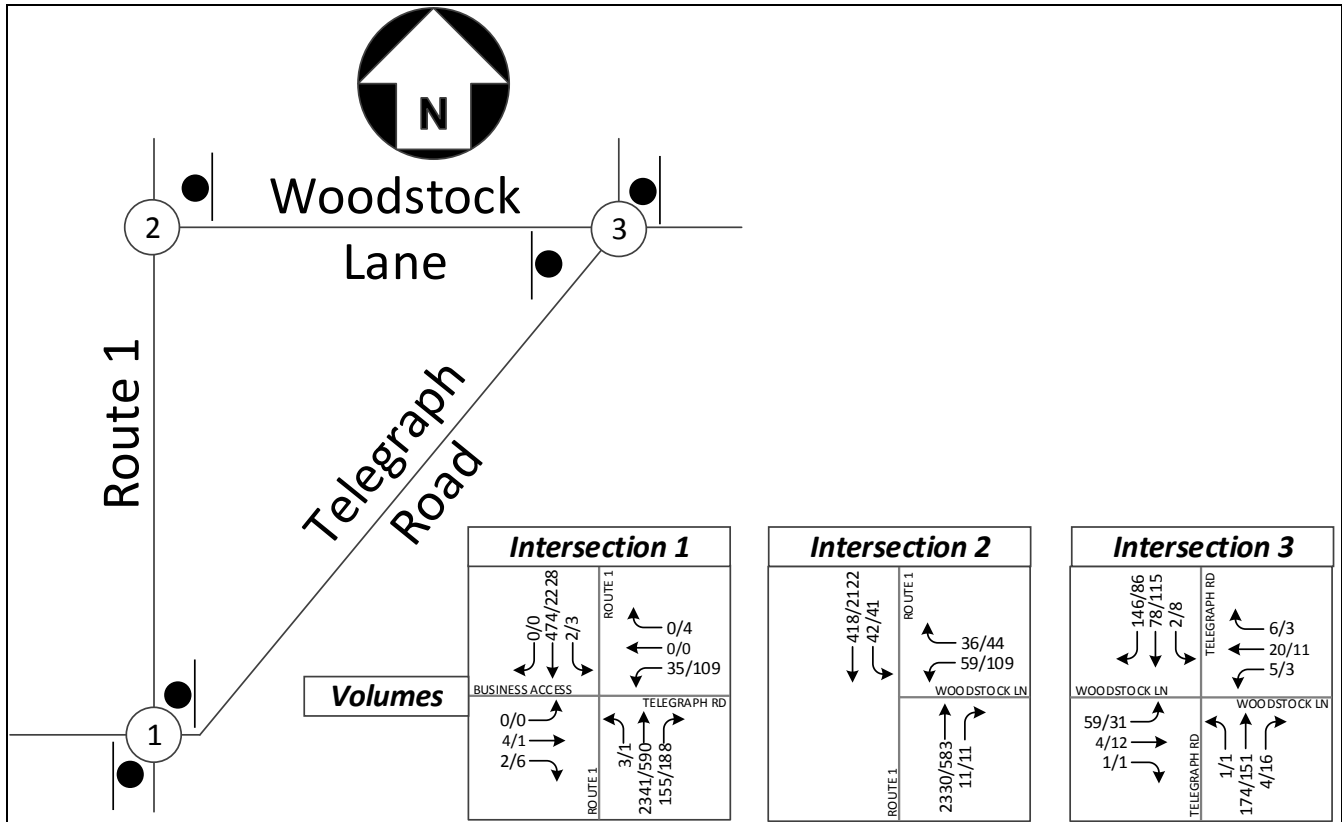


Figure 5: Future with Development (2018) Volumes

Intersection capacity analyses were performed for each scenario at each intersection during the weekday morning and afternoon peak hours. *Synchro, version 8 (Build 805, Revision 881)* was used to analyze the study intersection with results based on the Highway Capacity Manual (HCM) methodology. According to Stafford County guidelines on traffic operations performance, it is desirable to achieve a LOS C or better per lane group (Stafford County Comprehensive Plan 2010-2030, Section 4.6). The average delay and the levels of service for each scenario are shown in Table 3 and Figure 6, Figure 7, and Figure 8.

**Table 3: Delay and Level of Service**

LOS	Existing		Future without Development		Future with Development	
	AM	PM	AM	PM	AM	PM
<b>Intersection 1: Route 1 &amp; Telegraph Road</b>						
<b>Eastbound</b>						
Delay	247.0	66.5	>300	94.4	>300	96.5
LOS	F	F	F	F	F	F
<b>Westbound</b>						
Delay	>300	>300	>300	>300	>300	>300
LOS	F	F	F	F	F	F
<b>Northbound</b>						
Delay	0.0	0.1	0.1	0.1	0.1	0.1
LOS	A	A	A	A	A	A
<b>Southbound</b>						
Delay	0.3	0.1	0.4	0.1	0.4	0.1
LOS	A	A	A	A	A	A
<b>Intersection 2: Route 1 &amp; Woodstock Lane</b>						
<b>Westbound</b>						
Delay	>300	231.8	>300	>300	>300	>300
LOS	F	F	F	F	F	F
<b>Northbound</b>						
Delay	0.0	0.0	0.0	0.0	0.0	0.0
LOS	A	A	A	A	A	A
<b>Southbound</b>						
Delay	2.6	0.2	5.3	0.3	6.0	0.4
LOS	A	A	A	A	A	A
<b>Intersection 3: Telegraph Road &amp; Woodstock Lane</b>						
<b>Eastbound</b>						
Delay	11.4	11.0	11.7	11.2	12.4	11.9
LOS	B	B	B	B	B	B
<b>Westbound</b>						
Delay	11.7	0.0	12.0	0.0	11.8	11.5
LOS	B	A	B	A	B	B
<b>Northbound</b>						
Delay	0.0	0.0	0.1	0.1	0.1	0.1
LOS	A	A	A	A	A	A
<b>Southbound</b>						
Delay	0.0	0.1	0.0	0.1	0.1	0.3
LOS	A	A	A	A	A	A

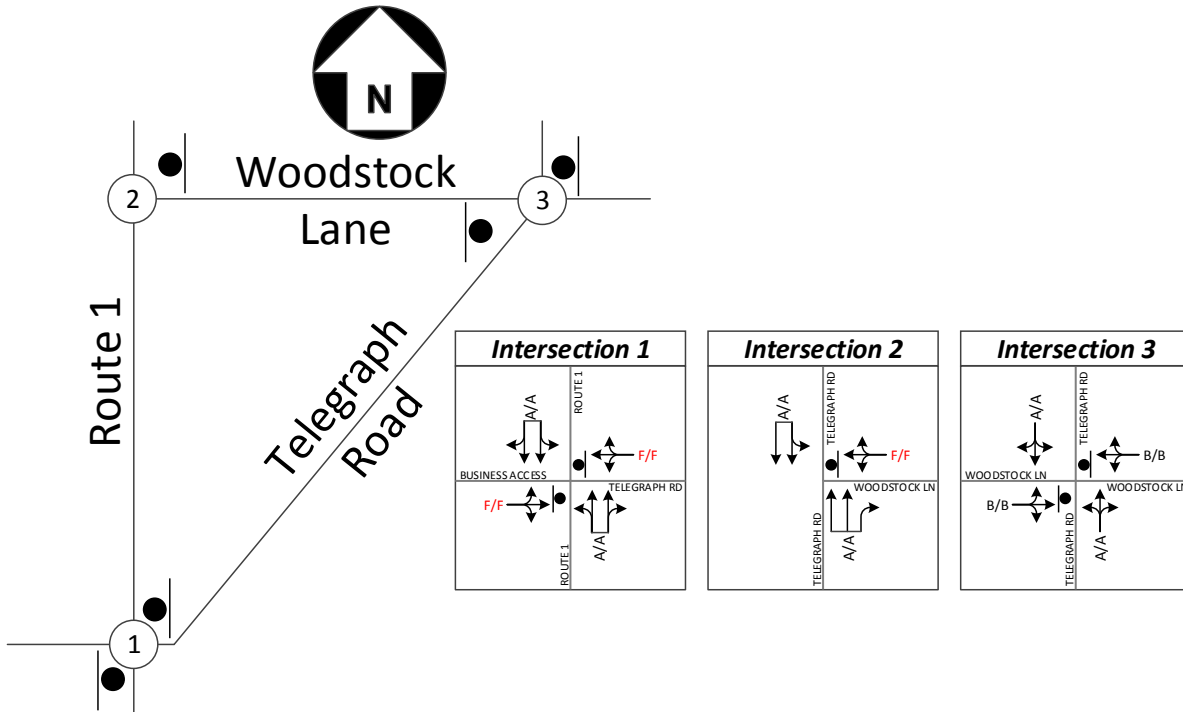


Figure 6: Existing (2014) Level of Service

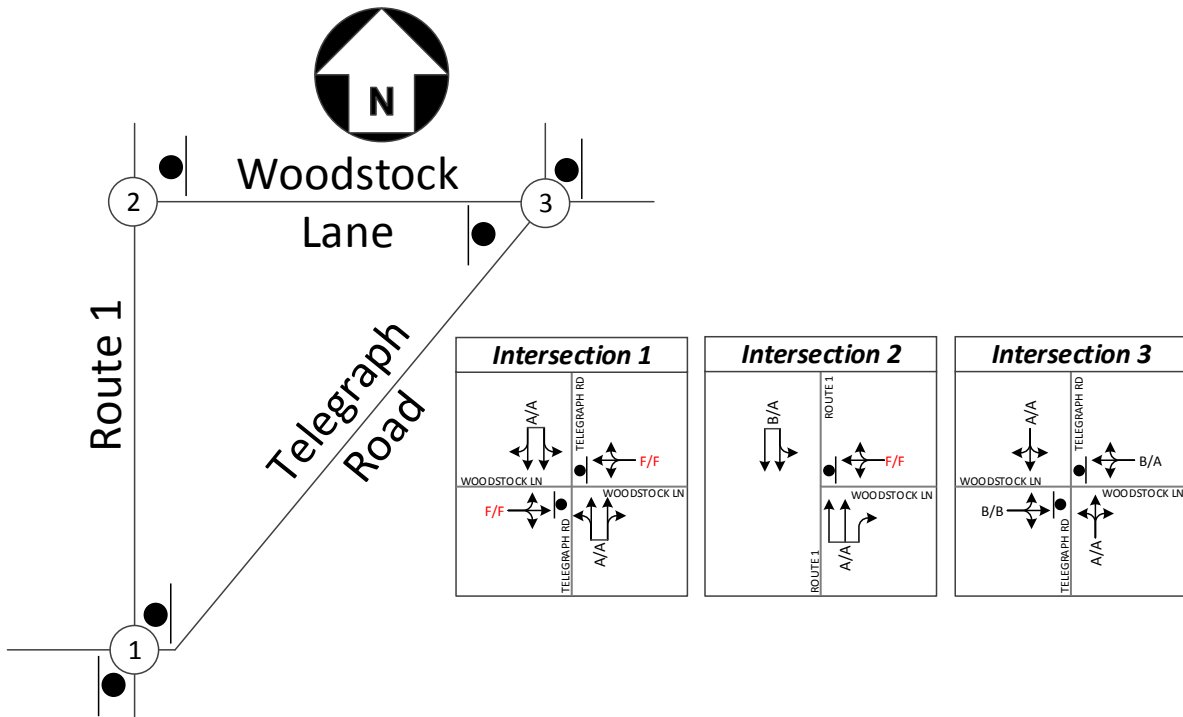


Figure 7: Future without Development (2018) Level of Service

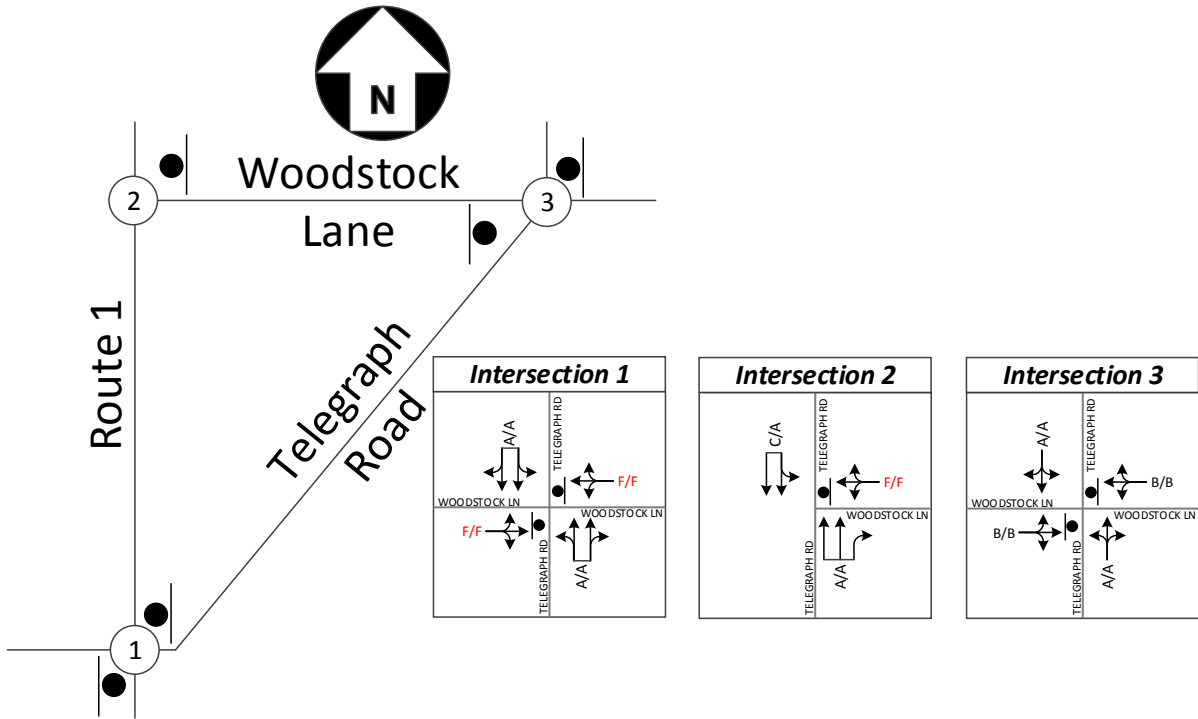


Figure 8: Future with Development (2018) Level of Service

As shown throughout Table 3 and Figure 6, Figure 7, and Figure 8, most approach delays were increased by less than one second compared to the future without development scenario. Delay increases of larger than one second would add to approach delays that were already in a failed state, such as the minor street approaches at both study intersections with Route 1. In addition, the proposed development will have a negligible impact to the level of service of the studied intersections. Per Stafford County guidelines, two of the studied intersections currently fall below the threshold of LOS of C; the proposed development will not adversely affect the LOS of the studied intersections.

**LEFT TURN LANE WARRANT**

Peak hour volumes were evaluated to determine whether a southbound left turn lane is warranted at the intersection of Route 1 and Woodstock Lane. Currently, the southbound approach of Route 1 has two through lanes; the left lane operates as a shared left-through lane. This section of Route 1 is an undivided four-lane roadway, with a posted speed limit of 45 miles per hour. The warrants are based on Figure 3-3 of VDOT’s Road Design Manual, Appendix F (page F-74), illustrated in Figure 9, with the red markers identifying the AM and PM peak hour volume plots.

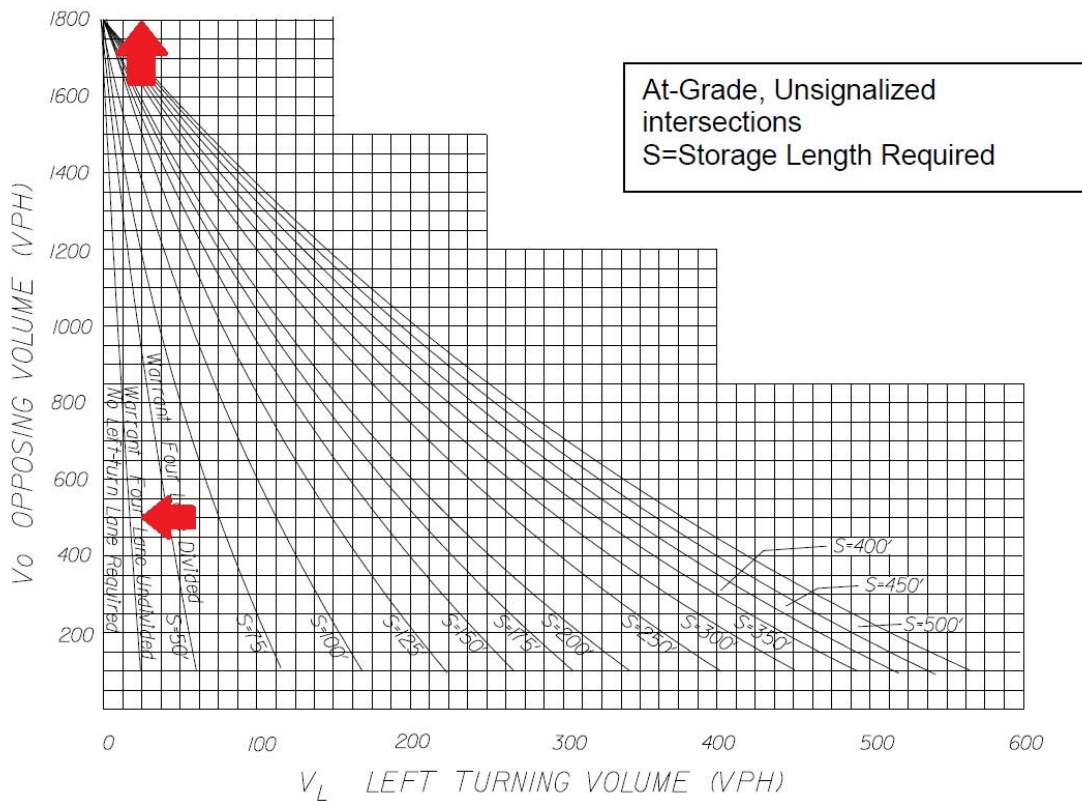


Figure 9: Left Turn Lane Warrants on Four-Lane Highways

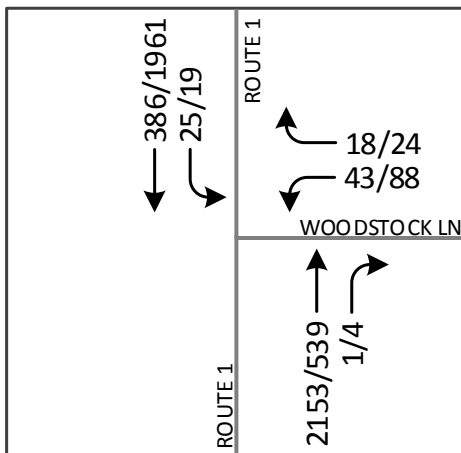


Figure 10: Route 1 & Woodstock Lane – AM/PM Peak Hour Existing Volumes

Comparing Figure 9 with the existing (2014) volumes shown in Figure 10, a left turn lane for the southbound approach is warranted. The PM peak hour volumes are above the “Warrant Four Lane Undivided” line, while the AM peak hour is above the upper bounds of the opposing volume axis. Due to the southbound approach warranting a left turn lane under existing conditions, there is no need to study if the southbound left turn lane is warranted based on future volumes, with or without the proposed development. The subject site only adds 4 AM peak hour trips to this left-turn and 12 PM peak hour trips, a small percentage of the total left-turns at this intersection in the future.

## **CONCLUSIONS**

The addition of 40 single-family homes near the intersection of Telegraph Road and Woodstock Lane will have minimal impacts on the nearby roadway network. The stop-controlled intersection of Telegraph Road and Woodstock Lane will continue to experience levels of service of A and B along all approaches as it does under existing conditions and under background future conditions without the Reserve at Woodstock Lane. While the turns onto Route 1 from Telegraph Road and Woodstock Lane experience long delays, this is also true under existing conditions and due to the large volume of through traffic along Route 1.

A left-turn lane is warranted along southbound Route 1 under existing conditions and will continue to be warranted under background future conditions, with the proposed hotel constructed, and under total future conditions with the development of the Reserve at Woodstock Lane. The Reserve at Woodstock Lane will only account for approximately ten percent of the AM traffic making this turn and thirty percent of the PM peak hour traffic making this turn. Most of the traffic using this turn lane will be going to existing developments, and the approved hotel will account for 30 percent of the southbound left turns during the AM peak hour and 25 percent of the turns during the PM peak hour.



Capacity Analysis – Reserve at Woodstock Lane  
October 7, 2014

## **APPENDICES**

Appendix A: Turning Movement Count Data

Appendix B: Synchro Reports

Capacity Analysis & Left Turn Warrant – Reserve at Woodstock Lane  
October 7, 2014

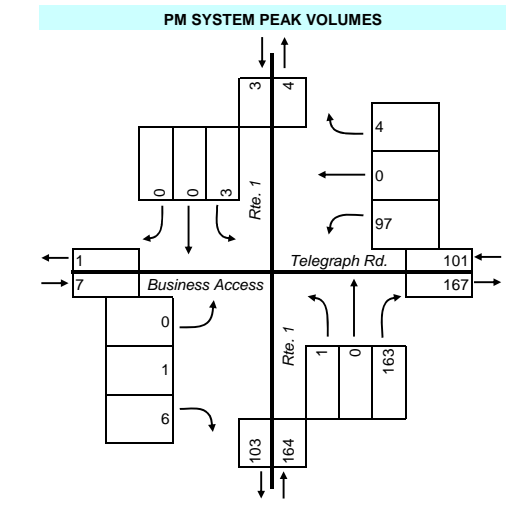
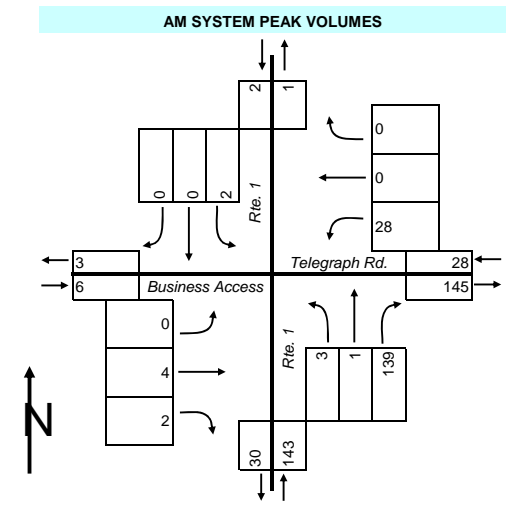
## Appendix A: Turning Movement Count Data

**Gorove/Slade Associates**

Project Name :	Reserve at Woodstock Lane
Project # :	2528-002
Location :	Stafford County, VA
Data Source :	Gorove/Slade Associates, Inc.

Intersection:		Telegraph Road at Route 1 and Business Access															
AM PEAK	Direction:	Southbound				Westbound				Northbound				Eastbound			
	Roadway:	Rte. 1				Telegraph Rd.				Rte. 1				Business Access			
	Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:00 AM	to 6:15 AM	0	0	0	0	0	0	4	0	12	0	0	0	0	0	0	0
6:15 AM	to 6:30 AM	0	0	0	0	0	0	6	0	9	1	0	0	0	0	0	0
6:30 AM	to 6:45 AM	0	0	1	0	0	0	8	0	23	0	0	0	0	0	0	0
6:45 AM	to 7:00 AM	0	0	0	0	0	0	7	0	33	1	0	0	0	0	0	0
7:00 AM	to 7:15 AM	0	0	0	0	0	0	6	0	46	0	1	0	0	4	0	0
7:15 AM	to 7:30 AM	0	0	1	0	0	0	7	0	37	0	2	0	2	0	0	0
7:30 AM	to 7:45 AM	0	0	1	0	0	0	9	0	87	0	0	0	0	0	0	0
7:45 AM	to 8:00 AM	0	0	1	0	0	0	10	0	76	0	1	0	1	0	0	0
8:00 AM	to 8:15 AM	0	0	1	0	0	0	26	0	39	0	0	0	0	0	0	0
8:15 AM	to 8:30 AM	0	0	0	0	1	0	9	0	38	0	2	0	0	1	0	0
8:30 AM	to 8:45 AM	0	0	0	0	0	0	25	0	25	0	0	0	0	0	0	0
8:45 AM	to 9:00 AM	0	0	0	0	0	0	27	0	32	0	0	0	0	0	0	0
PM PEAK	Direction:	Southbound				Westbound				Northbound				Eastbound			
	Roadway:	Rte. 1				Telegraph Rd.				Rte. 1				Business Access			
	Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to 4:15 PM	0	0	0	0	1	0	33	0	46	0	0	0	1	0	0	0
4:15 PM	to 4:30 PM	0	0	2	0	1	0	20	0	26	0	0	0	0	1	0	0
4:30 PM	to 4:45 PM	0	0	1	0	2	0	22	0	37	0	1	0	2	0	0	0
4:45 PM	to 5:00 PM	0	0	0	0	0	0	22	0	54	0	0	0	3	0	0	0
5:00 PM	to 5:15 PM	0	0	1	1	1	1	37	0	49	0	0	0	1	0	0	0
5:15 PM	to 5:30 PM	0	0	2	0	2	0	46	0	56	0	0	0	0	0	0	0
5:30 PM	to 5:45 PM	0	0	1	0	0	0	37	0	29	0	1	0	2	0	1	0
5:45 PM	to 6:00 PM	0	0	0	1	1	0	29	0	38	0	1	0	0	0	0	0
6:00 PM	to 6:15 PM	4	0	0	0	1	0	15	0	44	0	0	0	1	0	0	0
6:15 PM	to 6:30 PM	1	0	0	0	0	0	26	0	31	0	0	0	0	0	0	0
6:30 PM	to 6:45 PM	1	0	1	0	0	0	26	0	35	0	2	0	2	0	0	0
6:45 PM	to 7:00 PM	1	0	0	0	1	0	14	0	43	0	0	0	1	0	0	0
PEAK HOURS	Direction:	Southbound				Westbound				Northbound				Eastbound			
Roadway:	Rte. 1	Telegraph Rd.				Rte. 1				Business Access							
Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
<b>AM INTERSECTION PEAK HOUR</b>																	
7:30 AM to 8:30 AM		0	0	3	0	1	0	54	0	240	0	3	0	1	1	0	0
<b>PM INTERSECTION PEAK HOUR</b>																	
4:45 PM to 5:45 PM		0	0	4	1	3	1	142	0	188	0	1	0	6	0	1	0
<b>AM SYSTEM PEAK HOUR</b>																	
6:30 AM to 7:30 AM		0	0	2	0	0	0	28	0	139	1	3	0	2	4	0	0
<b>PM SYSTEM PEAK HOUR</b>																	
4:00 PM to 5:00 PM		0	0	3	0	4	0	97	0	163	0	1	0	6	1	0	0

#####  
PM Weather Conditions: Clear

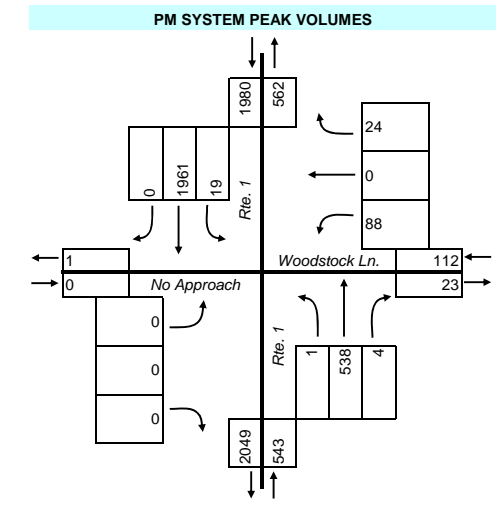
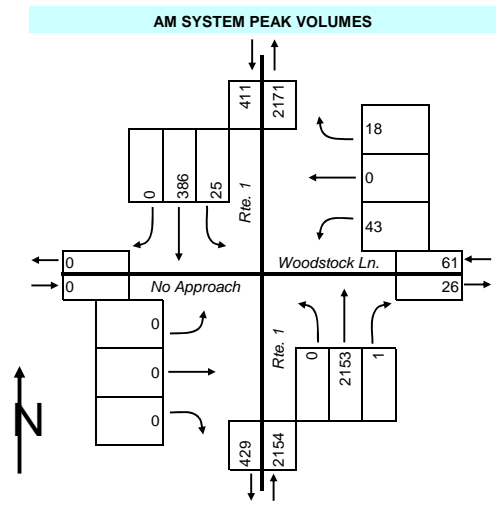


**Gorove/Slade Associates**

Project Name :	Reserve at Woodstock Lane
Project # :	2528-002
Location :	Stafford County, VA
Data Source:	Gorove/Slade Associates, Inc.

Intersection:		Woodstock Lane at Route 1															
AM PEAK	Direction:	Southbound				Westbound				Northbound				Eastbound			
	Roadway:	Rte. 1				Woodstock Ln.				Rte. 1				No Approach			
	Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:00 AM	to 6:15 AM	0	51	1	0	11	0	6	0	0	646	0	0	0	0	0	0
6:15 AM	to 6:30 AM	0	59	3	0	6	0	10	0	0	517	0	0	0	0	0	0
6:30 AM	to 6:45 AM	0	71	2	0	7	0	7	0	0	552	0	0	0	0	0	0
6:45 AM	to 7:00 AM	0	83	6	0	6	0	8	0	0	537	0	0	0	0	0	1
7:00 AM	to 7:15 AM	0	108	3	0	2	0	15	0	0	520	0	0	0	0	0	0
7:15 AM	to 7:30 AM	0	124	14	0	3	0	13	0	1	544	0	0	0	0	0	0
7:30 AM	to 7:45 AM	0	123	10	0	7	0	14	0	0	486	0	0	0	0	0	0
7:45 AM	to 8:00 AM	0	137	12	0	5	0	19	0	2	466	0	0	0	0	0	0
8:00 AM	to 8:15 AM	0	129	13	0	10	0	23	0	4	445	0	0	0	0	0	0
8:15 AM	to 8:30 AM	0	137	14	0	6	0	14	0	1	387	0	0	0	0	0	0
8:30 AM	to 8:45 AM	0	171	23	0	6	0	13	0	2	383	0	0	0	0	0	0
8:45 AM	to 9:00 AM	0	187	16	0	15	0	39	0	2	402	0	0	0	0	0	0
PM PEAK	Direction:	Southbound				Westbound				Northbound				Eastbound			
	Roadway:	Rte. 1				Woodstock Ln.				Rte. 1				No Approach			
	Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to 4:15 PM	0	534	10	0	11	0	32	0	1	134	0	0	0	0	0	0
4:15 PM	to 4:30 PM	0	471	2	0	3	0	19	0	1	130	1	0	0	0	0	0
4:30 PM	to 4:45 PM	0	490	4	0	5	0	18	0	1	153	0	0	0	0	0	0
4:45 PM	to 5:00 PM	0	466	3	0	5	0	19	0	1	121	0	0	0	0	0	0
5:00 PM	to 5:15 PM	0	496	11	0	8	0	24	0	2	168	0	0	0	0	0	0
5:15 PM	to 5:30 PM	0	432	2	0	14	0	23	0	5	153	0	0	0	0	0	0
5:30 PM	to 5:45 PM	0	459	3	0	3	0	25	0	1	125	0	0	0	0	0	0
5:45 PM	to 6:00 PM	0	482	8	0	5	0	18	0	1	113	0	0	0	0	0	0
6:00 PM	to 6:15 PM	0	530	8	0	5	0	10	0	3	107	0	0	0	0	0	0
6:15 PM	to 6:30 PM	0	488	8	0	6	0	11	0	3	124	0	0	0	0	0	0
6:30 PM	to 6:45 PM	0	550	10	0	3	0	12	0	2	139	0	0	0	0	0	0
6:45 PM	to 7:00 PM	0	355	6	0	5	0	6	0	7	107	0	0	0	0	0	0
PEAK HOURS	Direction:	Southbound				Westbound				Northbound				Eastbound			
	Roadway:	Rte. 1				Woodstock Ln.				Rte. 1				No Approach			
	Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
<b>AM INTERSECTION PEAK HOUR</b>																	
7:00 AM	to 8:00 AM	0	492	39	0	17	0	61	0	3	2016	0	0	0	0	0	0
<b>PM INTERSECTION PEAK HOUR</b>																	
5:45 PM	to 6:45 PM	0	2050	34	0	19	0	51	0	9	483	0	0	0	0	0	0
<b>AM SYSTEM PEAK HOUR</b>																	
6:30 AM	to 7:30 AM	0	386	25	0	18	0	43	0	1	2153	0	0	0	0	0	1
<b>PM SYSTEM PEAK HOUR</b>																	
4:00 PM	to 5:00 PM	0	1961	19	0	24	0	88	0	4	538	1	0	0	0	0	0

#####  
PM Weather Conditions: Clear

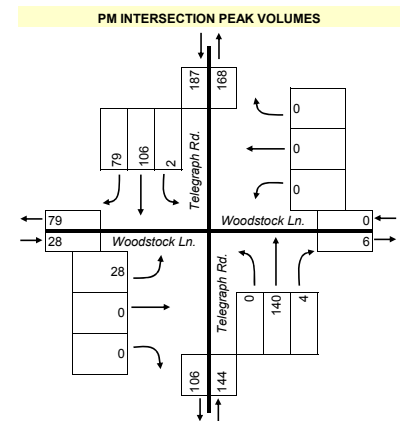
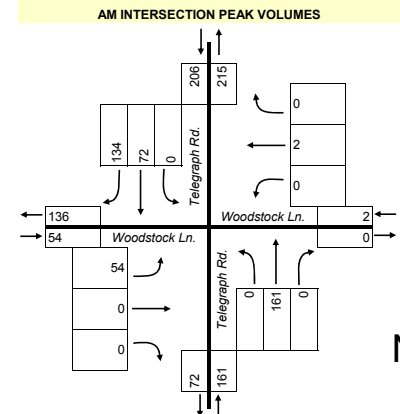


Project Name :  
 Project # :  
 Location  
 Data Source :

Reserve at Woodstock Lane
TBD
Stafford County, VA
Gorove/Slade Associates, Inc.

Intersection:		Telegraph Road at Woodstock Lane																
AM PEAK		Southbound				Westbound				Northbound				Eastbound				
Direction:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Roadway:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Movement:		Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
6:30 AM to 6:45 AM		13	11	0	0	0	0	0	0	0	11	0	0	0	0	3	4	0
6:45 AM to 7:00 AM		10	5	0	0	0	0	0	0	0	20	0	0	0	0	0	2	0
7:00 AM to 7:15 AM		17	6	0	0	0	0	0	0	0	23	0	0	0	0	0	2	0
7:15 AM to 7:30 AM		14	5	0	0	0	1	0	0	0	23	0	0	1	0	2	0	0
7:30 AM to 7:45 AM		17	7	0	0	0	0	0	2	0	40	0	0	0	0	3	0	0
7:45 AM to 8:00 AM		22	7	0	0	0	0	0	2	0	48	0	0	0	0	6	0	0
8:00 AM to 8:15 AM		24	14	0	0	0	0	0	1	1	56	0	0	0	0	8	0	0
8:15 AM to 8:30 AM		25	17	0	0	0	0	0	1	0	40	0	0	0	0	6	0	0
8:30 AM to 8:45 AM		25	13	0	0	0	1	0	3	0	45	0	0	0	0	5	0	0
8:45 AM to 9:00 AM		35	13	0	0	0	1	0	0	0	44	0	0	0	0	12	0	0
9:00 AM to 9:15 AM		42	24	0	0	0	0	0	0	0	38	0	0	0	0	29	0	0
9:15 AM to 9:30 AM		32	22	0	0	0	0	0	0	0	34	0	0	0	0	8	0	0
PM PEAK		Southbound				Westbound				Northbound				Eastbound				
Direction:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Roadway:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Movement:		Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
4:00 PM to 4:15 PM		29	28	1	0	0	0	0	0	0	24	0	0	0	0	9	0	0
4:15 PM to 4:30 PM		27	22	0	0	0	0	0	2	0	31	0	0	0	0	7	1	0
4:30 PM to 4:45 PM		24	21	0	0	0	0	0	0	0	34	0	0	0	0	7	0	0
4:45 PM to 5:00 PM		22	20	0	0	0	0	0	4	2	41	0	0	0	0	4	0	0
5:00 PM to 5:15 PM		24	30	0	0	0	0	0	6	1	22	0	0	0	0	9	0	0
5:15 PM to 5:30 PM		13	28	1	0	0	0	0	0	0	36	0	0	0	0	7	0	0
5:30 PM to 5:45 PM		20	28	1	0	0	0	0	0	1	41	0	0	0	0	8	0	0
5:45 PM to 6:00 PM		14	26	0	0	0	1	0	0	0	42	0	0	0	0	6	0	0
6:00 PM to 6:15 PM		8	15	0	0	0	0	0	0	2	38	1	0	1	0	10	0	0
6:15 PM to 6:30 PM		24	12	0	1	0	0	0	0	1	21	0	0	0	0	8	0	0
6:30 PM to 6:45 PM		18	8	0	0	0	1	0	2	0	33	0	0	0	0	15	0	0
6:45 PM to 7:00 PM		9	7	0	0	0	2	0	2	0	33	0	0	0	0	9	0	0
PEAK HOURS		Southbound				Westbound				Northbound				Eastbound				
Direction:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Roadway:		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
Movement:		Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
<b>AM INTERSECTION PEAK HOUR</b>																		
8:30 AM to 9:30 AM		134	72	0	0	0	2	0	3	0	161	0	0	0	0	54	0	
<b>PM INTERSECTION PEAK HOUR</b>																		
4:45 PM to 5:45 PM		79	106	2	0	0	0	0	10	4	140	0	0	0	0	28	0	
<b>AM SYSTEM PEAK HOUR</b>		#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	
<b>PM SYSTEM PEAK HOUR</b>		#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	
PEAK HOUR FACTORS		Southbound				Westbound				Northbound				Eastbound				
		Telegraph Rd.				Woodstock Ln.				Telegraph Rd.				Woodstock Ln.				
AM PEAK HOUR		#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	
PM PEAK HOUR		#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	
<b>Overall AM PEAK HOUR FACTOR</b>						= #REF!								<b>Overall PM PEAK HOUR FACTOR</b>				
<b>AM Period Intersection Volume:</b>		937								<b>PM Period Intersection Volume:</b>				988				

Date of Counts: Wednesday, June 11, 2014  
 AM Weather Conditions: Clear



















Capacity Analysis & Left Turn Warrant – Reserve at Woodstock Lane  
October 7, 2014

## Appendix B: Synchro Reports











HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	2	28	0	0	3	2154	139	2	427	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	2	30	0	0	3	2341	151	2	464	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1646	2967	232	2664	2892	1246	464			2492		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1646	2967	232	2664	2892	1246	464			2492		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	69	100	0	100	100	100			99		
cM capacity (veh/h)	65	14	770	8	16	165	1093			181		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	7	30	1174	1322	234	232						
Volume Left	0	30	3	0	2	0						
Volume Right	2	0	0	151	0	0						
cSH	21	8	1093	1700	181	1700						
Volume to Capacity	0.32	3.76	0.00	0.78	0.01	0.14						
Queue Length 95th (ft)	23	Err	0	0	1	0						
Control Delay (s)	247.0	Err	0.1	0.0	0.6	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	247.0	Err	0.0		0.3							
Approach LOS	F	F										
Intersection Summary												
Average Delay			102.1									
Intersection Capacity Utilization			81.0%	ICU Level of Service	D							
Analysis Period (min)			15									
Description: Route 1 & Telegraph Road												

HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

















10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	43	18	2153	1	25	386
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	20	2340	1	27	420
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2604	1170			2341	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2604	1170			2341	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	89			87	
cM capacity (veh/h)	17	186			208	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	66	1170	1170	1	167	280
Volume Left	47	0	0	0	27	0
Volume Right	20	0	0	1	0	0
cSH	24	1700	1700	1700	208	1700
Volume to Capacity	2.79	0.69	0.69	0.00	0.13	0.16
Queue Length 95th (ft)	208	0	0	0	11	0
Control Delay (s)	1151.5	0.0	0.0	0.0	7.0	0.0
Lane LOS	F				A	
Approach Delay (s)	1151.5	0.0			2.6	
Approach LOS	F					
Intersection Summary						
Average Delay			27.2			
Intersection Capacity Utilization			69.7%		ICU Level of Service	C
Analysis Period (min)			15			



















HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	54	0	0	0	2	0	0	161	0	0	72	134
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	0	0	0	2	0	0	175	0	0	78	146
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	327	326	151	326	399	175	224			175		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	327	326	151	326	399	175	224			175		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	100	100	100	100	100			100		
cM capacity (veh/h)	624	592	895	627	539	868	1345			1401		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	59	2	175	224								
Volume Left	59	0	0	0								
Volume Right	0	0	0	146								
cSH	624	539	1345	1401								
Volume to Capacity	0.09	0.00	0.00	0.00								
Queue Length 95th (ft)	8	0	0	0								
Control Delay (s)	11.4	11.7	0.0	0.0								
Lane LOS	B	B										
Approach Delay (s)	11.4	11.7	0.0	0.0								
Approach LOS	B	B										
<b>Intersection Summary</b>												
Average Delay			1.5									
Intersection Capacity Utilization			28.3%		ICU Level of Service					A		
Analysis Period (min)			15									











HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	0	1	6	97	0	4	1	539	163	3	2046	0	
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	1	7	105	0	4	1	586	177	3	2224	0	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type							None						
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	2530	2996	1112	1802	2907	382	2224					763	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	2530	2996	1112	1802	2907	382	2224					763	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1					4.1	
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2	
p0 queue free %	100	92	97	0	100	99	100					100	
cM capacity (veh/h)	14	13	203	45	15	616	231					845	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	8	110	294	470	1115	1112							
Volume Left	0	105	1	0	3	0							
Volume Right	7	4	0	177	0	0							
cSH	67	47	231	1700	845	1700							
Volume to Capacity	0.11	2.35	0.00	0.28	0.00	0.65							
Queue Length 95th (ft)	9	287	0	0	0	0							
Control Delay (s)	65.5	802.2	0.2	0.0	0.1	0.0							
Lane LOS	F	F	A		A								
Approach Delay (s)	65.5	802.2	0.1		0.1								
Approach LOS	F	F											
Intersection Summary													
Average Delay			28.6										
Intersection Capacity Utilization			77.6%		ICU Level of Service				D				
Analysis Period (min)			15										
Description: Route 1 & Telegraph Road													

















HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	88	24	539	4	19	1961
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	96	26	586	4	21	2132
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1693	293			590	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1693	293			590	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	96			98	
cM capacity (veh/h)	82	703			981	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	122	293	293	4	731	1421
Volume Left	96	0	0	0	21	0
Volume Right	26	0	0	4	0	0
cSH	101	1700	1700	1700	981	1700
Volume to Capacity	1.20	0.17	0.17	0.00	0.02	0.84
Queue Length 95th (ft)	204	0	0	0	2	0
Control Delay (s)	231.8	0.0	0.0	0.0	0.6	0.0
Lane LOS	F				A	
Approach Delay (s)	231.8	0.0			0.2	
Approach LOS	F					
Intersection Summary						
Average Delay			10.0			
Intersection Capacity Utilization			80.6%		ICU Level of Service	D
Analysis Period (min)			15			

















HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	28	0	0	0	0	0	0	140	4	2	106	79
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	0	0	0	0	0	0	152	4	2	115	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	317	319	158	317	360	154	201			157		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	317	319	158	317	360	154	201			157		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	100	100	100	100	100			100		
cM capacity (veh/h)	635	597	887	635	566	892	1371			1423		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	30	0	157	203								
Volume Left	30	0	0	2								
Volume Right	0	0	4	86								
cSH	635	1700	1371	1423								
Volume to Capacity	0.05	0.00	0.00	0.00								
Queue Length 95th (ft)	4	0	0	0								
Control Delay (s)	11.0	0.0	0.0	0.1								
Lane LOS	B	A		A								
Approach Delay (s)	11.0	0.0	0.0	0.1								
Approach LOS	B	A										
<b>Intersection Summary</b>												
Average Delay			0.9									
Intersection Capacity Utilization			22.1%		ICU Level of Service					A		
Analysis Period (min)			15									











HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	2	31	0	0	3	2341	151	2	467	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	2	34	0	0	3	2545	164	2	508	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1791	3227	254	2896	3145	1354	508			2709		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1791	3227	254	2896	3145	1354	508			2709		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	53	100	0	100	100	100			99		
cM capacity (veh/h)	50	9	746	4	11	140	1053			148		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	7	34	1276	1436	256	254						
Volume Left	0	34	3	0	2	0						
Volume Right	2	0	0	164	0	0						
cSH	14	4	1053	1700	148	1700						
Volume to Capacity	0.47	7.57	0.00	0.84	0.01	0.15						
Queue Length 95th (ft)	29	Err	0	0	1	0						
Control Delay (s)	410.4	Err	0.1	0.0	0.8	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	410.4	Err	0.1		0.4							
Approach LOS	F	F										
Intersection Summary												
Average Delay			104.2									
Intersection Capacity Utilization			86.7%	ICU Level of Service	E							
Analysis Period (min)			15									
Description: Route 1 & Telegraph Road												

















HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	52	25	2330	11	38	418
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	57	27	2533	12	41	454
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2842	1266			2545	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2842	1266			2545	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	83			76	
cM capacity (veh/h)	10	160			172	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	84	1266	1266	12	193	303
Volume Left	57	0	0	0	41	0
Volume Right	27	0	0	12	0	0
cSH	15	1700	1700	1700	172	1700
Volume to Capacity	5.60	0.74	0.74	0.01	0.24	0.18
Queue Length 95th (ft)	Err	0	0	0	22	0
Control Delay (s)	Err	0.0	0.0	0.0	13.6	0.0
Lane LOS	F				B	
Approach Delay (s)	Err	0.0			5.3	
Approach LOS	F					
Intersection Summary						
Average Delay			268.7			
Intersection Capacity Utilization			75.5%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	0	1	0	2	0	1	174	0	0	78	146
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	0	1	0	2	0	1	189	0	0	85	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	357	355	164	357	435	189	243			189		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	357	355	164	357	435	189	243			189		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	100	100	100	100	100	100			100		
cM capacity (veh/h)	596	570	880	598	514	853	1323			1385		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	65	2	190	243								
Volume Left	64	0	1	0								
Volume Right	1	0	0	159								
cSH	600	514	1323	1385								
Volume to Capacity	0.11	0.00	0.00	0.00								
Queue Length 95th (ft)	9	0	0	0								
Control Delay (s)	11.7	12.0	0.1	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	11.7	12.0	0.1	0.0								
Approach LOS	B	B										
<b>Intersection Summary</b>												
Average Delay			1.6									
Intersection Capacity Utilization			29.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	1	6	106	0	4	1	590	177	3	2224	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	7	115	0	4	1	641	192	3	2417	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2751	3260	1209	1962	3164	417	2417			834		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2751	3260	1209	1962	3164	417	2417			834		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	88	96	0	100	99	99			100		
cM capacity (veh/h)	9	9	175	33	10	585	194			795		











Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	8	120	322	513	1212	1209
Volume Left	0	115	1	0	3	0
Volume Right	7	4	0	192	0	0
cSH	48	34	194	1700	795	1700
Volume to Capacity	0.16	3.53	0.01	0.30	0.00	0.71
Queue Length 95th (ft)	13	Err	0	0	0	0
Control Delay (s)	94.4	Err	0.2	0.0	0.2	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	94.4	Err	0.1		0.1	
Approach LOS	F	F				

Intersection Summary		
Average Delay		353.7
Intersection Capacity Utilization	83.0%	ICU Level of Service E
Analysis Period (min)		15
Description: Route 1 & Telegraph Road		



















HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	37	583	11	29	2122
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	40	634	12	32	2307
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1850	317			646	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1850	317			646	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	94			97	
cM capacity (veh/h)	64	679			936	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	154	317	317	12	800	1538
Volume Left	114	0	0	0	32	0
Volume Right	40	0	0	12	0	0
cSH	83	1700	1700	1700	936	1700
Volume to Capacity	1.85	0.19	0.19	0.01	0.03	0.90
Queue Length 95th (ft)	331	0	0	0	3	0
Control Delay (s)	510.5	0.0	0.0	0.0	0.9	0.0
Lane LOS	F				A	
Approach Delay (s)	510.5	0.0			0.3	
Approach LOS	F					
Intersection Summary						
Average Delay			25.3			
Intersection Capacity Utilization			93.7%		ICU Level of Service	F
Analysis Period (min)			15			

















HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	31	0	1	0	0	0	1	151	4	2	115	86
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	0	1	0	0	0	1	164	4	2	125	93
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	345	347	172	346	391	166	218			168		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	345	347	172	346	391	166	218			168		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	100	100	100	100	100			100		
cM capacity (veh/h)	609	575	872	607	543	878	1351			1409		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	35	0	170	221								
Volume Left	34	0	1	2								
Volume Right	1	0	4	93								
cSH	614	1700	1351	1409								
Volume to Capacity	0.06	0.00	0.00	0.00								
Queue Length 95th (ft)	4	0	0	0								
Control Delay (s)	11.2	0.0	0.1	0.1								
Lane LOS	B	A	A	A								
Approach Delay (s)	11.2	0.0	0.1	0.1								
Approach LOS	B	A										
<b>Intersection Summary</b>												
Average Delay			1.0									
Intersection Capacity Utilization			22.7%		ICU Level of Service					A		
Analysis Period (min)			15									











HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	2	35	0	0	3	2341	155	2	474	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	2	38	0	0	3	2545	168	2	515	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1798	3239	258	2902	3155	1357	515			2713		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1798	3239	258	2902	3155	1357	515			2713		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	52	100	0	100	100	100			99		
cM capacity (veh/h)	50	9	741	4	10	139	1047			147		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	7	38	1276	1441	260	258						
Volume Left	0	38	3	0	2	0						
Volume Right	2	0	0	168	0	0						
cSH	14	4	1047	1700	147	1700						
Volume to Capacity	0.48	8.75	0.00	0.85	0.01	0.15						
Queue Length 95th (ft)	30	Err	0	0	1	0						
Control Delay (s)	420.3	Err	0.1	0.0	0.8	0.0						
Lane LOS	F	F	A		A							
Approach Delay (s)	420.3	Err	0.1		0.4							
Approach LOS	F	F										
Intersection Summary												
Average Delay			117.0									
Intersection Capacity Utilization			87.0%	ICU Level of Service	E							
Analysis Period (min)			15									
Description: Route 1 & Telegraph Road												

















HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	59	36	2330	11	42	418
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	39	2533	12	46	454
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2851	1266			2545	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2851	1266			2545	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	76			73	
cM capacity (veh/h)	10	160			172	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	103	1266	1266	12	197	303
Volume Left	64	0	0	0	46	0
Volume Right	39	0	0	12	0	0
cSH	15	1700	1700	1700	172	1700
Volume to Capacity	6.71	0.74	0.74	0.01	0.27	0.18
Queue Length 95th (ft)	Err	0	0	0	25	0
Control Delay (s)	Err	0.0	0.0	0.0	15.1	0.0
Lane LOS	F				C	
Approach Delay (s)	Err	0.0			6.0	
Approach LOS	F					
Intersection Summary						
Average Delay			329.0			
Intersection Capacity Utilization			76.5%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	4	1	5	20	6	1	174	4	2	78	146
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	4	1	5	22	7	1	189	4	2	85	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	379	364	164	365	441	191	243			193		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	379	364	164	365	441	191	243			193		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	99	100	99	96	99	100			100		
cM capacity (veh/h)	554	562	880	586	509	850	1323			1380		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	70	34	195	246								
Volume Left	64	5	1	2								
Volume Right	1	7	4	159								
cSH	558	565	1323	1380								
Volume to Capacity	0.12	0.06	0.00	0.00								
Queue Length 95th (ft)	11	5	0	0								
Control Delay (s)	12.4	11.8	0.1	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	12.4	11.8	0.1	0.1								
Approach LOS	B	B										
<b>Intersection Summary</b>												
Average Delay			2.4									
Intersection Capacity Utilization			31.4%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
1: Business Access/Telegraph Road & Route 1

10/6/2014













Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	1	6	109	0	4	1	590	188	3	2228	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	7	118	0	4	1	641	204	3	2422	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2755	3276	1211	1970	3174	423	2422			846		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2755	3276	1211	1970	3174	423	2422			846		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	87	96	0	100	99	99			100		
cM capacity (veh/h)	9	9	174	32	10	580	193			787		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	8	123	322	525	1214	1211
Volume Left	0	118	1	0	3	0
Volume Right	7	4	0	204	0	0
cSH	47	33	193	1700	787	1700
Volume to Capacity	0.16	3.69	0.01	0.31	0.00	0.71
Queue Length 95th (ft)	13	Err	0	0	0	0
Control Delay (s)	96.5	Err	0.2	0.0	0.2	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	96.5	Err	0.1		0.1	
Approach LOS	F	F				

Intersection Summary		
Average Delay		361.3
Intersection Capacity Utilization	83.3%	ICU Level of Service E
Analysis Period (min)		15
Description: Route 1 & Telegraph Road		

















HCM Unsignalized Intersection Capacity Analysis  
2: Route 1 & Woodstock Lane

10/6/2014

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	109	44	583	11	41	2122
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	48	634	12	45	2307
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1876	317			646	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1876	317			646	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	93			95	
cM capacity (veh/h)	60	679			936	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	166	317	317	12	813	1538
Volume Left	118	0	0	0	45	0
Volume Right	48	0	0	12	0	0
cSH	82	1700	1700	1700	936	1700
Volume to Capacity	2.04	0.19	0.19	0.01	0.05	0.90
Queue Length 95th (ft)	370	0	0	0	4	0
Control Delay (s)	591.2	0.0	0.0	0.0	1.2	0.0
Lane LOS	F				A	
Approach Delay (s)	591.2	0.0			0.4	
Approach LOS	F					
Intersection Summary						
Average Delay			31.4			
Intersection Capacity Utilization			94.7%		ICU Level of Service	F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
3: Telegraph Road & Woodstock Lane

10/6/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	31	12	1	3	11	3	1	151	16	8	115	86
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	34	13	1	3	12	3	1	164	17	9	125	93
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	373	373	172	372	411	173	218			182		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	373	373	172	372	411	173	218			182		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	98	100	99	98	100	100			99		
cM capacity (veh/h)	568	554	872	571	527	871	1351			1394		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	48	18	183	227								
Volume Left	34	3	1	9								
Volume Right	1	3	17	93								
cSH	569	575	1351	1394								
Volume to Capacity	0.08	0.03	0.00	0.01								
Queue Length 95th (ft)	7	2	0	0								
Control Delay (s)	11.9	11.5	0.1	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.9	11.5	0.1	0.3								
Approach LOS	B	B										
<b>Intersection Summary</b>												
Average Delay			1.8									
Intersection Capacity Utilization			31.2%		ICU Level of Service				A			
Analysis Period (min)			15									



# INTERSECTION SAFETY STUDY

Prepared for: Virginia Department of Transportation

Central Region Operations Traffic Engineering

(UPC #81378, TO 12-092)

DAVENPORT Project Number: 13-368

F€€G/2014

## RTE. 1 at RTE. 637 & RTE. 639

### Stafford County, VA



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# Intersection Safety Study

VDOT CRO Task 12-092  
Rte. 1 (Jefferson Davis Highway) at  
Rte. 637 (Telegraph Road) &  
Rte. 639 (Woodstock Lane)  
Stafford County, VA

Á  
M&G 2014

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*DAVENPORT Project #13-368*



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**VDOT Intersection Operational and Safety Analysis**  
**Routes 1/637/639, Stafford County, VA**  
**VDOT CRO 12-092**  
**DAVENPORT Project Number 13-368**  
**October 2, 2014**

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**VDOT Intersection Operational and Safety Analysis  
Routes 1/637/639, Stafford County, VA  
VDOT CRO 12-092  
DAVENPORT Project Number 13-368  
October 2, 2014**

## **1.0 Introduction**

DAVENPORT performed an intersection operational and safety analysis for the intersections of:

- Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – south intersection);
- Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane); and
- Route 637 (Telegraph Road) at Route 639 (Woodstock Lane)

The purpose of the study was to evaluate traffic flow patterns along the minor roadways to determine if consolidation of traffic would be beneficial to the operation and safety of the area. Figures 1A and 1B show a vicinity map and location map, respectively.

