

TRAFFIC IMPACT  
ANALYSIS  
FOR  
CORNWALLIS CROSSINGS

LOCATED  
IN  
JOHNSTON COUNTY, NORTH CAROLINA

Prepared For:  
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March 2008

RKA Project #07270



03/26/08

**TRAFFIC IMPACT ANALYSIS REPORT  
CORNWALLIS CROSSINGS  
JOHNSTON COUNTY, NORTH CAROLINA**

**EXECUTIVE SUMMARY**

**1. Summary and Overview**

This study determines the potential impacts to the surrounding transportation system caused by the additional traffic generated by the proposed Cornwallis Crossings development to be located in the southwest quadrant of the NC 42 and Cornwallis Road intersection in the Cleveland Township, Johnston County, North Carolina and developed by Duke Lazzara Development, LLC.

The development is currently proposed to consist of an approximately 55,000 square foot supermarket, approximately 67,400 square feet of general retail space, and six (6) outparcels. At this time specific tenants of these outparcels are not known, therefore some typical land uses were assumed to be in place as follows: a convenience market with twelve (12) gasoline fueling positions, an approximately 15,000 square foot pharmacy with drive-thru, a bank with three (3) drive-thru lanes, an approximately 7,500 square foot high-turnover sit-down restaurant and two (2) approximately 3,500 square foot fast-food restaurants with drive-thru lanes. For the purpose of the study, the development is expected to be fully built-out in 2010. Access to the site is currently proposed via three (3) driveways along NC 42 and two (2) driveways along Cornwallis Road.

This study analyzed existing (2008) traffic conditions, background (2010) traffic conditions without the proposed development, combined (2010) traffic conditions with the proposed development in place and combined (2012) traffic conditions with the proposed development in place. The study area consists of the NC 42 and Cornwallis Road intersection, as well as the proposed site driveway intersections. An AM peak period [7:00 to 9:00] and PM peak period [4:30 to 6:30] turning movement count was conducted at the study intersection on January 7, 2008 by Ramey Kemp & Associates, Inc. Refer to Figure 1 for an illustration of the existing AM and PM peak hour volumes.

**2. Site Trip Generation**

Average weekday daily, AM and PM peak hour site trips for the study were calculated utilizing trip generation rates found in the Institute of Transportation Engineers (ITE) *Trip Generation* manual, 7<sup>th</sup> Edition. It is estimated that the development will generate approximately 23,822 trips during a typical weekday with 1,105 trips expected to occur during the AM peak hour and 1,902 trips expected to occur during the PM peak hour. However, not all of these trips will impact the adjacent roadway network. A portion of these trips will exist as pass-by trips. A summary of the trip generation is provided in Table 1.

**TABLE 1  
Site Trip Generation**

ITE Land Use (Code)	Size	Average Daily Traffic (vpd)	AM Peak Hour (vph)		PM Peak Hour (vph)	
			Entering	Exiting	Entering	Exiting
Supermarket (850)	55,000 sf	5,074	134	86	297	285
Shopping Center (820)	67,400 sf	5,255	75	48	232	251
Convenience Market with Gasoline Pumps (853)	12 fueling positions	6,511	103	103	115	115
Pharmacy/Drugstore with Drive-Thru (881)	15,000 sf	1,322	23	17	63	66
Drive-In Bank (912)	3 lanes	1,234	34	24	77	77
High-Turnover Sit-Down Restaurant (932)	7,500 sf	954	45	41	50	32
Fast-Food Restaurant with Drive-Thru (934)	3,500 sf	1,736	95	91	63	58
Fast-Food Restaurant with Drive-Thru (934)	3,500 sf	1,736	95	91	63	58
<b>Total Trips</b>		<b>23,822</b>	<b>604</b>	<b>501</b>	<b>960</b>	<b>942</b>
Less Pass-By Trips		11,264	156	156	408	408
Total Primary (New) Trips		12,558	448	345	552	534

**3. Site Access**

Access to the site is currently proposed via one (1) full-movement driveway along NC 42, two (2) right-in/right-out driveways along NC 42, and two (2) full-movement driveways along Cornwallis Road.

**4. Peak Hour Intersection Levels of Service**

Refer to the following table for a summary of intersection levels of service for the intersections considered in this study. Background traffic includes traffic from two (2) adjacent developments as well as traffic resulting from the 9% compounded annual growth rate applied to existing traffic as required by the Johnston County

Planning Department. Combined traffic includes background traffic as well as site traffic.

**TABLE 2**  
**Summary of Analysis Results**

INTERSECTION	A P P R O A C H	PEAK HOUR LEVEL OF SERVICE							
		Existing (2008)		Background (2010)		Combined (2010)		Combined (2012)	
		AM	PM	AM	PM	AM	PM	AM	PM
NC 42 (EB/WB) at Cornwallis Road (NB/SB) (Signalized)	EB	D	E	F (D)	F (D)	E (D)	F (D)	(D)	(C)
	WB	E	E	F (D)	F (D)	E (D)	F (E)	(D)	(D)
	NB	E	C	F (D)	D (D)	F (D)	F (D)	(E)	(E)
	SB	D	E	D (C)	F (D)	F (E)	F (E)	(C)	(D)
	<b>Overall</b>	<b>E</b>	<b>E</b>	<b>F (D)</b>	<b>F (D)</b>	<b>E (D)</b>	<b>F (D)</b>	<b>(D)</b>	<b>(D)</b>
NC 42 (EB/WB) at Site Driveway #1 (NB) / Existing Driveway (SB) (Unsignalized / Proposed Signal)	EB	A <sup>1</sup>	A <sup>1</sup>	B <sup>1</sup>	B <sup>1</sup>	C (B)	D (C)	(B)	(C)
	WB	--	--	--	--	B (B)	B (B)	(B)	(B)
	NB	--	--	--	--	E (E)	F (E)	(E)	(E)
	SB	D <sup>2</sup>	C <sup>2</sup>	E <sup>2</sup>	F <sup>2</sup>	D (E)	E (E)	(E)	(E)
	<b>Overall</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>C (B)</b>	<b>C (C)</b>	<b>(B)</b>	<b>(C)</b>
NC 42 (EB/WB) at Site Driveway #2 (NB) (Unsignalized)	EB					--	--	--	--
	WB	N/A	N/A	N/A	N/A	--	--	--	--
	NB					C <sup>2</sup> (A <sup>2</sup> )	F <sup>2</sup> (B <sup>2</sup> )	(A <sup>2</sup> )	(B <sup>2</sup> )
	<b>Overall</b>					<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
NC 42 (EB/WB) at Site Driveway #3 (NB) (Unsignalized)	EB					--	--	--	--
	WB	N/A	N/A	N/A	N/A	--	--	--	--
	NB					C <sup>2</sup> (A <sup>2</sup> )	F <sup>2</sup> (A <sup>2</sup> )	(A <sup>2</sup> )	(B <sup>2</sup> )
	<b>Overall</b>					<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
Cornwallis Road (NB/SB) at Site Driveway #4 (EB) (Unsignalized)	NB					A <sup>1</sup> (A <sup>1</sup> )	B <sup>1</sup> (B <sup>1</sup> )	(A <sup>1</sup> )	(B <sup>1</sup> )
	SB	N/A	N/A	N/A	N/A	--	--	--	--
	EB					D <sup>2</sup> (D <sup>2</sup> )	F <sup>2</sup> (F <sup>2</sup> )	(C <sup>2</sup> )	(D <sup>2</sup> )
	<b>Overall</b>					<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
Cornwallis Road (NB/SB) at Site Driveway #5 (EB) (Unsignalized)	NB					A <sup>1</sup> (A <sup>1</sup> )	C <sup>1</sup> (C <sup>1</sup> )	(A <sup>1</sup> )	(B <sup>1</sup> )
	SB	N/A	N/A	N/A	N/A	--	--	--	--
	EB					F <sup>2</sup> (F <sup>2</sup> )	F <sup>2</sup> (F <sup>2</sup> )	(D <sup>2</sup> )	(F <sup>2</sup> )
	<b>Overall</b>					<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>

( ) indicates LOS under improved conditions.

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

## 5. Accident Data Review

A 3 year accident summary for the intersection of NC 42 and Cornwallis Road (SR 1525) was obtained from NCDOT. The accident analysis revealed a total of 29 accidents for the 3 year period beginning May 1, 2004. A summary of the data is provided in the TIA.

## 6. Conclusions & Recommendations

Capacity analysis indicates that under existing traffic conditions, the signalized intersection of NC 42 and Cornwallis Road operates at an overall LOS E during both the AM and PM peak hours. Each of the intersection approaches currently operates at a LOS E or better during both the AM and PM peak hour periods. Under background

(2010) and combined (2010) traffic conditions, the signalized intersection is expected to operate at an overall LOS F during both the AM and PM peak hours. Significant delays and queues are expected to occur at each of the intersection approaches during both of the peak hour periods. *The intersection of NC 42 and Cornwallis Road is expected to operate poorly regardless of whether or not the proposed site is in place under future traffic conditions. Significant geometric and traffic control improvements would be needed in order to improve the operation of this intersection in the future.* It should be noted that these significant improvements represent improvements that are needed to mitigate impacts to the transportation network that are not a direct result of the proposed site being developed, therefore these improvements are considered to be outside the scope and responsibility of the developer.

The left turn movements from NC 42 and the minor street approach the Existing Driveway operates at an acceptable LOS during both the AM and PM peak hours under existing traffic conditions. The operation of this intersection is expected to deteriorate under background (2010) traffic conditions without improvements along NC 42. This intersection is proposed to be signalized and the main site driveway (Site Driveway #1) is proposed to align directly across from the Existing Driveway when the proposed site is developed. The proposed signalized intersection of NC 42 and Existing Driveway / Site Driveway #1 is expected to operate at an overall intersection LOS C or better during both the AM and PM peak hours. In addition, the eastbound and westbound approaches of NC 42 are also expected to operate at LOS D or better during both the AM and PM peak hours.

The following improvements are recommended to be constructed as part of this project:

#### Intersection of NC 42 and Cornwallis Road

- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct a second exclusive left turn lane to create dual left turn lanes on the eastbound approach of NC 42 with a minimum length of 300 feet of full width storage and deceleration distance and the appropriate length of taper. As part of this improvement, a second receiving lane should be constructed on the northern leg of Cornwallis Road. This second receiving lane should provide a minimum of 500 feet of full width travel lane before tapering down to a single northbound travel lane. It should be noted that the northbound receiving lane is proposed along the frontage of the Cornwallis Commons adjacent development and consideration should be given to this developer's responsibility to provide a portion of this improvement given this adjacent developments impacts on the study intersection.
- Restripe the existing northbound exclusive right turn lane on Cornwallis Road to allow through movements as well as right turn movements.
- Modify the existing traffic signal to provide a right turn overlap phase for the

eastbound right turn movement on NC 42. In addition, this signal should be interconnected to the proposed signal to the west in order to allow coordinated traffic operation along NC 42.

Intersection of NC 42 and Existing Site Driveway / Site Driveway #1

- Construct Site Driveway #1 with two egress lanes (one shared left-through lane and one exclusive right turn lane) and two ingress lane.
- Construct exclusive dual left turn lanes on the westbound approach of NC 42 with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper. It should be noted that an exclusive westbound left turn lane with 100 feet of full storage and bay taper already exists at this intersection.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 150 feet of full width storage and deceleration distance and the appropriate length of taper.
- Install a new traffic signal that provides protected phase for the eastbound and westbound left turn movements as well as an overlap phase for the northbound right turn movement. In addition, this signal should be interconnected to the proposed existing traffic signal to the east in order to allow coordinated traffic operation along NC 42.

Intersection of NC 42 and Site Driveway #2

- Construct Site Driveway #2 with one egress lane (one exclusive right turn lane) and one ingress lane.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

Intersection of NC 42 and Site Driveway #3

- Construct Site Driveway #3 with one egress lane (one exclusive right turn lane) and one ingress lane.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

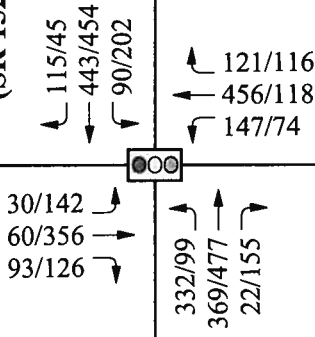
Intersection of Cornwallis Road and Site Driveway #4

- Construct Site Driveway #4 with two egress lanes (one exclusive left turn lane and one exclusive right turn lane) and one ingress lane.
- Construct an exclusive left turn lane on the northbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct an exclusive right turn lane on the southbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

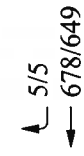
Intersection of Cornwallis Road and Site Driveway #5

- Construct Site Driveway #5 with two egress lanes (one exclusive left turn lane and one exclusive right turn lane) and one ingress lane.
- Construct an exclusive left turn lane on the northbound approach of Cornwallis Road with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct an exclusive right turn lane on the southbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

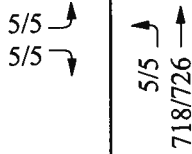
**Cornwallis Road  
(SR 1525)**



**Existing  
Driveway**



**NC 42**



\* Traffic counts were not taken at this intersection. The turning movements at this intersection were assumed to be five vehicles per movement. The through traffic volumes on NC 42 were determined by balancing the volumes with the counts taken at the intersection of NC 42 and Cornwallis Road/

**LEGEND**



Signalized Intersection

XX/XX

Traffic Volumes - AM Peak/PM Peak



**CORNWALLIS CROSSINGS  
JOHNSTON CO., NORTH CAROLINA**

Existing (2008) Traffic Conditions

Scale: Not to Scale

Figure 1

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**TRAFFIC IMPACT ANALYSIS REPORT  
CORNWALLIS CROSSINGS  
JOHNSTON COUNTY, NORTH CAROLINA**

