Traffic Impact Analysis
Chatham County Grocery
Chatham County, NC

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

TRAFFIC IMPACT ANALYSIS

FOR

CHATHAM COUNTY GROCERY

LOCATED

IN

CHATHAM COUNTY, NORTH CAROLINA

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TRAFFIC IMPACT ANALYSIS

CHATHAM COUNTY GROCERY

CHATHAM COUNTY, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Chatham County Grocery development to be located in the southwest quadrant of the intersection of US 15-501 and Polks Landing Road in Chatham County, North Carolina. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

The proposed development, anticipated to be completed in 2019, is assumed to consist of the following uses:

- 12,200 sq. ft. shopping center
- 49,100 sq. ft. grocery store
- 4,000 sq. ft. drive-in bank
- 4,000 sq. ft. fast-food restaurant with drive-thru window

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2017) Traffic Conditions
- Background (2019) Traffic Conditions without Synchronized Street
- Background (2019) Traffic Conditions with Synchronized Street
- Combined (2019) Traffic Conditions without Synchronized Street
- Combined (2019) Traffic Conditions with Synchronized Street

1.1. Site Location and Study Area

The development is proposed to be located in the southwest quadrant of the intersection of US 15-501 and Polks Landing Road in Chatham County, North Carolina. Refer to Figure 1 for the site location map.

The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and Chatham County (County) and consists of the following existing intersections:

- US 15-501 and Lystra Road
- US 15-501 and Polks Landing Road

1.2. Proposed Land Use and Site Access

The proposed development, anticipated to be completed in 2019, is assumed to consist of the following uses:

- 12,200 sq. ft. shopping center
- 49,100 sq. ft. grocery store
- 4,000 sq. ft. drive-in bank
- 4,000 sq. ft. fast-food restaurant with drive-thru window

These uses, particularly the drive-in bank and fast-food restaurant, are assumed at this time based on coordination with the developer. Site access is proposed via two full movement intersections on Polks Landing Road and one full movement intersection along US 15-501. Plans to convert US 15-501 into a synchronized street are currently under development. Refer to Figure 2 for a copy of the preliminary site plan.

1.3. Adjacent Land Uses

The proposed development is located in an area consisting primarily of undeveloped land and residential development. The Polks Village mixed use development is located north of the site on Polks Landing Road. The Chatham Downs Commercial development is located in the southeast quadrant of US 15-501 and Lystra Road.

1.4. Existing Roadways

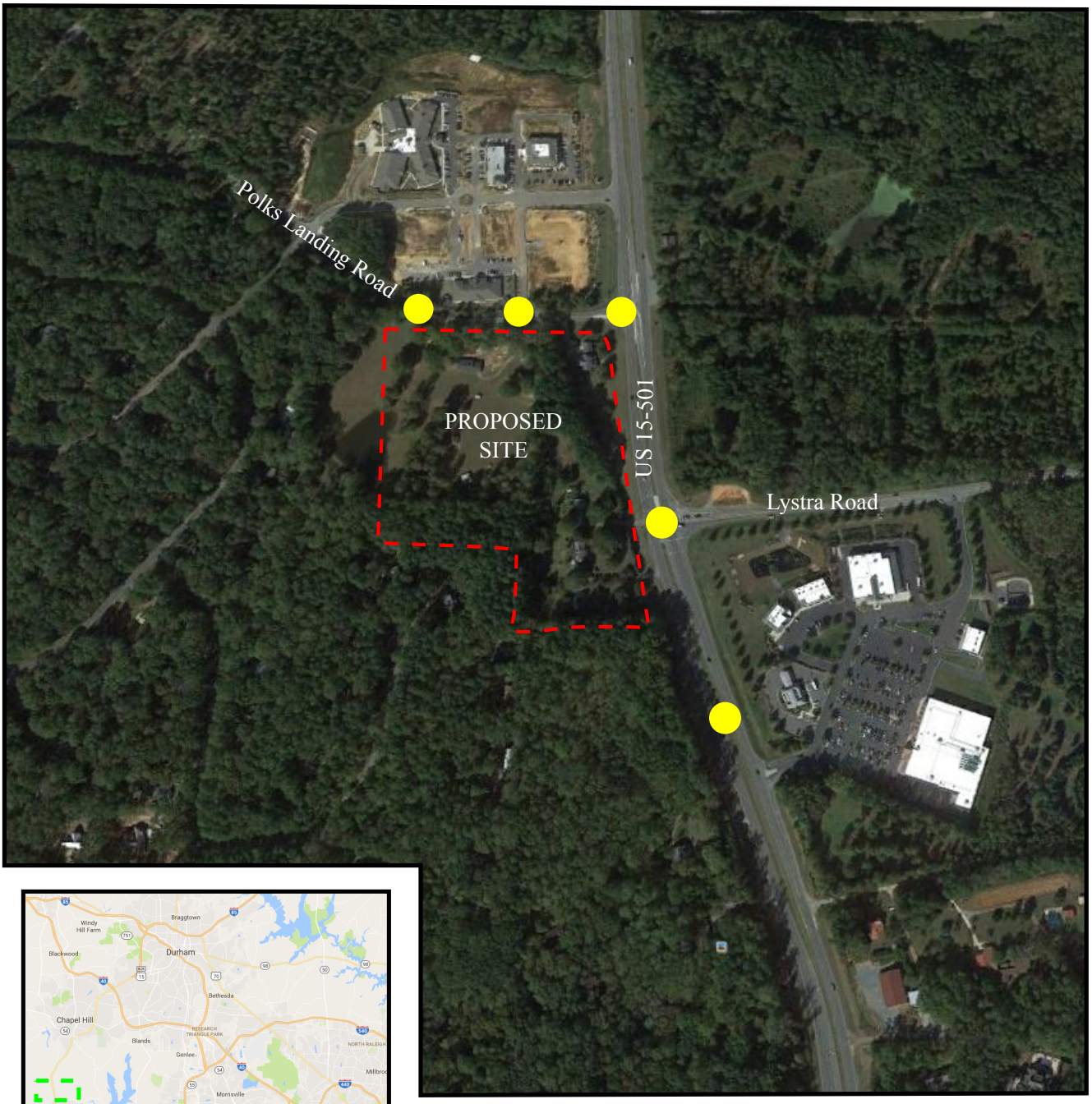
US 15-501 is a four-lane roadway running in a north-south direction with a posted speed limit of 55 mph within the study area. Based on the most recent data (2015) from the NCDOT, US

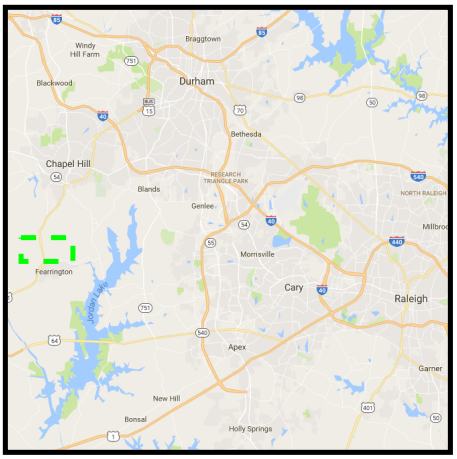
15-501 had an average AADT volume of approximately 22,000 vpd north of its intersection with Polks Landing Road.

Lystra Road is a two-lane roadway running in an east-west direction with a posted speed limit of 45 mph within the study area. Based on the most recent data (2015) from the NCDOT, Lystra Road had an AADT volume of approximately 5,600 vpd east of its intersection with US 15-501.

Polks Landing Road is a two-lane roadway running in an east-west direction with a posted speed limit of 25 mph within the study area. Based on the traffic counts from 2017, and assuming that the PM peak hour volume is 10% of the average daily traffic, Polks Landing Road has an AADT volume of approximately 1,000 vpd west of its intersection with US 15-501.