The three subject intersections are currently unsignalized and located approximately 2,200 feet apart along Route 1 in Stafford County, Virginia. Route 1 is a four-lane undivided roadway and Routes 637 and 639 are two-lane undivided roadways. Currently, there are no turn lanes provided at any of the three intersections. Route 637 intersects with Route 1 south of the intersection with Route 639, then continues north for approximately three miles and intersects with Route 1 again. Route 639 serves as a short connector between Routes 1 and 637.

Crash history from 2010-2012 was reviewed for the study intersections. The intersection of Route 1 and Route 639 currently experiences a pattern of southbound rear-end crashes. No crash patterns were noted at the intersections of Route 1 and Route 637, and Route 639 and Route 637.

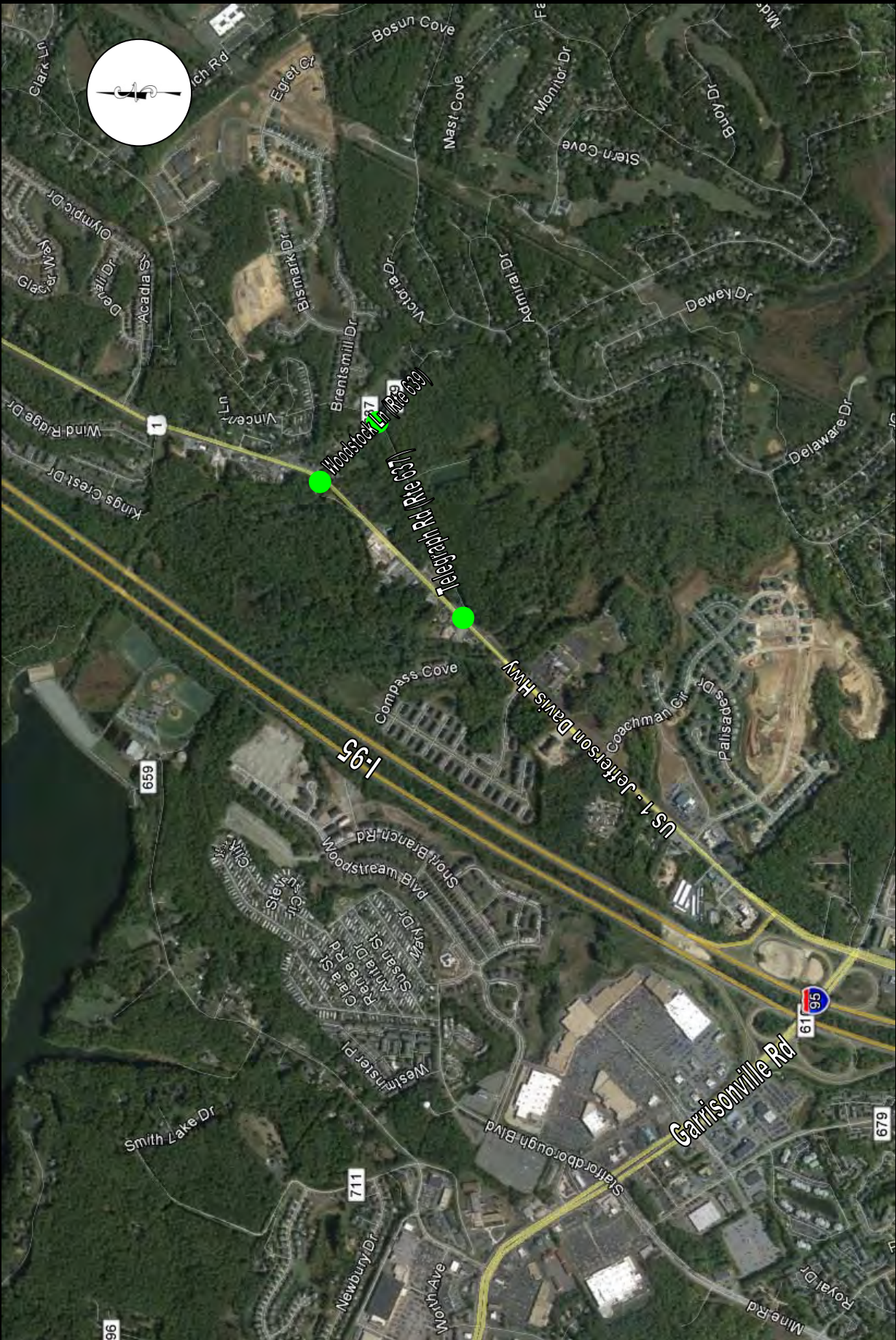
A signal warrant analysis was previously carried out by the Virginia Department of Transportation (VDOT) in October 2012 for the intersection of Route 1 at Route 639. This study found that the four-hour and one-hour warrants were satisfied at the time; however, signalization was ultimately not recommended because observed queues on Route 639 were short-lived during peak hours.

This analysis investigates four (4) improvement alternatives focused on improving the overall traffic flow and safety of the area. Analysis was completed for short term and long term conditions to identify the needed improvements for the long term 2040 design year as well as interim improvements.



Per the approved project scope, analyses were prepared for the following nine (9) scenarios:

1. Existing Conditions;
2. Short Term Future with Existing Conditions;
3. Short Term Future with Alternative 1 – Consolidation of Traffic to Route 637;
4. Short Term Future with Alternative 2 – Consolidation of Traffic to Route 639;
5. Long Term Future with Existing Conditions;
6. Long Term Future with Alternative 1 – Consolidation of Traffic to Route 637;
7. Long Term Future with Alternative 2 – Consolidation of Traffic to Route 639;
8. Long Term Future with Alternative 3 – Relocated Route 637; and
9. Long Term Future with Alternative 4 – Consolidated Left Turns;



STUDY INTERSECTIONS  
 EXISTING ●

FIGURE 1A  
 VICINITY MAP



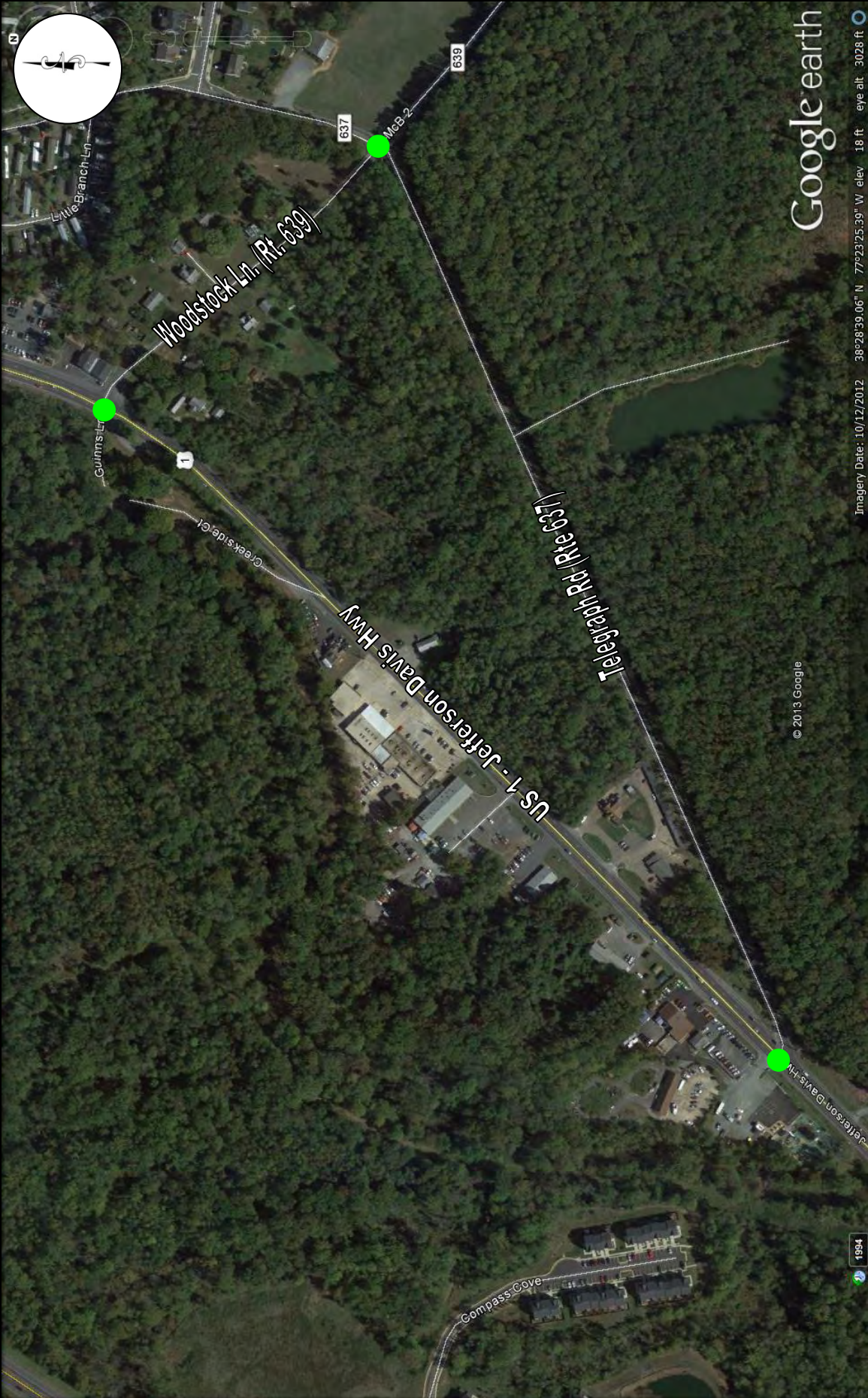


FIGURE 1B  
SITE LOCATION MAP

STUDY INTERSECTIONS  
EXISTING ●



## 2.0 Existing Roadway Conditions

### 2.1 Inventory

A field investigation was conducted by DAVENPORT staff to determine the existing roadway conditions in the study area. Table 1 contains the results of this effort. Figure 2 illustrates the existing lane geometry.

Table 1 - Street Inventory					
Facility Name	Route #	Typical Cross Section	Pavement Width	Speed Limit	Maintained By
Jefferson Davis Highway	Route 1	4-lane undivided	Approx. 50'	45 MPH	VDOT
Telegraph Road	Route 637	2-lane undivided	Approx. 20'	35 MPH	VDOT
Woodstock Lane	Route 639	2-lane undivided	Approx. 18'	30 MPH	VDOT

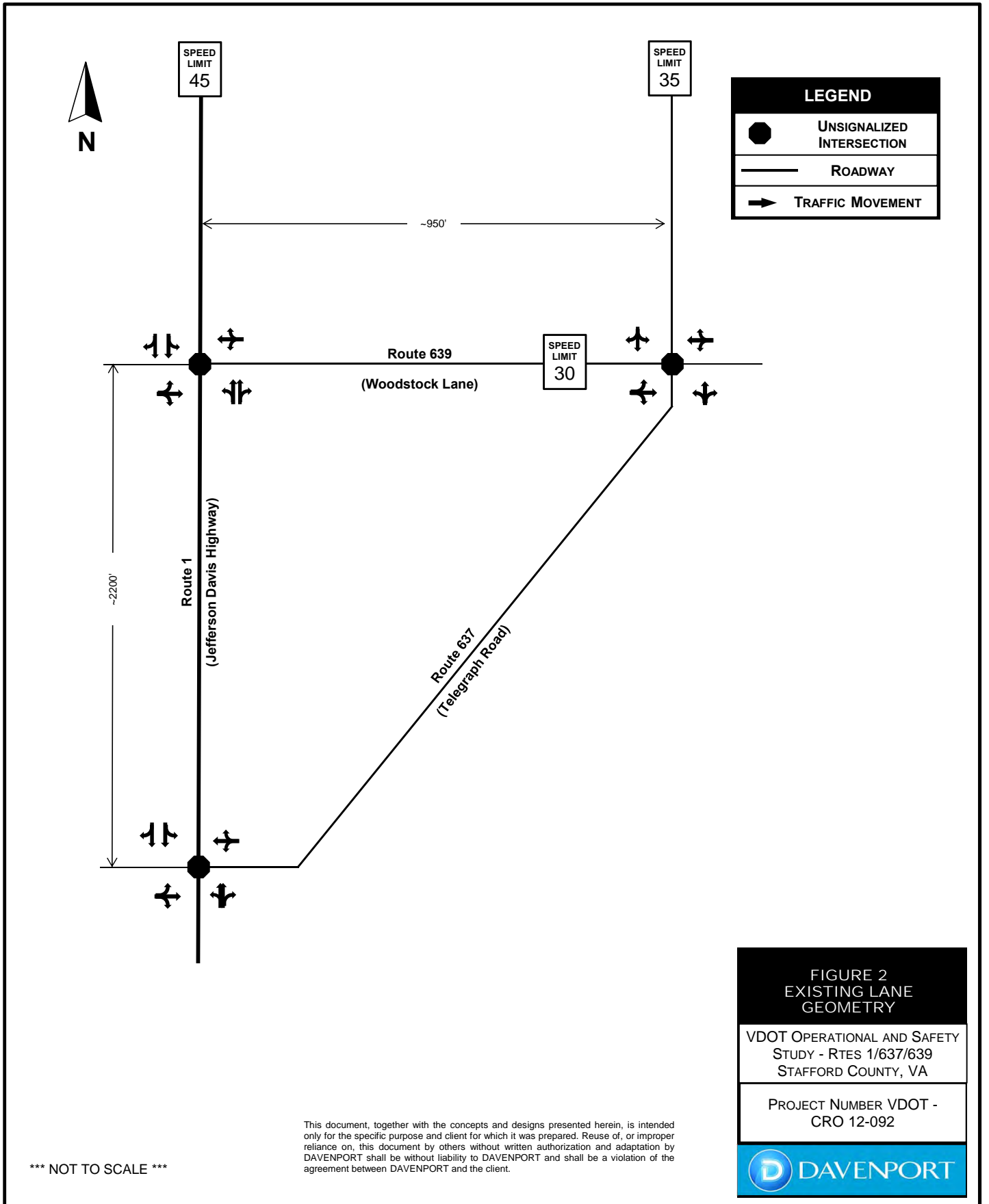
### 2.2 Existing Traffic Volumes

The scope of this project as defined by VDOT was to collect traffic data at the following intersections:

1. Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection);
2. Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane); and
3. Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)

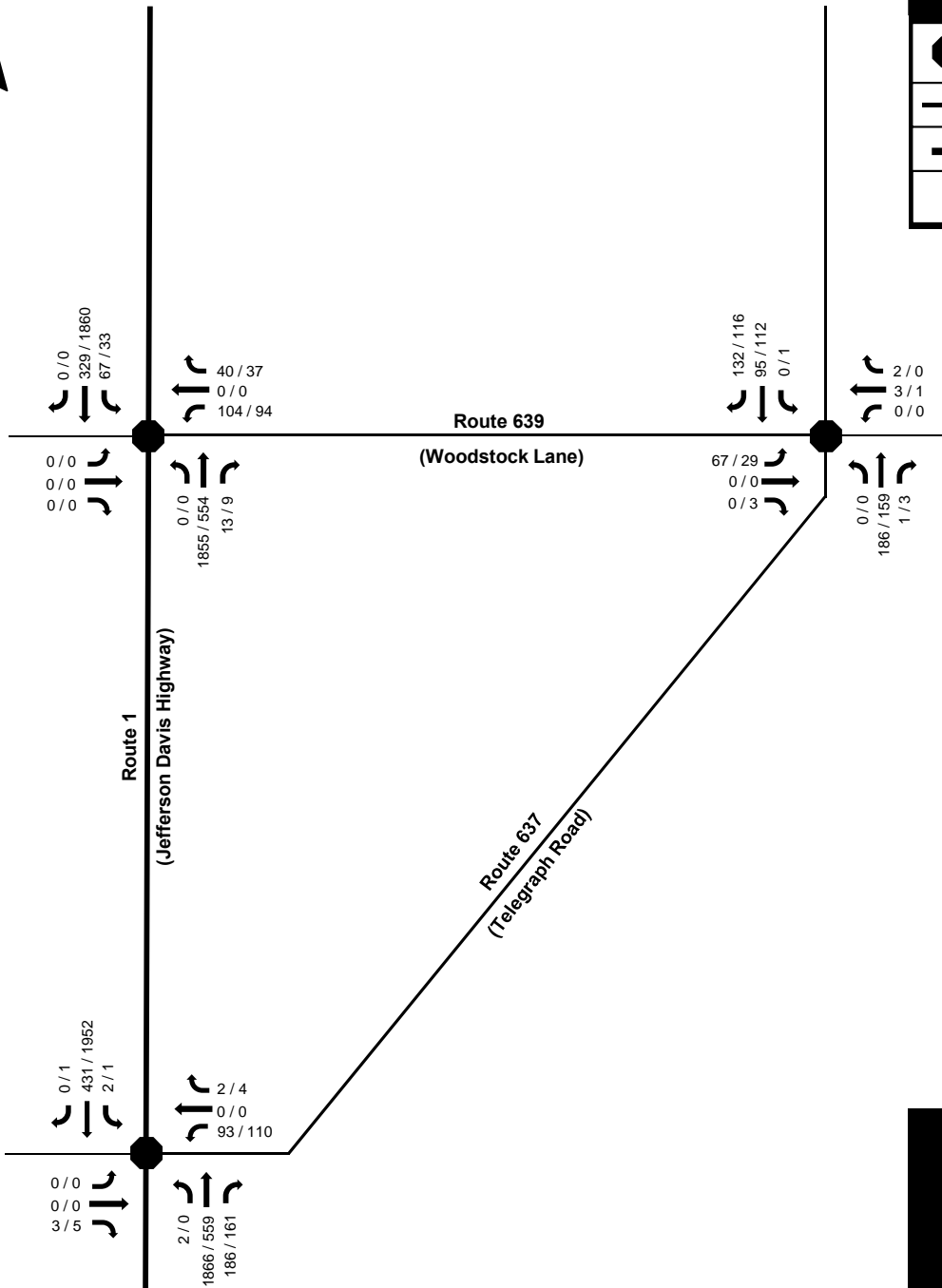
Table 2 contains the dates these counts were conducted. The counts occurred while schools were in session. The traffic volumes were balanced along Route 1 by using the highest through volume in order to obtain more conservative results (note a small imbalance is present along Route 639 as result of the addition of traffic generated from an approved development). Figure 3 presents these traffic volumes for AM and PM peaks. More information can be found in the Traffic Volume Data section of the appendix.

Table 2 - Traffic Volume Data	
<u>Count Location:</u>	<u>Date Taken:</u>
Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)	1/9/2014
Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)	1/9/2014
Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)	1/9/2014





LEGEND	
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	AM/ PM PEAKS



Note: Traffic counts were captured on January 9, 2014. Existing traffic volumes include traffic from the approved development.

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\*\*\* NOT TO SCALE \*\*\*

**FIGURE 3**  
**2014 EXISTING**  
**TRAFFIC VOLUMES**

VDOT OPERATIONAL AND SAFETY  
 STUDY - RTES 1/637/639  
 STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
 CRO 12-092

### 3.0 Crash History

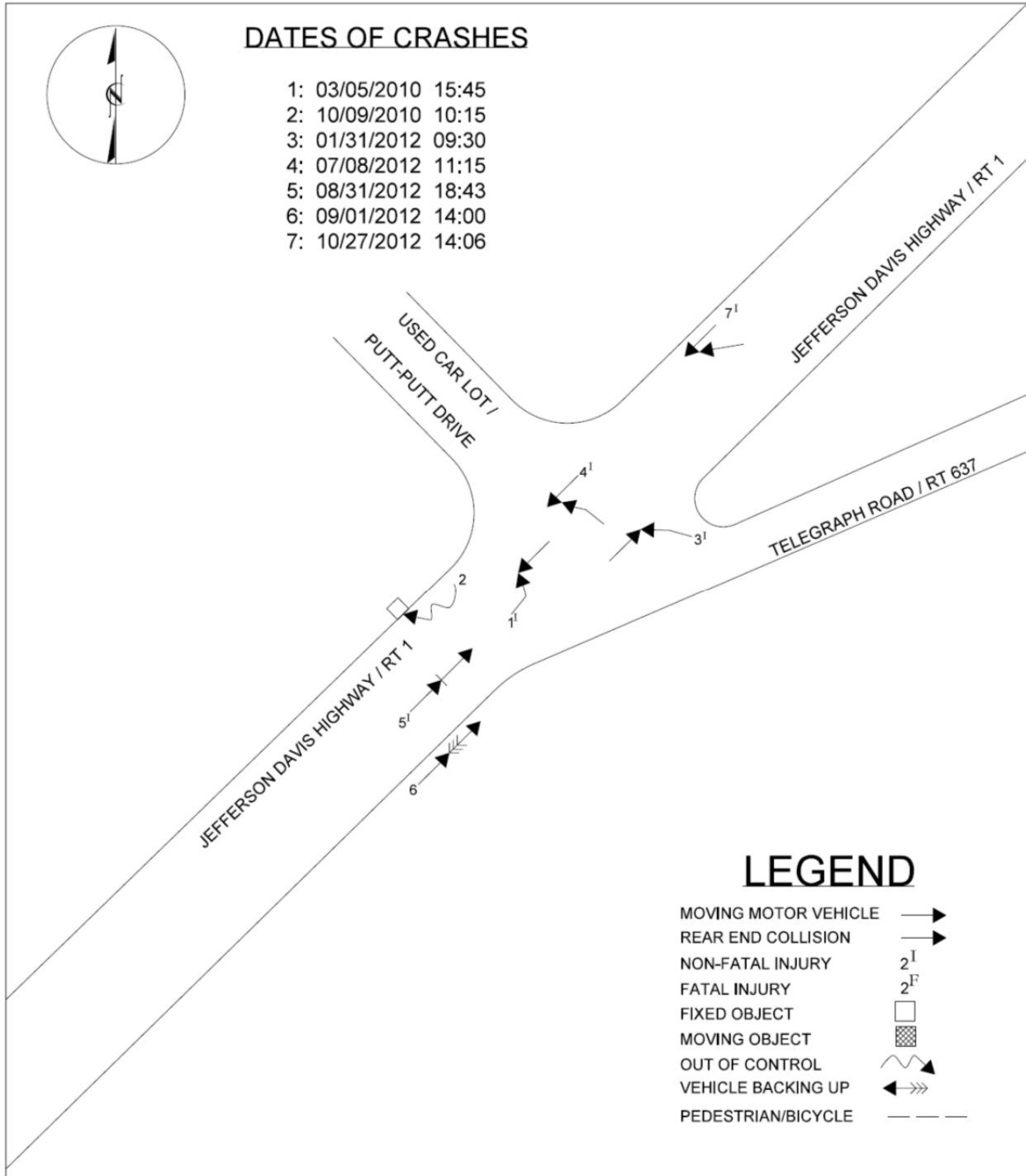
In order to assess the existing traffic safety issues, crash history for the years 2010, 2011, and 2012 was provided by VDOT and reviewed for the study intersections. The results are summarized in Table 3.

<b>Table 3 - Crash Data Summary from January 2010 to December 2012</b>						
<b>Intersection</b>	<b>Rear-end</b>	<b>Sideswipe</b>	<b>Angle/ Left Turn</b>	<b>Fixed Object</b>	<b>Other*</b>	<b>Total</b>
Route 1 at Route 637	1	1	1 (NB) <u>2 (WB)</u> 3 total	1	1	<b>7</b>
Route 1 at Route 639	11 (SB) <u>1(WB)</u> 12 total	1 (SB) <u>1(WB)</u> 2 total	1 (U-turn) <u>1 (WB)</u> 2 total	0	0	<b>16</b>
Route 639 at Route 637	0	0	1	0	0	<b>1</b>
<b>*Other crashes running off road / fleeing police</b>						

### 3.1 Discussion of Crash History

#### 3.1.1 Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)

There were a total of seven (7) crashes at the intersection of Route 1 and Route 637 from 2010-2012. A collision diagram for this intersection is provided in Figure 4. The severity of the crashes was property damage and minor injuries. There were three (3) angle crashes, one (1) rear-end, one (1) sideswipe, one (1) fixed object, and one (1) backed into. These crashes were varied with no particular pattern noted.



**Figure 4 – Collision Diagram for Route 1 at Route 637**

### **3.1.2 Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)**

There were a total of 16 reported crashes at this intersection during the crash history period. A collision diagram for this intersection is provided in Figure 5. The severity of the crashes was mainly property damage and minor injuries. One southbound rear-end crash reported serious injuries.

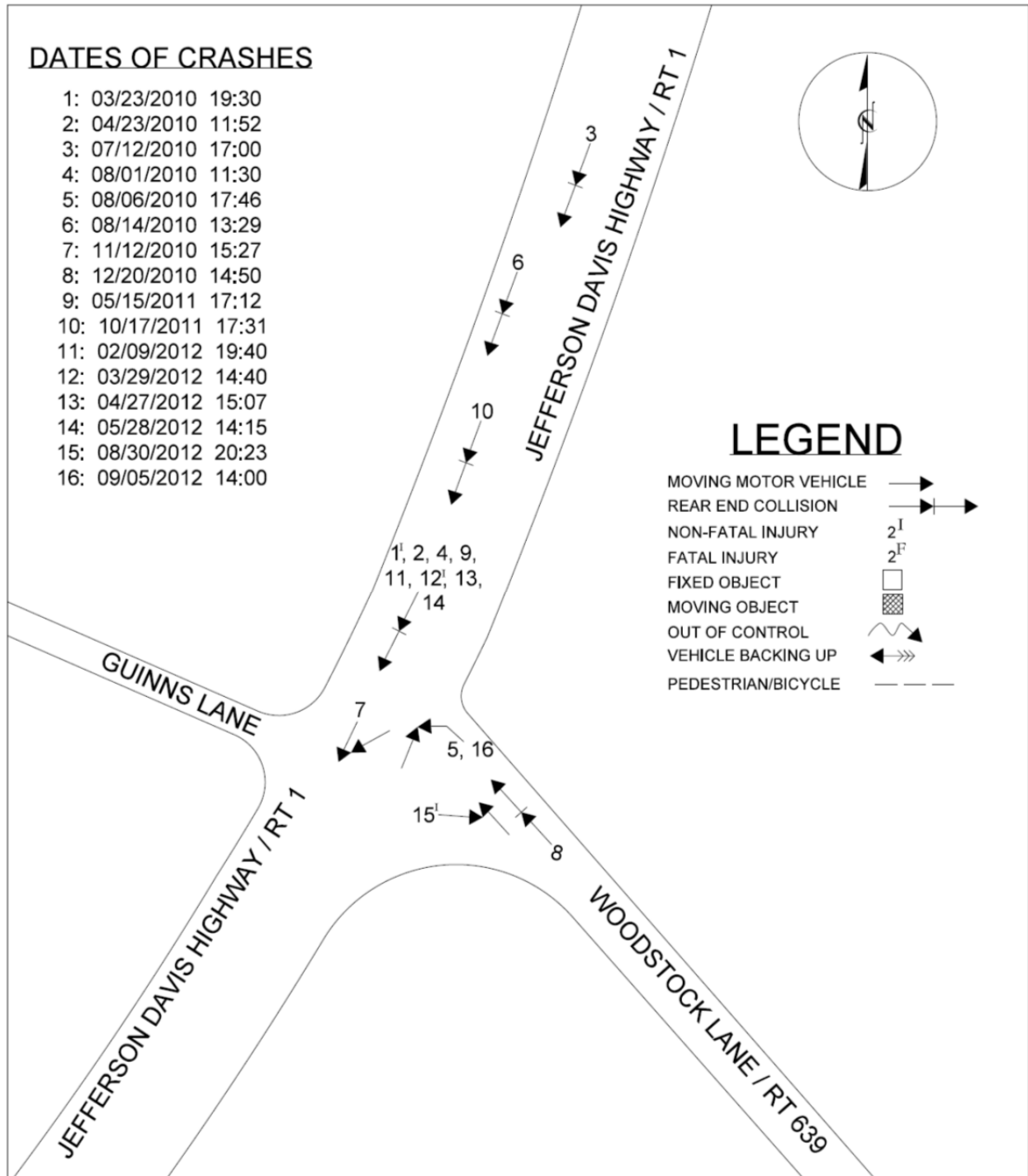
The most common crash type at this intersection was rear-end crashes with 12 incidents reported during the history period – 11 of them southbound rear-end crashes. The frequency of southbound rear-end crashes is likely due to the volume of southbound vehicles attempting to turn left onto Route 639 and the lack of a southbound left turn lane on Route 1. Without a turn lane to store southbound left turning vehicles, vehicles must stop or slow down in the southbound through lane on Route 1 while waiting for a gap in northbound traffic to complete their maneuver. This creates a conflict with the southbound through traffic, which likely contributes to the frequency of these crashes.

Other common causes for rear-end crashes include driver inattentiveness, excess speeds, poor visibility of traffic control devices, and pedestrians crossing the street. However, given the pattern of southbound rear-end crashes at this intersection and for the reasons discussed above, improvements to accommodate the southbound left turning vehicles have the potential to enhance the safety of this intersection.

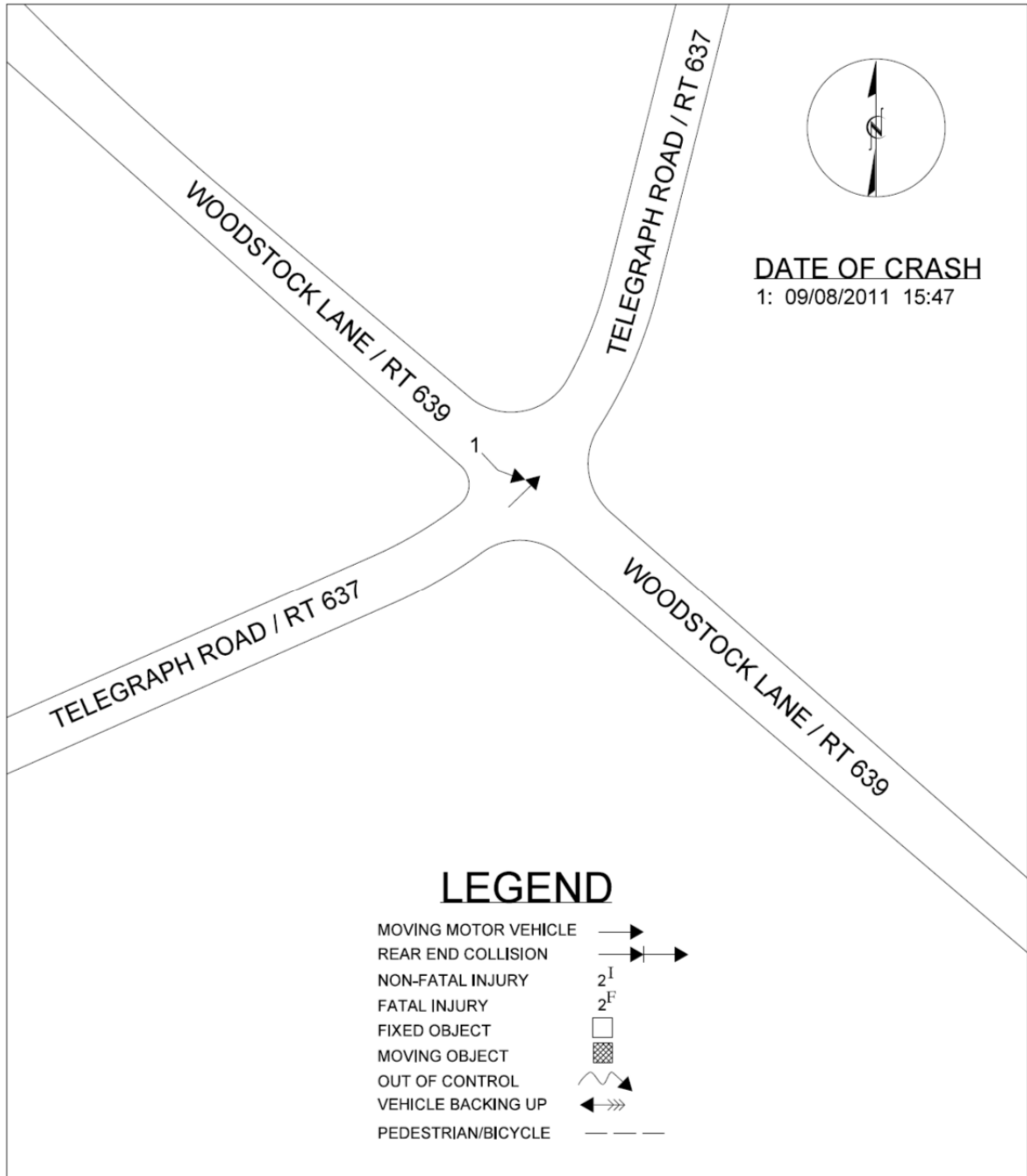
Other crashes at this intersection include two (2) sideswipes and two (2) angle crashes. These crashes were varied and no pattern was noted.

### **3.1.3 Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)**

At the intersection of Route 639 and Route 637, one (1) crash was reported during the three year crash history period. This was a left turn crash with property damage only reported. There were no noted crash patterns at this intersection. A collision diagram for this intersection is provided in Figure 6.



**Figure 5 – Collision Diagram for  
Route 1 at Route 639**



**Figure 6 – Collision Diagram for Route 639 at Route 637**



## 4.0 Approved Developments and Committed Improvements

### 4.1 Approved Developments

Approved developments are developments that have been recently approved in the area, but not yet constructed. Per VDOT, there is one approved development to be considered in this study. The Affordable Suites development is to be located on the southwest quadrant of the intersection of Route 639 at Route 637. This development is planned to consist of 72 rooms. Approved development trips were distributed to the study intersections based on existing traffic patterns and engineering judgment. Per VDOT, site traffic associated with this development was added to existing traffic volumes. More information can be found in the Supporting Documentation of the Appendix.

### 4.2 Committed Improvements

Committed Improvements are improvements that are planned by VDOT, a local municipality, or a developer in the area, but not yet constructed. Per VDOT, there are plans to widen Route 1 to six lanes. This widening project was assumed to be completed in 2040 long term analysis conditions.

## 5.0 Methodology

The analysis for this project was conducted in accordance with current VDOT standards and/or as directed by VDOT staff. Table 4 contains a summary of the base assumptions.

<b>Table 4 - Assumptions</b>	
<b>Peak Hour Factor</b>	Existing Analysis – Per traffic data collection, by movement Short Term Future Analyses – 0.92 or existing, whichever is higher Long Term Future Analyses – 0.92
<b>Background Traffic Annual Growth Rate</b>	Route 1 – 3.4% Route 637 – 2.5% Route 639 – 2.5%
<b>Analysis Software</b>	Synchro/SimTraffic Version 7.0
<b>Base Signal Timing/ Phasing</b>	Not applicable
<b>Lane Widths</b>	12-feet unless measured otherwise
<b>Heavy Vehicle Percentages</b>	Existing Analysis – Per traffic data collection, by movement Future Analyses – 2% or existing, whichever is higher

### 5.1 Level of Service Evaluation Criteria

The Transportation Research Board’s Highway Capacity Manual (HCM) utilizes a term “level of service” to measure how traffic operates in intersections and on roadway segments. There are currently six levels of service ranging from A to F. Level of service “A” represents the best conditions and Level of Service “F” represents the worst. Synchro Traffic Modeling software was used to determine the level of service for studied intersections. All worksheet reports from the analyses can be found in the Appendix.

<b>Table 5 – Highway Capacity Manual</b>			
Levels of Service and Control Delay Criteria			
<b>Signalized Intersection</b>		<b>Unsignalized Intersection</b>	
Level of Service	Control Delay Per vehicle (sec)	Level of Service	Delay Range (sec)
A	$\leq 10$	A	$\leq 10$
B	$> 10$ and $\leq 20$	B	$> 10$ and $\leq 15$
C	$> 20$ and $\leq 35$	C	$> 15$ and $\leq 25$
D	$> 35$ and $\leq 55$	D	$> 25$ and $\leq 35$
E	$> 55$ and $\leq 80$	E	$> 35$ and $\leq 50$
F	$> 80$	F	$> 50$

## **6.0 Existing Conditions Analysis**

### **6.1 Existing Level of Service and Signal Warrant Analysis**

Capacity analysis was carried out for the existing conditions at the study intersections. A signal warrant analysis was also carried out for the Route 1 at Route 637 intersection as well as the Route 1 at Route 639 intersection under existing conditions. The signal warrant analysis was conducted using the PC-Warrants software. The Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD 2009 Edition), has established nine criteria that can be used to justify the installation of a traffic signal, which are the following:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume
- Warrant 5: School Crossing
- Warrant 6: Coordinated Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection Near a Grade Crossing

The level of service and signal warrant analysis results for existing conditions are discussed by intersection below.

### 6.1.1 Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)

The westbound approach of the intersection of Route 1 at Route 637 is currently operating at LOS F during the AM and PM peaks. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning left from the minor approach.

<b>Table 6 - Level of Service Rte. 1 at Rte. 637 (unsignalized)</b>			
<b>2014 Existing</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 637</b>	<b>EB Overall</b>	<b>B (10.2)</b>	<b>C (24.3)</b>
	<b>WB Overall</b>	<b>F (Err)</b>	<b>F (Err)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.1)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.1)</b>	<b>A (0.0)</b>
	<b>SBLT</b>	A (1.1)	A (0.2)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>A (0.5)</b>	<b>A (0.1)</b>
LOS (delay in seconds)			

DAVENPORT performed a thirteen (13) hour turning movement traffic count at the intersection of Route 1 and Route 637. The full report for this traffic count can be found in the Appendix.

Signal warrants 1-3 are related to traffic volumes and were considered for this analysis. Warrant 7 relates to crash experience and was also considered. Warrants 4, 5, 6, 8 & 9 were not applicable for this analysis. Route 1 has posted speed limit exceeding 40 mph, the traffic volumes in the 70 percent threshold of vehicles per hour on higher-volume minor-street approach were used in analysis.

Table 7 below summarizes the signal warrant results at the intersection of Route 1 and Route 637.

<b>Table 7 - Signal Warrant Results (Route 1 at Route 637)</b>		
MUTCD Warrants Existing Conditions	1 - Eight-hour Volume	Not Satisfied
	2 - Four-hour Volume	<b>Satisfied</b>
	3 - Peak hour Volume	<b>Satisfied</b>
	4 – Pedestrian Volume	Not Applicable
	5 – School Crossing	Not Applicable
	6 – Coordinated Signal System	Not Applicable
	7 – Crash Experience	Not Satisfied
	8 – Roadway Network	Not Applicable
	9 – Intersection Near a Grade Crossing	Not Applicable

The analysis indicates that **two (2) warrants for signalization are satisfied. These include Warrant 2 (four hour volume), and Warrant 3 (peak hour volume).** However, the eight hour volume warrant was not satisfied. Additional information can be found in the Supporting Documentation section of the Appendix.

### **6.1.2 Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)**

The westbound approach of the intersection of Route 1 at Route 639 is currently operating at LOS F during the AM and PM peaks. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning left from the minor approach.

<b>Table 8 - Level of Service Rte. 1 at Rte. 639 (unsignalized)</b>			
<b>2014 Existing</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	<b>WB Overall</b>	<b>F (Err)</b>	<b>F (753.5)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.0)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	<b>SBLT</b>	E (40.9)	A (1.8)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>D (25.9)</b>	<b>A (0.9)</b>
LOS (delay in seconds)			

DAVENPORT also performed a thirteen (13) hour turning movement traffic count at the intersection of Route 1 and Route 639. The full report for this traffic count can be found in the Appendix.

Signal warrants 1-3 are related to traffic volumes and were considered for this analysis. Warrant 7 relates to crash experience and was also considered. Warrants 4, 5, 6, 8 & 9 were not applicable for this analysis. Route 1 has posted speed limit exceeding 40 mph, the traffic volumes in the 70 percent threshold of vehicles per hour on higher-volume minor-street approach were used in analysis.

Table 9 summarizes the signal warrant results at the intersection of Route 1 and Route 639.

<b>Table 9 - Signal Warrant Results (Route 1 at Route 639)</b>		
MUTCD Warrants Existing Conditions	1 - Eight-hour Volume	Not Satisfied
	<b>2 - Four-hour Volume</b>	<b>Satisfied</b>
	<b>3 - Peak hour Volume</b>	<b>Satisfied</b>
	4 – Pedestrian Volume	Not Applicable
	5 – School Crossing	Not Applicable
	6 – Coordinated Signal System	Not Applicable
	7 – Crash Experience	Not Satisfied
	8 – Roadway Network	Not Applicable
	9 – Intersection Near a Grade Crossing	Not Applicable

The analysis indicates that **two (2) warrants for signalization are satisfied. These include Warrant 2 (four hour volume), and Warrant 3 (peak hour volume).** However, the eight hour volume warrant was not satisfied. A signal warrant analysis was previously carried out by the Virginia Department of Transportation (VDOT) in October 2012 for the intersection of Route 1 at Route 639. This study found that the four-hour and one-hour warrants were satisfied at the time; however, signalization was ultimately not recommended because observed queues on Route 639 were short-lived during peak hours. Additional information can be found in the Supporting Documentation section of the Appendix.

### **6.1.3 Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)**

The eastbound approach of the intersection of Route 639 at Route 637 is currently operating at LOS B during the AM and PM peaks.

<b>Table 10 - Level of Service Rte. 637 at Rte. 639 (unsignalized)</b>			
<b>2014 Existing</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	B (14.6)	B (12.0)
	<b>WB Overall</b>	B (12.1)	B (12.4)
<b>Rte. 637</b>	<b>NB Overall</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	A (0.0)	A (0.1)

LOS (delay in seconds)

## **7.0 Short Term Future Analysis**

In order to improve the safety and operation of traffic in the study area, two improvement alternatives were assessed for future short term conditions. These include:

- Alternative 1 – Consolidation of Traffic to Route 637
- Alternative 2 – Consolidation of Traffic to Route 639

A sensitivity analysis was carried out for Alternatives 1 and 2 to determine the amount of time each alternative would provide an acceptable level of service along Route 1, one year prior to failure. Yearly analysis iterations were performed up until failure was observed at the proposed signalized intersection of each alternative.

### **7.1 Future Traffic Volumes**

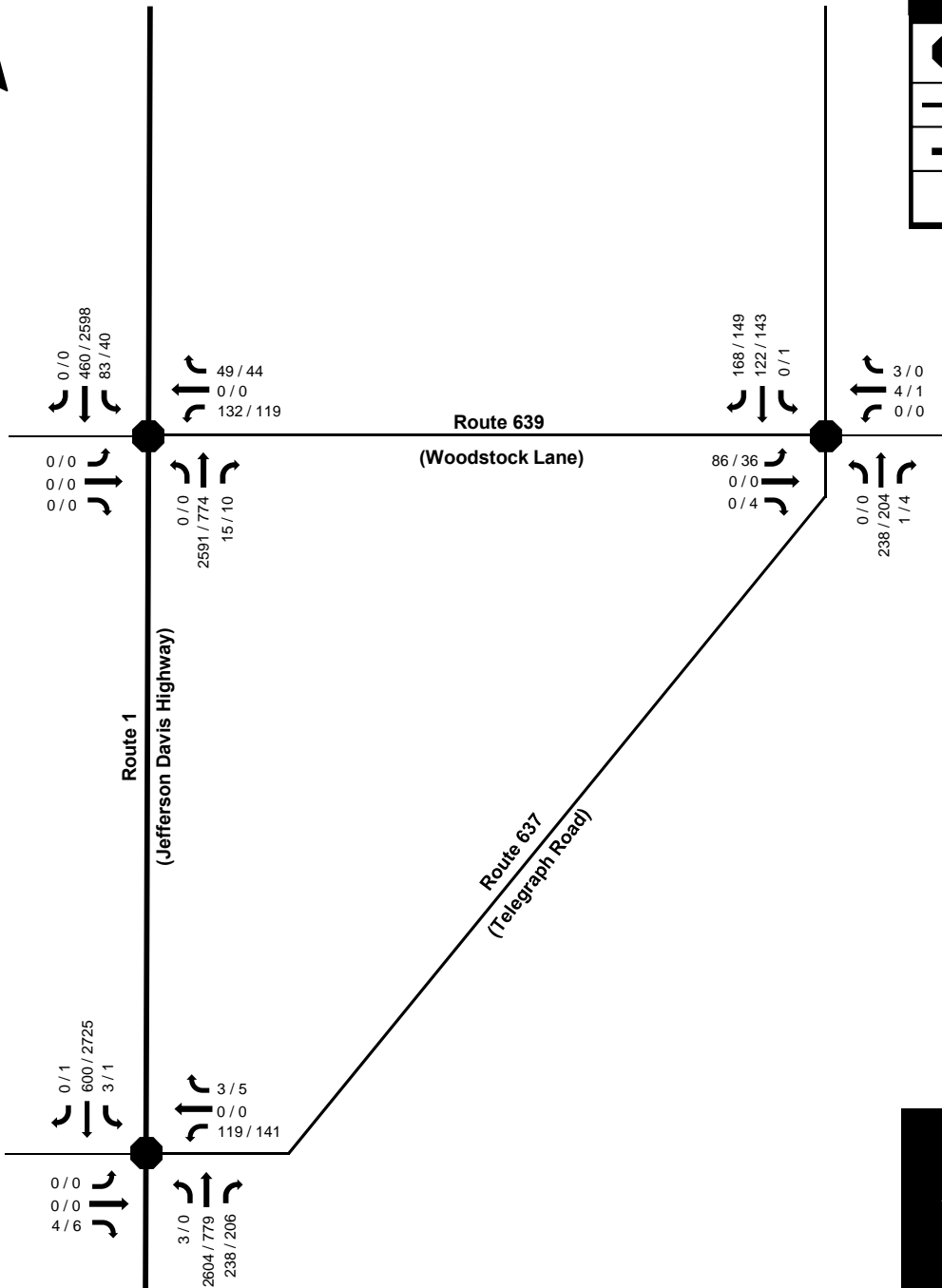
Future growth rates were provided by VDOT and were shown previously in Table 4 located on page 15. The 3.4% growth rate along Route 1 was used per conclusions derived from the Route 1 Corridor Study report conducted in March 2013. A 2.5% growth rate for other minor approaches was applied per VDOT guidance. The growth rates were compounded annually to represent future volumes. Growth rates were not applied to the approved development traffic. Future traffic volumes were obtained by summing the future no build volumes and the approved development trips. A minimal volume imbalance along Route 1 is present as a result of the implementation of differing growth rates upon Route 1 and Routes 637 & 639. An analysis year of 2024 was determined to be the final year of an acceptable level of service along Route 1 in short term conditions. Figure 7 shows 2024 future traffic volumes projected for the AM and PM peaks with existing lane geometry.

The improvement Alternatives 1 and 2 were analyzed by rerouting traffic volumes, as appropriate. Alternative 1 – Consolidation of Traffic to Route 637 – involves creating a right-in right-out condition for Route 639 to prohibit left turns. Southbound left turns from Route 1 and westbound left turns from Route 639 were rerouted to the intersection of Route 1 and Route 637. Likewise, Alternative 2 – Consolidation of Traffic to Route 639 – involves a right-in right-out condition on Route 637 to prohibit left turns. Southbound and westbound left turns at this intersection were rerouted to the intersection of Route 1 and Route 639. More information can be found in the Traffic Volume Data section of the appendix.

