

October 14, 2004

Mr. Robert Swain
Robert Swain Company
P.O. Box 5689
Cary, North Carolina 27512

Subject: Traffic Assessment
Williams Pond Residential Development
Chatham County, North Carolina

Dear Mr. Swain:

This letter summarizes the findings of the traffic assessment prepared by Ramey Kemp and Associates, Inc. (RKA) for the residential development proposed on the south side of Bynum Ridge Road (SR 1711) east of Bynum Road in Chatham County. The purpose of this study is to determine impacts to the surrounding transportation system created by traffic generated by the development. The study area for this project includes the intersections of Bynum Ridge Road and the two (2) proposed site driveways. The intersections were analyzed under future traffic conditions with full build out site traffic during the weekday a.m. and p.m. peak hours.

The proposed development is expected to be built out in 2015, and will consist of 185 single-family dwelling units. Pokeberry Creek runs through the site and separates the development into two parcels. Access to the development is proposed via two full access driveways on Bynum Ridge Road. The two driveways on Bynum Ridge Road will be located approximately 1800 feet west (Site Driveway #1) and 900 feet east (Site Driveway #2) of Pokeberry Creek, respectively. During an on-site field visit, the NCDOT approved the location of the two site driveways.

Based on the preliminary site plan, 63 homes will be located west of Pokeberry Creek and 122 units will be located east of Pokeberry Creek. Traffic from the 63 units will utilize the westernmost driveway while traffic from the 122 units will utilize the easternmost driveway. Refer to Figure 1 for the preliminary site plan.

Existing (2004) Traffic Conditions

An automated 24-hour traffic count was conducted by RKA on Bynum Ridge Road near the proposed site on July 14-15, 2004. This data was used to determine the a.m. and p.m. peak hour traffic volumes on Bynum Ridge Road. Since school was not in session during the time of traffic data collection and existing traffic volumes are low, the existing peak hour volumes were increased by 50% to account for school traffic and any seasonal

factors. Refer to Figure 2 for the existing (2004) peak hour traffic volumes. The unadjusted traffic count data are included in Appendix B.

Background (2015) Traffic Conditions

In order to account for growth of traffic and subsequent traffic conditions at the future year (2015), background traffic projections are needed. Background traffic includes existing traffic plus traffic due to growth of the community and surrounding area that is anticipated to occur regardless of whether the proposed development is constructed. A conservative approach was taken and existing peak hour traffic volumes were projected to 2015 using a compounded annual growth rate of five percent (5%) to determine background (2015) traffic volumes. It is our understanding that there are no approved adjacent developments that will impact study intersections. Refer to Figure 2 for the background (2015) peak hour traffic volumes without site traffic.

Trip Generation and Distribution

Traffic generated by the proposed development was estimated utilizing methodology contained within the Institute of Transportation Engineers (ITE) *Trip Generation* manual, 7th Edition. It is estimated that full build out of the proposed development will generate approximately 1,929 total new site trips (965 enter and 965 exit) during an average 24-hour weekday period. Of this total, approximately 148 total site trips (37 enter and 111 exit) will occur during the weekday a.m. peak hour, while approximately 199 total site trips (126 enter and 73 exit) will occur during the weekday p.m. peak hour. Refer to Table 1 for a detailed breakdown of the entering and exiting site traffic.

TABLE 1
TRIP GENERATION TABLE
 PROPOSED RESIDENTIAL DEVELOPMENT

ITE Land Use (Code)	Density	2-way Volume (vpd)	AM Peak Hour (vph)		PM Peak Hour (vph)	
			Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	185 units	1,929	37	111	126	73

Primary site trips generated by the proposed development were distributed based on existing traffic patterns and engineering judgment. Refer to Figure 3 for the primary site trip distribution percentages. It is expected that approximately 55% of the site trips will access the site to/from the east on Bynum Ridge Road, while approximately 45% will

access the site to/from the west on Bynum Ridge Road. Figure 4 illustrates the total peak hour site trips for the proposed development.

Combined (2015) Traffic Conditions

Total peak hour site trips (Figure 4) were added to the background traffic volumes to determine combined traffic conditions with the site built out. Refer to Figure 5 for the combined peak hour traffic volumes with the proposed site.

