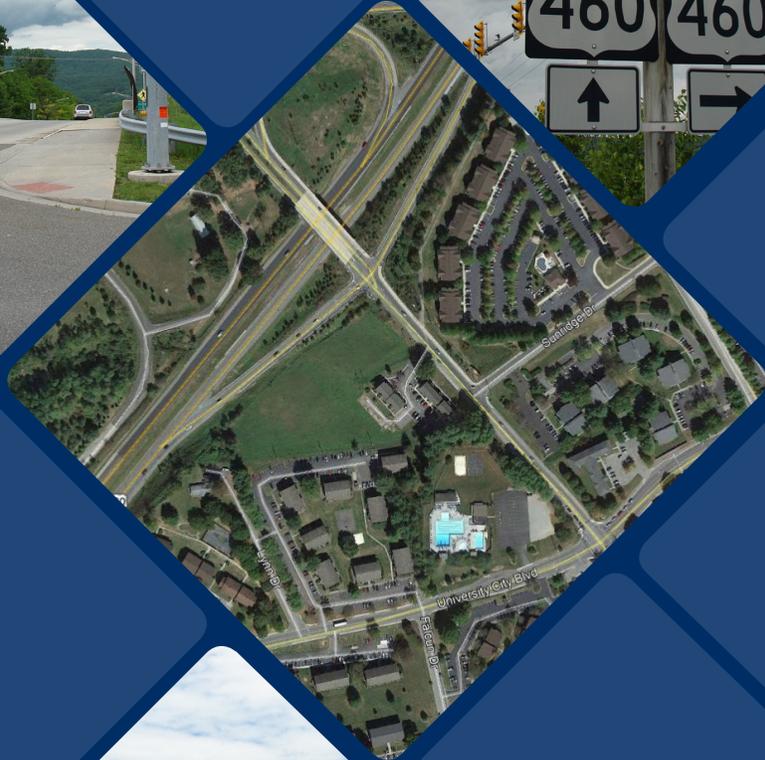


TRAFFIC IMPACT ANALYSIS  
FRITH PROPERTY  
BLACKSBURG, VIRGINIA  
MAY 2018



# TRAFFIC IMPACT ANALYSIS

FOR

## FRITH PROPERTY

LOCATED

IN

## BLACKSBURG, VIRGINIA

Prepared For:  
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May 2018



RKA Project No. 18130

Prepared By: CTS

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**TRAFFIC IMPACT ANALYSIS REPORT  
FRITH PROPERTY  
BLACKSBURG, VIRGINIA**

**1. INTRODUCTION**

This report summarizes the findings of the Traffic Impact Analysis (TIA) that was performed for the proposed rezoning of the Frith Property located at 1435 Toms Creek Road in Blacksburg, Virginia. The purpose of this study is to evaluate the current traffic conditions at the study intersections, estimate the trip generation potential of the proposed development, and determine what roadway improvements, if any, are needed to accommodate the projected traffic volumes.

**1.1. Executive Summary**

The proposed development is to be located on the west side of Toms Creek Road [south of US 460] in Blacksburg, Virginia. The proposed site is expected to consist of a 204-bedroom student housing development. If approved, the development is expected to be complete and occupied for Virginia Tech's 2020-21 academic school year. Full access to Toms Creek Road is to be provided via the existing access connection located approximately 265 feet south of the US 460 Westbound (WB) ramps. Distance is measured center-to-center.

Based on coordination with the Town of Blacksburg and the Virginia Department of Transportation (VDOT), it was determined that the weekday AM and PM peak hours would be analyzed for the following intersections:

- Toms Creek Road & US 460 WB Ramps
- Toms Creek Road & Terrace Apartments Access (Future Site Access)
- Toms Creek Road & Sunridge Drive

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Based on discussions with the Town and VDOT, it was determined that the following scenarios would be analyzed:

- Existing (2018) traffic conditions
- Future (2020) ‘No-Build’ traffic conditions
- Future (2020) ‘Build’ traffic conditions

Through field reconnaissance by RKA, it appears that sufficient sight distance is currently available at the existing Terrace Apartments access (future site access). Additional sight distance could be provided for vehicles turning onto Toms Creek Road with the removal/elimination of vegetation that is located along the US 460 WB Off-Ramp.

Based on the traffic capacity analysis results, the following roadway improvements are recommended to accommodate the future (2020) ‘build’ traffic conditions with the proposed development:

Toms Creek Road and Terrace Apartments and Future Site Access:

- Widen Toms Creek Road to provide a two-way left turn lane between the Terrace Apartments/Future Site Access and Sunridge Drive.

**1.2. Site Location and Study Area**

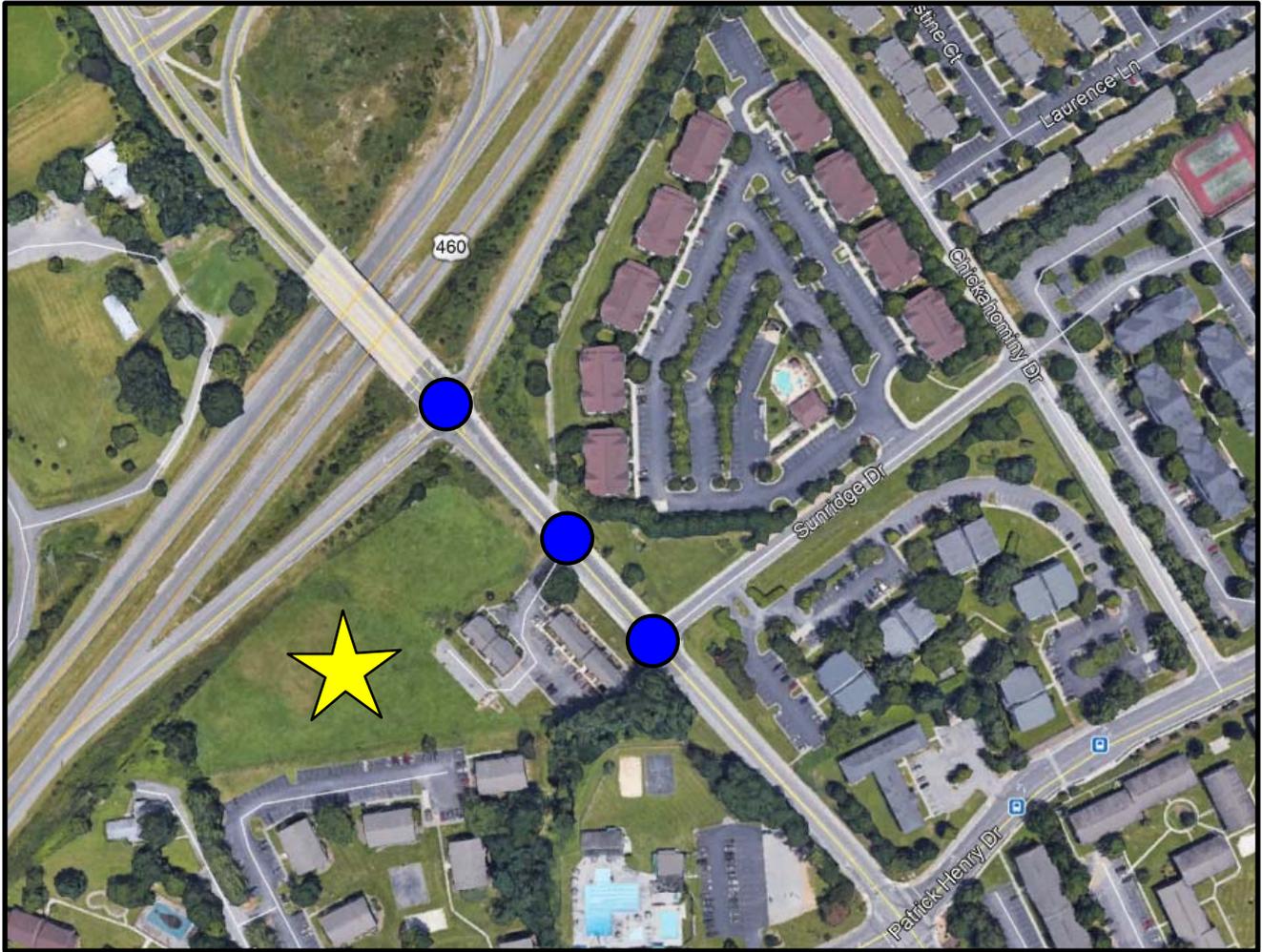
The proposed development is to be located on the west side of Toms Creek Road [south of US 460] in Blacksburg, Virginia. The study area consists of the following intersections:

- Toms Creek Road & US 460 WB Ramps
- Toms Creek Road & Terrace Apartments/Future Site Access
- Toms Creek Road & Sunridge Drive

Refer to Figure 1 for the site location map.

**1.3. Existing Land Uses**

The site is currently undeveloped.



**LEGEND**

-  Site Location
-  Existing Study Intersection



 <b>RAMEY KEMP &amp; ASSOCIATES</b> <small>TRANSPORTATION ENGINEERS</small>	
<i>Frith Property Blacksburg, Virginia</i>	
<i>Site Location Map</i>	
Not to Scale	Figure 1

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#### **1.4. Proposed Land Uses and Access**

The proposed site is expected to consist of a 204-bedroom student housing development. If approved, the development is expected to be complete and occupied for Virginia Tech’s 2020-21 academic school year. Full access to Toms Creek Road is to be provided via the existing access connection located approximately 265 feet south of the US 460 Westbound (WB) ramps. Distance is measured center-to-center. Refer to Figure 2 for the preliminary site plan.

#### **1.5. Existing Roadway Network**

Toms Creek Road is a two-lane facility with a posted speed limit of 25 miles per hour (mph) south of US 460. Based on 2017 VDOT Annual Average Daily Traffic (AADT) estimates, Toms Creek Road carries approximately 1,800 vehicles per day north of US 460.

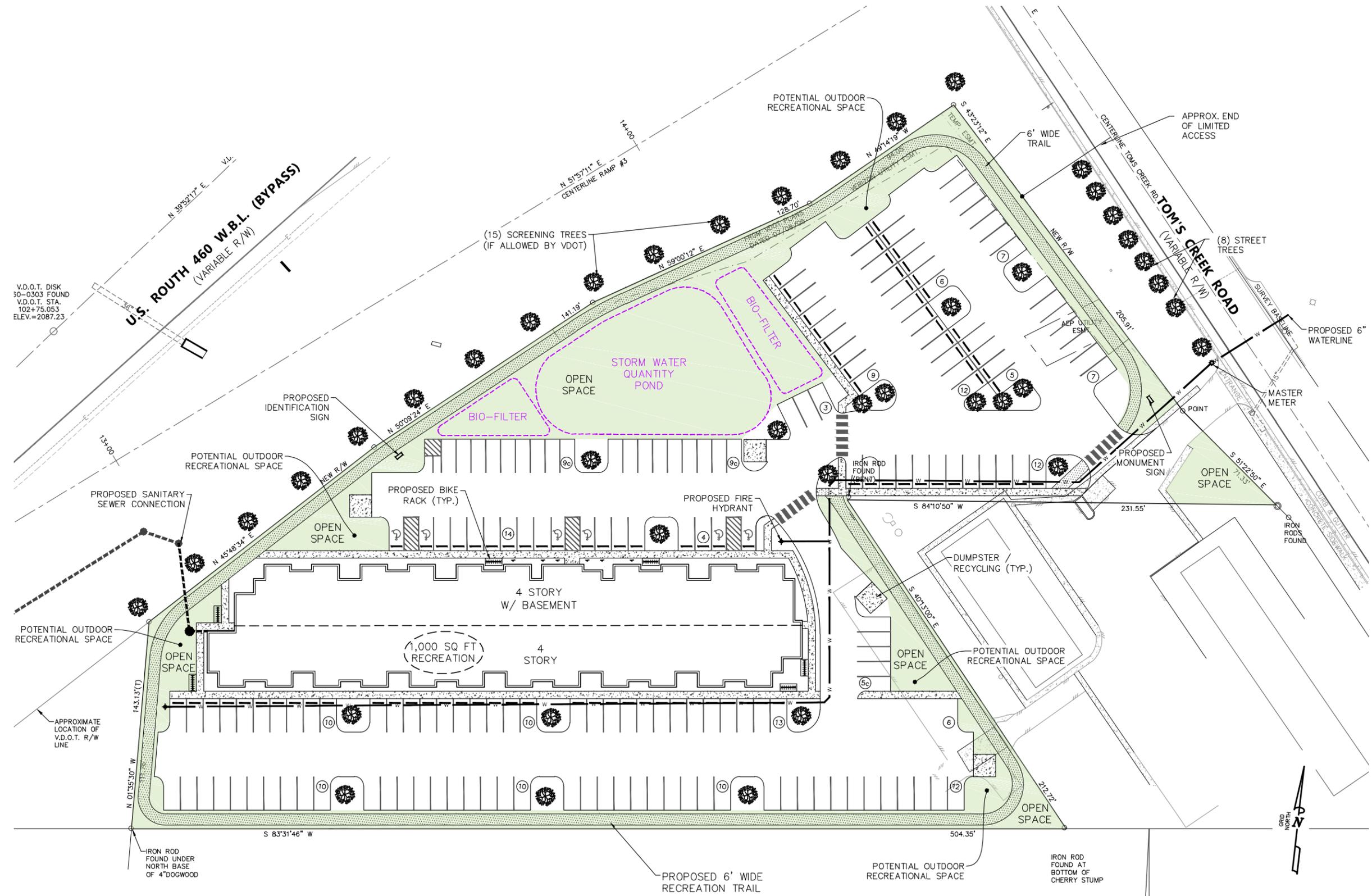
Sunridge Drive is a two-lane facility with no posted speed limit.

Existing lane configurations (number of traffic lanes on the intersection approach), lane widths, storage capacities, and other intersection and roadway information within the study area was collected through field reconnaissance by Ramey Kemp and Associates, Inc. (RKA). Refer to Figure 3 for an illustration of the existing geometrics and traffic control at the study intersections.

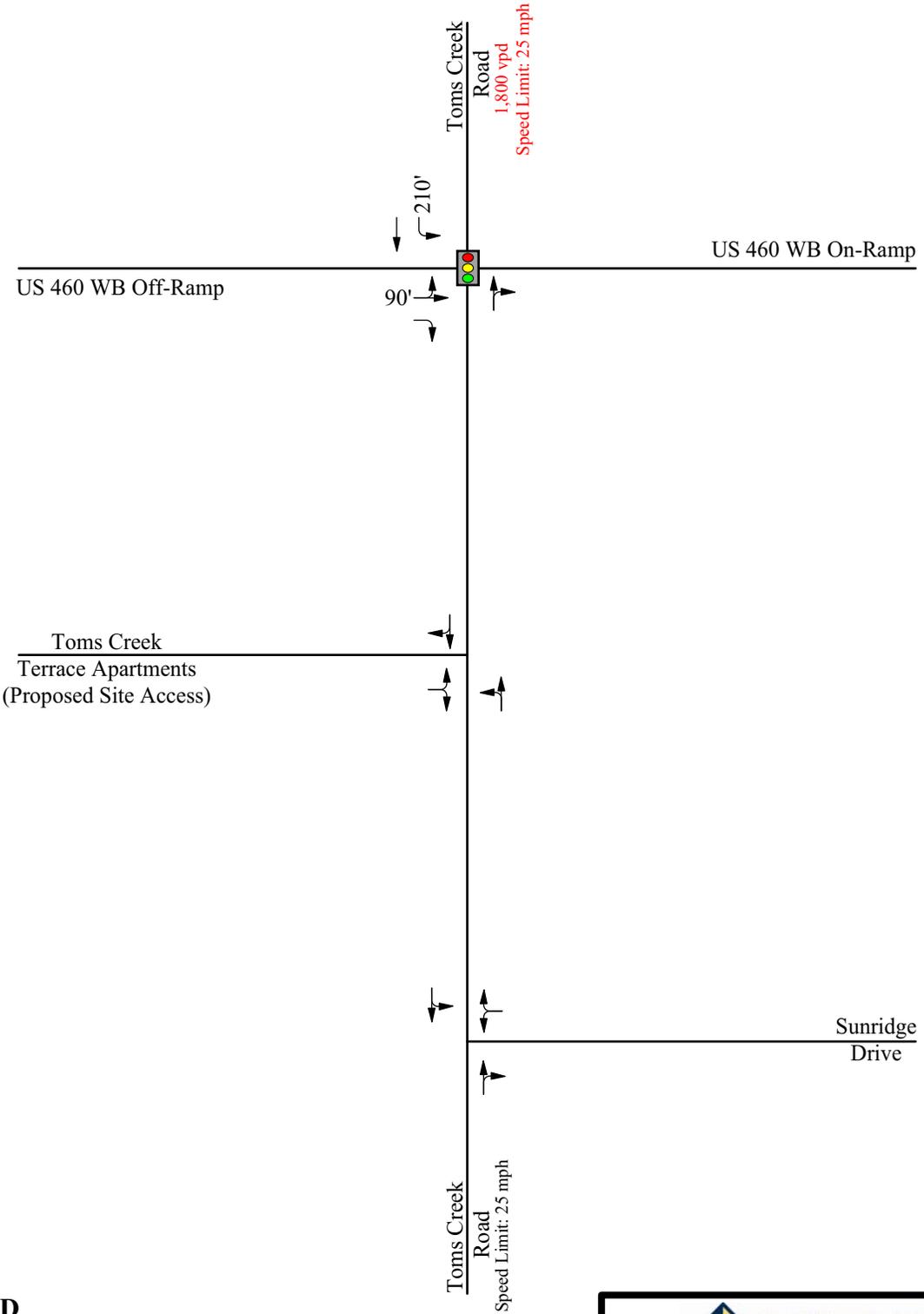
## **2. TRAFFIC ANALYSIS PROCEDURE**

All study intersections were analyzed using the methodology outlined in the Highway Capacity Manual (HCM) published by the Transportation Research Board. The computer software package, Synchro (Version 10.2), was used to complete all analyses for the signalized and unsignalized intersections. Synchro was developed by Trafficware Corporation and allows the user to input data into the Synchro software and calculate the output based on methodologies in the HCM.