The following sections provide a general description of the alternatives, discussion of any operational changes and improvements required, and provide preliminary detail on the foreseen advantages and disadvantages to each proposed alternative. A conceptual design and opinion of probable construction cost was developed for the improvement alternatives. The level of service results for each alternative is provided at the end of the discussion of short term improvements.



LEGEND	
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
AM/ PM PEAKS	



Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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**FIGURE 7**  
2024 VOLUMES WITH  
EXISTING LANE  
GEOMETRY

VDOT OPERATIONAL AND SAFETY  
STUDY - RTES 1/637/639  
STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
CRO 12-092



## 7.2 2024 Future Conditions (No Improvements)

The level of service results for the projected 2024 no improvement conditions are discussed by intersection below.

### ***Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)***

The westbound approach of the intersection of Route 1 at Route 637 is anticipated to continue operating at LOS F during the AM and PM peaks in 2024 future no build conditions. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning left from the minor approach.

<b>Table 11 - Level of Service Rte. 1 at Rte. 637 (unsignalized)</b>			
<b>2024 Future No Improvements</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 637</b>	<b>EB Overall</b>	<b>B (11.2)</b>	<b>E (46.6)</b>
	<b>WB Overall</b>	<b>F (Err)</b>	<b>F (Err)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.9)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.4)</b>	<b>A (0.0)</b>
	<b>SBLT</b>	A (7.3)	A (0.5)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>A (3.7)</b>	<b>A (0.3)</b>

### ***Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)***

The westbound approach of the intersection of Route 1 at Route 639 is also expected to continue operating at LOS F during the AM and PM peaks in 2024 future conditions. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning left from the minor approach.

**Table 12 - Level of Service  
Rte. 1 at Rte. 639 (unsignalized)**

2024 Future No Improvements		AM Peak	PM Peak
Rte. 639	EB Overall	A (0.0)	A (0.0)
	WB Overall	F (Err)	F (Err)
Rte. 1	NBLT	A (0.0)	A (0.0)
	NBTR	A (0.0)	A (0.0)
	NB Overall	A (0.0)	A (0.0)
	SBLT	F (485.9)	A (6.4)
	SBTR	A (0.0)	A (0.0)
	SB Overall	F (302.2)	A (3.3)

**Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)**

The eastbound approach of the intersection of Route 639 at Route 637 is anticipated to operate at LOS C during the AM peak and LOS B on the westbound approach during the PM peak in 2024 no improvement conditions.

**Table 13 - Level of Service  
Rte. 637 at Rte. 639 (unsignalized)**

2024 Future No Improvements		AM Peak	PM Peak
Rte. 639	EB Overall	C (19.4)	B (13.5)
	WB Overall	B (13.4)	B (13.7)
Rte. 637	NB Overall	A (0.0)	A (0.0)
	SB Overall	A (0.0)	A (0.1)
LOS (delay in seconds)			

### 7.3 Alternative 1 – Consolidation of Traffic to Route 637

This improvement alternative consolidates left-turning traffic to Route 637 by creating a right-in right-out condition at Route 1 and Route 639. Left-turning vehicles at the intersection of Route 1 and Route 639 were rerouted to the intersection of Route 1 and Route 637. Figure 8A illustrates the existing volumes under Alternative 1 conditions while Figure 8B illustrates 2024 future volumes under Alternative 1 geometry.

#### 7.3.1 Alternative 1 Signal Warrant Analysis

A signal warrant analysis was conducted based upon existing volumes at the intersection of Route 1 and Route 637. The analysis also included the diverted trips as a result of the consolidation of traffic to Route 637. Given that Route 1 has posted speed limit greater than 40 mph, the traffic volumes in the 70 percent threshold of vehicles per hour on higher-volume minor-street approach were used in analysis. For the purposes of this signal warrant analysis, right turn volumes on the minor street were excluded. Table 17 below summarizes the signal warrant results at the intersection of Route 1 and Route 637 in Alternative 1 conditions.

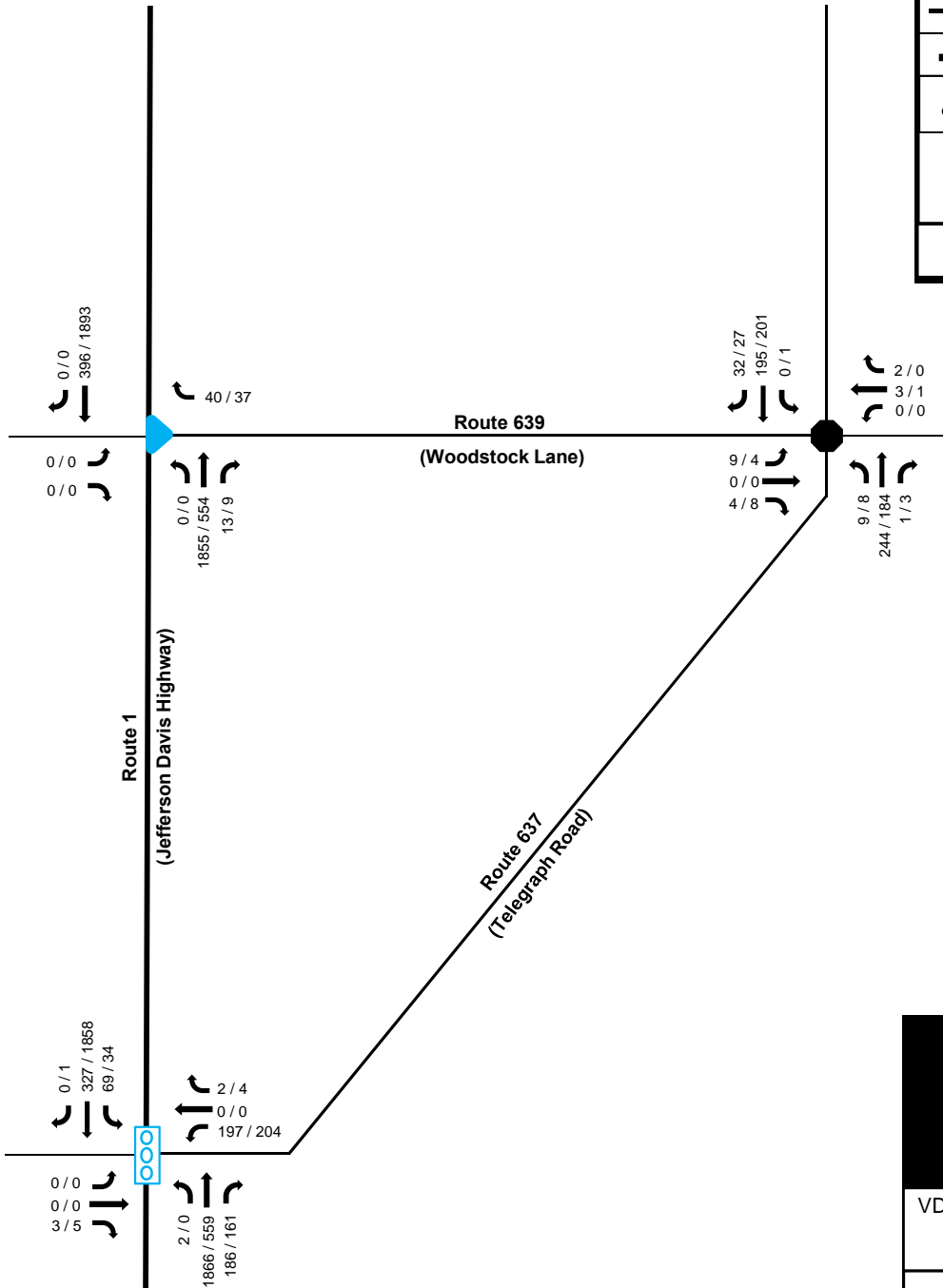
<b>Table 17- Signal Warrant Results (Route 1 at Route 637)</b>		
MUTCD Warrants Existing Volumes Alternative 1 Conditions	<b>1 - Eight-hour Volume</b>	<b>Satisfied</b>
	<b>2 - Four-hour Volume</b>	<b>Satisfied</b>
	<b>3 - Peak hour Volume</b>	<b>Satisfied</b>
	4 – Pedestrian Volume	Not Applicable
	5 – School Crossing	Not Applicable
	6 – Coordinated Signal System	Not Applicable
	7 – Crash Experience	Not Satisfied
	8 – Roadway Network	Not Applicable
	9 – Intersection Near a Grade Crossing	Not Applicable

The analysis indicates that **three (3) warrants for signalization are satisfied. These include Warrant 1 (Eight Hour Volume), Warrant 2 (Four Hour Volume), and Warrant 3 (Peak Hour Volume).** The eight hour warrant table can be found in the Appendix.

The Manual on Uniform Traffic Control Devices (MUTCD) indicates that a traffic signal can be considered when one of these warrants is met. Our analysis indicated that **three (3) signal warrants were met.** The analysis indicates that traffic volumes at the intersection give reason to consider installing a traffic control signal to improve operating conditions. In order to improve the operation and safety of the intersection, it is recommended that a traffic signal be installed at this intersection.



LEGEND	
	SIGNALIZED INTERSECTION
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	RIGHT IN / RIGHT OUT
BLACK = EXISTING BLUE = PROPOSED	
AM/ PM PEAKS	



**FIGURE 8A**  
 2014 VOLUMES -  
 CONSOLIDATION TO  
 ROUTE 637

VDOT OPERATIONAL AND SAFETY  
 STUDY - RTES 1/637/639  
 STAFFORD COUNTY, VA

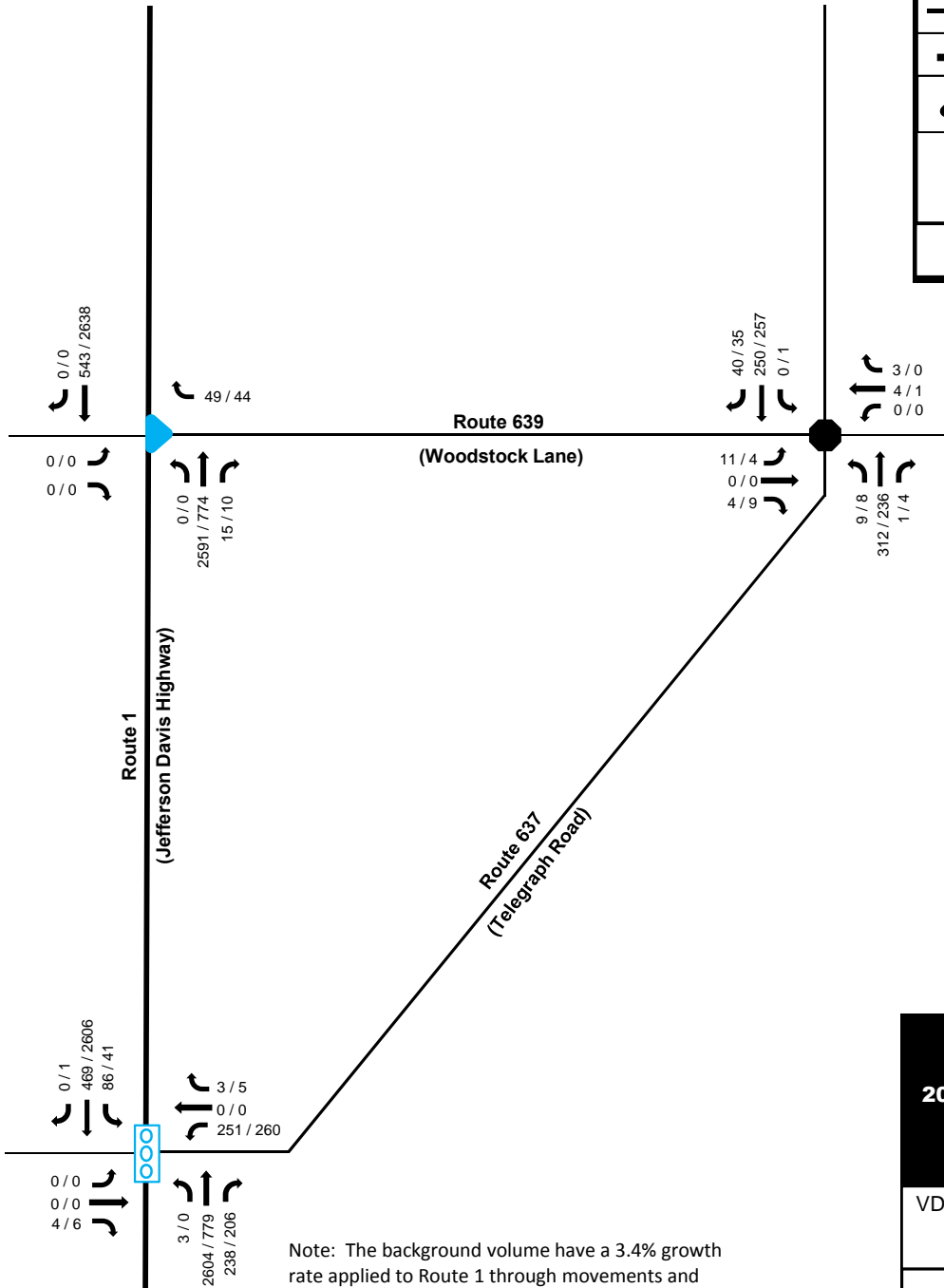
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LEGEND	
	SIGNALIZED INTERSECTION
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	RIGHT IN / RIGHT OUT
BLACK = EXISTING BLUE = PROPOSED	
AM/ PM PEAKS	



Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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**FIGURE 8B**  
**2024 FUTURE VOLUMES**  
**ALTERNATIVE 1**

VDOT OPERATIONAL AND SAFETY  
 STUDY - RTES 1/637/639  
 STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
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### 7.3.2 Alternative 1 Level of Service Analysis

The level of service results for the Alternative 1 improvement scenario in 2024 conditions are discussed by intersection below.

#### **Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)**

Based upon the resulting signal warrant analysis providing that the installation of a signal is warranted in future conditions, Alternative 1 analysis included signalization of this existing intersection. With the signalization of this intersection in place it is anticipated to operate at LOS E during the AM peak and LOS D during the PM peaks under Alternative 1 improvement conditions.

<b>Table 14 - Level of Service Rte. 1 at Rte. 637 (signalized)</b>			
<b>2024 Future Alternative 1 - Consolidation of Traffic to Rte. 637</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 637</b>	<b>EB Overall</b>	<b>E (69.7)</b>	<b>E (73.9)</b>
	WBL	F (121.3)	F (117.7)
	WBTR	F (119.5)	F (110.7)
	<b>WB Overall</b>	<b>F (120.4)</b>	<b>F (114.2)</b>
<b>Rte. 1</b>	NBL	A (4.0)	A (0.0)
	NBT	F (83.3)	A (5.7)
	NBR	A (4.9)	A (4.9)
	<b>NB Overall</b>	<b>E (75.7)</b>	<b>A (5.5)</b>
	SBL	F (260.8)	A (3.2)
	SBTR	A (2.6)	E (64.9)
	<b>SB Overall</b>	<b>E (62.3)</b>	<b>E (63.3)</b>
	<b>Intersection Overall</b>	<b>E (76.6)</b>	<b>D (52.5)</b>

LOS (delay in seconds)

**Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)**

The westbound approach of the intersection of Route 1 at Route 639 is expected to operate at LOS F during the AM peak and LOS B in the PM peak in 2024 Alternative 1 improvement conditions. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning from the minor approach in the AM peak hour due to heavy northbound through movements on Route 1.

<b>Table 15 - Level of Service Rte. 1 at Rte. 639 (unsignalized)</b>			
<b>2024 Future Alternative 1- Consolidation of Traffic to Rte. 637</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	<b>WB Overall (Right Turns Only)</b>	<b>F (204.7)</b>	<b>B (13.5)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.0)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	<b>SBT</b>	A (0.0)	A (0.0)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
LOS (delay in seconds)			

**Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)**

The eastbound approach of the intersection of Route 639 at Route 637 is anticipated to operate at LOS C during the AM peak and the westbound approach is anticipated to operate at LOS C during the PM peak under Alternative 1 improvement conditions.

<b>Table 16 - Level of Service Rte. 637 at Rte. 639 (unsignalized)</b>			
<b>2024 Future Alternative 1- Consolidation of Traffic to Rte. 637</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	C (15.7)	B (11.6)
	<b>WB Overall</b>	C (15.6)	C (16.2)
<b>Rte. 637</b>	<b>NB Overall</b>	A (1.0)	A (1.0)
	<b>SB Overall</b>	A (0.0)	A (0.1)
LOS (delay in seconds)			

### **7.3.3 Alternative 1 Recommendations**

The following recommendations are proposed for Alternative 1 – Consolidation of Traffic to Route 637:

- Signalization of Route 1 at Route 637.
- Right-in right-out condition at Route 1 and Route 639.
- A westbound left turn lane on Route 637 with approximately 300 feet of storage plus appropriate taper.
- A southbound left turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.
- A northbound right turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.
- A northbound left turn lane on Route 1 at Route 637 with 100 feet of storage plus appropriate taper.

With the above mentioned improvements in place, the intersection of Route 1 at Route 637 is anticipated to operate at LOS E during the AM peak and LOS D during the PM peak. The westbound 95<sup>th</sup> percentile queues on Route 637 are anticipated to be contained within the proposed storage during peak periods.

Figure 9 presents the conceptual plan for Alternative 1.





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PROJECT: 13-368  
 DATE: 09/10/14  
 DESIGNED BY: JGT  
 DRAWN BY: JGT  
 CHECKED BY: JTW  
 SCALE: AS NOTED

NO.	DATE	REVISIONS	DESCRIPTION

CLIENT:  
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PROJECT:  
 VDOT INTERSECTION  
 OPERATIONAL AND  
 SAFETY ANALYSIS  
 ROUTES 1/637/639,  
 STAFFORD COUNTY, VA

TITLE:  
 ALTERNATIVE 1  
 SHORT TERM  
 IMPROVEMENT  
 CONCEPT

SHEET NO.  
**FIGURE 9**

### **7.3.4 Opinion of Probable Cost: Alternative 1 – Consolidation of Traffic to Route 637**

An opinion of probable cost was determined for the short term improvement scenario of Alternative 1. The cost estimate was assembled using 2013 VDOT statewide averages for roadway line items and with direction from VDOT staff. The cost of construction along with PE, CE and contingency considerations for the improvements set forth under Alternative 1 is estimated to be \$4,450,000. A detailed line item breakdown of the engineer's estimate may be found in the supporting documentation section of the Appendix. This estimate is not considered part of the sealed document and is being offered with the caveats noted on the line item estimate.

### **7.3.5 Alternative 1 Advantages & Disadvantages**

Some of the advantages of this option include:

1. Signalizing Route 1 and Route 637 and modifying Route 1 and Route 639 to a right-in right-out has the potential to reduce crashes and improve the safety of both intersections.
2. Improved operation and reduced delay for the minor street approaches of Routes 637 and 639 at Route 1.
3. Widening necessary for improvements will have minimal impact on surrounding businesses.
4. Operation of intersection of Route 637 and Route 639 is not adversely impacted by this improvement alternative.

Some of the disadvantages include:

1. Left turning traffic at the intersection of Route 1 and Route will be rerouted to the intersection of Route 1 and Route 637. This will require additional travel time for left turning vehicles at the intersection of Route 1 and Route 639.
2. Close proximity of adjacent signal with Port Aquia Drive to the south – approximately 900 feet. A waiver from VDOT must be attained to implement this improvement.
3. Sharp angle is present at intersection of Route 637 with Route 1 for westbound right turning traffic.
4. Additional right-of-way will be required.
5. Utility relocation may be required.

## 7.4 Alternative 2 – Consolidation of Traffic to Route 639

This improvement alternative consolidates left-turning traffic to Route 639 by creating a right-in right-out condition at Route 1 and Route 637. Left-turning vehicles at the intersection of Route 1 and Route 637 were rerouted to the intersection of Route 1 and Route 639. Figure 10A illustrates the existing volumes under Alternative 2 conditions while Figure 8B illustrates 2024 future volumes under Alternative 2 geometry.

### 7.4.1 Alternative 2 Signal Warrant Analysis

A signal warrant analysis was conducted based upon existing volumes at the intersection of Route 1 and Route 639. The analysis also included the diverted trips as a result of the consolidation of traffic to Route 639. Given that Route 1 has posted speed limit greater than 40 mph, the traffic volumes in the 70 percent threshold of vehicles per hour on higher-volume minor-street approach were used in analysis. For the purposes of this signal warrant analysis, right turn volumes on the minor street were excluded. Table 21 below summarizes the signal warrant results at the intersection of Route 1 and Route 639 in Alternative 2 conditions.

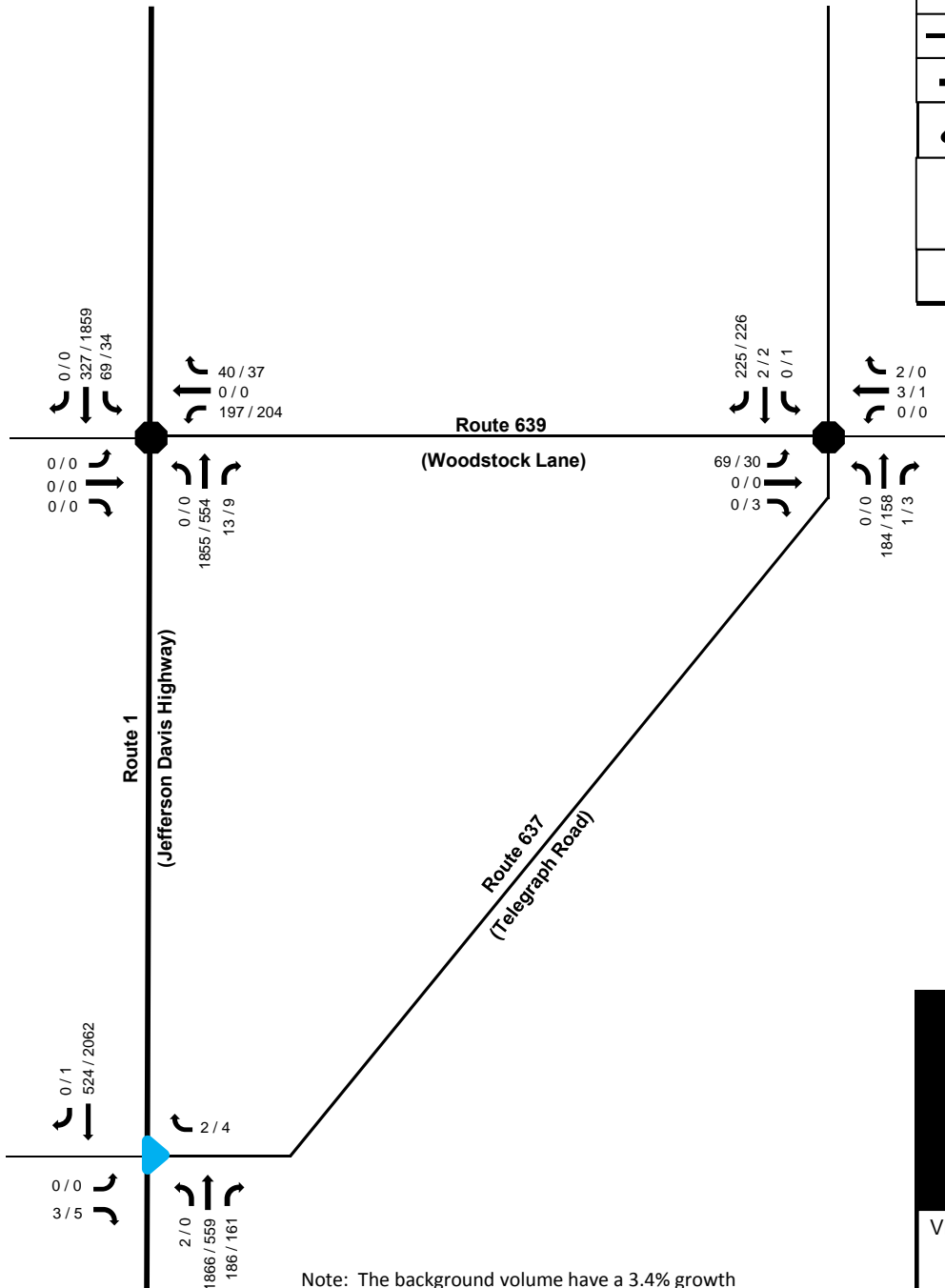
<b>Table 21 - Signal Warrant Results (Route 1 at Route 637)</b>		
MUTCD Warrants Existing Volumes Alternative 2 Conditions	<b>1 - Eight-hour Volume</b>	<b>Satisfied</b>
	<b>2 - Four-hour Volume</b>	<b>Satisfied</b>
	<b>3 - Peak hour Volume</b>	<b>Satisfied</b>
	4 – Pedestrian Volume	Not Applicable
	5 – School Crossing	Not Applicable
	6 – Coordinated Signal System	Not Applicable
	7 – Crash Experience	Not Satisfied
	8 – Roadway Network	Not Applicable
	9 – Intersection Near a Grade Crossing	Not Applicable

The analysis indicates that **three (3) warrants for signalization are satisfied. These include Warrant 1 (eight hour volume), Warrant 2 (four hour volume), and Warrant 3 (peak hour volume).** The eight hour warrant table can be found in the Appendix.

The Manual on Uniform Traffic Control Devices (MUTCD) indicates that a traffic signal can be considered when one of these warrants is met. Our analysis indicated that **three (3) signal warrants were met.** The analysis indicates that traffic volumes at the intersection give reason to consider installing a traffic control signal to improve operating conditions. In order to improve the operation and safety of the intersection, it is recommended that a traffic signal be installed at this intersection.



LEGEND	
	UNSIGNALED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	RIGHT IN / RIGHT OUT
BLACK = EXISTING BLUE = PROPOSED	
AM/ PM PEAKS	



Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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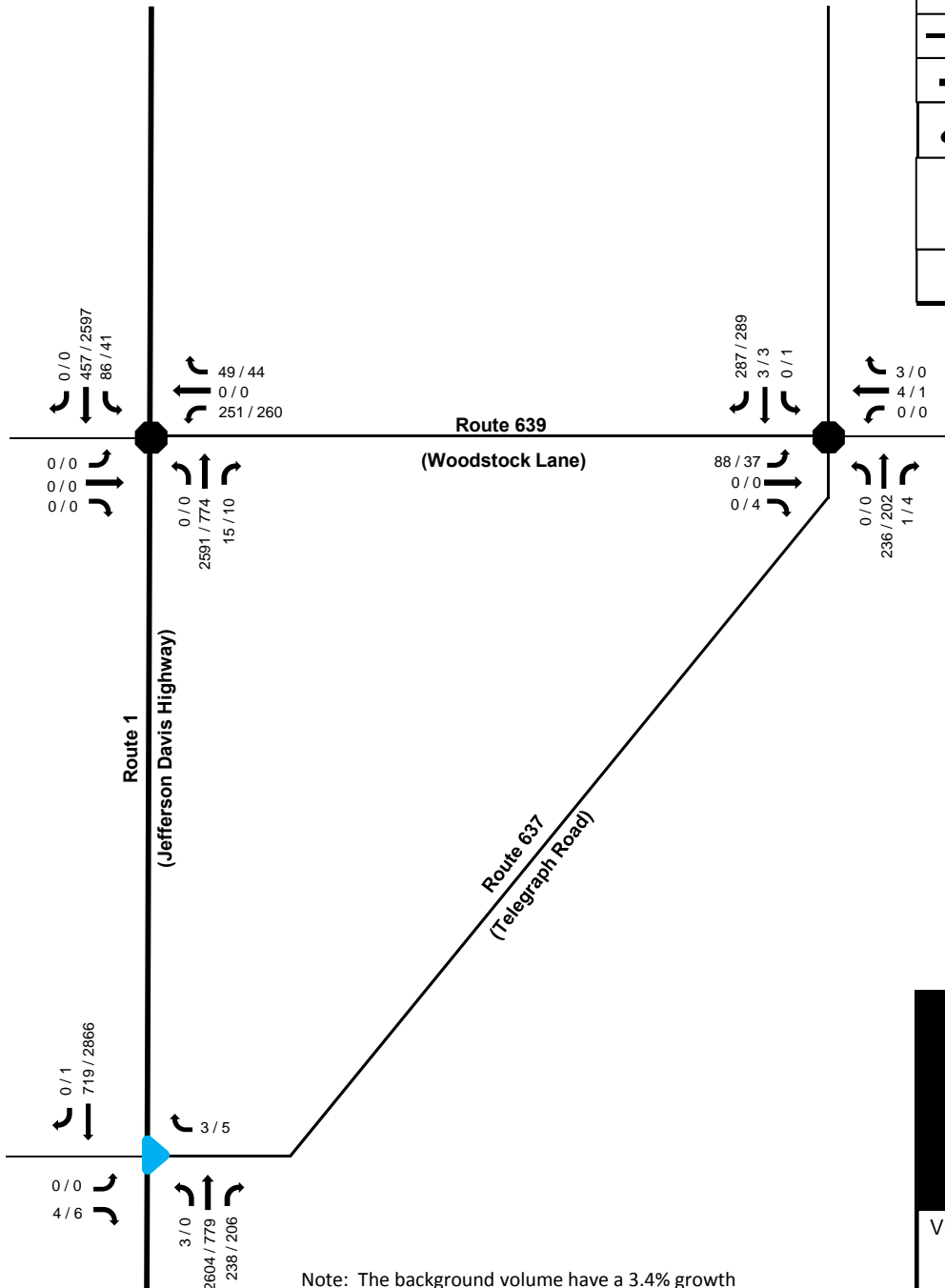
FIGURE 10A  
2014 VOLUMES -  
CONSOLIDATION TO  
ROUTE 639

VDOT OPERATIONAL AND SAFETY  
STUDY - RTES 1/637/639  
STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
CRO 12-092



LEGEND	
	UNSIGNALED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	RIGHT IN / RIGHT OUT
BLACK = EXISTING BLUE = PROPOSED	
AM/ PM PEAKS	



Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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**FIGURE 10B**  
**2024 FUTURE**  
**VOLUMES**  
**ALTERNATIVE 2**

VDOT OPERATIONAL AND SAFETY  
 STUDY - RTES 1/637/639  
 STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
 CRO 12-092

### 7.4.2 Alternative 2 Level of Service Analysis

The level of service results for the Alternative 2 improvement scenario in 2024 conditions are discussed by intersection below.

#### **Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)**

In Alternative 2 2024 future improvement conditions, this intersection is anticipated to operate at LOS F during the AM peak on the westbound approach and LOS F during the PM peak on the eastbound approach. The LOS F condition is mainly due to lack of sufficient gaps for vehicles turning from the minor approach due to heavy through movements on Route 1.

<b>Table 18 - Level of Service Rte. 1 at Rte. 637 (unsignalized)</b>			
<b>2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 637</b>	<b>EB Overall</b>	<b>B (11.9)</b>	<b>F (77.3)</b>
	<b>WB Overall</b>	<b>F (52.3)</b>	<b>B (13.3)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (1.1)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.5)</b>	<b>A (0.0)</b>
	<b>SBLT</b>	A (0.0)	A (0.0)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	A (0.0)	<b>A (0.0)</b>
<b>LOS (delay in seconds)</b>			

**Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)**

Based upon the resulting signal warrant analysis providing that the installation of a signal is warranted in future conditions, Alternative 2 analysis included signalization of this existing intersection. With the signalization of this intersection in place it is anticipated to operate at LOS E during the AM peak and LOS D in the PM peak under Alternative 2 improvement conditions.

<b>Table 19 - Level of Service Rte. 1 at Rte. 639 (signalized)</b>			
<b>2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	<b>WBL</b>	F (146.6)	F (124.3)
	<b>WBTR</b>	F (93.3)	F (93.6)
	<b>WB Overall</b>	<b>F (120.8)</b>	<b>F (109.4)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.0)	A (0.0)
	<b>NBTR</b>	E (69.5)	A (5.0)
	<b>NB Overall</b>	<b>E (69.5)</b>	<b>E (5.0)</b>
	<b>SBL</b>	F (199.0)	A (2.8)
	<b>SBTR</b>	A (1.8)	D (40.9)
	<b>SB Overall</b>	<b>D (51.4)</b>	<b>D (39.9)</b>
	<b>Intersection Overall</b>	<b>E (71.4)</b>	<b>D (39.1)</b>
	<b>LOS (delay in seconds)</b>		

**Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)**

The eastbound approach of the intersection of Route 639 at Route 637 is anticipated to operate at LOS C during the AM peak and the westbound approach is anticipated to operate at LOS B during the PM peak under Alternative 2 improvement conditions.

<b>Table 20 - Level of Service Rte. 637 at Rte. 639 (unsignalized)</b>			
<b>2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 639</b>	<b>EB Overall</b>	C (17.5)	B (13.2)
	<b>WB Overall</b>	B (13.7)	B (14.9)
<b>Rte. 637</b>	<b>NB Overall</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	A (0.0)	A (0.1)
<b>LOS (delay in seconds)</b>			

### **7.4.3 Alternative 2 Recommendations**

The following are recommendations for Alternative 2 – Consolidation of Traffic to Route 639:

- Signalization of Route 1 at Route 639.
- Right-in right-out condition at Route 1 and Route 637.
- A westbound left turn lane on Route 639 with approximately 300 feet of storage plus appropriate taper.
- A southbound left turn lane on Route 1 at Route 639 with 200 feet of storage plus appropriate taper.
- A northbound left turn lane on Route 1 at Route 639 with 100 feet of storage plus appropriate taper.

The intersection of Route 1 at Route 639 is anticipated to operate at LOS E during the AM peak and LOS D during the PM peak with this improvement option in place. Per SimTraffic simulations, the westbound 95<sup>th</sup> percentile queues on Route 639 are anticipated to extend to the intersection of Route 639 and Route 637 during the AM peak.

### **7.4.4 Alternative 2 Advantages/Disadvantages**

Some of the advantages of this option include:

1. Signalizing Route 1 and Route 639 and modifying Route 1 and Route 637 to a right-in right-out has the potential to reduce crashes and improve the safety of both intersections.
2. Improved operations and reduced delay for the minor street approaches of Routes 637 and 639 at Route 1.

Some of the disadvantages include:

1. An increase in delay will occur at the intersection of Route 637 and Route 639 as a result of rerouted traffic.
2. Constructability issues arise due to a steep slope on the west side of Route 1.
3. Known conflicts with existing gas and sewer utilities are present.
4. Additional right of way will be required.
5. Extensive westbound queues are present that reach the intersection of Route 637 and Route 639 impacting the operation of the intersection.

Figure 11 illustrates the conceptual design of the Alternative 2 improvements.





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 STAFFORD COUNTY, VA

TITLE:  
 ALTERNATIVE 2  
 SHORT TERM  
 IMPROVEMENT  
 CONCEPT

SHEET NO.  
**FIGURE 11**

#### **7.4.5 Opinion of Probable Cost: Alternative 2 – Consolidation of Traffic to Route 639**

An opinion of probable cost was determined for the short term improvement scenario Alternative 2. The cost estimate was assembled using 2013 VDOT statewide averages for roadway line items and per guidance provided from VDOT staff. Per the VDOT functional classification maps, the subject section of Route 1 is classified as an urban principal arterial. Also, given the right of way constraints and potential development along the corridor, the availability of right of way to accommodate ditches, drainage, etc. is limited. Therefore the conceptual design of this improvement alternative is proposed as an urban design with a closed drainage system. The cost of construction along with PE, CE and contingency considerations for the improvements set forth under Alternative 2 is estimated to be \$5,250,000. A detailed line item breakdown of the engineer's estimate may be found in the supporting documentation section of the Appendix. This estimate is not considered part of the sealed document and is being offered with the caveats noted on the line item estimate.

#### **7.4.6 Short Term Alternative Comparison**

Table 22 summarizes the two considered short term improvement alternatives advantages and disadvantages along with its implications to the surrounding area. Table 23 summarizes the overall level of service for each intersection under each improvement alternative. Tables 24-26 show the level of service per movement at each study intersection under each improvement scenario and Table 27-29 represents the queue summary for each short term alternative.



**Table 22 - Short Term Alternative Comparison**

Short Term Alternative	Description	Impacts	Year 2024 Intersection Operations (AM LOS, PM LOS)	Approximate Construction Cost	Advantages	Disadvantages
Alternative 1: Consolidation of Traffic to Route 637	<ul style="list-style-type: none"> <li>• Signalization of Route 1 at Route 637.</li> <li>• Right-in right-out condition at Route 1 and Route 639.</li> <li>• A westbound left turn lane on Route 637 with approximately 300 feet of storage plus appropriate taper.</li> <li>• A southbound left turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.</li> <li>• A northbound right turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.</li> <li>• A northbound left turn lane on Route 1 at Route 637 with 100 feet of storage plus appropriate taper.</li> </ul>	Environmental: Nearby wetlands not to be disturbed by widening	Rte. 1 @ Rte. 673 LOS E, LOS D  Rte. 1 @ Rte. 639 LOS F, LOS B  Rte. 637 @ Rte. 639 LOS C, LOS C	\$4,450,000.00	<ul style="list-style-type: none"> <li>• Signalizing Route 1 and Route 637 and modifying Route 1 and Route 369 to a right-in right-out has the potential to reduce crashes and improve the safety of both intersections.</li> <li>• Lowest cost alternative</li> <li>• Improved operation and reduced delay for the minor street approaches of Routes 637 and 639 at Route 1.</li> <li>• Operation of intersection of Route 637 and Route 639 is not adversely impacted by this improvement alternative.</li> <li>• Widening necessary for improvements will have minimal impact on surrounding businesses</li> </ul>	<ul style="list-style-type: none"> <li>• Close proximity of adjacent signal with Port Aquia Drive to the south – approximately 900 feet. A waiver from VDOT must be obtained to implement this improvement.</li> <li>• Sharp angle is present at intersection of Route 637 with Route 1 for westbound right turning traffic.</li> <li>• Additional right-of-way will be required.</li> <li>• Utility relocation may be required.</li> </ul>
		Cultural: Presence of nearby historical landmarks				
		Right-of-Way: Additional right-of-way and drainage and/or utility relocation may be required.				
		Surrounding Businesses: No nearby business present along Route 637				
Alternative 2: Consolidation of Traffic to Route 639	<ul style="list-style-type: none"> <li>• Signalization of Route 1 at Route 639.</li> <li>• Right-in right-out condition at Route 1 and Route 637.</li> <li>• A westbound left turn lane on Route 639 with approximately 300 feet of storage plus appropriate taper.</li> <li>• A southbound left turn lane on Route 1 at Route 639 with 250 feet of storage plus appropriate taper.</li> <li>• A northbound left turn lane on Route 1 at Route 639 with 100 feet of storage plus appropriate taper.</li> </ul>	Environmental: No known environmental impacts present	Rte. 1 @ Rte. 637 LOS F, LOS F  Rte. 1 @ Rte. 639 LOS E, LOS D  Rte. 637 @ Rte. 639 LOS C, LOS C	\$5,250,000.00	<ul style="list-style-type: none"> <li>• Signalizing Route 1 and Route 639 and modifying Route 1 and Route 637 to a right-in right-out has the potential to reduce crashes and improve the safety of both intersections.</li> <li>• Improved operation and reduced delay for the minor street approaches of Routes 637 and 639 at Route 1.</li> </ul>	<ul style="list-style-type: none"> <li>• Highest cost Alternative</li> <li>• Constructability issues arise due to a steep slope on the west side of Route 1.</li> <li>• Known conflicts with existing gas and sewer utilities are present.</li> <li>• Extensive westbound queues are present that reach the intersection of Route 637 and Route 639 impacting the operation of the intersection.</li> <li>• Additional right of way will be required.</li> </ul>
		Cultural: No known cultural impacts present				
		Right-of-Way: Nearby businesses and existing topography are anticipated to increase cost associated with Right of Way acquisition				
		Surrounding Businesses: Business to north of Route 639 will necessitate widening to occur on southern portion of Route 639 due to its proximity				

**Table 23 - Level of Service Summary  
Future Short Term Conditions**

AM Peak	2024 Future No Improvements (unsignalized)	2024 Future Alternative 1 - Consolidation of Traffic to Rte. 637 (signalized)	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639 (signalized)
Rte. 1 at Rte. 637	F (Err) WB Approach	E (76.6)	F (52.3) WB Approach
Rte. 1 at Rte. 639	F (Err) WB Approach	F (204.7) WB Approach	E (71.4)
Rte. 637 at Rte. 639	C (19.4) EB Approach	C (16.4) EB Approach	C (17.5) EB Approach
PM Peak	2024 Future No Improvements (unsignalized)	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637 (signalized)	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639 (signalized)
Rte. 1 at Rte. 637	F (Err) WB Approach	D (52.5)	F (77.3) EB Approach
Rte. 1 at Rte. 639	F (Err) WB Approach	B (13.5) WB Approach	D (39.1)
Rte. 637 at Rte. 639	B (13.7) WB Approach	C (16.2) WB Approach	B (14.9) WB Approach

LOS (delay in seconds)

Note for unsignalized conditions, LOS and delay indicates only minor street approach with longest delay

**Table 24 – Level of Service  
Rte. 1 at Rte. 637**

AM Peak		2024 Future No Improvements	2024 Future Alternative 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639
Rte. 637	EB Overall	<b>B (11.2)</b>	<b>E (69.7)</b>	<b>B (11.9)</b>
	WBL		F (121.3)	
	WBTR		F (119.5)	
	WBR			
	WB Overall	<b>F (Err)</b>	<b>F (120.4)</b>	<b>F (52.3)</b>
Rte. 1	NBL		A (4.0)	
	NBLT	A (0.9)		A (1.1)
	NBT		F (83.3)	
	NBTR	A (0.0)		A (0.0)
	NBR		A (4.9)	
	NB Overall	<b>A (0.4)</b>	<b>E (75.7)</b>	<b>A (0.5)</b>
	SBL		F (260.8)	
	SBLT	A (7.3)		A (0.0)
	SBT			
	SBTR	A (0.0)	A (2.6)	A (0.0)
	SB Overall	<b>A (3.7)</b>	<b>E (62.3)</b>	<b>A (0.0)</b>
	Intersection Overall		<b>E (76.6)</b>	
	PM Peak		2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637
Rte. 637	EB Overall	<b>E (46.6)</b>	<b>E (73.9)</b>	<b>F (77.3)</b>
	WBL		F (117.7)	
	WBTR		F (110.7)	
	WBR			
	WB Overall	<b>F (Err)</b>	<b>F (114.2)</b>	<b>B (13.3)</b>
Rte. 1	NBL		A (0.0)	
	NBLT	A (0.0)		A (0.0)
	NBT		A (5.7)	
	NBTR	A (0.0)		A (0.0)
	NBR		A (4.9)	
	NB Overall	<b>A (0.0)</b>	<b>A (5.5)</b>	<b>A (0.0)</b>
	SBL		A (3.2)	
	SBLT	A (0.5)		A (0.0)
	SBT			
	SBTR	A (0.0)	E (64.9)	A (0.0)
	SB Overall	<b>A (0.3)</b>	<b>E (63.3)</b>	<b>A (0.0)</b>
	Intersection Overall		<b>D (52.5)</b>	

LOS (delay in seconds)

**Table 25 – Level of Service  
Rte. 1 at Rte. 639**

AM Peak		2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639
Rte. 639	EB Overall	A (0.0)	A (0.0)	A (0.0)
	WBL			F (146.6)
	WBTR			F (93.3)
	WB Overall	F (Err)	F (204.7)	F (120.8)
Rte. 1	NBL			
	NBLT	A (0.0)	A (0.0)	A (0.0)
	NBT			
	NBTR	A (0.0)	A (0.0)	E (69.5)
	NB Overall	A (0.0)	A (0.0)	E (69.5)
	SBL			F (199.0)
	SBLT	F (485.9)		
	SBT		A (0.0)	
	SBTR	A (0.0)	A (0.0)	A (1.8)
	SB Overall	F (302.2)	A (0.0)	D (51.4)
	Intersection Overall			E (71.4)
PM Peak		2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639
Rte. 639	EB Overall	A (0.0)	A (0.0)	A (0.0)
	WBL			F (124.3)
	WBTR			F (93.6)
	WB Overall	F (Err)	B (13.5)	F (109.4)
Rte. 1	NBL			
	NBLT	A (0.0)	A (0.0)	A (0.0)
	NBT			
	NBTR	A (0.0)	A (0.0)	A (5.0)
	NB Overall	A (0.0)	A (0.0)	E (5.0)
	SBL			A (2.8)
	SBLT	A (6.4)		
	SBT		A (0.0)	
	SBTR	A (0.0)	A (0.0)	D (40.9)
	SB Overall	A (3.3)	A (0.0)	D (39.9)
	Intersection Overall			D (39.1)

LOS (delay in seconds)

**Table 26 – Level of Service  
Rte. 637 at Rte. 639 (unsignalized)**

AM Peak		2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639
Rte. 639	EB Overall	C (19.4)	C (15.7)	C (17.5)
	WB Overall	B (13.4)	C (15.6)	B (13.7)
Rte. 637	NB Overall	A (0.0)	A (1.0)	A (0.0)
	SB Overall	A (0.0)	A (0.0)	A (0.0)
PM Peak		2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639
Rte. 639	EB Overall	B (13.5)	B (11.6)	B (13.2)
	WB Overall	B (13.7)	C (16.2)	B (14.9)
Rte. 637	NB Overall	A (0.0)	A (1.0)	A (0.0)
	SB Overall	A (0.1)	A (0.1)	A (0.1)

LOS (delay in seconds)

**Table 27 - Queuing Summary**

Rte. 1 at Rte. 637

AM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte. 637	EBL/EBR	19	25	30		25	
	WBL/WBR	660	804	869			
	WBL			472	300		
	WBR					17	
Rte. 1	NBT/ NBL	156	691			668	
	NBT/NBR	155	622			638	
	SBT/ SBL	15	41				
	SBT/SBR	7	21	60			
	NBT			1446			
	NBT			1494			
	NBL			11	100		
	NBR			283	200		
	SBL			191	200		
SBT			60				
PM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte. 637	EBL/EBR	29	44	31		42	
	WBL/WBR	819	1143	263			
	WBL			237	300		
	WBR					17	
Rte. 1	NBT/NBR	2	4				
	SBT/ SBL	9	15				
	SBT/SBR			488			
	NBT			75			
	NBT			100			
	NBR			51	200		
	SBL			73	200		
	SBT			398			



**Table 28 - Queuing Summary**

Rte. 1 at Rte. 639

AM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte.639	WBL/WBR	1080	999			760	
	WBL					428	300
	WBR			196			
Rte. 1	NBT/NBR	2	5			1885	
	NBT					1899	
	SBT/ SBL	199	1697				
	SBT/SBR	92	1765			61	
	SBL					175	200
	SBT					55	
PM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte.639	WBL/WBR	938	1064			253	
	WBL					230	300
	WBR			60			
Rte. 1	NBT/NBR					95	
	NBT					77	
	SBL					85	200
	SBT			378		504	
	SBT/ SBL	155	276				
	SBT/SBR	127	199	351		530	

**Table 29 - Queuing Summary**

Rte. 637 at Rte. 639

AM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte. 639	EBL/EBR	137	41	41		65	
	WBL/WBT/WBR	50	99	27		28	
Rte. 637	NBL/NBT/NBR			18			
	SBL/SBT/SBR	593	544	2		79	
PM Peak		95th Percentile Queue (feet)					
		2014 Existing	2024 Future No Build	2024 Alternative 1	Alternative 1 Proposed Storage	2024 Alternative 2	Alternative 2 Proposed Storage
Rte. 639	EBL/EBR	48	44	30		48	
	WBL/WBT/WBR	12	17	9		13	
Rte. 637	NBL/NBT/NBR			17			
	SBL/SBT/SBR	288	592	5		2	

## **8.0 Long Term Future Analysis**

The 2040 long term alternatives were developed such that the need for accommodating future traffic was balanced against the need to minimize negative impacts on the surrounding environment. The long term alternatives considered included:

- Alternative 1 – Consolidation of Traffic to Route 637;
- Alternative 2 – Consolidation of Traffic to Route 639;
- Alternative 3 – Relocated Route 637; and
- Alternative 4 – Consolidated Left Turns.

The following sections provide a general description of the alternatives, discussion of any operational changes and improvements required, and provide preliminary detail on the foreseen advantages and disadvantages of each proposed alternative. A conceptual design and opinion of probable construction cost was developed for only the selected long term improvement alternative.

### **8.1 Future Traffic Volumes**

Future long term analyses for 2040 were carried out for the following alternatives:

- Alternative 1 – Consolidation of Traffic to Route 637;
- Alternative 2 – Consolidation of Traffic to Route 639;
- Alternative 3 – Relocated Route 637; and
- Alternative 4 – Consolidated Left Turns.

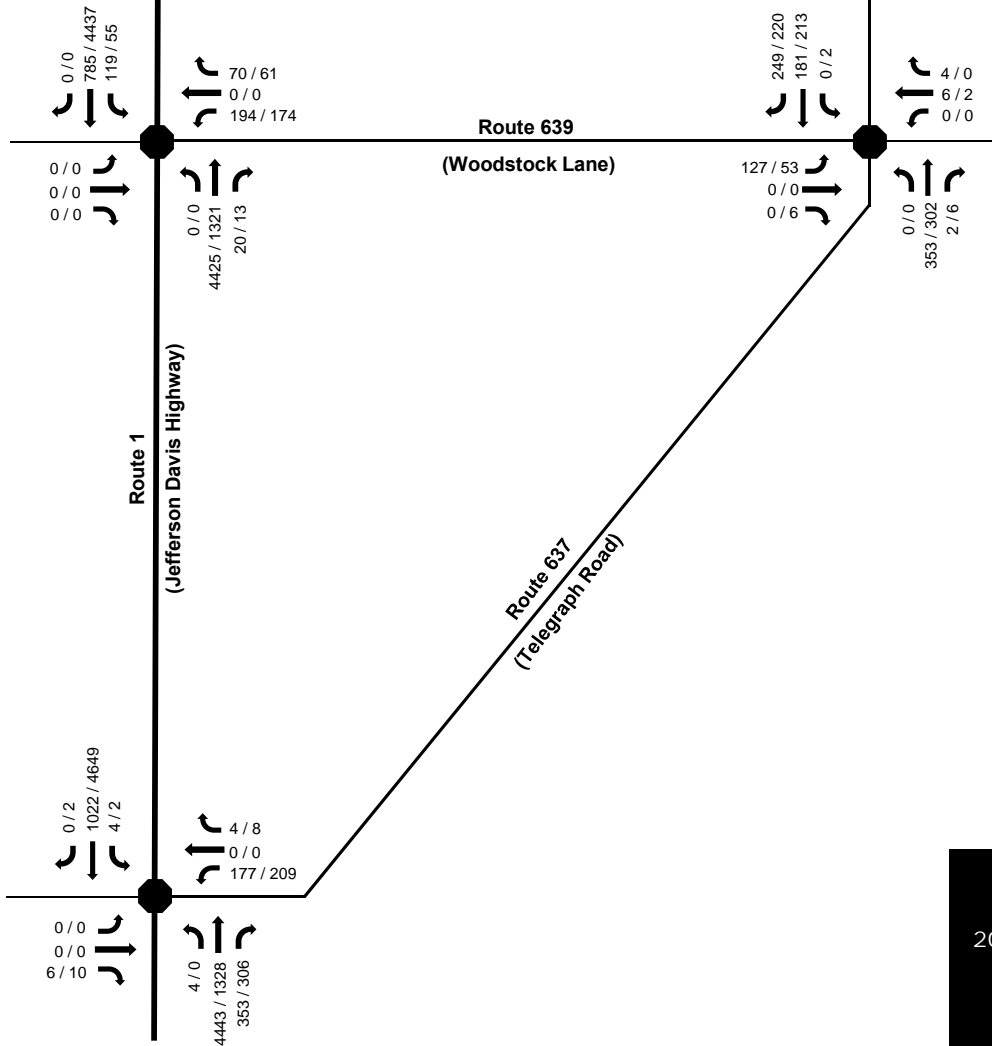
It was assumed that Route 1 will be widened to six lanes with a median for the long term 2040 analysis. Future traffic volumes were obtained by summing the future no build volumes and the approved development trips. A minimal volume imbalance along Route 1 is present as a result of the implementation of differing growth rates upon Route 1 and Routes 637 & 639.