For this study, the Highway Capacity Software (HCS) output module in Synchro (Version 5.0) was utilized to analyze the study intersections. Synchro Version 5.0 includes HCM calculations for unsignalized intersections based on methodologies of the 2000 Highway Capacity Manual (HCM).

Combined a.m. and p.m. peak hour traffic volumes at study intersections were analyzed to determine the expected levels of service. The results of the analysis are summarized in Table 2. Under combined traffic conditions with the site, analysis indicates that the minor street approaches of both site driveways at the intersections with Bynum Ridge Road will operate at level of service (LOS) A in the a.m. and p.m. peak hours with minor street turning vehicles experiencing short delays. Analysis reports are included in Appendix C of this study.

**TABLE 2
 COMBINED (2015) PEAK HOUR CAPACITY ANALYSIS RESULTS**

INTERSECTION	A P P R O A C H	LANEAGE	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
Bynum Ridge Road (EB/WB) & Site Driveway #1 (NB) (Unsignalized)	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- LOS A ¹ LOS A ²	N/A	-- LOS A ¹ LOS A ²	N/A
Bynum Ridge Road (EB/WB) & Site Driveway #2 (NB) (Unsignalized)	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- LOS A ¹ LOS A ²	N/A	-- LOS A ¹ LOS A ²	N/A

1. Level of service for left turn movement on major approach.
 2. Level of service for minor approach.

Conclusions and Recommendations

In summary, traffic generated by the proposed residential development is not expected to have a significant impact on the study intersections.

Since peak hour traffic volumes on Bynum Ridge Road are relatively low, no auxiliary turn lanes are warranted on Bynum Ridge Road at the site driveways. Based on the analysis results, adequate capacity will be provided at the intersections of Site Driveway #1 and Site Driveway #2 without auxiliary turn lanes.

It is recommended to construct Site Driveway #1 and Site Driveway #2 with one egress lane (a shared left turn and right turn lane) and one ingress lane.

If you should have any questions, or comments, relative to this traffic assessment, please feel free to contact me at (919) 872-0480 ext. 110.

Sincerely,
Ramey Kemp and Associates, Inc.