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





N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

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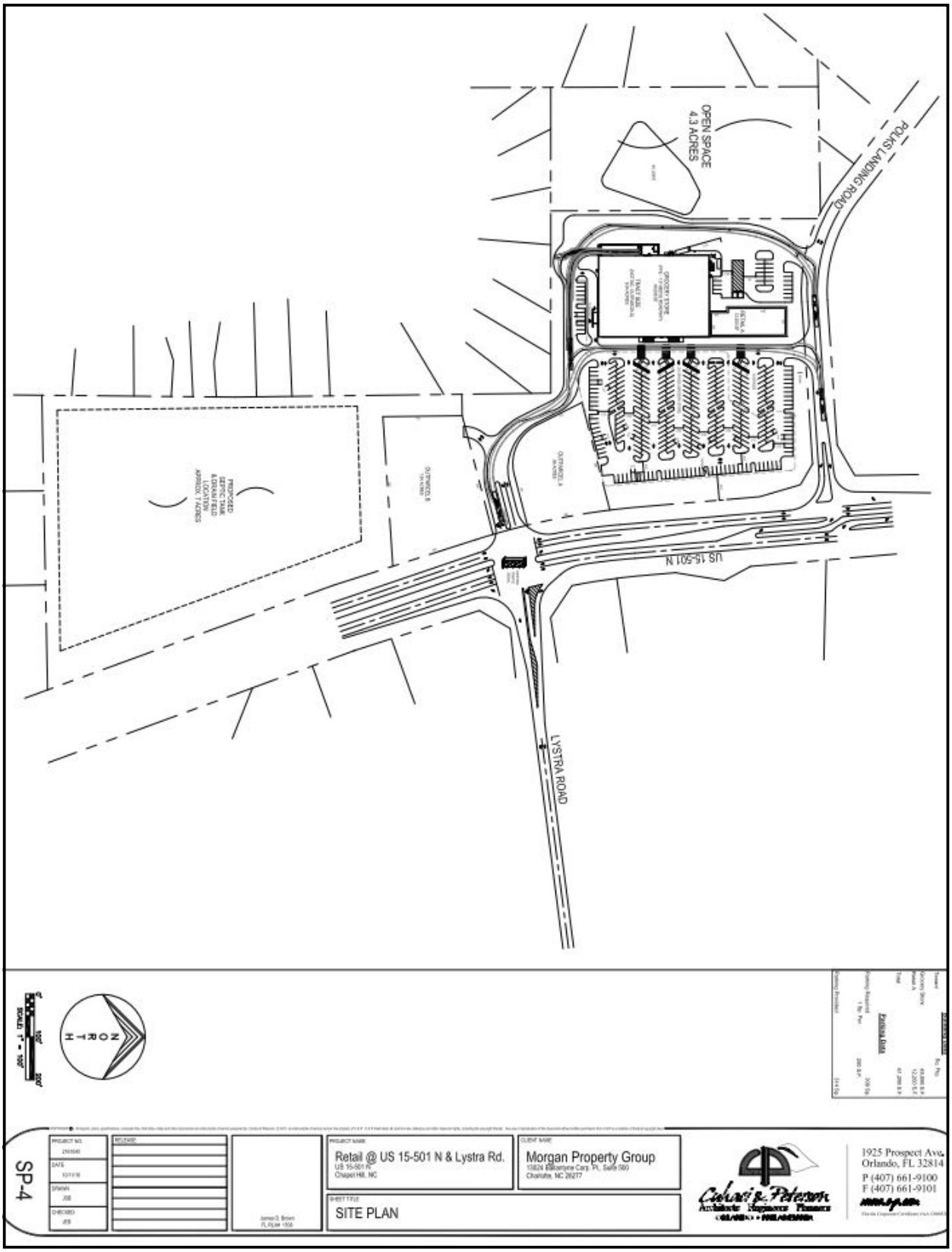
Chatham County
Grocery Store
Chatham County, NC

Site Location Map

Scale: Not to Scale

Figure 1



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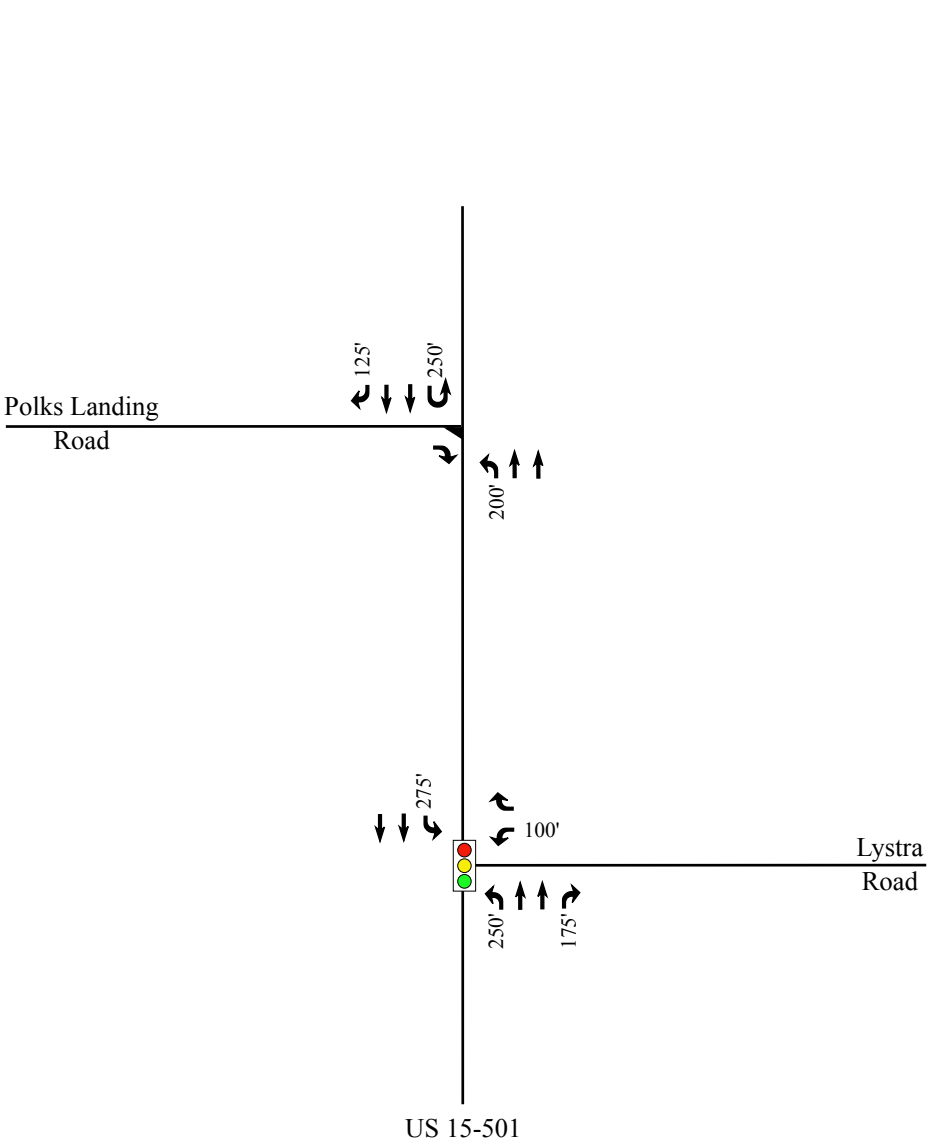
Chatham County
Grocery Store
Chatham County, NC

Preliminary Site Plan

Scale: Not to Scale

Figure 2



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- Existing Lane
- X' Storage (In Feet)

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Chatham County
Grocery Store
Chatham County, NC

2017 Existing
Lane Configurations

Scale: Not to Scale | Figure 3

2. EXISTING (2017) PEAK HOUR CONDITIONS

2.1. Existing (2017) Peak Hour Traffic

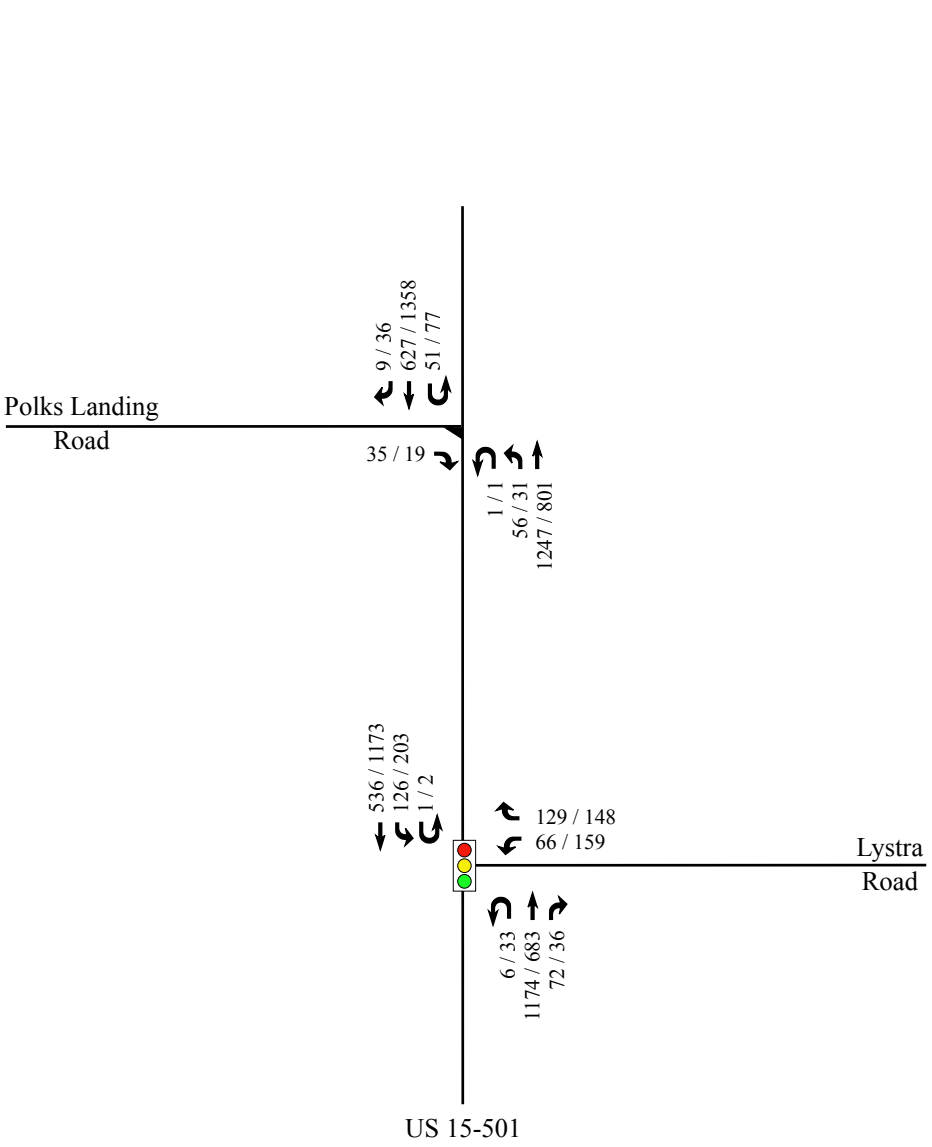
Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in February of 2017 by Burns Service Inc. during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods:

- US 15-501 and Lystra Road
- US 15-501 and Polks Landing Road

Traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for existing (2017) weekday AM and PM peak hour traffic volumes with existing lane geometry. A copy of the count data is located in Appendix A of this report.