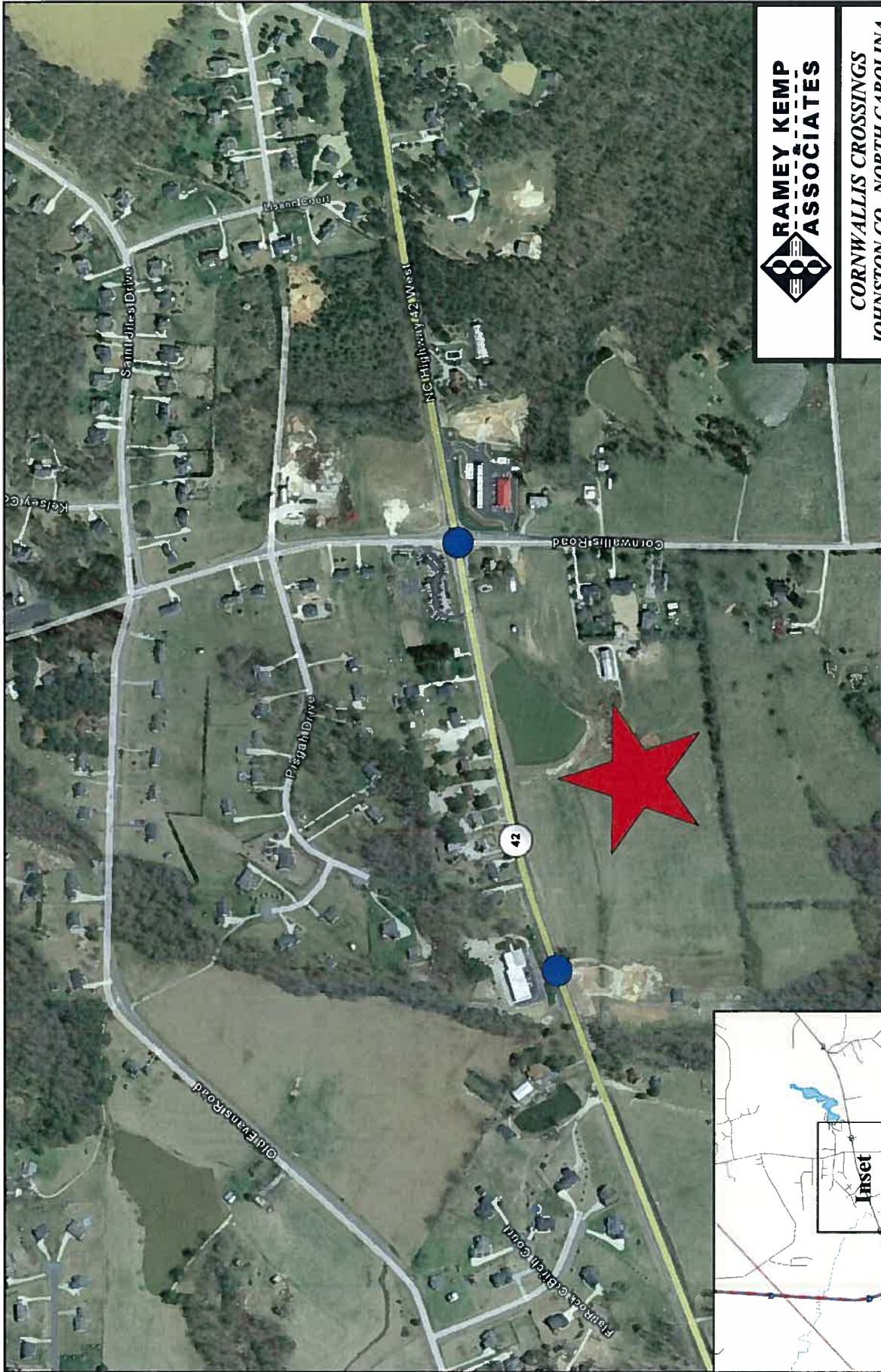
**1. INTRODUCTION**


This report summarizes the findings of the Traffic Impact Analysis (TIA) that was conducted for the proposed Cornwallis Crossings retail development, located in the southwest quadrant of the NC 42 and Cornwallis Road intersection in Johnston County, North Carolina. The development is currently proposed to consist of an approximately 55,000 square foot supermarket, approximately 67,400 square feet of general retail space, and six (6) outparcels. For the purpose of the study, the development is expected to be fully built-out in 2010. Access to the site is currently proposed via one (1) full-movement driveway along NC 42, two (2) right-in/right-out driveways along NC 42, and two (2) full-movement driveways along Cornwallis Road.

The purpose of this study is to determine the impact to the surrounding transportation system caused by the traffic generated by the proposed development. It was determined that the following traffic conditions would need to be studied in order to accomplish the objective: 1) existing (2008) traffic conditions, 2) background (2010) traffic conditions without the proposed development in place, 3) combined (2010) conditions with the proposed development in place, and 4) combined (2012) conditions with the proposed development in place.



**1.1. Site Location and Study Area**

The proposed development is located in the southwest quadrant of the NC 42 and Cornwallis Road intersection in Johnston County, North Carolina, as illustrated on Figure 1. The scope of the project was developed through coordination with the North Carolina Department of Transportation (NCDOT) and the Johnston County Planning Department. Based on coordination efforts, it was determined that the study area would consist of the NC 42 / Cornwallis Road intersection, NC 42 / Existing Driveway to the west of Cornwallis Road, and the proposed site driveways.



	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Site Location Map	
Scale: Not to Scale	Figure 1

**LEGEND**

-  Off-site Study Intersections
-  Site Location



### **1.2. Proposed Land Use and Site Access**

The development is currently proposed to consist of an approximately 55,000 square foot supermarket, approximately 67,400 square feet of general retail space, and six (6) outparcels. Access to the site is currently proposed via one (1) full-movement driveway along NC 42, two (2) right-in/right-out driveways along NC 42, and two (2) full-movement driveways along Cornwallis Road. Refer to Figure 2 for a conceptual sketch of the site layout and proposed driveway connections.

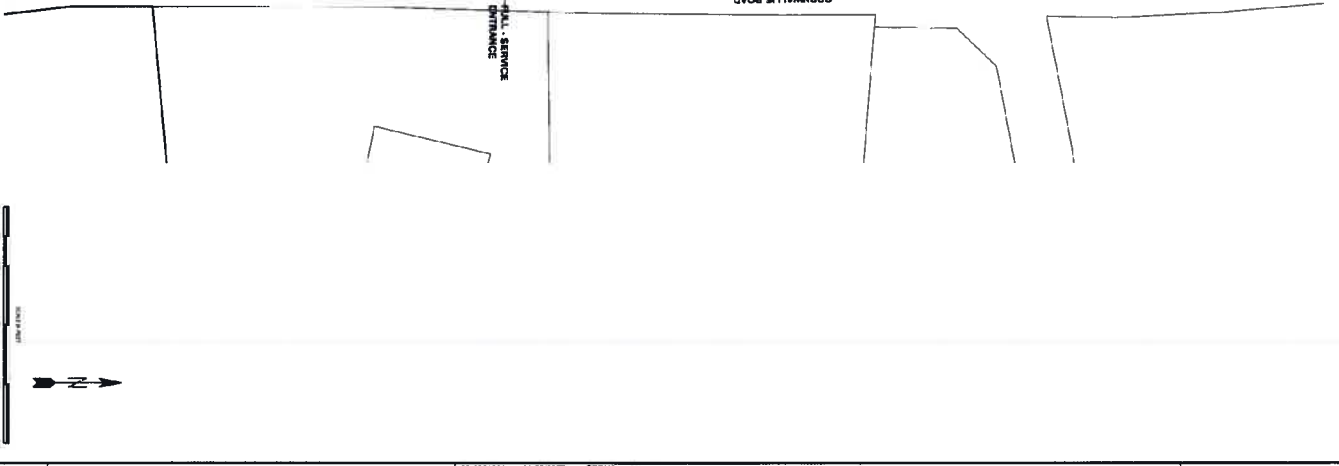
### **1.3. Existing and Proposed Adjacent Land Uses**

The existing land uses within the study area consist of small commercial businesses, scattered residential housing and vacant farmland. Cleveland Auto Sales is located in the northwest quadrant of the NC 42/Cornwallis Road intersection and a Citgo gas station is located in the southeast quadrant. In addition, there is a car-repair shop located on the north side of NC 42 with an existing driveway connection onto NC 42. Site Driveway #1 is proposed to align with the existing driveway on the north side of NC 42.

Based on discussions with the NCDOT and the Johnston County Planning Department, there are two (2) approved adjacent developments that shall be considered in the analyses. The Cornwallis Commons development is proposed in the northeast quadrant of the NC 42 and Cornwallis Road intersection and is proposed to consist of approximately 100,000 square feet of retail space. The Cunningham Tract is a proposed residential subdivision, located along the east side of Cornwallis Road, north of NC 42. Further discussion of the adjacent development traffic is provided in Section 4.

### **1.4. Existing and Proposed Roadways**

Roads in the study area include NC 42 and Cornwallis Road [SR 1525]. NC 42 is primarily a two-lane, undivided facility in the vicinity of the proposed development with a posted speed limit of 45 mph. NC 42 had an Average Daily Traffic (ADT) volume of approximately 15,000 vehicles per day (vpd) to the west of Cornwallis Road and approximately 13,000 vpd to the east of Cornwallis Road according to the NCDOT 2006 AADT Map.



SHEET  
C1.2  
1 OF 1

**CORNWALLIS RD/  
NC 42 COMMERCIAL**  
XXXX XXXXXXXXXXXXXXXX  
XXXX OF XXXXX XXXX COUNTY, NORTH CAROLINA

03-0721009 11/09/2007 CRP/JA  
JOB NO. DATE DRAWN BY  
**SITE PLAN**  
SCALE: 1" = 100' CHK BY:

NO.	DATE	DESCRIPTION	BY
REVISIONS			

**BASS, NIXON & KENNEDY, INC.**  
**CONSULTING ENGINEERS**  
• 5716 CRAPEL HILL ROAD, SUITE 209, RALEIGH, NC 27607  
• 3319 HERITAGE TRADE DRIVE, SUITE 201, WAKE FOREST, NC 27587  
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Cornwallis Road (SR 1565) is primarily a two-lane, undivided facility in the vicinity of the proposed development with a posted speed limit of 55 mph. Cornwallis Road had an Average Daily Traffic (ADT) volume of approximately 7,300 vpd to the north of NC 42 and approximately 7,400 vpd to the south of NC 42 according to the NCDOT 2006 AADT Map.

## **2. TRAFFIC ANALYSIS PROCEDURE**

Study intersections were analyzed using the methodology outlined in the 2000 Highway Capacity Manual (HCM) published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (version 7), was used to complete the analyses for all of the study area intersections. Synchro 7 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 2000 HCM. Therefore, Synchro 7 was used to conduct all capacity analyses at unsignalized and signalized intersections in this study. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

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 conditions.” Level of service (LOS) is a term used to represent different driving conditions, and is defined as a “qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers.”

Level of service varies from Level “A” representing free flow, to Level “F” where breakdown conditions are evident. Refer to Table 2.0 for HCM levels of service and related average control delay per vehicle for both signalized and unsignalized Intersections. Control delay as defined by the HCM includes “initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay”. An average control delay of 50 seconds at a signalized intersection results in a level of service D operation at the intersection.

**TABLE 1**  
**Highway Capacity Manual - Levels of Service and Delay**

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

### 3. EXISTING TRAFFIC CONDITIONS

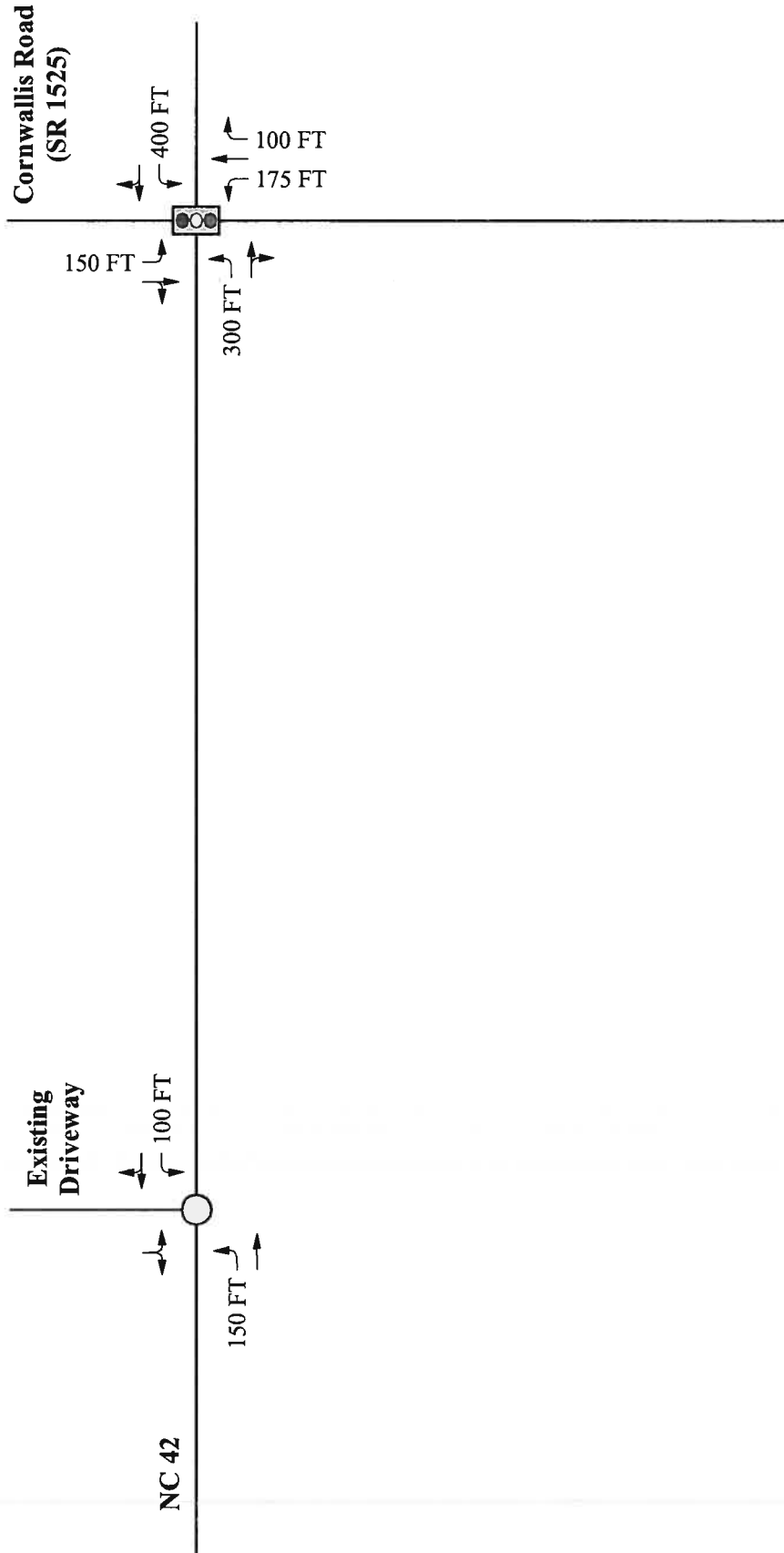
Existing lane configurations (number of traffic lanes on the intersection approach), lane widths, storage capacities, traffic signal data and other intersection and roadway information was collected through field reconnaissance by Ramey Kemp & Associates, Inc. (RKA). Refer to Figure 3 for the existing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


#### 3.1. Existing (2008) Peak Hour Traffic Volumes

Existing (2008) peak hour turning movement traffic counts were conducted by RKA at the following intersections on the date noted:

- NC 42 at Cornwallis Road January 7, 2008



Peak period counts were conducted during the weekday AM peak period [7:00 to 9:00] and PM peak period [4:30 PM – 6:30 PM]. It should be noted that the turning movement volumes at the existing driveway connection to NC 42 to the west of Cornwallis Road were estimated since it was expected that volumes at this intersection are very low. Refer to Appendix A for a copy of the raw traffic count data. Refer to Figure 4 for the existing (2008) weekday AM and PM peak hour traffic volumes.