The HCM defines capacity as “the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control condition.” Level of service (LOS) is a term used to represent different driving conditions, and is defined as a “qualitative



	Frith Property Blacksburg, Virginia		Preliminary Site Plan	
	Scale: Not to Scale		Figure 2	



**LEGEND**



Signalized Intersection



Existing Lane Configuration and Storage Length (in Feet)

x,xxx vpd Annual Daily Traffic Volumes (vehicles per day)

<i>Frith Property Blacksburg, Virginia</i>	
<i>Existing Geometrics and Traffic Control</i>	
Not to Scale	Figure 3

measure describing operational conditions within a traffic stream, and their perception by motorists and/or passenger.” Level of service varies from Level “A”, representing free flow, to Level “F”, where greater vehicle delays are evident.

For signalized intersections, Synchro calculates the average control delay and LOS for each lane group as well as the overall intersection. For unsignalized intersections, Synchro calculates the average control delay for stop-controlled movements, but does not provide an overall LOS for the intersection.

Refer to Table 1 for HCM levels of service and related average control delay per vehicle. Control delay as defined by the HCM includes “initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.” As shown in Table 1, an average control delay of 40 seconds at a signalized intersection results in LOS D operation.

**TABLE 1**  
HIGHWAY CAPACITY MANUAL – LEVELS OF SERVICE AND DELAY

SIGNALIZED INTERSECTION		UNSIGNALIZED INTERSECTION	
LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SECONDS)	LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SECONDS)
A	0-10	A	0-10
B	10-20	B	10-15
C	20-35	C	15-25
D	35-55	D	25-35
E	55-80	E	35-50
F	>80	F	>50

In order to evaluate the need for additional storage for existing turn lanes at the study intersections, or to determine the minimum storage required for newly warranted turn lanes, the queue lengths at each of the intersections under existing and future conditions were analyzed. The queue lengths reported at the study intersections are the maximum queue lengths calculated by SimTraffic, and are based on an average of ten (10) simulation runs.

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### **3. EXISTING TRAFFIC CONDITIONS**

Existing traffic volumes were obtained from turning movement counts that were conducted at the study intersections on a typical weekday during the AM (7:00 to 9:00) and PM (4:00 to 6:00) peak periods while Virginia Tech and other schools were in session. Please note that the existing traffic volumes were balanced upwards between intersections. Refer to Figure 4 for an illustration of the existing traffic volumes. A copy of the traffic count data can be found in Appendix A.

#### **3.1. Analysis of Existing (2018) Peak Hour Traffic Conditions**

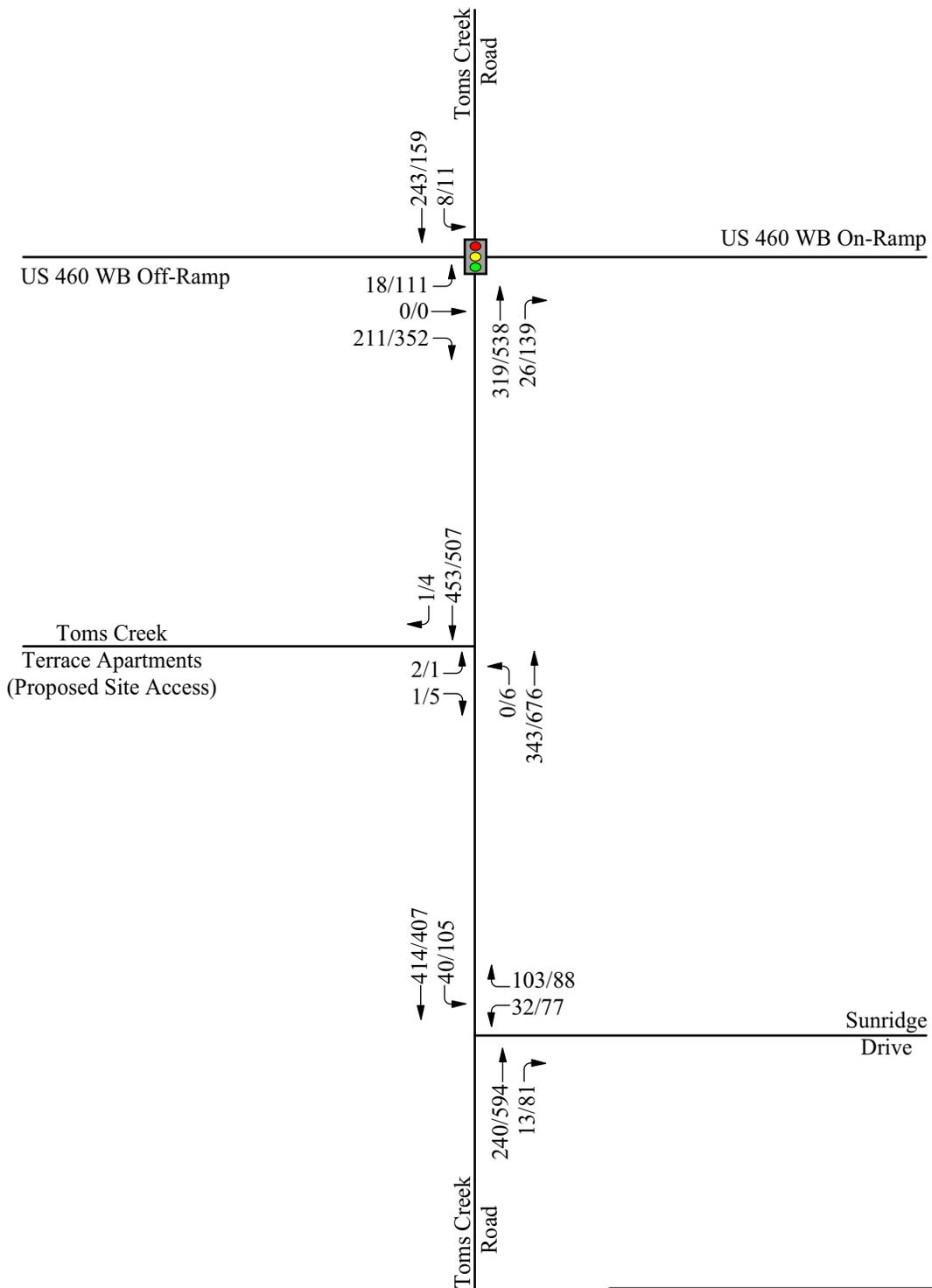
In order to determine the current delays and operating levels of service at the study intersections, the existing (2018) traffic volumes (Figure 4) were analyzed under existing lane configurations and traffic control conditions. Under all traffic conditions, the signalized intersection was analyzed utilizing signal phasing and timing data obtained from VDOT (that can be found in Appendix B). Cycle lengths were optimized for the three-phase signal and may vary between existing and future traffic conditions. The results of the analysis are presented in Section 8 of this report.

### **4. 'NO-BUILD' TRAFFIC CONDITIONS**

To determine the traffic impact of the proposed development, a comparison of the future conditions of the study intersections must be made. This is done by analyzing the future build-out year (2020) without and with the traffic generated by the proposed development. The future year condition without the development is referred to as the 'no-build' condition, and is determined by projecting the existing traffic to the build-out year using a compounded annual growth rate.

#### **4.1. Background Traffic Growth**

In order to account for the growth of traffic and subsequent traffic conditions at a future year, background traffic projections are needed. Background traffic is the component of traffic due to the growth of the community and surrounding area that is anticipated to occur regardless of whether the site is developed. An annual growth rate of 0.5% was applied to the existing traffic volumes [per VDOT] to project background traffic volumes for the horizon year 2020. Refer to Figure 5 for an illustration of the projected (2020) peak hour traffic volumes.



**LEGEND**

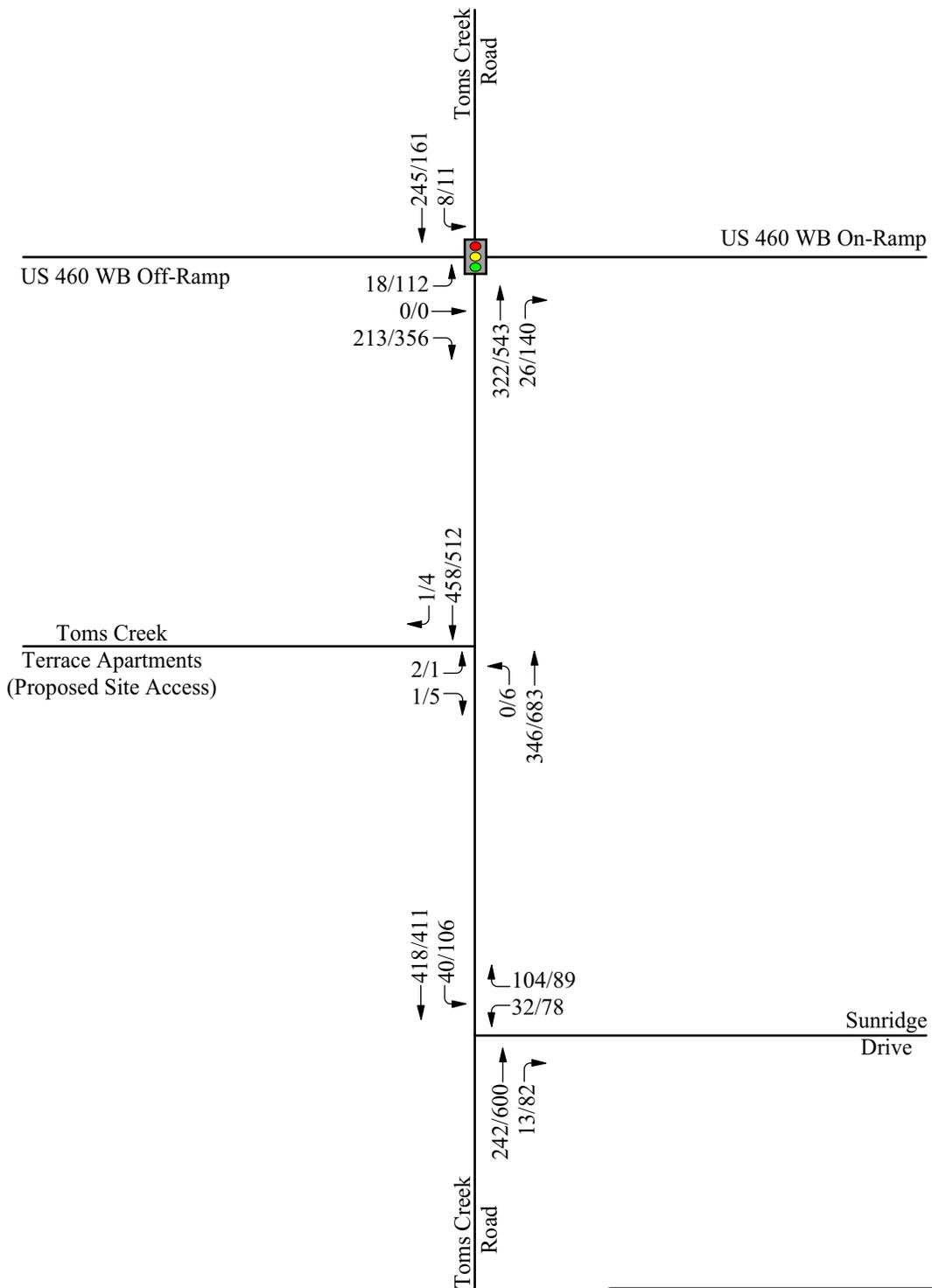


Signalized Intersection

X/Y AM/PM Peak Hour Traffic



<p><i>Frith Property</i> <i>Blacksburg, Virginia</i></p>	
<p><i>Existing (2018)</i> <i>Traffic Volumes</i></p>	
Not to Scale	Figure 4



**LEGEND**

-  Signalized Intersection
- X/Y AM/PM Peak Hour Traffic



 <p><b>RAMEY KEMP &amp; ASSOCIATES</b> TRANSPORTATION ENGINEERS</p>	
<p><i>Frith Property Blacksburg, Virginia</i></p>	
<p><i>Projected (2020) Traffic Volumes</i></p>	
<p>Not to Scale</p>	<p>Figure 5</p>

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## **4.2. Adjacent Development Traffic**

Based on coordination with the Town and VDOT, it is understood that there is one (1) adjacent development in the vicinity of the site that should be accounted for in this TIA: Terrace View PRD. Based on the Terrace View traffic study [completed by Balzer and Associates on May 1, 2018] the existing student housing complex is located east of Toms Creek Road and south of Patrick Henry Drive. The study proposes a new increase of 988 bedrooms to the existing 533 bedrooms that are currently constructed. With the additional bedrooms provided, the development is expected to see an increase of 74 total trips (21 entering and 53 exiting) during the AM peak hour and 153 total trips (79 entering and 74 exiting) during the PM peak hour. Due to the development being utilized for student housing, the majority of traffic is expected to access the site to/from the south; therefore, a minimal amount is expected to affect the Frith Property study area. Refer to Figure 6 for an illustration of the adjacent development traffic volumes, which was distributed and assigned based on the anticipated trip distribution for the proposed development (discussed in Section 6).

## **4.3. ‘No-Build’ (2020) Peak Hour Traffic Conditions**

The ‘no-build’ (2020) peak hour traffic volumes were determined by adding the approved development peak hour traffic volumes to the projected (2020) peak hour traffic volumes. Refer to Figure 7 for an illustration of the future (2020) ‘no-build’ traffic volumes.

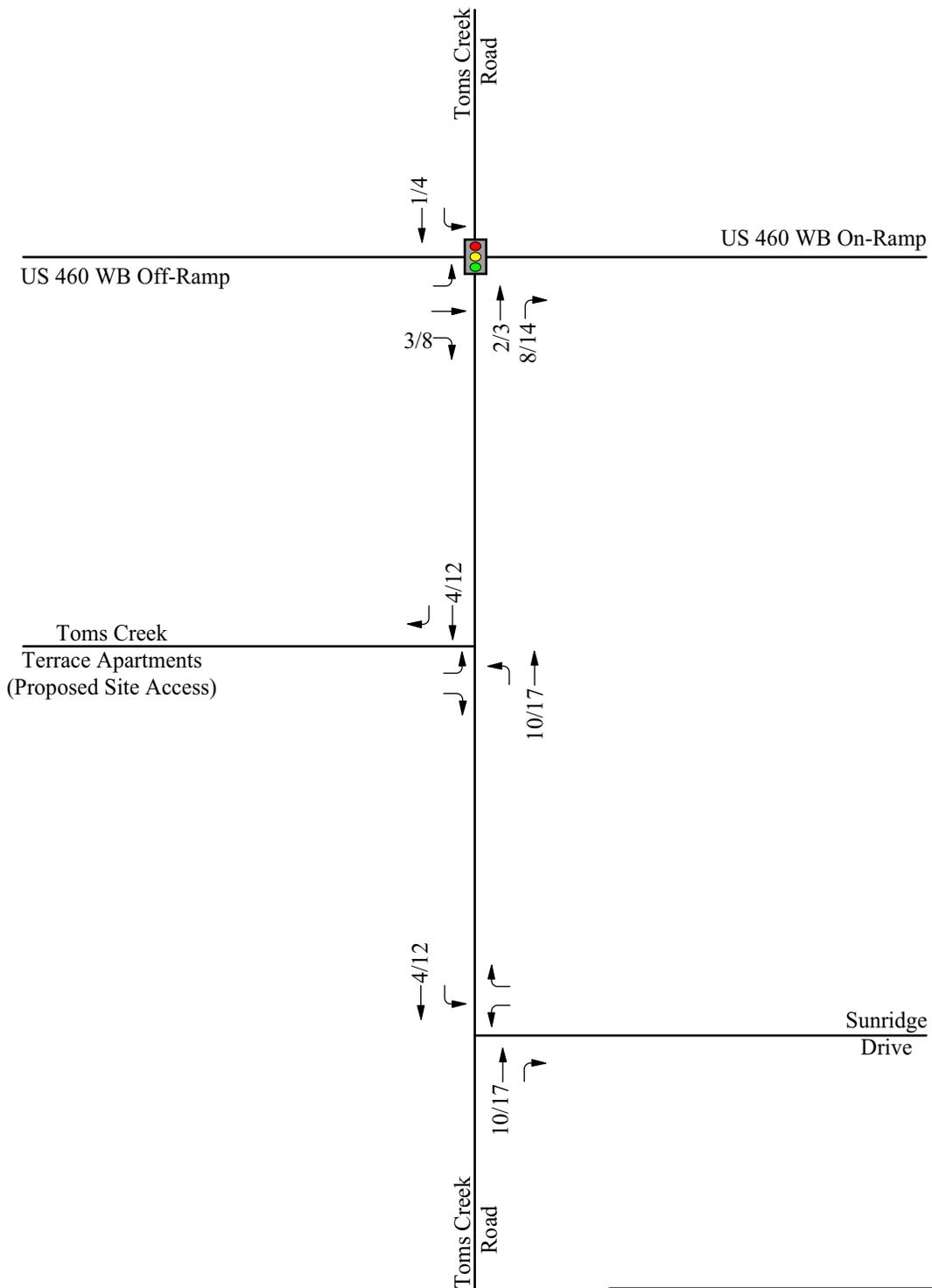
## **4.4. Analysis of Future (2020) ‘No-Build’ Peak Hour Traffic Conditions**

Utilizing the future (2020) ‘no-build’ traffic volumes (Figure 7), the study intersections were analyzed using the same methodology as previously noted for the existing traffic conditions. The results of the future (2020) ‘no-build’ analysis are presented in Section 8 of this report.