2.2. Analysis of Existing (2017) Peak Hour Traffic

The existing (2017) weekday AM and PM peak hour traffic volumes were analyzed to determine the current levels of service at the study intersections under existing roadway conditions. Signal information was obtained from NCDOT and is included in Appendix B. The results of the analysis are presented in Section 7 of this report.



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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Chatham County
Grocery Store
Chatham County, NC

Existing (2017)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 4

3. BACKGROUND (2019) PEAK HOUR CONDITIONS

In order to account for 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 or not the proposed development is constructed. Background traffic is comprised of existing traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

3.1. Ambient Traffic Growth

Through coordination with the County and NCDOT, it was determined that an annual growth rate of 3% would be used to generate projected (2019) weekday AM and PM peak hour traffic volumes. Refer to Figure 5a for projected (2019) peak hour traffic without the synchronized street and Figure 5b for project (2019) peak hour traffic with the synchronized street.

3.2. Adjacent Development Traffic

Through coordination with the County, the following adjacent developments were identified to be included in this study:

- Fearrington Retail
- Briar Chapel
- Polks Village
- Williams Corner

Fearrington Retail is expected to consist of a grocery store and retail development and be located in the northwest quadrant of the US 15-501 and Morris Road / Village Way intersection. Briar Chapel is expected to consist of mixed-use development and be located west of US 15-501. Polks Village is expected to consist of mixed-use office and commercial development and be located in the northwest quadrant of the intersection US 15-501 and Polks Landing Road. Williams Corner is expected to consist of mixed-use development and be located in the northeast quadrant of the intersection of US 15-501 and Lystra Road.

It should be noted that Fearrington Retail and Williams Corner development have not begun construction despite their respective TIA build-years being 2009 and 2010. To maintain conservative results, the full build-out traffic from both developments were included in the analysis. The Polks Village and Briar Chapel developments have begun construction and through coordination with the County, only the unbuilt portions of development were included in the analysis. Adjacent development trips without the synchronized street are shown in Figure 6a and adjacent development trips with the synchronized street are shown in Figure 6b. Adjacent development information can be found in Appendix C.

3.3. Future Roadway Improvements

Based on coordination with the NCDOT and the County, it was determined the future synchronized street improvements along US 15-501 should be included in this study. Plans are under development and have not been finalized. The synchronized street roadway configurations utilized in this study were determined based on coordination with the NCDOT.

3.4. Background (2019) Peak Hour Traffic Volumes

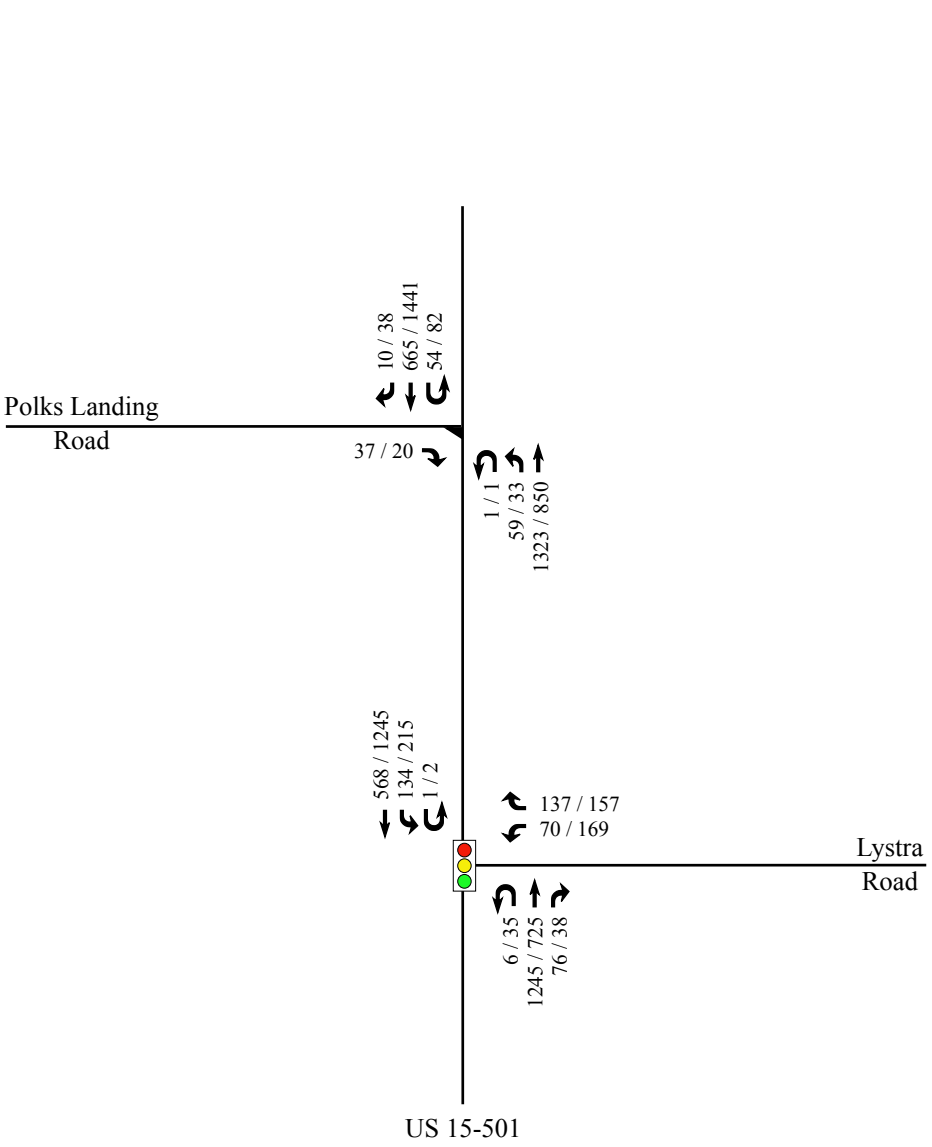
The background (2019) traffic volumes were determined by projecting the existing (2017) peak hour traffic to the year 2019, and adding the adjacent development trips. Refer to Figure 7a for an illustration of the background (2019) peak hour traffic volumes without the synchronized street and Figure 7b for the background (2019) peak hour traffic volumes with the synchronized street.

3.5. Analysis of Background (2019) Peak Hour Traffic Conditions

The background (2019) AM and PM peak hour traffic volumes at the study intersections were analyzed with future geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.

It should be noted that the background (2019) analysis results are conservative as the Fearrington Retail and Williams Corner developments have not begun construction despite their respective TIA build-years being 2009 and 2010. If these developments continue to delay construction, it is likely that they will not be constructed before the proposed site. Without the

additional background traffic associated with these two developments, all intersections are expected to operate with better LOS and delay than illustrated in this report under all future 2019 traffic conditions.



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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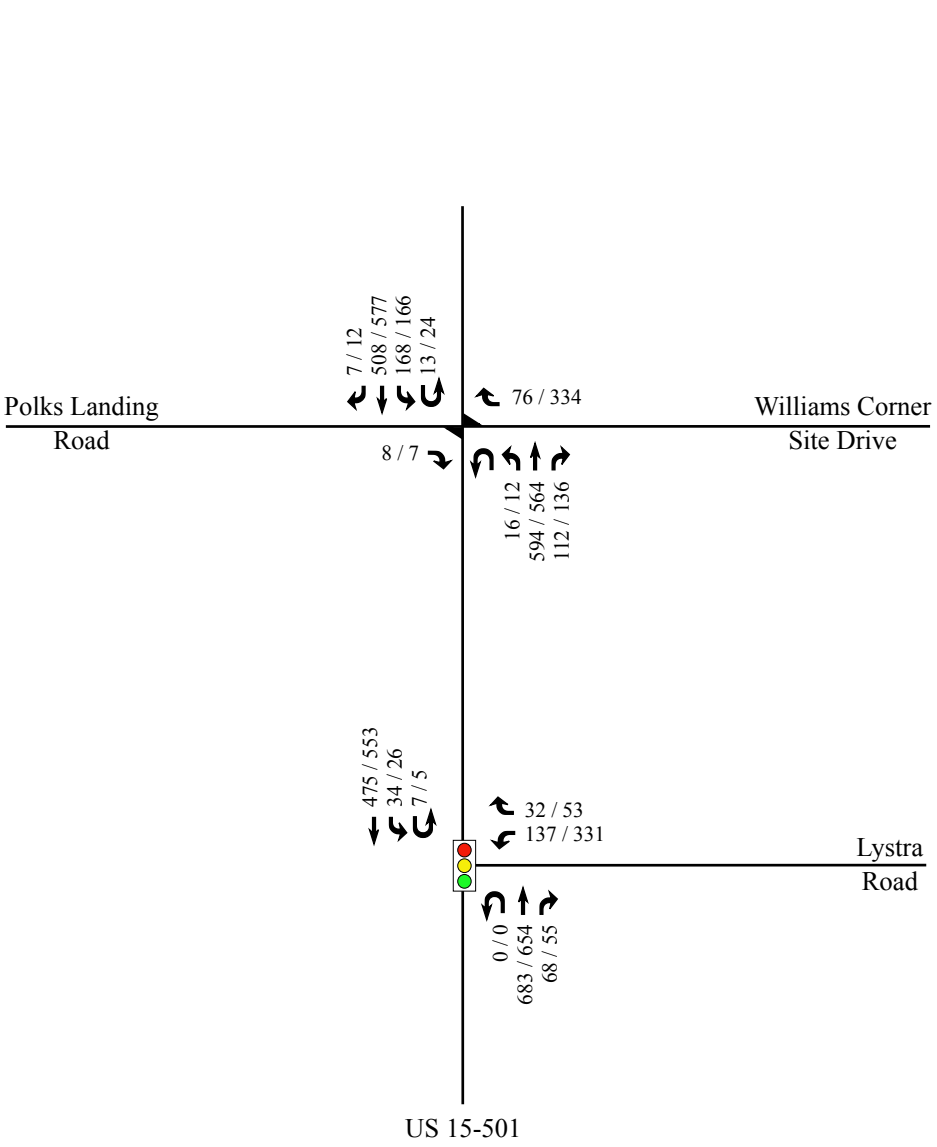
Chatham County
Grocery Store
Chatham County, NC