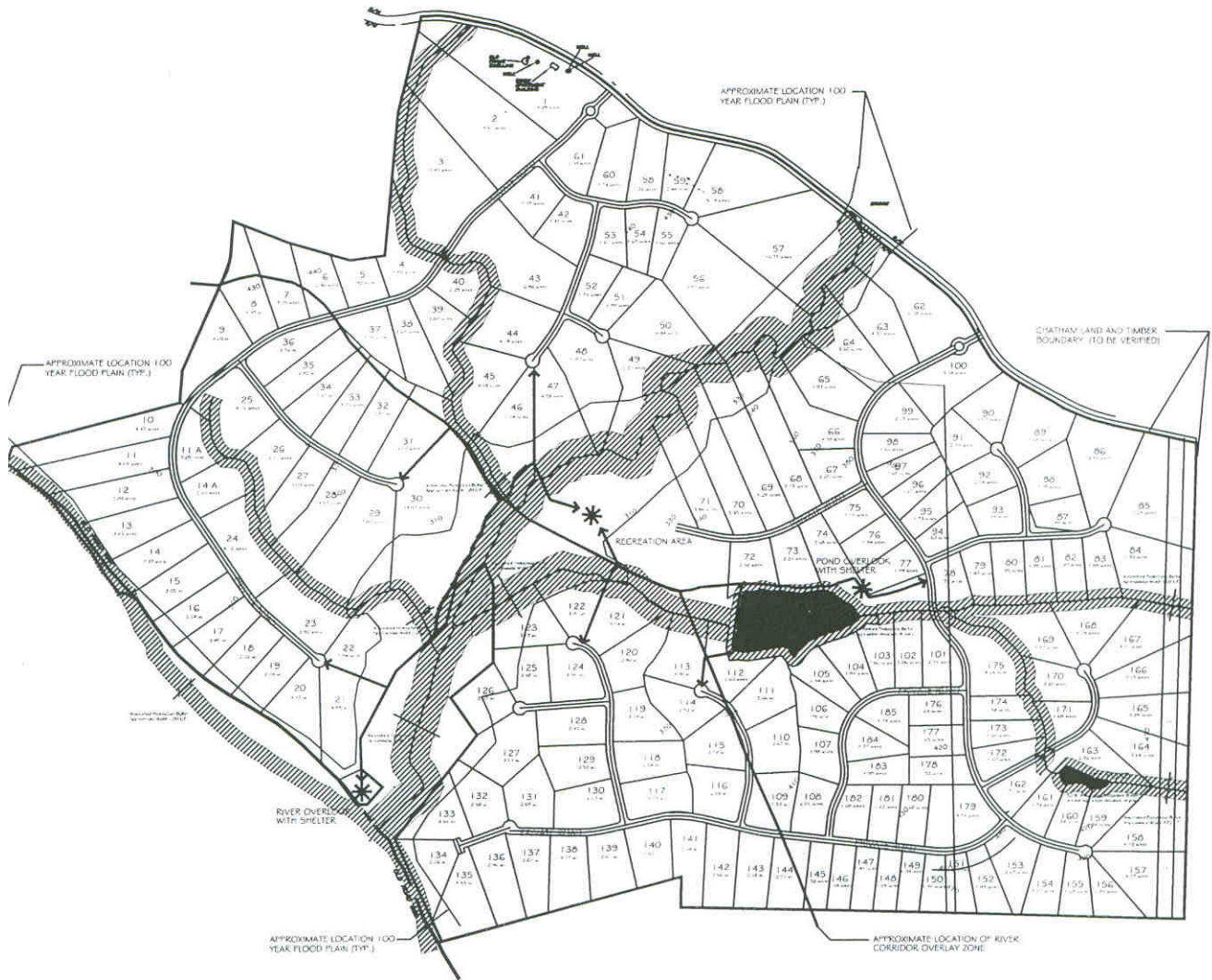
Rynal G. Stephenson, P.E.