The improvement alternatives were analyzed by rerouting traffic volumes, as appropriate. Alternative 3 – Relocated Route 637 - involves relocating Route 637 to the north (south of Route 639) and abandoning the existing segment connecting to Route 1. Alternative 4 – Consolidated Left Turns - involves rerouting the southbound left turns from both intersections to Route 639 and consolidating the westbound left turns from both intersections to Route 637. These improvement alternatives and details about the assumed rerouted traffic are discussed further in the Improvement Alternatives section of this report. In addition, more information can be found in the Traffic Volume Data section of the appendix.

The 2040 future traffic volumes under the six-lane Route 1 configuration are provided on Figure 12.



LEGEND	
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	AM/ PM PEAKS



**FIGURE 12**  
**2040 FUTURE VOLUMES**  
**WITH NO**  
**IMPROVEMENTS**

VDOT OPERATIONAL AND SAFETY STUDY - RTES 1/637/639 STAFFORD COUNTY, VA

PROJECT NUMBER VDOT - CRO 12-092

Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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## 8.2 2040 Level of Service (Future No Improvements)

The level of service results for the 2040 long term conditions with a six-lane Route 1 are discussed by intersection below. The intersections of Route 1 & Route 637 as well as Route 1 & Route 639 were analyzed as unsignalized with no movement restrictions in 2040 analysis results shown below.

### 8.2.1 Route 1 (Jefferson Davis Highway) at Route 637 (Telegraph Road – South Intersection)

In 2040 future conditions with no improvements beyond the six-laned Route 1, the westbound approach of Route 637 is anticipated to operate at LOS F during the AM and PM peaks.

<b>Table 30 – Level of Service Rte. 1 at Rte. 637</b>			
<b>2040 Future No Improvements (unsignalized)</b>		<b>AM Peak</b>	<b>PM Peak</b>
<b>Rte. 637</b>	<b>EB Overall</b>	<b>B (11.2)</b>	<b>F (63.4)</b>
	<b>WB Overall</b>	<b>F (Err)</b>	<b>F (Err)</b>
<b>Rte. 1</b>	<b>NBLT</b>	A (0.4)	A (0.0)
	<b>NBT</b>	A (0.0)	A (0.0)
	<b>NBTR</b>	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.1)</b>	<b>A (0.0)</b>
	<b>SBLT</b>	F (199.6)	A (0.4)
	<b>SBT</b>	A (0.0)	A (0.0)
	<b>SBTR</b>	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>F (50.5)</b>	<b>A (0.1)</b>
LOS (delay in seconds)			

### 8.2.2 Route 1 (Jefferson Davis Highway) at Route 639 (Woodstock Lane)

The westbound approach of the intersection of Route 1 at Route 639 is anticipated to operate at LOS F during the AM and PM peaks in 2040 future conditions with no improvements other than the six-lane Route 1.

<b>Table 31 – Level of Service Rte. 1 at Rte. 639</b>			
2040 Future No Improvements (unsignalized)		AM Peak	PM Peak
Rte. 639	EB Overall	<b>A (0.0)</b>	<b>A (0.0)</b>
	WB Overall	<b>F (Err)</b>	<b>F (Err)</b>
Rte. 1	NBLT	A (0.0)	A (0.0)
	NBT	A (0.0)	A (0.0)
	NBTR	A (0.0)	A (0.0)
	<b>NB Overall</b>	<b>A (0.0)</b>	<b>A (0.0)</b>
	SBLT	F (3713.9)	A (7.6)
	SBT	A (0.0)	A (0.0)
	SBTR	A (0.0)	A (0.0)
	<b>SB Overall</b>	<b>F (1295.1)</b>	<b>A (2.0)</b>
LOS (delay in seconds)			

### 8.2.3 Route 639 (Woodstock Lane) at Route 637 (Telegraph Road)

The eastbound approach of the intersection of Route 639 at Route 637 is anticipated to operate at LOS C during the AM and PM peaks in 2040 future conditions with no improvements other than the six-lane Route 1.

<b>Table 32 – Level of Service Rte. 637 at Rte. 639</b>			
2040 Future No Improvements (unsignalized)		AM Peak	PM Peak
Rte. 639	EB Overall	C (24.2)	C (16.9)
	WB Overall	B (14.7)	C (16.5)
Rte. 637	NB Overall	A (0.0)	A (0.0)
	SB Overall	A (0.0)	A (0.1)
LOS (delay in seconds)			

### **8.3 Long Term Improvement Alternatives**

Four (4) improvement alternatives were assessed for future long term conditions. These include:

- Alternative 1 – Consolidation of Traffic to Route 637;
- Alternative 2 – Consolidation of Traffic to Route 639;
- Alternative 3 – Relocated Route 637; and
- Alternative 4 – Consolidated Left Turns.

Details regarding these improvement alternatives and the level of service results are discussed below.

#### **8.3.1 Alternative 1 – Consolidation of Traffic to Route 637**

This improvement alternative consolidates left-turning traffic to Route 637 by creating a right-in right-out condition at Route 1 and Route 639. Left-turning vehicles at the intersection of Route 1 and Route 639 were rerouted to the intersection of Route 1 and Route 637. The following are recommendations for Alternative 1 – Consolidation of Traffic to Route 637:

- Realignment of Route 1 at Route 637.
- Signalization of Route 1 at Route 637.
- Right-in right-out condition at Route 1 and Route 639.
- Three (3) left turn lanes with approximately 2,000 feet of storage, and a shared through-right lane with 350 feet of storage westbound on Route 637 at Route 1.
- A southbound left turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.
- A northbound right turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.
- A northbound left turn lane on Route 1 at Route 637 with 100 feet of storage plus appropriate taper.

The intersection of Route 1 at Route 637 is anticipated to operate at LOS E during the AM peak and LOS D during the PM peak with this improvement option in place. Extensive westbound queues on Route 637 are anticipated to be present during the AM peak. Given this extensive queuing, this option was not pursued for long term conditions.

### **8.3.2 Alternative 2 – Consolidation of Traffic to Route 639**

Similar to Alternative 1, this improvement alternative consolidates left-turning traffic to Route 639 by creating a right-in right-out condition at Route 1 and Route 637. Left-turning vehicles at the intersection of Route 1 and Route 637 were rerouted to the intersection of Route 1 and Route 639. The following are recommendations for Alternative 2 – Consolidation of Traffic to Route 639:

- Signalization of Route 1 at Route 639.
- Right-in right-out condition at Route 1 and Route 637.
- Three (3) left turn lanes with full storage and a shared through-right lane westbound on Route 639 at Route 1.
- A southbound left turn lane on Route 1 at Route 639 with 400 feet of storage plus appropriate taper.
- A northbound left turn lane on Route 1 at Route 639 with 100 feet of storage plus appropriate taper.

The intersection of Route 1 at Route 639 is anticipated to operate at LOS F during the AM peak and LOS D during the PM peak with this improvement option in place. The westbound queues on Route 639 are anticipated to extend through the intersection of Route 639 and Route 637 during the AM peak. Given the extensive queuing anticipated with this improvement alternative, this option was not pursued for long term conditions.

### **8.3.3 Alternative 3 – Relocated Route 637**

This improvement alternative involves relocating Route 637 to the north, south of Route 639, and abandoning the existing segment connecting to Route 1. Left-turning vehicles at the intersection of Route 1 and Route 639 were rerouted to the relocated intersection of Route 1 and Route 637. The following are recommendations for Alternative 3 – Relocated Route 637:

- Construct a new roadway segment of Route 637 and abandon existing alignment.
- Signalization of relocated Route 1 at Route 637.
- Right-in right-out condition at Route 1 and Route 639.
- Three (3) left turn lanes with full storage and a right turn lane with 100 feet of storage westbound on Route 637 at Route 1.
- A southbound left turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.
- A northbound right turn lane on Route 1 at Route 637 with 200 feet of storage plus appropriate taper.



The intersection of Route 1 at Route 637 is anticipated to operate at LOS E during the AM peak and LOS D during the PM peak. The westbound queues on Route 639 are anticipated to extend to through intersection of Route 639 and Route 637 during the AM peak. Given the extensive queuing anticipated with this improvement alternative, this option was not pursued for long term conditions.

### **8.3.4 Alternative 4 – Consolidated Left Turns**

In this improvement alternative, the southbound left turns from Route 1 are consolidated to the intersection with Route 639, and the westbound left turns from both minor streets are consolidated to Route 637. All other left turns at both intersections are restricted. A concept for this improvement alternative is provided in Figure 13. This alternative allows for two-phase signals at both intersections to maximize green time on Route 1. The following are recommendations for Alternative 4 – Consolidated Left Turns:

- Realignment of Route 637 at Route 1.
- Signalization of Route 1 at Route 637.
- Signalization of Route 1 at Route 639.
- One (1) westbound left turn lane on Route 637 with 500 feet of storage and one shared left-through-right lane.
- A northbound right turn lane on Route 1 at Route 637 with 200 feet of storage.
- A southbound left turn lane on Route 1 at Route 639 with 300 feet of storage.

The intersection of Route 1 at Route 637 is anticipated to operate at LOS E during the AM and PM peaks. Route 1 at Route 639 is anticipated to operate at LOS D in the AM peak and LOS A in the PM peak. The westbound approach on Route 637 is anticipated to have a 95<sup>th</sup> percentile queue of 594 feet during the PM peak. The southbound left turns on Route 1 at Route 639 are anticipated to have a 95<sup>th</sup> percentile queue of 215 feet during the AM peak. Level of service summaries for each intersection can be found beginning on page 56.

Some of the advantages of this option include:

1. Signalization of both intersections has the potential to reduce crashes and improve the safety of the intersections.
2. Improved operation and reduced delay for the minor street approaches of Routes 637 and 639 at Route 1.
3. Improved operation and queuing compared to other improvement alternatives.

Some of the disadvantages include:

1. Left turning traffic at both intersections will be restricted and rerouted. Travel time differential as result of rerouting is anticipated to be minimal.
2. Close proximity of adjacent signal with Port Aquia Drive to Route 1 at Route 637 – approximately 900 feet.
3. Additional right-of-way and drainage and/or utility relocation may be required.
4. Lengthy queues along northbound through movements in the AM and southbound through movements in the PM are anticipated due to heavy peak hour traffic volumes.

#### **8.4 Long Term Alternative Selection**

Alternatives 1, 2 & 3 were all observed to experience excessive queuing on various approaches throughout the study area. Due to this, it is recommended that Alternative 4 be constructed as the long term improvement scenario. Tables 33-36 provide a level of service summary for Alternative 4 and Tables 37-40 illustrate the queuing summary for each study intersection. Figure 13 illustrates the concept plan of the proposed improvements under the Alternative 4 scenario.

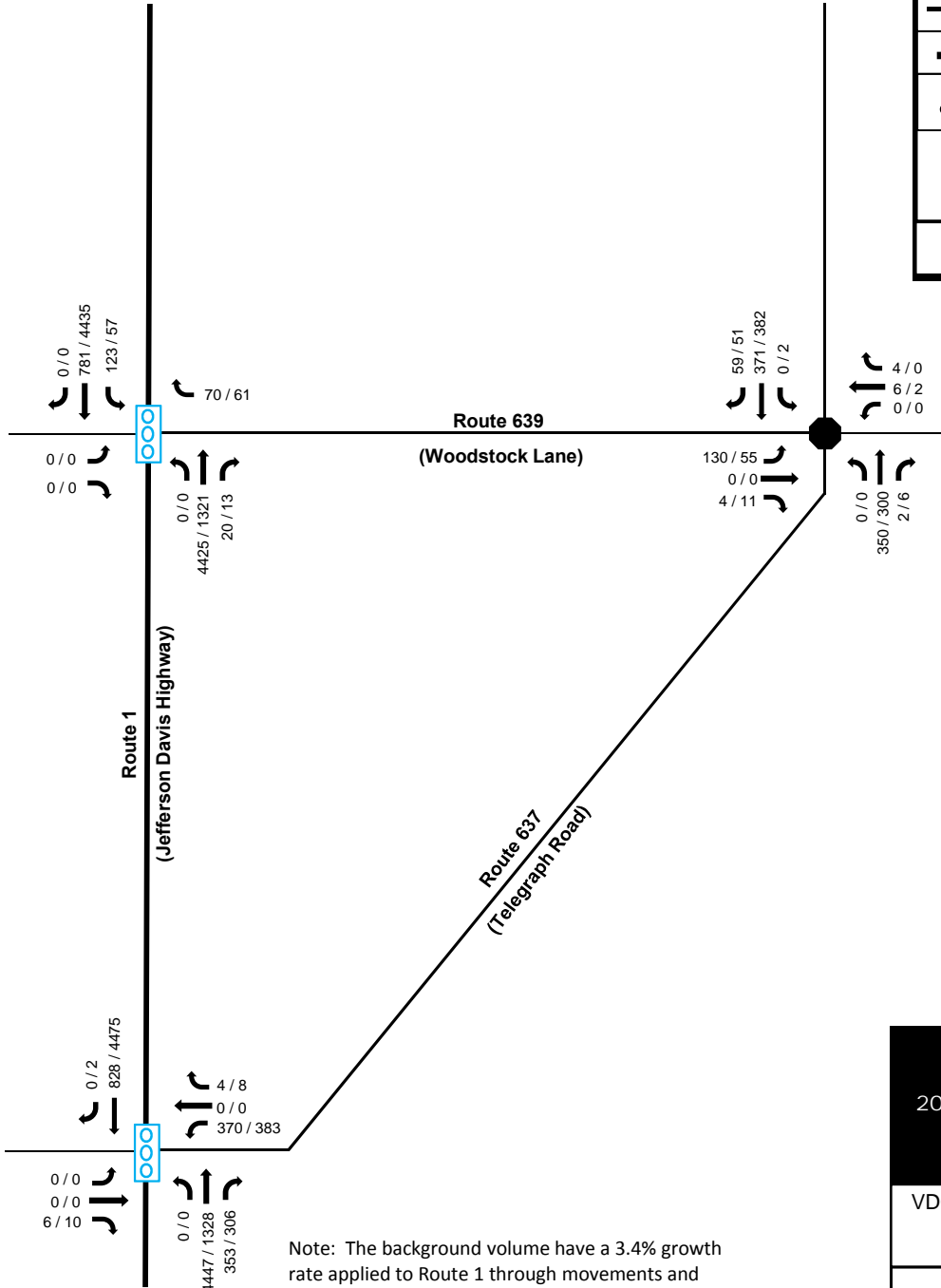
#### **8.5 Opinion of Probable Cost: Alternative 4 – Consolidated Left Turns**

An opinion of probable cost was drafted for the long term improvement scenario of Alternative 4. The cost estimate was prepared assuming that the widening of Route 1 to a six-lane median divided facility would be completed prior to construction of the recommended improvements posed under Alternative 4. Per the VDOT functional classification maps, the subject section of Route 1 is classified as an urban principal arterial. Also, given the right of way constraints and potential development along the corridor, the availability of right of way to accommodate ditches, drainage, etc. is limited. Therefore the conceptual design of this improvement alternative is proposed as an urban design with a closed drainage system. The cost of construction along with PE, CE and contingency considerations for the improvements set forth under Alternative 4 is estimated to be \$4,775,000. A detailed line item breakdown of the engineer's estimate may be found in the supporting documentation section of the Appendix. This estimate is not considered part of the sealed document and is being offered with the caveats noted on the line item estimate.





LEGEND	
	SIGNALIZED INTERSECTION
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	RIGHT IN / RIGHT OUT
BLACK = EXISTING BLUE = PROPOSED	
AM/ PM PEAKS	



Note: The background volume have a 3.4% growth rate applied to Route 1 through movements and 2.5% to all other movements. No growth rate was applied to the Approved Development traffic.

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FIGURE 13  
2040 FUTURE VOLUMES  
ALTERNATIVE 4

VDOT OPERATIONAL AND SAFETY  
STUDY - RTES 1/637/639  
STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
CRO 12-092

**Table 33 - Level of Service Summary  
Future Long Term Conditions**

AM Peak	2040 Future No Improvements	2040 Future Alternate 4 - Consolidated Left Turns
Rte. 1 at Rte. 637	F (Err) WB Approach	E (63.1)
Rte. 1 at Rte. 639	F (Err) WB Approach	D (35.2)
Rte. 637 at Rte. 639	C (24.2) EB Approach	D (30.8) EB Approach
PM Peak	2040 Future No Improvements	2040 Future Alternate 4 - Consolidated Left Turns
Rte. 1 at Rte. 637	F (Err) WB Approach	E (63.8)
Rte. 1 at Rte. 639	F (Err) WB Approach	A (4.9)
Rte. 637 at Rte. 639	C (16.9) EB Approach	C (18.9) EB Approach

LOS (delay in seconds)

Note for unsignalized conditions, LOS and delay indicates only minor street approach with longest delay

**Table 34 – Level of Service  
Rte. 1 at Rte. 637 (unsignalized)**

AM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (signalized)
Rte. 637	EB Overall	<b>B (11.2)</b>	<b>E (57.2)</b>
	WBL		F (115.8)
	WBTR		F (110.6)
	WBR		
	WB Overall	<b>F (Err)</b>	<b>F (113.3)</b>
Rte. 1	NBL		
	NBLT	A (0.4)	
	NBT	A (0.0)	E (75.0)
	NBTR	A (0.0)	
	NBR		A (2.8)
	NB Overall	<b>A (0.1)</b>	<b>E (69.7)</b>
	SBL		
	SBLT	F (199.6)	
	SBT	A (0.0)	A (2.3)
	SBTR	A (0.0)	
	SB Overall	<b>F (50.5)</b>	<b>A (2.3)</b>
	Intersection Overall		<b>E (63.1)</b>
PM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (signalized)
Rte. 637	EB Overall	<b>F (63.4)</b>	E (58.7)
	WBL		F (123.6)
	WBTR		F (123.7)
	WBR		
	WB Overall	<b>F (Err)</b>	<b>F (123.7)</b>
Rte. 1	NBL		
	NBLT	A (0.0)	
	NBT	A (0.0)	A (2.9)
	NBTR	A (0.0)	
	NBR		A (2.7)
	NB Overall	<b>A (0.0)</b>	<b>A (2.9)</b>
	SBL		
	SBLT	A (0.4)	
	SBT	A (0.0)	F (80.8)
	SBTR	A (0.0)	
	SB Overall	<b>A (0.1)</b>	<b>F (80.8)</b>
	Intersection Overall		<b>E (63.8)</b>

LOS (delay in seconds)

**Table 35 – Level of Service  
Rte. 1 at Rte. 639 (unsignalized)**

AM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (signalized)
Rte. 639	EB Overall	<b>A (0.0)</b>	<b>A (0.0)</b>
	WBL		
	WBTR		
	WB Overall	<b>F (Err)</b>	<b>E (69.0)</b>
Rte. 1	NBL		
	NBLT	A (0.0)	
	NBT	A (0.0)	D (39.9)
	NBTR	A (0.0)	
	NB Overall	<b>A (0.0)</b>	<b>D (39.9)</b>
	SBL		E (69.9)
	SBLT	F (3713.9)	
	SBT	A (0.0)	A (0.1)
	SBTR	A (0.0)	
	SB Overall	<b>F (1295.1)</b>	<b>A (9.6)</b>
Intersection Overall		<b>D (35.2)</b>	
PM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (signalized)
Rte. 639	EB Overall	<b>A (0.0)</b>	<b>A (0.0)</b>
	WBL		
	WBTR		
	WB Overall	<b>F (Err)</b>	<b>E (70.1)</b>
Rte. 1	NBL		
	NBLT	A (0.0)	
	NBT	A (0.0)	A (1.0)
	NBTR	A (0.0)	
	NB Overall	<b>A (0.0)</b>	<b>A (1.0)</b>
	SBL		A (0.4)
	SBLT	A (7.6)	
	SBT	A (0.0)	A (5.3)
	SBTR	A (0.0)	
	SB Overall	<b>A (2.0)</b>	<b>A (5.2)</b>
Intersection Overall		<b>A (4.9)</b>	

LOS (delay in seconds)

**Table 36 – Level of Service  
Rte. 637 at Rte. 639 (unsignalized)**

AM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (unsignalized)
Rte. 639	EB Overall	C (24.2)	D (30.8)
	WB Overall	B (14.7)	B (14.7)
Rte. 637	NB Overall	A (0.0)	A (0.0)
	SB Overall	A (0.0)	A (0.0)
PM Peak		2040 Future No Improvements (unsignalized)	2040 Future Alternate 4 - Consolidated Left Turns (unsignalized)
Rte. 639	EB Overall	C (16.9)	C (18.9)
	WB Overall	C (16.5)	C (16.5)
Rte. 637	NB Overall	A (0.0)	A (0.0)
	SB Overall	A (0.1)	A (0.1)

LOS (delay in seconds)

**Table 37 - Queuing Summary**

Rte. 1 at Rte. 637

AM Peak		95th Percentile Queue (feet)		
		2040 No Improvements	2040 Alternative 4	Alternative 4 Proposed Storage
Rte. 637	EBL/EBR	29		
	WBL/WBR	1082	443	
	EBR		27	
	WBL		435	500
Rte. 1	NBL/NBT	1243		
	NBT/NBR	779		
	NBT	1194	1318	
	NBT		1434	
	NBT		1442	
	NBR		282	200
	SBL/SBT	53		
	SBT		41	
	SBT		61	
	SBT/SBR		87	
PM Peak		95th Percentile Queue (feet)		
		2040 No Improvements	2040 Alternative 4	Alternative 4 Proposed Storage
Rte. 637	EBL/EBR	170		
	WBL/WBR	1257	535	
	EBR		45	
	WBL		494	500
Rte. 1	NBT/NBR	5		
	SBL/SBT	247		
	NBT		78	
	NBT		96	
	NBT		127	
	NBR		48	200
	SBT	225	2929	
	SBT		2903	
SBT/SBR	216	2873		



**Table 38 - Queuing Summary**

Rte. 1 at Rte. 639

AM Peak		95th Percentile Queue (feet)		
		2040 No Improvements	2040 Alternative 4	Alternative 4 Proposed Storage
Rte. 639	WBL/WBR	942		
	WBR		140	
Rte. 1	NBT		248	
	NBT		273	
	NBT/NBR		330	
	SBL		221	300
	SBL/SBT	2049		
	SBT	2096		
	SBT/SBR	2152		
PM Peak		95th Percentile Queue (feet)		
		2040 No Improvements	2040 Alternative 4	Alternative 4 Proposed Storage
Rte. 639	WBL/WBR	920		
	WBR		77	
Rte. 1	NBL/NBT		5	
	NBT/NBR	1	26	
	NBT		16	
	SBL		115	300
	SBT		1880	
	SBT	1391	1935	
	SBL/SBT	1328		
SBT/SBR	1231	1901		

**Table 39 - Queuing Summary**

Rte. 637 at Rte. 639

AM Peak		95th Percentile Queue (feet)			
		2040 No Improvements	2040 Alternative 4	Alternative 4 Proposed Storage	
Rte. 639	EBL/EBR	35	166		
	WBL/WBT/WBR	206	32		
Rte. 637	SBL/SBT/SBR	411	2		
PM Peak		95th Percentile Queue (feet)			
		2040 No Improvements	2040 Alternative 4		Alternative 4 Proposed Storage
Rte. 639	EBL/EBR	49	60		
	WBL/WBT/WBR	46	10		
Rte. 637	SBL/SBT/SBR	490	4		



NOT FOR CONSTRUCTION

CONCEPT

**DAVENPORT**  
 HOME OFFICE  
 305 WEST FIFTH STREET, SUITE 2A  
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 336.744.0336 www.davenportdc.com  
 NCBEL'S PRL LICENSE NO. C-2922



PROJECT: 13-368  
 DATE: 09/10/14  
 DESIGNED BY: JGT  
 DRAWN BY: JGT  
 CHECKED BY: JTW  
 SCALE: AS NOTED

NO.	DATE	REVISIONS	DESCRIPTION

CLIENT:  
 TIMMONS GROUP  
 1001 BOULDERS PARKWAY, SUITE 300  
 RICHMOND, VA 23225  
 P: (804) 200-6500 F: (804) 560-1016

PROJECT:  
 VDOT INTERSECTION  
 OPERATIONAL AND  
 SAFETY ANALYSIS  
 ROUTES 1/637/639,  
 STAFFORD COUNTY, VA

TITLE:  
 ALTERNATIVE 4  
 LONG TERM  
 IMPROVEMENT  
 CONCEPT

SHEET NO.  
**FIGURE 14**

## **9.0 Summary and Conclusion**

DAVENPORT performed an intersection operational and safety analysis for the intersections of Route 1 at Route 639, Route 1 at Route 637, and Route 637 at Route 639 in Stafford County VA. The objective of this study was to assess current conditions, develop alternative improvements for both the short term and the long term, and evaluate the merits of each alternative. The results of this study are summarized below and in the tables that follow.

### ***Existing Conditions***

The traffic capacity analysis for 2014 existing conditions shows that both study intersections on Route 1 (Route 637 and Route 639) currently operate at LOS F in one or more peak periods. This LOS F condition is mainly due to lack of sufficient gaps for left turning vehicles from the minor stop-controlled approach, as a result of heavy traffic volumes on Route 1. A signal warrant analysis based on MUTCD criteria shows that both intersections satisfy two (2) warrants for signalization: the four hour volume warrant and the peak hour volume warrant. However, they do not meet the eight hour volume warrant. The intersection of Route 639 at Route 637 currently operates at LOS B in AM and PM peak hours.

A crash analysis was carried out using crash data for years 2010, 2011, and 2012. At the intersection of Route 1 and Route 637, a total of 7 crashes were noted. The lack of turn lanes and the large number of conflicting movements at this intersection contribute to the potential for crashes. At the intersection of Route 1 and Route 639, a total of 16 crashes were reported in the three (3) year period. Improvements to accommodate southbound left turning vehicles are needed to enhance the safety of this intersection. At the intersection of Route 639 and Route 637 one (1) crash was reported; no crash patterns were noted at this location.

### ***Short Term Analysis***

For the 2024 Short Term analysis, two (2) improvement alternatives were considered. Alternative 1 consolidates traffic to Route 637 by creating a right in right out condition at Route 639, and installing a traffic signal at Route 637. Alternative 2 consolidates traffic to Route 639 by creating a right in right out at Route 637 and installing a traffic signal at Route 639. A comparison of both Alternatives, including the recommended improvements, cost estimates, advantages, and disadvantages can be found in Table 22.

### ***Long Term Analysis***

In the 2040 Long Term analysis, four (4) alternatives were studied. Alternatives 1 and 2 are the same as presented in the Short Term analysis. Alternative 3 involves relocating Route 637 to the north of its current location. Alternative 4 consolidates major street left turns to the intersection with Route 639, and minor street left turns to the intersection with Route 637. Due to heavy queues anticipated in Alternatives 1, 2 and 3, Alternative 4 has been identified as a feasible long term solution for this study area.

### ***Conclusion***

This study evaluates traffic flow patterns along Routes 1, 637, and 639 to determine if consolidation of traffic would be beneficial to the operation and safety of the area. Various improvement alternatives were considered for both short term and long term analysis years to assess the potential for improved operation and safety. These alternatives, along with their advantages and disadvantages, are detailed in this report.

Table 40 summarizes the level of service for short term and long term improvement alternatives. Further information on all alternatives may be found in the Appendix.

**Table 40 - Level of Service Summary**

AM Peak	2014 Existing	2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639	2040 Future No Improvements	2040 Future Alternative 4 - Consolidated Left Turns
Rte. 1 at Rte. 637	F (Err) WB Approach	F (Err) WB Approach	E (76.6)	F (52.3) WB Approach	F (Err) WB Approach	E (63.1)
Rte. 1 at Rte. 639	F (Err) WB Approach	F (Err) WB Approach	F (204.7) WB Approach	E (71.4)	F (Err) WB Approach	D (35.2)
Rte. 637 at Rte. 639	B (14.6) EB Approach	C (19.4) EB Approach	C (15.7) EB Approach	C (17.5) EB Approach	C (24.2) EB Approach	D (30.8) EB Approach
PM Peak	2014 Existing	2024 Future No Improvements	2024 Future Alternate 1 - Consolidation of Traffic to Rte. 637	2024 Future Alternative 2 - Consolidation of Traffic to Rte. 639	2040 Future No Improvements	2040 Future Alternative 4 - Consolidated Left Turns
Rte. 1 at Rte. 637	F (Err) WB Approach	F (Err) WB Approach	D (52.5)	F (77.3) EB Approach	F (Err) WB Approach	E (63.8)
Rte. 1 at Rte. 639	F (753.5) WB Approach	F (Err) WB Approach	B (13.5) WB Approach	D (39.1)	F (Err) WB Approach	A (4.9)
Rte. 637 at Rte. 639	B (12.4) WB Approach	B (13.7) WB Approach	C (16.2) WB Approach	B (14.9) WB Approach	C (16.9) EB Approach	C (18.9) EB Approach
<b>LOS (delay in seconds)</b>						

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# Appendix A: Synchro HCM Reports (Short Term Alternatives & Long Term Alternative)



## *Route 1 at Route 637*

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕↕			↕↕	
Volume (veh/h)	0	0	3	93	0	2	2	1866	186	2	431	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.38	0.79	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Hourly flow rate (vph)	0	0	8	118	0	4	4	2195	251	4	526	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1643	2988	263	2608	2863	1223	526			2447		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1643	2988	263	2608	2863	1223	526			2447		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	99	0	100	98	100			98		
cM capacity (veh/h)	64	14	698	12	17	174	887			174		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	8	122	1102	1349	267	263
Volume Left	0	118	4	0	4	0
Volume Right	8	4	0	251	0	0
cSH	698	12	887	1700	174	1700
Volume to Capacity	0.01	9.99	0.00	0.79	0.02	0.15
Queue Length 95th (ft)	1	Err	0	0	2	0
Control Delay (s)	10.2	Err	0.1	0.0	1.1	0.0
Lane LOS	B	F	A		A	
Approach Delay (s)	10.2	Err	0.1		0.5	
Approach LOS	B	F				

Intersection Summary		
Average Delay		391.5
Intersection Capacity Utilization	77.5%	ICU Level of Service
Analysis Period (min)		15
		D

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	0	4	119	0	3	3	2604	238	3	600	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.38	0.79	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Hourly flow rate (vph)	0	0	11	151	0	6	6	3064	322	6	732	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2293	4141	366	3625	3980	1693	732			3385		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2293	4141	366	3625	3980	1693	732			3385		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	98	0	100	93	99			92		
cM capacity (veh/h)	19	2	595	2	3	84	727			71		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	11	157	1538	1853	372	366
Volume Left	0	151	6	0	6	0
Volume Right	11	6	0	322	0	0
cSH	595	2	727	1700	71	1700
Volume to Capacity	0.02	85.87	0.01	1.09	0.08	0.22
Queue Length 95th (ft)	1	Err	1	0	7	0
Control Delay (s)	11.2	Err	0.9	0.0	7.3	0.0
Lane LOS	B	F	A		A	
Approach Delay (s)	11.2	Err	0.4		3.7	
Approach LOS	B	F				

Intersection Summary	
Average Delay	365.5
Intersection Capacity Utilization	101.8%
ICU Level of Service	G
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis  
 100: Driveway & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↕		↖	↕	↖	↖	↕	↖
Volume (vph)	0	0	4	251	0	3	3	2604	238	86	469	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lane Util. Factor		1.00		0.95	0.95		1.00	0.95	1.00	1.00	0.95	
Fr <sub>t</sub>		0.86		1.00	0.99		1.00	1.00	0.85	1.00	1.00	
Fl <sub>t</sub> Protected		1.00		0.95	0.95		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1429		1603	1603		1433	3505	1524	1656	3505	
Fl <sub>t</sub> Permitted		1.00		0.95	0.95		0.44	1.00	1.00	0.03	1.00	
Satd. Flow (perm)		1429		1603	1603		659	3505	1524	61	3505	
Peak-hour factor, PHF	0.25	0.25	0.38	0.82	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Adj. Flow (vph)	0	0	11	306	0	6	6	3064	322	172	572	0
RTOR Reduction (vph)	0	11	0	0	1	0	0	0	40	0	0	0
Lane Group Flow (vph)	0	0	0	156	155	0	6	3064	282	172	572	0
Heavy Vehicles (%)	2%	2%	15%	7%	2%	2%	26%	3%	6%	9%	3%	8%
Turn Type	Split		Split		Perm		Perm		pm+pt			
Protected Phases	4	4	8		8		2		2		1	6
Permitted Phases							2		2		6	
Actuated Green, G (s)	1.9		13.0		13.0		111.1		111.1		120.1	
Effective Green, g (s)	3.9		15.0		15.0		113.1		113.1		122.1	
Actuated g/C Ratio	0.03		0.10		0.10		0.77		0.77		0.83	
Clearance Time (s)	4.0		4.0		4.0		4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.0		3.0	
Lane Grp Cap (vph)	38		164		164		507		2697		1173	
v/s Ratio Prot	c0.00		c0.10		0.10		c0.87		c0.06		0.16	
v/s Ratio Perm							0.01		0.18		1.07	
v/c Ratio	0.01		0.95		0.95		0.01		1.14		0.24	
Uniform Delay, d <sub>1</sub>	69.7		65.6		65.6		3.9		17.0		4.8	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d <sub>2</sub>	0.1		55.7		53.9		0.0		66.4		0.1	
Delay (s)	69.7		121.3		119.5		4.0		83.3		4.9	
Level of Service	E		F		F		A		F		A	
Approach Delay (s)	69.7				120.4		75.7				62.3	
Approach LOS	E				F		E				E	

Intersection Summary

HCM Average Control Delay	76.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	147.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 100: Driveway & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕			↕	
Volume (veh/h)	0	0	4	0	0	3	3	2604	238	0	719	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.38	0.79	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Hourly flow rate (vph)	0	0	11	0	0	6	6	3064	322	0	877	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2427	4274	438	3685	4113	1693	877			3385		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2427	4274	438	3685	4113	1693	877			3385		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	98	100	100	93	99			100		
cM capacity (veh/h)	15	2	532	2	2	82	631			79		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	11	6	1538	1853	585	292
Volume Left	0	0	6	0	0	0
Volume Right	11	6	0	322	0	0
cSH	532	82	631	1700	1700	1700
Volume to Capacity	0.02	0.07	0.01	1.09	0.34	0.17
Queue Length 95th (ft)	2	6	1	0	0	0
Control Delay (s)	11.9	52.3	1.1	0.0	0.0	0.0
Lane LOS	B	F	A			
Approach Delay (s)	11.9	52.3	0.5		0.0	
Approach LOS	B	F				

Intersection Summary		
Average Delay		0.5
Intersection Capacity Utilization	96.3%	ICU Level of Service F
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔↔↔			↔↔↔	
Volume (veh/h)	0	0	6	177	0	4	4	4443	353	4	1022	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	7	192	0	4	4	4829	384	4	1111	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2742	6341	370	5415	6149	1802	1111			5213		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2742	6341	370	5415	6149	1802	1111			5213		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	99	0	100	94	99			63		
cM capacity (veh/h)	6	0	591	0	0	69	502			12		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	7	197	1212	2415	1591	282	555	278
Volume Left	0	192	4	0	0	4	0	0
Volume Right	7	4	0	0	384	0	0	0
cSH	591	0	502	1700	1700	12	1700	1700
Volume to Capacity	0.01	4269.50	0.01	1.42	0.94	0.37	0.33	0.16
Queue Length 95th (ft)	1	Err	1	0	0	22	0	0
Control Delay (s)	11.2	Err	0.4	0.0	0.0	199.6	0.0	0.0
Lane LOS	B	F	A			F		
Approach Delay (s)	11.2	Err	0.1			50.5		
Approach LOS	B	F						

Intersection Summary		
Average Delay		309.7
Intersection Capacity Utilization	119.8%	ICU Level of Service
Analysis Period (min)		15
		H

HCM Signalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗	↖	↔			↑↑↑	↗		↑↑↑	
Volume (vph)	0	0	6	370	0	4	0	4447	353	0	828	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.0	2.0	2.0			2.0	2.0		2.0	
Lane Util. Factor			1.00	0.95	0.95			0.91	1.00		0.91	
Frt			0.86	1.00	1.00			1.00	0.85		1.00	
Flt Protected			1.00	0.95	0.95			1.00	1.00		1.00	
Satd. Flow (prot)			1429	1681	1682			5036	1524		5036	
Flt Permitted			1.00	0.95	0.95			1.00	1.00		1.00	
Satd. Flow (perm)			1429	1681	1682			5036	1524		5036	
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)	0	0	7	402	0	4	0	4834	384	0	900	0
RTOR Reduction (vph)	0	0	6	0	0	0	0	0	47	0	0	0
Lane Group Flow (vph)	0	0	1	205	201	0	0	4834	337	0	900	0
Heavy Vehicles (%)	2%	2%	15%	2%	2%	2%	26%	3%	6%	7%	3%	8%
Turn Type			custom	Prot					Perm			
Protected Phases				3	8			2			6	
Permitted Phases			3						2			
Actuated Green, G (s)			17.0	17.0	17.0			125.0	125.0		125.0	
Effective Green, g (s)			19.0	19.0	19.0			127.0	127.0		127.0	
Actuated g/C Ratio			0.13	0.13	0.13			0.85	0.85		0.85	
Clearance Time (s)			4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)			3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)			181	213	213			4264	1290		4264	
v/s Ratio Prot				c0.12	0.12			c0.96			0.18	
v/s Ratio Perm			0.00						0.22			
v/c Ratio			0.00	0.96	0.94			1.13	0.26		0.21	
Uniform Delay, d1			57.2	65.1	65.0			11.5	2.3		2.1	
Progression Factor			1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2			0.0	50.7	45.7			63.5	0.5		0.1	
Delay (s)			57.2	115.8	110.6			75.0	2.8		2.3	
Level of Service			E	F	F			E	A		A	
Approach Delay (s)		57.2			113.3			69.7			2.3	
Approach LOS		E			F			E			A	

Intersection Summary

HCM Average Control Delay	63.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	103.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	0	5	110	0	4	0	559	161	1	1952	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.42	0.69	0.25	0.50	0.25	0.95	0.94	0.25	0.92	0.25
Hourly flow rate (vph)	0	0	12	159	0	8	0	588	171	4	2122	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2434	2891	1063	1755	2808	380	2126			760		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2434	2891	1063	1755	2808	380	2126			760		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	94	0	100	99	100			100		
cM capacity (veh/h)	17	16	199	51	18	624	181			816		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	12	167	294	465	1065	1065
Volume Left	0	159	0	0	4	0
Volume Right	12	8	0	171	0	4
cSH	199	54	181	1700	816	1700
Volume to Capacity	0.06	3.12	0.00	0.27	0.00	0.63
Queue Length 95th (ft)	5	Err	0	0	0	0
Control Delay (s)	24.3	Err	0.0	0.0	0.2	0.0
Lane LOS	C	F			A	
Approach Delay (s)	24.3	Err	0.0		0.1	
Approach LOS	C	F				

Intersection Summary		
Average Delay		545.7
Intersection Capacity Utilization	74.4%	ICU Level of Service D
Analysis Period (min)		15



HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	0	6	141	0	5	0	779	206	1	2725	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.42	0.69	0.25	0.50	0.25	0.95	0.94	0.25	0.92	0.25
Hourly flow rate (vph)	0	0	14	204	0	10	0	820	219	4	2962	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3392	4011	1483	2433	3904	520	2966			1039		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3392	4011	1483	2433	3904	520	2966			1039		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	86	0	100	98	100			99		
cM capacity (veh/h)	3	3	101	14	3	507	76			636		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	14	214	410	629	1485	1485
Volume Left	0	204	0	0	4	0
Volume Right	14	10	0	219	0	4
cSH	101	15	76	1700	636	1700
Volume to Capacity	0.14	14.38	0.00	0.37	0.01	0.87
Queue Length 95th (ft)	12	Err	0	0	0	0
Control Delay (s)	46.6	Err	0.0	0.0	0.5	0.0
Lane LOS	E	F			A	
Approach Delay (s)	46.6	Err	0.0		0.3	
Approach LOS	E	F				

Intersection Summary		
Average Delay		506.1
Intersection Capacity Utilization	97.5%	ICU Level of Service
Analysis Period (min)		15
		F

HCM Signalized Intersection Capacity Analysis  
 100: Driveway & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↕		↖	↕	↖	↖	↕	↖
Volume (vph)	0	0	6	260	0	5	0	779	206	41	2606	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Util. Factor		1.00		0.95	0.95			0.95	1.00	1.00	0.95	
Frt		0.86		1.00	0.99			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.96			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1429		1603	1601			3505	1524	1656	3504	
Flt Permitted		1.00		0.95	0.96			1.00	1.00	0.28	1.00	
Satd. Flow (perm)		1429		1603	1601			3505	1524	482	3504	
Peak-hour factor, PHF	0.25	0.25	0.38	0.82	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Adj. Flow (vph)	0	0	16	317	0	10	0	916	278	82	3178	4
RTOR Reduction (vph)	0	6	0	0	2	0	0	0	66	0	0	0
Lane Group Flow (vph)	0	10	0	165	160	0	0	916	212	82	3182	0
Heavy Vehicles (%)	2%	2%	15%	7%	2%	2%	26%	3%	6%	9%	3%	8%
Turn Type	Split		Split		Perm		Perm		pm+pt			
Protected Phases	4	4	8		8		2		2		1	6
Permitted Phases							2		2		6	
Actuated Green, G (s)	1.9		14.0		14.0		110.1		110.1		119.1	
Effective Green, g (s)	3.9		16.0		16.0		112.1		112.1		121.1	
Actuated g/C Ratio	0.03		0.11		0.11		0.76		0.76		0.82	
Clearance Time (s)	4.0		4.0		4.0		4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.0		3.0	
Lane Grp Cap (vph)	38		174		174		2673		1162		2887	
v/s Ratio Prot	c0.01		c0.10		0.10		0.26		0.01		c0.91	
v/s Ratio Perm									0.14		0.14	
v/c Ratio	0.27		0.95		0.92		0.34		0.18		1.10	
Uniform Delay, d1	70.1		65.1		64.9		5.6		4.8		13.0	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	3.8		52.6		45.9		0.1		0.1		51.9	
Delay (s)	73.9		117.7		110.7		5.7		4.9		64.9	
Level of Service	E		F		F		A		A		E	
Approach Delay (s)	73.9				114.2		5.5				63.3	
Approach LOS	E				F		A				E	

Intersection Summary

HCM Average Control Delay	52.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	147.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 100: Driveway & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕			↕	
Volume (veh/h)	0	0	6	0	0	5	0	779	206	0	2866	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.38	0.79	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Hourly flow rate (vph)	0	0	16	0	0	10	0	916	278	0	3495	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3965	4692	1750	2819	4555	597	3499			1195		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3965	4692	1750	2819	4555	597	3499			1195		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	76	100	100	98	100			100		
cM capacity (veh/h)	1	1	65	6	1	446	43			580		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	16	10	458	737	2330	1169
Volume Left	0	0	0	0	0	0
Volume Right	16	10	0	278	0	4
cSH	65	446	43	1700	1700	1700
Volume to Capacity	0.24	0.02	0.00	0.43	1.37	0.69
Queue Length 95th (ft)	21	2	0	0	0	0
Control Delay (s)	77.3	13.3	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	77.3	13.3	0.0		0.0	
Approach LOS	F	B				

Intersection Summary		
Average Delay		0.3
Intersection Capacity Utilization	89.3%	ICU Level of Service E
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕↕↕			↕↕↕	
Volume (veh/h)	0	0	10	209	0	8	0	1328	306	2	4649	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	11	227	0	9	0	1443	333	2	5053	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	5549	6835	1686	3309	6670	647	5055			1776		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5549	6835	1686	3309	6670	647	5055			1776		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.3		
p0 queue free %	100	100	85	0	100	98	100			99		
cM capacity (veh/h)	0	0	72	3	0	413	8			325		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	11	236	361	722	693	1265	2527	1265
Volume Left	0	227	0	0	0	2	0	0
Volume Right	11	9	0	0	333	0	0	2
cSH	72	3	8	1700	1700	325	1700	1700
Volume to Capacity	0.15	79.90	0.00	0.42	0.41	0.01	1.49	0.74
Queue Length 95th (ft)	12	Err	0	0	0	1	0	0
Control Delay (s)	63.4	Err	0.0	0.0	0.0	0.4	0.0	0.0
Lane LOS	F	F				A		
Approach Delay (s)	63.4	Err	0.0			0.1		
Approach LOS	F	F						

Intersection Summary			
Average Delay		333.3	
Intersection Capacity Utilization	116.6%		ICU Level of Service H
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗	↖	↔			↑↑↑	↗		↑↑↑	
Volume (vph)	0	0	10	383	0	8	0	1328	306	0	4475	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	2.0	2.0			2.0	2.0		2.0	
Lane Util. Factor			1.00	0.95	0.95			0.91	1.00		0.91	
Frt			0.86	1.00	0.99			1.00	0.85		1.00	
Flt Protected			1.00	0.95	0.95			1.00	1.00		1.00	
Satd. Flow (prot)			1429	1603	1603			5036	1524		5036	
Flt Permitted			1.00	0.95	0.95			1.00	1.00		1.00	
Satd. Flow (perm)			1429	1603	1603			5036	1524		5036	
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)	0	0	11	416	0	9	0	1443	333	0	4864	2
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	53	0	0	0
Lane Group Flow (vph)	0	0	11	212	212	0	0	1443	280	0	4866	0
Heavy Vehicles (%)	2%	2%	15%	7%	2%	2%	26%	3%	6%	9%	3%	8%
Turn Type			custom	Prot					Perm			
Protected Phases				3	8			2			6	
Permitted Phases			3						2			
Actuated Green, G (s)			18.0	18.0	18.0			124.0	124.0		124.0	
Effective Green, g (s)			18.0	20.0	20.0			126.0	126.0		126.0	
Actuated g/C Ratio			0.12	0.13	0.13			0.84	0.84		0.84	
Clearance Time (s)			4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)			3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)			171	214	214			4230	1280		4230	
v/s Ratio Prot				0.13	c0.13			0.29			c0.97	
v/s Ratio Perm			0.01						0.18			
v/c Ratio			0.06	0.99	0.99			0.34	0.22		1.15	
Uniform Delay, d1			58.5	64.9	64.9			2.7	2.4		12.0	
Progression Factor			1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2			0.2	58.7	58.8			0.2	0.4		68.8	
Delay (s)			58.7	123.6	123.7			2.9	2.7		80.8	
Level of Service			E	F	F			A	A		F	
Approach Delay (s)		58.7			123.7			2.9			80.8	
Approach LOS		E			F			A			F	

Intersection Summary

HCM Average Control Delay	63.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	111.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

## *Route 1 at Route 639*

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	0	0	104	0	40	0	1855	13	67	329	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	124	0	91	0	2132	31	143	392	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1834	2840	196	2629	2824	1082	392			2163		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1834	2840	196	2629	2824	1082	392			2163		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	0	100	54	100			35		
cM capacity (veh/h)	12	6	819	5	6	197	1178			218		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	215	1066	1097	338	196
Volume Left	0	124	0	0	143	0
Volume Right	0	91	0	31	0	0
cSH	1700	8	1178	1700	218	1700
Volume to Capacity	0.00	25.92	0.00	0.65	0.65	0.12
Queue Length 95th (ft)	0	Err	0	0	100	0
Control Delay (s)	0.0	Err	0.0	0.0	40.9	0.0
Lane LOS	A	F			E	
Approach Delay (s)	0.0	Err	0.0		25.9	
Approach LOS	A	F				

Intersection Summary		
Average Delay		742.0
Intersection Capacity Utilization	70.9%	ICU Level of Service C
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	0	0	132	0	49	0	2591	15	83	460	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	157	0	111	0	2978	36	177	548	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2501	3915	274	3623	3897	1507	548			3014		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2501	3915	274	3623	3897	1507	548			3014		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	0	0	100	0	0	0	100			0		
cM capacity (veh/h)	0	0	730	0	0	100	1032			96		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	269	1489	1525	450	274
Volume Left	0	157	0	0	177	0
Volume Right	0	111	0	36	0	0
cSH	1700	0	1032	1700	96	1700
Volume to Capacity	0.00	Err	0.00	0.90	1.83	0.16
Queue Length 95th (ft)	0	Err	0	0	364	0
Control Delay (s)	0.0	Err	0.0	0.0	485.9	0.0
Lane LOS	A	F			F	
Approach Delay (s)	0.0	Err	0.0		302.2	
Approach LOS	A	F				

Intersection Summary		
Average Delay		Err
Intersection Capacity Utilization	91.5%	ICU Level of Service
Analysis Period (min)	15	F



HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕			↕	
Volume (veh/h)	0	0	0	0	0	49	0	2591	15	0	543	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	0	0	111	0	2978	36	0	646	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2247	3660	323	3319	3642	1507	646			3014		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2247	3660	323	3319	3642	1507	646			3014		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	0	100	100	100	100	0	100			100		
cM capacity (veh/h)	0	5	672	3	5	100	935			112		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	111	1489	1525	431	215
Volume Left	0	0	0	0	0	0
Volume Right	0	111	0	36	0	0
cSH	1700	100	935	1700	1700	1700
Volume to Capacity	0.00	1.12	0.00	0.90	0.25	0.13
Queue Length 95th (ft)	0	181	0	0	0	0
Control Delay (s)	0.0	204.7	0.0	0.0	0.0	0.0
Lane LOS	A	F				
Approach Delay (s)	0.0	204.7	0.0		0.0	
Approach LOS	A	F				

Intersection Summary		
Average Delay		6.0
Intersection Capacity Utilization	82.1%	ICU Level of Service E
Analysis Period (min)		15

HCM Signalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↕		↖	↕		↖	↕	
Volume (vph)	0	0	0	251	0	49	0	2591	15	86	457	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				2.0	2.0			2.0		2.0	2.0	
Lane Util. Factor				0.95	0.95			0.95		1.00	0.95	
Fr <sub>t</sub>				1.00	0.92			1.00		1.00	1.00	
Fl <sub>t</sub> Protected				0.95	0.98			1.00		0.95	1.00	
Satd. Flow (prot)				1559	1456			3532		1597	3539	
Fl <sub>t</sub> Permitted				0.95	0.98			1.00		0.04	1.00	
Satd. Flow (perm)				1559	1456			3532		71	3539	
Peak-hour factor, PHF	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Adj. Flow (vph)	0	0	0	299	0	111	0	2978	36	183	544	0
RTOR Reduction (vph)	0	0	0	0	35	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	212	163	0	0	3014	0	183	544	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	12%	2%	2%	5%	13%	2%	2%
Turn Type	Split			Split		Perm			pm+pt			
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)				13.0	13.0			91.0		100.0	100.0	
Effective Green, g (s)				15.0	15.0			93.0		102.0	102.0	
Actuated g/C Ratio				0.12	0.12			0.77		0.84	0.84	
Clearance Time (s)				4.0	4.0			4.0		4.0	4.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				193	180			2715		148	2983	
v/s Ratio Prot				c0.14	0.11			c0.85		c0.07	0.15	
v/s Ratio Perm										0.97		
v/c Ratio				1.10	0.91			1.11		1.24	0.18	
Uniform Delay, d <sub>1</sub>				53.0	52.3			14.0		47.8	1.8	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>				93.6	41.0			55.5		151.2	0.0	
Delay (s)				146.6	93.3			69.5		199.0	1.8	
Level of Service				F	F			E		F	A	
Approach Delay (s)		0.0			120.8			69.5			51.4	
Approach LOS		A			F			E			D	