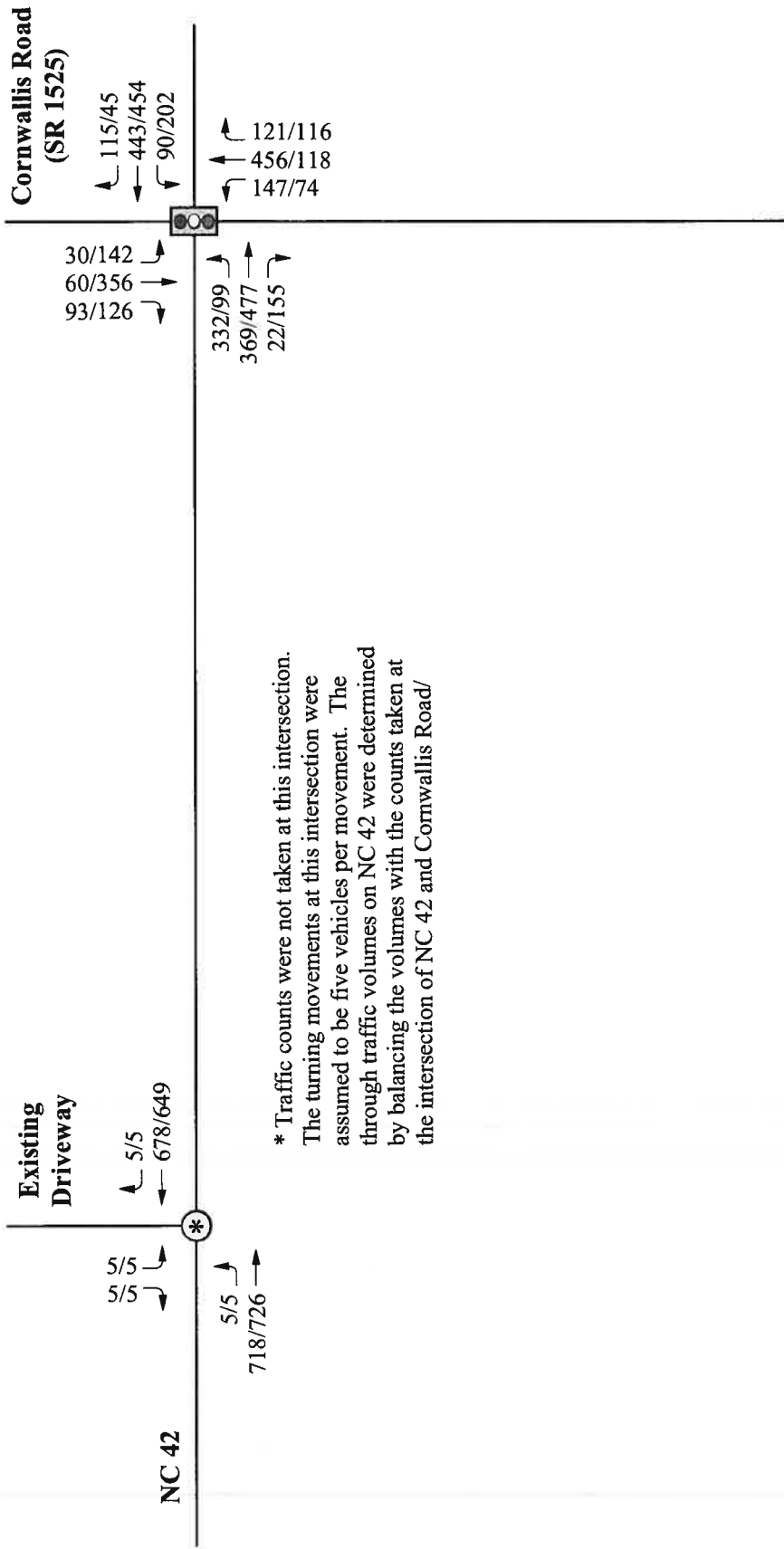


 <b>RAMEY KEMP ASSOCIATES</b>	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Existing Traffic Lanes	
Scale: Not to Scale	Figure 3



**LEGEND**

-  Signalized Intersection
-  Existing Traffic Lanes



\* Traffic counts were not taken at this intersection. The turning movements at this intersection were assumed to be five vehicles per movement. The through traffic volumes on NC 42 were determined by balancing the volumes with the counts taken at the intersection of NC 42 and Cornwallis Road/

**LEGEND**



Signalized Intersection

XX/XX

Traffic Volumes - AM Peak/PM Peak



**CORNWALLIS CROSSINGS**  
JOHNSTON CO., NORTH CAROLINA

Existing (2008) Traffic Conditions

Scale: Not to Scale

Figure 4

### **3.2. Analysis of Existing (2008) Peak Hour Traffic Conditions**

The existing (2008) weekday AM and PM peak hour traffic volumes were analyzed to determine the current Levels of Service (LOS) at the study intersections under existing roadway conditions. The results of these analyses are presented in Section 7 of this report.

## **4. BACKGROUND TRAFFIC CONDITIONS**

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 proposed development is constructed. Background traffic is comprised of projected traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

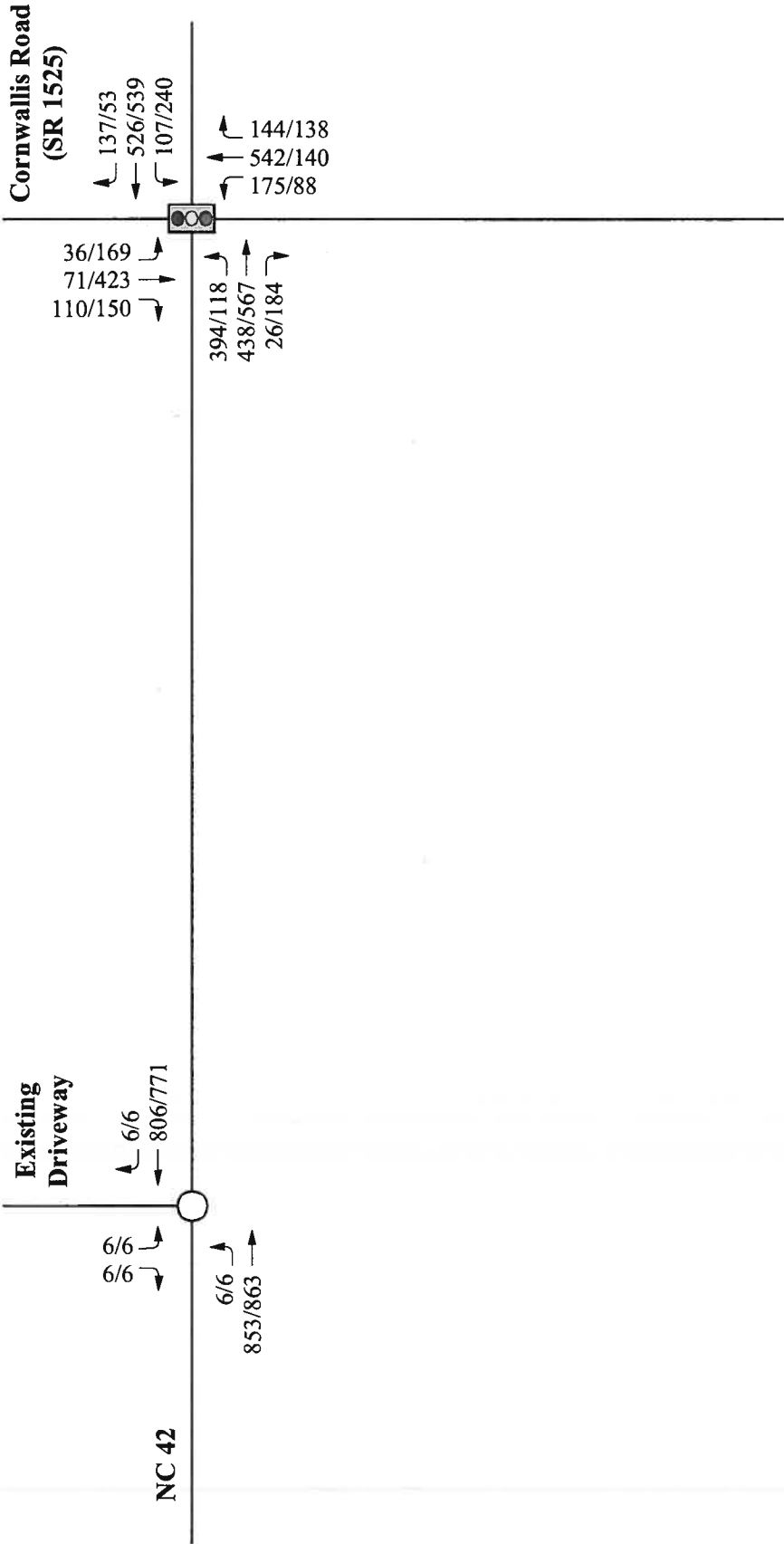
### **4.1. Projected Traffic Growth**

Based on the Johnston County Planning Department Traffic Impact Analysis Guidelines, a compounded annual growth rate of 9.0% was used for the study. The growth rate was applied to the existing traffic volumes to calculate traffic growth to both the build-out year of the proposed development as well as two years beyond the build-out year of the proposed development. Refer to Figure 5 for the projected (2010) weekday AM and PM peak hour traffic volumes and Figure 6 for the projected (2012) weekday AM and PM peak hour traffic volumes.

### **4.2. Adjacent Development Traffic**

Based on discussions with the NCDOT and the Johnston County Planning Department, there are two (2) approved adjacent developments in the vicinity of the proposed development that shall be considered. The Cornwallis Commons development is proposed in the northeast quadrant of the NC 42 and Cornwallis Road intersection and is proposed to consist of approximately 100,000 square feet of retail space. The Cunningham Tract is a proposed residential subdivision, located along the east side of Cornwallis Road, north of NC 42. Based on a review of adjacent development traffic information provided by the County, AM and PM peak hour volumes associated with the developments were assigned to

the study intersection, as illustrated on Figure 7. Refer to Appendix B for more detailed information on the adjacent development traffic.




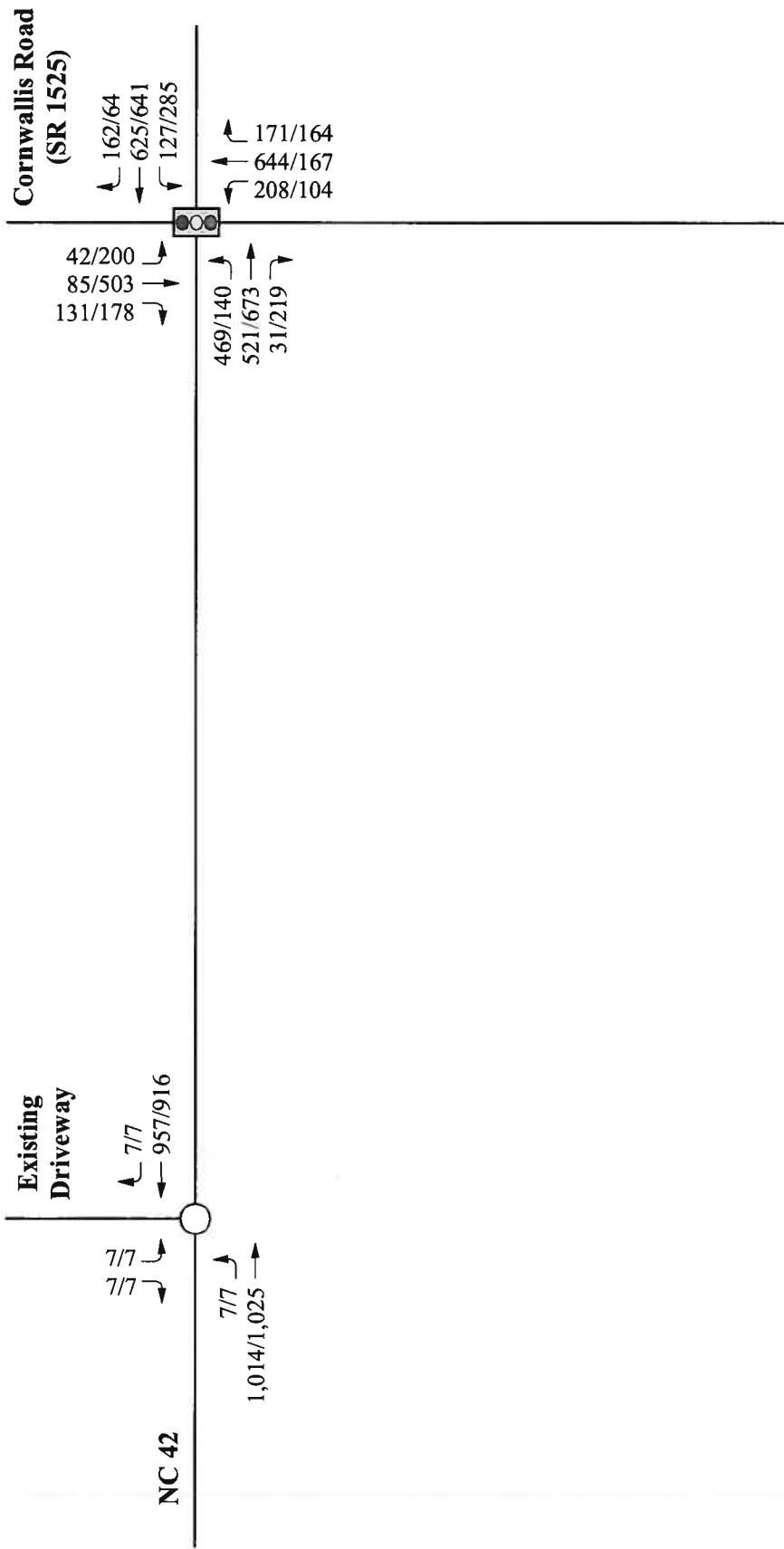
**LEGEND**

 Signalized Intersection


XX/XX Traffic Volumes - AM Peak/PM Peak




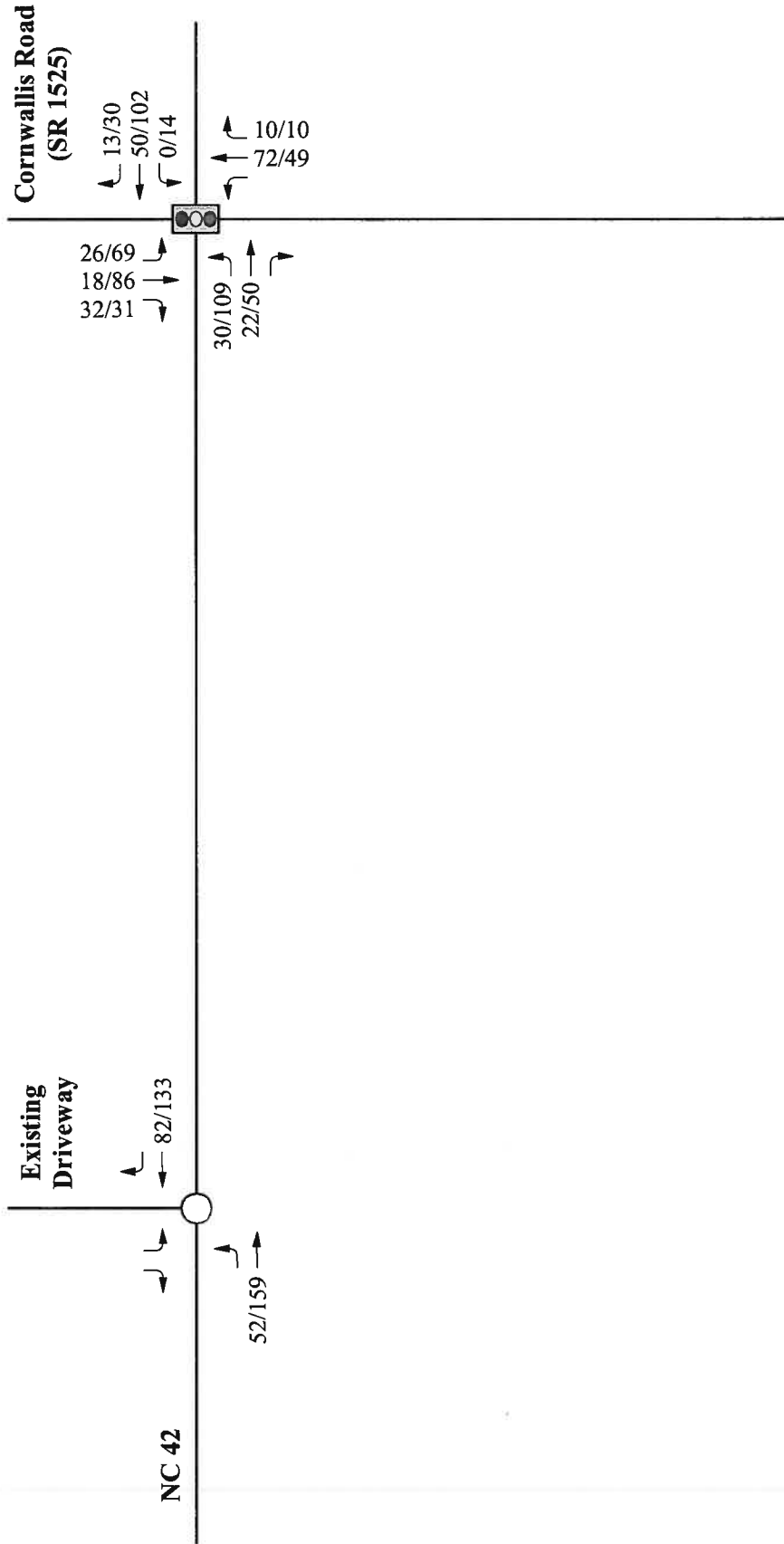
	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Projected (2010) Traffic Conditions	
Scale: Not to Scale	Figure 5