Attachments

TECHNICAL APPENDIX

APPENDIX A

FIGURES



*PROPOSED RESIDENTIAL DEVELOPMENT
CHATHAM COUNTY, NORTH CAROLINA*

Site Land Use Plan

Scale: Not to Scale

Figure 1

EXISTING (2004) CONDITIONS

Bynum Ridge Road

← 14/29

17/24 →



BACKGROUND (2015) CONDITIONS

Bynum Ridge Road

← 23/49

28/41 →



LEGEND

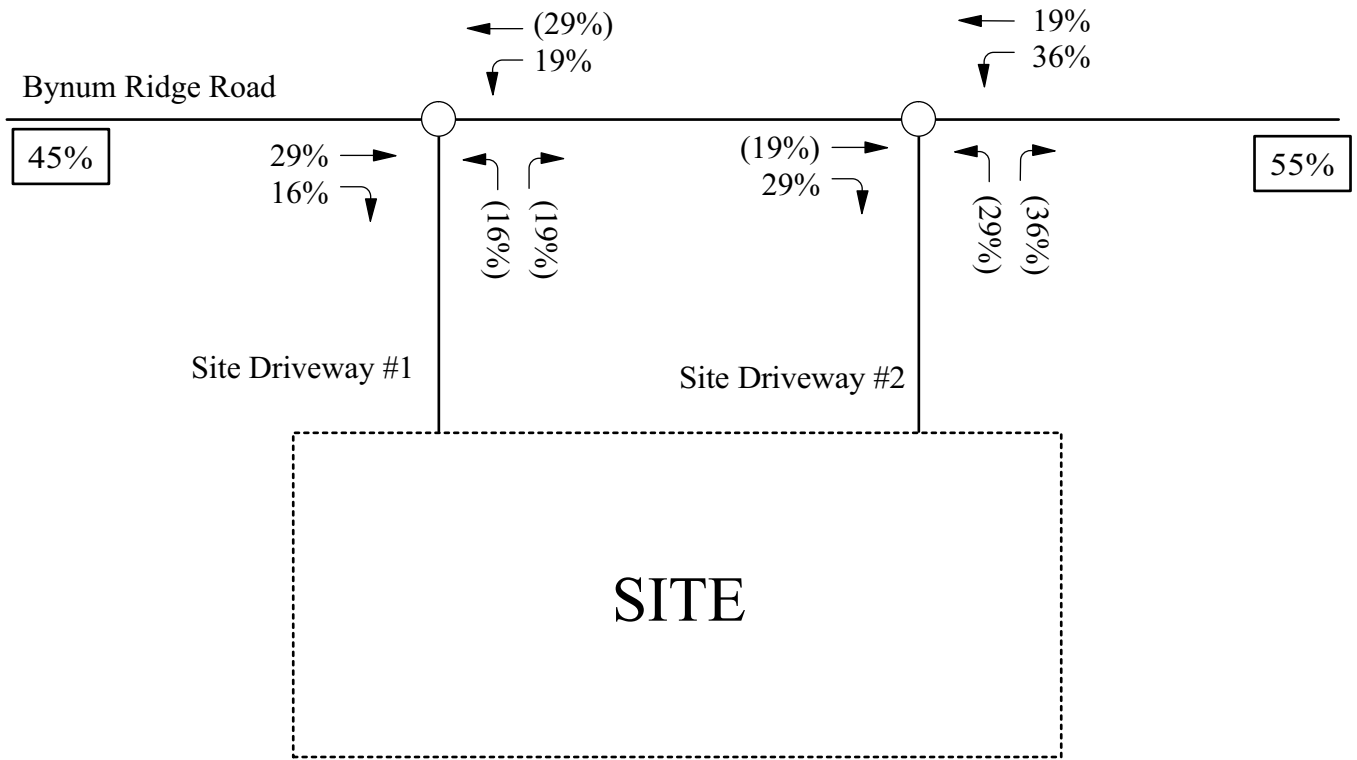
X/Y → AM/PM Peak Hour Traffic

*PROPOSED RESIDENTIAL DEVELOPMENT