Intersection Summary

HCM Average Control Delay	71.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	121.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔↔↔			↔↔↔	
Volume (veh/h)	0	0	0	194	0	70	0	4425	20	119	785	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	211	0	76	0	4810	22	129	853	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2791	5943	284	5364	5933	1614	853			4832		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2791	5943	284	5364	5933	1614	853			4832		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	0	0	100	0	0	9	100			0		
cM capacity (veh/h)	0	0	712	0	0	84	782			16		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	287	1202	2405	1224	343	427	213
Volume Left	0	211	0	0	0	129	0	0
Volume Right	0	76	0	0	22	0	0	0
cSH	1700	0	782	1700	1700	16	1700	1700
Volume to Capacity	0.00	Err	0.00	1.41	0.72	8.20	0.25	0.13
Queue Length 95th (ft)	0	Err	0	0	0	Err	0	0
Control Delay (s)	0.0	Err	0.0	0.0	0.0	3713.9	0.0	0.0
Lane LOS	A	F				F		
Approach Delay (s)	0.0	Err	0.0			1295.1		
Approach LOS	A	F						

Intersection Summary		
Average Delay		Err
Intersection Capacity Utilization	125.8%	ICU Level of Service
Analysis Period (min)	15	H

HCM Signalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↑↑↑		↘	↑↑↑	
Volume (vph)	0	0	0	0	0	70	0	4425	20	123	781	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						2.0		2.0		2.0	2.0	
Lane Util. Factor						1.00		0.91		1.00	0.91	
Frt						0.86		1.00		1.00	1.00	
Flt Protected						1.00		1.00		0.95	1.00	
Satd. Flow (prot)						1467		5081		1641	5085	
Flt Permitted						1.00		1.00		0.03	1.00	
Satd. Flow (perm)						1467		5081		52	5085	
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)	0	0	0	0	0	76	0	4810	22	134	849	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	76	0	4832	0	134	849	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	12%	2%	2%	5%	10%	2%	2%
Turn Type			custom			Over				pm+pt		
Protected Phases						1		2		1	6	
Permitted Phases			2							6		
Actuated Green, G (s)						12.3		129.7		146.0	150.0	
Effective Green, g (s)						14.3		131.7		148.0	150.0	
Actuated g/C Ratio						0.10		0.88		0.99	1.00	
Clearance Time (s)						4.0		4.0		4.0	4.0	
Vehicle Extension (s)						3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)						140		4461		203	5085	
v/s Ratio Prot						0.05		c0.95		c0.06	0.17	
v/s Ratio Perm										0.59		
v/c Ratio						0.54		1.08		0.66	0.17	
Uniform Delay, d1						64.7		9.2		62.1	0.0	
Progression Factor						1.00		0.22		1.00	1.00	
Incremental Delay, d2						4.2		37.9		7.8	0.1	
Delay (s)						69.0		39.9		69.9	0.1	
Level of Service						E		D		E	A	
Approach Delay (s)		0.0			69.0			39.9			9.6	
Approach LOS		A			E			D			A	

Intersection Summary			
HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	99.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	0	0	94	0	37	0	554	9	33	1860	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.86	0.25	0.75	0.25	0.92	0.62	0.61	0.90	0.25
Hourly flow rate (vph)	0	0	0	109	0	49	0	602	15	54	2067	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2525	2792	1033	1751	2784	308	2067			617		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2525	2792	1033	1751	2784	308	2067			617		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	0	100	93	100			94		
cM capacity (veh/h)	13	18	233	48	18	659	274			907		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	159	301	316	1087	1033
Volume Left	0	109	0	0	54	0
Volume Right	0	49	0	15	0	0
cSH	1700	67	274	1700	907	1700
Volume to Capacity	0.00	2.36	0.00	0.19	0.06	0.61
Queue Length 95th (ft)	0	383	0	0	5	0
Control Delay (s)	0.0	753.5	0.0	0.0	1.8	0.0
Lane LOS	A	F			A	
Approach Delay (s)	0.0	753.5	0.0		0.9	
Approach LOS	A	F				

Intersection Summary	
Average Delay	41.9
Intersection Capacity Utilization	85.4%
ICU Level of Service	E
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	0	0	119	0	44	0	774	10	40	2598	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.86	0.25	0.75	0.25	0.92	0.62	0.61	0.90	0.25
Hourly flow rate (vph)	0	0	0	138	0	59	0	841	16	66	2887	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3497	3875	1443	2424	3867	429	2887			857		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3497	3875	1443	2424	3867	429	2887			857		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	0	100	89	100			91		
cM capacity (veh/h)	2	3	124	14	3	548	130			730		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	197	421	437	1509	1443
Volume Left	0	138	0	0	66	0
Volume Right	0	59	0	16	0	0
cSH	1700	20	130	1700	730	1700
Volume to Capacity	0.00	10.08	0.00	0.26	0.09	0.85
Queue Length 95th (ft)	0	Err	0	0	7	0
Control Delay (s)	0.0	Err	0.0	0.0	6.4	0.0
Lane LOS	A	F			A	
Approach Delay (s)	0.0	Err	0.0		3.3	
Approach LOS	A	F				

Intersection Summary	
Average Delay	494.1
Intersection Capacity Utilization	114.0%
ICU Level of Service	H
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕			↕	
Volume (veh/h)	0	0	0	0	0	44	0	774	10	0	2638	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	0	0	100	0	890	24	0	3140	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3685	4054	1570	2472	4042	457	3140			913		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3685	4054	1570	2472	4042	457	3140			913		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	100	100	81	100			100		
cM capacity (veh/h)	1	3	99	15	3	524	99			742		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	100	445	469	2094	1047
Volume Left	0	0	0	0	0	0
Volume Right	0	100	0	24	0	0
cSH	1700	524	99	1700	1700	1700
Volume to Capacity	0.00	0.19	0.00	0.28	1.23	0.62
Queue Length 95th (ft)	0	17	0	0	0	0
Control Delay (s)	0.0	13.5	0.0	0.0	0.0	0.0
Lane LOS	A	B				
Approach Delay (s)	0.0	13.5	0.0		0.0	
Approach LOS	A	B				

Intersection Summary		
Average Delay		0.3
Intersection Capacity Utilization	76.3%	ICU Level of Service
Analysis Period (min)		15
		D

HCM Signalized Intersection Capacity Analysis  
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗	↕		↗	↕↗		↗	↕↗	
Volume (vph)	0	0	0	260	0	44	0	774	10	41	2597	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				2.0	2.0			2.0		2.0	2.0	
Lane Util. Factor				0.95	0.95			0.95		1.00	0.95	
Fr <sub>t</sub>				1.00	0.92			1.00		1.00	1.00	
Fl <sub>t</sub> Protected				0.95	0.98			1.00		0.95	1.00	
Satd. Flow (prot)				1559	1467			3523		1597	3539	
Fl <sub>t</sub> Permitted				0.95	0.98			1.00		0.28	1.00	
Satd. Flow (perm)				1559	1467			3523		470	3539	
Peak-hour factor, PHF	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Adj. Flow (vph)	0	0	0	310	0	100	0	890	24	87	3092	0
RTOR Reduction (vph)	0	0	0	0	24	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	211	175	0	0	913	0	87	3092	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	12%	2%	2%	5%	13%	2%	2%
Turn Type	Split			Split			Perm			pm+pt		
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)				17.0	17.0			107.0		116.0	116.0	
Effective Green, g (s)				19.0	19.0			109.0		118.0	118.0	
Actuated g/C Ratio				0.13	0.13			0.77		0.84	0.84	
Clearance Time (s)				4.0	4.0			4.0		4.0	4.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				210	198			2723		449	2962	
v/s Ratio Prot				c0.14	0.12			0.26		0.01	c0.87	
v/s Ratio Perm										0.15		
v/c Ratio				1.00	0.88			0.34		0.19	1.04	
Uniform Delay, d <sub>1</sub>				61.0	59.9			4.9		2.6	11.5	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>				63.3	33.7			0.1		0.2	29.4	
Delay (s)				124.3	93.6			5.0		2.8	40.9	
Level of Service				F	F			A		A	D	
Approach Delay (s)		0.0			109.4			5.0			39.9	
Approach LOS		A			F			A			D	

Intersection Summary

HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	141.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔↔↔			↔↔↔	
Volume (veh/h)	0	0	0	174	0	61	0	1321	13	55	4437	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	189	0	66	0	1436	14	60	4823	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	5487	6392	1608	3170	6385	486	4823			1450		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5487	6392	1608	3170	6385	486	4823			1450		
tC, single (s)	7.5	6.5	6.9	7.7	6.5	7.1	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	0	100	87	100			86		
cM capacity (veh/h)	0	0	94	3	0	502	20			425		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	255	359	718	373	1265	2411	1206
Volume Left	0	189	0	0	0	60	0	0
Volume Right	0	66	0	0	14	0	0	0
cSH	1700	5	20	1700	1700	425	1700	1700
Volume to Capacity	0.00	56.55	0.00	0.42	0.22	0.14	1.42	0.71
Queue Length 95th (ft)	0	Err	0	0	0	12	0	0
Control Delay (s)	0.0	Err	0.0	0.0	0.0	7.6	0.0	0.0
Lane LOS	A	F				A		
Approach Delay (s)	0.0	Err	0.0			2.0		
Approach LOS	A	F						

Intersection Summary		
Average Delay		389.1
Intersection Capacity Utilization	136.0%	ICU Level of Service
Analysis Period (min)		15
		H

HCM Signalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↖↗↘		↖	↖↗↘	
Volume (vph)	0	0	0	0	0	61	0	1321	13	57	4435	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0		4.0		4.0	4.0	
Lane Util. Factor						1.00		0.91		1.00	0.91	
Frt						0.86		1.00		1.00	1.00	
Flt Protected						1.00		1.00		0.95	1.00	
Satd. Flow (prot)						1467		5076		1770	5085	
Flt Permitted						1.00		1.00		0.16	1.00	
Satd. Flow (perm)						1467		5076		306	5085	
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)	0	0	0	0	0	66	0	1436	14	62	4821	0
RTOR Reduction (vph)	0	0	0	0	0	64	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	0	1449	0	62	4821	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	12%	2%	2%	5%	2%	2%	2%
Turn Type			custom			custom	Perm			pm+pt		
Protected Phases								2		1	6	
Permitted Phases			6			1	2			6		
Actuated Green, G (s)						5.5		136.5		146.0	150.0	
Effective Green, g (s)						5.5		136.5		146.0	150.0	
Actuated g/C Ratio						0.04		0.91		0.97	1.00	
Clearance Time (s)						4.0		4.0		4.0	4.0	
Vehicle Extension (s)						3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)						54		4619		352	5085	
v/s Ratio Prot								0.29		0.01	c0.95	
v/s Ratio Perm						0.00				0.17		
v/c Ratio						0.04		0.31		0.18	0.95	
Uniform Delay, d1						69.7		0.9		0.2	0.0	
Progression Factor						1.00		1.00		1.00	1.00	
Incremental Delay, d2						0.3		0.2		0.2	5.3	
Delay (s)						70.1		1.0		0.4	5.3	
Level of Service						E		A		A	A	
Approach Delay (s)		0.0			70.1			1.0			5.2	
Approach LOS		A			E			A			A	

Intersection Summary

HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

## *Route 637 at Route 639*

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	67	0	0	0	3	2	0	186	1	0	95	132
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	110	0	0	0	8	4	0	251	4	0	116	183
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	469	463	208	461	553	253	299			255		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	469	463	208	461	553	253	299			255		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	77	100	100	100	98	99	100			100		
cM capacity (veh/h)	482	499	838	514	444	790	1166			1321		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	110	12	255	299
Volume Left	110	0	0	0
Volume Right	0	4	4	183
cSH	482	521	1166	1321
Volume to Capacity	0.23	0.02	0.00	0.00
Queue Length 95th (ft)	22	2	0	0
Control Delay (s)	14.6	12.1	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	14.6	12.1	0.0	0.0
Approach LOS	B	B		

Intersection Summary			
Average Delay		2.6	
Intersection Capacity Utilization		30.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	86	0	0	0	4	3	0	238	1	0	122	168
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	141	0	0	0	11	6	0	322	4	0	149	233
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	600	591	265	589	706	324	382			326		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	600	591	265	589	706	324	382			326		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	64	100	100	100	97	99	100			100		
cM capacity (veh/h)	389	422	778	423	363	722	1084			1245		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	17	326	382
Volume Left	141	0	0	0
Volume Right	0	6	4	233
cSH	389	443	1084	1245
Volume to Capacity	0.36	0.04	0.00	0.00
Queue Length 95th (ft)	41	3	0	0
Control Delay (s)	19.4	13.4	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	19.4	13.4	0.0	0.0
Approach LOS	C	B		

Intersection Summary			
Average Delay		3.4	
Intersection Capacity Utilization		34.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	11	0	4	0	4	3	9	312	1	0	250	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	18	0	16	0	11	6	36	422	4	0	305	56
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	840	830	333	844	856	424	360			426		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	840	830	333	844	856	424	360			426		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	93	100	98	100	96	99	97			100		
cM capacity (veh/h)	259	296	709	270	286	630	1105			1134		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	34	17	462	360
Volume Left	18	0	36	0
Volume Right	16	6	4	56
cSH	369	356	1105	1134
Volume to Capacity	0.09	0.05	0.03	0.00
Queue Length 95th (ft)	8	4	3	0
Control Delay (s)	15.7	15.6	1.0	0.0
Lane LOS	C	C	A	
Approach Delay (s)	15.7	15.6	1.0	0.0
Approach LOS	C	C		

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		37.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	88	0	0	0	4	3	0	236	1	0	3	287
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	144	0	0	0	11	6	0	319	4	0	4	399
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	535	526	203	524	723	321	402			323		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	535	526	203	524	723	321	402			323		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	66	100	100	100	97	99	100			100		
cM capacity (veh/h)	430	457	838	464	352	720	1065			1237		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	144	17	323	402
Volume Left	144	0	0	0
Volume Right	0	6	4	399
cSH	430	433	1065	1237
Volume to Capacity	0.34	0.04	0.00	0.00
Queue Length 95th (ft)	36	3	0	0
Control Delay (s)	17.5	13.7	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	17.5	13.7	0.0	0.0
Approach LOS	C	B		

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization		36.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	127	0	0	0	6	4	0	353	2	0	181	249
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	138	0	0	0	7	4	0	384	2	0	197	271
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	724	718	332	717	852	385	467			386		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	724	718	332	717	852	385	467			386		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	57	100	100	100	98	99	100			100		
cM capacity (veh/h)	323	355	710	345	297	663	1006			1173		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	138	11	386	467								
Volume Left	138	0	0	0								
Volume Right	0	4	2	271								
cSH	323	381	1006	1173								
Volume to Capacity	0.43	0.03	0.00	0.00								
Queue Length 95th (ft)	51	2	0	0								
Control Delay (s)	24.2	14.7	0.0	0.0								
Lane LOS	C	B										
Approach Delay (s)	24.2	14.7	0.0	0.0								
Approach LOS	C	B										
<b>Intersection Summary</b>												
Average Delay			3.5									
Intersection Capacity Utilization			45.2%		ICU Level of Service				A			
Analysis Period (min)			15									



HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

8/1/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	130	0	4	0	6	4	0	350	2	0	371	59
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	141	0	4	0	7	4	0	380	2	0	403	64
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	824	818	435	821	849	382	467			383		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	824	818	435	821	849	382	467			383		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	49	100	99	100	98	99	100			100		
cM capacity (veh/h)	276	311	621	291	298	666	1006			1176		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	146	11	383	467
Volume Left	141	0	0	0
Volume Right	4	4	2	64
cSH	281	382	1006	1176
Volume to Capacity	0.52	0.03	0.00	0.00
Queue Length 95th (ft)	69	2	0	0
Control Delay (s)	30.8	14.7	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	30.8	14.7	0.0	0.0
Approach LOS	D	B		

Intersection Summary			
Average Delay		4.6	
Intersection Capacity Utilization		43.9%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	29	0	3	0	1	0	0	159	3	1	112	116
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.25	0.38	0.25	0.25	0.25	0.25	0.86	0.38	0.25	0.78	0.90
Hourly flow rate (vph)	43	0	8	0	4	0	0	185	8	4	144	129
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	407	409	208	413	469	189	272			193		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	407	409	208	413	469	189	272			193		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	92	100	99	100	99	100	100			100		
cM capacity (veh/h)	536	534	837	547	494	858	1194			1393		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	51	4	193	276
Volume Left	43	0	0	4
Volume Right	8	0	8	129
cSH	568	494	1194	1393
Volume to Capacity	0.09	0.01	0.00	0.00
Queue Length 95th (ft)	7	1	0	0
Control Delay (s)	12.0	12.4	0.0	0.1
Lane LOS	B	B		A
Approach Delay (s)	12.0	12.4	0.0	0.1
Approach LOS	B	B		

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization	29.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	36	0	4	0	1	0	0	204	4	1	143	149
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.25	0.38	0.25	0.25	0.25	0.25	0.86	0.38	0.25	0.78	0.90
Hourly flow rate (vph)	53	0	11	0	4	0	0	237	11	4	183	166
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	519	522	266	527	599	242	349			248		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	519	522	266	527	599	242	349			248		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	88	100	99	100	99	100	100			100		
cM capacity (veh/h)	451	461	777	457	416	801	1117			1330		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	63	4	248	353
Volume Left	53	0	0	4
Volume Right	11	0	11	166
cSH	485	416	1117	1330
Volume to Capacity	0.13	0.01	0.00	0.00
Queue Length 95th (ft)	11	1	0	0
Control Delay (s)	13.5	13.7	0.0	0.1
Lane LOS	B	B		A
Approach Delay (s)	13.5	13.7	0.0	0.1
Approach LOS	B	B		

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		33.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	4	0	9	0	1	0	8	236	4	1	257	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	7	0	36	0	3	0	32	319	16	4	313	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	738	745	338	773	761	327	362			335		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	738	745	338	773	761	327	362			335		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	98	100	95	100	99	100	97			100		
cM capacity (veh/h)	314	331	704	293	324	714	1104			1224		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	43	3	367	366
Volume Left	7	0	32	4
Volume Right	36	0	16	49
cSH	591	324	1104	1224
Volume to Capacity	0.07	0.01	0.03	0.00
Queue Length 95th (ft)	6	1	2	0
Control Delay (s)	11.6	16.2	1.0	0.1
Lane LOS	B	C	A	A
Approach Delay (s)	11.6	16.2	1.0	0.1
Approach LOS	B	C		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		29.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	37	0	4	0	1	0	0	202	4	1	3	289
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	61	0	16	0	3	0	0	273	16	4	4	401
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	495	501	204	509	694	281	405			289		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	495	501	204	509	694	281	405			289		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	87	100	98	100	99	100	100			100		
cM capacity (veh/h)	469	470	836	464	365	758	1063			1273		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	77	3	289	409
Volume Left	61	0	0	4
Volume Right	16	0	16	401
cSH	516	365	1063	1273
Volume to Capacity	0.15	0.01	0.00	0.00
Queue Length 95th (ft)	13	1	0	0
Control Delay (s)	13.2	14.9	0.0	0.1
Lane LOS	B	B		A
Approach Delay (s)	13.2	14.9	0.0	0.1
Approach LOS	B	B		

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		34.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

7/30/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	53	0	6	0	2	0	0	302	6	2	213	220
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	58	0	7	0	2	0	0	328	7	2	232	239
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	688	690	351	693	807	332	471			335		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	688	690	351	693	807	332	471			335		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	83	100	99	100	99	100	100			100		
cM capacity (veh/h)	348	367	692	354	315	710	1003			1225		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	64	2	335	473
Volume Left	58	0	0	2
Volume Right	7	0	7	239
cSH	366	315	1003	1225
Volume to Capacity	0.18	0.01	0.00	0.00
Queue Length 95th (ft)	16	1	0	0
Control Delay (s)	16.9	16.5	0.0	0.1
Lane LOS	C	C		A
Approach Delay (s)	16.9	16.5	0.0	0.1
Approach LOS	C	C		

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

8/1/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	55	0	11	0	2	0	0	300	6	2	382	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	0	12	0	2	0	0	326	7	2	415	55
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	778	780	443	789	804	329	471			333		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	778	780	443	789	804	329	471			333		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	80	100	98	100	99	100	100			100		
cM capacity (veh/h)	302	326	615	302	316	712	1003			1227		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	72	2	333	473
Volume Left	60	0	0	2
Volume Right	12	0	7	55
cSH	330	316	1003	1227
Volume to Capacity	0.22	0.01	0.00	0.00
Queue Length 95th (ft)	20	1	0	0
Control Delay (s)	18.9	16.5	0.0	0.1
Lane LOS	C	C		A
Approach Delay (s)	18.9	16.5	0.0	0.1
Approach LOS	C	C		

Intersection Summary			
Average Delay		1.6	
Intersection Capacity Utilization		41.9%	ICU Level of Service A
Analysis Period (min)		15	

# Appendix B: SimTraffic Queuing and Blocking Reports (Short Term Alternatives & Long Term Alternative)



**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LR	LR	LT	TR	LT	TR
Maximum Queue (ft)	30	530	160	151	20	7
Average Queue (ft)	3	315	6	5	1	0
95th Queue (ft)	19	660	156	155	15	7
Link Distance (ft)	154	2505	1647	1647	2353	2353
Upstream Blk Time (%)			0	0		
Queuing Penalty (veh)			0	0		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	NB	SB	SB
Directions Served	LR	TR	LT	TR
Maximum Queue (ft)	951	3	219	123
Average Queue (ft)	903	0	87	14
95th Queue (ft)	1080	2	199	92
Link Distance (ft)	938	2353	1319	1319
Upstream Blk Time (%)	81			
Queuing Penalty (veh)	110			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	112	54	440
Average Queue (ft)	39	14	333
95th Queue (ft)	137	50	593
Link Distance (ft)	938	396	411
Upstream Blk Time (%)			74
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 110

**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LR	LR	LT	TR	LT	TR
Maximum Queue (ft)	43	612	1081	933	35	28
Average Queue (ft)	5	567	87	71	7	2
95th Queue (ft)	25	804	691	622	41	21
Link Distance (ft)	154	2505	1647	1647	2353	2353
Upstream Blk Time (%)			0	0		
Queuing Penalty (veh)			0	0		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	NB	NB	SB	SB
Directions Served	LR	LT	TR	LT	TR
Maximum Queue (ft)	944	0	7	1345	1347
Average Queue (ft)	931	0	0	1073	1042
95th Queue (ft)	999	0	5	1697	1765
Link Distance (ft)	938	2353	2353	1319	1319
Upstream Blk Time (%)	94			59	59
Queuing Penalty (veh)	162			0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	57	105	422
Average Queue (ft)	15	36	379
95th Queue (ft)	41	99	544
Link Distance (ft)	938	396	411
Upstream Blk Time (%)			88
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 162

**Intersection: 100: Driveway & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LR	L	LR	L	T	T	R	L	T	TR
Maximum Queue (ft)	56	395	794	24	1633	1651	300	205	88	72
Average Queue (ft)	6	304	436	1	719	768	94	101	15	25
95th Queue (ft)	30	472	869	11	1446	1494	283	191	60	60
Link Distance (ft)	150		2532		1742	1742			2367	2367
Upstream Blk Time (%)					0	0				
Queuing Penalty (veh)					0	0				
Storage Bay Dist (ft)		300		100			200	200		
Storage Blk Time (%)		45	49		15	12		3		
Queuing Penalty (veh)		57	61		0	30		7		

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB
Directions Served	R
Maximum Queue (ft)	228
Average Queue (ft)	86
95th Queue (ft)	196
Link Distance (ft)	925
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	57	31	38	2
Average Queue (ft)	13	7	2	0
95th Queue (ft)	41	27	18	2
Link Distance (ft)	925	390	2532	410
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 155

**Intersection: 100: Driveway & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	NB
Directions Served	LR	R	LT	TR
Maximum Queue (ft)	42	26	1531	1528
Average Queue (ft)	5	4	84	76
95th Queue (ft)	25	17	668	638
Link Distance (ft)	149	2492	1862	1862
Upstream Blk Time (%)			0	0
Queuing Penalty (veh)			0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	LR	T	TR	L	T	TR
Maximum Queue (ft)	348	608	1630	1649	199	79	72
Average Queue (ft)	239	345	897	939	86	15	27
95th Queue (ft)	428	760	1899	1885	175	55	61
Link Distance (ft)		926	2343	2343		1609	1609
Upstream Blk Time (%)		3	0	0			
Queuing Penalty (veh)		8	5	3			
Storage Bay Dist (ft)	300				200		
Storage Blk Time (%)	23	29	19		2		
Queuing Penalty (veh)	39	36	0		5		

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	68	33	83
Average Queue (ft)	37	7	9
95th Queue (ft)	65	28	79
Link Distance (ft)	926	399	404
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 96

**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	NB	NB	SB
Directions Served	LR	LR	LT	T	TR	LT
Maximum Queue (ft)	48	747	1650	1650	1815	20
Average Queue (ft)	6	688	238	219	99	15
95th Queue (ft)	29	1082	1243	1194	779	53
Link Distance (ft)	136	2485	1802	1802	1802	2336
Upstream Blk Time (%)			0	0	0	
Queuing Penalty (veh)			0	0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	SB	SB	SB
Directions Served	LR	LT	T	TR
Maximum Queue (ft)	924	1674	1668	1670
Average Queue (ft)	920	1451	1417	1382
95th Queue (ft)	942	2049	2096	2152
Link Distance (ft)	920	1660	1660	1660
Upstream Blk Time (%)	99	59	65	65
Queuing Penalty (veh)	252	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	37	188	415
Average Queue (ft)	13	82	398
95th Queue (ft)	35	206	471
Link Distance (ft)	920	396	411
Upstream Blk Time (%)			97
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 252

**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	L	LR	T	T	T	R	T	T	TR
Maximum Queue (ft)	44	402	412	1867	1807	1966	300	60	80	112
Average Queue (ft)	6	268	280	506	570	587	89	13	24	35
95th Queue (ft)	27	435	443	1318	1434	1442	282	41	61	87
Link Distance (ft)	144		2523	2408	2408	2408		2353	2353	2353
Upstream Blk Time (%)				0	0	0				
Queuing Penalty (veh)				0	0	0				
Storage Bay Dist (ft)		500					200			
Storage Blk Time (%)		1	1			9				
Queuing Penalty (veh)		1	2			30				

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	NB	NB	NB	SB
Directions Served	R	T	T	TR	L
Maximum Queue (ft)	166	270	294	359	263
Average Queue (ft)	71	146	171	206	127
95th Queue (ft)	140	248	273	330	221
Link Distance (ft)	913	2353	2353	2353	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				300	
Storage Blk Time (%)				0	
Queuing Penalty (veh)				1	

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	181	31	3
Average Queue (ft)	91	9	0
95th Queue (ft)	166	32	2
Link Distance (ft)	913	390	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 34

**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	SB
Directions Served	LR	LR	TR	LT
Maximum Queue (ft)	49	731	2	12
Average Queue (ft)	6	208	0	1
95th Queue (ft)	29	819	2	9
Link Distance (ft)	155	2505	1492	2353
Upstream Blk Time (%)		1		
Queuing Penalty (veh)		1		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	SB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	900	239	152
Average Queue (ft)	614	26	5
95th Queue (ft)	1040	155	127
Link Distance (ft)	938	1289	1289
Upstream Blk Time (%)	16		0
Queuing Penalty (veh)	19		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	63	30	178
Average Queue (ft)	20	1	60
95th Queue (ft)	48	12	288
Link Distance (ft)	938	396	411
Upstream Blk Time (%)			10
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 20

**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	SB
Directions Served	LR	LR	TR	LT
Maximum Queue (ft)	57	1176	4	26
Average Queue (ft)	12	645	0	1
95th Queue (ft)	44	1143	4	15
Link Distance (ft)	155	2505	1492	2353
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	SB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	952	521	413
Average Queue (ft)	909	56	18
95th Queue (ft)	1064	276	199
Link Distance (ft)	938	1289	1289
Upstream Blk Time (%)	83	0	0
Queuing Penalty (veh)	125	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	53	25	442
Average Queue (ft)	20	4	343
95th Queue (ft)	44	17	592
Link Distance (ft)	938	396	411
Upstream Blk Time (%)			76
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 125



**Intersection: 100: Driveway & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LR	L	LR	T	T	R	L	T	TR
Maximum Queue (ft)	48	258	294	97	123	66	110	501	583
Average Queue (ft)	7	142	155	30	46	21	25	189	253
95th Queue (ft)	31	237	263	75	100	51	73	398	488
Link Distance (ft)	150		2532	1742	1742			2367	2367
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		300				200	200		
Storage Blk Time (%)		0	1	0				3	
Queuing Penalty (veh)		1	1	0				1	

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	SB	SB
Directions Served	R	T	TR
Maximum Queue (ft)	75	742	616
Average Queue (ft)	28	33	29
95th Queue (ft)	60	378	351
Link Distance (ft)	925	1350	1350
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	32	19	38	7
Average Queue (ft)	9	1	2	0
95th Queue (ft)	30	9	17	5
Link Distance (ft)	925	390	2532	410
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 3

**Intersection: 100: Driveway & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB
Directions Served	LR	R
Maximum Queue (ft)	56	26
Average Queue (ft)	11	3
95th Queue (ft)	42	17
Link Distance (ft)	149	2492
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	LR	T	TR	L	T	TR
Maximum Queue (ft)	251	287	106	127	148	739	670
Average Queue (ft)	144	167	28	39	26	224	277
95th Queue (ft)	230	253	77	95	85	504	530
Link Distance (ft)		926	2343	2343		1609	1609
Upstream Blk Time (%)						0	
Queuing Penalty (veh)						0	
Storage Bay Dist (ft)	300				200		
Storage Blk Time (%)	0	0	0			4	
Queuing Penalty (veh)	0	0	0			2	

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	61	25	2
Average Queue (ft)	22	2	0
95th Queue (ft)	48	13	2
Link Distance (ft)	926	399	404
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 2
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**Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)**

Movement	EB	WB	NB	SB	SB	SB
Directions Served	LR	LR	TR	LT	T	TR
Maximum Queue (ft)	149	968	6	345	298	194
Average Queue (ft)	110	876	0	30	22	14
95th Queue (ft)	170	1257	5	247	225	216
Link Distance (ft)	136	2485	1682	2336	2336	2336
Upstream Blk Time (%)	60					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)**

Movement	WB	NB	SB	SB	SB
Directions Served	LR	TR	LT	T	TR
Maximum Queue (ft)	926	1	1609	1606	1482
Average Queue (ft)	920	0	526	501	356
95th Queue (ft)	932	1	1328	1391	1231
Link Distance (ft)	920	2336	1592	1592	1592
Upstream Blk Time (%)	98		1	1	1
Queuing Penalty (veh)	218		0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

**Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)**

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	53	46	424
Average Queue (ft)	26	17	398
95th Queue (ft)	49	46	490
Link Distance (ft)	920	396	411
Upstream Blk Time (%)			94
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 218

# Queuing and Blocking Report

7/30/2014

## Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	L	LR	T	T	T	R	T	T	TR
Maximum Queue (ft)	58	439	468	92	110	161	56	2384	2385	2374
Average Queue (ft)	13	300	318	37	50	70	21	1895	1952	1981
95th Queue (ft)	45	494	535	78	96	127	48	2929	2903	2873
Link Distance (ft)	143		2520	1797	1797	1797		2352	2352	2352
Upstream Blk Time (%)								6	6	6
Queuing Penalty (veh)								85	86	89
Storage Bay Dist (ft)		500					200			
Storage Blk Time (%)		3	4			0				
Queuing Penalty (veh)		6	7			0				

## Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	LT	T	TR	L	T	T	TR
Maximum Queue (ft)	95	10	30	52	220	1699	1742	1703
Average Queue (ft)	40	0	2	5	34	661	710	696
95th Queue (ft)	77	5	16	26	115	1880	1935	1901
Link Distance (ft)	913	2352	2352	2352		1724	1724	1724
Upstream Blk Time (%)						2	2	3
Queuing Penalty (veh)						0	0	0
Storage Bay Dist (ft)					300			
Storage Blk Time (%)						6		
Queuing Penalty (veh)						3		

## Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

Movement	EB	WB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	80	25	6
Average Queue (ft)	30	1	0
95th Queue (ft)	60	10	4
Link Distance (ft)	913	390	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

## Network Summary

Network wide Queuing Penalty: 275

# Appendix C: Synchro HCM Reports (Non-Selected Long Term Alternatives)

## *Route 1 at Route 637*

HCM Signalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗ ↘	↗		↗	↑↑↑	↗	↗	↑↑↑	
Volume (vph)	0	0	6	370	0	4	4	4443	353	123	828	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lane Util. Factor		1.00		0.97	1.00		1.00	0.91	1.00	1.00	0.91	
Fr <sub>t</sub>		0.86		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Fl <sub>t</sub> Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1429		3273	1583		1433	5036	1524	1656	5036	
Fl <sub>t</sub> Permitted		1.00		0.95	1.00		0.27	1.00	1.00	0.04	1.00	
Satd. Flow (perm)		1429		3273	1583		409	5036	1524	63	5036	
Peak-hour factor, PHF	0.25	0.25	0.38	0.82	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Adj. Flow (vph)	0	0	16	451	0	8	8	5227	477	246	1010	0
RTOR Reduction (vph)	0	16	0	0	7	0	0	0	51	0	0	0
Lane Group Flow (vph)	0	0	0	451	1	0	8	5227	426	246	1010	0
Heavy Vehicles (%)	2%	2%	15%	7%	2%	2%	26%	3%	6%	9%	3%	8%
Turn Type	Perm			Prot			Perm			Perm pm+pt		
Protected Phases		4		3	8			2			1	6
Permitted Phases	4						2		2		6	
Actuated Green, G (s)		1.9		13.0	18.9		106.1	106.1	106.1	120.1	120.1	
Effective Green, g (s)		3.9		15.0	20.9		108.1	108.1	108.1	122.1	122.1	
Actuated g/C Ratio		0.03		0.10	0.14		0.74	0.74	0.74	0.83	0.83	
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		38		334	225		301	3703	1121	182	4183	
v/s Ratio Prot		c0.00		c0.14	0.00			c1.04		c0.11	0.20	
v/s Ratio Perm							0.02		0.28	1.01		
v/c Ratio		0.01		1.35	0.01		0.03	1.41	0.38	1.35	0.24	
Uniform Delay, d <sub>1</sub>		69.7		66.0	54.1		5.2	19.5	7.1	58.9	2.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d <sub>2</sub>		0.1		176.2	0.0		0.0	186.9	0.2	189.9	0.0	
Delay (s)		69.8		242.2	54.1		5.3	206.3	7.4	248.8	2.7	
Level of Service		E		F	D		A	F	A	F	A	
Approach Delay (s)		69.8			238.9			189.4			50.9	
Approach LOS		E			F			F			D	

Intersection Summary

HCM Average Control Delay	168.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	147.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	119.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕↕↕			↕↕↕	
Volume (veh/h)	0	0	6	0	0	4	4	4443	353	0	1199	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.38	0.79	0.25	0.50	0.50	0.85	0.74	0.50	0.82	0.25
Hourly flow rate (vph)	0	0	16	0	0	8	8	5227	477	0	1462	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3229	7182	487	5985	6944	1981	1462			5704		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3229	7182	487	5985	6944	1981	1462			5704		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	97	100	100	85	98			100		
cM capacity (veh/h)	3	0	493	0	0	52	354			8		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	16	8	1315	2614	1784	585	585	292
Volume Left	0	0	8	0	0	0	0	0
Volume Right	16	8	0	0	477	0	0	0
cSH	493	52	354	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.15	0.02	1.54	1.05	0.34	0.34	0.17
Queue Length 95th (ft)	2	13	2	0	0	0	0	0
Control Delay (s)	12.5	86.7	1.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	F	A					
Approach Delay (s)	12.5	86.7	0.4			0.0		
Approach LOS	B	F						

Intersection Summary		
Average Delay		0.4
Intersection Capacity Utilization	110.4%	ICU Level of Service
Analysis Period (min)		15
		H



HCM Signalized Intersection Capacity Analysis  
 100: Relocated Route 637 & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↑↑↑	↔	↔	↑↑↑
Volume (vph)	370	4	4443	353	123	828
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	2.0	2.0	2.0	2.0
Lane Util. Factor	0.97	1.00	0.91	1.00	1.00	0.91
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3273	1583	5036	1524	1656	5036
Flt Permitted	0.95	1.00	1.00	1.00	0.04	1.00
Satd. Flow (perm)	3273	1583	5036	1524	73	5036
Peak-hour factor, PHF	0.79	0.50	0.50	0.74	0.50	0.82
Adj. Flow (vph)	468	8	8886	477	246	1010
RTOR Reduction (vph)	0	5	0	40	0	0
Lane Group Flow (vph)	468	3	8886	437	246	1010
Heavy Vehicles (%)	7%	2%	3%	6%	9%	3%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases	8	8		2	6	
Actuated Green, G (s)	11.0	11.0	91.0	91.0	101.0	101.0
Effective Green, g (s)	13.0	11.0	93.0	93.0	103.0	103.0
Actuated g/C Ratio	0.11	0.09	0.78	0.78	0.86	0.86
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	355	145	3903	1181	168	4323
v/s Ratio Prot	c0.14		c1.76		c0.10	0.20
v/s Ratio Perm		0.00		0.29	1.15	
v/c Ratio	1.32	0.02	2.28	0.37	1.46	0.23
Uniform Delay, d1	53.5	49.6	13.5	4.3	48.0	1.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	161.8	0.1	575.3	0.2	238.5	0.0
Delay (s)	215.3	49.7	588.8	4.5	286.6	1.5
Level of Service	F	D	F	A	F	A
Approach Delay (s)	212.5		559.1			57.4
Approach LOS	F		F			E

Intersection Summary

HCM Average Control Delay	487.4	HCM Level of Service	F
HCM Volume to Capacity ratio	2.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	113.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗ ↘	↗		↗	↑↑↑	↗	↗	↑↑↑	
Volume (vph)	0	0	10	383	0	8	0	1328	306	57	4475	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Util. Factor		1.00		0.97	1.00			0.91	1.00	1.00	0.91	
Frt		0.86		1.00	0.85			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1429		3273	1583			5036	1524	1656	5034	
Flt Permitted		1.00		0.95	1.00			1.00	1.00	0.14	1.00	
Satd. Flow (perm)		1429		3273	1583			5036	1524	244	5034	
Peak-hour factor, PHF	0.25	0.25	0.42	0.69	0.25	0.50	0.25	0.92	0.92	0.25	0.92	0.25
Adj. Flow (vph)	0	0	24	555	0	16	0	1443	333	228	4864	8
RTOR Reduction (vph)	0	1	0	0	13	0	0	0	105	0	0	0
Lane Group Flow (vph)	0	23	0	555	3	0	0	1443	228	228	4872	0
Heavy Vehicles (%)	2%	2%	15%	7%	2%	2%	26%	3%	6%	9%	3%	8%
Turn Type	Perm			Prot			Perm			Perm pm+pt		
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4						2		2		6	
Actuated Green, G (s)		2.9		18.0	24.9			99.3	99.3	115.1	115.1	
Effective Green, g (s)		4.9		20.0	26.9			101.3	101.3	117.1	117.1	
Actuated g/C Ratio		0.03		0.14	0.18			0.68	0.68	0.79	0.79	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		47		442	288			3447	1043	325	3983	
v/s Ratio Prot		c0.02		c0.17	0.00			0.29		0.07	c0.97	
v/s Ratio Perm									0.15	0.49		
v/c Ratio		0.49		1.26	0.01			0.42	0.22	0.70	1.22	
Uniform Delay, d1		70.3		64.0	49.6			10.3	8.7	9.0	15.5	
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		7.8		132.4	0.0			0.1	0.1	6.7	102.9	
Delay (s)		78.2		196.4	49.6			10.4	8.8	15.7	118.3	
Level of Service		E		F	D			B	A	B	F	
Approach Delay (s)		78.2			192.3			10.1			113.7	
Approach LOS		E			F			B			F	

Intersection Summary

HCM Average Control Delay	95.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	148.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	110.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔				↗		↔↔↔			↔↔↔	
Volume (veh/h)	0	0	10	0	0	11	0	1328	306	0	4858	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.42	0.69	0.25	0.50	0.25	0.92	0.92	0.25	0.92	0.25
Hourly flow rate (vph)	0	0	24	0	0	22	0	1443	333	0	5280	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	5788	7061	1764	3394	6898	647	5288			1776		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5788	7061	1764	3394	6898	647	5288			1776		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	63	100	100	95	100			100		
cM capacity (veh/h)	0	0	63	2	0	413	6			346		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	24	22	361	722	693	2112	2112	1064
Volume Left	0	0	0	0	0	0	0	0
Volume Right	24	22	0	0	333	0	0	8
cSH	63	413	6	1700	1700	1700	1700	1700
Volume to Capacity	0.37	0.05	0.00	0.42	0.41	1.24	1.24	0.63
Queue Length 95th (ft)	35	4	0	0	0	0	0	0
Control Delay (s)	92.4	14.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B						
Approach Delay (s)	92.4	14.2	0.0			0.0		
Approach LOS	F	B						

Intersection Summary		
Average Delay		0.4
Intersection Capacity Utilization	103.9%	ICU Level of Service
Analysis Period (min)		15
		G

HCM Signalized Intersection Capacity Analysis  
 100: Relocated Route 637 & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↑↑↑	↔	↔	↑↑↑
Volume (vph)	383	8	1328	306	57	4475
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lane Util. Factor	0.97	1.00	0.91	1.00	1.00	0.91
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3273	1583	4117	1524	1656	5036
Flt Permitted	0.95	1.00	1.00	1.00	0.15	1.00
Satd. Flow (perm)	3273	1583	4117	1524	253	5036
Peak-hour factor, PHF	0.69	0.50	0.92	0.92	0.25	0.92
Adj. Flow (vph)	555	16	1443	333	228	4864
RTOR Reduction (vph)	0	8	0	92	0	0
Lane Group Flow (vph)	555	8	1443	241	228	4864
Heavy Vehicles (%)	7%	2%	26%	6%	9%	3%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases	8	8		2	6	
Actuated Green, G (s)	16.0	16.0	92.0	92.0	106.0	106.0
Effective Green, g (s)	18.0	18.0	94.0	94.0	108.0	108.0
Actuated g/C Ratio	0.14	0.14	0.72	0.72	0.83	0.83
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	453	219	2977	1102	340	4184
v/s Ratio Prot	c0.17		0.35		0.06	c0.97
v/s Ratio Perm		0.01		0.16	0.49	
v/c Ratio	1.23	0.04	0.48	0.22	0.67	1.16
Uniform Delay, d1	56.0	48.5	7.7	5.9	5.7	11.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	119.6	0.1	0.1	0.1	5.1	76.1
Delay (s)	175.6	48.6	7.8	6.0	10.9	87.1
Level of Service	F	D	A	A	B	F
Approach Delay (s)	172.1		7.5			83.7
Approach LOS	F		A			F

Intersection Summary

HCM Average Control Delay	72.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

## *Route 1 at Route 639*

HCM Unsignalized Intersection Capacity Analysis  
 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔				↗		↔↔↔			↔↔↔	
Volume (veh/h)	0	0	0	0	0	70	0	4425	20	0	904	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	0	0	159	0	5086	48	0	1076	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2931	6210	359	5469	6186	1719	1076			5134		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2931	6210	359	5469	6186	1719	1076			5134		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	0	100	100	100	100	0	100			100		
cM capacity (veh/h)	0	0	638	0	0	71	644			15		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	159	1272	2543	1319	430	430	215
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	159	0	0	48	0	0	0
cSH	1700	71	644	1700	1700	1700	1700	1700
Volume to Capacity	0.00	2.25	0.00	1.50	0.78	0.25	0.25	0.13
Queue Length 95th (ft)	0	376	0	0	0	0	0	0
Control Delay (s)	0.0	700.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	F						
Approach Delay (s)	0.0	700.2	0.0			0.0		
Approach LOS	A	F						

Intersection Summary		
Average Delay		17.5
Intersection Capacity Utilization	96.9%	ICU Level of Service
Analysis Period (min)		15
		F

# HCM Signalized Intersection Capacity Analysis

## 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗	↘		↖	↑↑↑		↙	↑↑↑	
Volume (vph)	0	0	0	370	0	70	0	4425	20	123	781	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	2.0			2.0		2.0	2.0	
Lane Util. Factor				0.97	1.00			0.91		1.00	0.91	
Fr <sub>t</sub>				1.00	0.85			1.00		1.00	1.00	
Fl <sub>t</sub> Protected				0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)				3183	1442			5077		1597	5085	
Fl <sub>t</sub> Permitted				0.95	1.00			1.00		0.04	1.00	
Satd. Flow (perm)				3183	1442			5077		63	5085	
Peak-hour factor, PHF	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Adj. Flow (vph)	0	0	0	440	0	159	0	5086	48	262	930	0
RTOR Reduction (vph)	0	0	0	0	101	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	440	58	0	0	5133	0	262	930	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	12%	2%	2%	5%	13%	2%	2%
Turn Type	Perm			Prot			Perm			pm+pt		
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4						2			6		
Actuated Green, G (s)				15.7	15.7			102.0		118.0	118.0	
Effective Green, g (s)				13.7	17.7			104.0		120.0	120.0	
Actuated g/C Ratio				0.10	0.12			0.73		0.85	0.85	
Clearance Time (s)				4.0	4.0			4.0		4.0	4.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				308	180			3726		205	4306	
v/s Ratio Prot				c0.14	0.04			c1.01		c0.13	0.18	
v/s Ratio Perm										0.95		
v/c Ratio				1.43	0.32			1.38		1.28	0.22	
Uniform Delay, d <sub>1</sub>				64.0	56.5			18.8		56.7	2.0	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>				210.7	1.1			171.7		157.2	0.0	
Delay (s)				274.7	57.6			190.6		214.0	2.1	
Level of Service				F	E			F		F	A	
Approach Delay (s)		0.0			217.1			190.6			48.6	
Approach LOS		A			F			F			D	

### Intersection Summary

HCM Average Control Delay	168.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	141.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	113.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/20/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔				↗		↔↔↔			↔↔↔	
Volume (veh/h)	0	0	0	0	0	70	0	4425	20	0	904	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.84	0.25	0.44	0.25	0.87	0.42	0.47	0.84	0.25
Hourly flow rate (vph)	0	0	0	0	0	159	0	5086	48	0	1076	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								598				
pX, platoon unblocked	0.24	0.24		0.24	0.24	0.24				0.24		
vC, conflicting volume	2931	6210	359	5469	6186	1719	1076			5134		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0	11736	359	8599	11635	0	1076			7182		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	100	100	36	100			100		
cM capacity (veh/h)	87	0	638	0	0	249	644			0		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	159	1272	2543	1319	430	430	215
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	159	0	0	48	0	0	0
cSH	1700	249	644	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.64	0.00	1.50	0.78	0.25	0.25	0.13
Queue Length 95th (ft)	0	98	0	0	0	0	0	0
Control Delay (s)	0.0	42.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	E						
Approach Delay (s)	0.0	42.0	0.0			0.0		
Approach LOS	A	E						

Intersection Summary		
Average Delay		1.0
Intersection Capacity Utilization	96.9%	ICU Level of Service
Analysis Period (min)		15
		F



# HCM Unsignalized Intersection Capacity Analysis

## 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕↕↕			↕↕↕	
Volume (veh/h)	0	0	0	0	0	61	0	1321	13	0	4492	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.86	0.25	0.75	0.25	0.92	0.62	0.61	0.90	0.25
Hourly flow rate (vph)	0	0	0	0	0	81	0	1436	21	0	4991	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	5551	6448	1664	3110	6437	489	4991			1457		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5551	6448	1664	3110	6437	489	4991			1457		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	100	100	84	100			100		
cM capacity (veh/h)	0	0	86	5	0	499	17			460		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	81	359	718	380	1996	1996	998
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	81	0	0	21	0	0	0
cSH	1700	499	17	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.16	0.00	0.42	0.22	1.17	1.17	0.59
Queue Length 95th (ft)	0	14	0	0	0	0	0	0
Control Delay (s)	0.0	13.6	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	B						
Approach Delay (s)	0.0	13.6	0.0			0.0		
Approach LOS	A	B						

### Intersection Summary

Average Delay		0.2						
Intersection Capacity Utilization		90.1%		ICU Level of Service			E	
Analysis Period (min)		15						

# HCM Signalized Intersection Capacity Analysis

## 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗	↘		↖	↑↑↑		↙	↑↑↑	
Volume (vph)	0	0	0	383	0	65	0	1318	13	57	4435	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				2.0	2.0			2.0		2.0	2.0	
Lane Util. Factor				0.97	1.00			0.91		1.00	0.91	
Fr <sub>t</sub>				1.00	0.85			1.00		1.00	1.00	
Fl <sub>t</sub> Protected				0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)				3183	1442			5072		1597	5085	
Fl <sub>t</sub> Permitted				0.95	1.00			1.00		0.15	1.00	
Satd. Flow (perm)				3183	1442			5072		254	5085	
Peak-hour factor, PHF	0.25	0.25	0.25	0.86	0.25	0.75	0.25	0.92	0.62	0.61	0.90	0.25
Adj. Flow (vph)	0	0	0	445	0	87	0	1433	21	93	4928	0
RTOR Reduction (vph)	0	0	0	0	77	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	445	10	0	0	1453	0	93	4928	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	12%	2%	2%	5%	13%	2%	2%
Turn Type	Perm			Prot			Perm			pm+pt		
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4						2			6		
Actuated Green, G (s)				15.0	15.0			109.0		118.0	118.0	
Effective Green, g (s)				17.0	17.0			111.0		120.0	120.0	
Actuated g/C Ratio				0.12	0.12			0.79		0.85	0.85	
Clearance Time (s)				4.0	4.0			4.0		4.0	4.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				384	174			3993		283	4328	
v/s Ratio Prot				c0.14	0.01			0.29		0.02	c0.97	
v/s Ratio Perm										0.26		
v/c Ratio				1.16	0.06			0.36		0.33	1.14	
Uniform Delay, d <sub>1</sub>				62.0	54.9			4.5		2.5	10.5	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>				96.8	0.1			0.1		0.7	65.6	
Delay (s)				158.8	55.1			4.5		3.2	76.1	
Level of Service				F	E			A		A	E	
Approach Delay (s)		0.0			141.8			4.5			74.8	
Approach LOS		A			F			A			E	

### Intersection Summary

HCM Average Control Delay	65.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	141.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	103.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕↕↕			↕↕↕	
Volume (veh/h)	0	0	0	0	0	61	0	1321	13	0	4492	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.86	0.25	0.75	0.25	0.92	0.62	0.61	0.90	0.25
Hourly flow rate (vph)	0	0	0	0	0	81	0	1436	21	0	4991	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								598				
pX, platoon unblocked	0.87	0.87		0.87	0.87	0.87					0.87	
vC, conflicting volume	5551	6448	1664	3110	6437	489	4991				1457	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5706	6735	1664	2905	6723	0	4991				1008	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2				2.2	
p0 queue free %	100	100	100	100	100	91	100				100	
cM capacity (veh/h)	0	0	86	6	0	917	17				595	