**LEGEND**

-  Signalized Intersection
- XX/XX Traffic Volumes - AM Peak/PM Peak

	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Projected (2012) Traffic Conditions	
Scale: Not to Scale	Figure 6



**LEGEND**

-  Signalized Intersection
- XX/XX** Traffic Volumes - AM Peak/PM Peak



<b>RAMEY KEMP &amp; ASSOCIATES</b>	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Total Adjacent Development Traffic	
Scale: Not to Scale	Figure 7

#### **4.3. Background (2010) Peak Hour Traffic Conditions**

The background (2010) peak hour traffic volumes were determined by adding the projected (2010) traffic volumes (Figure 5) and the approved adjacent development traffic (Figure 7). Refer to Figure 8 for an illustration of the background (2010) AM and PM peak hour traffic volumes at the study intersection.

#### **4.4. Analysis of Background (2010) Peak Hour Traffic Conditions**

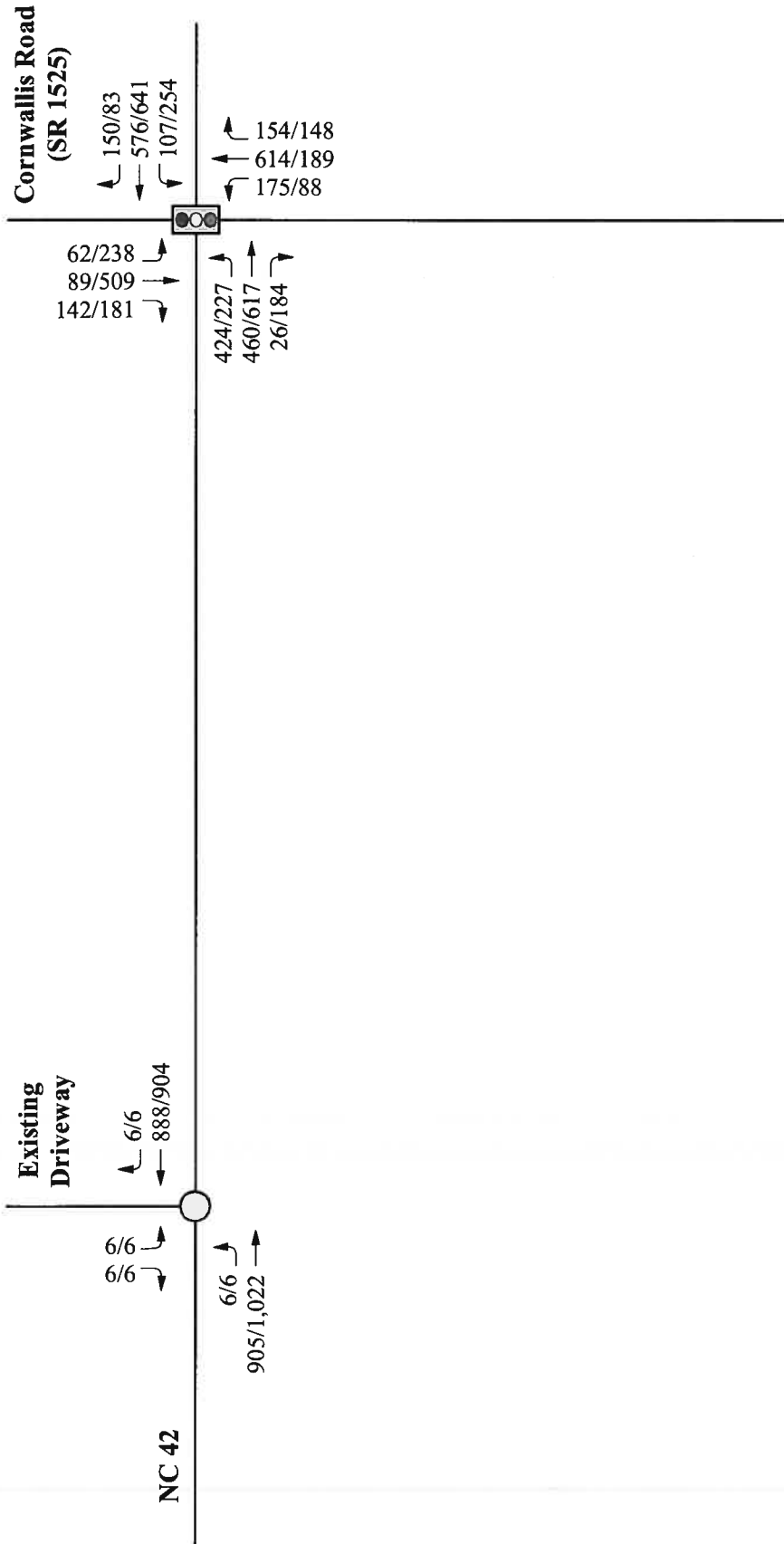
The analysis of background traffic conditions allows a determination of impacts created by the site by comparing the analysis results of future traffic conditions with the same future traffic conditions with the addition of site traffic. The background peak hour traffic volumes at the study intersection were analyzed using the lane configurations and traffic control conditions as discussed in Section 3.2. It should be noted that roadway improvements associated with the Cornwallis Commons development were considered in the background analyses. In addition, per the Johnston County Guidelines, improvements are to be determined that would bring the study intersections to an acceptable level of service under future traffic conditions. Therefore, the background (2010) traffic volumes were analyzed with roadway and traffic control improvements in place and this analysis scenario is referred to as the Background (2010) Improved analysis. The results of these analyses are presented in Section 7 of this report.


#### **4.5. Background (2012) Peak Hour Traffic Conditions**

The background (2012) peak hour traffic volumes were determined by adding the projected (2012) traffic volumes (Figure 6) and the approved adjacent development traffic (Figure 7). Refer to Figure 9 for an illustration of the background (2012) AM and PM peak hour traffic volumes at the study intersection.

#### **4.6. Analysis of Background (2012) Peak Hour Traffic Conditions**


The background (2012) traffic conditions were not analyzed in this study since the development is expected to be in place by 2010.

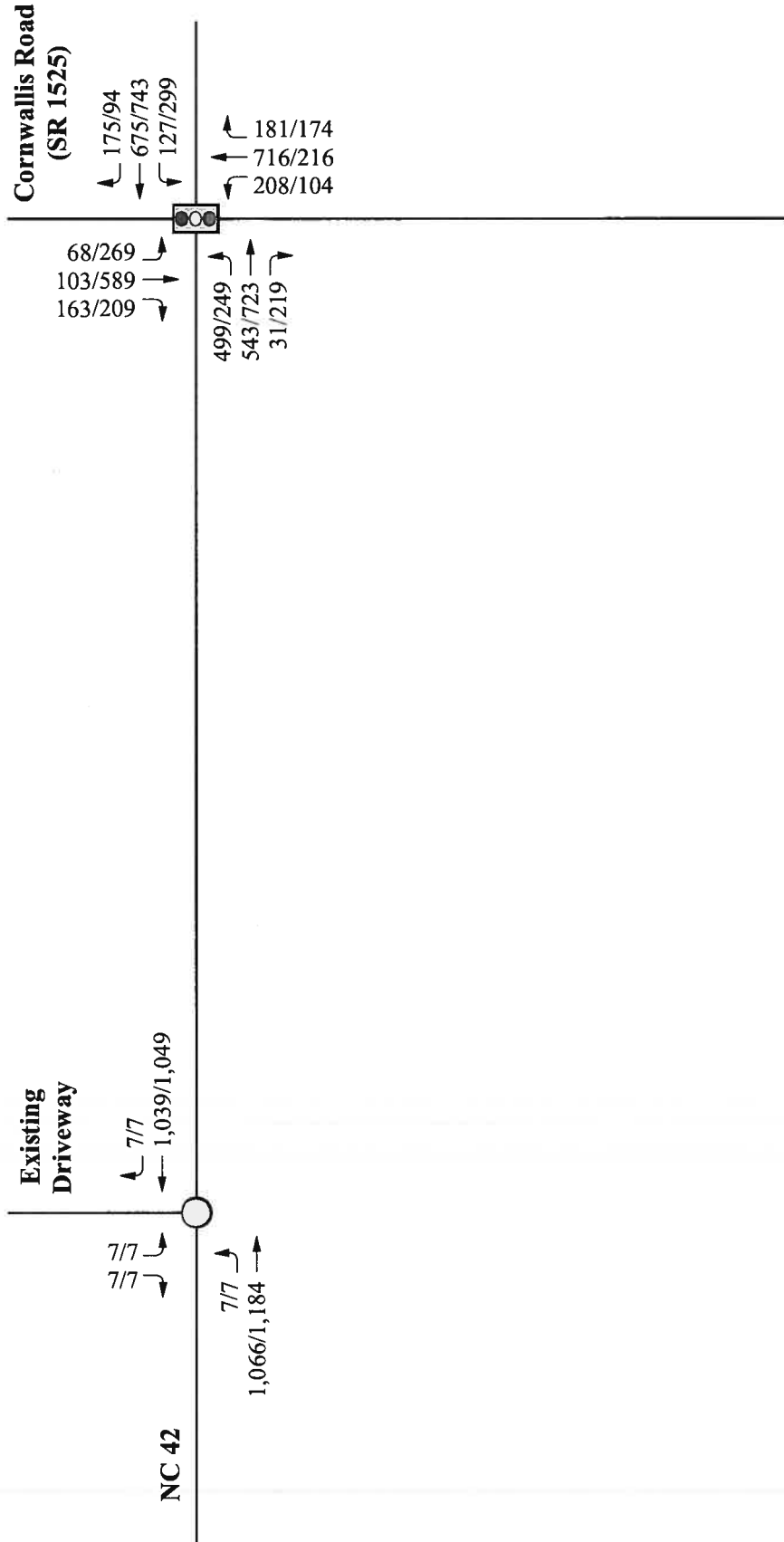


 <b>RAMEY KEMP ASSOCIATES</b>	
<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Background (2010) Traffic Conditions	
Scale: Not to Scale	Figure 8



**LEGEND**

-  Signalized Intersection
- XX/XX Traffic Volumes - AM Peak/PM Peak



**LEGEND**




Signalized Intersection

XX/XX

Traffic Volumes - AM Peak/PM Peak



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Background (2012) Traffic Conditions	
Scale: Not to Scale	Figure 9

## **5. TRIP GENERATION**

The average weekday daily, AM peak and PM peak hour site trips for the proposed development were calculated utilizing the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (7<sup>th</sup> Edition). The development is currently proposed to consist of an approximately 55,000 square foot supermarket, approximately 67,400 square feet of general retail space, and six (6) outparcels. At this time, the specific tenants of these outparcels are not known, therefore specific land uses were assumed in order to generate traffic. The following land uses were assumed for the purposes of this study: a convenience market with twelve (12) gasoline fueling positions, an approximately 15,000 square foot pharmacy with drive-thru, a bank with three (3) drive-thru lanes, an approximately 7,500 square foot high-turnover sit-down restaurant and two (2) approximately 3,500 square foot fast-food restaurants with drive-thru lanes. The proposed site is expected to generate 23,822 total trips (11,911 enter and 11,911 exit) during an average weekday 24-hour period. Of this total, 1,105 total trips (604 enter and 501 exit) will occur during the AM peak hour and 1,902 total trips (960 enter and 942 exit) will occur during the PM peak hour. However, not all of the trips expected to be generated by the proposed development are expected to be new trips to the study area. Some of the site trips are considered pass-by trips. Table 2 summarizes the estimated traffic generation for the proposed development.

### **5.1. Pass-By Trip Adjustments**

The ITE *Trip Generation Handbook* defines pass-by trips as intermediate stops on the way from an origin to a primary trip destination. Pass-by trips are attracted from the traffic passing the site on an adjacent street, when the adjacent street provides direct access to the generator. These trips will not add to the overall traffic volumes on the roadway, but will add to the turning traffic at the site's driveway connections. ITE pass-by rates were applied to trips along NC 42 and Cornwallis Road during the AM and PM peak hours. Pass-by rates for daily traffic volumes are not available from the ITE Trip Generation Manual, therefore the PM peak hour pass-by rates were applied to the daily traffic volumes. Refer to Table 2 for a breakdown of pass-by trips for the development.

## 5.2. Primary Trips

Primary trips are new trips drawn to the study area by the proposed development. Primary trips are determined by subtracting the pass-by trips from the total trips generated by the proposed development. The proposed site is expected to generate 12,558 primary (new) trips (6,279 enter and 6,279 exit) during an average weekday 24-hour period. Of this total, 793 primary (new) trips (448 enter and 345 exit) are expected to occur during the AM peak hour and 1,086 primary (new) trips (552 enter and 534 exit) are expected to occur during the PM peak hour. Refer to Table 2 for a breakdown of primary trips for the development.