# **5. PROJECT TRAFFIC**

## **5.1. Trip Generation**

The proposed student housing development is expected to consist of 204 bedrooms. In order to estimate the trip generation potential, a 24-hour traffic count was conducted at the Village at Blacksburg development on Sunridge Drive (see Appendix A) that has similar operations as the proposed development (i.e., not located on any transit routes). The Village at Blacksburg is a student housing development consisting of 432 bedrooms. Based on the conducted traffic

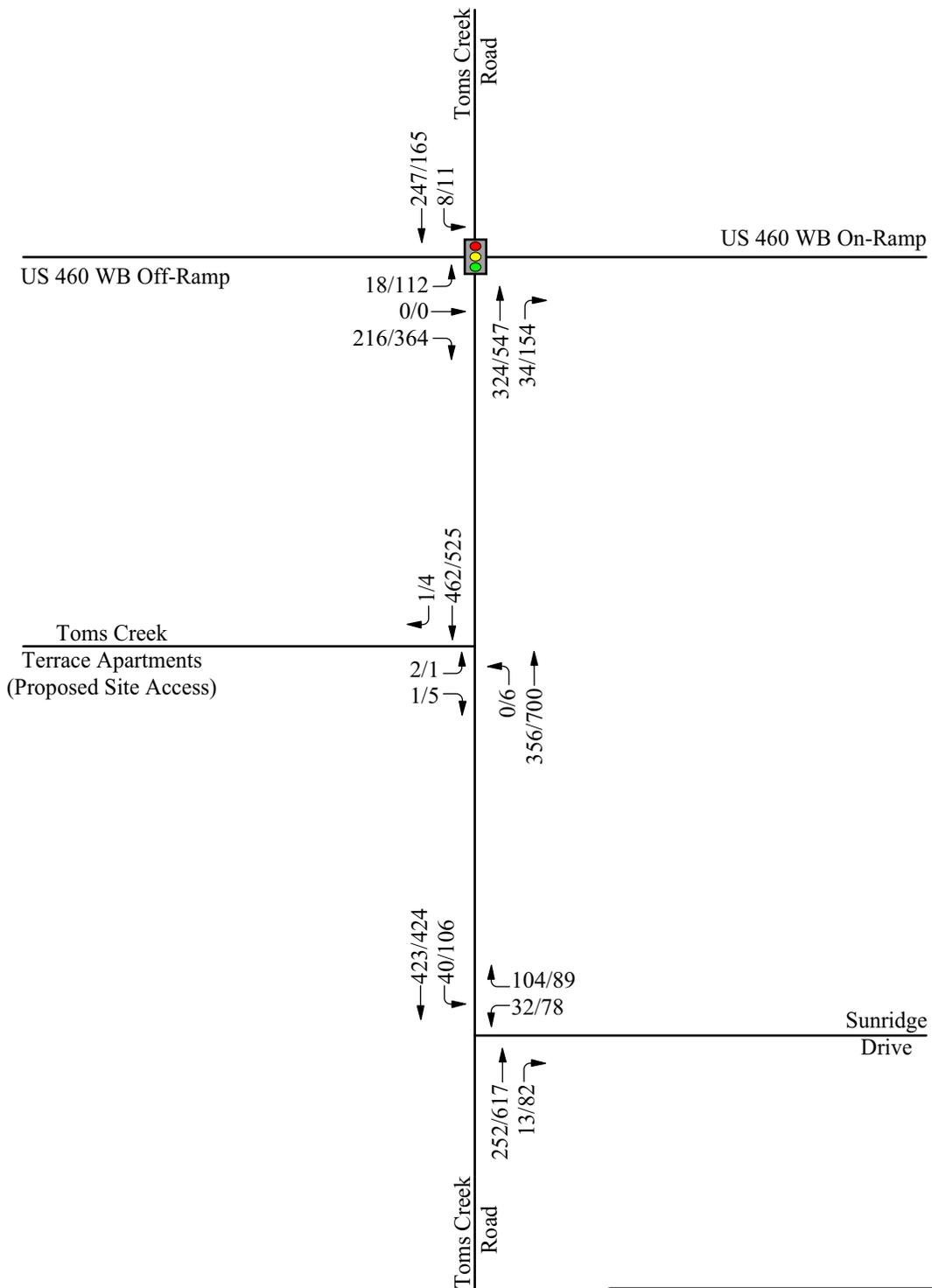


**LEGEND**

-  Signalized Intersection
- X/Y AM/PM Peak Hour Traffic



		
<p><i>Frith Property Blacksburg, Virginia</i></p>		
<p><i>Adjacent Development Traffic Volumes [Terrace View]</i></p>		
	Not to Scale	Figure 6



**LEGEND**



Signalized Intersection

X/Y AM/PM Peak Hour Traffic



<i>Frith Property Blacksburg, Virginia</i>	
<i>No-Build (2020) Traffic Volumes</i>	
Not to Scale	Figure 7

count, the Village at Blacksburg generates 42 total trips (14 entering and 28 exiting) during the AM peak hour and 139 total trips (64 entering and 75 exiting) during the PM peak hour. A trip rate was then calculated comparing the amount of trips generated (entering and exiting) during the peak hours. The calculated trip rate was then applied to the proposed number of bedrooms [at Frith Property] to estimate the trip generation potential of the proposed development. Table 2 provides a summary of the trip generation calculations.

**TABLE 2**  
**TRIP GENERATION**

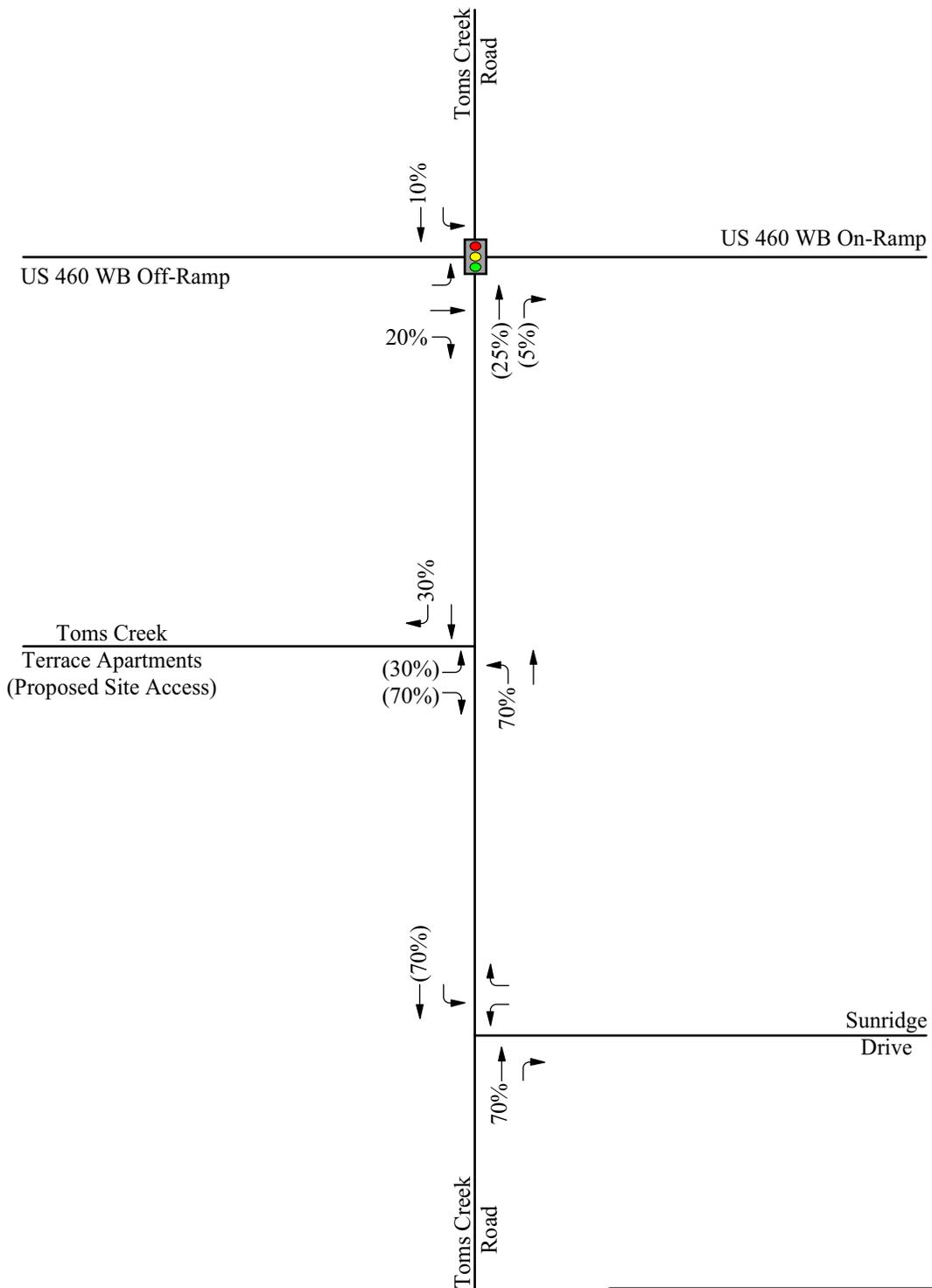
DEVELOPMENT	BEDROOMS	AM PEAK HOUR (vph)		PM PEAK HOUR (vph)	
		Enter	Exit	Enter	Exit
Village at Blacksburg	432	14	28	64	75
Rates (Trips per Bedroom)		0.032	0.065	0.148	0.174
Frith Property	204	7	13	30	35

## 6. SITE TRIP DISTRIBUTION AND ASSIGNMENT

The primary site trip distribution for the proposed development was determined based on a review of the existing traffic patterns, surrounding land uses, and engineering judgment, and are summarized below:

- 70% to/from the south via Toms Creek Road
- 5% to/from the north via Toms Creek Road
- 20% to/from the west via US 460 WB Ramp
- 5% to/from the east via US 460 EB Ramp

Refer to Figures 8 and 9 for illustrations of the site trip distribution and the site trip assignment, respectively.



**LEGEND**

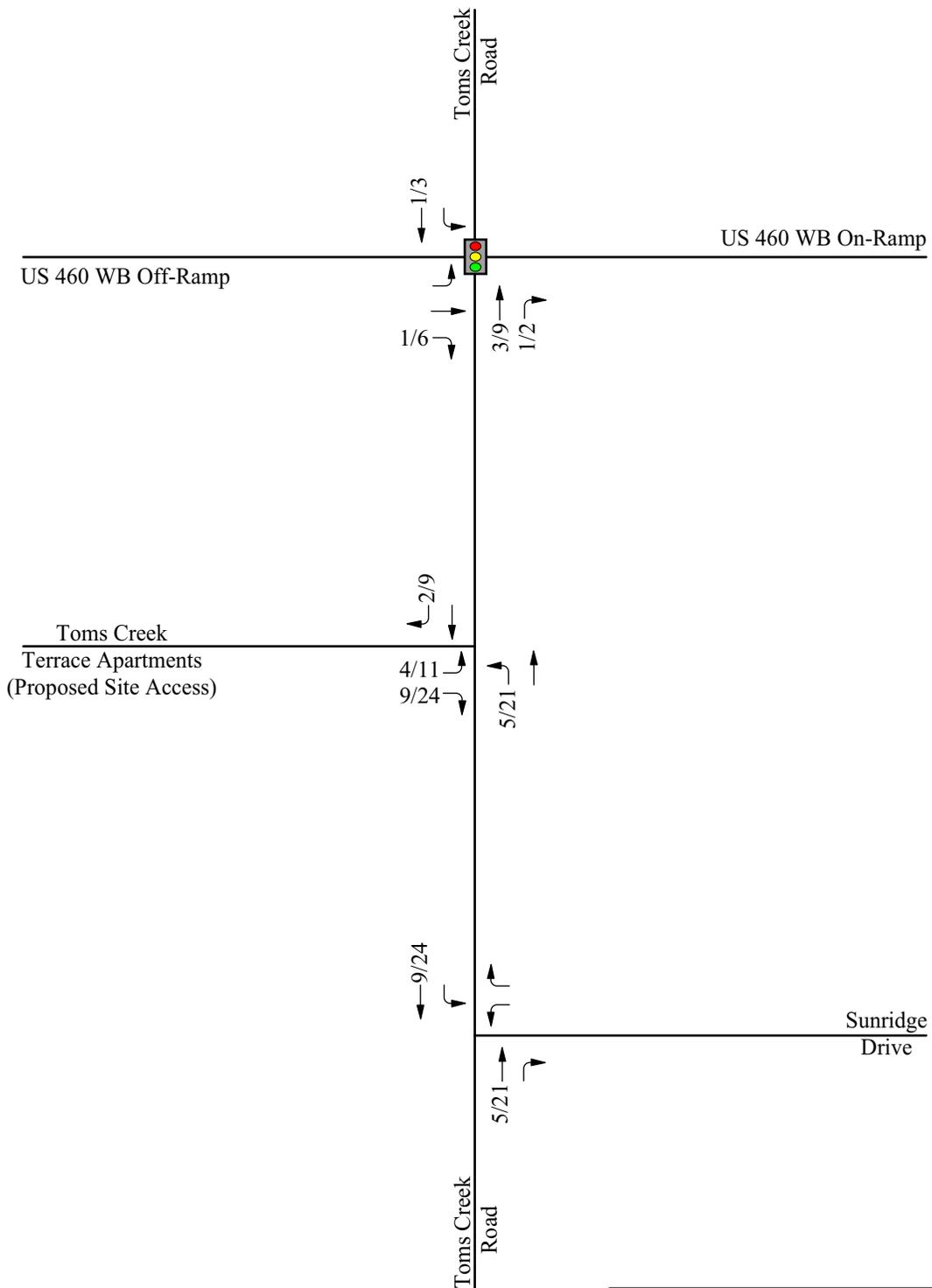


Signalized Intersection

X% (Y%) Entering (Exiting) Peak Hour Site Traffic



	
<i>Frith Property Blacksburg, Virginia</i>	
<i>Site Trip Distribution</i>	
Not to Scale	Figure 8



**LEGEND**



Signalized Intersection

X/Y AM/PM Peak Hour Site Traffic



<i>Frith Property Blacksburg, Virginia</i>	
<i>Site Trip Assignment</i>	
Not to Scale	Figure 9

---

## **7. 'BUILD' TRAFFIC CONDITIONS**

'Build' traffic represents the future build-out year of a development. It is typically determined by combining the 'no-build' and site traffic.

### **7.1. Proposed 'Build' (2020) Peak Hour Traffic Conditions**

Future (2020) 'build' conditions were determined by adding the site-generated traffic volumes (Figure 9) to the future (2020) 'no-build' traffic volumes (Figure 7). Refer to Figure 10 for an illustration of the future (2020) 'build' traffic volumes with the development built-out.

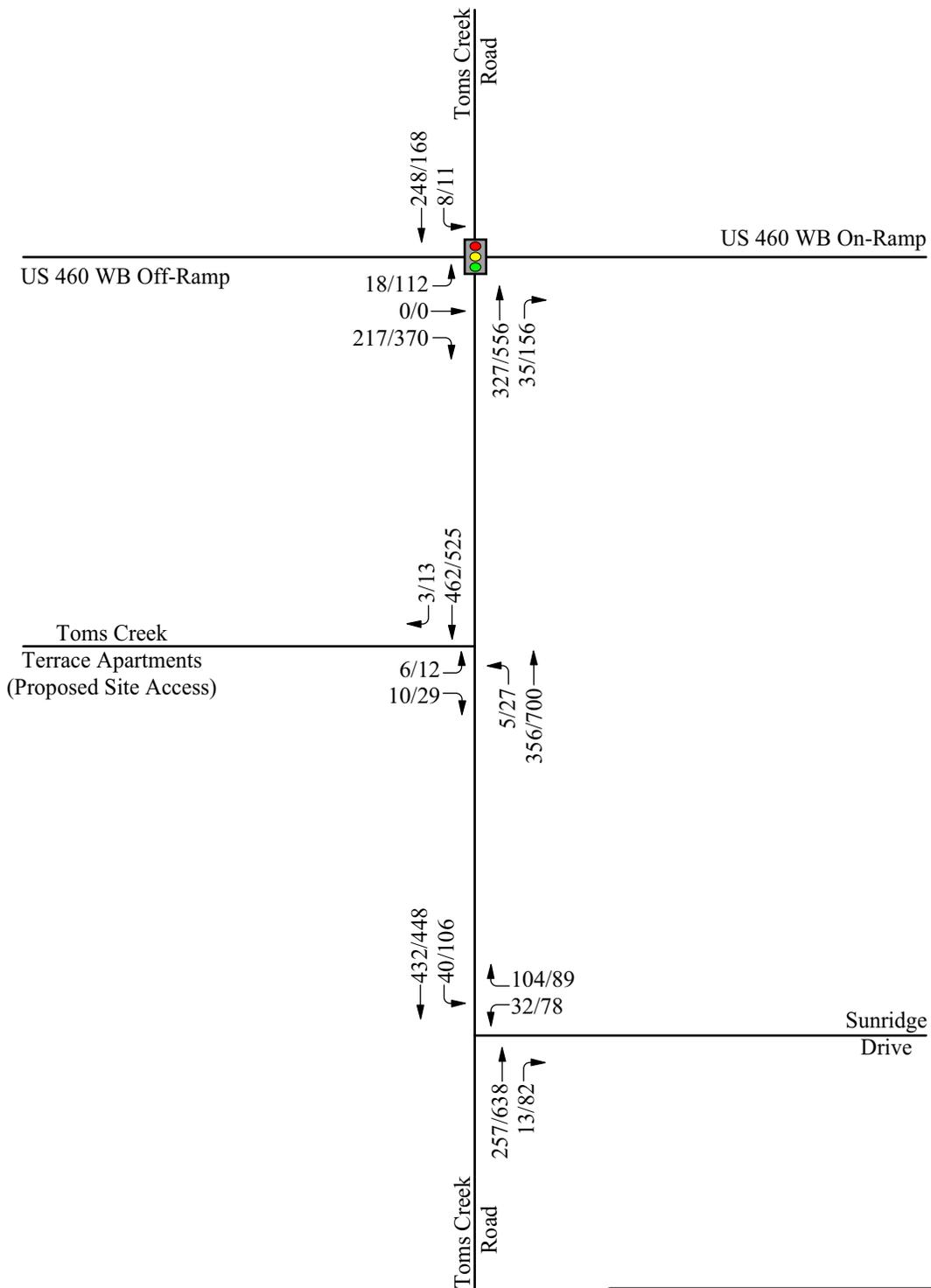
### **7.2. Analysis of Future (2020) 'Build' Peak Hour Traffic Conditions**

The study intersections were analyzed with the future (2020) 'build' traffic volumes (Figure 10), using the same methodology as previously discussed for existing and 'no-build' traffic conditions. The results are presented in Section 8 of this report.