Projected (2019)
Peak Hour Traffic Volumes
without Synchronized Street

Scale: Not to Scale

Figure 5



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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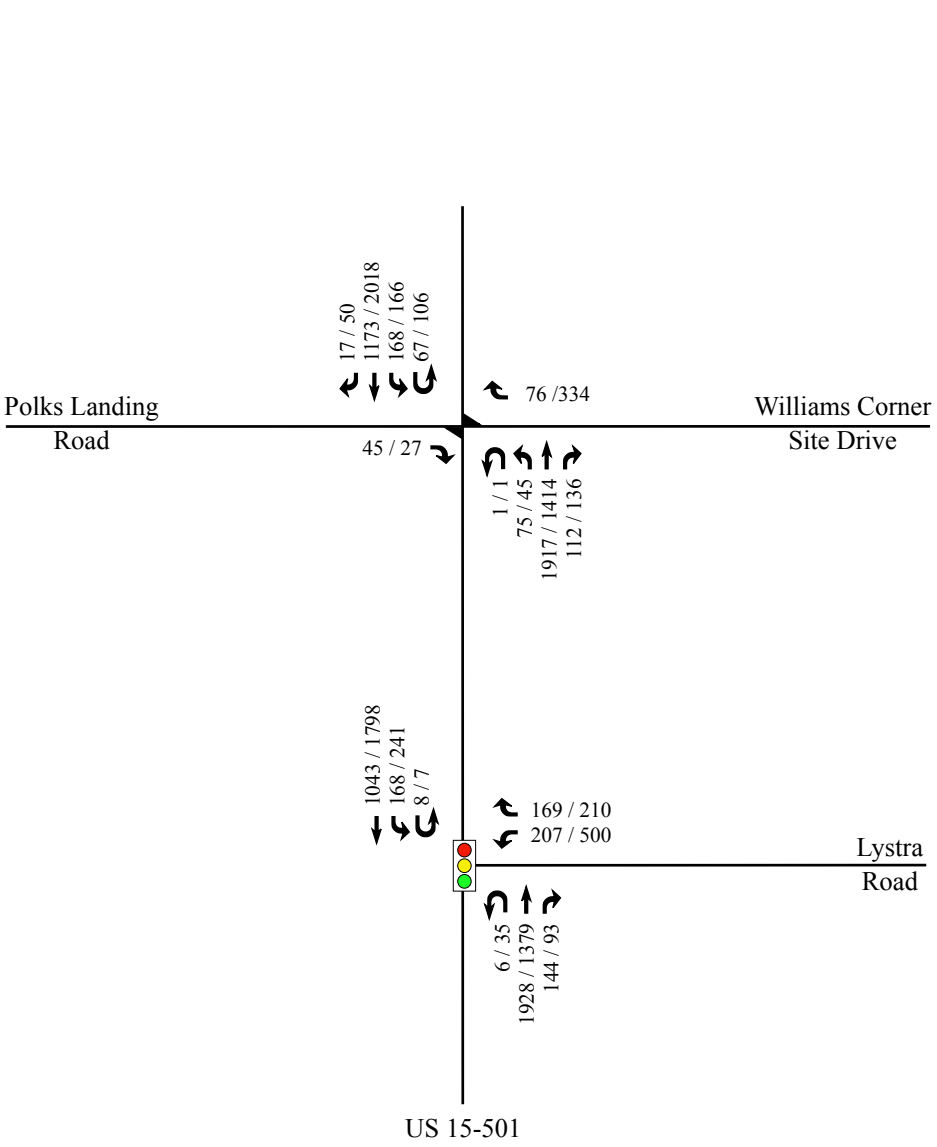
Chatham County
Grocery Store
Chatham County, NC

Total Adjacent Development
Traffic Volumes
without Synchronized Street

Scale: Not to Scale

Figure 6



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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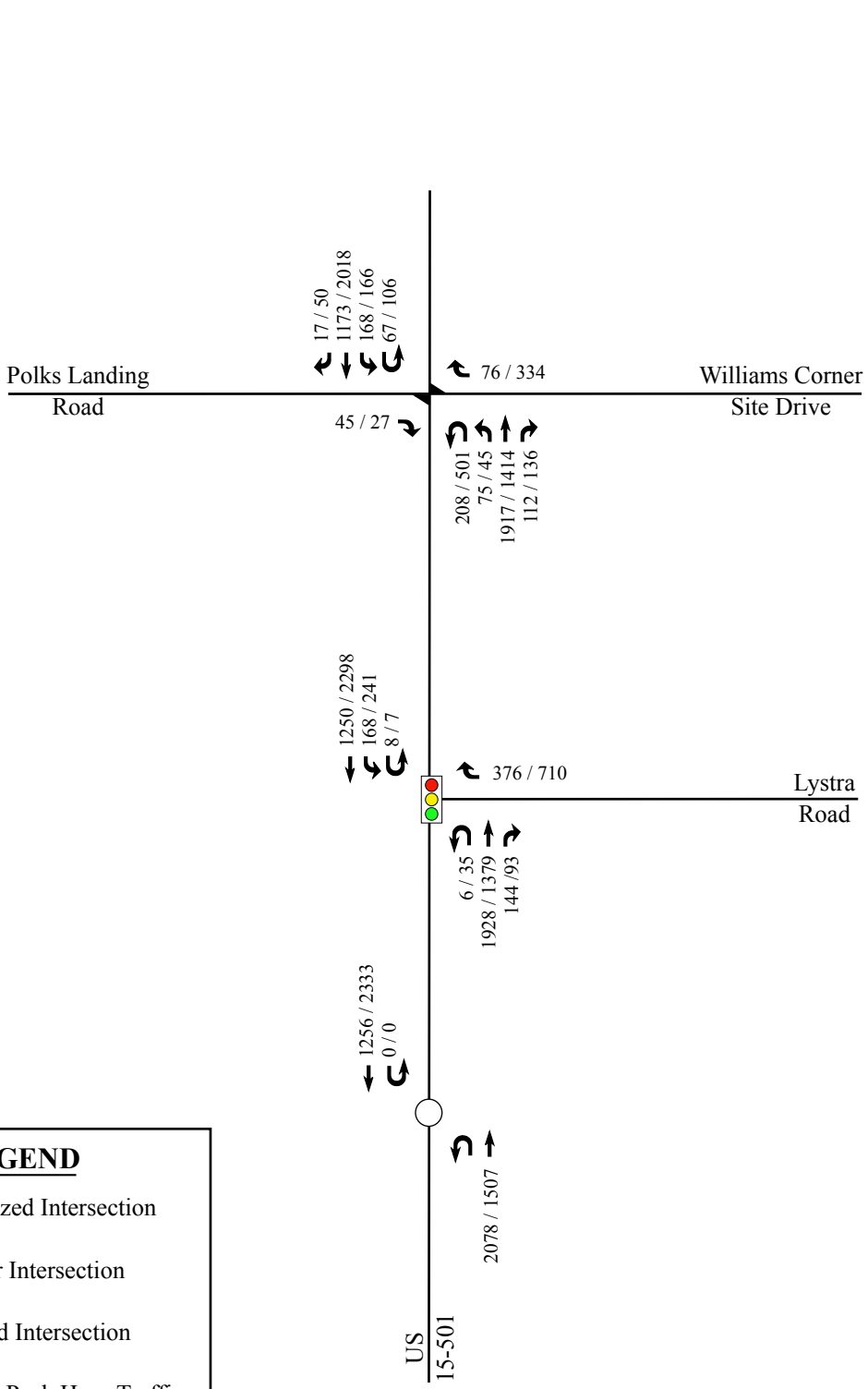
Chatham County
Grocery Store
Chatham County, NC

Background (2019)
Peak Hour Traffic Volumes
without Synchronized Street

Scale: Not to Scale

Figure 7a



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Chatham County
Grocery Store
Chatham County, NC

Background (2019)
Peak Hour Traffic Volumes
with Synchronized Street

Scale: Not to Scale

Figure 7b

4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

The proposed development is expected to consist of a 12,200 sq. ft. shopping center, 49,100 sq. ft. grocery store, 4,000 sq. ft. drive-in bank, and a 4,000 sq. ft. fast-food restaurant with drive-thru window. Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 9th Edition. Table 1 provides a summary of the trip generation potential for the site.

Table 1: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Shopping Center (820)	12,200 sq. ft.	1,730	27	16	70	76
Supermarket (850)	49,098 sq. ft.	5,020	103	63	237	228
Drive-in Bank (912)	4,000 sq. ft.	600	28	21	49	49
Fast Food with Drive-Thru Window (934)	4,000 sq. ft.	1,990	93	89	68	63
Total Trips		**9,340**	**251**	**189**	**424**	**416**
Pass-By Trips: Shopping Center (34% PM)			--	--	*-25*	*-25*
Pass-By Trips: Supermarket (36% PM)			--	--	*-84*	*-84*
Pass-By Trips: Drive-in Bank (29% AM, 35% PM)			*-8*	*-8*	*-18*	*-18*
Pass-By Trips: Fast Food with Drive-Thru Window (49% AM, 50% PM)			*-45*	*-45*	*-33*	*-33*
Total Pass-By Trips			***-53***	***-53***	***-160***	***-160***
Total Primary Trips			**198**	**136**	**264**	**256**

It is estimated that the proposed development will generate approximately 9,340 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume,

it is anticipated that 440 trips (251 entering and 189 exiting) will occur during the AM peak hour and 840 (424 entering and 416 exiting) will occur during the PM peak hour.