**TABLE 2  
Trip Generation**

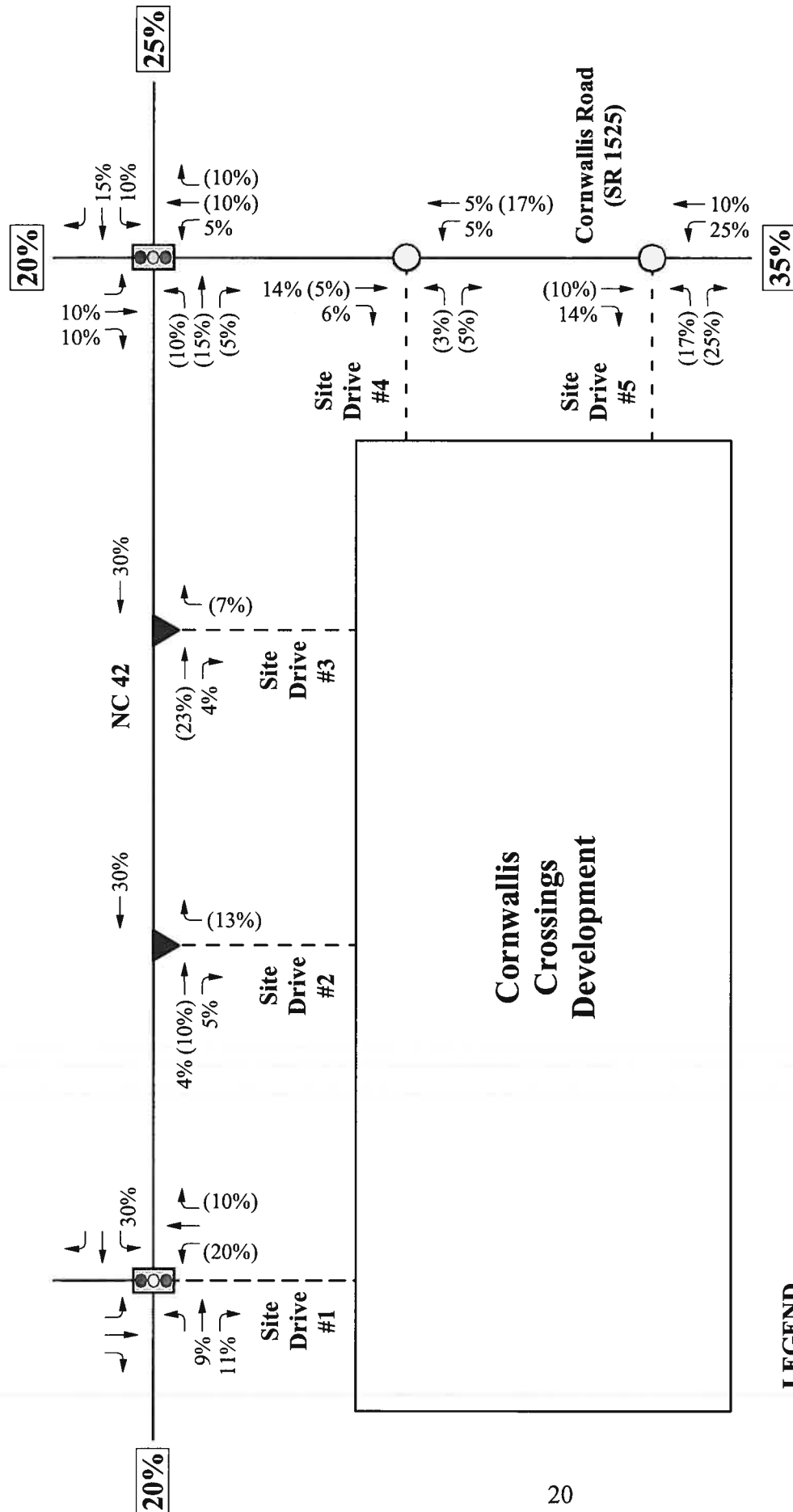
ITE Land Use (Code)	Size	Average Daily Traffic (vpd)	AM Peak Hour (vph)		PM Peak Hour (vph)	
			Entering	Exiting	Entering	Exiting
Supermarket (850)	55,000 sf	5,074	134	86	297	285
Shopping Center (820)	67,400 sf	5,255	75	48	232	251
Convenience Market with Gasoline Pumps (853)	12 fueling positions	6,511	103	103	115	115
Pharmacy/Drugstore with Drive-Thru (881)	15,000 sf	1,322	23	17	63	66
Drive-In Bank (912)	3 lanes	1,234	34	24	77	77
High-Turnover Sit-Down Restaurant (932)	7,500 sf	954	45	41	50	32
Fast-Food Restaurant with Drive-Thru (934)	3,500 sf	1,736	95	91	63	58
Fast-Food Restaurant with Drive-Thru (934)	3,500 sf	1,736	95	91	63	58
<b>Total Trips</b>		<b>23,822</b>	<b>604</b>	<b>501</b>	<b>960</b>	<b>942</b>
Less Pass-By Trips		11,264	156	156	408	408
Total Primary (New) Trips		12,558	448	345	552	534

### **5.3. Site Trip Distribution and Assignment**

Trip distribution percentages are based on the location of residential housing, local employment centers, existing traffic patterns, engineering judgment, and discussions with NCDOT and the Johnston County Planning Department. Based on the location of the proposed development, it is anticipated that the primary site traffic distribution into the development will be as follows:

- 20% to/from the west along NC 42
- 25% to/from the east along NC 42
- 20% to/from the north along Cornwallis Road
- 35% to/from the south along Cornwallis Road

Refer to Figure 10 for an illustration of the primary trip distribution percentages. The primary site trips illustrated in Table 2 were assigned to the study intersections based on the distribution percentages shown on Figure 10 and are illustrated on Figure 11. Refer to Figure 12 for an illustration of the pass-by trip distribution percentages. Pass-by site trips illustrated in Table 2 were assigned to the study intersections based on the distribution percentages shown in Figure 12 and are illustrated on Figure 13. Primary site trips (Figure 11) were added to pass-by site trips (Figure 13) to determine the total peak hour site trips (Figure 14).



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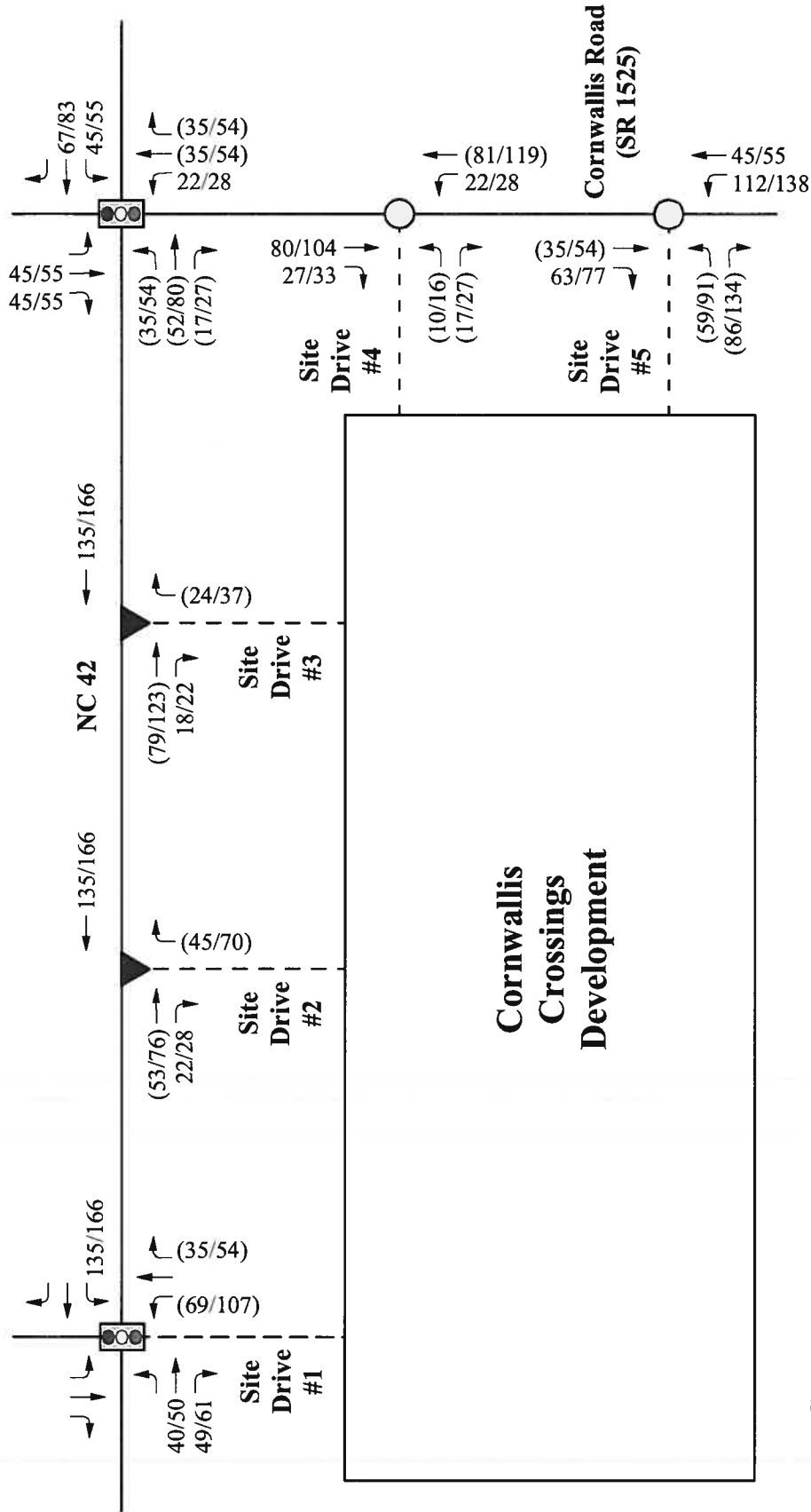
Primary Trip Distribution

Scale: Not to Scale




Figure 10



- LEGEND**
- Signalized Intersection
  - Unsignalized Intersection
  - Right-In / Right-Out
  - XX% (XX%) Distribution Percentages Entering (Exiting)

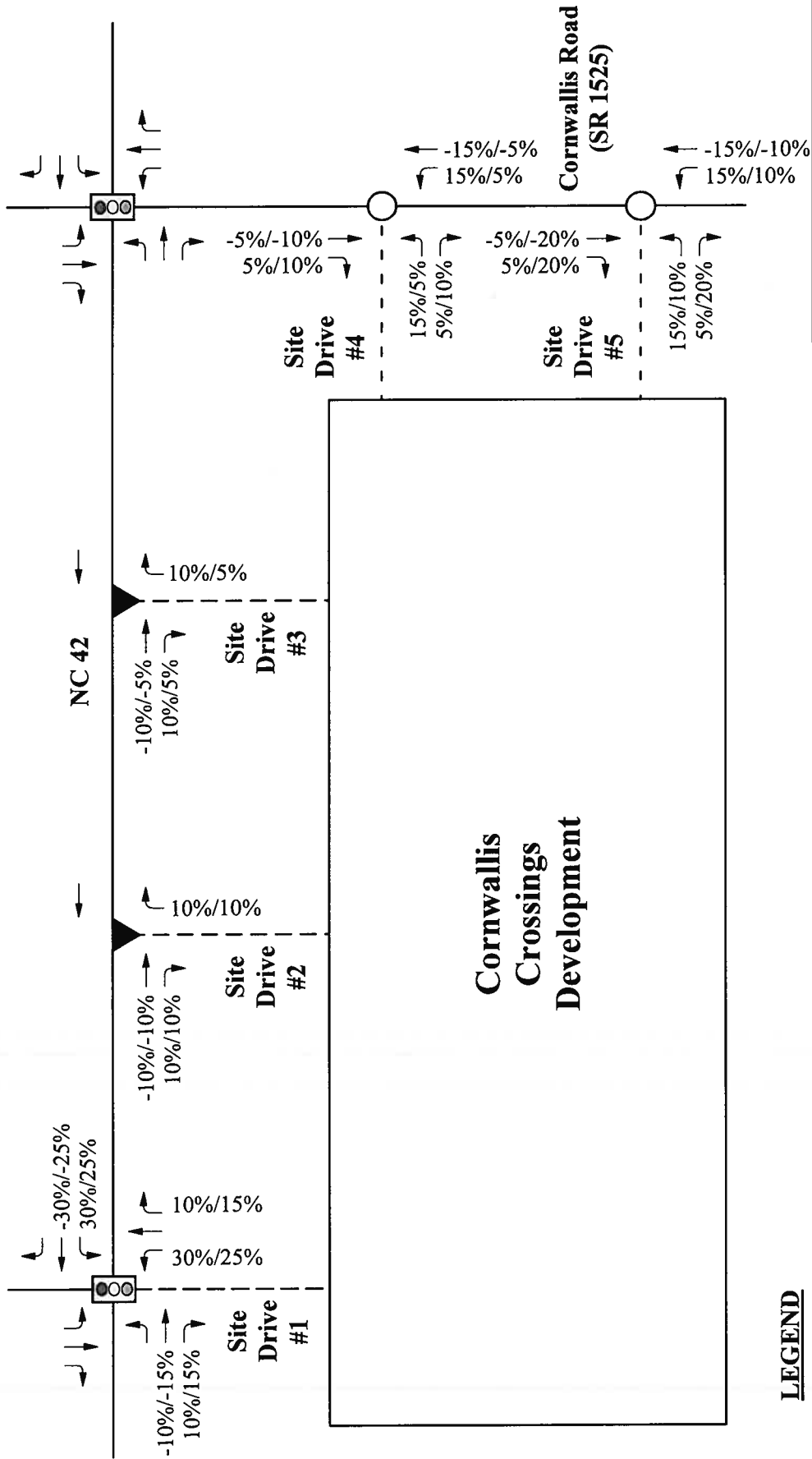


**LEGEND**

-  Signalized Intersection
-  Unsignalized Intersection
-  Right-In / Right-Out
- XX/ (XX) Traffic Volumes - AM Peak/PM Peak Entering (Exiting)



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<b>JOHNSTON CO., NORTH CAROLINA</b>	
Primary Trip Assignment	
Scale: Not to Scale	Figure 11



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**JOHNSTON CO., NORTH CAROLINA**