## **8. CAPACITY ANALYSIS**

### **8.1. Toms Creek Road and US 460 WB Ramps**

Refer to Table 3 for a summary of the capacity analysis results for this signalized intersection. Under existing and all future traffic conditions, capacity analysis indicates that the intersection operates at an overall LOS A during the AM peak hour and LOS B during the PM peak hour. In addition, all lane groups operate at LOS C or better.



**LEGEND**



Signalized Intersection

X/Y AM/PM Peak Hour Traffic



<i>Frith Property Blacksburg, Virginia</i>	
<i>Build (2020) Traffic Volumes</i>	
Not to Scale	Figure 10

**TABLE 3**  
ANALYSIS SUMMARY OF TOMS CREEK ROAD & US 460 WB RAMPS  
[SIGNALIZED]

CONDITION	LANE GROUP	AM PEAK HOUR				PM PEAK HOUR			
		Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)
Existing (2018) Conditions	NBT/R	A	9.3	121	A (7.4)	B	13.7	233	B (11.1)
	SBL	B	14.8	30		C	20.4	34	
	SBT	A	5.6	106		A	4.4	84	
	EBLT	B	12.7	46		B	18.3	87	
	EBR	A	5.5	99		A	6.5	118	
'No-Build' (2020) Conditions	NBT/R	A	9.5	105	A (7.5)	B	13.5	237	B (11.1)
	SBL	B	14.9	32		C	20.5	32	
	SBT	A	5.6	109		A	4.1	81	
	EBLT	B	12.8	39		B	19.3	92	
	EBR	A	5.6	113		A	6.9	126	
'Build' (2020) Conditions	NBT/R	A	9.5	121	A (7.5)	B	13.7	231	B (11.2)
	SBL	B	14.9	34		C	20.6	34	
	SBT	A	5.7	94		A	4.1	70	
	EBLT	B	12.8	43		B	19.5	95	
	EBR	A	5.6	99		A	7.0	123	

Based on a review of the maximum queuing results that are based on the average results of ten (10) simulation runs, it appears that existing queues provide a good representation of the [observed] traffic conditions. While the majority of the maximum queues are not expected to exceed 130 feet during the AM and PM peak hours under all conditions, the northbound queue could extend back past the Terrace Apartments access on occasion. Refer to Appendices D and E for more detailed capacity and queuing analysis results, respectively.

Based on the capacity and queuing analysis results, no improvements are recommended to accommodate the proposed development traffic at this intersection.

## 8.2. Toms Creek Road and Terrace Apartments and Future Site Access

Refer to Table 4 for a summary of the capacity analysis results for this unsignalized intersection. Under existing and future 'no-build' traffic conditions, capacity analysis indicates that the northbound major street left turn movement [into the Terrace Apartments complex] experiences minor delays of less than 9.0 seconds per vehicle and operates at LOS A during the AM and PM peak hours, while the stop-controlled eastbound approach of the Terrace

Apartments complex experiences minor to moderate overall delays of 16.0 seconds per vehicle or less and operates at LOS C or better during the peak hours.

**TABLE 4**  
ANALYSIS SUMMARY OF TOMS CREEK ROAD & TERRACE APARTMENTS/FUTURE SITE ACCESS [UNSIGNALIZED]

CONDITION	LANE GROUP	AM PEAK HOUR				PM PEAK HOUR			
		Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)
Existing (2018) Conditions	NBL/T <sup>2</sup>	A	0.0	0	--	A	8.5	86	--
	SBT/R <sup>3</sup>	-	-	0		-	-	18	
	EBL/R <sup>1</sup>	C	15.7	31		B	14.1	31	
'No-Build' (2020) Conditions	NBL/T <sup>2</sup>	A	0.0	0	--	A	8.6	77	--
	SBT/R <sup>3</sup>	-	-	0		-	-	34	
	EBL/R <sup>1</sup>	C	16.0	31		B	14.5	36	
'Build' (2020) Conditions Improved	<b>NBL<sup>2</sup></b>	A	8.6	24	--	A	8.7	42	--
	NBT <sup>3</sup>	-	-	0		-	-	23	
	SBT/R <sup>3</sup>	-	-	0		-	-	0	
	EBL/R <sup>1</sup>	B	14.7	46		C	18.9	60	

1. Level of service for minor approach
2. Level of service for major street left turn movement
3. HCM methodology does not provide lane group or overall LOS or delay for major street through movements or right turns at unsignalized intersections

**Note: 'Build' (2020) Conditions include any recommended and/or warranted turn lanes.**

Based on VDOT's Access Management Design Standards for Entrances and Intersections, a left turn lane is warranted on Toms Creek Road at the Terrace Apartments Access/Future Site Access with the proposed development constructed. Refer to the Appendix C for the VDOT turn lane warrant diagrams. Under future 'build' traffic conditions with the left turn lane provided, capacity analysis indicates that the northbound major street left turn movement [into the Terrace Apartments complex] is expected to experience minor delays of less than 9.0 seconds per vehicle and operate at LOS A during the AM and PM peak hours. The stop-controlled eastbound approach of the Terrace Apartments complex is expected to experience minor to moderate overall delays of less than 19.0 seconds per vehicle and operate at LOS C or better during the peak hours.

Based on a review of the maximum queuing results that are based on the average results of ten (10) simulation runs, it appears that existing queues provide a good representation of the [observed] traffic conditions. The maximum queues are not expected to exceed 90 feet during

the AM and PM peak hours under all conditions. As previously mentioned, the northbound queue [at the US 460 WB Ramp] could extend back past this intersection on occasion; but, the northbound queue is not expected to extend back to Sunridge Drive. Refer to Appendices D and E for more detailed capacity and queuing analysis results, respectively.

In order to accommodate the proposed development, a northbound left turn lane should be provided on Toms Creek Road at this intersection. Due to the proximity to Sunridge Drive, Toms Creek Road should be widened to provide a two-way left turn lane between the Terrace Apartments/Future Site Access and Sunridge Drive.

### 8.3. Toms Creek Road and Sunridge Drive

Refer to Table 5 for a summary of the capacity analysis results for this unsignalized intersection. Under existing and future ‘no-build’ traffic conditions, capacity analysis indicates that the southbound major street left turn movement [onto Sunridge Drive] experiences minor delays of less than 10.0 seconds per vehicle and operates at LOS A during the AM and PM peak hours. The stop-controlled westbound approach of Sunridge Drive experiences minor overall delays of 14.5 seconds per vehicle or less and operates at LOS B during the AM peak hour, but experiences greater overall delays and operates at LOS F during the PM peak hour.

**TABLE 5**  
ANALYSIS SUMMARY OF TOMS CREEK ROAD & SUNRIDGE DRIVE  
[UNSIGNALIZED]

CONDITION	LANE GROUP	AM PEAK HOUR				PM PEAK HOUR			
		Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)	Lane LOS	Delay (s)	Lane Queue (ft)	Overall LOS (Delay)
Existing (2018) Conditions	NBT/R <sup>3</sup>	-	-	2	--	-	-	22	--
	SBL/T <sup>2</sup>	A	8.1	83		A	9.7	176	
	WBL/R <sup>1</sup>	B	14.2	87		F	69.4	227	
‘No-Build’ (2020) Conditions	NBT/R <sup>3</sup>	-	-	0	--	-	-	17	--
	SBL/T <sup>2</sup>	A	8.1	85		A	9.8	204	
	WBL/R <sup>1</sup>	B	14.5	86		F	85.5	249	
‘Build’ (2020) Conditions Improved	NBT/R <sup>3</sup>	-	-	2	--	-	-	27	--
	SBL <sup>2</sup>	A	8.1	51		A	9.9	84	
	SBT <sup>3</sup>	-	-	8		-	-	27	
	WBL/R <sup>1</sup>	B	14.6	106		F	90.4	251	

1. Level of service for minor approach
2. Level of service for major street left turn movement
3. HCM methodology does not provide lane group or overall LOS or delay for major street through movements or right turns at unsignalized intersections

**Note: ‘Build’ (2020) Conditions include any recommended and/or warranted turn lanes.**

---

As previously indicated, a two-way left turn lane should be provided on Toms Creek Road between the Terrace Apartments/Future Site Access and Sunridge Drive. Under future ‘build’ traffic conditions with the left turn lane provided, capacity analysis indicates that the southbound major street left turn movement [onto Sunridge Drive] is expected to experience minor delays of less than 10.0 seconds per vehicle and operate at LOS A during the AM and PM peak hours. The stop-controlled westbound approach of Sunridge Drive is expected to experience minor overall delays of less than 15.0 seconds per vehicle and operate at LOS B during the AM peak hour, but is expected to experience greater overall delays and operate at LOS F during the PM peak hour.

Based on a review of the maximum queuing results that are based on the average results of ten (10) simulation runs, it appears that existing queues provide a good representation of the [observed] traffic conditions. The maximum queues are not expected to exceed 110 feet during the AM peak hour under all conditions; however, queues exceed 175 feet on the southbound approach of Toms Creek Road during the existing and future ‘no-build’ traffic conditions. With the left turn lane provided, the southbound queues are not expected to exceed 85 feet during the future ‘build’ traffic conditions. As for the stop-controlled approach of Sunridge Drive, queues exceed 225 feet under all conditions. Greater delays and queues are not uncommon on stop-controlled approaches at unsignalized intersections during peak times when mainline traffic is typically the heaviest. Refer to Appendices D and E for more detailed capacity and queuing analysis results, respectively.

Based on the capacity and queuing analysis results, no additional improvements besides the two-way left turn lane on Toms Creek Road are recommended to accommodate the proposed development traffic at this intersection.

## **9. SIGHT DISTANCE EVALUATION**

The sight distance for drivers entering/exiting the proposed development was evaluated in the field. Table 6 summarizes the sight distance requirements for driveways on two-lane roadways according to Appendix F in the VDOT Road Design Manual.

**TABLE 6**  
**SIGHT DISTANCE REQUIREMENTS**  
 [FROM TABLES 2-5 AND 2-7 IN APPENDIX F OF VDOT ROAD DESIGN MANUAL]

DESIGN SPEED	TURN	MINIMUM SIGHT DISTANCE
Toms Creek Road: 30 mph	Left from major road	200 feet
	Left from stop	335 feet
	Right from stop	335 feet

Because Toms Creek Road has a posted speed limit of 25 mph, minimum sight distance requirements were based on a design speed of 30 mph. Based on Table 2-7 from Appendix F, the minimum required sight distances for vehicles making left or right turns out of the existing Terrace Apartments access onto Toms Creek Road from a stop position is 335 feet. Based on Table 2-5, the minimum required sight distance for vehicles making left turns off of Toms Creek Road into the site is 200 feet.

Through field reconnaissance by RKA, it appears that sufficient sight distance is available at the existing Terrace Apartments access (future site access). Additional sight distance could be provided for vehicles turning left onto Toms Creek Road with the removal/elimination of vegetation that is located along the US 460 WB Off-Ramp.

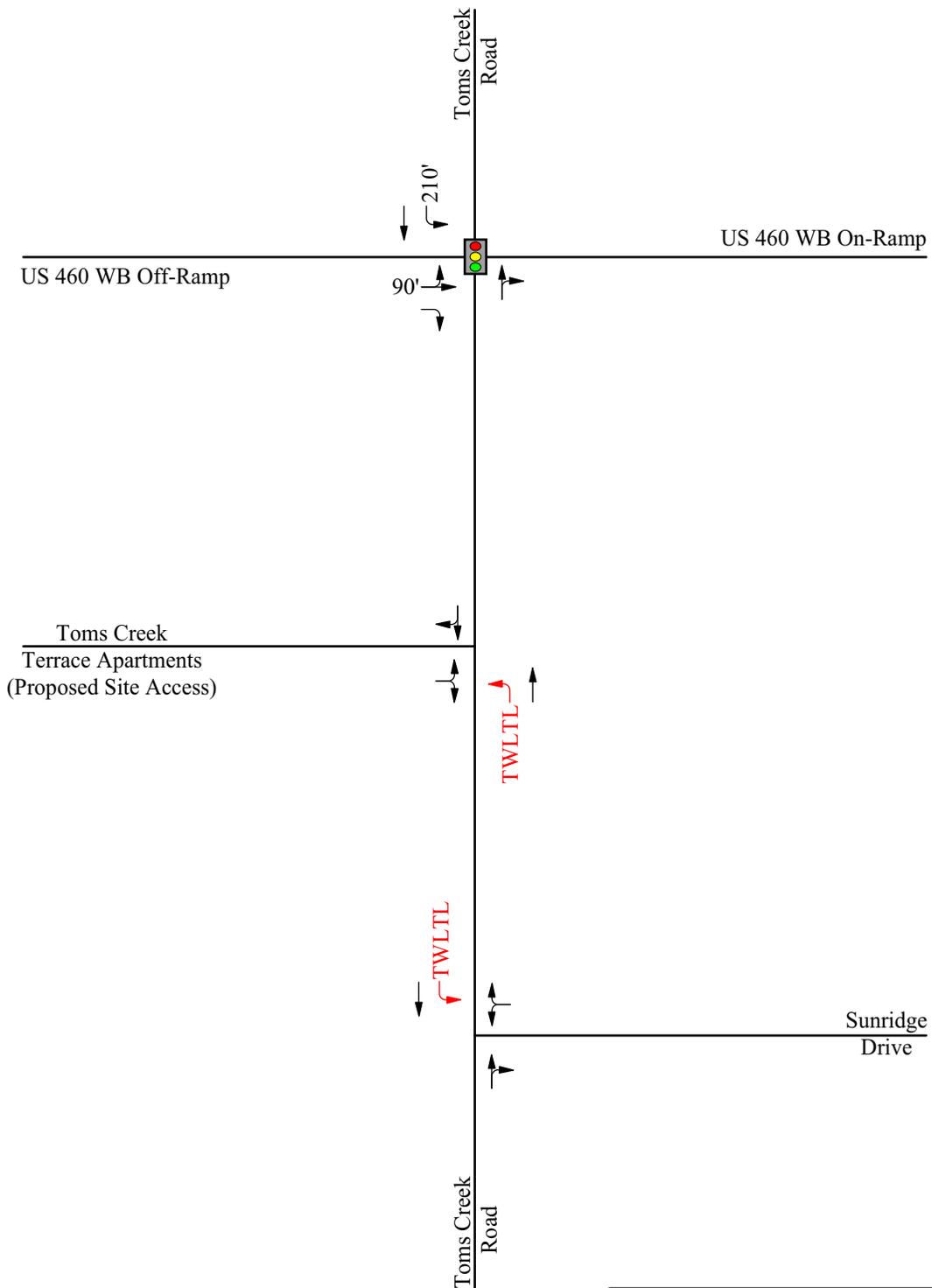
## 10. RECOMMENDATIONS

Based on VDOT’s Access Management Design Standards for Entrances and Intersections and traffic capacity analysis, the following roadway improvements are recommended to accommodate the projected 2020 traffic conditions with the proposed development:

### Toms Creek Road and Terrace Apartments and Future Site Access:

- Widen Toms Creek Road to provide a two-way left turn lane between the Terrace Apartments/Future Site Access and Sunridge Drive.

Figure 11 shows the recommended lane configurations.