Pass-by trips were taken into consideration in this study. Pass-by trips are made by the traffic already using the adjacent roadway, entering the site as an intermediate stop on their way to another destination. Pass-by trips are expected to account for 106 trips (53 entering and 53 exiting) occurring during the weekday AM peak hour and 320 trips (160 entering and 160 exiting) occuring during the weekday PM peak hour. It should be noted that the pass-by trips were balanced, as it is likely that these trips would enter and exit in the same hour.

The total primary site trips are the calculated site trips after the reduction for pass-by trips. Primary site trips are expected to be 334 trips (198 entering and 136 exiting) during the AM peak hour and 520 trips (264 entering and 256 exiting) during the PM peak hour.

4.2. Diverted Traffic

Diverted traffic volumes must be considered to better estimate the future traffic volumes with the synchronized street. Through coordination with the NCDOT, the intersection of US 15-501 and Lystra Road will remain signalized, however it will operate as a left-over intersection. The exact location for the southbound U-turn location is assumed to be located near the Chatham Downs Drive intersection for the purposes of this study. Refer to Appendix D for Figures illustrating the diverted traffic.

4.3. Site Trip Distribution and Assignment

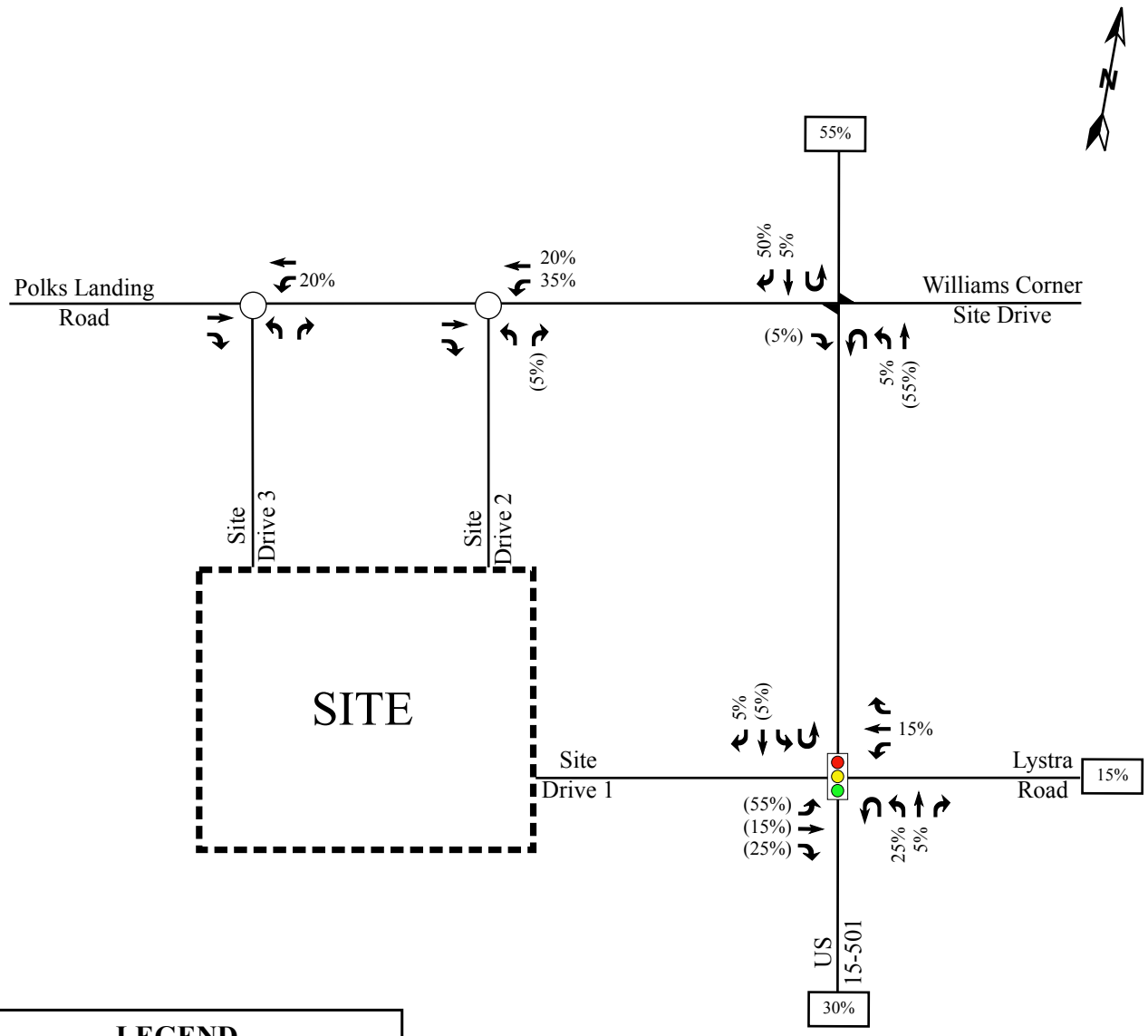
Trip distribution percentages used in assigning site traffic for this development were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. It is estimated that trips will be distributed as follows:

- 55% to/from the north via US 15-501
- 30% to/from the south via US 15-501
- 15% to/from the east via Lystra Road

The site trip distribution is shown in Figure 8a without the synchronized street and Figure 8b with the synchronized street. Refer to Figure 9a for the primary site trip assignment without the synchronized street and Figure 9b with the synchronized street.

The pass-by site trips were distributed based on existing traffic patterns with consideration given to the proposed driveway access and site layout. Refer to Figure 10a for the pass-by site trip distribution without the synchronized street and Figure 10b with the synchronized street. Pass-by site trips without the synchronized street are shown in Figure 11a and with the synchronized street in Figure 11b.

The total site trips were determined by adding the primary site trips and the pass-by site trips. Refer to Figure 12a for the total peak hour site trips without the synchronized street and Figure 12b with the synchronized street.



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Left-Over Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- Z% Regional Trip Distribution

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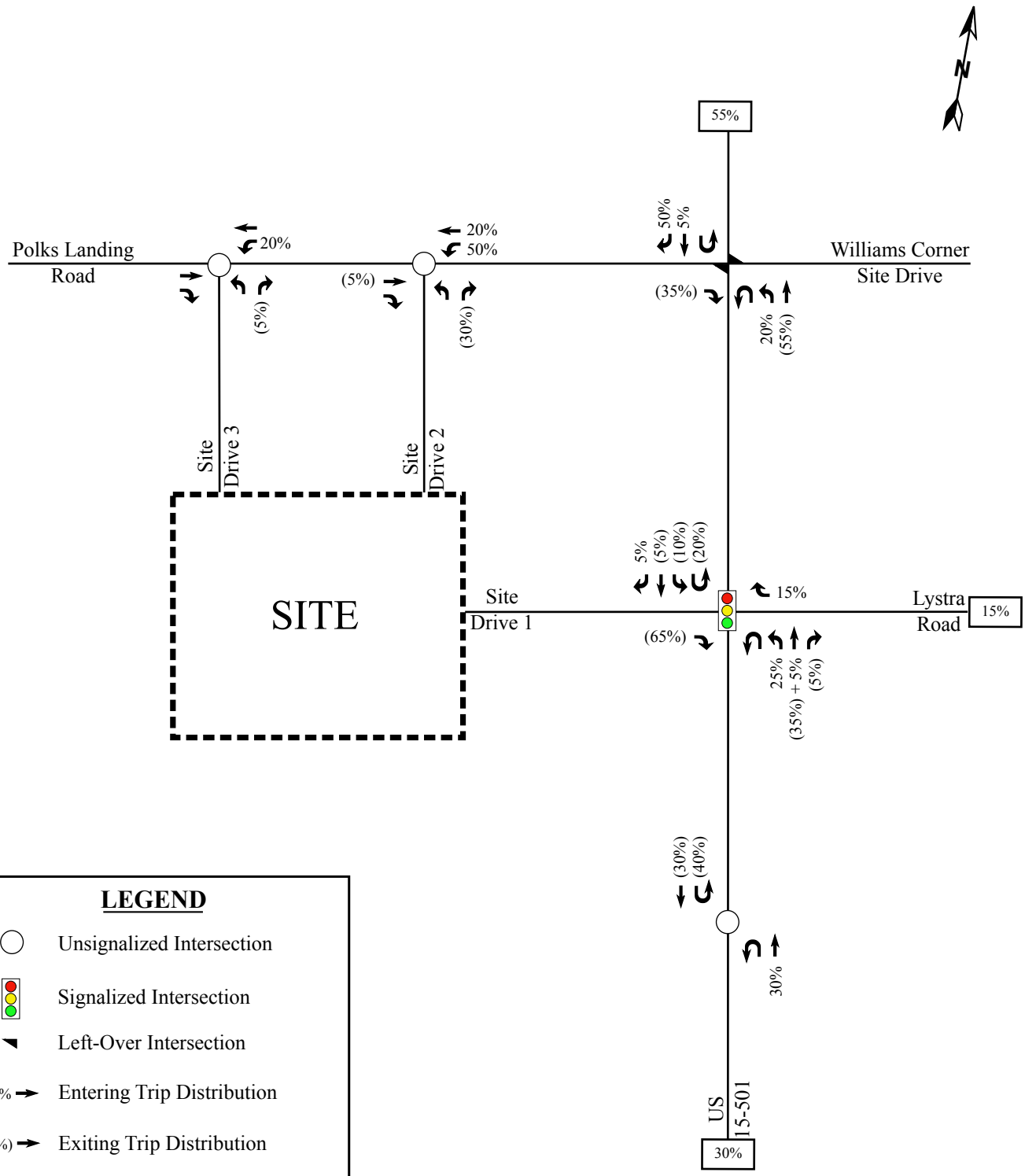
Chatham County
Grocery Store
Chatham County, NC