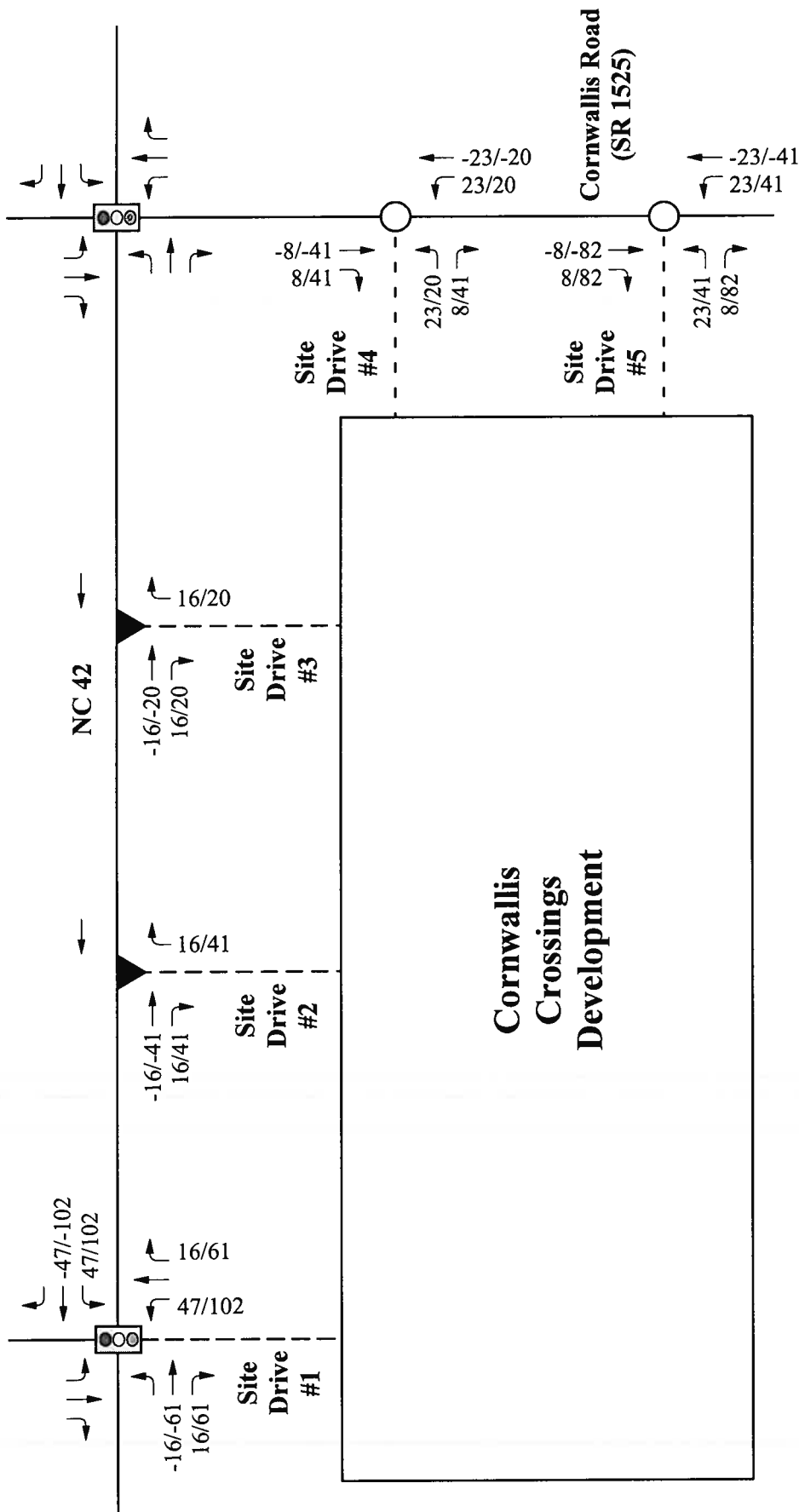
Pass-By Trip Distribution

Scale: Not to Scale

Figure 12

**LEGEND**

- Signalized Intersection
- Unsignalized Intersection
- Right-In / Right-Out
- Distribution Percentages - AM Peak/PM Peak



**RAMEY KEMP & ASSOCIATES**





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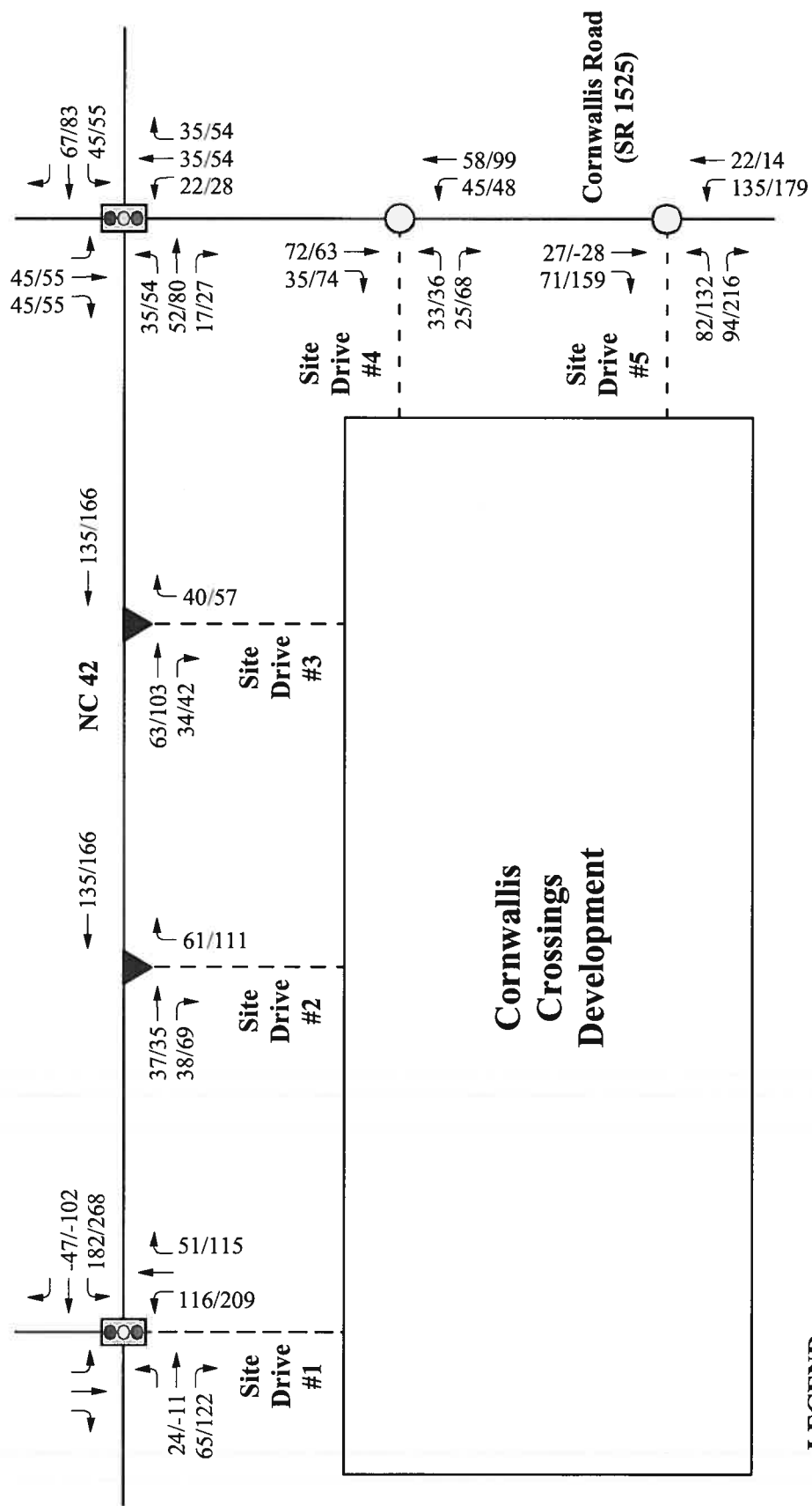
Pass-By Trip Assignment

Scale: Not to Scale      Figure 13



**LEGEND**

-  Signalized Intersection
-  Unsignalized Intersection
-  Right-In / Right-Out
-  Traffic Volumes - AM Peak/PM Peak



<b>CORNWALLIS CROSSINGS</b> JOHNSTON CO., NORTH CAROLINA	
Total Site Trips	
Scale: Not to Scale	Figure 14



**LEGEND**

- Signalized Intersection
- Unsignalized Intersection
- Right-In / Right-Out
- XX/XX Traffic Volumes - AM Peak/PM Peak

## **6. COMBINED TRAFFIC CONDITIONS**

### **6.1. Combined (2010) Peak Hour Traffic Conditions**

In order to determine peak hour traffic volumes for combined (2010) traffic conditions, the total peak hour site trips (Figure 14) were combined with background (2010) traffic volumes (Figure 8). Refer to Figure 15 for an illustration of the combined (2010) peak hour traffic volumes.

### **6.2. Analysis of Combined (2010) Peak Hour Traffic Conditions**

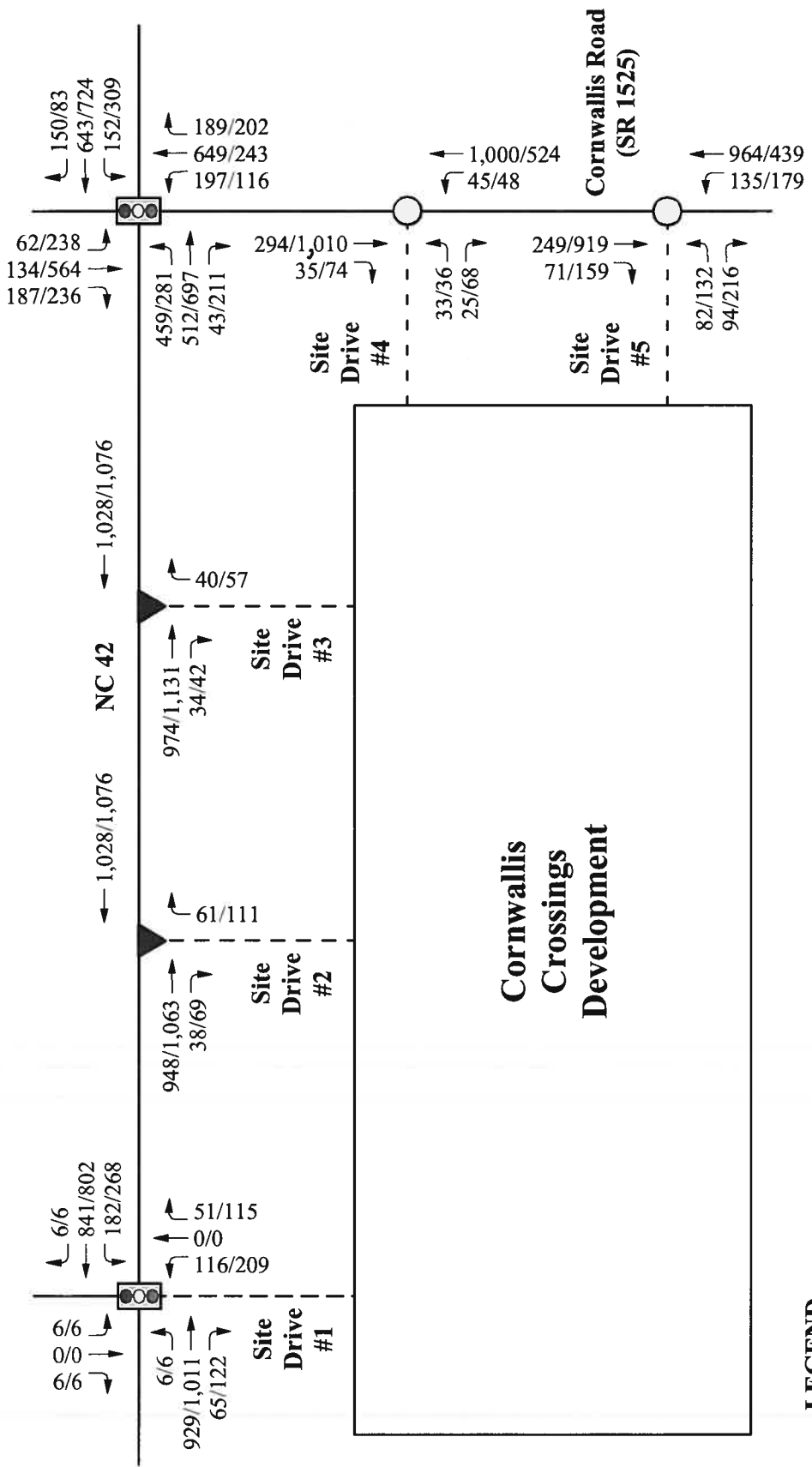
Combined (2010) traffic volumes were analyzed using the same lane configurations and traffic control conditions as under background traffic conditions with and without any improvements that the developer of the proposed property is recommended to install to mitigate potential impacts to the surrounding transportation network. In addition, as required by Johnston County, an analysis scenario was performed to show what improvements are needed to achieve an acceptable level of service “D” or better. This analysis scenario is referred to as the Combined (2010) Improved analysis scenario. It should be noted that the Combined Improved scenario may represent improvements that are needed to mitigate impacts to the transportation network that are not a direct result of the proposed site being developed, therefore some or all of these improvements may be outside the scope and responsibility of the developer. The analysis results are presented in Section 7 of this report.

### **6.3 Combined (2012) Peak Hour Traffic Conditions**

In order to determine peak hour traffic volumes for combined (2012) traffic conditions, the total peak hour site trips (Figure 14) were combined with background (2012) traffic volumes (Figure 9). Refer to Figure 16 for an illustration of the combined (2012) peak hour traffic volumes.

### **6.4 Analysis of Combined Peak Hour Traffic Conditions**

Combined (2012) traffic volumes were analyzed to determine the lane configurations and traffic control conditions needed to maintain an acceptable level of service two years beyond the expected build out of the proposed development. The analysis results are presented in Section 7 of this report.

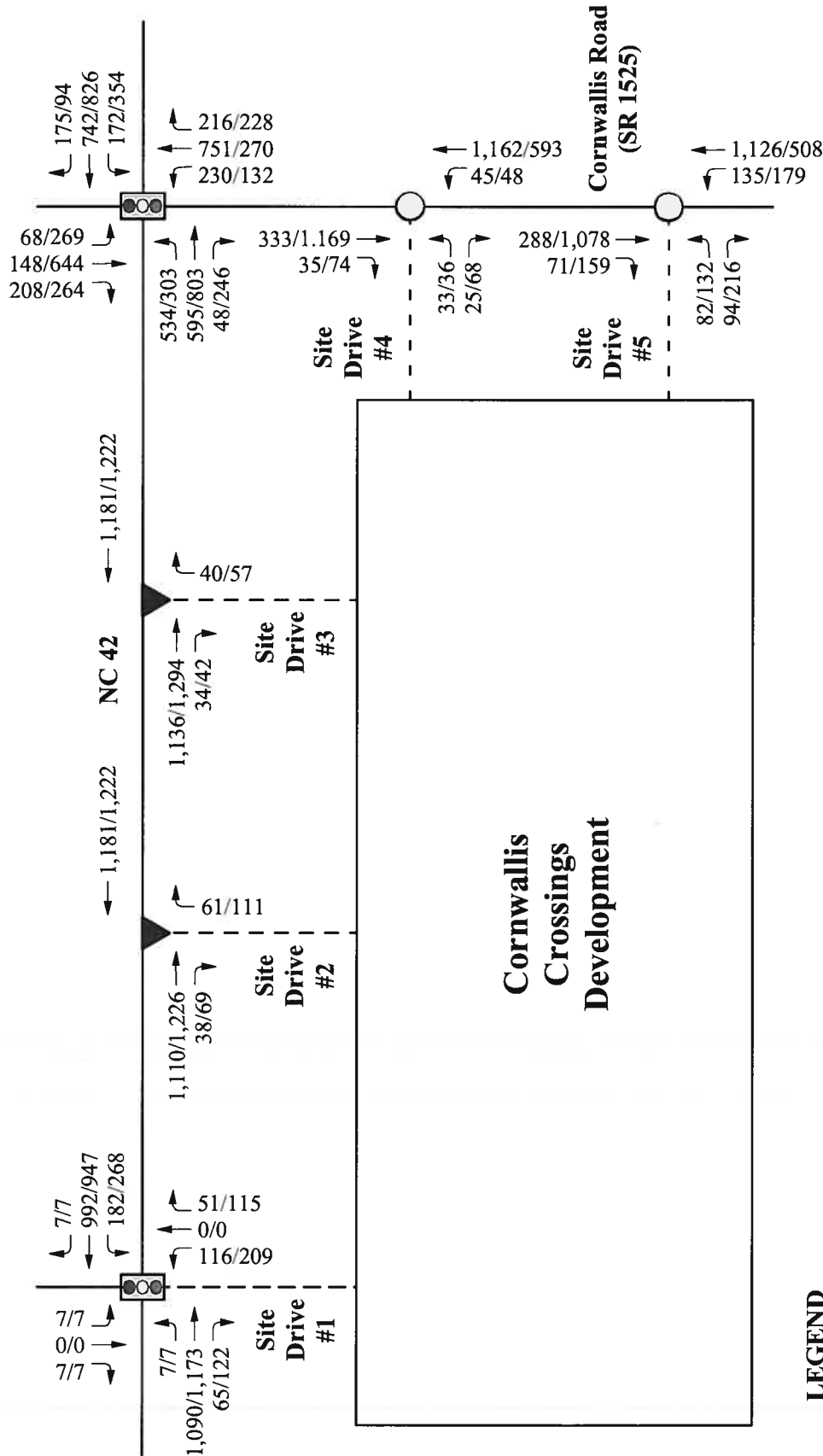


<b>CORNWALLIS CROSSINGS</b> <b>JOHNSTON CO., NORTH CAROLINA</b>	
Combined (2010) Traffic Conditions	
Scale: Not to Scale	Figure 15