CHATHAM COUNTY, NORTH CAROLINA*

Existing (2004) and Background (2015)
Peak Hour Traffic

Scale: Not to Scale

Figure 2

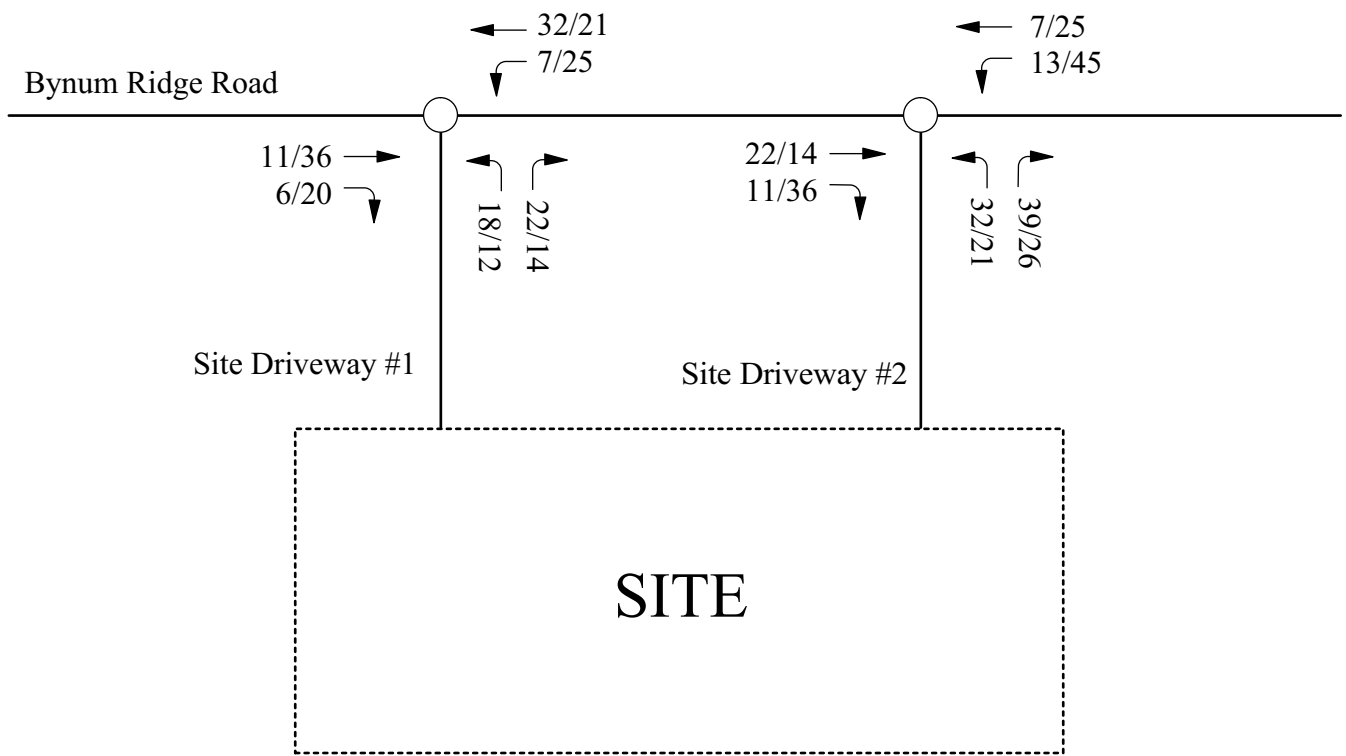


LEGEND

- Unsignalized Intersection
- X% → Percent of Entering Trips
- (Y%) → Percent of Exiting Trips



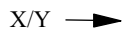
<i>PROPOSED RESIDENTIAL DEVELOPMENT CHATHAM COUNTY, NORTH CAROLINA</i>		
Site Trip Distribution Percentages		
	Scale: Not to Scale	Figure 3