Site Trip Distribution
without Synchronized Street

Scale: Not to Scale

Figure 8a



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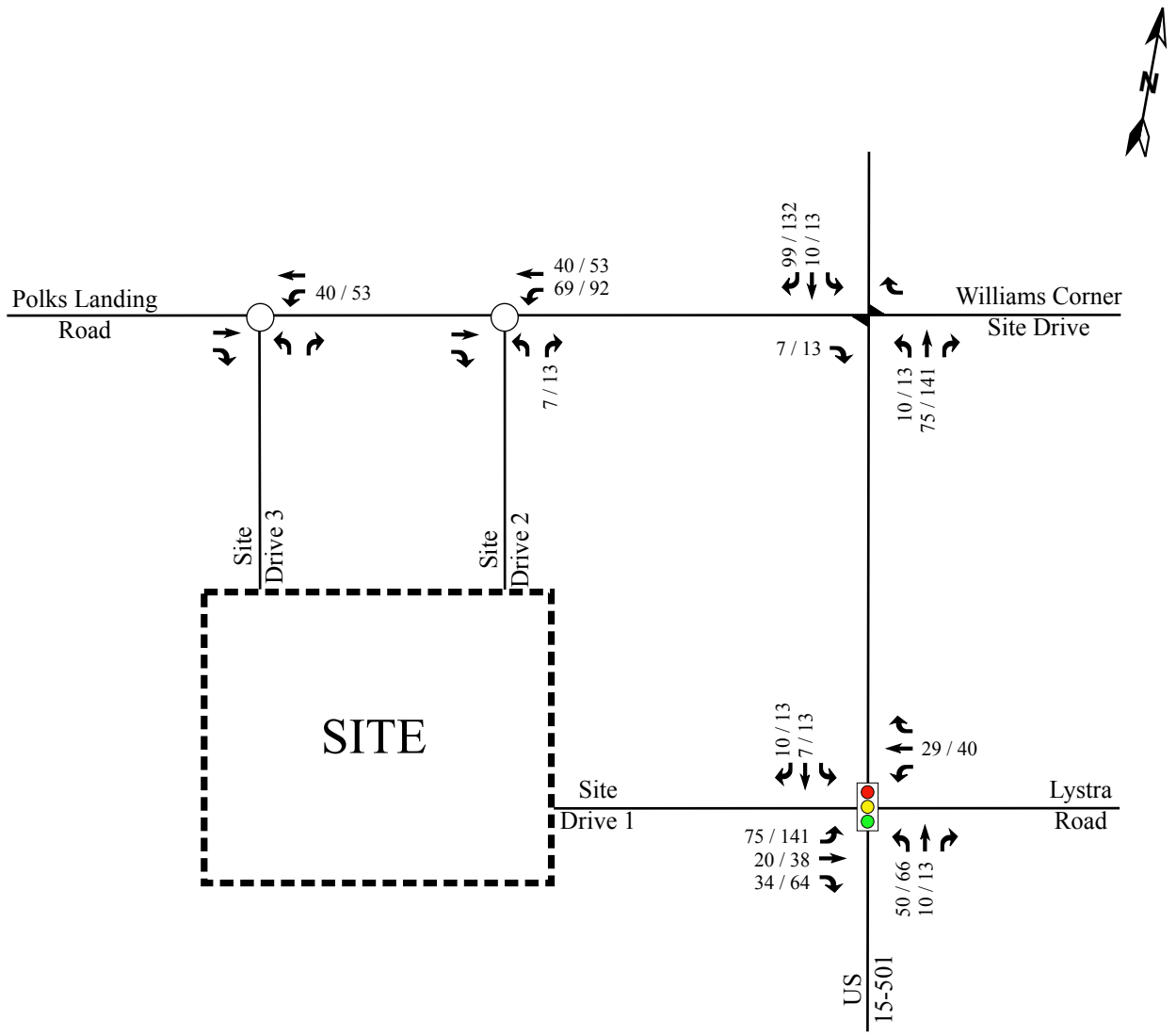
Chatham County
Grocery Store
Chatham County, NC

Site Trip Distributions
With Synchronized Street

Scale: Not to Scale

Figure 8b



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Site Trips

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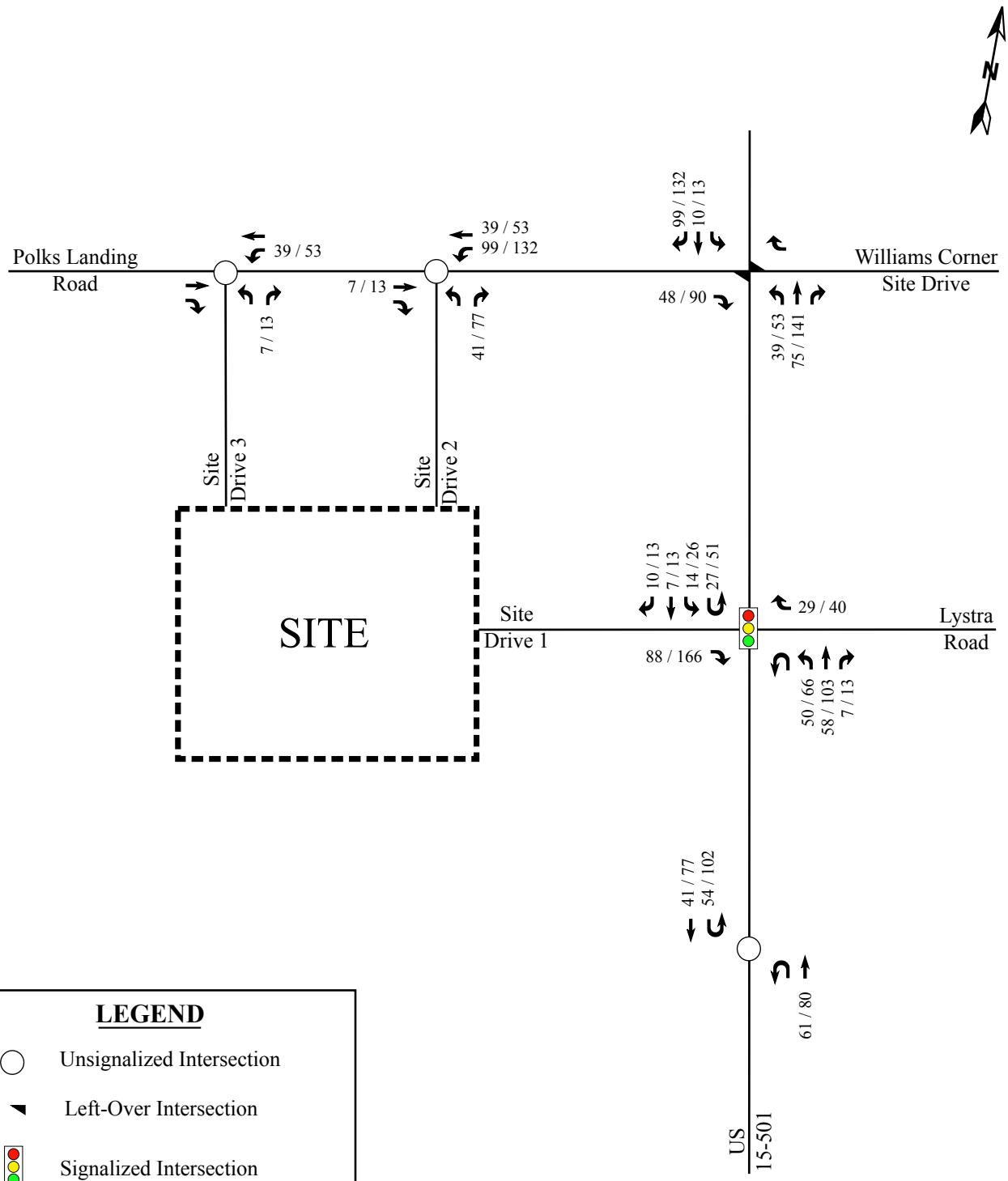
Chatham County
Grocery Store
Chatham County, NC