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	81	359	718	380	1996	1996	998
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	81	0	0	21	0	0	0
cSH	1700	917	17	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.09	0.00	0.42	0.22	1.17	1.17	0.59
Queue Length 95th (ft)	0	7	0	0	0	0	0	0
Control Delay (s)	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A						
Approach Delay (s)	0.0	9.3	0.0			0.0		
Approach LOS	A	A						

### Intersection Summary

Average Delay		0.1						
Intersection Capacity Utilization		90.1%		ICU Level of Service			E	
Analysis Period (min)		15						

## *Route 637 at Route 639*

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	16	0	4	0	6	4	9	464	2	0	371	59
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	26	0	16	0	16	8	36	627	8	0	452	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1212	1200	493	1212	1237	631	534			635		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1212	1200	493	1212	1237	631	534			635		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	81	100	97	100	91	98	96			100		
cM capacity (veh/h)	136	178	576	150	169	481	948			948		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	42	24	671	534
Volume Left	26	0	36	0
Volume Right	16	8	8	82
cSH	191	216	948	948
Volume to Capacity	0.22	0.11	0.04	0.00
Queue Length 95th (ft)	20	9	3	0
Control Delay (s)	29.1	23.7	1.0	0.0
Lane LOS	D	C	A	
Approach Delay (s)	29.1	23.7	1.0	0.0
Approach LOS	D	C		

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	130	0	0	0	6	4	0	350	2	0	4	425
Peak Hour Factor	0.61	0.25	0.25	0.25	0.38	0.50	0.25	0.74	0.25	0.25	0.82	0.72
Hourly flow rate (vph)	213	0	0	0	16	8	0	473	8	0	5	590

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	213	24	481	595
Volume Left (vph)	213	0	0	0
Volume Right (vph)	0	8	8	590
Hadj (s)	0.37	-0.17	0.07	-0.43
Departure Headway (s)	7.1	7.3	5.8	5.2
Degree Utilization, x	0.42	0.05	0.77	0.85
Capacity (veh/h)	470	426	608	680
Control Delay (s)	15.1	10.7	25.4	30.7
Approach Delay (s)	15.1	10.7	25.4	30.7
Approach LOS	C	B	D	D

Intersection Summary			
Delay		25.8	
HCM Level of Service		D	
Intersection Capacity Utilization	47.1%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Relocated Route 637

5/20/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	16	0	4	0	6	4	9	464	2	0	371	59
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.61	0.25	0.92	0.92	0.38	0.50	0.92	0.92	0.92	0.25	0.92	0.72
Hourly flow rate (vph)	26	0	4	0	16	8	10	504	2	0	403	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1126				
pX, platoon unblocked												
vC, conflicting volume	985	970	444	974	1010	505	485			507		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	985	970	444	974	1010	505	485			507		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	100	99	100	93	99	99			100		
cM capacity (veh/h)	204	251	614	228	238	567	1078			1058		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	31	24	516	485
Volume Left	26	0	10	0
Volume Right	4	8	2	82
cSH	225	295	1078	1058
Volume to Capacity	0.14	0.08	0.01	0.00
Queue Length 95th (ft)	12	7	1	0
Control Delay (s)	23.5	18.3	0.3	0.0
Lane LOS	C	C	A	
Approach Delay (s)	23.5	18.3	0.3	0.0
Approach LOS	C	C		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	0	11	0	2	0	8	350	6	2	382	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.25	0.38	0.25	0.25	0.25	0.25	0.86	0.38	0.25	0.78	0.90
Hourly flow rate (vph)	7	0	29	0	8	0	32	407	16	8	490	57
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1017	1021	518	1042	1041	415	546			423		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1017	1021	518	1042	1041	415	546			423		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	96	100	95	100	96	100	97			99		
cM capacity (veh/h)	197	227	558	191	220	638	938			1136		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	36	8	455	554
Volume Left	7	0	32	8
Volume Right	29	0	16	57
cSH	406	220	938	1136
Volume to Capacity	0.09	0.04	0.03	0.01
Queue Length 95th (ft)	7	3	3	1
Control Delay (s)	14.7	21.9	1.0	0.2
Lane LOS	B	C	A	A
Approach Delay (s)	14.7	21.9	1.0	0.2
Approach LOS	B	C		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		36.7%	ICU Level of Service A
Analysis Period (min)		15	



HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	55	0	6	0	2	0	0	300	6	2	0	433
Peak Hour Factor	0.68	0.25	0.38	0.25	0.25	0.25	0.25	0.86	0.38	0.25	0.78	0.90
Hourly flow rate (vph)	81	0	16	0	8	0	0	349	16	8	0	481
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	97	8	365	489								
Volume Left (vph)	81	0	0	8								
Volume Right (vph)	16	0	16	481								
Hadj (s)	0.22	0.03	0.06	-0.42								
Departure Headway (s)	6.0	6.1	4.8	4.3								
Degree Utilization, x	0.16	0.01	0.49	0.58								
Capacity (veh/h)	528	489	726	823								
Control Delay (s)	10.2	9.1	12.3	12.9								
Approach Delay (s)	10.2	9.1	12.3	12.9								
Approach LOS	B	A	B	B								
Intersection Summary												
Delay			12.4									
HCM Level of Service			B									
Intersection Capacity Utilization			45.4%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 300: Route 639 (Woodstock Lane) & Relocated Route 637

5/15/2014



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	0	11	0	2	0	8	350	6	2	382	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.25	0.38	0.25	0.25	0.25	0.25	0.86	0.38	0.25	0.78	0.90
Hourly flow rate (vph)	7	0	29	0	8	0	32	407	16	8	490	57
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1126				
pX, platoon unblocked												
vC, conflicting volume	1017	1021	518	1042	1041	415	546			423		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1017	1021	518	1042	1041	415	546			423		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	96	100	95	100	96	100	97			99		
cM capacity (veh/h)	197	227	558	191	220	638	938			1136		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	36	8	455	554
Volume Left	7	0	32	8
Volume Right	29	0	16	57
cSH	406	220	938	1136
Volume to Capacity	0.09	0.04	0.03	0.01
Queue Length 95th (ft)	7	3	3	1
Control Delay (s)	14.7	21.9	1.0	0.2
Lane LOS	B	C	A	A
Approach Delay (s)	14.7	21.9	1.0	0.2
Approach LOS	B	C		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

# Appendix D: SimTraffic Queuing and Blocking Reports (Non-Selected Long Term Alternatives)

Queuing and Blocking Report

AM 2040 Alternative 1 - Consolidation of Traffic to Rte. 637

5/15/2014

Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	EB	WB	WB	WB	B6	NB	NB	NB	NB	NB	SB	SB
Directions Served	LR	L	L	TR	T	L	T	T	T	R	L	T
Maximum Queue (ft)	30	307	302	21	2271	26	602	602	602	300	216	50
Average Queue (ft)	5	285	277	3	1696	1	412	417	424	93	116	12
95th Queue (ft)	23	327	329	13	2817	8	626	645	649	264	190	37
Link Distance (ft)	138	228	228	228	2250		587	587	587			2351
Upstream Blk Time (%)		67	51		36		1	2	2			
Queuing Penalty (veh)		84	64		134		0	0	0			
Storage Bay Dist (ft)						100				200	200	
Storage Blk Time (%)							16		11		1	
Queuing Penalty (veh)							1		40		2	

Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (ft)	70	67
Average Queue (ft)	17	31
95th Queue (ft)	52	61
Link Distance (ft)	2351	2351
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB
Directions Served	R
Maximum Queue (ft)	185
Average Queue (ft)	84
95th Queue (ft)	175
Link Distance (ft)	920
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

## Queuing and Blocking Report

AM 2040 Alternative 1 - Consolidation of Traffic to Rte. 637

5/15/2014

### Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	44	31	45	450
Average Queue (ft)	10	7	4	178
95th Queue (ft)	32	27	23	517
Link Distance (ft)	920	396	2250	411
Upstream Blk Time (%)				31
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

### Network Summary

Network wide Queuing Penalty: 324

Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	EB	WB	NB	NB	NB
Directions Served	LR	R	LT	T	TR
Maximum Queue (ft)	54	24	630	637	642
Average Queue (ft)	8	2	485	500	522
95th Queue (ft)	34	12	843	861	864
Link Distance (ft)	137	2486	598	598	598
Upstream Blk Time (%)			9	10	13
Queuing Penalty (veh)			0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB	WB	WB	B10	B10	B6	NB	NB	NB	SB	SB	SB
Directions Served	L	L	TR	T	T	T	T	T	TR	L	T	T
Maximum Queue (ft)	210	189	172	147	133	671	2352	2359	2369	300	396	333
Average Queue (ft)	173	163	36	103	77	568	2267	2257	2263	136	41	34
95th Queue (ft)	192	197	105	168	136	920	2619	2649	2601	265	190	130
Link Distance (ft)	98	98	98	54	54	655	2326	2326	2326		473	473
Upstream Blk Time (%)	89	82		61	55	52	13	10	9			
Queuing Penalty (veh)	128	119		133	119	225	195	152	139			
Storage Bay Dist (ft)											200	
Storage Blk Time (%)							25				11	
Queuing Penalty (veh)							0				29	

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	SB
Directions Served	TR
Maximum Queue (ft)	74
Average Queue (ft)	40
95th Queue (ft)	73
Link Distance (ft)	473
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	124	31	104	473
Average Queue (ft)	56	10	54	361
95th Queue (ft)	99	33	85	607
Link Distance (ft)	655	396	2486	410
Upstream Blk Time (%)				66
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1240

Intersection: 100: Relocated Route 637 & Route 1 (Jefferson Davis Highway)

Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	R	L	T	T	T
Maximum Queue (ft)	299	1031	190	1357	1466	1483	300	300	424	364	91
Average Queue (ft)	293	978	13	825	909	979	145	211	58	37	33
95th Queue (ft)	307	1180	91	1314	1410	1532	339	330	269	178	72
Link Distance (ft)		1013		1910	1910	1910			515	515	515
Upstream Blk Time (%)		67									
Queuing Penalty (veh)		252									
Storage Bay Dist (ft)	200		100				200	200			
Storage Blk Time (%)	95	96				18		40			
Queuing Penalty (veh)	180	182				64		111			

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB
Directions Served	R
Maximum Queue (ft)	182
Average Queue (ft)	50
95th Queue (ft)	121
Link Distance (ft)	911
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 300: Route 639 (Woodstock Lane) & Relocated Route 637

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	132	31	79	462
Average Queue (ft)	35	8	3	334
95th Queue (ft)	98	29	26	610
Link Distance (ft)	911	389	1013	410
Upstream Blk Time (%)				64
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 788



Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	EB	WB	WB	WB	B6	NB	NB	NB	NB	SB	SB	SB
Directions Served	LR	L	L	TR	T	T	T	T	R	L	T	T
Maximum Queue (ft)	72	299	298	23	67	140	162	159	100	300	2379	2369
Average Queue (ft)	12	192	190	2	6	57	66	74	32	52	2100	2106
95th Queue (ft)	41	265	248	12	34	124	138	134	72	178	2903	2872
Link Distance (ft)	138	227	227	227	2253	589	589	589			2348	2348
Upstream Blk Time (%)		4	2								8	8
Queuing Penalty (veh)		6	3								124	121
Storage Bay Dist (ft)									200	200		
Storage Blk Time (%)						2				0	15	
Queuing Penalty (veh)						0				1	9	

Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	SB
Directions Served	TR
Maximum Queue (ft)	2365
Average Queue (ft)	2122
95th Queue (ft)	2842
Link Distance (ft)	2348
Upstream Blk Time (%)	8
Queuing Penalty (veh)	126
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB	SB	SB	SB
Directions Served	R	T	T	TR
Maximum Queue (ft)	96	517	498	498
Average Queue (ft)	45	393	396	382
95th Queue (ft)	80	722	723	724
Link Distance (ft)	920	483	483	483
Upstream Blk Time (%)		9	10	10
Queuing Penalty (veh)		0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

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Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

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Movement	EB	WB	NB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	62	31	46
Average Queue (ft)	16	3	3
95th Queue (ft)	46	18	18
Link Distance (ft)	920	396	2253
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

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Network Summary

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Network wide Queuing Penalty: 388

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Intersection: 100: Route 637 (Telegraph Road) & Route 1 (Jefferson Davis Highway)

Movement	EB	WB
Directions Served	LR	R
Maximum Queue (ft)	177	48
Average Queue (ft)	99	6
95th Queue (ft)	204	26
Link Distance (ft)	137	2487
Upstream Blk Time (%)	43	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB	WB	WB	B6	B6	B10	NB	NB	NB	SB	SB	SB
Directions Served	L	L	TR	T	T	T	T	T	TR	L	T	T
Maximum Queue (ft)	200	184	154	151	132	659	95	131	168	68	507	525
Average Queue (ft)	174	172	47	96	99	628	27	40	65	34	469	478
95th Queue (ft)	196	188	118	167	151	735	68	95	134	63	560	538
Link Distance (ft)	105	105	105	59	59	642	2326	2326	2326		473	473
Upstream Blk Time (%)	84	82	2	53	65	48					10	11
Queuing Penalty (veh)	122	119	4	116	142	208					0	0
Storage Bay Dist (ft)										200		
Storage Blk Time (%)							0				11	
Queuing Penalty (veh)							0				6	

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	SB
Directions Served	TR
Maximum Queue (ft)	504
Average Queue (ft)	473
95th Queue (ft)	548
Link Distance (ft)	473
Upstream Blk Time (%)	12
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 300: Route 639 (Woodstock Lane) & Route 637 (Telegraph Road)

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LR
Maximum Queue (ft)	61	31	82	462
Average Queue (ft)	26	3	51	356
95th Queue (ft)	49	18	71	605
Link Distance (ft)	642	396	2487	410
Upstream Blk Time (%)				64
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 718

Intersection: 100: Relocated Route 637 & Route 1 (Jefferson Davis Highway)

Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	R	L	T	T	T
Maximum Queue (ft)	299	828	195	190	198	269	78	297	535	542	540
Average Queue (ft)	237	342	22	81	102	118	39	46	523	527	524
95th Queue (ft)	342	660	116	166	176	209	78	133	558	537	536
Link Distance (ft)		1013		1910	1910	1910			515	515	515
Upstream Blk Time (%)									10	11	11
Queuing Penalty (veh)									145	164	162
Storage Bay Dist (ft)	200		100				200	200			
Storage Blk Time (%)	36	75				1			14		
Queuing Penalty (veh)	71	150				3			8		

Intersection: 200: Route 639 (Woodstock Lane) & Route 1 (Jefferson Davis Highway)

Movement	WB	SB	SB	SB
Directions Served	R	T	T	TR
Maximum Queue (ft)	97	517	498	517
Average Queue (ft)	41	479	484	483
95th Queue (ft)	77	607	575	588
Link Distance (ft)	911	483	483	483
Upstream Blk Time (%)		11	13	13
Queuing Penalty (veh)		0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 300: Route 639 (Woodstock Lane) & Relocated Route 637

Movement	EB	WB	NB	SB
Directions Served	LR	LTR	LTR	LTR
Maximum Queue (ft)	62	31	276	54
Average Queue (ft)	13	6	16	3
95th Queue (ft)	40	26	100	24
Link Distance (ft)	911	389	1013	410
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 703

# Appendix E: Traffic Volume Data

# DAVENPORT

305 West 4th Street, Suite 2A  
Winston-Salem, NC 27101  
336-744-1636

Counted By: B. Soblesky

File Name : Rte 1 at Rte 637  
Site Code : 13-368  
Start Date : 1/9/2014  
Page No : 1

Weather: Clear

**Groups Printed- Cars - Trucks - Buses**

Start Time	Route 1 (Jefferson Davis Hwy) Southbound					Route 637 (Telegraph Rd.) Westbound					Route 1 (Jefferson Davis Hwy) Northbound					Victory Lane Auto Service Drive Eastbound					Exclu. Total	Inclu. Total	Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total				
06:00 AM	0	50	0	0	50	4	0	1	0	5	0	260	10	0	270	0	0	0	0	0	0	0	325	325
06:15 AM	1	49	0	0	50	7	0	0	0	7	0	315	7	0	322	0	0	0	0	0	0	0	379	379
06:30 AM	0	78	0	0	78	2	0	0	0	2	1	383	17	0	401	0	0	0	0	0	0	0	481	481
06:45 AM	0	88	0	0	88	6	0	0	0	6	0	386	28	0	414	0	0	0	0	0	0	0	508	508
<b>Total</b>	<b>1</b>	<b>265</b>	<b>0</b>	<b>0</b>	<b>266</b>	<b>19</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>20</b>	<b>1</b>	<b>1344</b>	<b>62</b>	<b>0</b>	<b>1407</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1693</b>	<b>1693</b>
07:00 AM	0	120	0	0	120	8	0	0	0	8	1	548	20	0	569	0	0	2	2	2	2	699	701	
07:15 AM	0	80	0	0	80	9	0	0	0	9	1	499	42	0	542	0	0	1	0	1	0	632	632	
07:30 AM	1	90	0	0	91	12	0	1	0	13	0	442	63	0	505	0	0	0	0	0	0	609	609	
07:45 AM	1	105	0	0	106	9	0	1	0	10	0	372	61	0	433	0	0	0	1	0	1	549	550	
<b>Total</b>	<b>2</b>	<b>395</b>	<b>0</b>	<b>0</b>	<b>397</b>	<b>38</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>40</b>	<b>2</b>	<b>1861</b>	<b>186</b>	<b>0</b>	<b>2049</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2489</b>	<b>2492</b>	
08:00 AM	0	116	0	0	116	27	0	0	0	27	2	244	59	0	305	0	0	1	0	1	0	449	449	
08:15 AM	0	107	1	0	108	18	0	0	0	18	3	225	53	0	281	0	0	0	1	0	1	407	408	
08:30 AM	0	126	0	0	126	24	0	0	0	24	0	192	31	0	223	0	0	1	0	1	0	374	374	
08:45 AM	1	131	0	0	132	25	0	1	0	26	0	213	34	0	247	0	0	0	0	0	0	405	405	
<b>Total</b>	<b>1</b>	<b>480</b>	<b>1</b>	<b>0</b>	<b>482</b>	<b>94</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>95</b>	<b>5</b>	<b>874</b>	<b>177</b>	<b>0</b>	<b>1056</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1635</b>	<b>1636</b>	
09:00 AM	0	119	0	0	119	16	0	0	0	16	1	151	16	0	168	0	0	1	1	1	1	304	305	
09:15 AM	0	103	0	0	103	5	0	0	0	5	0	120	16	0	136	0	0	0	0	0	0	244	244	
09:30 AM	0	105	0	0	105	4	0	0	0	4	1	137	22	0	160	2	0	0	1	2	1	271	272	
09:45 AM	1	108	1	0	110	8	0	1	0	9	0	146	16	0	162	0	0	1	0	1	0	282	282	
<b>Total</b>	<b>1</b>	<b>435</b>	<b>1</b>	<b>0</b>	<b>437</b>	<b>33</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>34</b>	<b>2</b>	<b>554</b>	<b>70</b>	<b>0</b>	<b>626</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>1101</b>	<b>1103</b>	
10:00 AM	0	92	2	0	94	7	0	0	0	7	0	131	6	0	137	0	0	3	0	3	0	241	241	
10:15 AM	1	113	0	0	114	8	0	0	0	8	1	118	11	0	130	0	0	1	0	1	0	253	253	
10:30 AM	0	101	1	0	102	6	0	1	0	7	1	144	21	0	166	1	0	0	0	1	0	276	276	
10:45 AM	0	115	0	0	115	8	0	1	0	9	1	141	18	0	160	0	0	0	0	0	0	284	284	
<b>Total</b>	<b>1</b>	<b>421</b>	<b>3</b>	<b>0</b>	<b>425</b>	<b>29</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>31</b>	<b>3</b>	<b>534</b>	<b>56</b>	<b>0</b>	<b>593</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>1054</b>	<b>1054</b>	
11:00 AM	0	140	0	0	140	8	0	1	0	9	1	131	30	0	162	0	0	1	0	1	0	312	312	
11:15 AM	0	154	1	0	155	10	0	0	1	10	1	147	14	0	162	0	0	0	1	0	2	327	329	
11:30 AM	1	164	1	0	166	15	0	0	0	15	2	128	20	0	150	1	0	6	0	7	0	338	338	
11:45 AM	0	181	0	0	181	11	0	1	0	12	2	137	29	0	168	0	0	0	0	0	0	361	361	
<b>Total</b>	<b>1</b>	<b>639</b>	<b>2</b>	<b>0</b>	<b>642</b>	<b>44</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>46</b>	<b>6</b>	<b>543</b>	<b>93</b>	<b>0</b>	<b>642</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>8</b>	<b>2</b>	<b>1338</b>	<b>1340</b>	
12:00 PM	0	173	0	0	173	11	0	0	0	11	0	143	25	0	168	0	0	2	0	2	0	354	354	
12:15 PM	1	195	0	0	196	7	0	0	0	7	2	154	29	0	185	0	0	1	0	1	0	389	389	
12:30 PM	0	175	1	0	176	8	0	1	0	9	2	175	25	0	202	0	0	1	0	1	0	388	388	
12:45 PM	0	179	0	0	179	12	0	2	0	14	0	152	24	0	176	0	0	0	0	0	0	369	369	
<b>Total</b>	<b>1</b>	<b>722</b>	<b>1</b>	<b>0</b>	<b>724</b>	<b>38</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>41</b>	<b>4</b>	<b>624</b>	<b>103</b>	<b>0</b>	<b>731</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>1500</b>	<b>1500</b>	
01:00 PM	0	136	0	0	136	15	0	0	0	15	1	120	23	0	144	0	0	0	0	0	0	295	295	
01:15 PM	0	166	0	0	166	9	0	1	0	10	0	146	20	0	166	0	0	2	0	2	0	344	344	
01:30 PM	0	161	0	0	161	11	0	2	0	13	0	139	20	0	159	1	0	1	0	2	0	335	335	
01:45 PM	0	128	1	0	129	10	0	0	0	10	0	112	30	0	142	0	0	0	1	0	1	281	282	
<b>Total</b>	<b>0</b>	<b>591</b>	<b>1</b>	<b>0</b>	<b>592</b>	<b>45</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>48</b>	<b>1</b>	<b>517</b>	<b>93</b>	<b>0</b>	<b>611</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>1255</b>	<b>1256</b>	
02:00 PM	0	199	1	0	200	10	0	0	3	10	0	125	25	0	150	0	0	0	0	0	3	360	363	
02:15 PM	0	192	1	0	193	7	0	0	0	7	1	117	26	0	144	0	0	0	0	0	0	344	344	
02:30 PM	0	194	0	0	194	4	0	1	0	5	0	153	49	0	202	0	0	0	0	0	0	401	401	

# DAVENPORT

305 West 4th Street, Suite 2A  
Winston-Salem, NC 27101  
336-744-1636

File Name : Rte 1 at Rte 637  
Site Code : 13-368  
Start Date : 1/9/2014  
Page No : 2

### Groups Printed- Cars - Trucks - Buses

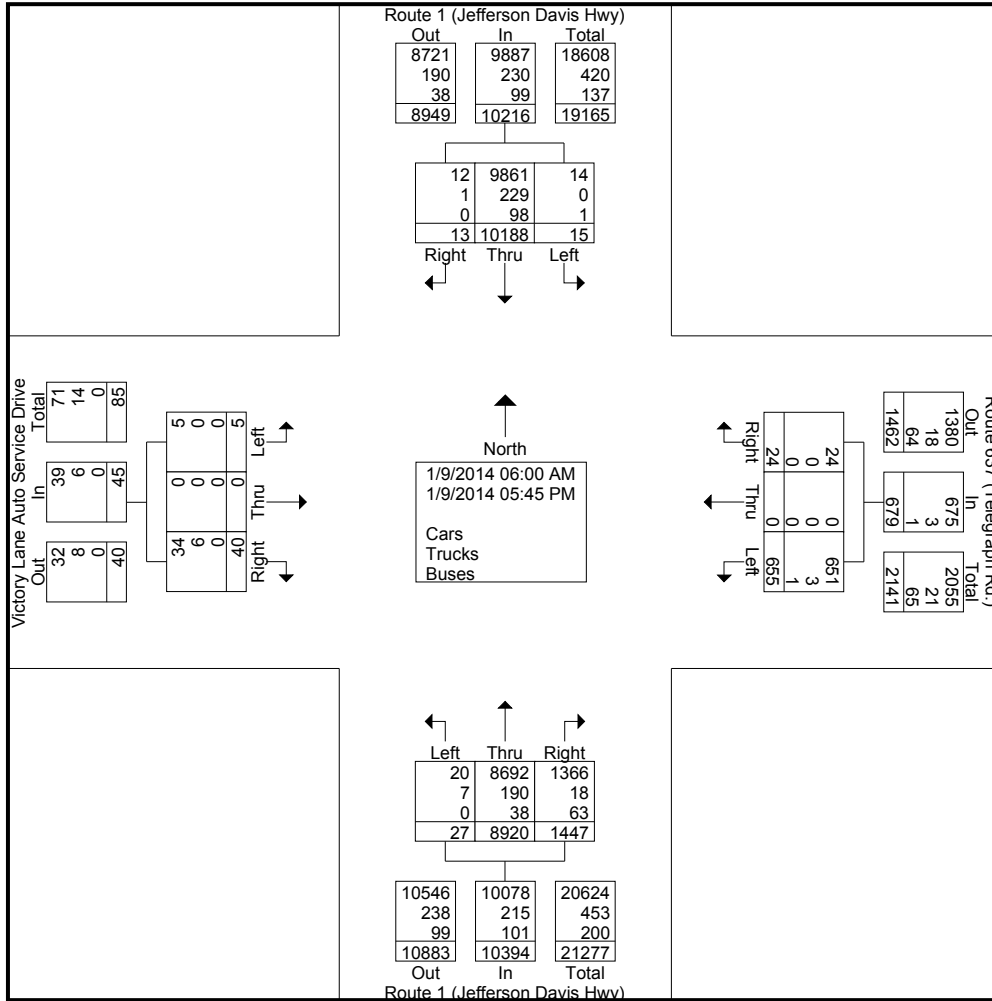
Start Time	Route 1 (Jefferson Davis Hwy) Southbound					Route 637 (Telegraph Rd.) Westbound					Route 1 (Jefferson Davis Hwy) Northbound					Victory Lane Auto Service Drive Eastbound					Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total			
02:45 PM	1	270	0	0	271	21	0	1	0	22	0	122	31	0	153	0	0	1	0	1	0	447	447
Total	1	855	2	0	858	42	0	2	3	44	1	517	131	0	649	0	0	1	0	1	3	1552	1555
03:00 PM	0	328	0	0	328	7	0	0	0	7	0	125	42	0	167	0	0	0	0	0	0	502	502
03:15 PM	1	398	1	0	400	18	0	0	0	18	0	148	41	0	189	0	0	1	0	1	0	608	608
03:30 PM	1	428	0	0	429	22	0	0	0	22	1	133	43	0	177	0	0	2	0	2	0	630	630
03:45 PM	1	545	0	0	546	26	0	1	0	27	1	141	42	0	184	0	0	2	0	2	0	759	759
Total	3	1699	1	0	1703	73	0	1	0	74	2	547	168	0	717	0	0	5	0	5	0	2499	2499
04:00 PM	0	462	0	0	462	11	0	0	0	11	0	123	37	0	160	0	0	0	0	0	0	633	633
04:15 PM	0	512	1	0	513	24	0	1	0	25	0	119	41	0	160	0	0	3	0	3	0	701	701
04:30 PM	0	459	0	0	459	40	0	2	0	42	0	146	41	0	187	0	0	1	0	1	0	689	689
04:45 PM	1	446	0	0	447	25	0	0	0	25	0	144	31	0	175	0	0	0	0	0	0	647	647
Total	1	1879	1	0	1881	100	0	3	0	103	0	532	150	0	682	0	0	4	0	4	0	2670	2670
05:00 PM	0	465	0	0	465	21	0	1	0	22	0	146	41	0	187	0	0	1	0	1	0	675	675
05:15 PM	1	454	0	0	455	33	0	1	0	34	0	103	42	0	145	0	0	2	0	2	0	636	636
05:30 PM	0	439	0	0	439	25	0	0	0	25	0	118	35	0	153	0	0	2	0	2	0	619	619
05:45 PM	1	449	0	0	450	21	0	1	0	22	0	106	40	0	146	0	0	0	0	0	0	618	618
Total	2	1807	0	0	1809	100	0	3	0	103	0	473	158	0	631	0	0	5	0	5	0	2548	2548
Grand Total	15	10188	13	0	10216	655	0	24	4	679	27	8920	1447	0	10394	5	0	40	8	45	12	21334	21346
Apprch %	0.1	99.7	0.1			96.5	0	3.5			0.3	85.8	13.9			11.1	0	88.9					
Total %	0.1	47.8	0.1		47.9	3.1	0	0.1		3.2	0.1	41.8	6.8		48.7	0	0	0.2		0.2	0.1	99.9	
Cars	14	9861	12		9887	651	0	24		679	20	8692	1366		10078	5	0	34		47	0	0	20691
% Cars	93.3	96.8	92.3		96.8	99.4	0	100		99.4	74.1	97.4	94.4		97	100	0	85		100	88.7	0	96.9
Trucks	0	229	1		230	3	0	0		3	7	190	18		215	0	0	6		6	0	0	454
% Trucks	0	2.2	7.7		2.3	0.5	0	0		0.4	25.9	2.1	1.2		2.1	0	0	15		11.3	0	0	2.1
Buses	1	98	0		99	1	0	0		1	0	38	63		101	0	0	0		0	0	0	201
% Buses	6.7	1	0		1	0.2	0	0		0.1	0	0.4	4.4		1	0	0	0		0	0	0	0.9



# DAVENPORT

305 West 4th Street, Suite 2A  
 Winston-Salem, NC 27101  
 336-744-1636

File Name : Rte 1 at Rte 637  
 Site Code : 13-368  
 Start Date : 1/9/2014  
 Page No : 3

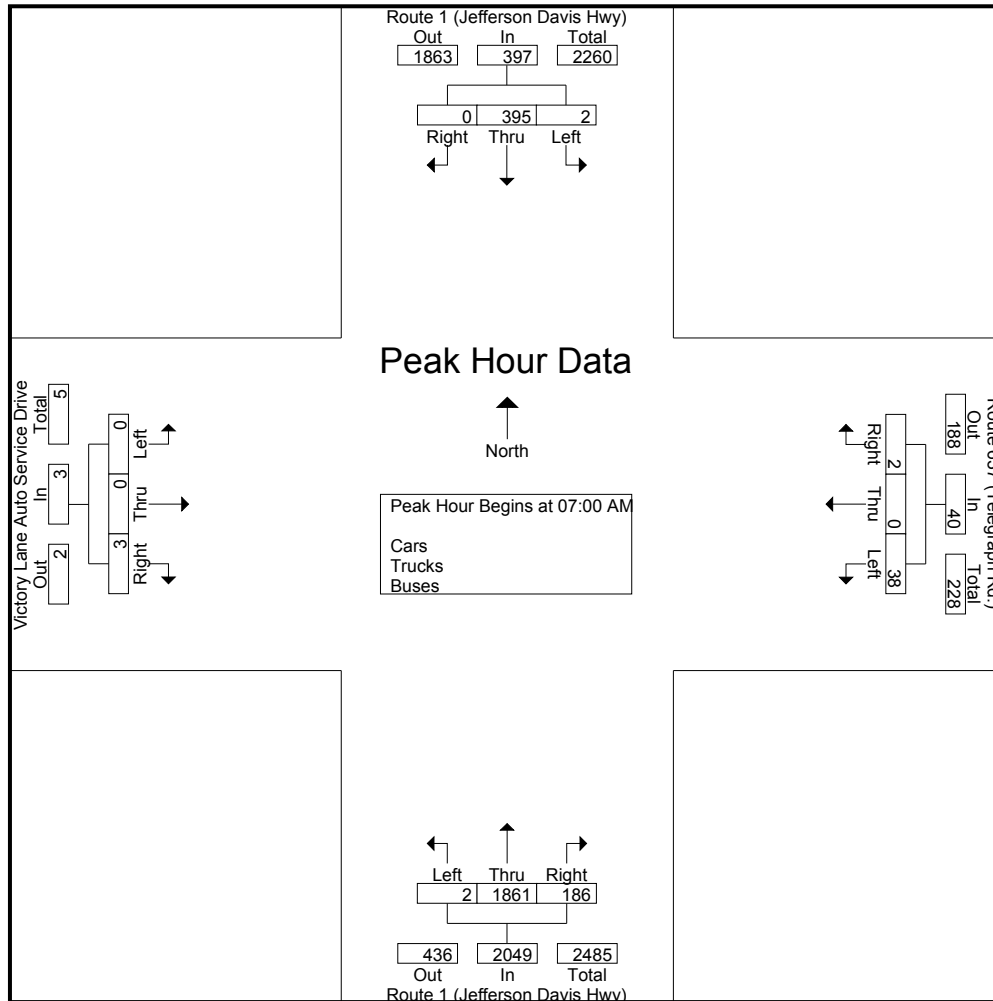


# DAVENPORT

305 West 4th Street, Suite 2A  
 Winston-Salem, NC 27101  
 336-744-1636

File Name : Rte 1 at Rte 637  
 Site Code : 13-368  
 Start Date : 1/9/2014  
 Page No : 4

Start Time	Route 1 (Jefferson Davis Hwy) Southbound				Route 637 (Telegraph Rd.) Westbound				Route 1 (Jefferson Davis Hwy) Northbound				Victory Lane Auto Service Drive Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	120	0	120	8	0	0	8	1	548	20	569	0	0	2	2	699
07:15 AM	0	80	0	80	9	0	0	9	1	499	42	542	0	0	1	1	632
07:30 AM	1	90	0	91	12	0	1	13	0	442	63	505	0	0	0	0	609
07:45 AM	1	105	0	106	9	0	1	10	0	372	61	433	0	0	0	0	549
Total Volume	2	395	0	397	38	0	2	40	2	1861	186	2049	0	0	3	3	2489
% App. Total	0.5	99.5	0		95	0	5		0.1	90.8	9.1		0	0	100		
PHF	.500	.823	.000	.827	.792	.000	.500	.769	.500	.849	.738	.900	.000	.000	.375	.375	.890

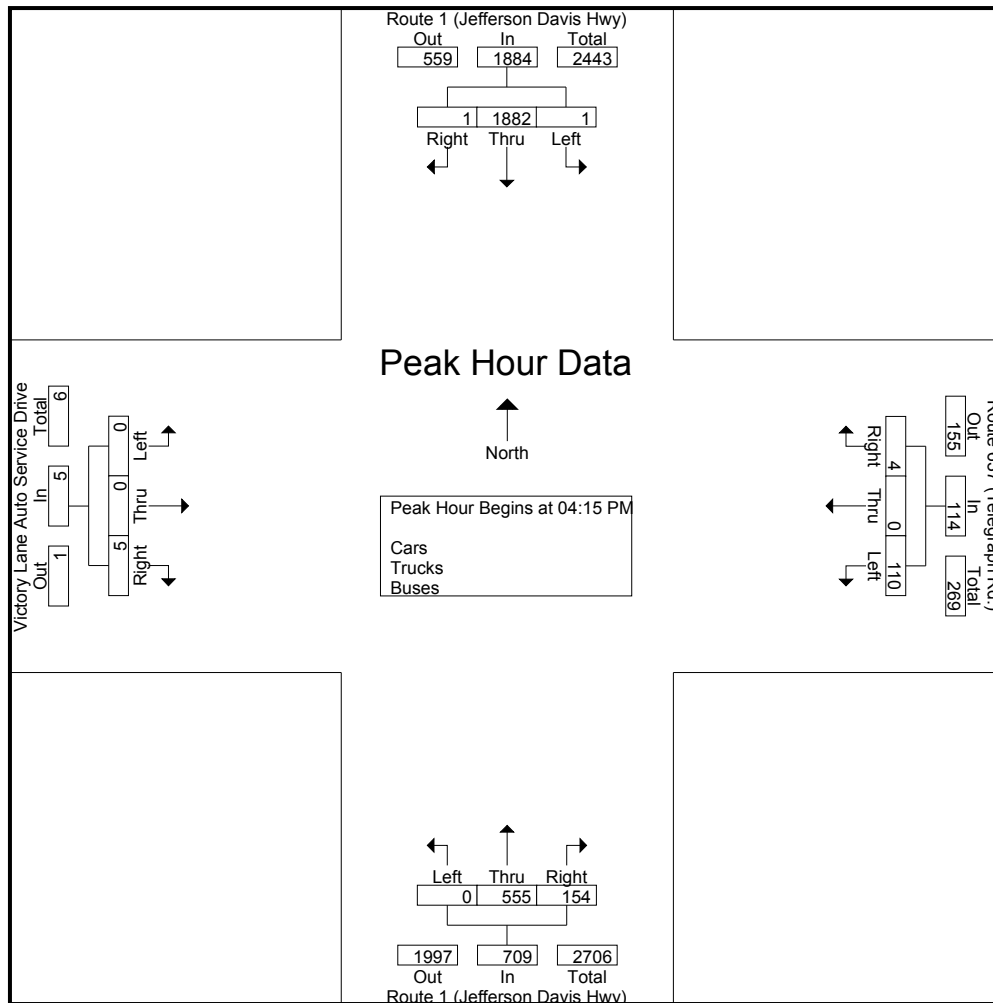


# DAVENPORT

305 West 4th Street, Suite 2A  
 Winston-Salem, NC 27101  
 336-744-1636

File Name : Rte 1 at Rte 637  
 Site Code : 13-368  
 Start Date : 1/9/2014  
 Page No : 5

Start Time	Route 1 (Jefferson Davis Hwy) Southbound				Route 637 (Telegraph Rd.) Westbound				Route 1 (Jefferson Davis Hwy) Northbound				Victory Lane Auto Service Drive Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	512	1	513	24	0	1	25	0	119	41	160	0	0	3	3	701
04:30 PM	0	459	0	459	40	0	2	42	0	146	41	187	0	0	1	1	689
04:45 PM	1	446	0	447	25	0	0	25	0	144	31	175	0	0	0	0	647
05:00 PM	0	465	0	465	21	0	1	22	0	146	41	187	0	0	1	1	675
Total Volume	1	1882	1	1884	110	0	4	114	0	555	154	709	0	0	5	5	2712
% App. Total	0.1	99.9	0.1		96.5	0	3.5		0	78.3	21.7		0	0	100		
PHF	.250	.919	.250	.918	.688	.000	.500	.679	.000	.950	.939	.948	.000	.000	.417	.417	.967



Counted by: B. Whitaker, B. Van Parys

File Name : Rte 1 at Rte 639

Site Code : 13-368

Start Date : 1/9/2014

Weather: Clear

Page No : 1

Groups Printed- Cars - Trucks - Buses

Start Time	Route 1 (Jefferson Davis Hwy) From North					Route 639 (Woodstock Ln) From East					Route 1 (Jefferson Davis Hwy) From South					Route 639 (Woodstock Ln) From West					Exclu. Total	Inclu. Total	Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total			
06:00 AM	0	43	2	1	45	10	0	10	0	20	1	236	0	0	237	0	0	0	0	0	1	302	303
06:15 AM	0	50	2	0	52	7	0	6	0	13	0	319	0	0	319	0	0	0	0	0	0	384	384
06:30 AM	0	68	5	0	73	11	0	5	0	16	0	348	0	0	348	0	0	0	0	0	0	437	437
06:45 AM	0	76	4	0	80	7	0	10	0	17	0	369	0	0	369	0	0	0	0	0	0	466	466
Total	0	237	13	1	250	35	0	31	0	66	1	1272	0	0	1273	0	0	0	0	0	1	1589	1590
07:00 AM	0	98	3	0	101	2	0	14	0	16	1	521	0	0	522	0	0	0	0	0	0	639	639
07:15 AM	0	64	1	0	65	2	0	10	0	12	0	490	0	0	490	0	0	0	1	0	1	567	568
07:30 AM	0	78	8	0	86	2	0	17	0	19	1	449	0	0	450	0	0	0	0	0	0	555	555
07:45 AM	0	89	3	0	92	8	0	16	0	24	3	354	0	0	357	0	0	0	0	0	0	473	473
Total	0	329	15	0	344	14	0	57	0	71	5	1814	0	0	1819	0	0	0	1	0	1	2234	2235
08:00 AM	0	92	11	0	103	4	0	17	0	21	0	245	0	0	245	0	0	0	0	0	0	369	369
08:15 AM	0	88	8	0	96	6	0	14	0	20	1	206	0	0	207	0	0	0	0	0	0	323	323
08:30 AM	0	91	17	0	108	9	0	32	0	41	2	180	0	0	182	0	0	0	0	0	0	331	331
08:45 AM	0	103	25	0	128	17	0	21	0	38	3	221	0	0	224	0	0	0	0	0	0	390	390
Total	0	374	61	0	435	36	0	84	0	120	6	852	0	0	858	0	0	0	0	0	0	1413	1413
09:00 AM	0	100	5	0	105	8	0	16	1	24	1	142	0	0	143	0	0	1	0	1	1	273	274
09:15 AM	0	90	2	0	92	6	0	16	0	22	0	118	0	0	118	0	0	0	0	0	0	232	232
09:30 AM	0	87	4	0	91	4	0	13	0	17	0	117	0	0	117	0	0	0	0	0	0	225	225
09:45 AM	0	98	2	0	100	5	0	11	0	16	5	153	0	0	158	0	0	0	0	0	0	274	274
Total	0	375	13	0	388	23	0	56	1	79	6	530	0	0	536	0	0	1	0	1	1	1004	1005
10:00 AM	0	84	2	0	86	3	0	10	0	13	0	125	0	0	125	0	0	0	0	0	0	224	224
10:15 AM	0	103	2	0	105	3	0	9	1	12	1	131	0	0	132	0	0	0	0	0	1	249	250
10:30 AM	0	86	0	0	86	2	0	12	0	14	2	133	0	0	135	0	0	0	0	0	0	235	235
10:45 AM	0	107	2	0	109	3	0	11	0	14	3	128	0	0	131	0	0	0	0	0	0	254	254
Total	0	380	6	0	386	11	0	42	1	53	6	517	0	0	523	0	0	0	0	0	1	962	963
11:00 AM	0	208	4	0	212	2	0	15	0	17	2	210	0	0	212	0	0	0	0	0	0	441	441
11:15 AM	0	135	4	0	139	0	0	10	0	10	0	150	0	0	150	0	0	0	0	0	0	299	299
11:30 AM	0	139	1	0	140	4	0	10	2	14	1	132	0	0	133	0	0	0	0	0	2	287	289
11:45 AM	0	158	4	0	162	3	0	15	0	18	1	129	0	0	130	0	0	0	0	0	0	310	310
Total	0	640	13	0	653	9	0	50	2	59	4	621	0	0	625	0	0	0	0	0	2	1337	1339
12:00 PM	0	178	5	0	183	4	0	12	0	16	2	151	0	0	153	0	0	0	0	0	0	352	352
12:15 PM	0	141	0	0	141	2	0	8	0	10	2	129	0	0	131	0	0	0	0	0	0	282	282
12:30 PM	0	161	1	0	162	4	0	10	0	14	2	164	0	0	166	0	0	0	0	0	0	342	342
12:45 PM	0	160	4	0	164	0	0	12	0	12	5	159	0	0	164	0	0	0	0	0	0	340	340
Total	0	640	10	0	650	10	0	42	0	52	11	603	0	0	614	0	0	0	0	0	0	1316	1316
01:00 PM	0	115	0	0	115	2	0	10	0	12	2	110	0	0	112	0	0	0	0	0	0	239	239
01:15 PM	0	171	2	0	173	2	0	13	0	15	2	148	0	0	150	0	0	0	0	0	0	338	338
01:30 PM	0	143	3	0	146	3	0	7	0	10	3	132	0	0	135	0	0	0	0	0	0	291	291
01:45 PM	0	132	1	0	133	4	0	14	0	18	1	120	0	0	121	0	0	0	0	0	0	272	272
Total	0	561	6	0	567	11	0	44	0	55	8	510	0	0	518	0	0	0	0	0	0	1140	1140
02:00 PM	0	151	2	0	153	2	0	21	2	23	2	113	0	0	115	0	0	0	0	0	2	291	293
02:15 PM	0	173	5	0	178	3	0	16	0	19	3	111	0	0	114	0	0	0	0	0	0	311	311

There are no Titles Defined

Counted by: B. Whitaker, B. Van Parys

File Name : Rte 1 at Rte 639

Site Code : 13-368

Start Date : 1/9/2014

Weather: Clear

Page No : 2

Groups Printed- Cars - Trucks - Buses

Start Time	Route 1 (Jefferson Davis Hwy) From North					Route 639 (Woodstock Ln) From East					Route 1 (Jefferson Davis Hwy) From South					Route 639 (Woodstock Ln) From West					Exclu. Total	Inclu. Total	Int. Total	
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total				
02:30 PM	0	170	3	0	173	4	0	10	0	14	1	134	0	0	135	0	0	0	0	0	0	0	322	322
02:45 PM	0	227	12	0	239	4	0	16	0	20	1	111	0	0	112	0	0	0	0	0	0	0	371	371
Total	0	721	22	0	743	13	0	63	2	76	7	469	0	0	476	0	0	0	0	0	0	2	1295	1297
03:00 PM	0	308	7	0	315	9	0	18	0	27	1	126	0	0	127	0	0	0	0	0	0	0	469	469
03:15 PM	0	406	10	0	416	2	0	16	0	18	2	135	0	0	137	0	0	0	0	0	0	0	571	571
03:30 PM	0	426	6	0	432	2	0	20	0	22	2	104	0	0	106	0	0	0	0	0	0	0	560	560
03:45 PM	0	506	1	0	507	15	0	21	0	36	1	122	0	0	123	0	0	0	2	0	0	2	666	668
Total	0	1646	24	0	1670	28	0	75	0	103	6	487	0	0	493	0	0	0	2	0	0	2	2266	2268
04:00 PM	0	438	4	0	442	8	0	24	0	32	1	113	0	0	114	0	0	0	0	0	0	0	588	588
04:15 PM	0	515	3	0	518	9	0	26	0	35	1	109	0	0	110	0	0	0	0	0	0	0	663	663
04:30 PM	0	440	9	0	449	3	0	24	0	27	2	129	0	0	131	0	0	0	0	0	0	0	607	607
04:45 PM	0	467	6	0	473	7	0	15	0	22	1	126	0	0	127	0	0	0	0	0	0	0	622	622
Total	0	1860	22	0	1882	27	0	89	0	116	5	477	0	0	482	0	0	0	0	0	0	0	2480	2480
05:00 PM	0	400	1	0	401	6	0	16	0	22	3	135	0	0	138	0	0	0	0	0	0	0	561	561
05:15 PM	0	470	4	0	474	8	0	23	0	31	2	92	0	0	94	0	0	0	0	0	0	0	599	599
05:30 PM	0	371	8	0	379	4	0	11	0	15	3	97	0	0	100	0	0	0	1	0	0	1	494	495
05:45 PM	0	439	3	0	442	2	0	9	0	11	3	110	0	0	113	0	0	0	0	0	0	0	566	566
Total	0	1680	16	0	1696	20	0	59	0	79	11	434	0	0	445	0	0	0	1	0	0	1	2220	2221
Grand Total	0	9443	221	1	9664	237	0	692	6	929	76	8586	0	0	8662	0	0	1	4	1	11	19256	19267	
Apprch %	0	97.7	2.3			25.5	0	74.5			0.9	99.1	0			0	0	100						
Total %	0	49	1.1		50.2	1.2	0	3.6		4.8	0.4	44.6	0		45	0	0	0			0.1	99.9		
Cars	0	9286	198		9484	209	0	623		838	72	8432	0		8504	0	0	1		5	0	0	18831	
% Cars	0	98.3	89.6	0	98.1	88.2	0	90	100	89.6	94.7	98.2	0	0	98.2	0	0	100	100	100	0	0	97.7	
Trucks	0	119	2		121	5	0	8		13	1	122	0		123	0	0	0		0	0	0	257	
% Trucks	0	1.3	0.9	0	1.3	2.1	0	1.2	0	1.4	1.3	1.4	0	0	1.4	0	0	0	0	0	0	0	1.3	
Buses	0	38	21		60	23	0	61		84	3	32	0		35	0	0	0		0	0	0	179	
% Buses	0	0.4	9.5	100	0.6	9.7	0	8.8	0	9	3.9	0.4	0	0	0.4	0	0	0	0	0	0	0	0.9	