**LEGEND**



Signalized Intersection



Existing Lane Configuration and Storage Length (in Feet)

TWLTL Proposed Two-Way Left Turn Lane



<p><i>Frith Property Blacksburg, Virginia</i></p>	
<p><i>Proposed Lane Geometrics and Traffic Control</i></p>	
Not to Scale	Figure 11

# **TECHNICAL APPENDIX**

# **APPENDIX A**

## **TRAFFIC COUNT DATA**

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Toms Creek and US 460 NB Ramps) AM Peak

Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Toms Creek Road Southbound					US 460 NB Ramp Westbound					Toms Creek Road Northbound					US 460 NB Ramp Eastbound					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	
07:00	0	33	1	0	34	0	0	0	0	0	3	42	0	0	45	34	0	3	0	37	116
07:15	0	55	1	1	57	0	0	0	0	0	1	45	0	0	46	50	0	2	0	52	155
07:30	0	70	2	0	72	0	0	0	0	0	5	87	0	0	92	42	0	0	0	42	206
07:45	0	65	1	0	66	0	0	0	0	0	3	98	0	0	101	67	0	4	0	71	238
Total	0	223	5	1	229	0	0	0	0	0	12	272	0	0	284	193	0	9	0	202	715
08:00	0	52	1	0	53	0	0	0	0	0	12	60	0	0	72	55	0	8	0	63	188
08:15	0	51	4	0	55	0	0	0	1	1	5	61	0	0	66	43	0	6	1	50	172
08:30	0	53	3	0	56	0	0	0	1	1	7	75	0	0	82	50	0	7	0	57	196
08:45	0	66	7	0	73	0	0	0	1	1	8	102	0	0	110	51	0	6	1	58	242
Total	0	222	15	0	237	0	0	0	3	3	32	298	0	0	330	199	0	27	2	228	798
Grand Total	0	445	20	1	466	0	0	0	3	3	44	570	0	0	614	392	0	36	2	430	1513
Apprch %	0	95.5	4.3	0.2		0	0	0	100		7.2	92.8	0	0		91.2	0	8.4	0.5		
Total %	0	29.4	1.3	0.1	30.8	0	0	0	0.2	0.2	2.9	37.7	0	0	40.6	25.9	0	2.4	0.1	28.4	
Cars +	0	445	20	1	466	0	0	0	3	3	43	565	0	0	608	377	0	35	2	414	1491
% Cars +	0	100	100	100	100	0	0	0	100	100	97.7	99.1	0	0	99	96.2	0	97.2	100	96.3	98.5
Trucks	0	0	0	0	0	0	0	0	0	0	1	5	0	0	6	15	0	1	0	16	22
% Trucks	0	0	0	0	0	0	0	0	0	0	2.3	0.9	0	0	1	3.8	0	2.8	0	3.7	1.5

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Page No : 1

Groups Printed- Trucks

Start Time	Toms Creek Road Southbound					US 460 NB Ramp Westbound					Toms Creek Road Northbound					US 460 NB Ramp Eastbound					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		
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
07:45	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	3	0	0	0	0	3	6
Total	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	9	0	0	0	0	9	12
08:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	2
08:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	2
08:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	5	5
Total	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	6	0	1	0	0	7	10
Grand Total	0	0	0	0	0	0	0	0	0	0	1	5	0	0	6	15	0	1	0	0	16	22
Apprch %	0	0	0	0	0	0	0	0	0	0	16.7	83.3	0	0	93.8	0	6.2	0	0			
Total %	0	0	0	0	0	0	0	0	0	0	4.5	22.7	0	0	27.3	68.2	0	4.5	0	72.7		

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Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Toms Creek Road Southbound						US 460 NB Ramp Westbound						Toms Creek Road Northbound						US 460 NB Ramp Eastbound						Intl. Total
	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total	
16:00	0	40	3	0	0	43	0	0	0	0	1	1	25	116	0	0	0	141	70	0	20	0	0	90	275
16:15	0	33	0	0	0	33	0	0	0	0	1	1	30	128	0	0	0	158	61	0	16	0	0	77	269
16:30	0	37	1	0	0	38	0	0	0	0	0	0	31	130	0	0	0	161	59	0	26	0	0	85	284
16:45	0	30	2	1	0	33	0	0	0	0	3	3	20	130	0	0	0	150	76	0	22	0	0	98	284
Total	0	140	6	1	0	147	0	0	0	0	5	5	106	504	0	0	0	610	266	0	84	0	0	350	1112
17:00	0	33	5	0	0	38	0	0	0	0	3	3	36	138	0	0	0	174	70	0	22	0	0	92	307
17:15	0	38	2	0	0	40	0	0	0	0	2	2	46	141	0	0	0	187	80	0	24	0	0	104	333
17:30	0	42	3	1	0	46	0	0	0	0	1	1	27	123	0	0	0	150	92	0	29	0	0	121	318
17:45	0	39	1	0	0	40	0	0	0	0	1	1	23	111	0	0	0	134	93	0	36	0	3	132	307
Total	0	152	11	1	0	164	0	0	0	0	7	7	132	513	0	0	0	645	335	0	111	0	3	449	1265
Grand Total	0	292	17	2	0	311	0	0	0	0	12	12	238	1017	0	0	0	1255	601	0	195	0	3	799	2377
Approch %	0	93.9	5.5	0.6	0		0	0	0	0	100		19	81	0	0	0		75.2	0	24.4	0	0.4		
Total %	0	12.3	0.7	0.1	0	13.1	0	0	0	0	0.5	0.5	10	42.8	0	0	0	52.8	25.3	0	8.2	0	0.1	33.6	
Cars +	0	292	17	2	0	311	0	0	0	0	12	12	238	1015	0	0	0	1253	601	0	195	0	3	799	2375
% Cars +	0	100	100	100	0	100	0	0	0	0	100	100	100	99.8	0	0	0	99.8	100	0	100	0	100	100	99.9
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0.2	0	0	0	0	0	0	0.1

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Page No : 1

Groups Printed- Trucks

Start Time	Toms Creek Road Southbound						US 460 NB Ramp Westbound						Toms Creek Road Northbound						US 460 NB Ramp Eastbound						Int. Total	
	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total	Right	Thru	Left	UTrn	Peds	App. Total		
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2	
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2	
Apprch %	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	

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1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Toms Creek and Residential Access) AM Peak

Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Toms Creek Road Southbound				Toms Creek Road Northbound				Residential Access Eastbound				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
07:00	0	63	0	63	49	0	0	49	1	0	0	1	113
07:15	1	102	0	103	47	1	0	48	1	0	0	1	152
07:30	1	112	0	113	93	0	0	93	1	0	0	1	207
07:45	0	129	0	129	106	0	0	106	0	1	0	1	236
Total	2	406	0	408	295	1	0	296	3	1	0	4	708
08:00	0	112	0	112	70	0	0	70	0	1	0	1	183
08:15	0	92	0	92	74	0	0	74	0	0	1	1	167
08:30	0	104	0	104	81	1	0	82	3	0	0	3	189
08:45	0	120	0	120	113	1	0	114	2	1	1	4	238
Total	0	428	0	428	338	2	0	340	5	2	2	9	777
Grand Total	2	834	0	836	633	3	0	636	8	3	2	13	1485
Apprch %	0.2	99.8	0		99.5	0.5	0		61.5	23.1	15.4		
Total %	0.1	56.2	0	56.3	42.6	0.2	0	42.8	0.5	0.2	0.1	0.9	
Cars +	2	832	0	834	632	3	0	635	8	3	2	13	1482
% Cars +	100	99.8	0	99.8	99.8	100	0	99.8	100	100	100	100	99.8
Trucks	0	2	0	2	1	0	0	1	0	0	0	0	3
% Trucks	0	0.2	0	0.2	0.2	0	0	0.2	0	0	0	0	0.2

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Site Code :

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Page No : 1

Groups Printed- Trucks

Start Time	Toms Creek Road Southbound				Toms Creek Road Northbound				Residential Access Eastbound				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	1	0	1	0	0	0	0	0	0	0	0	1
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	1	0	1	1	0	0	1	0	0	0	0	2
Total	0	2	0	2	1	0	0	1	0	0	0	0	3
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	2	0	2	1	0	0	1	0	0	0	0	3
Apprch %	0	100	0		100	0	0		0	0	0		
Total %	0	66.7	0	66.7	33.3	0	0	33.3	0	0	0	0	





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Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Toms Creek Road Southbound				Sunridge Drive Westbound				Toms Creek Road Northbound				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
07:00	63	8	0	71	14	6	0	20	2	35	0	37	128
07:15	98	4	0	102	20	8	1	29	0	26	0	26	157
07:30	105	10	0	115	39	11	2	52	1	56	0	57	224
07:45	122	13	0	135	32	11	0	43	3	71	0	74	252
Total	388	35	0	423	105	36	3	144	6	188	0	194	761
08:00	98	10	1	109	9	4	0	13	3	61	0	64	186
08:15	89	7	1	97	23	6	1	30	6	51	0	57	184
08:30	93	11	0	104	25	21	1	47	2	59	1	62	213
08:45	113	14	0	127	30	21	3	54	6	82	0	88	269
Total	393	42	2	437	87	52	5	144	17	253	1	271	852
Grand Total	781	77	2	860	192	88	8	288	23	441	1	465	1613
Apprch %	90.8	9	0.2		66.7	30.6	2.8		4.9	94.8	0.2		
Total %	48.4	4.8	0.1	53.3	11.9	5.5	0.5	17.9	1.4	27.3	0.1	28.8	
Cars +	775	69	2	846	189	88	8	285	23	438	1	462	1593
% Cars +	99.2	89.6	100	98.4	98.4	100	100	99	100	99.3	100	99.4	98.8
Trucks	6	8	0	14	3	0	0	3	0	3	0	3	20
% Trucks	0.8	10.4	0	1.6	1.6	0	0	1	0	0.7	0	0.6	1.2

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Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Trucks

Start Time	Toms Creek Road Southbound				Sunridge Drive Westbound				Toms Creek Road Northbound				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
07:00	1	2	0	3	0	0	0	0	0	0	0	0	3
07:15	1	0	0	1	0	0	0	0	0	0	0	0	1
07:30	0	1	0	1	0	0	0	0	0	0	0	0	1
07:45	2	1	0	3	1	0	0	1	0	2	0	2	6
Total	4	4	0	8	1	0	0	1	0	2	0	2	11
08:00	0	1	0	1	1	0	0	1	0	0	0	0	2
08:15	0	1	0	1	1	0	0	1	0	0	0	0	2
08:30	0	0	0	0	0	0	0	0	0	1	0	1	1
08:45	2	2	0	4	0	0	0	0	0	0	0	0	4
Total	2	4	0	6	2	0	0	2	0	1	0	1	9
Grand Total	6	8	0	14	3	0	0	3	0	3	0	3	20
Apprch %	42.9	57.1	0		100	0	0		0	100	0		
Total %	30	40	0	70	15	0	0	15	0	15	0	15	

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Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Toms Creek Road Southbound				Sunridge Drive Westbound				Toms Creek Road Northbound				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
16:00	91	19	0	110	18	9	2	29	21	131	1	153	292
16:15	84	15	0	99	16	15	1	32	17	142	0	159	290
16:30	81	17	0	98	19	8	2	29	11	148	1	160	287
16:45	88	19	0	107	22	22	3	47	18	123	0	141	295
Total	344	70	0	414	75	54	8	137	67	544	2	613	1164
17:00	79	26	0	105	22	20	5	47	24	154	1	179	331
17:15	96	28	0	124	24	16	3	43	21	178	0	199	366
17:30	108	26	0	134	18	22	5	45	18	139	0	157	336
17:45	121	24	0	145	23	19	7	49	18	116	0	134	328
Total	404	104	0	508	87	77	20	184	81	587	1	669	1361
Grand Total	748	174	0	922	162	131	28	321	148	1131	3	1282	2525
Apprch %	81.1	18.9	0		50.5	40.8	8.7		11.5	88.2	0.2		
Total %	29.6	6.9	0	36.5	6.4	5.2	1.1	12.7	5.9	44.8	0.1	50.8	
Cars +	748	174	0	922	161	131	28	320	148	1129	3	1280	2522
% Cars +	100	100	0	100	99.4	100	100	99.7	100	99.8	100	99.8	99.9
Trucks	0	0	0	0	1	0	0	1	0	2	0	2	3
% Trucks	0	0	0	0	0.6	0	0	0.3	0	0.2	0	0.2	0.1

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Toms Creek and Sunridge) PM Peak

Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Trucks

Start Time	Toms Creek Road Southbound				Sunridge Drive Westbound				Toms Creek Road Northbound				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
16:00	0	0	0	0	0	0	0	0	0	1	0	1	1
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	1	0	0	1	0	0	0	0	1
Total	0	0	0	0	1	0	0	1	0	1	0	1	2
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	0	0	0	0	1	0	1	1
Grand Total	0	0	0	0	1	0	0	1	0	2	0	2	3
Apprch %	0	0	0		100	0	0		0	100	0		
Total %	0	0	0		33.3	0	0	33.3	0	66.7	0	66.7	

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Sunridge and Village at Blacksburg Access)

Site Code :

Start Date : 4/18/2018

Page No : 1

Groups Printed- Cars + - Trucks

Start Time	Village at Blacksburg Access Southbound				Sunridge Drive Westbound				Sunridge Drive Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
00:00	1	1	2	4	5	0	1	6	0	4	0	4	14
00:15	6	0	0	6	2	0	0	2	0	2	0	2	10
00:30	2	1	0	3	0	0	0	0	1	3	0	4	7
00:45	0	2	0	2	2	0	0	2	0	4	0	4	8
Total	9	4	2	15	9	0	1	10	1	13	0	14	39
01:00	2	0	0	2	1	0	0	1	0	1	0	1	4
01:15	5	0	2	7	1	0	0	1	0	3	0	3	11
01:30	3	3	2	8	2	0	0	2	0	2	0	2	12
01:45	1	2	0	3	0	0	0	0	0	3	0	3	6
Total	11	5	4	20	4	0	0	4	0	9	0	9	33
02:00	1	1	0	2	1	0	0	1	0	1	0	1	4
02:15	0	1	0	1	0	0	0	0	0	0	0	0	1
02:30	2	0	0	2	1	0	0	1	0	2	0	2	5
02:45	0	0	0	0	1	0	0	1	0	1	0	1	2
Total	3	2	0	5	3	0	0	3	0	4	0	4	12
03:00	0	0	0	0	0	0	0	0	0	3	0	3	3
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	0	0	0	0	4	0	4	4
04:00	0	0	0	0	0	0	0	0	0	1	0	1	1
04:15	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30	0	0	0	0	1	0	0	1	0	0	0	0	1
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	1	0	1	0	1	2
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15	0	0	1	1	0	0	0	0	0	0	0	0	1
05:30	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45	0	0	1	1	0	0	0	0	0	0	0	0	1
Total	0	0	2	2	0	0	0	0	0	0	0	0	2
06:00	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15	0	0	0	0	0	0	0	0	0	2	0	2	2
06:30	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45	2	0	0	2	0	0	0	0	0	0	0	0	2
Total	2	0	0	2	0	0	0	0	0	2	0	2	4
07:00	1	0	0	1	0	0	1	1	0	0	0	0	2
07:15	3	0	0	3	0	0	1	1	0	0	0	0	4
07:30	13	1	0	14	1	0	1	2	0	1	0	1	17
07:45	3	0	0	3	1	0	7	8	0	1	0	1	12
Total	20	1	0	21	2	0	10	12	0	2	0	2	35
08:00	0	1	0	1	0	0	2	2	0	5	1	6	9
08:15	2	1	2	5	0	0	0	0	0	3	0	3	8
08:30	9	3	2	14	2	0	6	8	0	1	1	2	24
08:45	10	2	0	12	0	0	2	2	0	3	7	10	24
Total	21	7	4	32	2	0	10	12	0	12	9	21	65
09:00	4	4	0	8	2	0	0	2	0	3	0	3	13
09:15	5	3	0	8	4	0	0	4	0	1	1	2	14
09:30	9	2	1	12	1	0	6	7	0	4	3	7	26
09:45	7	3	0	10	4	0	7	11	0	3	4	7	28
Total	25	12	1	38	11	0	13	24	0	11	8	19	81

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Sunridge and Village at Blacksburg Access)

Site Code :

Start Date : 4/18/2018

Page No : 2

Groups Printed- Cars + - Trucks

Start Time	Village at Blacksburg Access Southbound				Sunridge Drive Westbound				Sunridge Drive Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
10:00	5	0	0	5	0	0	2	2	0	5	1	6	13
10:15	4	0	0	4	1	0	5	6	0	3	2	5	15
10:30	7	5	0	12	4	0	3	7	0	1	4	5	24
10:45	10	3	0	13	0	0	8	8	0	2	3	5	26
Total	26	8	0	34	5	0	18	23	0	11	10	21	78
11:00	7	0	0	7	0	0	1	1	0	3	2	5	13
11:15	4	1	1	6	3	0	0	3	0	6	2	8	17
11:30	4	2	0	6	1	0	0	1	0	4	3	7	14
11:45	7	1	1	9	10	0	1	11	0	4	2	6	26
Total	22	4	2	28	14	0	2	16	0	17	9	26	70
12:00	7	0	0	7	3	0	2	5	0	6	2	8	20
12:15	5	1	1	7	3	0	3	6	0	4	6	10	23
12:30	9	0	0	9	2	0	1	3	0	2	1	3	15
12:45	4	1	1	6	1	0	2	3	0	7	3	10	19
Total	25	2	2	29	9	0	8	17	0	19	12	31	77
13:00	4	2	0	6	4	0	2	6	0	4	5	9	21
13:15	4	5	1	10	1	0	5	6	0	16	0	16	32
13:30	7	3	0	10	5	0	0	5	0	4	3	7	22
13:45	15	3	1	19	2	0	0	2	0	5	7	12	33
Total	30	13	2	45	12	0	7	19	0	29	15	44	108
14:00	14	1	0	15	1	0	1	2	0	5	3	8	25
14:15	6	2	0	8	5	0	1	6	0	6	5	11	25
14:30	8	2	0	10	1	0	1	2	0	9	6	15	27
14:45	9	8	0	17	5	0	1	6	0	6	6	12	35
Total	37	13	0	50	12	0	4	16	0	26	20	46	112
15:00	3	4	0	7	2	0	1	3	0	5	0	5	15
15:15	1	1	1	3	5	0	1	6	0	5	2	7	16
15:30	12	3	2	17	3	0	3	6	0	9	5	14	37
15:45	6	2	0	8	1	0	4	5	0	12	8	20	33
Total	22	10	3	35	11	0	9	20	0	31	15	46	101
16:00	10	2	1	13	0	0	3	3	0	13	5	18	34
16:15	8	5	2	15	6	0	1	7	0	7	1	8	30
16:30	4	3	0	7	3	0	0	3	0	3	5	8	18
16:45	11	5	2	18	2	0	4	6	0	8	1	9	33
Total	33	15	5	53	11	0	8	19	0	31	12	43	115
17:00	17	3	0	20	3	0	1	4	0	16	3	19	43
17:15	12	3	1	16	4	0	0	4	0	16	0	16	36
17:30	19	5	0	24	6	0	0	6	0	9	0	9	39
17:45	11	0	1	12	7	0	1	8	0	5	2	7	27
Total	59	11	2	72	20	0	2	22	0	46	5	51	145
18:00	8	5	2	15	4	0	2	6	0	15	2	17	38
18:15	14	2	0	16	3	0	0	3	0	10	1	11	30
18:30	16	9	0	25	2	0	0	2	0	9	1	10	37
18:45	12	2	0	14	1	0	0	1	0	12	0	12	27
Total	50	18	2	70	10	0	2	12	0	46	4	50	132
19:00	9	1	1	11	3	0	0	3	0	8	0	8	22
19:15	10	4	0	14	2	0	0	2	0	10	1	11	27
19:30	7	2	0	9	3	0	0	3	0	15	0	15	27
19:45	10	2	1	13	6	0	0	6	0	9	1	10	29
Total	36	9	2	47	14	0	0	14	0	42	2	44	105