Primary Site
Trip Assignment
without Syncrhonized Street

Scale: Not to Scale

Figure 9a



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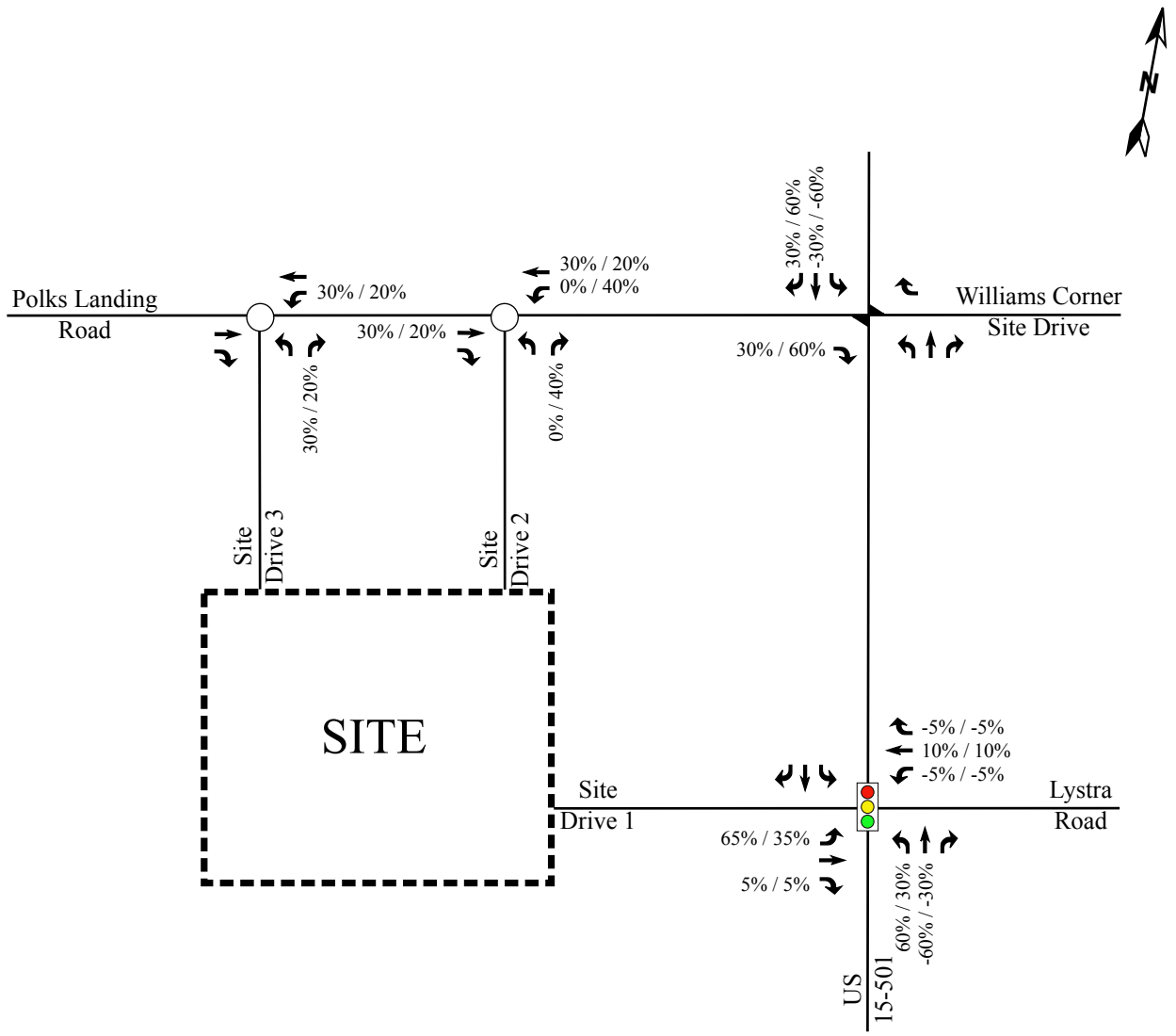
Chatham County
Grocery Store
Chatham County, NC

Primary Site
Trip Assignment with
Synchronized Street

Scale: Not to Scale

Figure 9b



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Pass-By Distribution

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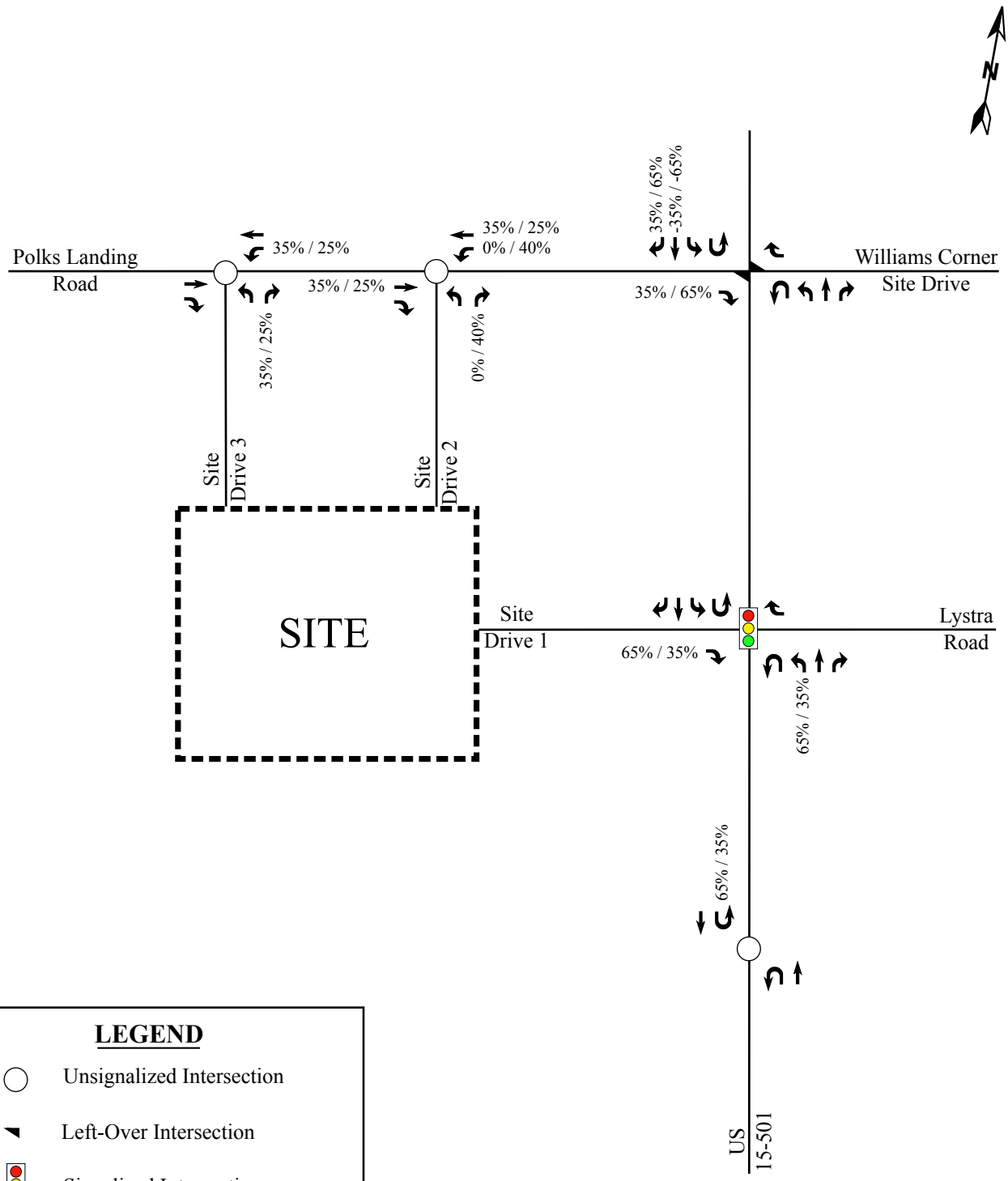
Chatham County
Grocery Store
Chatham County, NC

Pass-By Trip
Distribution Percentages

Scale: Not to Scale

Figure 10a



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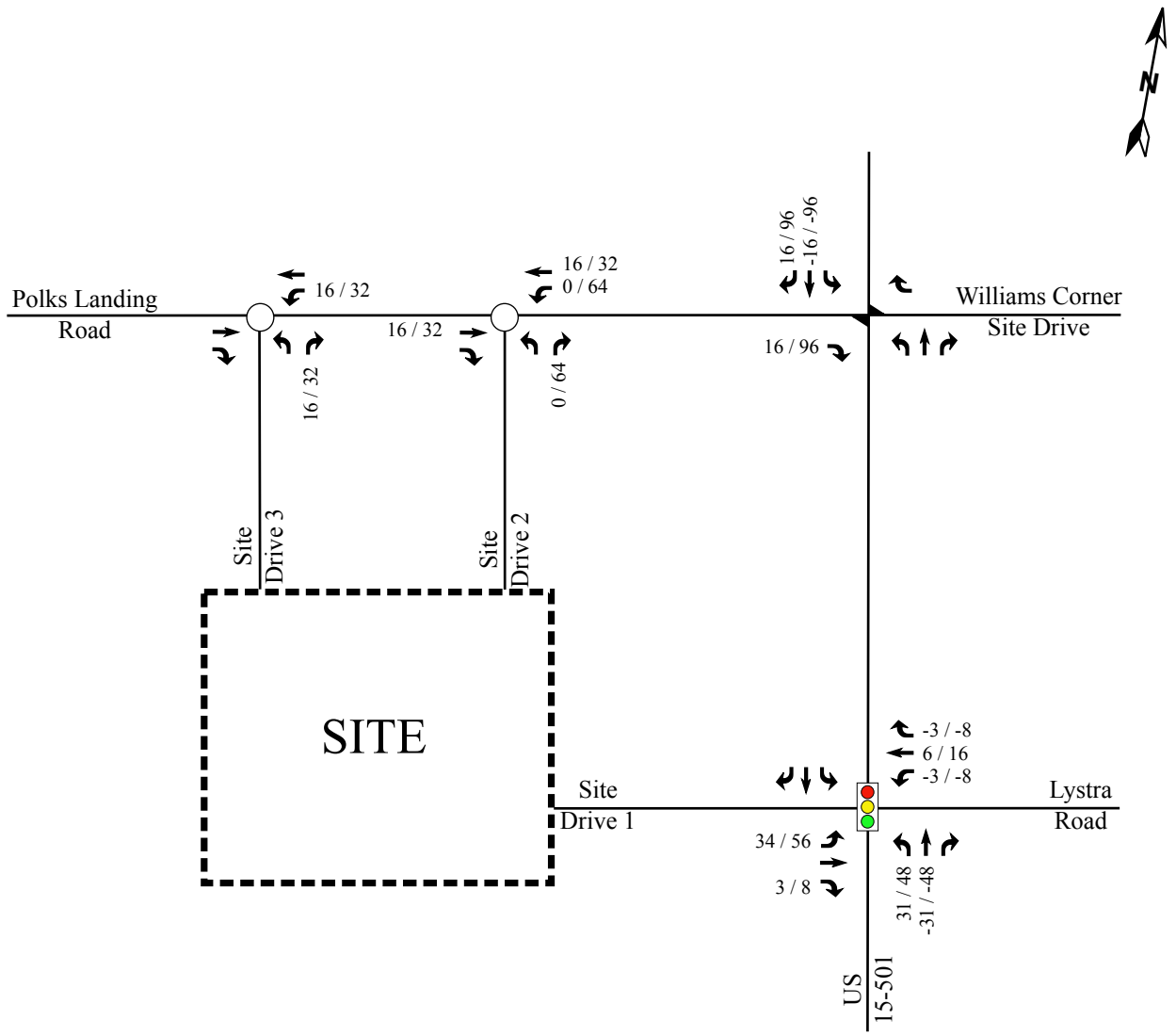
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Pass-By Trip
Distribution Percentages