There are no Titles Defined

Counted by: B. Whitaker, B. Van Parys

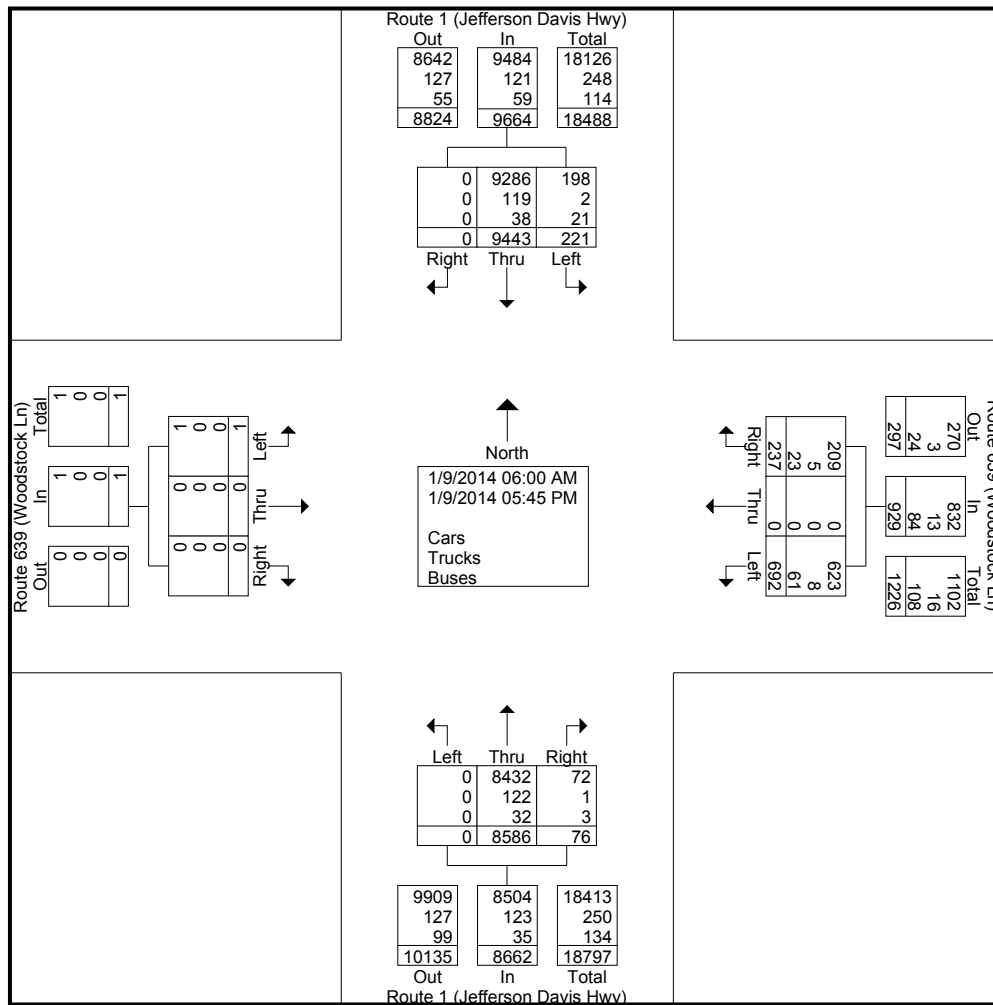
File Name : Rte 1 at Rte 639

Site Code : 13-368

Start Date : 1/9/2014

Weather: Clear

Page No : 3



There are no Titles Defined

Counted by: B. Whitaker, B. Van Parys

File Name : Rte 1 at Rte 639

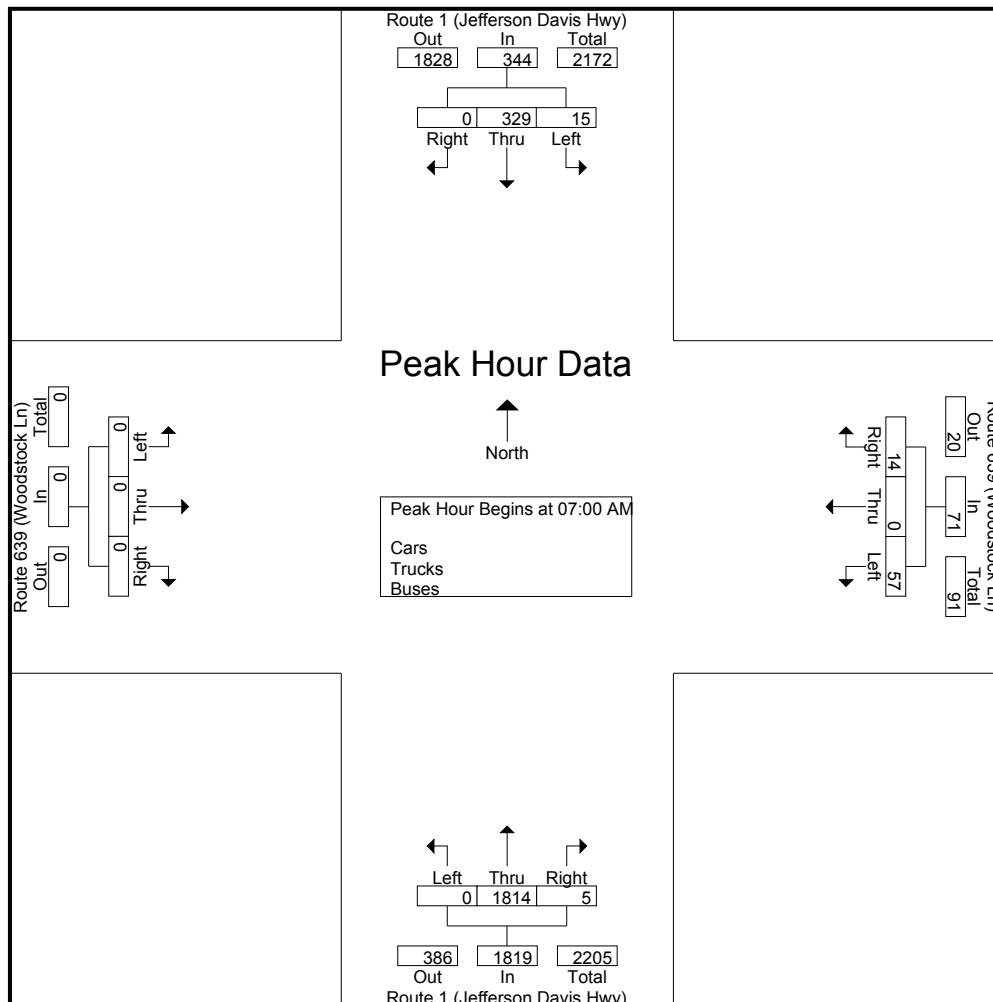
Site Code : 13-368

Start Date : 1/9/2014

Weather: Clear

Page No : 4

	Route 1 (Jefferson Davis Hwy) From North				Route 639 (Woodstock Ln) From East				Route 1 (Jefferson Davis Hwy) From South				Route 639 (Woodstock Ln) From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																		
Peak Hour for Entire Intersection Begins at 07:00 AM																		
07:00 AM	0	98	3	101	2	0	14	16	1	521	0	522	0	0	0	0	0	639
07:15 AM	0	64	1	65	2	0	10	12	0	490	0	490	0	0	0	0	0	567
07:30 AM	0	78	8	86	2	0	17	19	1	449	0	450	0	0	0	0	0	555
07:45 AM	0	89	3	92	8	0	16	24	3	354	0	357	0	0	0	0	0	473
Total Volume	0	329	15	344	14	0	57	71	5	1814	0	1819	0	0	0	0	0	2234
% App. Total	0	95.6	4.4		19.7	0	80.3		0.3	99.7	0		0	0	0			
PHF	.000	.839	.469	.851	.438	.000	.838	.740	.417	.870	.000	.871	.000	.000	.000	.000	.000	.874



There are no Titles Defined

Counted by: B. Whitaker, B. Van Parys

File Name : Rte 1 at Rte 639

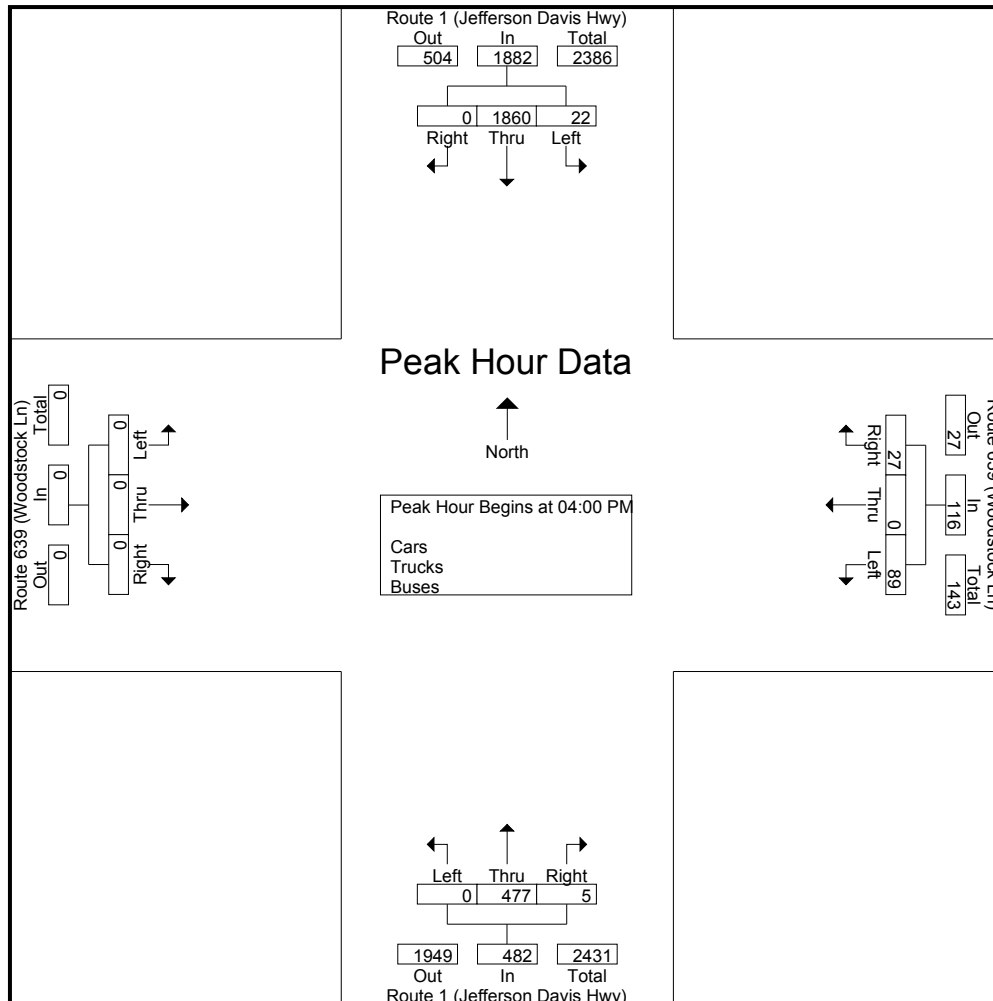
Site Code : 13-368

Start Date : 1/9/2014

Weather: Clear

Page No : 5

Start Time	Route 1 (Jefferson Davis Hwy) From North				Route 639 (Woodstock Ln) From East				Route 1 (Jefferson Davis Hwy) From South				Route 639 (Woodstock Ln) From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	438	4	442	8	0	24	32	1	113	0	114	0	0	0	0	588
04:15 PM	0	515	3	518	9	0	26	35	1	109	0	110	0	0	0	0	663
04:30 PM	0	440	9	449	3	0	24	27	2	129	0	131	0	0	0	0	607
04:45 PM	0	467	6	473	7	0	15	22	1	126	0	127	0	0	0	0	622
Total Volume	0	1860	22	1882	27	0	89	116	5	477	0	482	0	0	0	0	2480
% App. Total	0	98.8	1.2		23.3	0	76.7		1	99	0		0	0	0		
PHF	.000	.903	.611	.908	.750	.000	.856	.829	.625	.924	.000	.920	.000	.000	.000	.000	.935





Counted By: B. Soblesky

File Name : Route 639 at Route 637

Site Code : 13-368

Start Date : 1/9/2014

Page No : 1

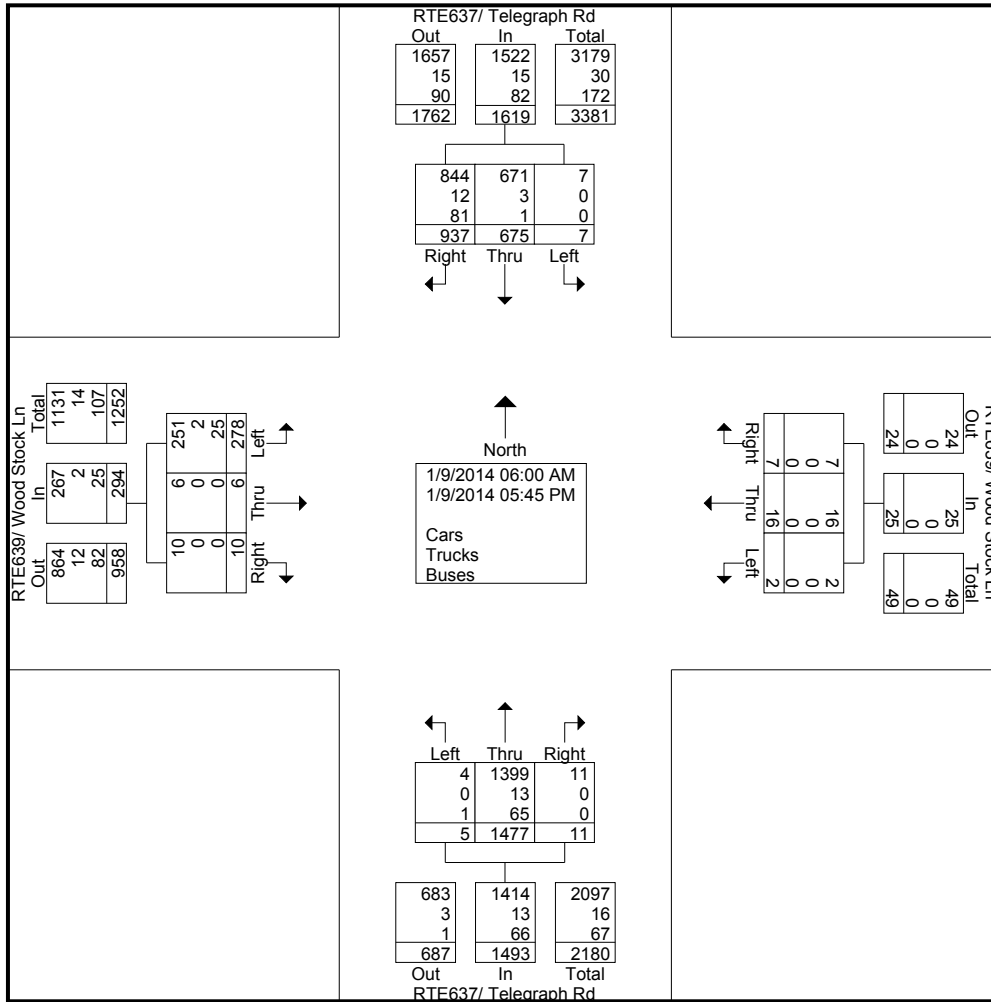
Weather: Clear

Groups Printed- Cars - Trucks - Buses

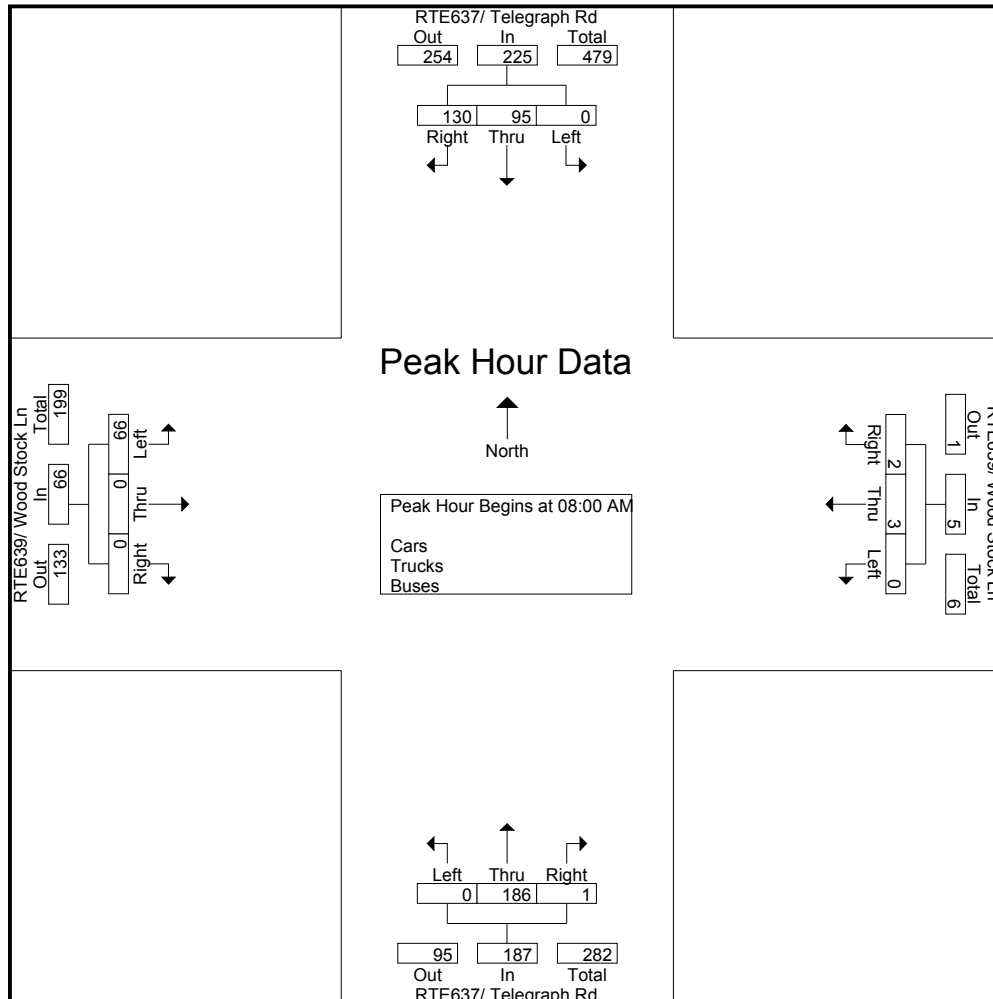
Start Time	RTE637/ Telegraph Rd From North					RTE639/ Wood Stock Ln From East					RTE637/ Telegraph Rd From South					RTE639/ Wood Stock Ln From West					Exclu. Total	Inclu. Total	Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total			
06:00 AM	20	4	0	0	24	0	0	0	0	0	0	10	0	0	10	0	0	3	0	3	0	37	37
06:15 AM	10	7	0	0	17	0	0	0	0	0	0	8	1	0	9	0	0	2	0	2	0	28	28
06:30 AM	14	2	0	0	16	0	0	0	0	0	0	17	0	0	17	0	0	5	0	5	0	38	38
06:45 AM	19	6	0	0	25	0	0	0	0	0	0	28	0	0	28	0	0	4	0	4	0	57	57
Total	63	19	0	0	82	0	0	0	0	0	0	63	1	0	64	0	0	14	0	14	0	160	160
07:00 AM	13	9	0	0	22	0	1	0	0	1	0	20	0	0	20	0	0	4	0	4	0	47	47
07:15 AM	17	11	0	0	28	0	0	0	0	0	0	45	0	0	45	0	0	1	0	1	0	74	74
07:30 AM	16	10	0	0	26	0	1	0	0	1	0	58	1	0	59	1	0	10	0	11	0	97	97
07:45 AM	23	10	0	0	33	1	1	0	0	2	2	66	0	0	68	0	1	5	0	6	0	109	109
Total	69	40	0	0	109	1	3	0	0	4	2	189	1	0	192	1	1	20	0	22	0	327	327
08:00 AM	28	29	0	0	57	1	0	0	0	1	0	63	0	0	63	0	0	11	0	11	0	132	132
08:15 AM	15	16	0	0	31	1	2	0	0	3	1	46	0	0	47	0	0	10	0	10	0	91	91
08:30 AM	42	25	0	0	67	0	1	0	0	1	0	35	0	0	35	0	0	18	0	18	0	121	121
08:45 AM	45	25	0	0	70	0	0	0	0	0	0	42	0	0	42	0	0	27	0	27	0	139	139
Total	130	95	0	0	225	2	3	0	0	5	1	186	0	0	187	0	0	66	0	66	0	483	483
09:00 AM	20	16	0	0	36	0	0	0	0	0	0	17	0	0	17	0	0	3	0	3	0	56	56
09:15 AM	20	5	0	0	25	0	0	0	0	0	0	20	0	0	20	0	0	1	0	1	0	46	46
09:30 AM	17	4	0	0	21	0	0	0	0	0	0	23	0	0	23	0	0	6	0	6	0	50	50
09:45 AM	15	9	0	0	24	0	0	0	0	0	0	16	0	0	16	0	0	4	0	4	0	44	44
Total	72	34	0	0	106	0	0	0	0	0	0	76	0	0	76	0	0	14	0	14	0	196	196
10:00 AM	11	7	0	0	18	0	0	0	0	0	0	11	0	0	11	0	0	2	0	2	0	31	31
10:15 AM	13	7	0	0	20	0	0	0	0	0	0	13	0	0	13	1	0	2	0	3	0	36	36
10:30 AM	12	7	0	0	19	0	0	0	0	0	0	19	0	0	19	0	0	2	0	2	0	40	40
10:45 AM	14	12	0	0	26	0	1	0	0	1	0	19	2	1	21	0	1	3	0	4	1	52	53
Total	50	33	0	0	83	0	1	0	0	1	0	62	2	1	64	1	1	9	0	11	1	159	160
11:00 AM	13	6	1	0	20	1	0	1	0	2	0	27	0	0	27	0	0	3	0	3	0	52	52
11:15 AM	11	9	0	0	20	0	0	0	0	0	0	16	0	0	16	0	1	3	0	4	0	40	40
11:30 AM	18	16	0	0	34	0	0	0	0	0	0	21	0	0	21	0	0	2	0	2	0	57	57
11:45 AM	18	11	0	0	29	0	1	0	0	1	0	27	0	0	27	0	0	4	0	4	0	61	61
Total	60	42	1	0	103	1	1	1	0	3	0	91	0	0	91	0	1	12	0	13	0	210	210
12:00 PM	14	12	1	0	27	0	1	0	0	1	0	25	0	0	25	0	1	2	0	3	0	56	56
12:15 PM	11	9	0	0	20	1	0	0	0	1	0	31	0	0	31	0	0	4	0	4	0	56	56
12:30 PM	13	7	0	0	20	0	0	0	0	0	1	24	0	0	25	1	0	3	0	4	0	49	49
12:45 PM	11	15	1	0	27	0	1	0	0	1	0	23	0	0	23	0	0	8	0	8	0	59	59
Total	49	43	2	0	94	1	2	0	0	3	1	103	0	0	104	1	1	17	0	19	0	220	220
01:00 PM	15	17	0	0	32	0	0	0	0	0	0	24	0	0	24	0	0	3	0	3	0	59	59
01:15 PM	11	7	1	0	19	0	0	1	0	1	0	20	0	0	20	0	0	4	0	4	0	44	44
01:30 PM	10	10	0	0	20	0	1	0	0	1	0	20	0	0	20	1	0	5	0	6	0	47	47
01:45 PM	17	10	0	0	27	0	0	0	0	0	1	28	1	0	30	0	0	2	0	2	0	59	59
Total	53	44	1	0	98	0	1	1	0	2	1	92	1	0	94	1	0	14	0	15	0	209	209
02:00 PM	20	10	1	0	31	0	2	0	0	2	0	25	0	0	25	1	0	4	0	5	0	63	63
02:15 PM	16	6	0	0	22	0	0	0	0	0	0	26	0	0	26	0	0	6	0	6	0	54	54
02:30 PM	15	7	0	0	22	0	0	0	0	0	1	47	0	0	48	0	1	3	0	4	0	74	74
02:45 PM	25	21	0	0	46	0	0	0	0	0	0	31	0	0	31	0	0	14	0	14	0	91	91
Total	76	44	1	0	121	0	2	0	0	2	1	129	0	0	130	1	1	27	0	29	0	282	282
03:00 PM	27	6	0	0	33	1	0	0	0	1	0	41	0	0	41	0	1	10	0	11	0	86	86

Groups Printed- Cars - Trucks - Buses

Start Time	RTE637/ Telegraph Rd From North					RTE639/ Wood Stock Ln From East					RTE637/ Telegraph Rd From South					RTE639/ Wood Stock Ln From West					Exclu. Total	Inclu. Total	Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total			
03:15 PM	16	20	0	2	36	0	0	0	0	0	0	43	0	0	43	0	0	13	0	13	2	92	94
03:30 PM	25	20	0	0	45	0	0	0	0	0	0	43	0	0	43	0	0	9	0	9	0	97	97
03:45 PM	43	30	1	0	74	0	1	0	0	1	0	41	0	0	41	0	0	3	0	3	0	119	119
Total	111	76	1	2	188	1	1	0	0	2	0	168	0	0	168	0	1	35	0	36	2	394	396
04:00 PM	33	16	0	0	49	0	0	0	0	0	0	41	0	0	41	0	0	5	0	5	0	95	95
04:15 PM	29	29	0	0	58	0	0	0	0	0	1	38	0	0	39	0	0	2	0	2	0	99	99
04:30 PM	31	35	0	0	66	0	0	0	0	0	1	38	0	0	39	0	0	6	0	6	0	111	111
04:45 PM	26	22	1	0	49	0	1	0	0	1	2	35	0	0	37	0	0	10	0	10	0	97	97
Total	119	102	1	0	222	0	1	0	0	1	4	152	0	0	156	0	0	23	0	23	0	402	402
05:00 PM	26	19	0	0	45	0	0	0	0	0	0	40	0	0	40	2	0	2	0	4	0	89	89
05:15 PM	28	36	0	0	64	0	0	0	0	0	0	46	0	0	46	1	0	9	0	10	0	120	120
05:30 PM	18	26	0	0	44	0	1	0	0	1	0	38	0	0	38	0	0	9	0	9	0	92	92
05:45 PM	13	22	0	0	35	1	0	0	0	1	1	42	0	0	43	2	0	7	0	9	0	88	88
Total	85	103	0	0	188	1	1	0	0	2	1	166	0	0	167	5	0	27	0	32	0	389	389
Grand Total	937	675	7	2	1619	7	16	2	0	25	11	1477	5	1	1493	10	6	278	0	294	3	3431	3434
Apprch %	57.9	41.7	0.4			28	64	8			0.7	98.9	0.3			3.4	2	94.6					
Total %	27.3	19.7	0.2		47.2	0.2	0.5	0.1		0.7	0.3	43	0.1		43.5	0.3	0.2	8.1		8.6	0.1	99.9	
Cars	844	671	7		1524	7	16	2		25	11	1399	4		1415	10	6	251		267	0	0	3231
% Cars	90.1	99.4	100	100	94	100	100	100	0	100	100	94.7	80	100	94.7	100	100	90.3	0	90.8	0	0	94.1
Trucks	12	3	0		15	0	0	0		0	0	13	0		13	0	0	2		2	0	0	30
% Trucks	1.3	0.4	0	0	0.9	0	0	0	0	0	0	0.9	0	0	0.9	0	0	0.7	0	0.7	0	0	0.9
Buses	81	1	0		82	0	0	0		0	0	65	1		66	0	0	25		25	0	0	173
% Buses	8.6	0.1	0	0	5.1	0	0	0	0	0	0	4.4	20	0	4.4	0	0	9	0	8.5	0	0	5



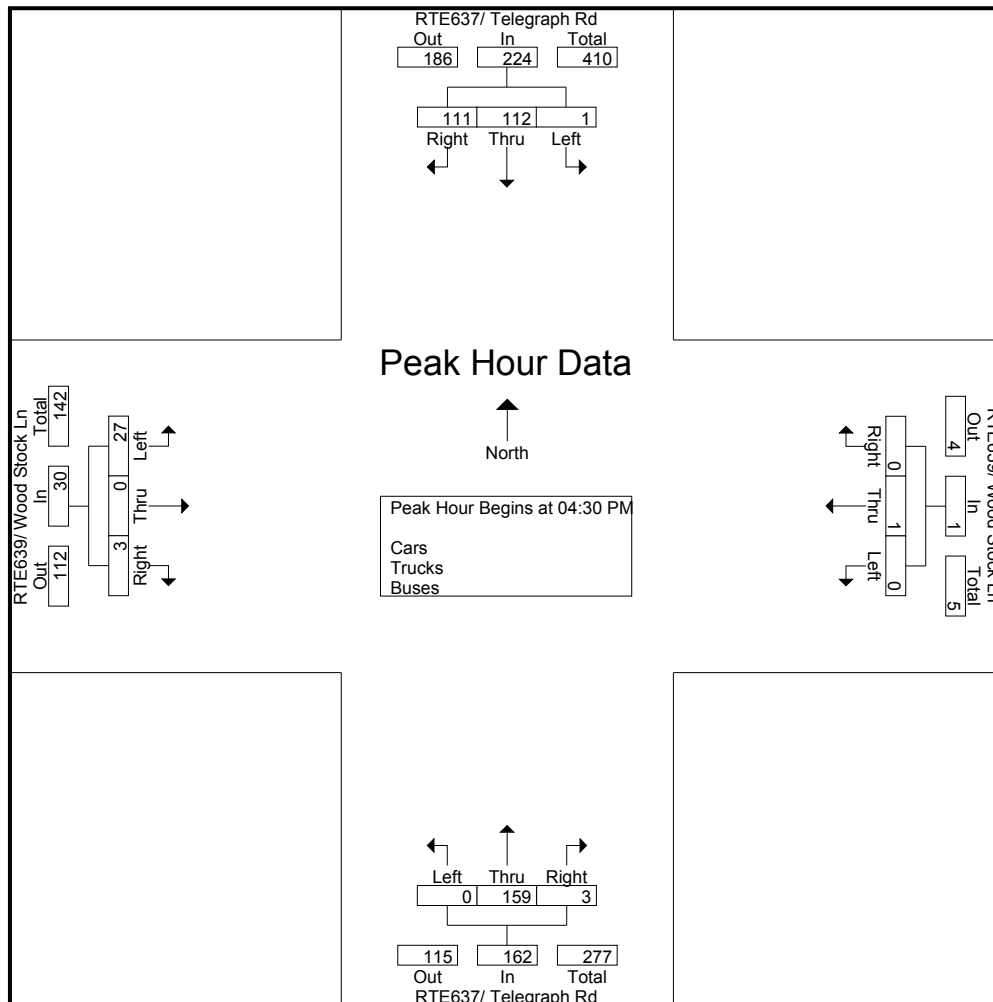
Start Time	RTE637/ Telegraph Rd From North				RTE639/ Wood Stock Ln From East				RTE637/ Telegraph Rd From South				RTE639/ Wood Stock Ln From West				Int. Total
	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	28	29	0	57	1	0	0	1	0	63	0	63	0	0	11	11	132
08:15 AM	15	16	0	31	1	2	0	3	1	46	0	47	0	0	10	10	91
08:30 AM	42	25	0	67	0	1	0	1	0	35	0	35	0	0	18	18	121
08:45 AM	45	25	0	70	0	0	0	0	0	42	0	42	0	0	27	27	139
Total Volume	130	95	0	225	2	3	0	5	1	186	0	187	0	0	66	66	483
% App. Total	57.8	42.2	0		40	60	0		0.5	99.5	0		0	0	100		
PHF	.722	.819	.000	.804	.500	.375	.000	.417	.250	.738	.000	.742	.000	.000	.611	.611	.869



Start Time	RTE637/ Telegraph Rd From North				RTE639/ Wood Stock Ln From East				RTE637/ Telegraph Rd From South				RTE639/ Wood Stock Ln From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
04:30 PM	31	35	0	66	0	0	0	0	1	38	0	39	0	0	6	6	111
04:45 PM	26	22	1	49	0	1	0	1	2	35	0	37	0	0	10	10	97
05:00 PM	26	19	0	45	0	0	0	0	0	40	0	40	2	0	2	4	89
05:15 PM	28	36	0	64	0	0	0	0	0	46	0	46	1	0	9	10	120
Total Volume	111	112	1	224	0	1	0	1	3	159	0	162	3	0	27	30	417
% App. Total	49.6	50	0.4		0	100	0		1.9	98.1	0		10	0	90		
PHF	.895	.778	.250	.848	.000	.250	.000	.250	.375	.864	.000	.880	.375	.000	.675	.750	.869

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM



Rte 1 at Rte 637																												
AM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic	
EBL	0				0	0	0		0		0	0	0		0		0	0	0	0		0		0	0	0	0	
EBT	0				0	0	0		0		0	0	0		0		0	0	0	0		0		0	0	0	0	
EBR	3				3	4	4		4		4	4	4		4		4	6	6		6		6	6	0	6	6	
WBL	38	55		4	93	119	119	128	251	-119	0	119	119	128	251	-119	0	177	177	190	370	-177	0	190	370	194	370	
WBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0	
WBR	2				2	3	3	0	3	0	3	3	3	0	3	0	3	4	4	0	4	0	4	4	0	4	4	
NBL	2				2	3	3		3		3	3	3		3		3	4	4		4		4	4	0	4	-4	0
NBT	1,861		5	5	1,866	2,604	2,600		2,604		2,604	2,604	2,600		2,604		2,604	4,443	4,439		4,443		4,443	0	4,443	4	4,447	
NBR	186				186	238	238		238		238	238	238		238		238	353	353		353		353	0	353		353	
SBL	2			9	2	3	3	74	86	-3	0	3	3	74	86	-3	0	4	4	110	123	-4	0	110	31	-4	0	
SBT	395	32	4		431	600	597	-128	469	119	719	600	597	-128	469	119	719	1,022	1,019	-190	828	177	1,199	-190	828	-194	828	
SBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0	
Total	2,489	87	8	17	2,584	3,573	3,565	74	3,656	-3	3,571	3,573	3,565	74	3,656	-3	3,571	6,013	6,005	110	6,132	-4	6,009	110	6,040		6,030	

Rte 1 at Rte 639																											
AM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic
EBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
EBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
EBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
WBL	57	43	4		104	132	128	-128	0	119	251	132	128	-128	0	119	251	194	190	-190	0	177	370	-190	0	-194	0
WBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
WBR	14	19	7	7	40	49	42	0	49	0	49	49	42	0	49	0	49	70	63	0	70	0	70	0	70	70	
NBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
NBT	1,814	41			1,855	2,591	2,591	0	2,591	0	2,591	2,591	2,591	0	2,591	0	2,591	4,425	4,425	0	4,425	0	4,425	0	4,425	4,425	
NBR	5	3	5	5	13	15	10		15		15	15	10		15		15	20	15		20		20	0	20	20	
SBL	15	43	9		67	83	74	-74	0	3	86	83	74	-74	0	3	86	119	110	-110	0	4	123	-110	92	4	123
SBT	329			9	329	460	460	74	543	-3	457	460	460	74	543	-3	457	785	785	110	904	-4	781	110	812	-4	781
SBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
Total	2,234	149	24	21	2407	3330	3,306	-128	3199	119	3449	3330	3,306	-128	3199	119	3449	5612	5,588	-190	5418	177	5789	-190	5418		5,633

Rte 639 at Rte 637																											
AM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic
EBL	66		1	1	67	86	84	-74	11	3	88	86	84	-74	11	3	88	127	125	-110	16	4	130	-110	108	4	130
EBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
EBR	0			4	0	0	0		4		0	0	0		4		0	0	0		4		0	0	4	0	0
WBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
WBT	3				3	4	4		4		4	4	4		4		4	6	6		6		6	0	6	6	
WBR	2				2	3	3		3		3	3	3		3		3	4	4		4		4	4	0	4	4
NBL	0			9	0	0	0		9		0	0	0		9		0	0	0		9		0	0	9	0	0
NBT	186				186	238	238	74	312	-3	236	238	238	74	312	-3	236	353	353	110	464	-4	350	110	373		353
NBR	1				1	1	1		1		1	1	1		1		1	2	2		2		2	0	2		2
SBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0
SBT	95				95	122	122	128	250	-119	3	122	122	128	250	-119	3	181	181	190	371	-177	4	190	371	190	371
SBR	130		2	2	132	168	166	-128	40	119	287	168	166	-128	40	119	287	249	247	-190	59	177	425	-190	59	-190	59
Total	483	0	3	15	486	621	618	0	634	0	621	621	618	0	634	0	621	921	918	0	933	0	921	0	935		936

Rte 1 at Rte 637																												
PM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic	
EBL	0				0	0	0		0		0	0	0		0		0	0	0	0		0		0	0	0		0
EBT	0				0	0	0		0		0	0	0		0		0	0	0	0		0		0	0	0		0
EBR	5				5	6	6		6		6	6	6		6		6	10	10		10		10	0	10		10	
WBL	110			5	110	141	141	114	260	-141	0	141	141	114	260	-141	0	209	209		169	383	-209	0	169	383	174	383
WBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
WBR	4				4	5	5	0	5	0	5	5	5	0	5	0	5	8	8		0	8	0	8	0	8		8
NBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0	0	0	0
NBT	555		4	4	559	779	775		779		779	779	775		779		779	1,328	1,324		1,328		1,328	0	1,328	0	1,328	
NBR	154	7			161	206	206		206		206	206	206		206		206	306	306		306		306	0	306		306	
SBL	1			8	1	1	1	32	41	-1	0	1	1	32	41	-1	0	2	2		48	57	-2	0	48	14	-2	0
SBT	1,882	65	5		1,952	2,725	2,720	-114	2,606	141	2,866	2,725	2,720	-114	2,606	141	2,866	4,649	4,644		-169	4,475	209	4,858	-169	4,475	-174	4,475
SBR	1				1	1	1		1		1	1	1		1		1	2	2		2		2	0	2		2	
Total	2,712	72	9	17	2,793	3,865	3,856	32	3,905	-1	3,864	3,865	3,856	32	3,905	-1	3,864	6,512	6,504		48	6,568	-2	6,511	48	6,525		6,529

Rte 1 at Rte 639																												
PM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic	
EBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
EBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
EBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
WBL	89		5		94	119	114	-114	0	141	260	119	114	-114	0	141	260	174	169		-169	0	209	383	-169	0	-174	0
WBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
WBR	27		10	10	37	44	35	0	44	0	44	44	35	0	44	0	44	61	51		0	61	0	61	0	61	61	
NBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
NBT	477	77			554	774	774	0	774	0	774	774	774	0	774	0	774	1,321	1,321		0	1,321	0	1,321	0	1,321	1,321	
NBR	5		4	4	9	10	6		10		10	10	6		10		10	13	10		13		13	0	13		13	
SBL	22	3	8		33	40	32	-32	0	1	41	40	32	-32	0	1	41	55	48		-48	0	2	57	-48	43	2	57
SBT	1,860			8	1,860	2,598	2,598	32	2,638	-1	2,597	2,598	2,598	32	2,638	-1	2,597	4,437	4,437		48	4,492	-2	4,435	48	4,449	-2	4,435
SBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
Total	2,480	80	26	21	2586	3585	3559	-114	3467	141	3726	3585	3,559	-114	3467	141	3726	6062	6035		-169	5888	209	6271	-169	5888		6,083

Rte 639 at Rte 637																												
PM Peak	2014 Count	Balancing	Approved Development	Approved Development Alts 1 & 3	2014 Base	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2024 Future Background	2024 Future Background w/out Appd Dev	2024 Alt. 1 Div. Traffic	2024 Alt. 1 Future Traffic	2024 Alt. 2 Div. Traffic	2024 Alt. 2 Future Traffic	2040 Future Background	2040 Future Background w/out Appd Dev	2040 Alt. 1 Div. Traffic	2040 Alt. 1 Future Traffic	2040 Alt. 2 Div. Traffic	2040 Alt. 2 Future Traffic	2040 Alt. 3 Div. Traffic	2040 Alt. 3 Future Traffic	2040 Alt. 4 Div. Traffic	2040 Alt. 4 Future Traffic	
EBL	27		2	2	29	36	35	-32	4	1	37	36	35	-32	4	1	37	53	51		-48	5	2	55	-48	46	2	55
EBT	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
EBR	3			5	3	4	4		9		4	4	4		9		4	6	6		11		6	0	11		6	
WBL	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
WBT	1				1	1	1		1		1	1	1		1		1	2	2		2		2	0	2		2	
WBR	0				0	0	0		0		0	0	0		0		0	0	0		0		0	0	0		0	
NBL	0			8	0	0	0		8		0	0	0		8		0	0	0		8		0	0	8		0	
NBT	159				159	204	204	32	236	-1	202	204	204	32	236	-1	202	302	302		48	350	-2	300	48	307	302	
NBR	3				3	4	4		4		4	4	4		4		4	6	6		6		6	0	6		6	
SBL	1				1	1	1		1		1	1	1		1		1	2	2		2		2	0	2		2	
SBT	112				112	143	143	114	257	-141	3	143	143	114	257	-141	3	213	213		169	382	-209	4	169	382	169	382
SBR	111	4	1	1	116	149	147	-114	35	141	289	149	147	-114	35	141	289	220	219		-169	51	209	429	-169	51	-169	51
Total	417	4	3	16	424	542	539	0	554	0	542	542	539	0	554	0	542	803	800		0	816	0	803	0	813		818

# Appendix F: Supporting Documentation



# DAVENPORT

305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : **Route 1 at 637\_Existing**

Study Date : **02/12/14**

## Signal Warrants - Summary

### Major Street Approaches

**Northbound: Route 1**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **10,394**

**Southbound: Route 1**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **10,216**

### Minor Street Approaches

**Eastbound: Driveway**

Number of Lanes: **1**

Total Approach Volume: **5**

**Westbound: Route 637**

Number of Lanes: **1**

Total Approach Volume: **655**

### Warrant Summary (Rural values apply.)

<b>Warrant 1 - Eight Hour Vehicular Volumes</b> .....	<b>Not Satisfied</b>
<b>Warrant 1A - Minimum Vehicular Volume</b> .....	<b>Not Satisfied</b>
Required volumes reached for 1 hours, 8 are needed	
<b>Warrant 1B - Interruption of Continuous Traffic</b> .....	<b>Not Satisfied</b>
Required volumes reached for 5 hours, 8 are needed	
<b>Warrant 1 A&amp;B - Combination of Warrants</b> .....	<b>Not Satisfied</b>
Required volumes reached for 3 hours, 8 are needed	
<b>Warrant 2 - Four Hour Volumes</b> .....	<b>Satisfied</b>
Number of hours (5) volumes exceed minimum >= minimum required (4).	
<b>Warrant 3 - Peak Hour</b> .....	<b>Satisfied</b>
<b>Warrant 3A - Peak Hour Delay</b> .....	<b>Satisfied</b>
Number of hours (6) volumes exceed minimum >= required (1). Delay data not evaluated.	
<b>Warrant 3B - Peak Hour Volumes</b> .....	<b>Satisfied</b>
Volumes exceed minimums for at least one hour.	
<b>Warrant 4 - Pedestrian Volumes</b> .....	<b>Not Evaluated</b>
<b>Warrant 5 - School Crossing</b> .....	<b>Not Evaluated</b>
<b>Warrant 6 - Coordinated Signal System</b> .....	<b>Not Evaluated</b>
<b>Warrant 7 - Crash Experience</b> .....	<b>Not Evaluated</b>
<b>Warrant 8 - Roadway Network</b> .....	<b>Not Evaluated</b>
<b>Warrant 9 - Intersection Near a Grade Crossing</b> .....	<b>Not Evaluated</b>

# DAVENPORT

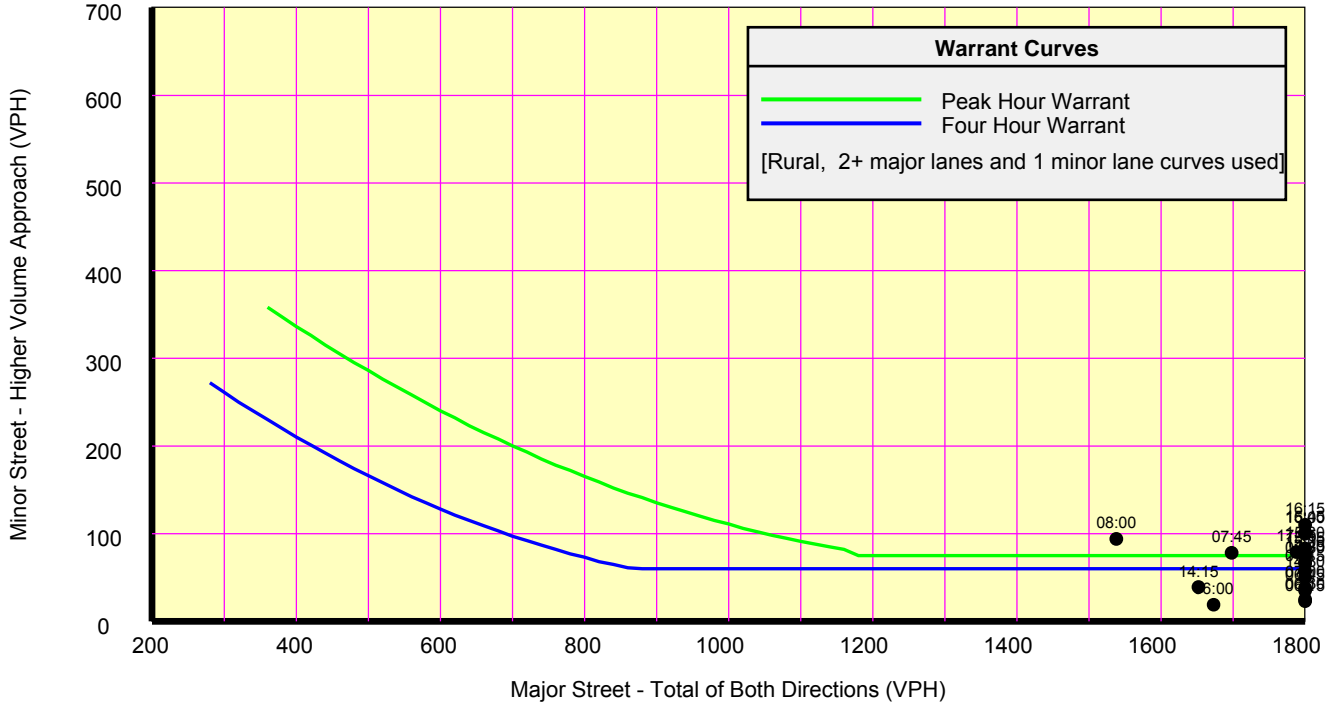
305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : Route 1 at 637\_Existing

Study Date : 02/12/14

## Signal Warrants - Summary



### Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

War 1B-Interruption of Traffic

War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol	Dir	Maj 420	Min 105	Hour Begin	Major Total	Minor Vol	Dir	Maj 630	Min 53	Hour Begin	Major Total	Minor Vol	Dir	Maj 504	Min 84
16:15	2,593	110	W	Yes	Yes	15:45	2,671	101	W	Yes	Yes	15:45	2,671	101	W	Yes	Yes
15:45	2,671	101	W	Yes	No	16:45	2,466	104	W	Yes	Yes	16:45	2,466	104	W	Yes	Yes
15:30	2,631	83	W	Yes	No	07:15	2,178	57	W	Yes	Yes	08:00	1,538	94	W	Yes	Yes
16:00	2,563	100	W	Yes	No	14:45	2,114	68	W	Yes	Yes	15:30	2,631	83	W	Yes	No
15:15	2,547	77	W	Yes	No	08:15	1,404	83	W	Yes	Yes	15:15	2,547	77	W	Yes	No
07:00	2,446	38	W	Yes	No	07:00	2,446	38	W	Yes	No	07:00	2,446	38	W	Yes	No
15:00	2,420	73	W	Yes	No	06:45	2,409	35	W	Yes	No	15:00	2,420	73	W	Yes	No
06:45	2,409	35	W	Yes	No	06:30	2,292	25	W	Yes	No	06:45	2,409	35	W	Yes	No
06:30	2,292	25	W	Yes	No	06:15	2,042	23	W	Yes	No	06:30	2,292	25	W	Yes	No
07:15	2,178	57	W	Yes	No	14:30	1,904	50	W	Yes	No	07:15	2,178	57	W	Yes	No
14:45	2,114	68	W	Yes	No	06:00	1,673	19	W	Yes	No	14:45	2,114	68	W	Yes	No
06:15	2,042	23	W	Yes	No	14:15	1,652	39	W	Yes	No	06:15	2,042	23	W	Yes	No
07:30	1,945	66	W	Yes	No	14:00	1,507	42	W	Yes	No	07:30	1,945	66	W	Yes	No
14:30	1,904	50	W	Yes	No	12:00	1,455	38	W	Yes	No	14:30	1,904	50	W	Yes	No
17:15	1,788	79	W	Yes	No	11:45	1,449	37	W	Yes	No	07:45	1,698	78	W	Yes	No
07:45	1,698	78	W	Yes	No	12:15	1,394	42	W	Yes	No	06:00	1,673	19	W	Yes	No
06:00	1,673	19	W	Yes	No	11:30	1,387	44	W	Yes	No	14:15	1,652	39	W	Yes	No
14:15	1,652	39	W	Yes	No	13:45	1,354	31	W	Yes	No	14:00	1,507	42	W	Yes	No
08:00	1,538	94	W	Yes	No	12:30	1,345	44	W	Yes	No	12:00	1,455	38	W	Yes	No
14:00	1,507	42	W	Yes	No	11:15	1,323	47	W	Yes	No	11:45	1,449	37	W	Yes	No
12:00	1,455	38	W	Yes	No	12:45	1,287	47	W	Yes	No	12:15	1,394	42	W	Yes	No
11:45	1,449	37	W	Yes	No	11:00	1,284	44	W	Yes	No	11:30	1,387	44	W	Yes	No
08:15	1,404	83	W	Yes	No	13:30	1,278	38	W	Yes	No	13:45	1,354	31	W	Yes	No
12:15	1,394	42	W	Yes	No	13:15	1,273	40	W	Yes	No	12:30	1,345	44	W	Yes	No

# DAVENPORT

305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : **Route 1 at 639\_Existing**

Study Date : **02/12/14**

## Signal Warrants - Summary

### Major Street Approaches

**Northbound: Route 1**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **8,662**

**Southbound: Route 1**

Number of Lanes: **2**

85% Speed > 40 MPH.