LEGEND



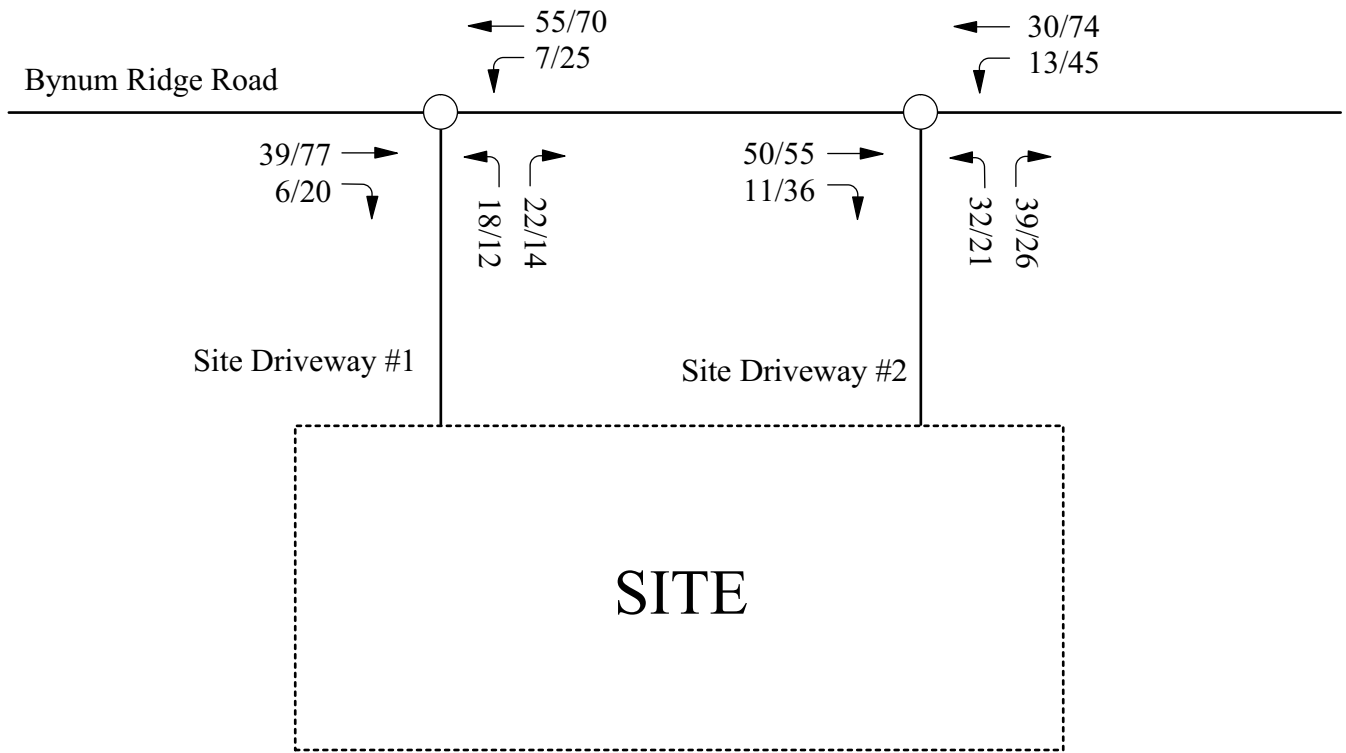
Unsignalized Intersection



X/Y AM/PM Peak Hour Trips



<i>PROPOSED RESIDENTIAL DEVELOPMENT CHATHAM COUNTY, NORTH CAROLINA</i>		
Peak Hour Site Trip Assignment		
	Scale: Not to Scale	Figure 4



LEGEND

- Unsignalized Intersection
- X/Y → AM/PM Peak Hour Trips












<i>PROPOSED RESIDENTIAL DEVELOPMENT CHATHAM COUNTY, NORTH CAROLINA</i>		
Combined (2015) Peak Hour Traffic		
	Scale: Not to Scale	Figure 5

APPENDIX B
TRAFFIC COUNT DATA

APPENDIX C
CAPACITY ANALYSIS RESULTS











3: Bynum Ridge Road & Site Driveway #1
Williams Pond Residential

Combined (2015) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	39	6	7	55	18	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	43	7	8	61	20	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			50		123	47
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			50		123	47
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	98
cM capacity (veh/h)			1557		867	1023
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	50	69	44			
Volume Left	0	8	20			
Volume Right	7	0	24			
cSH	1700	1557	946			
Volume to Capacity	0.03	0.00	0.05			
Queue Length (ft)	0	0	4			
Control Delay (s)	0.0	0.9	9.0			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.9	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			13.7%	ICU Level of Service		A











5: Bynum Ridge Road & Site Driveway #2
Williams Pond Residential

Combined (2015) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	50	11	13	30	32	39
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	56	12	14	33	36	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		124	62
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		124	62
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		96	96
cM capacity (veh/h)			1534		863	1003
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	48	79			
Volume Left	0	14	36			
Volume Right	12	0	43			
cSH	1700	1534	935			
Volume to Capacity	0.04	0.01	0.08			
Queue Length (ft)	0	1	7			
Control Delay (s)	0.0	2.3	9.2			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.3	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization			15.0%		ICU Level of Service	A










3: Bynum Ridge Road & Site Driveway #1
Williams Pond Residential

Combined (2015) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	77	20	25	70	12	14
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	86	22	28	78	13	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			108		230	97
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			108		230	97
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	98
cM capacity (veh/h)			1483		744	960
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	108	106	29			
Volume Left	0	28	13			
Volume Right	22	0	16			
cSH	1700	1483	846			
Volume to Capacity	0.06	0.02	0.03			
Queue Length (ft)	0	1	3			
Control Delay (s)	0.0	2.1	9.4			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.1	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			17.6%		ICU Level of Service	A

5: Bynum Ridge Road & Site Driveway #2
Williams Pond Residential

Combined (2015) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	55	36	45	74	21	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	61	40	50	82	23	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			101		263	81
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			101		263	81
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		97	97
cM capacity (veh/h)			1491		701	979
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	101	132	52			
Volume Left	0	50	23			
Volume Right	40	0	29			
cSH	1700	1491	832			
Volume to Capacity	0.06	0.03	0.06			
Queue Length (ft)	0	3	5			
Control Delay (s)	0.0	3.0	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			23.8%	ICU Level of Service		A