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

File Name : Blacksburg(Sunridge and Village at Blacksburg Access)

Site Code :

Start Date : 4/18/2018

Page No : 3

Groups Printed- Cars + - Trucks

Start Time	Village at Blacksburg Access Southbound				Sunridge Drive Westbound				Sunridge Drive Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
20:00	11	5	0	16	2	0	0	2	0	12	0	12	30
20:15	11	4	0	15	3	0	0	3	0	7	1	8	26
20:30	7	5	0	12	2	0	0	2	0	21	0	21	35
20:45	9	5	4	18	2	0	0	2	0	12	2	14	34
Total	38	19	4	61	9	0	0	9	0	52	3	55	125
21:00	5	3	0	8	5	0	0	5	0	13	0	13	26
21:15	11	3	1	15	3	0	1	4	0	10	1	11	30
21:30	7	3	0	10	7	0	0	7	0	11	0	11	28
21:45	11	6	0	17	2	0	0	2	0	10	0	10	29
Total	34	15	1	50	17	0	1	18	0	44	1	45	113
22:00	8	1	0	9	4	0	0	4	0	9	0	9	22
22:15	5	1	0	6	4	0	0	4	0	8	0	8	18
22:30	3	0	0	3	3	0	0	3	0	7	0	7	13
22:45	11	3	0	14	3	0	0	3	0	7	0	7	24
Total	27	5	0	32	14	0	0	14	0	31	0	31	77
23:00	2	2	0	4	3	0	0	3	0	6	0	6	13
23:15	4	3	0	7	2	0	0	2	0	9	0	9	18
23:30	8	4	0	12	6	0	0	6	0	9	0	9	27
23:45	3	2	2	7	1	0	0	1	0	9	0	9	17
Total	17	11	2	30	12	0	0	12	0	33	0	33	75
Grand Total	547	184	40	771	202	0	95	297	1	516	125	642	1710
Apprch %	70.9	23.9	5.2		68	0	32		0.2	80.4	19.5		
Total %	32	10.8	2.3	45.1	11.8	0	5.6	17.4	0.1	30.2	7.3	37.5	
Cars +	546	184	40	770	202	0	95	297	1	515	125	641	1708
% Cars +	99.8	100	100	99.9	100	0	100	100	100	99.8	100	99.8	99.9
Trucks	1	0	0	1	0	0	0	0	0	1	0	1	2
% Trucks	0.2	0	0	0.1	0	0	0	0	0	0.2	0	0.2	0.1

# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

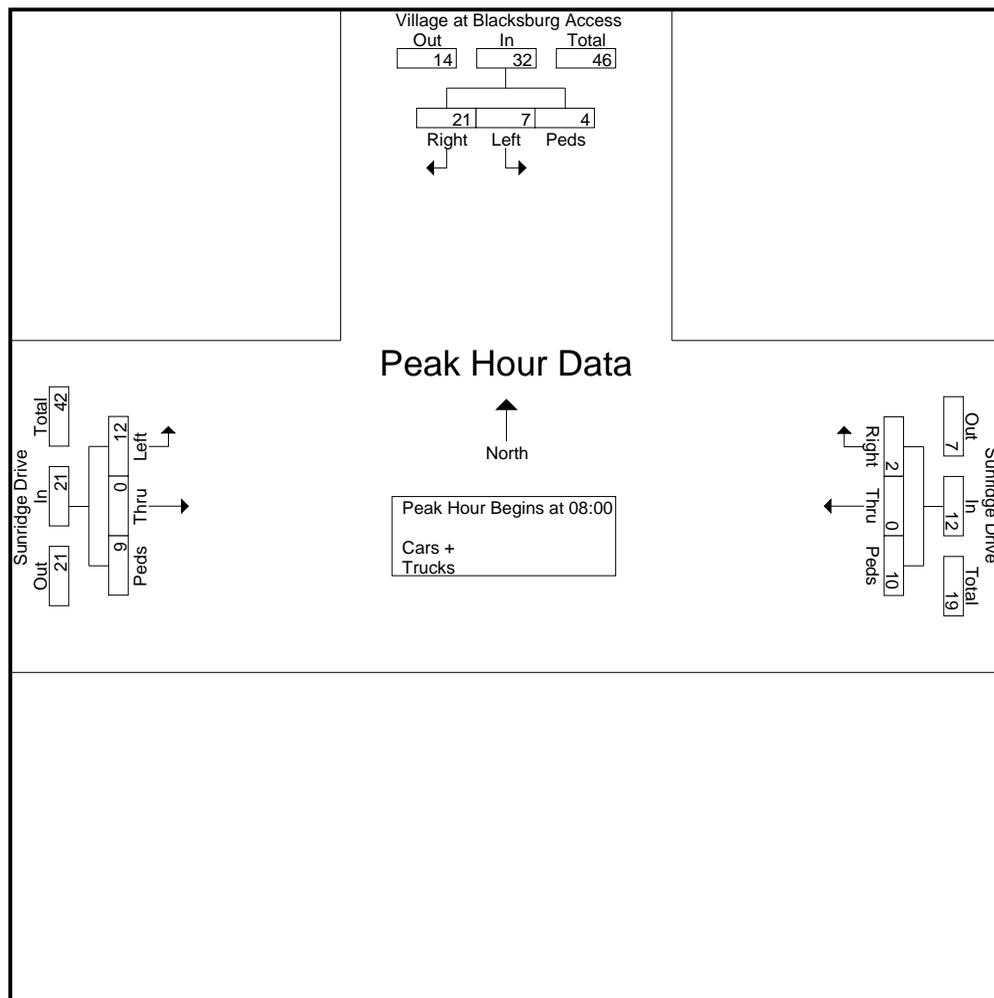
File Name : Blacksburg(Sunridge and Village at Blacksburg Access)

Site Code :

Start Date : 4/18/2018

Page No : 4

Start Time	Village at Blacksburg Access Southbound				Sunridge Drive Westbound				Sunridge Drive Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00													
08:00	0	1	0	1	0	0	2	2	0	5	1	6	9
08:15	2	1	2	5	0	0	0	0	0	3	0	3	8
08:30	9	3	2	14	2	0	6	8	0	1	1	2	24
08:45	10	2	0	12	0	0	2	2	0	3	7	10	24
Total Volume	21	7	4	32	2	0	10	12	0	12	9	21	65
% App. Total	65.6	21.9	12.5		16.7	0	83.3		0	57.1	42.9		
PHF	.525	.583	.500	.571	.250	.000	.417	.375	.000	.600	.321	.525	.677



# Burns Service Inc.

1202 Langdon Terrace Drive  
Indian Trail, NC, 28079

*We Count because YOU Count*

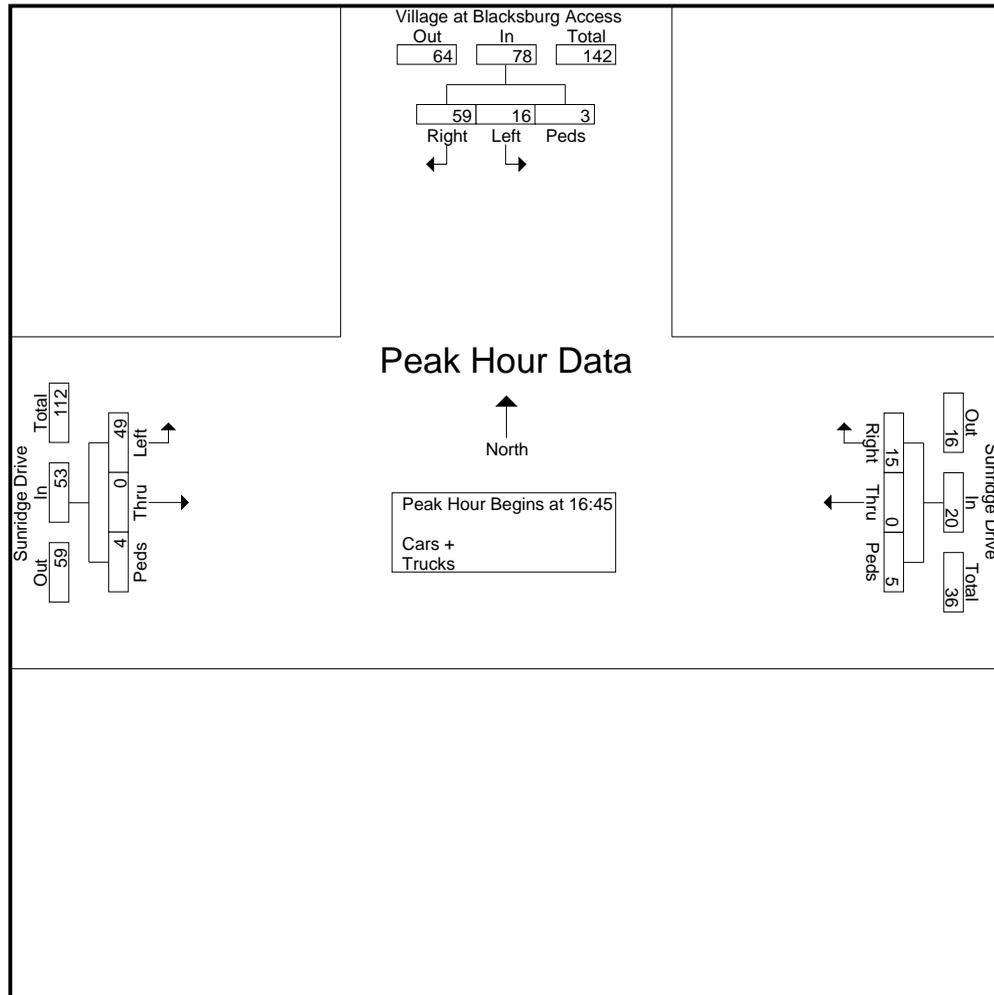
File Name : Blacksburg(Sunridge and Village at Blacksburg Access)

Site Code :

Start Date : 4/18/2018

Page No : 6

Start Time	Village at Blacksburg Access Southbound				Sunridge Drive Westbound				Sunridge Drive Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 16:45													
16:45	11	5	2	18	2	0	4	6	0	8	1	9	33
17:00	17	3	0	20	3	0	1	4	0	16	3	19	43
17:15	12	3	1	16	4	0	0	4	0	16	0	16	36
17:30	19	5	0	24	6	0	0	6	0	9	0	9	39
Total Volume	59	16	3	78	15	0	5	20	0	49	4	53	151
% App. Total	75.6	20.5	3.8		75	0	25		0	92.5	7.5		
PHF	.776	.800	.375	.813	.625	.000	.313	.833	.000	.766	.333	.697	.878



# **APPENDIX B**

**SIGNAL PHASING**

**&**

**TIMING DATA**

ASMA T. ALI  
Lic. No. 044404  
PROFESSIONAL ENGINEER

Digitally signed by Asma T Ali  
Date: 2014.08.18 17:12:12 -04'00'

---

Name: Asma T. Ali  
Company: T3 Design  
Date: Aug 18, 2014

---

Implementation Date: 12-22-14  
By: MB

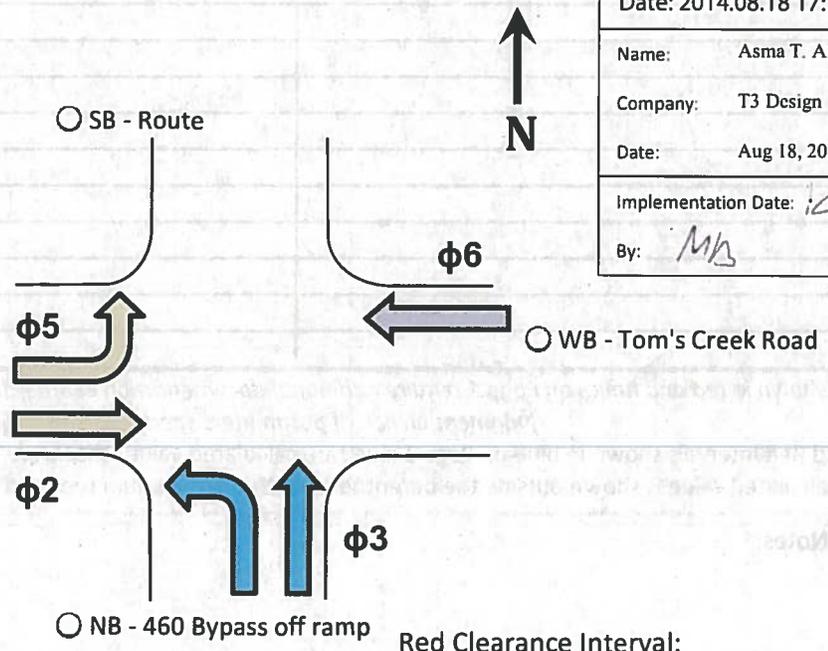
**Intersection Information:**

Operations Region: Southwest  
 Locality: Montgomery County  
 Intersection Node: 600016  
 Reference #: N/A  
 EB/WB Street: Tom's Creek Road  
 NB Street: 460 Bypass off ramp  
 SB Street:

**Traffic Engineering**

**VDOT Yellow Change & Red Clearance Interval Calculator**

Additional Notes: Intervals were calculated using the best available phasing. Intervals should be checked by phase, road name, and direction for each approach prior to input.



Yellow Change Interval:

$$Y = t + \frac{1.47 * V}{2a + 64.4g}$$

$a = 10 \text{ ft/s}^2$   
 $t = 1 \text{ s}$

Red Clearance Interval:

$$R = \frac{w + L}{1.47 * V} - 1$$

$V_{lts}$  is used in place of  $V$  for calculation of  $R_{lt}$

Approach - Street - Movement	V (mph)*	V data	g	V <sub>LTS</sub> (mph)*	L (ft)*	w (ft)*	Y (s)**	R (s)**
EB - Tom's Creek Road - Through	32	SL + 7	0.06		20	58	3.0 (3.0)	0.7 (1.0)
EB - Tom's Creek Road - Left	20	SL - 5	0.06	20	20	64	2.2 (3.0)	1.9
WB - Tom's Creek Road - Through	32	SL + 7	-0.03		20	44	3.6	0.4 (1.0)
WB - Tom's Creek Road - Left								
NB - 460 Bypass off ramp - Through	42	SL + 7	0.05		20	66	3.7	0.4 (1.0)
NB - 460 Bypass off ramp - Left	30	SL - 5	0.05	20	20	70	2.9 (3.0)	2.1
SB - - Through								
SB - - Left								

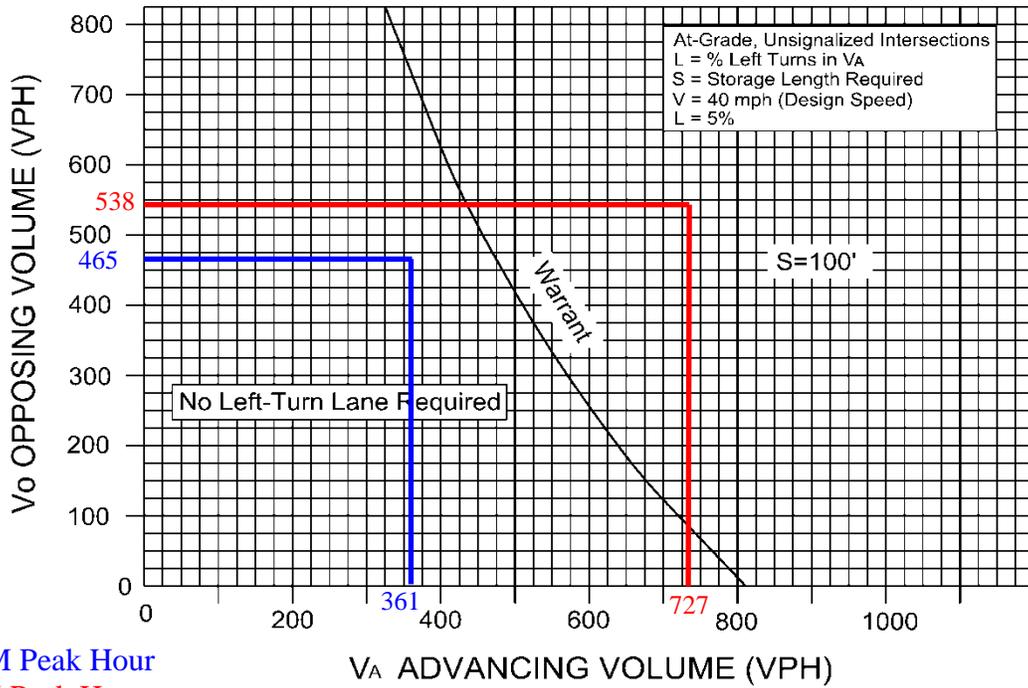
*\*Engineering judgment applied for all numbers in red and italics. Provide supporting documentation.\**  
**\*\* Calculated intervals in blue indicate values below the minimum required time. \*\***