Total Approach Volume: **9,664**

### Minor Street Approaches

**Eastbound: Driveway**

Number of Lanes: **1**

Total Approach Volume: **1**

**Westbound: Route 639**

Number of Lanes: **1**

Total Approach Volume: **692**

### Warrant Summary (Rural values apply.)

<b>Warrant 1 - Eight Hour Vehicular Volumes</b> .....	<b>Not Satisfied</b>
<b>Warrant 1A - Minimum Vehicular Volume</b> ..... <span style="color: red;">Not Satisfied</span>	
Required volumes reached for 0 hours, 8 are needed	
<b>Warrant 1B - Interruption of Continuous Traffic</b> ..... <span style="color: red;">Not Satisfied</span>	
Required volumes reached for 7 hours, 8 are needed	
<b>Warrant 1 A&amp;B - Combination of Warrants</b> ..... <span style="color: red;">Not Satisfied</span>	
Required volumes reached for 2 hours, 8 are needed	
<b>Warrant 2 - Four Hour Volumes</b> .....	<b>Satisfied</b>
Number of hours (6) volumes exceed minimum >= minimum required (4).	
<b>Warrant 3 - Peak Hour</b> .....	<b>Satisfied</b>
<b>Warrant 3A - Peak Hour Delay</b> ..... <span style="color: red;">Not Satisfied</span>	
Approach volumes on minor street don't exceed minimums for any hour. Delay data not evaluated.	
<b>Warrant 3B - Peak Hour Volumes</b> ..... <span style="color: green;">Satisfied</span>	
Volumes exceed minimums for at least one hour.	
<b>Warrant 4 - Pedestrian Volumes</b> .....	<b>Not Evaluated</b>
<b>Warrant 5 - School Crossing</b> .....	<b>Not Evaluated</b>
<b>Warrant 6 - Coordinated Signal System</b> .....	<b>Not Evaluated</b>
<b>Warrant 7 - Crash Experience</b> .....	<b>Not Evaluated</b>
<b>Warrant 8 - Roadway Network</b> .....	<b>Not Evaluated</b>
<b>Warrant 9 - Intersection Near a Grade Crossing</b> .....	<b>Not Evaluated</b>

# DAVENPORT

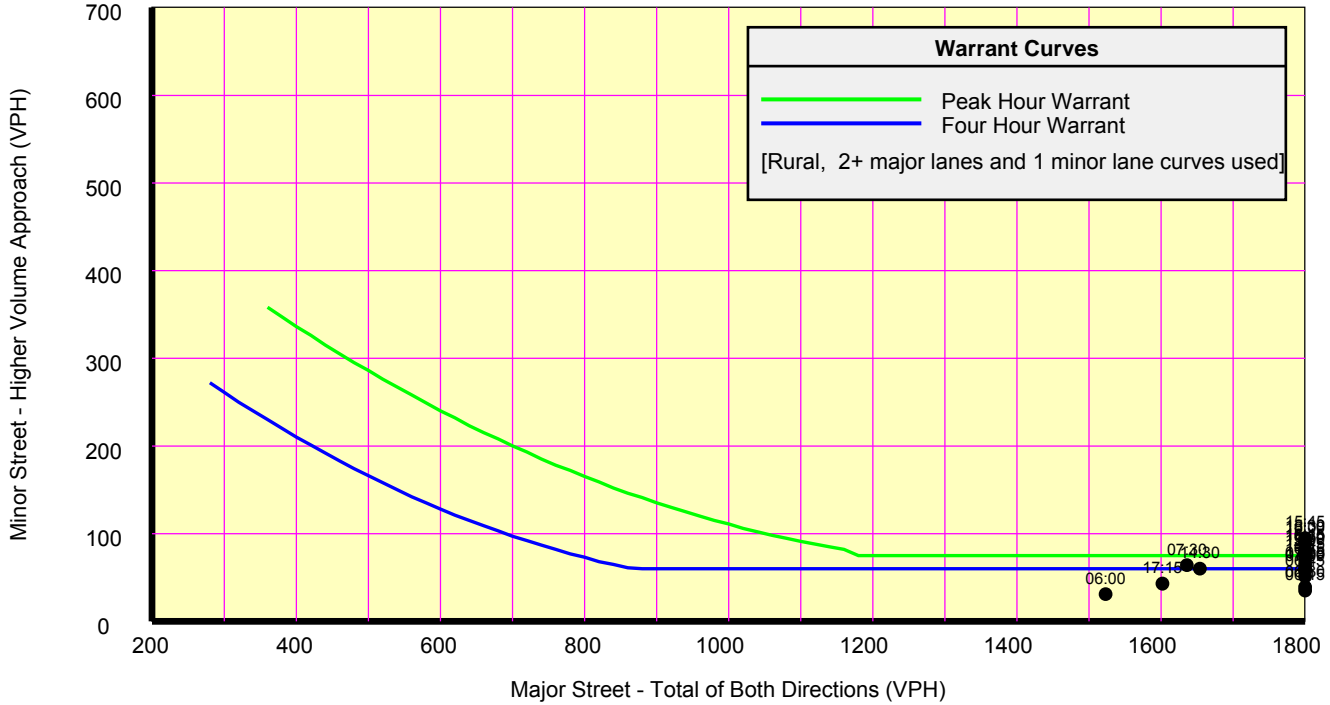
305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : **Route 1 at 639\_Existing**

Study Date : **02/12/14**

## Signal Warrants - Summary



### Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

War 1B-Interruption of Traffic

War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol	Dir	Maj 420	Min 105	Hour Begin	Major Total	Minor Vol	Dir	Maj 630	Min 53	Hour Begin	Major Total	Minor Vol	Dir	Maj 504	Min 84
15:45	2,394	95	W	Yes	No	16:15	2,347	81	W	Yes	Yes	15:30	2,352	91	W	Yes	Yes
16:00	2,364	89	W	Yes	No	15:15	2,277	81	W	Yes	Yes	08:00	1,293	84	W	Yes	Yes
15:30	2,352	91	W	Yes	No	07:00	2,163	57	W	Yes	Yes	16:30	2,287	78	W	Yes	No
16:15	2,347	81	W	Yes	No	14:15	1,393	60	W	Yes	Yes	15:15	2,277	81	W	Yes	No
16:30	2,287	78	W	Yes	No	08:00	1,293	84	W	Yes	Yes	16:45	2,186	65	W	Yes	No
15:15	2,277	81	W	Yes	No	13:15	1,126	55	W	Yes	Yes	15:00	2,163	75	W	Yes	No
16:45	2,186	65	W	Yes	No	09:00	924	56	W	Yes	Yes	07:00	2,163	57	W	Yes	No
15:00	2,163	75	W	Yes	No	06:45	2,163	51	W	Yes	No	06:45	2,163	51	W	Yes	No
07:00	2,163	57	W	Yes	No	06:30	2,048	39	W	Yes	No	17:00	2,141	59	W	Yes	No
06:45	2,163	51	W	Yes	No	06:15	1,864	35	W	Yes	No	06:30	2,048	39	W	Yes	No
17:00	2,141	59	W	Yes	No	17:15	1,602	43	W	Yes	No	07:15	1,888	60	W	Yes	No
06:30	2,048	39	W	Yes	No	06:00	1,523	31	W	Yes	No	14:45	1,884	70	W	Yes	No
07:15	1,888	60	W	Yes	No	11:00	1,278	50	W	Yes	No	06:15	1,864	35	W	Yes	No
14:45	1,884	70	W	Yes	No	12:00	1,264	42	W	Yes	No	14:30	1,654	60	W	Yes	No
06:15	1,864	35	W	Yes	No	11:45	1,228	45	W	Yes	No	07:30	1,636	64	W	Yes	No
14:30	1,654	60	W	Yes	No	10:45	1,226	46	W	Yes	No	17:15	1,602	43	W	Yes	No
07:30	1,636	64	W	Yes	No	12:30	1,206	45	W	Yes	No	06:00	1,523	31	W	Yes	No
17:15	1,602	43	W	Yes	No	11:15	1,190	47	W	Yes	No	14:15	1,393	60	W	Yes	No
06:00	1,523	31	W	Yes	No	10:30	1,174	48	W	Yes	No	07:45	1,390	79	W	Yes	No
14:15	1,393	60	W	Yes	No	11:30	1,173	45	W	Yes	No	11:00	1,278	50	W	Yes	No
07:45	1,390	79	W	Yes	No	12:45	1,159	42	W	Yes	No	12:00	1,264	42	W	Yes	No
08:00	1,293	84	W	Yes	No	12:15	1,155	40	W	Yes	No	11:45	1,228	45	W	Yes	No
11:00	1,278	50	W	Yes	No	10:15	1,122	47	W	Yes	No	10:45	1,226	46	W	Yes	No
12:00	1,264	42	W	Yes	No	13:00	1,085	44	W	Yes	No	14:00	1,219	63	W	Yes	No

# DAVENPORT

305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : **Route 1 at 637\_Existing (Alt 1 Scenario)**

Study Date : **02/12/14**

## Signal Warrants - Summary

### Major Street Approaches

**Northbound: Route 1**  
 Number of Lanes: **2**  
 85% Speed > 40 MPH.  
 Total Approach Volume: **10,401**

**Southbound: Route 1**  
 Number of Lanes: **2**  
 85% Speed > 40 MPH.  
 Total Approach Volume: **9,767**

### Minor Street Approaches

**Eastbound: Driveway**  
 Number of Lanes: **1**  
 Total Approach Volume: **5**

**Westbound: Route 637**  
 Number of Lanes: **1**  
 Total Approach Volume: **1,566**

### Warrant Summary (Rural values apply.)

<b>Warrant 1 - Eight Hour Vehicular Volumes</b> .....	<b>Satisfied</b>
<b>Warrant 1A - Minimum Vehicular Volume</b> ..... <b>Not Satisfied</b>	
Required volumes reached for 7 hours, 8 are needed	
<b>Warrant 1B - Interruption of Continuous Traffic</b> ..... <b>Satisfied</b>	
Required volumes reached for 12 hours, 8 are needed	
<b>Warrant 1 A&amp;B - Combination of Warrants</b> ..... <b>Satisfied</b>	
Required volumes reached for 11 hours, 8 are needed	
<b>Warrant 2 - Four Hour Volumes</b> .....	<b>Satisfied</b>
Number of hours (12) volumes exceed minimum >= minimum required (4).	
<b>Warrant 3 - Peak Hour</b> .....	<b>Satisfied</b>
<b>Warrant 3A - Peak Hour Delay</b> ..... <b>Satisfied</b>	
Number of hours (29) volumes exceed minimum >= required (1). Delay data not evaluated.	
<b>Warrant 3B - Peak Hour Volumes</b> ..... <b>Satisfied</b>	
Volumes exceed minimums for at least one hour.	
<b>Warrant 4 - Pedestrian Volumes</b> .....	<b>Not Evaluated</b>
<b>Warrant 5 - School Crossing</b> .....	<b>Not Evaluated</b>
<b>Warrant 6 - Coordinated Signal System</b> .....	<b>Not Evaluated</b>
<b>Warrant 7 - Crash Experience</b> .....	<b>Not Evaluated</b>
<b>Warrant 8 - Roadway Network</b> .....	<b>Not Evaluated</b>
<b>Warrant 9 - Intersection Near a Grade Crossing</b> .....	<b>Not Evaluated</b>

# DAVENPORT

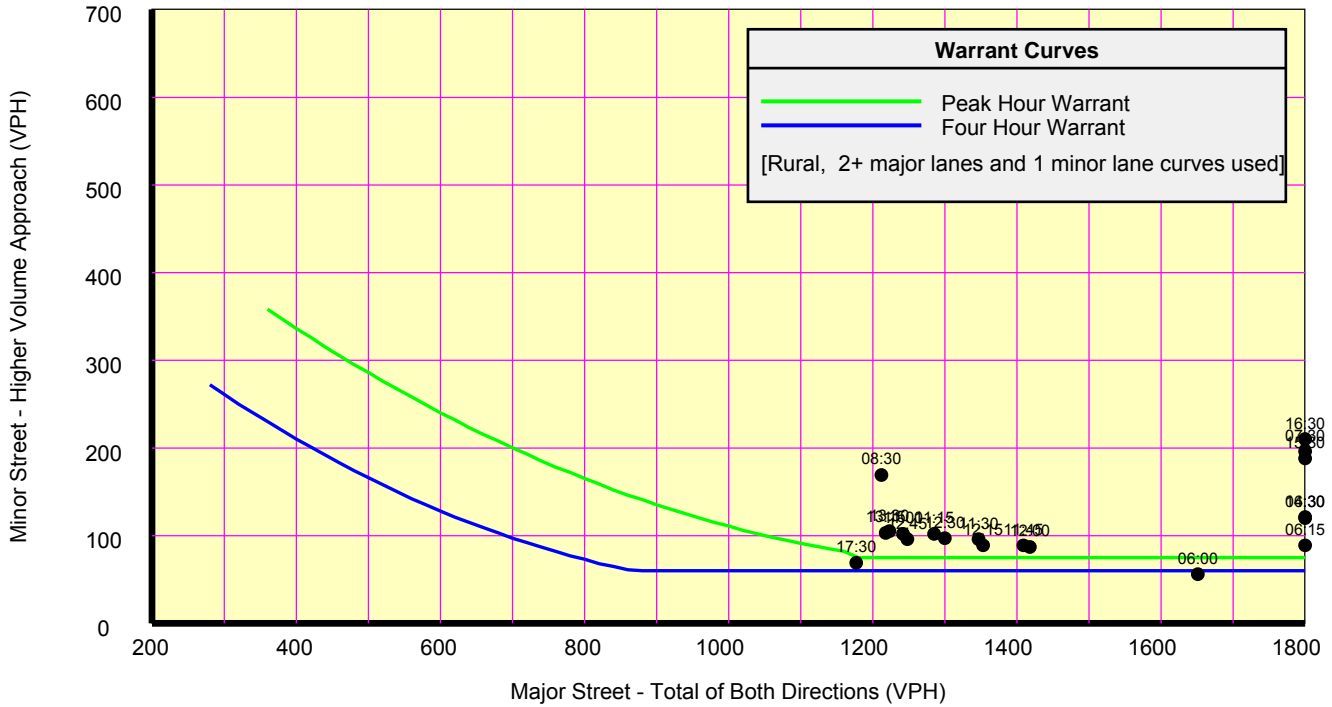
305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : Route 1 at 637\_Existing (Alt 1 Scenario)

Study Date : 02/12/14

## Signal Warrants - Summary



### Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

War 1B-Interruption of Traffic

War 1C-Combination of Warrants

Hour Begin	Major		Maj Dir	Maj Min		Hour Begin	Major		Maj Dir	Maj Min		Hour Begin	Major		Maj Dir	Maj Min	
	Total	Vol		420	105		Total	Vol		630	53		Total	Vol		504	84
15:30	2,562	188	W	Yes	Yes	16:00	2,544	203	W	Yes	Yes	16:15	2,597	204	W	Yes	Yes
16:30	2,509	210	W	Yes	Yes	07:00	2,430	209	W	Yes	Yes	15:15	2,478	171	W	Yes	Yes
06:30	2,278	120	W	Yes	Yes	17:00	2,407	169	W	Yes	Yes	07:15	2,160	207	W	Yes	Yes
07:30	1,922	196	W	Yes	Yes	15:00	2,361	160	W	Yes	Yes	06:15	2,025	89	W	Yes	Yes
14:30	1,870	121	W	Yes	Yes	06:00	1,651	56	W	Yes	Yes	17:15	1,755	129	W	Yes	Yes
13:30	1,223	105	W	Yes	Yes	08:00	1,512	191	W	Yes	Yes	14:15	1,612	110	W	Yes	Yes
08:30	1,212	169	W	Yes	Yes	14:00	1,458	116	W	Yes	Yes	08:15	1,372	179	W	Yes	Yes
06:15	2,025	89	W	Yes	No	12:00	1,418	87	W	Yes	Yes	12:15	1,353	89	W	Yes	Yes
06:00	1,651	56	W	Yes	No	11:00	1,242	102	W	Yes	Yes	11:15	1,285	102	W	Yes	Yes
12:00	1,418	87	W	Yes	No	13:00	1,158	96	W	Yes	Yes	13:15	1,218	103	W	Yes	Yes
11:45	1,409	89	W	Yes	No	09:00	1,012	99	W	Yes	Yes	10:15	1,044	84	W	Yes	Yes
12:15	1,353	89	W	Yes	No	10:00	975	78	W	Yes	Yes	06:00	1,651	56	W	Yes	No
11:30	1,347	96	W	Yes	No	05:45	1,156	38	W	Yes	No	05:45	1,156	38	W	Yes	No
12:30	1,300	97	W	Yes	No	05:30	677	30	W	Yes	No	10:00	975	78	W	Yes	No
11:15	1,285	102	W	Yes	No	05:15	310	16	W	No	No	09:30	973	77	W	Yes	No
12:45	1,248	96	W	Yes	No	22:45	0	0	W	No	No	09:45	972	78	W	Yes	No
11:00	1,242	102	W	Yes	No	22:30	0	0	W	No	No	09:15	959	83	W	Yes	No
13:15	1,218	103	W	Yes	No	22:15	0	0	W	No	No	05:30	677	30	W	Yes	No
17:30	1,177	69	W	Yes	No	22:00	0	0	W	No	No	05:15	310	16	W	No	No
10:45	1,169	95	W	Yes	No	21:45	0	0	W	No	No	22:45	0	0	W	No	No
13:00	1,158	96	W	Yes	No	21:30	0	0	W	No	No	22:30	0	0	W	No	No
05:45	1,156	38	W	Yes	No	21:15	0	0	W	No	No	22:15	0	0	W	No	No
10:30	1,118	88	W	Yes	No	21:00	0	0	W	No	No	22:00	0	0	W	No	No
10:15	1,044	84	W	Yes	No	20:45	0	0	W	No	No	21:45	0	0	W	No	No

# DAVENPORT

305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : **Route 1 at 639\_Existing (Alt 2 Scenario)**

Study Date : **02/12/14**

## Signal Warrants - Summary

### Major Street Approaches

**Northbound: Route 1**

Number of Lanes: **2**  
 85% Speed > 40 MPH.  
 Total Approach Volume: **8,763**

**Southbound: Route 1**

Number of Lanes: **2**  
 85% Speed > 40 MPH.  
 Total Approach Volume: **9,710**

### Minor Street Approaches

**Eastbound: Driveway**

Number of Lanes: **1**  
 Total Approach Volume: **1**

**Westbound: Route 639**

Number of Lanes: **1**  
 Total Approach Volume: **1,558**

### Warrant Summary (Rural values apply.)

<b>Warrant 1 - Eight Hour Vehicular Volumes</b> .....	<b>Satisfied</b>
<b>Warrant 1A - Minimum Vehicular Volume</b> ..... <b>Not Satisfied</b>	
Required volumes reached for 7 hours, 8 are needed	
<b>Warrant 1B - Interruption of Continuous Traffic</b> ..... <b>Satisfied</b>	
Required volumes reached for 12 hours, 8 are needed	
<b>Warrant 1 A&amp;B - Combination of Warrants</b> ..... <b>Satisfied</b>	
Required volumes reached for 10 hours, 8 are needed	
<b>Warrant 2 - Four Hour Volumes</b> .....	<b>Satisfied</b>
Number of hours (12) volumes exceed minimum >= minimum required (4).	
<b>Warrant 3 - Peak Hour</b> .....	<b>Satisfied</b>
<b>Warrant 3A - Peak Hour Delay</b> ..... <b>Satisfied</b>	
Number of hours (28) volumes exceed minimum >= required (1). Delay data not evaluated.	
<b>Warrant 3B - Peak Hour Volumes</b> ..... <b>Satisfied</b>	
Volumes exceed minimums for at least one hour.	
<b>Warrant 4 - Pedestrian Volumes</b> .....	<b>Not Evaluated</b>
<b>Warrant 5 - School Crossing</b> .....	<b>Not Evaluated</b>
<b>Warrant 6 - Coordinated Signal System</b> .....	<b>Not Evaluated</b>
<b>Warrant 7 - Crash Experience</b> .....	<b>Not Evaluated</b>
<b>Warrant 8 - Roadway Network</b> .....	<b>Not Evaluated</b>
<b>Warrant 9 - Intersection Near a Grade Crossing</b> .....	<b>Not Evaluated</b>

# DAVENPORT

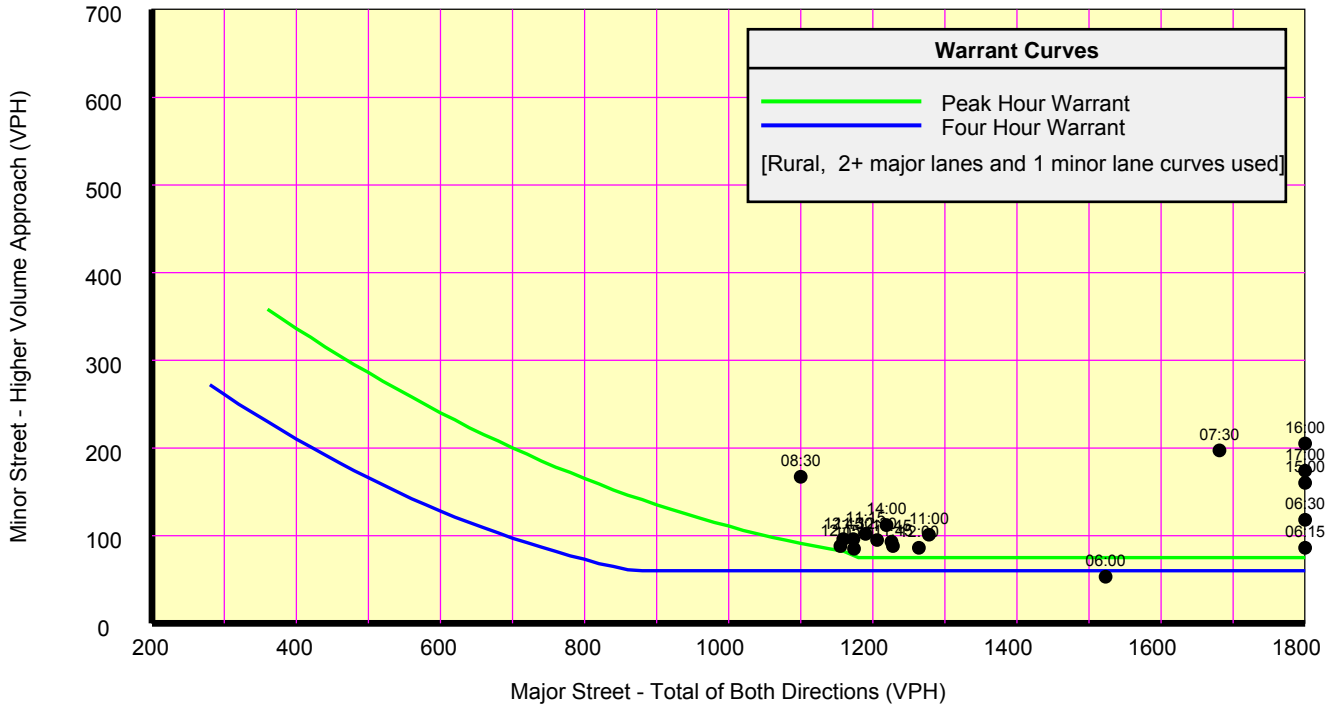
305 West 4th Street, Winston-Salem, NC 27101

Phone: 336-744-1636

Study Name : Route 1 at 639\_Existing (Alt 2 Scenario)

Study Date : 02/12/14

## Signal Warrants - Summary



### Analysis of 8-Hour Volume Warrants:

#### War 1A-Minimum Volume

#### War 1B-Interruption of Traffic

#### War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol Dir	Maj 420	Min 105	Hour Begin	Major Total	Minor Vol Dir	Maj 630	Min 53	Hour Begin	Major Total	Minor Vol Dir	Maj 504	Min 84
16:00	2,424	205 W	Yes	Yes	16:00	2,424	205 W	Yes	Yes	15:30	2,372	188 W	Yes	Yes
15:00	2,163	160 W	Yes	Yes	07:00	2,250	208 W	Yes	Yes	16:30	2,327	215 W	Yes	Yes
17:00	2,141	174 W	Yes	Yes	15:00	2,163	160 W	Yes	Yes	07:15	1,954	208 W	Yes	Yes
06:30	2,090	118 W	Yes	Yes	17:00	2,141	174 W	Yes	Yes	06:15	1,885	86 W	Yes	Yes
07:30	1,681	197 W	Yes	Yes	06:00	1,523	53 W	Yes	Yes	14:30	1,654	118 W	Yes	Yes
14:00	1,219	112 W	Yes	Yes	08:00	1,293	193 W	Yes	Yes	12:30	1,206	95 W	Yes	Yes
08:30	1,100	167 W	Yes	Yes	11:00	1,278	101 W	Yes	Yes	08:15	1,193	180 W	Yes	Yes
06:15	1,885	86 W	Yes	No	12:00	1,264	86 W	Yes	Yes	10:30	1,174	85 W	Yes	Yes
06:00	1,523	53 W	Yes	No	14:00	1,219	112 W	Yes	Yes	11:30	1,173	96 W	Yes	Yes
11:00	1,278	101 W	Yes	No	13:00	1,085	96 W	Yes	Yes	13:30	1,095	103 W	Yes	Yes
12:00	1,264	86 W	Yes	No	09:00	924	95 W	Yes	Yes	06:00	1,523	53 W	Yes	No
11:45	1,228	88 W	Yes	No	10:00	909	75 W	Yes	Yes	10:15	1,122	81 W	Yes	No
10:45	1,226	93 W	Yes	No	05:45	1,074	36 W	Yes	No	05:45	1,074	36 W	Yes	No
12:30	1,206	95 W	Yes	No	05:30	653	29 W	Yes	No	17:30	1,034	73 W	Yes	No
11:15	1,190	102 W	Yes	No	05:15	282	15 W	No	No	09:45	927	75 W	Yes	No
10:30	1,174	85 W	Yes	No	22:45	0	0 W	No	No	09:30	914	74 W	Yes	No
11:30	1,173	96 W	Yes	No	22:30	0	0 W	No	No	10:00	909	75 W	Yes	No
12:45	1,159	96 W	Yes	No	22:15	0	0 W	No	No	09:15	887	78 W	Yes	No
12:15	1,155	88 W	Yes	No	22:00	0	0 W	No	No	05:30	653	29 W	Yes	No
13:15	1,126	102 W	Yes	No	21:45	0	0 W	No	No	17:45	555	33 W	Yes	No
13:45	1,122	98 W	Yes	No	21:30	0	0 W	No	No	05:15	282	15 W	No	No
10:15	1,122	81 W	Yes	No	21:15	0	0 W	No	No	22:45	0	0 W	No	No
13:30	1,095	103 W	Yes	No	21:00	0	0 W	No	No	22:30	0	0 W	No	No
13:00	1,085	96 W	Yes	No	20:45	0	0 W	No	No	22:15	0	0 W	No	No



Trip Generation Summary - Phase 1  
Average Weekday Driveway Volumes

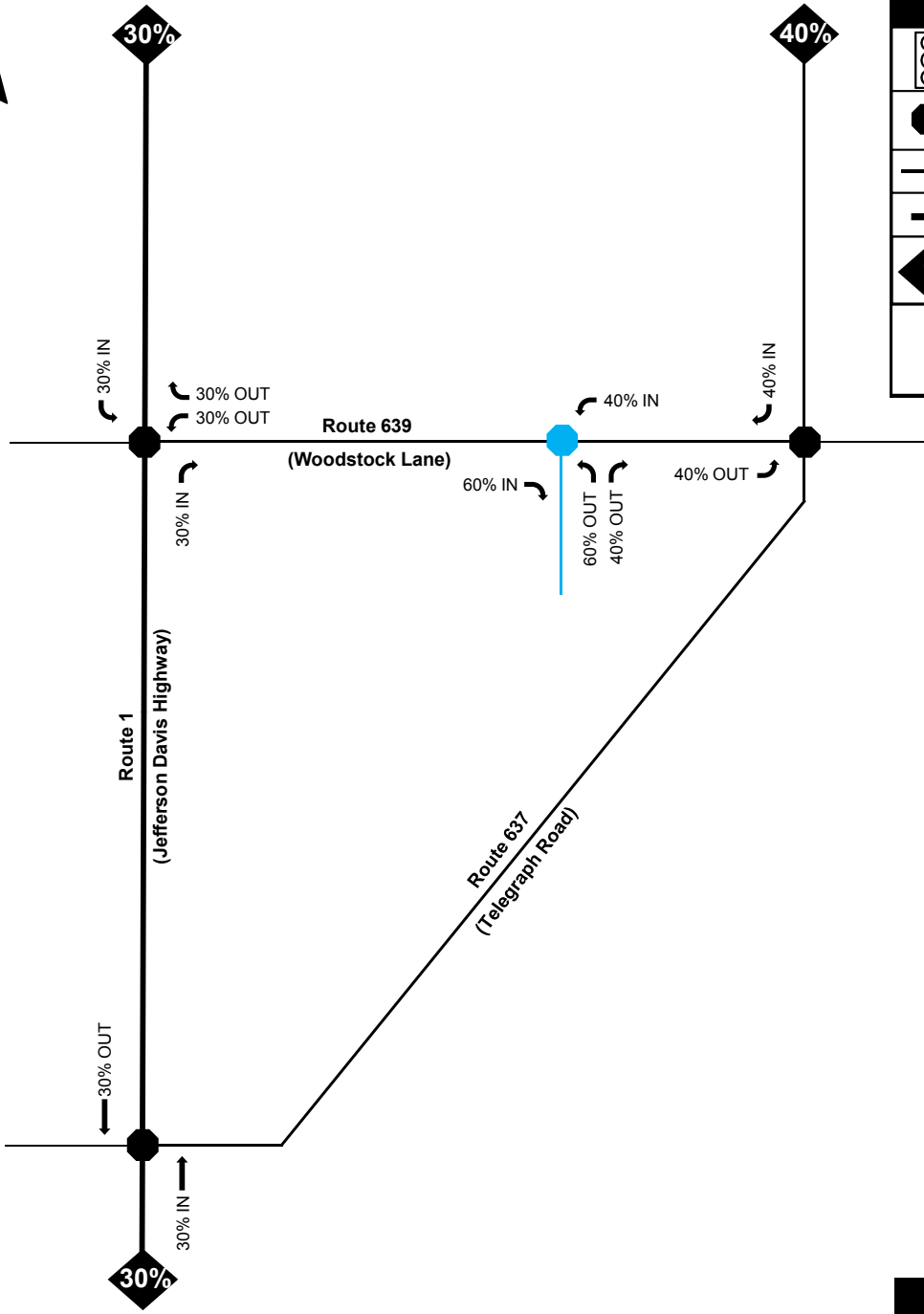
Project: New Project  
Alternative: Alternative 1

Open Date: 1/28/2014  
Analysis 1/28/2014

ITE	Land Use	Average Daily Trips			AM Peak Hour Adjacent Street Traffic			PM Peak Hour Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
311	HOTELSUITES 1 72 Rooms	177	176	353	15	12	27	13	16	29
Unadjusted Driveway Volume		177	353	530	15	12	27	13	16	29
Unadjusted Pass-By Trips		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Adjusted Driveway Volume		177	353	530	15	12	27	13	16	29
Adjusted Pass-By Trips		0	0	0	0	0	0	0	0	0
Adjusted Volume Added to Adjacent Streets		177	353	530	15	12	27	13	16	29

Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent



LEGEND	
	SIGNALIZED INTERSECTION
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	ORIGIN NODE
BLACK = EXISTING	
GREY = UNANALYZED	
BLUE = PROPOSED	

APPROVED  
DEVELOPMENT  
DISTRIBUTION -  
AFFORDABLE SUITES

VDOT OPERATIONAL AND SAFETY  
STUDY - RTES 1/637/639  
STAFFORD COUNTY, VA

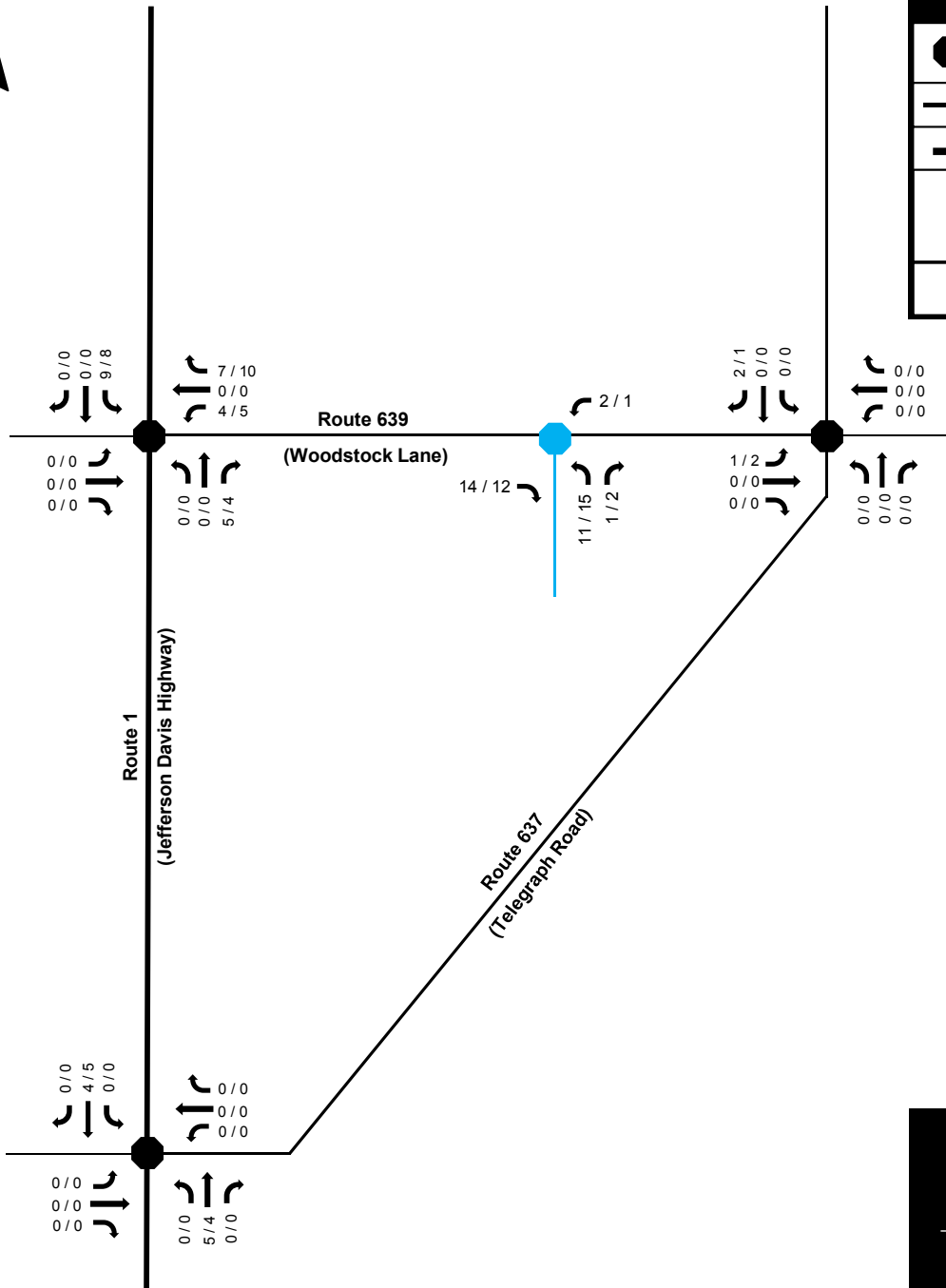
PROJECT NUMBER 13-368

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\*\*\* NOT TO SCALE \*\*\*



LEGEND	
	UNSIGNALIZED INTERSECTION
	ROADWAY
	TRAFFIC MOVEMENT
	BLACK = EXISTING
	BLUE = PROPOSED
AM/ PM PEAKS	



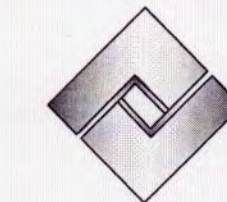
APPROVED  
DEVELOPMENT SITE  
TRIPS - AFFORDABLE  
SUITES

VDOT OPERATIONAL AND SAFETY  
STUDY - RTES 1/637/639  
STAFFORD COUNTY, VA

PROJECT NUMBER VDOT -  
CRO 12-092

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\*\*\* NOT TO SCALE \*\*\*



**Fairbanks & Franklin**

Civil Engineering  
Land Planning

11901 Main Street  
Fredericksburg, VA 22408  
(540) 899-3700

LAYOUT PLAN

**AFFORDABLE SUITES OF AMERICA**  
STAFFORD COUNTY, VIRGINIA

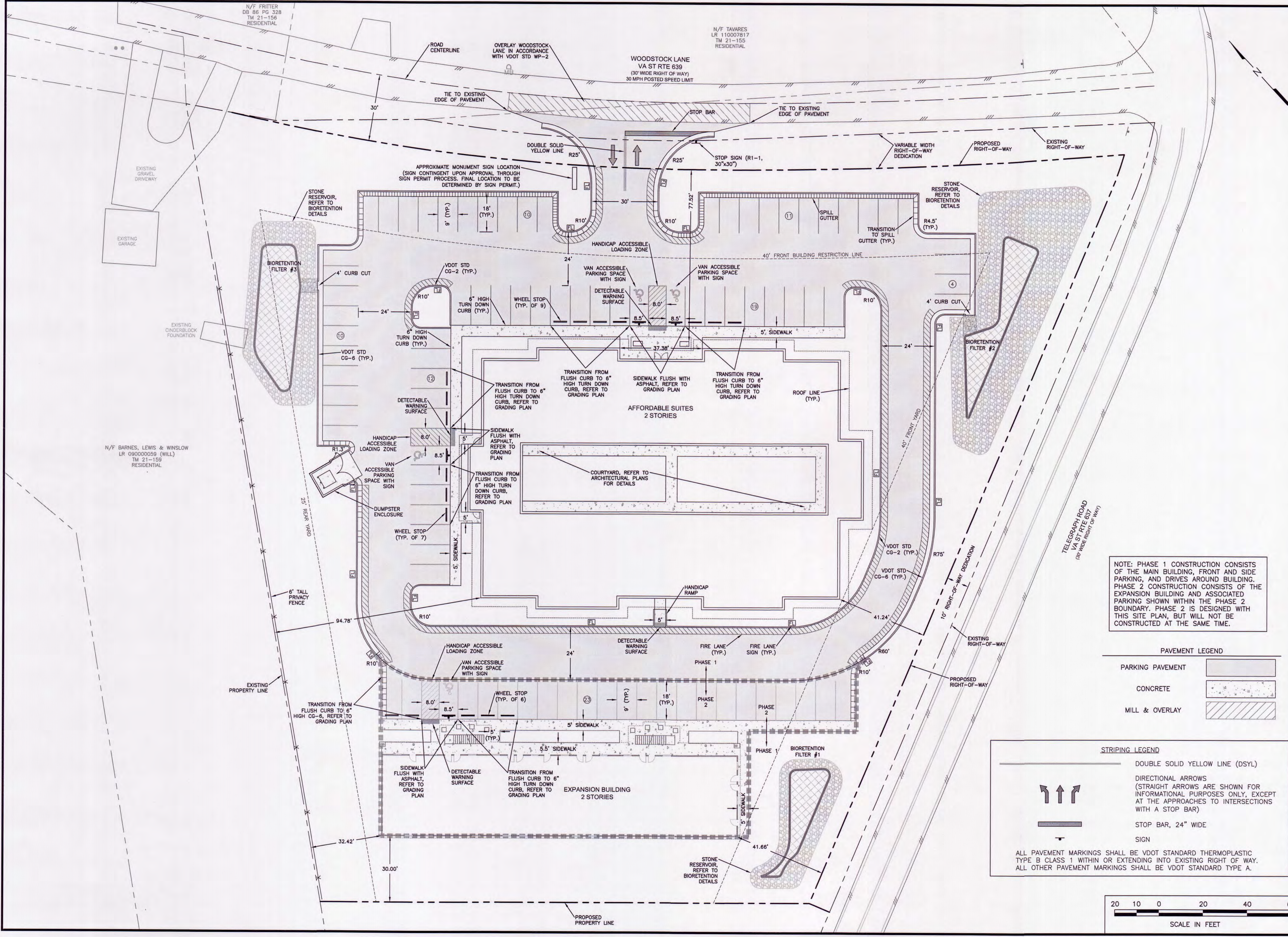


DATE : 11-22-13  
DESIGNED : JKS  
DRAWN : JKS  
CHECKED : JDF

REVISIONS:

DOCUMENT NO.  
**181-1001**

SHEET  
**4** OF **29**



NOTE: PHASE 1 CONSTRUCTION CONSISTS OF THE MAIN BUILDING, FRONT AND SIDE PARKING, AND DRIVES AROUND BUILDING. PHASE 2 CONSTRUCTION CONSISTS OF THE EXPANSION BUILDING AND ASSOCIATED PARKING SHOWN WITHIN THE PHASE 2 BOUNDARY. PHASE 2 IS DESIGNED WITH THIS SITE PLAN, BUT WILL NOT BE CONSTRUCTED AT THE SAME TIME.

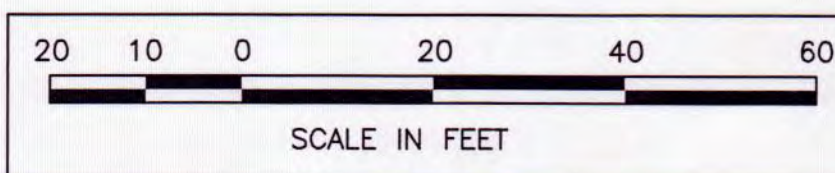
PAVEMENT LEGEND

PARKING PAVEMENT	
CONCRETE	
MILL & OVERLAY	

STRIPING LEGEND

	DOUBLE SOLID YELLOW LINE (DSYL)
	DIRECTIONAL ARROWS (STRAIGHT ARROWS ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY, EXCEPT AT THE APPROACHES TO INTERSECTIONS WITH A STOP BAR)
	STOP BAR, 24" WIDE
	SIGN

ALL PAVEMENT MARKINGS SHALL BE VDOT STANDARD THERMOPLASTIC TYPE B CLASS 1 WITHIN OR EXTENDING INTO EXISTING RIGHT OF WAY. ALL OTHER PAVEMENT MARKINGS SHALL BE VDOT STANDARD TYPE A.



## **\*DISCLAIMER\***

**Cost estimates are not to be considered a part of the sealed document. Estimates are being offered with the caveats noted.**

**OPINION OF PROBABLE CONSTRUCTION COSTS**

PROJECT: INTERSECTION SAFETY STUDY - RTE 1 /RTE 637 / RTE 639  
 SHORT TERM ALTERNATIVE 1 (CONSOLIDATION OF TRAFFIC TO ROUTE 637)  
 NUMBER: 13-368  
 DATE: 09/24/14  
 ESTIMATE: \$4,450,000

DAVENPORT has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. DAVENPORT cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Item No.	Item Description	Quantity and Unit	Unit Price	Amount
<b>ROADWAY ITEMS</b>				
1	Mobilization	7% PCT		\$51,488
2	Pavement Planing (0-2")	10,485 SY	\$16.00*	\$167,760
3	Asphalt Concrete Type BM-25.0D (5")	1,490 TN	\$115.00*	\$171,350
4	Asphalt Concrete Type IM-19.5D (4")	1,170 TN	\$100.00*	\$117,000
5	Asphalt Concrete Type SM-12.5D (1.5")	1,320 TN	\$145.00*	\$191,400
6	Liquid Asphalt Material CRS-2	475 GA	\$3.71	\$1,762
7	Aggregate Base Course, 21B	1,455 CY	\$48.00*	\$69,840
8	Median Strip MS-1	65 SY	\$71.44	\$4,644
9	Type B, Class I, Pavement Line Marking (4")	19,200 LF	\$0.51	\$9,792
10	Type B, Class I, Pavement Line Marking (24")	135 LF	\$5.66	\$764
11	Pavement Message Marking Elongated Arrow Single	8 EA	\$111.24	\$890
12	Pavement Message Marking Elongated Arrow Double	2 EA	\$169.43	\$339
13	Grading	20% PCT		\$147,108
14	Erosion Control	8% PCT		\$58,843
15	Traffic Control	12% PCT		\$88,265
16	Traffic Signal	1 EA	\$250,000	\$250,000
			<b>SUBTOTAL:</b>	<b>\$1,331,245</b>
<b>OTHER CONSTRUCTION COSTS</b>				
	Construction Surveying	2% PCT		\$26,625
	Construction Engineering	20% PCT		\$266,249
	Stormwater Management (per VDOT)	1 LS		\$75,000
	VDOT Administration	1 LS		\$25,000
	Materials Testing	2% PCT		\$26,625
			<b>EXPECTED CONSTRUCTION CONTRACT TOTAL:</b>	<b>\$1,750,744</b>
	Contingencies On All Above Items	25% PCT		\$437,686
			<b>EXPECTED CONSTRUCTION TOTAL:</b>	<b>\$2,188,430</b>
<b>RIGHT OF WAY &amp; UTILITY COSTS</b>				
	Utility Relocation	25% PCT		\$547,107
	Right of Way Acquisition**	80,332 SF	\$15	\$1,204,980
	VDOT Administration	1 LS		\$25,000
	Contingency	1 LS		\$150,000
			<b>EXPECTED ROW TOTAL:</b>	<b>\$1,927,087</b>
<b>PRELIMINARY ENGINEERING</b>				
	Design	15% PCT		\$218,924
	VDOT Administration	1 LS		\$50,000
	Contingency	1 LS		\$50,000
			<b>EXPECTED PE TOTAL:</b>	<b>\$318,924</b>
			<b>PROJECT BUDGET</b>	<b>\$4,434,441</b>

**NOTES:**

- Unit prices based upon 2013 VDOT statewide averages, except \* unit priced provided by VDOT.
- \$207/LF for closed drainage assumes average 24"-36" RCP and inlet spacing of 200'.
- ROW areas determined from GIS property data and assumed proposed right-of-way set at 20' from edge of travel.
- \*\* \$/SF for ROW acquisition assumed to be \$15/SF. Actual cost should be verified by VDOT and the estimate updated accordingly.

**OPINION OF PROBABLE CONSTRUCTION COSTS**

PROJECT: INTERSECTION SAFETY STUDY - RTE 1 /RTE 637 / RTE 639  
 SHORT TERM ALTERNATIVE 2 (CONSOLIDATION OF TRAFFIC TO ROUTE 639)  
 NUMBER: 13-368  
 DATE: 09/24/14  
 ESTIMATE: \$5,250,000

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Item No.	Item Description	Quantity	Unit	Unit Price	Amount
<b>ROADWAY ITEMS</b>					
1	Mobilization	7%	PCT		\$87,903
2	Pavement Planing (0-2")	11,355	SY	\$16.00*	\$181,680
3	Asphalt Concrete Type BM-25.0D (5")	1,300	TN	\$115.00*	\$149,500
4	Asphalt Concrete Type IM-19.5D (4")	825	TN	\$100.00*	\$82,500
5	Asphalt Concrete Type SM-12.5D (1.5")	1,265	TN	\$145.00*	\$183,425
6	Liquid Asphalt Material CRS-2	480	GA	\$3.71	\$1,781
7	Aggregate Base Course, 21B	1,270	CY	\$48.00*	\$60,960
8	Median Strip MS-1	30	SY	\$71.44	\$2,143
9	Closed Drainage System	1,355	LF	\$207.00	\$280,485
10	Culvert Modification	1	LS		\$250,000
11	Standard Combination Curb & Gutter CG-6	2,710	LF	\$19.78	\$53,604
12	Type B, Class I, Pavement Line Marking (4")	13,915	LF	\$0.51	\$7,097
13	Type B, Class I, Pavement Line Marking (24")	140	LF	\$5.66	\$792
14	Pavement Message Marking Elongated Arrow Single	10	EA	\$111.24	\$1,112
15	Pavement Message Marking Elongated Arrow Double	4	EA	\$169.43	\$678
16	Grading	20%	PCT		\$251,151
17	Erosion Control	8%	PCT		\$100,461
18	Traffic Control	12%	PCT		\$150,691
19	Traffic Signal	1	EA	\$250,000	\$250,000
				<b>SUBTOTAL:</b>	<b>\$1,826,380</b>
<b>OTHER CONSTRUCTION COSTS</b>					
	Construction Surveying	2%	PCT		\$36,528
	Construction Engineering	20%	PCT		\$365,276
	Stormwater Management (per VDOT)	1	LS		\$75,000
	VDOT Administration	1	LS		\$25,000
	Materials Testing	2%	PCT		\$36,528
				<b>EXPECTED CONSTRUCTION CONTRACT TOTAL:</b>	<b>\$2,364,711</b>
	Contingencies On All Above Items	25%	PCT		\$591,178
				<b>EXPECTED CONSTRUCTION TOTAL:</b>	<b>\$2,955,889</b>
<b>RIGHT OF WAY &amp; UTILITY COSTS</b>					
	Utility Relocation	25%	PCT		\$738,972
	Right of Way Acquisition**	64,936	SF	\$15	\$974,040
	VDOT Administration	1	LS		\$25,000
	Contingency	1	LS		\$150,000
				<b>EXPECTED ROW TOTAL:</b>	<b>\$1,888,012</b>
<b>PRELIMINARY ENGINEERING</b>					
	Design	15%	PCT		\$296,165
	VDOT Administration	1	LS		\$50,000
	Contingency	1	LS		\$50,000
				<b>EXPECTED PE TOTAL:</b>	<b>\$396,165</b>
				<b>PROJECT BUDGET</b>	<b>\$5,240,066</b>

**NOTES:**

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- \$207/LF for closed drainage assumes average 24"-36" RCP and inlet spacing of 200'.
- ROW areas determined from GIS property data and assumed proposed right-of-way set at 20' from edge of travel.
- \*\* \$/SF for ROW acquisition assumed to be \$15/SF. Actual cost should be verified by VDOT and the estimate updated accordingly.

**OPINION OF PROBABLE CONSTRUCTION COSTS**

PROJECT: INTERSECTION SAFETY STUDY - RTE 1 /RTE 637 / RTE 639  
 LONG TERM ALTERNATIVE 4 (CONSOLIDATED LEFT TURNS)  
 NUMBER: 13-368  
 DATE: 09/24/14  
 ESTIMATE: \$4,775,000

DAVENPORT has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. DAVENPORT cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Item No.	Item Description	Quantity	Unit	Price	Amount
<b>ROADWAY ITEMS</b>					
1	Mobilization	7%	PCT		\$48,938
2	Pavement Planing (0-2")	0	SY	\$16.00*	\$0
3	Asphalt Concrete Type BM-25.0D (5")	1,595	TN	\$115.00*	\$183,425
4	Asphalt Concrete Type IM-19.5D (4")	1,450	TN	\$100.00*	\$145,000
5	Asphalt Concrete Type SM-12.5D (1.5")	545	TN	\$145.00*	\$79,025
6	Liquid Asphalt Material CRS-2	210	GA	\$3.71	\$779
7	Aggregate Base Course, 21B	1,940	CY	\$48.00*	\$93,120
8	Median Strip MS-1	45	SY	\$71.44	\$3,215
9	Closed Drainage System	765	LF	\$207.00	\$158,355
10	Standard Combination Curb & Gutter CG-6	1,530	LF	\$19.78	\$30,263
11	Type B, Class I, Pavement Line Marking (4")	6,600	LF	\$0.51	\$3,366
12	Type B, Class I, Pavement Line Marking (24")	235	LF	\$5.66	\$1,330
13	Pavement Message Marking Elongated Arrow Single	8	EA	\$111.24	\$890
14	Pavement Message Marking Elongated Arrow Double	2	EA	\$169.43	\$339
15	Grading	30%	PCT		\$209,732
16	Erosion Control	8%	PCT		\$55,929
17	Traffic Control	12%	PCT		\$83,893
18	Traffic Signal	2	EA	\$250,000	\$500,000
				SUBTOTAL:	\$1,597,598
<b>OTHER CONSTRUCTION COSTS</b>					
	Construction Surveying	2%	PCT		\$31,952
	Construction Engineering	20%	PCT		\$319,520
	Wetland Mitigation	1	LS		\$50,000
	Stormwater Management (per VDOT)	1	LS		\$75,000
	VDOT Administration	1	LS		\$25,000
	Materials Testing	2%	PCT		\$31,951.97
				EXPECTED CONSTRUCTION CONTRACT TOTAL:	\$2,131,022
	Contingencies On All Above Items	25%	PCT		\$532,755
				EXPECTED CONSTRUCTION TOTAL:	\$2,663,777
<b>RIGHT OF WAY &amp; UTILITY COSTS</b>					
	Utility Relocation	15%	PCT		\$399,567
	Right of Way Acquisition**	74,893	SF	\$15	\$1,123,395
	VDOT Administration	1	LS		\$25,000
	Contingency	1	LS		\$150,000
				EXPECTED ROW TOTAL:	\$1,697,962
<b>PRELIMINARY ENGINEERING</b>					
	Design	15%	PCT		\$267,975
	Wetland Permitting	1	LS		\$25,000
	VDOT Administration	1	LS		\$50,000
	Contingency	1	LS		\$50,000
				EXPECTED PE TOTAL:	\$392,975
				PROJECT BUDGET	\$4,754,714

**NOTES:**

- Unit prices based upon 2013 VDOT statewide averages, except \* unit priced provided by VDOT.
- \$207/LF for closed drainage assumes average 24"-36" RCP and inlet spacing of 200'.
- Assumes widening of Route 1 to a 6-lane, median-divided section is completed by others
- ROW areas determined from GIS property data and assumed proposed right-of-way set at 20' from edge of travel.
- \*\* \$/SF for ROW acquisition assumed to be \$15/SF. Actual cost should be verified by VDOT and the estimate updated accordingly.



ATTACHMENT 3		
INTERSECTION	ROUTE 1 / TELAGRAPH ROAD	ROUTE 1 / WOODSTOCK LANE
Existing AM	Eastbound Approach: LOS F Delay 247.0 Volume to Capacity 0.32  Westbound Approach: LOS F Delay ERR Volume to Capacity 3.76	Westbound Approach: LOS F Delay 1151.5 Volume to Capacity 2.79
Existing PM	Eastbound Approach: LOS F Delay 65.5 Volume to Capacity 0.11  Westbound Approach: LOS F Delay 802.2 Volume to Capacity 2.35	Westbound Approach: LOS F Delay 231.8 Volume to Capacity 1.20
Future without development AM	Eastbound Approach: LOS F Delay 410.4 Volume to Capacity 0.47  Westbound Approach: LOS F Delay ERR Volume to Capacity 7.57	Westbound Approach: LOS F Delay ERR Volume to Capacity 5.60
Future without development PM	Eastbound Approach: LOS F Delay 94.4 Volume to Capacity 0.16  Westbound Approach: LOS F Delay ERR Volume to Capacity 3.53	Westbound Approach: LOS F Delay 510.5 Volume to Capacity 1.85
Future with development AM	Eastbound Approach: LOS F Delay 420.3 Volume to Capacity 0.48  Westbound Approach: LOS F Delay ERR Volume to Capacity 8.75	Westbound Approach: LOS F Delay ERR Volume to Capacity 6.71
Future with development PM	Eastbound Approach: LOS F Delay 96.5	Westbound Approach: LOS F Delay 591.2 Volume to Capacity 2.04

	<p>Volume to Capacity 0.16</p> <p>Westbound Approach: LOS F Delay ERR Volume to Capacity 3.69</p>	
<b>Impact of Proposed Development</b>	<p><b>AM Eastbound Approach: Delay +9.9</b></p> <p><b>PM Eastbound Approach: LOS F Delay +2.1 Volume to Capacity +0.01</b></p> <p><b>AM Westbound Approach: LOS F Delay ERR Volume to Capacity +1.18</b></p> <p><b>PM Westbound Approach: LOS F Delay ERR Volume to Capacity +0.16</b></p>	<p><b>AM Westbound Approach: LOS F Delay ERR Volume to Capacity +1.11</b></p> <p><b>PM Westbound Approach: LOS F Delay 80.7 Volume to Capacity +0.19</b></p>