**LEGEND**

- Signalized Intersection
- Unsignalized Intersection
- Right-In / Right-Out
- Traffic Volumes - AM Peak/PM Peak



**Cornwallis Crossings Development**

**RAMEY KEMP ASSOCIATES**

**CORNWALLIS CROSSINGS**  
JOHNSTON CO., NORTH CAROLINA

Combined (2012) Traffic Conditions

Scale: Not to Scale

Figure 16



**LEGEND**

- Signalized Intersection
- Unsignalized Intersection
- Right-In / Right-Out
- Traffic Volumes - AM Peak/PM Peak

## 7. CAPACITY ANALYSIS

### 7.1. NC 42 and Cornwallis Road

The signalized intersection of NC 42 and Cornwallis Road was analyzed under existing conditions with the lane configurations shown in Table 3. Refer to Table 3 for a summary of the analysis results.

**TABLE 3**  
**Analysis Summary of NC 42 and Cornwallis Road**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
EXISTING (2008) CONDITIONS	EB	1 LT, 1 TH-RT	D	E (56.7 s)	E	E (58.8 s)
	WB	1 LT, 1 TH-RT	E			
	NB	1 LT, 1 TH, 1 RT	E			
	SB	1 LT, 1 TH-RT	D			
BACKGROUND (2010) CONDITIONS	EB	1 LT, 1 TH-RT	F	F (91.9 s)	F	F (123.5 s)
	WB	1 LT, 1 TH, <i>1 RT</i>	F			
	NB	1 LT, 1 TH, 1 RT	F			
	SB	1 LT, 1 TH-RT	D			
BACKGROUND (2010) IMPROVED CONDITIONS	EB	<u>2</u> LT, <u>2</u> TH, <u>1</u> RT	D	D (45.1 s)	D	D (50.5 s)
	WB	1 LT, <u>2</u> TH, <i>1 RT</i>	D			
	NB	<u>2</u> LT, 1 TH, 1 <b>TH-RT</b>	D			
	SB	<u>2</u> LT, 1 TH, <u>1</u> RT	C			
COMBINED (2010) NO IMPROVEMENTS CONDITIONS	EB	1 LT, 1 TH-RT	F	F (122.7 s)	F	F (190.3 s)
	WB	1 LT, 1 TH, <i>1 RT</i>	F			
	NB	1 LT, 1 TH, 1 RT	F			
	SB	1 LT, 1 TH-RT	F			
COMBINED (2010) CONDITIONS	EB	<b>2</b> LT, 1 TH, <b>1</b> RT	E	E (73.9 s)	F	F (141.4 s)
	WB	1 LT, 1 TH, <i>1 RT</i>	E			
	NB	1 LT, 1 TH, 1 <b>TH-RT</b>	F			
	SB	1 LT, 1 TH-RT	F			
COMBINED (2010) IMPROVED CONDITIONS	EB	<b>2</b> LT, <b>2</b> TH, <b>1</b> RT	D	D (47.0 s)	D	D (52.7 s)
	WB	1 LT, <u>2</u> TH, <i>1 RT</i>	D			
	NB	<u>2</u> LT, 1 TH, 1 <b>TH-RT</b>	D			
	SB	<u>2</u> LT, 1 TH, <u>1</u> RT	E			
COMBINED (2012) IMPROVED CONDITIONS	EB	<b>2</b> LT, <b>2</b> TH, <b>1</b> RT	D	D (49.8 s)	C	D (43.6 s)
	WB	<u>2</u> LT, <u>2</u> TH, <i>1 RT</i>	D			
	NB	<u>2</u> LT, 1 TH, 1 <b>TH-RT</b>	E			
	SB	<u>2</u> LT, <u>2</u> TH, <u>1</u> RT	C			

\*Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements *italicized* are committed to by adjacent developments.

\*Improvements required by development denoted in **BOLD**.

Capacity analysis indicates that under existing traffic conditions, the signalized intersection of NC 42 and Cornwallis Road operates at an overall LOS E during both the AM and PM peak hours. Each of the intersection approaches currently operates at a LOS E or better

during either the AM or PM peak hour periods.

Analysis indicates that the signalized intersection of NC 42 and Cornwallis Road is expected to operate at an overall LOS F during both the AM and PM peak hours with background (2010) and combined (2010) volumes under existing roadway configurations and traffic control. Significant delays and queues are expected to occur at each of the intersection approaches during both of the peak hour periods.

The combined (2010) analysis scenario represents the operation of the intersection with improvements made at the intersection by the developer of the proposed development that mitigate the impact of the additional trips expected to be generated by the proposed development. Under these traffic conditions, analysis indicates that the signalized intersection is expected to operate at an overall LOS E during the AM peak hour and LOS F during the PM peak hour. With the recommended improvements in place, the intersection operation is expected to be improved during the AM peak hour and maintained during the PM peak hour when compared to the expected future traffic conditions without the proposed development in place.

According to Johnston County guidelines, a traffic impact analysis must identify potential or suggested improvements to allow intersections within the study area to operate at a better level of service. The intersection of NC 42 and Cornwallis Road is expected to operate poorly regardless of whether or not the proposed site is in place under future traffic conditions. Significant geometric and traffic control improvements would be needed in order to improve the operation of this intersection in the future. Some of these improvements might include adding an additional receiving lane on each of the intersection approaches as well as additional left and right turn lanes on each approach. For the purposes of comparison, an "Improved" analysis was performed on background (2010), combined (2010), and combined (2012) traffic conditions in order to determine the ultimate improvements needed at this intersection in order to provide adequate level of service.

Refer to Appendix C for printouts of each of the analysis scenarios summarized in Table 3.

## 7.2. NC 42 and Existing Driveway / Site Driveway #1

The signalized intersection of NC 42 and Existing Driveway / Site Driveway #1 was analyzed as a full-movement intersection with the lane configurations and traffic control as shown in Table 4. Refer to Table 4 for a summary of the analysis results.

Capacity analysis indicates that under existing (2008) traffic conditions, the eastbound left turn movement from NC 42 is expected to operate at LOS A during both the AM and PM peak hours. The minor street approach of the Existing Driveway is expected to operate at LOS D during the AM peak hour and LOS C during the PM peak hour.

**TABLE 4**  
**Analysis Summary of NC 42 and Existing Driveway / Site Driveway #1**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
EXISTING (2008) CONDITIONS	EB WB SB	1 LT, 1 TH 1 LT, 1 TH-RT 1 LT-RT	A <sup>1</sup> -- D <sup>2</sup>	N/A	A <sup>1</sup> -- C <sup>2</sup>	N/A
BACKGROUND (2010) CONDITIONS	EB WB SB	1 LT, 1 TH 1 LT, 1 TH-RT 1 LT-RT	B <sup>1</sup> -- E <sup>2</sup>	N/A	B <sup>1</sup> -- F <sup>2</sup>	N/A
BACKGROUND (2010) IMPROVED CONDITIONS	EB WB SB	1 LT, 2 TH 1 LT, <u>1 TH</u> , 1 TH-RT 1 LT-RT	B <sup>1</sup> -- D <sup>2</sup>	N/A	B <sup>1</sup> -- D <sup>2</sup>	N/A
COMBINED (2010) CONDITIONS	EB WB NB SB	1 LT, 1 TH, 1 RT 2 LT, 1 TH-RT 1 LT-TH, 1 RT 1 LT-TH-RT	C B E D	<b>C</b> (20.7 s)	D B F E	<b>C</b> (35.0 s)
COMBINED (2010) IMPROVED CONDITIONS	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, <u>1 TH</u> , 1 TH-RT 2 LT, 1 TH-RT 1 LT, 1 TH-RT	B B E E	<b>B</b> (18.7 s)	C B E E	<b>C</b> (25.0 s)
COMBINED (2012) IMPROVED CONDITIONS	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, <u>1 TH</u> , 1 TH-RT 2 LT, TH-RT 1 LT, 1 TH-RT	B B E E	<b>B</b> (17.6 s)	C B E E	<b>C</b> (25.4 s)

\*Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements required by development denoted in **BOLD**.

1. Level of service for major approach.
2. Level of service for minor approach.

Under background (2010) traffic conditions, analysis indicates that the eastbound left turn movements from NC 42 are expected to operate at LOS B during both the AM and PM peak hours. The operation of the minor street approach of the Existing Driveway is expected to deteriorate to LOS E during the AM peak hour and LOS F during the PM peak hour. However, analysis indicates that with ultimate improvements in place, the minor street approach is expected to operate at LOS D during both the AM and PM peak hours.

Capacity analysis indicates that under combined (2010), combined (2010) improved, and combined (2012) improved traffic conditions, the overall intersection and the eastbound and westbound approaches of NC 42 are expected to operate at LOS D or better during both the AM and PM peak hours. Refer to Appendix D for printouts of the analyses.

### 7.3. NC 42 and Site Driveway #2

The unsignalized intersection of NC 42 and Site Driveway #2 was analyzed as a right-in/right-out intersection with the lane configurations and traffic control as shown in Table 5. Refer to Table 5 for a summary of the analysis results.

**TABLE 5**  
**Analysis Summary of NC 42 and Site Driveway #2**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
COMBINED (2010) CONDITIONS	EB WB NB	1 TH, 1 RT 1 TH 1 RT	-- -- C <sup>2</sup>	N/A	-- -- F <sup>2</sup>	N/A
COMBINED (2010) IMPROVED CONDITIONS	EB WB NB	<u>2</u> TH, 1 RT <u>2</u> TH 1 RT	-- -- A <sup>2</sup>	N/A	-- -- B <sup>2</sup>	N/A
COMBINED (2012) IMPROVED CONDITIONS	EB WB NB	<u>2</u> TH, 1 RT <u>2</u> TH 1 RT	-- -- A <sup>2</sup>	N/A	-- -- B <sup>2</sup>	N/A

\* Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements required by development denoted in **BOLD**.

1. Level of service for major approach.
2. Level of service for minor approach.

Capacity analysis indicates that under combined (2010) traffic conditions, the northbound minor street approach of Site Driveway #2 is expected to operate at LOS C during the AM peak hour and LOS F during the PM peak hour.

Capacity analyses indicates that under combined (2010) improved and combined (2012) improved traffic conditions, the northbound minor street approach of Site Driveway #2 is expected to operate at LOS B or better during both the AM and PM peak hours. Refer to Appendix E for printouts of the analyses.

#### 7.4. NC 42 and Site Driveway #3

The unsignalized intersection of NC 42 and Site Driveway #3 was analyzed as a right-in/right-out intersection with the lane configurations and traffic control as shown in Table 6. Refer to Table 6 for a summary of the analysis results.

**TABLE 6**  
**Analysis Summary of NC 42 and Site Driveway #3**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
COMBINED (2010) CONDITIONS	EB WB NB	1 TH, 1 RT 1 TH 1 RT	-- -- C <sup>2</sup>	N/A	-- -- F <sup>2</sup>	N/A
COMBINED (2010) IMPROVED CONDITIONS	EB WB NB	<u>2</u> TH, 1 RT <u>2</u> TH 1 RT	-- -- A <sup>2</sup>	N/A	-- -- A <sup>2</sup>	N/A
COMBINED (2012) IMPROVED CONDITIONS	EB WB NB	<u>2</u> TH, 1 RT <u>2</u> TH 1 RT	-- -- A <sup>2</sup>	N/A	-- -- B <sup>2</sup>	N/A

\* Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements required by development denoted in **BOLD**.

1. Level of service for major approach.
2. Level of service for minor approach.

Capacity analysis indicates that under combined (2010) traffic conditions, the northbound

minor street approach of Site Driveway #3 is expected to operate at LOS C during the AM peak hour and LOS F during the PM peak hour.

Capacity analyses indicates that under combined (2010) improved and combined (2012) improved traffic conditions, the northbound minor street approach of Site Driveway #3 is expected to operate at LOS B or better during both the AM and PM peak hours. Refer to Appendix F for printouts of the analyses.

#### 7.5. Cornwallis Road and Site Drive #4

The unsignalized intersection of Cornwallis Road and Site Driveway #4 was analyzed as a full-movement intersection with the lane configurations and traffic control as shown in Table 7. Refer to Table 7 for a summary of the analysis results.

**TABLE 7**  
**Analysis Summary of Cornwallis Road and Site Driveway #4**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
COMBINED (2010) CONDITIONS	<b>EB</b> NB SB	<b>1 LT, 1 RT</b> 1 LT, 1 TH 1 TH, 1 RT	D <sup>2</sup> A <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A
COMBINED (2010) IMPROVED CONDITIONS	<b>EB</b> NB SB	<b>1 LT, 1 RT</b> 1 LT, 1 TH <u>2 TH, 1 RT</u>	D <sup>2</sup> A <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A
COMBINED (2012) IMPROVED CONDITIONS	<b>EB</b> NB SB	<b>1 LT, 1 RT</b> 1 LT, <u>2 TH</u> <u>2 TH, 1 RT</u>	C <sup>2</sup> A <sup>1</sup> --	N/A	D <sup>2</sup> B <sup>1</sup> --	N/A

\* Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements required by development denoted in **BOLD**.

1. Level of service for major approach.
2. Level of service for minor approach.

Capacity analysis indicates that under each of the future traffic conditions with the proposed site in place, the left turn movement from Cornwallis Road is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The minor street

approach of Site Driveway #4 is expected to operate at LOS D during the AM peak hour and LOS F during PM peak hour under the combined (2010) traffic conditions. However, under combined (2012) Improved traffic conditions, the minor street approach is expected to operate at an acceptable LOS D or better during both the AM and PM peak hours. Refer to Appendix G for printouts of the analyses.

#### 7.6. Cornwallis Road and Site Driveway #5

The unsignalized intersection of Cornwallis Road and Site Drive #3 was analyzed as a full-movement intersection with the lane configurations and traffic control as shown in Table 8. Refer to Table 8 for a summary of the analysis results.