Phase   Street - Movement	Right Turn Overlap	Left Turn Phase Type	Y Output Phase Adjusted	R Output Phase Adjusted	Controller Input Y	Controller Input R
2   EB - Tom's Creek Road - Through			3.0	1.0	3.0	1.0
3   NB - 460 Bypass off ramp - Through + Left		Split - Shared Signal	3.7	2.1	3.7	2.1
5   EB - Tom's Creek Road - Left		Protected	3.0	1.9	3.0	1.9
6   WB - Tom's Creek Road - Through			3.6	1.0	3.6	1.0

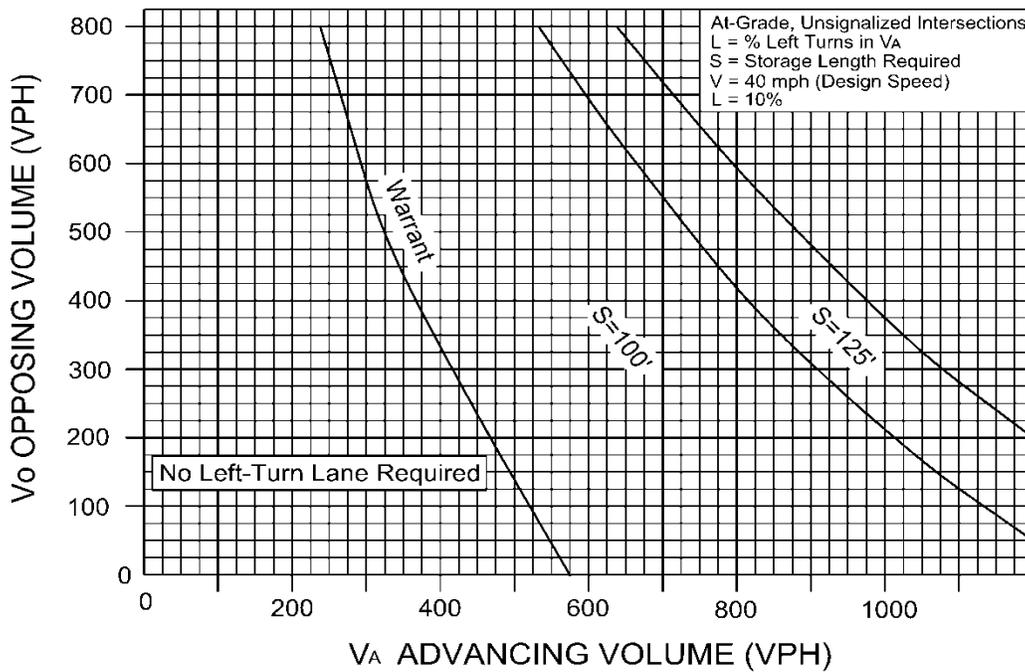
# **APPENDIX C**

## **VDOT TURN LANE WARRANT CHARTS**

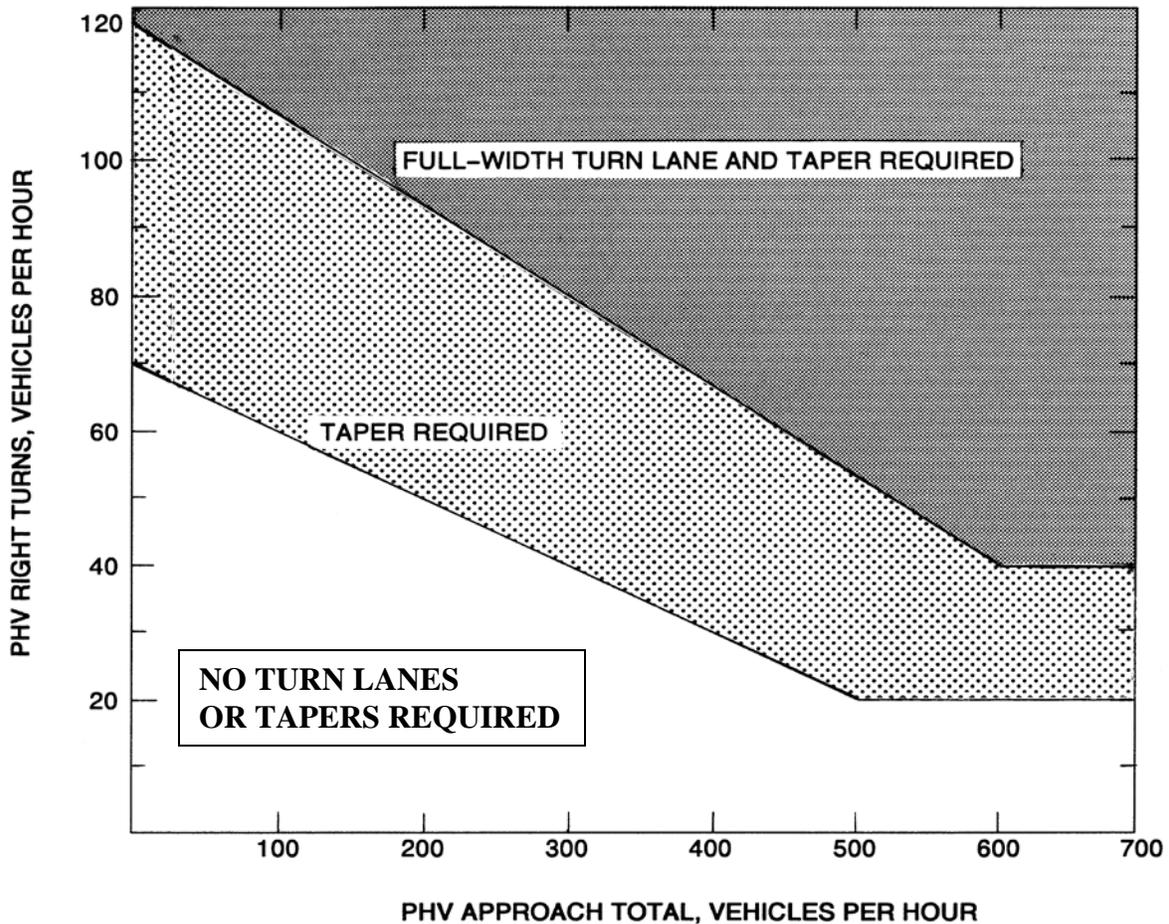
**WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAY**



**FIGURE 3-5**



**FIGURE 3-6**



Appropriate Radius required at all Intersections and Entrances (Commercial or Private).

**LEGEND**

**PHV** - Peak Hour Volume (also Design Hourly Volume equivalent)

**Adjustment for Right Turns**

For posted speeds at or under 45 mph, PHV right turns > 40, and PHV total < 300.

Adjusted right turns = PHV Right Turns - 20

If PHV is not known use formula:  $PHV = ADT \times K \times D$

K = the percent of AADT occurring in the peak hour

D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

When right turn facilities are warranted, see Figure 3-1 for design criteria.\*

**FIGURE 3-26 WARRANTS FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)**

\* Rev. 1/15

# **APPENDIX D**

## **CAPACITY ANALYSIS REPORTS**

**TOMS CREEK ROAD**

**&**

**US 460 RAMPS**

Frith Property  
1: Toms Creek Road & US 460 WB Ramp

Existing 2018  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	211	0	0	0	0	319	26	8	243	0
Future Volume (vph)	18	0	211	0	0	0	0	319	26	8	243	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.990				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1568	0	0	0	0	1858	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1568	0	0	0	0	1858	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			251					10				
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		773			722			272			1126	
Travel Time (s)		21.1			19.7			7.4			30.7	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	1%	4%	0%	0%	0%
Adj. Flow (vph)	21	0	251	0	0	0	0	380	31	10	289	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	251	0	0	0	0	411	0	10	289	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	14.0	14.0	14.0					25.0		11.0	36.0	
Total Split (%)	28.0%	28.0%	28.0%					50.0%		22.0%	72.0%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		8.8	8.8					17.2		7.3	18.8	
Actuated g/C Ratio		0.24	0.24					0.48		0.20	0.52	
v/c Ratio		0.05	0.44					0.46		0.03	0.29	
Control Delay		12.7	5.5					9.3		14.8	5.6	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		12.7	5.5					9.3		14.8	5.6	
LOS		B	A					A		B	A	
Approach Delay		6.1						9.3			5.9	
Approach LOS		A						A			A	
Queue Length 50th (ft)		2	0					35		1	23	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

Existing 2018  
 Timing Plan: AM Peak

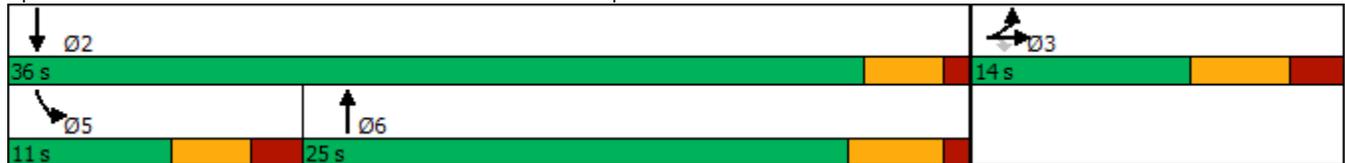
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		18	38					133		12	48	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		527	635					1186		369	1676	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.04	0.40					0.35		0.03	0.17	

Intersection Summary

Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 36  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.46  
 Intersection Signal Delay: 7.4  
 Intersection Capacity Utilization 32.5%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



Frith Property  
1: Toms Creek Road & US 460 WB Ramp

Existing 2018  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	0	352	0	0	0	0	538	139	11	159	0
Future Volume (vph)	111	0	352	0	0	0	0	538	139	11	159	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.972				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1615	0	0	0	0	1847	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1615	0	0	0	0	1847	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			371					31				
Link Speed (mph)		35			35			25				25
Link Distance (ft)		773			722			272			1126	
Travel Time (s)		15.1			14.1			7.4			30.7	
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	117	0	371	0	0	0	0	566	146	12	167	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	117	371	0	0	0	0	712	0	12	167	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	15.0	15.0	15.0					34.0		11.0	45.0	
Total Split (%)	25.0%	25.0%	25.0%					56.7%		18.3%	75.0%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		10.0	10.0					21.7		7.4	23.3	
Actuated g/C Ratio		0.24	0.24					0.52		0.18	0.56	
v/c Ratio		0.27	0.55					0.73		0.04	0.16	
Control Delay		18.3	6.5					13.7		20.4	4.4	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		18.3	6.5					13.7		20.4	4.4	
LOS		B	A					B		C	A	
Approach Delay		9.3						13.7			5.5	
Approach LOS		A						B			A	
Queue Length 50th (ft)		21	0					91		2	15	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

Existing 2018  
 Timing Plan: PM Peak

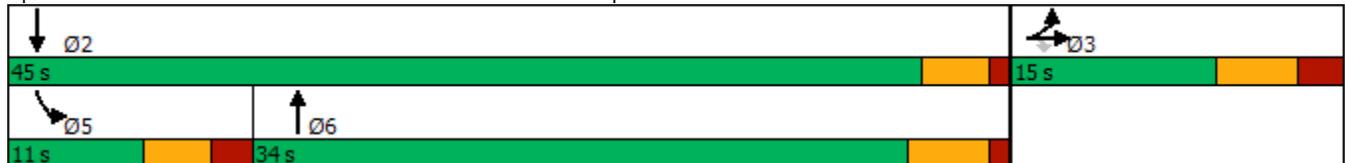
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		79	62					#318		17	32	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		504	718					1401		321	1741	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.23	0.52					0.51		0.04	0.10	

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 41.8  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 11.1  
 Intersection Capacity Utilization 49.6%  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



Frith Property  
1: Toms Creek Road & US 460 WB Ramp

No-Build 2020  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	216	0	0	0	0	324	34	8	247	0
Future Volume (vph)	18	0	216	0	0	0	0	324	34	8	247	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.987				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1568	0	0	0	0	1852	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1568	0	0	0	0	1852	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			257					13				
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		773			722			272			1126	
Travel Time (s)		15.1			14.1			7.4			30.7	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	1%	4%	0%	0%	0%
Adj. Flow (vph)	21	0	257	0	0	0	0	386	40	10	294	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	257	0	0	0	0	426	0	10	294	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	14.0	14.0	14.0					25.0		11.0	36.0	
Total Split (%)	28.0%	28.0%	28.0%					50.0%		22.0%	72.0%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		8.8	8.8					17.0		7.3	18.6	
Actuated g/C Ratio		0.25	0.25					0.47		0.20	0.52	
v/c Ratio		0.05	0.44					0.48		0.03	0.30	
Control Delay		12.8	5.6					9.5		14.9	5.6	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		12.8	5.6					9.5		14.9	5.6	
LOS		B	A					A		B	A	
Approach Delay		6.1						9.5			6.0	
Approach LOS		A						A			A	
Queue Length 50th (ft)		2	0					36		1	24	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

No-Build 2020  
 Timing Plan: AM Peak

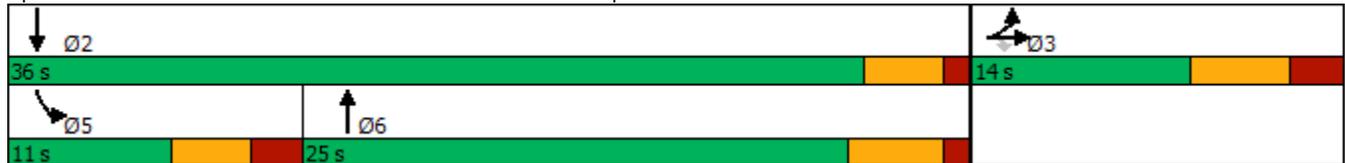
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		18	38					138		12	49	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		529	641					1174		370	1685	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.04	0.40					0.36		0.03	0.17	

Intersection Summary

Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 35.8  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.48  
 Intersection Signal Delay: 7.5  
 Intersection Capacity Utilization 33.0%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



Frith Property  
1: Toms Creek Road & US 460 WB Ramp

No-Build 2020  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	0	364	0	0	0	0	547	154	11	165	0
Future Volume (vph)	112	0	364	0	0	0	0	547	154	11	165	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.970				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1615	0	0	0	0	1843	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1615	0	0	0	0	1843	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			383					35				
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		773			722			272			1126	
Travel Time (s)		15.1			14.1			7.4			30.7	
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	118	0	383	0	0	0	0	576	162	12	174	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	118	383	0	0	0	0	738	0	12	174	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	14.0	14.0	14.0					35.0		11.0	46.0	
Total Split (%)	23.3%	23.3%	23.3%					58.3%		18.3%	76.7%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		9.7	9.7					22.6		7.3	24.1	
Actuated g/C Ratio		0.23	0.23					0.53		0.17	0.57	
v/c Ratio		0.29	0.58					0.74		0.04	0.16	
Control Delay		19.3	6.9					13.5		20.5	4.1	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		19.3	6.9					13.5		20.5	4.1	
LOS		B	A					B		C	A	
Approach Delay		9.8						13.5			5.2	
Approach LOS		A						B			A	
Queue Length 50th (ft)		22	0					95		2	16	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

No-Build 2020  
 Timing Plan: PM Peak

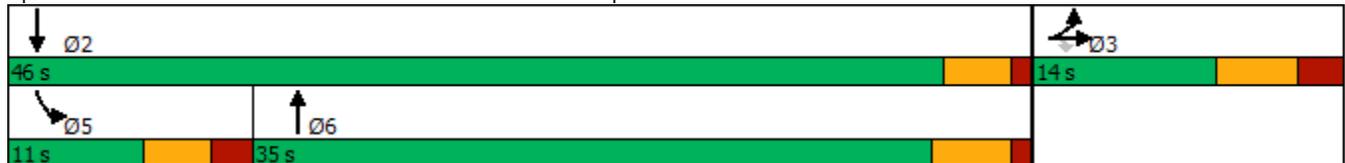
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		81	64					#324		17	31	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		452	691					1418		316	1754	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.26	0.55					0.52		0.04	0.10	

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 42.3  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 11.1  
 Intersection Capacity Utilization 51.0%  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



Frith Property  
1: Toms Creek Road & US 460 WB Ramp

Build 2020  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	217	0	0	0	0	327	35	8	248	0
Future Volume (vph)	18	0	217	0	0	0	0	327	35	8	248	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.987				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1568	0	0	0	0	1851	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1568	0	0	0	0	1851	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			258					13				
Link Speed (mph)		35			35			25				25
Link Distance (ft)		773			722			272				1126
Travel Time (s)		15.1			14.1			7.4				30.7
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	1%	4%	0%	0%	0%
Adj. Flow (vph)	21	0	258	0	0	0	0	389	42	10	295	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	258	0	0	0	0	431	0	10	295	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	14.0	14.0	14.0					25.0		11.0	36.0	
Total Split (%)	28.0%	28.0%	28.0%					50.0%		22.0%	72.0%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		8.8	8.8					17.1		7.2	18.6	
Actuated g/C Ratio		0.25	0.25					0.48		0.20	0.52	
v/c Ratio		0.05	0.45					0.49		0.03	0.30	
Control Delay		12.8	5.6					9.5		14.9	5.7	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		12.8	5.6					9.5		14.9	5.7	
LOS		B	A					A		B	A	
Approach Delay		6.1						9.5			6.0	
Approach LOS		A						A			A	
Queue Length 50th (ft)		2	0					37		1	24	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