**TABLE 8**  
**Analysis Summary of Cornwallis Road and Site Driveway #5**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall	Approach	Overall
COMBINED (2010) CONDITIONS	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, 1 RT	F <sup>2</sup> A <sup>1</sup> --	N/A	F <sup>2</sup> C <sup>1</sup> --	N/A
COMBINED (2010) IMPROVED CONDITIONS	EB NB SB	1 LT, 1 RT 1 LT, 1 TH <u>2 TH, 1 RT</u>	F <sup>2</sup> A <sup>1</sup> --	N/A	F <sup>2</sup> C <sup>1</sup> --	N/A
COMBINED (2012) IMPROVED CONDITIONS	EB NB SB	1 LT, 1 RT 1 LT, <u>2 TH</u> <u>2 TH, 1 RT</u>	D <sup>2</sup> A <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A

\* Improvements underlined are suggested to achieve a desirable LOS.

\*Improvements required by development denoted in **BOLD**.

1. Level of service for major approach.
2. Level of service for minor approach.

Capacity analysis indicates that under each of the future traffic conditions with the proposed site in place, the left turn movement from Cornwallis Road is expected to operate at LOS A during the AM peak hour and LOS C or better during the PM peak hour. The minor street approach of Site Driveway #5 is expected to operate at LOS F during both the AM and PM peak hours. Refer to Appendix H for printouts of the analyses.

### 7.7. Roadway Segments

Roadway segment analyses were conducted on the NC 42 and Cornwallis Road. The NC LOS software package was utilized to analyze the roadway segments. The NC LOS software package uses the methodologies in the 2000 Highway Capacity Manual. NC LOS determines the max AADT for each LOS threshold for a roadway segment. The Table 9 summarizes the segment analysis results for both NC 42 and Cornwallis Road and compares them to the maximum LOS for that analyzed segment of roadway. Refer to Appendix I for the NC LOS results for both NC 42 and Cornwallis Road segments.

**TABLE 9**  
**Summary of Segment Analysis**

Roadway Segment	2006 Johnson County AADT	Future 2010 AADT without the Site	Future 2010 AADT with the Site	NC LOS Maximum AADT
NC 42	15,000	21,175	23,700	A - 0 B - 1,200 C - 7,100 D - 14,600 E - 30,200
Cornwallis Road (SR 1525)	7,400	10,450	14,850	A - 0 B - 800 C - 4,700 D - 9,300 E - 19,400

The segment analysis indicates that NC 42 operates at LOS E based on 2006 ADT volumes provided by the NCDOT Traffic Survey Unit. NC 42 is expected to continue to operate at LOS E in 2010 with or without the proposed development in place. Cornwallis Road operates at LOS D based on 2006 ADT volumes. Cornwallis Road is expected to operate at LOS E in 2010 with or without the proposed development in place.

### 8. SIGHT DISTANCE REVIEW

Minimum lengths of acceptable sight distance are set based on the criteria found in the *Policy on Street and Driveway Access to North Carolina Highways*. It was determined that proposed driveway connections to NC 42 should have a minimum of 500 feet of sight distance on either side of the minor street connection. This site distance requirement was based on a two lane roadway facility with a design speed of 50 mph. The proposed

driveway connections to Cornwallis Road should have a minimum of 600 feet of sight distance on either side of the minor street connection. This site distance requirement was based on a two lane roadway facility with a design speed of 60 mph. Refer to Appendix J for excerpts concerning sight distance requirements from the driveway manual.

According to preliminary field investigations, it appears that there is adequate site distance available to meet the minimum requirements mentioned previously. However, specific sight distances at each of the proposed site driveway locations were not measured in the field due to the site plan being in a conceptual stage. Meeting the minimum required sight distances will be a requirement of the driveway improvement approval process.

## 9. ACCIDENT DATA REVIEW

Accident data was requested from the NCDOT Traffic Engineering Accident Analysis System for the intersection of NC 42 and Cornwallis Road (SR 1525). Refer to Table 10 for a summary of the accident data. Refer to Appendix J for detailed traffic accident data.

**TABLE 10**  
**Summary of Intersection Accident Analysis**

<b>Traffic Engineering Accident Analysis Report – Intersection Analysis (NC 42 and SR 1525 – Cornwallis Road)</b>					
<b>Year</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>Total</b>
<b>Type</b>					
Angle	0	2	0	1	3
Rear End	2	1	5	6	14
Sideswipe	0	2	1	0	3
Left – Turn	0	2	1	3	6
Other	0	1	1	1	3
<b>Severity</b>					
Fatal	0	0	0	0	0
Injury	1	4	2	6	13
PDO	1	4	6	5	16
<b>Condition</b>					
Wet	0	1	1	0	2
Night	2	4	1	2	9

## 10. CONCLUSIONS

This traffic impact analysis was conducted to determine potential traffic impacts caused by the proposed Cornwallis Crossing development located in the southwest quadrant of the NC 42 and Cornwallis Road intersection in Johnston County, North Carolina. The development is currently proposed to consist of an approximately 55,000 square foot supermarket, approximately 67,400 square feet of general retail space, and six outparcels. The tenants of these outparcels are not currently known, therefore assumptions were made for typical land uses including a convenience market with gasoline fueling positions, a pharmacy with a drive-thru, a bank with drive-thru lanes, a high-turnover sit-down restaurant and two (2) fast-food restaurants with drive-thru lanes. Access to the site is currently proposed via one (1) full-movement driveway along NC 42, two (2) right-in/right-out driveways along NC 42, and two (2) full-movement driveways along Cornwallis Road. For the purpose of the study, the development is expected to be fully built-out in 2010.

The proposed site is expected to generate 23,822 total trips (11,911 enter and 11,911 exit) during an average weekday 24-hour period. Of this total, 1,105 total trips (604 enter and 501 exit) will occur during the AM peak hour and 1,902 total trips (960 enter and 942 exit) will occur during the PM peak hour. However, not all of these trips are new trips drawn into the study area. Some trips are considered as pass-by trips which are trips that visit the site that are already in the study area. After the pass-by trip adjustment, the proposed site is expected to generate 793 primary (new) trips (448 enter and 345 exit) during the AM peak hour and 1,086 primary (new) trips (552 enter and 534 exit) during the PM peak hour.

Capacity analysis indicates that under existing traffic conditions, the signalized intersection of NC 42 and Cornwallis Road operates at an overall LOS E during both the AM and PM peak hours. Each of the intersection approaches currently operates at a LOS E or better during both the AM and PM peak hour periods. Under background (2010) and combined (2010) traffic conditions, the signalized intersection is expected to operate at an overall LOS F during both the AM and PM peak hours. Significant delays and queues are expected to occur at each of the intersection approaches during both of the peak hour periods. The intersection of NC 42 and Cornwallis Road is expected to operate poorly regardless of whether or not the proposed site is in place under future traffic conditions. Significant

geometric and traffic control improvements would be needed in order to improve the operation of this intersection in the future. It should be noted that these significant improvements represent improvements that are needed to mitigate impacts to the transportation network that are not a direct result of the proposed site being developed, therefore these improvements are considered to be outside the scope and responsibility of the developer.

The left turn movements from NC 42 and the minor street approach the Existing Driveway operates at an acceptable LOS during both the AM and PM peak hours under existing traffic conditions. The operation of this intersection is expected to deteriorate under background (2010) traffic conditions without improvements along NC 42. This intersection is proposed to be signalized and the main site driveway (Site Driveway #1) is proposed to align directly across from the Existing Driveway when the proposed site is developed. The proposed signalized intersection of NC 42 and Existing Driveway / Site Driveway #1 is expected to operate at an overall intersection LOS C or better during both the AM and PM peak hours. In addition, the eastbound and westbound approaches of NC 42 are also expected to operate at LOS D or better during both the AM and PM peak hours.

In addition, it should be noted that there is a possibility that the outparcel lot in the north east corner of the site may be developed as a Convenience market with fueling positions before the rest of the site is built out. In this case, the corner out parcel lot would access the NC 42 via one (1) right-in/right-out connection (Site Driveway #3) and Cornwallis Road via one (1) full access connection (Site Driveway #4). As the rest of the site is developed, these driveways would be connected to the internal driveway network within the site.

## **11. RECOMMENDATIONS**

The following is a summary of the roadway improvements recommended to be installed by the developer to mitigate combined (2010) traffic conditions: Refer to Figure 17 for an illustration the recommended improvements.

#### Intersection of NC 42 and Cornwallis Road

- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct a second exclusive left turn lane to create dual left turn lanes on the eastbound approach of NC 42 with a minimum length of 300 feet of full width storage and deceleration distance and the appropriate length of taper. As part of this improvement, a second receiving lane should be constructed on the northern leg of Cornwallis Road. This second receiving lane should provide a minimum of 500 feet of full width travel lane before tapering down to a single northbound travel lane. It should be noted that the northbound receiving lane is proposed along the frontage of the Cornwallis Commons adjacent development and consideration should be given to this developer's responsibility to provide a portion of this improvement given this adjacent developments impacts on the study intersection.
- Restripe the existing northbound exclusive right turn lane on Cornwallis Road to allow through movements as well as right turn movements.
- Modify the existing traffic signal to provide a right turn overlap phase for the eastbound right turn movement on NC 42. In addition, this signal should be interconnected to the proposed signal to the west in order to allow coordinated traffic operation along NC 42.

#### Intersection of NC 42 and Site Driveway #1

- Construct Site Driveway #1 with two egress lanes (one shared left-through lane and one exclusive right turn lane) and two ingress lane.
- Construct exclusive dual left turn lanes on the westbound approach of NC 42 with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper. It should be noted that an exclusive westbound left turn lane with 100 feet of full storage and bay taper already exists at this intersection.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 150 feet of full width storage and deceleration distance and the appropriate length of taper.
- Install a new traffic signal that provides protected phase for the eastbound and

westbound left turn movements as well as an overlap phase for the northbound right turn movement. In addition, this signal should be interconnected to the proposed existing traffic signal to the east in order to allow coordinated traffic operation along NC 42.

#### Intersection of NC 42 and Site Driveway #2

- Construct Site Driveway #2 with one egress lane (one exclusive right turn lane) and one ingress lane.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

#### Intersection of NC 42 and Site Driveway #3

- Construct Site Driveway #3 with one egress lane (one exclusive right turn lane) and one ingress lane.
- Construct an exclusive right turn lane on the eastbound approach of NC 42 with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

#### Intersection of Cornwallis Road and Site Driveway #4

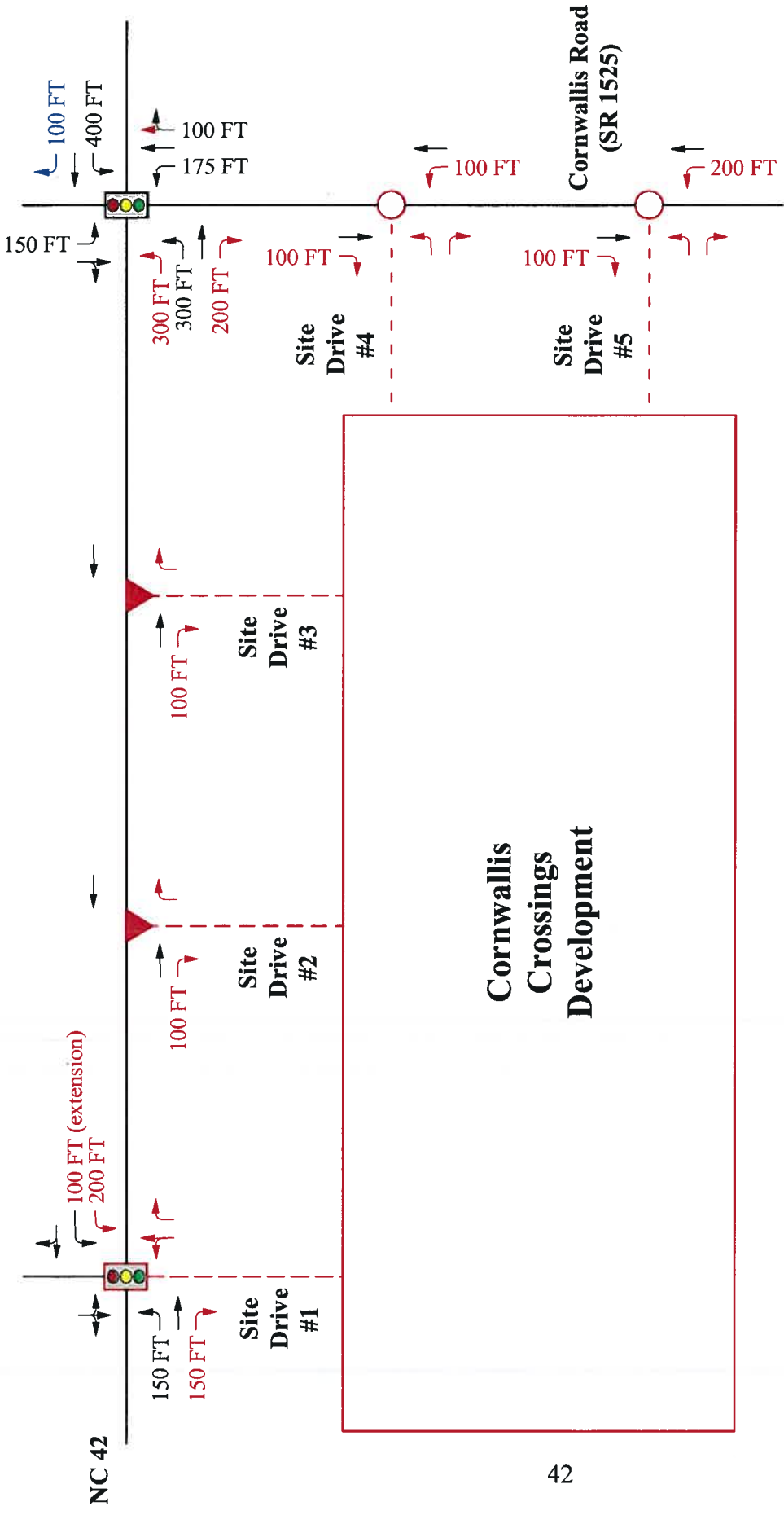
- Construct Site Driveway #4 with two egress lanes (one exclusive left turn lane and one exclusive right turn lane) and one ingress lane.
- Construct an exclusive left turn lane on the northbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct an exclusive right turn lane on the southbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.

#### Intersection of Cornwallis Road and Site Driveway #5





- Construct Site Driveway #5 with two egress lanes (one exclusive left turn lane and one

exclusive right turn lane) and one ingress lane.

- Construct an exclusive left turn lane on the northbound approach of Cornwallis Road with a minimum length of 200 feet of full width storage and deceleration distance and the appropriate length of taper.
- Construct an exclusive right turn lane on the southbound approach of Cornwallis Road with a minimum length of 100 feet of full width storage and deceleration distance and the appropriate length of taper.



**LEGEND**

-  Signalized Intersection
-  Unsignalized Intersection
-  Right-In / Right-Out
-  Traffic Lanes - Existing/By Others/By Developer

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Recommended Improvements	
Scale: Not to Scale	Figure 17

**Cornwallis Crossings Development**