Build 2020  
 Timing Plan: AM Peak

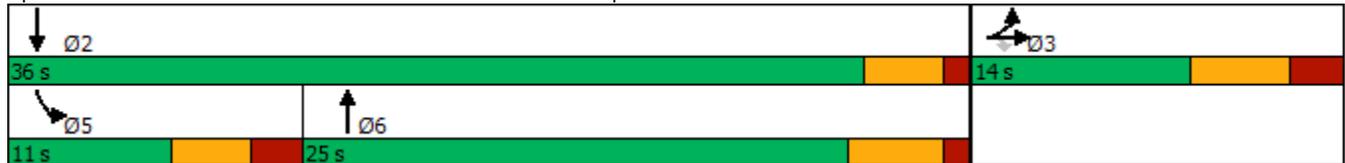
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		18	38					140		12	49	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		528	641					1173		369	1684	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.04	0.40					0.37		0.03	0.18	

Intersection Summary

Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 35.8  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.49  
 Intersection Signal Delay: 7.5  
 Intersection Capacity Utilization 33.2%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



Frith Property  
1: Toms Creek Road & US 460 WB Ramp

Build 2020  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	0	370	0	0	0	0	556	156	11	168	0
Future Volume (vph)	112	0	370	0	0	0	0	556	156	11	168	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	0		0	0		0	250		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	0			25			25			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.970				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1805	1615	0	0	0	0	1843	0	1805	1900	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1805	1615	0	0	0	0	1843	0	1805	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			389					35				
Link Speed (mph)		35			35			25				25
Link Distance (ft)		773			722			272			1126	
Travel Time (s)		15.1			14.1			7.4			30.7	
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	118	0	389	0	0	0	0	585	164	12	177	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	118	389	0	0	0	0	749	0	12	177	0
Turn Type	Split	NA	Perm					NA		Prot	NA	
Protected Phases	3	3						6		5	2	
Permitted Phases			3									
Detector Phase	3	3	3					6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					12.0		6.0	12.0	
Minimum Split (s)	12.0	12.0	12.0					23.0		11.0	16.0	
Total Split (s)	14.0	14.0	14.0					35.0		11.0	46.0	
Total Split (%)	23.3%	23.3%	23.3%					58.3%		18.3%	76.7%	
Yellow Time (s)	3.7	3.7	3.7					3.6		3.0	3.0	
All-Red Time (s)	2.1	2.1	2.1					1.0		1.9	1.0	
Lost Time Adjust (s)		-1.8	-1.8					-0.6		-0.9	0.0	
Total Lost Time (s)		4.0	4.0					4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					Min		None	Min	
Act Effct Green (s)		9.7	9.7					23.0		7.3	24.6	
Actuated g/C Ratio		0.23	0.23					0.54		0.17	0.58	
v/c Ratio		0.29	0.58					0.74		0.04	0.16	
Control Delay		19.5	7.0					13.7		20.6	4.1	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		19.5	7.0					13.7		20.6	4.1	
LOS		B	A					B		C	A	
Approach Delay		9.9						13.7			5.2	
Approach LOS		A						B			A	
Queue Length 50th (ft)		22	0					98		2	16	

Frith Property  
 1: Toms Creek Road & US 460 WB Ramp

Build 2020  
 Timing Plan: PM Peak

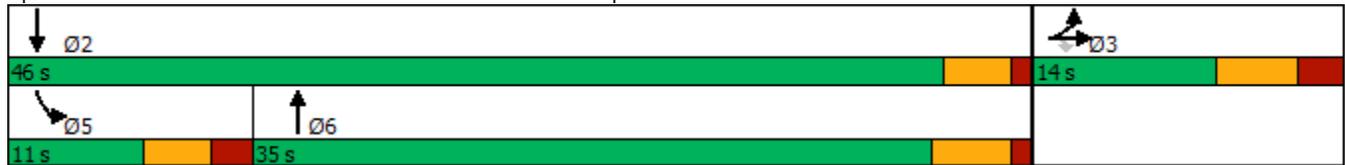
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		81	65					#343		17	31	
Internal Link Dist (ft)		693			642			192			1046	
Turn Bay Length (ft)										250		
Base Capacity (vph)		447	693					1406		313	1748	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.26	0.56					0.53		0.04	0.10	

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 42.7  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 11.2  
 Intersection Capacity Utilization 51.6%  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 1: Toms Creek Road & US 460 WB Ramp



**TOMS CREEK ROAD**  
**&**  
**TERRACE APARTMENTS ACCESS / FUTURE**  
**SITE ACCESS**

Frith Property  
2: Toms Creek Road & Existing Driveway

Existing 2018  
Timing Plan: AM Peak

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1	0	343	453	1
Future Vol, veh/h	2	1	0	343	453	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	2	1	0	413	546	1

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	960	547	547	0	-	0
Stage 1	547	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	287	541	1033	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	287	541	1033	-	-	-
Mov Cap-2 Maneuver	287	-	-	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	672	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1033	-	340	-	-
HCM Lane V/C Ratio	-	-	0.011	-	-
HCM Control Delay (s)	0	-	15.7	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Frith Property  
2: Toms Creek Road & Existing Driveway

Existing 2018  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	5	6	676	507	4
Future Vol, veh/h	1	5	6	676	507	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	5	7	735	551	4

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1302	553	555	0	-	0
Stage 1	553	-	-	-	-	-
Stage 2	749	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	179	537	1026	-	-	-
Stage 1	580	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	177	537	1026	-	-	-
Mov Cap-2 Maneuver	177	-	-	-	-	-
Stage 1	573	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.1	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1026	-	401	-	-
HCM Lane V/C Ratio	0.006	-	0.016	-	-
HCM Control Delay (s)	8.5	0	14.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Frith Property  
2: Toms Creek Road & Existing Driveway

No-Build 2020  
Timing Plan: AM Peak

Intersection

Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1	0	356	462	1
Future Vol, veh/h	2	1	0	356	462	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	2	1	0	429	557	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	987	558	558	0	0
Stage 1	558	-	-	-	-
Stage 2	429	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	277	533	1023	-	-
Stage 1	577	-	-	-	-
Stage 2	661	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	277	533	1023	-	-
Mov Cap-2 Maneuver	277	-	-	-	-
Stage 1	577	-	-	-	-
Stage 2	661	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1023	-	330	-	-
HCM Lane V/C Ratio	-	-	0.011	-	-
HCM Control Delay (s)	0	-	16	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Frith Property  
2: Toms Creek Road & Existing Driveway

No-Build 2020  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	5	6	700	525	4
Future Vol, veh/h	1	5	6	700	525	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	5	7	761	571	4

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1348	573	575	0	-	0
Stage 1	573	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	168	523	1008	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	458	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	166	523	1008	-	-	-
Mov Cap-2 Maneuver	166	-	-	-	-	-
Stage 1	561	-	-	-	-	-
Stage 2	458	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1008	-	385	-	-
HCM Lane V/C Ratio	0.006	-	0.017	-	-
HCM Control Delay (s)	8.6	0	14.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Frith Property  
2: Toms Creek Road & Existing Driveway

Build 2020 w Improvements  
Timing Plan: AM Peak

Intersection

Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	10	5	356	462	3
Future Vol, veh/h	6	10	5	356	462	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	7	12	6	429	557	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	1000	559	561	0	0
Stage 1	559	-	-	-	-
Stage 2	441	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	272	532	1020	-	-
Stage 1	576	-	-	-	-
Stage 2	653	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	270	532	1020	-	-
Mov Cap-2 Maneuver	270	-	-	-	-
Stage 1	573	-	-	-	-
Stage 2	653	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1020	-	390	-	-
HCM Lane V/C Ratio	0.006	-	0.049	-	-
HCM Control Delay (s)	8.6	-	14.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Frith Property  
2: Toms Creek Road & Existing Driveway

Build 2020 w Improvements  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	29	27	700	525	13
Future Vol, veh/h	12	29	27	700	525	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	13	32	29	761	571	14

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	1397	578	585	0	0
Stage 1	578	-	-	-	-
Stage 2	819	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	157	519	1000	-	-
Stage 1	565	-	-	-	-
Stage 2	437	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	152	519	1000	-	-
Mov Cap-2 Maneuver	152	-	-	-	-
Stage 1	549	-	-	-	-
Stage 2	437	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.9	0.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1000	-	304	-	-
HCM Lane V/C Ratio	0.029	-	0.147	-	-
HCM Control Delay (s)	8.7	-	18.9	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

**TOMS CREEK ROAD**  
**&**  
**SUNRIDGE DRIVE**

Frith Property  
3: Toms Creek Road & Sunridge Drive

Existing 2018  
Timing Plan: AM Peak

Intersection

Int Delay, s/veh	2.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	32	103	240	13	40	414
Future Vol, veh/h	32	103	240	13	40	414
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	3	1	0	10	1
Mvmt Flow	38	123	286	15	48	493

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	883	294	0	0	301
Stage 1	294	-	-	-	-
Stage 2	589	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.2
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.29
Pot Cap-1 Maneuver	319	743	-	-	1216
Stage 1	761	-	-	-	-
Stage 2	558	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	302	743	-	-	1216
Mov Cap-2 Maneuver	302	-	-	-	-
Stage 1	720	-	-	-	-
Stage 2	558	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.2	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	552	1216
HCM Lane V/C Ratio	-	-	0.291	0.039
HCM Control Delay (s)	-	-	14.2	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.2	0.1

Frith Property  
3: Toms Creek Road & Sunridge Drive

Existing 2018  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	9.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	77	88	594	81	105	407
Future Vol, veh/h	77	88	594	81	105	407
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	84	96	646	88	114	442

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1360	690	0	0	734
Stage 1	690	-	-	-	-
Stage 2	670	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	165	449	-	-	880
Stage 1	502	-	-	-	-
Stage 2	512	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	137	449	-	-	880
Mov Cap-2 Maneuver	137	-	-	-	-
Stage 1	416	-	-	-	-
Stage 2	512	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	69.4	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	218	880
HCM Lane V/C Ratio	-	-	0.823	0.13
HCM Control Delay (s)	-	-	69.4	9.7
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	6.1	0.4

Frith Property  
3: Toms Creek Road & Sunridge Drive

No-Build 2020  
Timing Plan: AM Peak

Intersection

Int Delay, s/veh 2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	104	252	13	40	423
Future Vol, veh/h	32	104	252	13	40	423
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	3	1	0	10	1
Mvmt Flow	38	124	300	15	48	504

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	908	308	0
Stage 1	308	-	-
Stage 2	600	-	-
Critical Hdwy	6.4	6.23	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.327	-
Pot Cap-1 Maneuver	308	730	-
Stage 1	750	-	-
Stage 2	552	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	291	730	-
Mov Cap-2 Maneuver	291	-	-
Stage 1	709	-	-
Stage 2	552	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	539	1201
HCM Lane V/C Ratio	-	-	0.3	0.04
HCM Control Delay (s)	-	-	14.5	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.3	0.1

Frith Property  
3: Toms Creek Road & Sunridge Drive

No-Build 2020  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	11					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	78	89	617	82	106	424
Future Vol, veh/h	78	89	617	82	106	424
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	85	97	671	89	115	461

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1407	716	0	0	760
Stage 1	716	-	-	-	-
Stage 2	691	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	155	434	-	-	861
Stage 1	488	-	-	-	-
Stage 2	501	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	127	434	-	-	861
Mov Cap-2 Maneuver	127	-	-	-	-
Stage 1	400	-	-	-	-
Stage 2	501	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	85.5	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	204	861
HCM Lane V/C Ratio	-	-	0.89	0.134
HCM Control Delay (s)	-	-	85.5	9.8
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	7	0.5

Frith Property  
3: Toms Creek Road & Sunridge Drive

Build 2020 w Improvements  
Timing Plan: AM Peak

Intersection

Int Delay, s/veh	2.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	104	257	13	40	432
Future Vol, veh/h	32	104	257	13	40	432
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	0	3	1	0	10	1
Mvmt Flow	38	124	306	15	48	514

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	924	314	0	0	321
Stage 1	314	-	-	-	-
Stage 2	610	-	-	-	-
Critical Hdwy	6.4	6.23	-	-	4.2
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.327	-	-	2.29
Pot Cap-1 Maneuver	302	724	-	-	1195
Stage 1	745	-	-	-	-
Stage 2	546	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	290	724	-	-	1195
Mov Cap-2 Maneuver	290	-	-	-	-
Stage 1	715	-	-	-	-
Stage 2	546	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	535	1195
HCM Lane V/C Ratio	-	-	0.303	0.04
HCM Control Delay (s)	-	-	14.6	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.3	0.1

Frith Property  
3: Toms Creek Road & Sunridge Drive

Build 2020 w Improvements  
Timing Plan: PM Peak

Intersection

Int Delay, s/veh	11.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	78	89	638	82	106	448
Future Vol, veh/h	78	89	638	82	106	448
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	85	97	693	89	115	487

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1455	738	0	0	782
Stage 1	738	-	-	-	-
Stage 2	717	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	145	421	-	-	845
Stage 1	476	-	-	-	-
Stage 2	487	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	125	421	-	-	845
Mov Cap-2 Maneuver	125	-	-	-	-
Stage 1	411	-	-	-	-
Stage 2	487	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	90.4	0	1.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	200	845
HCM Lane V/C Ratio	-	-	0.908	0.136
HCM Control Delay (s)	-	-	90.4	9.9
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	7.2	0.5

# **APPENDIX E**

## **QUEUEING ANALYSIS REPORTS**

## **EXISTING (2018) CONDITIONS**

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	46	99	121	30	106
Average Queue (ft)	12	52	48	6	38
95th Queue (ft)	37	83	98	25	82
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)					
Queuing Penalty (veh)					

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	3
95th Queue (ft)	19
Link Distance (ft)	503
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	87	2	83
Average Queue (ft)	42	0	13
95th Queue (ft)	71	2	51
Link Distance (ft)	676	1112	140
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 0

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	87	118	233	34	84
Average Queue (ft)	47	64	113	9	30
95th Queue (ft)	84	102	203	30	66
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)			1		
Queuing Penalty (veh)			6		
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	31	86	18
Average Queue (ft)	5	7	1
95th Queue (ft)	25	50	11
Link Distance (ft)	503	140	197
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		1	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	227	22	176
Average Queue (ft)	86	1	60
95th Queue (ft)	180	10	134
Link Distance (ft)	676	1112	140
Upstream Blk Time (%)			1
Queuing Penalty (veh)			5
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 12

## **FUTURE (2020) 'NO-BUILD' CONDITIONS**

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	39	113	105	32	109
Average Queue (ft)	11	51	44	6	40
95th Queue (ft)	35	85	88	25	87
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	4
95th Queue (ft)	20
Link Distance (ft)	503
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	86	85
Average Queue (ft)	42	13
95th Queue (ft)	71	50
Link Distance (ft)	676	140
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 0

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	92	126	237	32	81
Average Queue (ft)	48	67	114	9	31
95th Queue (ft)	83	104	201	29	67
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)			1		
Queuing Penalty (veh)			6		
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	36	77	34
Average Queue (ft)	7	5	2
95th Queue (ft)	28	35	18
Link Distance (ft)	503	140	197
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	249	17	204
Average Queue (ft)	98	1	64
95th Queue (ft)	204	8	147
Link Distance (ft)	676	1112	140
Upstream Blk Time (%)			2
Queuing Penalty (veh)			8
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 14

## **FUTURE (2020) 'BUILD' CONDITIONS**

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	43	99	121	34	94
Average Queue (ft)	11	51	46	8	41
95th Queue (ft)	36	83	93	29	83
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)					
Queuing Penalty (veh)					

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	46	24
Average Queue (ft)	14	1
95th Queue (ft)	41	12
Link Distance (ft)	497	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		50
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	106	2	51	8
Average Queue (ft)	44	0	11	0
95th Queue (ft)	79	2	40	8
Link Distance (ft)	670	1112		140
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			50	
Storage Blk Time (%)			0	
Queuing Penalty (veh)			1	

**Network Summary**

Network wide Queuing Penalty: 1

**Intersection: 1: Toms Creek Road & US 460 WB Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	95	123	231	34	70
Average Queue (ft)	49	66	113	8	30
95th Queue (ft)	86	100	196	28	62
Link Distance (ft)		737	197		1100
Upstream Blk Time (%)			1		
Queuing Penalty (veh)			5		
Storage Bay Dist (ft)	170			250	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

**Intersection: 2: Toms Creek Road & Existing Driveway**

Movement	EB	NB	NB
Directions Served	LR	L	T
Maximum Queue (ft)	60	42	23
Average Queue (ft)	25	12	1
95th Queue (ft)	53	39	28
Link Distance (ft)	497		140
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)		150	
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

**Intersection: 3: Toms Creek Road & Sunridge Drive**

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	251	27	84	27
Average Queue (ft)	95	1	35	2
95th Queue (ft)	219	12	66	29
Link Distance (ft)	670	1112		140
Upstream Blk Time (%)				0
Queuing Penalty (veh)				0
Storage Bay Dist (ft)			150	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

**Network Summary**

Network wide Queuing Penalty: 5



Charleston, SC - Charlotte, NC - Raleigh, NC - Richmond, VA - Winston-Salem, NC