Scale: Not to Scale

Figure 10b



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Pass-By Trips

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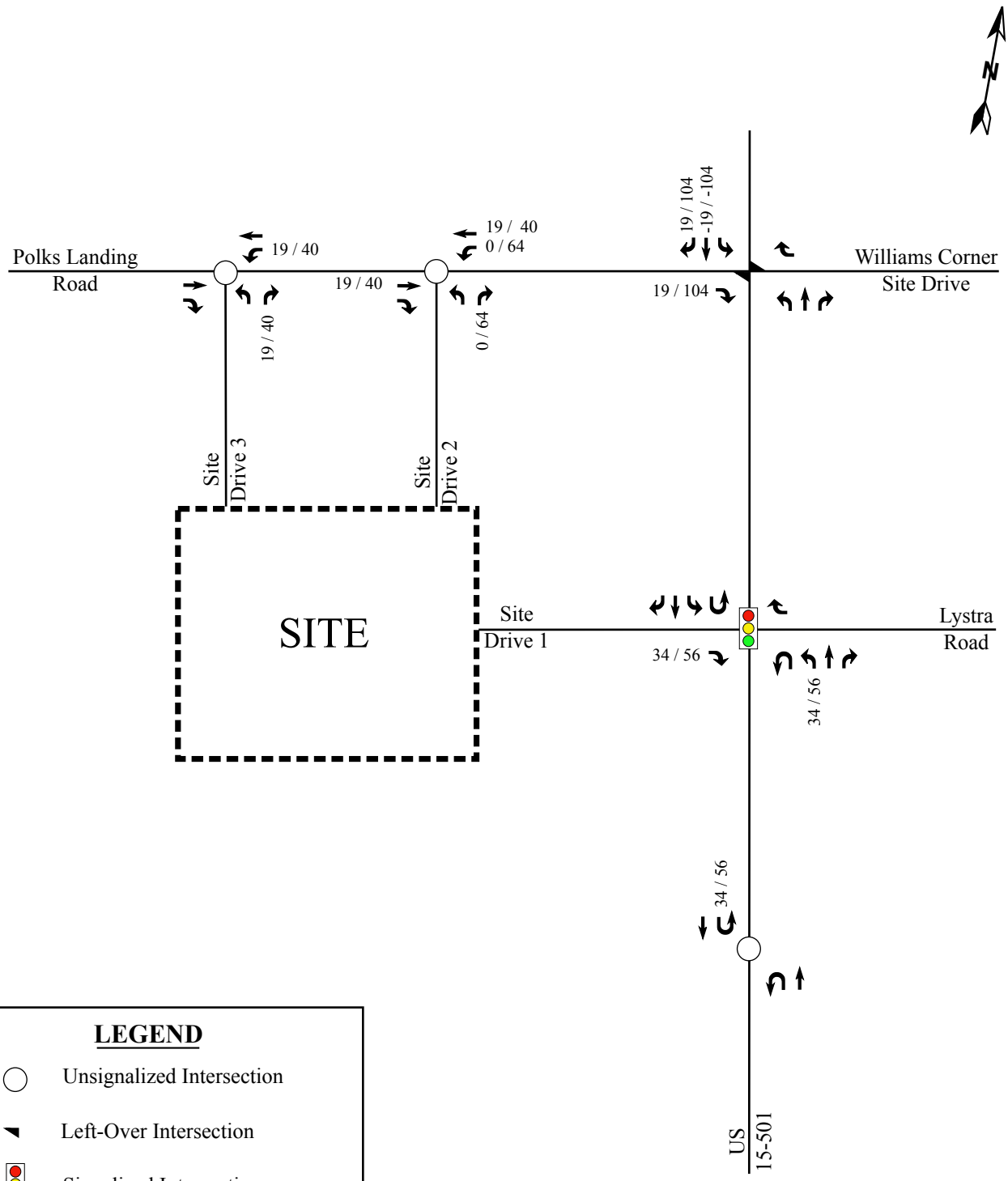
Chatham County
Grocery Store
Chatham County, NC

Pass-By Trip Assignment
without Synchronized Street

Scale: Not to Scale

Figure 11a



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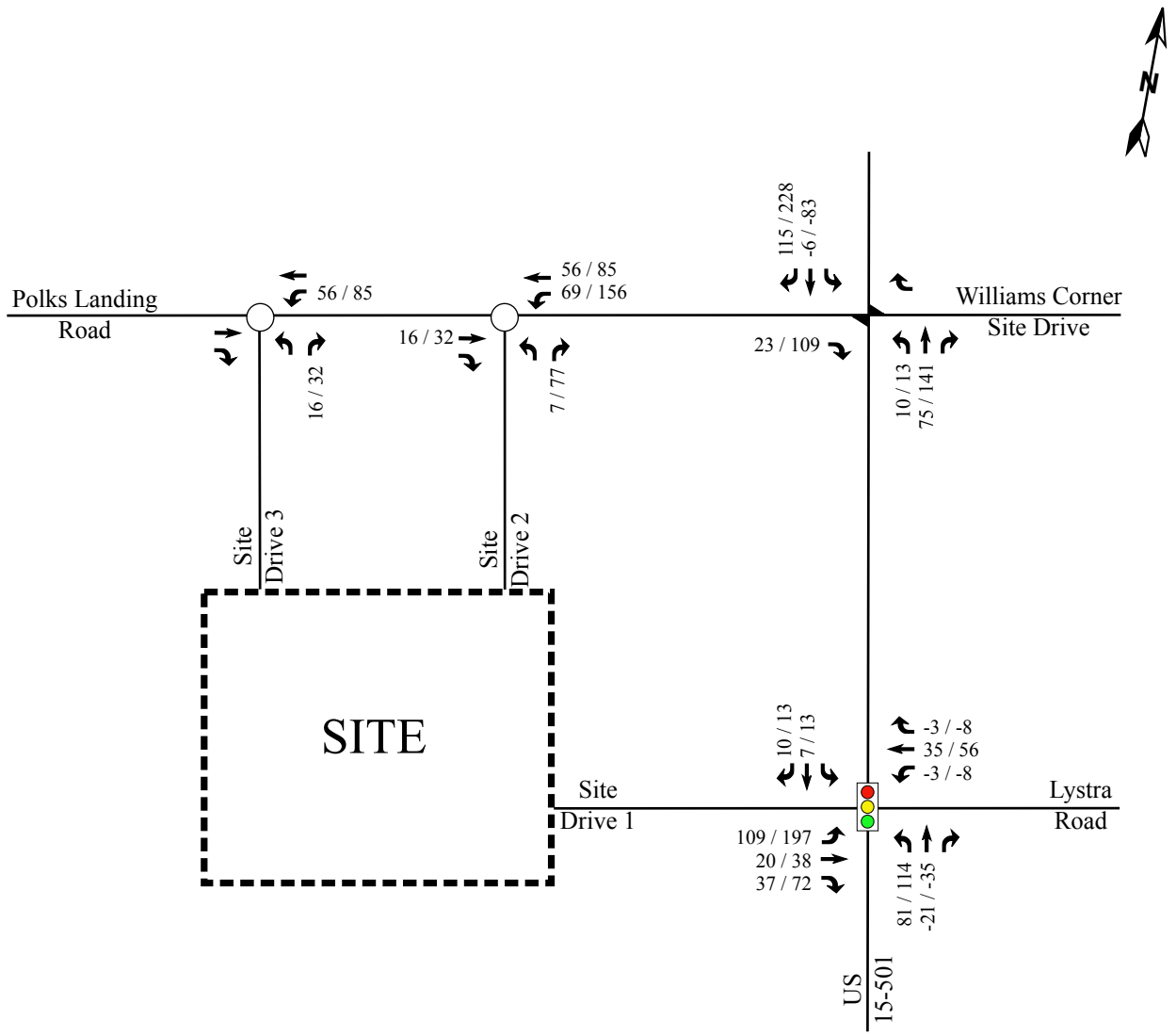
Chatham County
Grocery Store
Chatham County, NC

Pass-By
Trip Assignment with
Synchronized Street

Scale: Not to Scale

Figure 11b



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Total Site Trips

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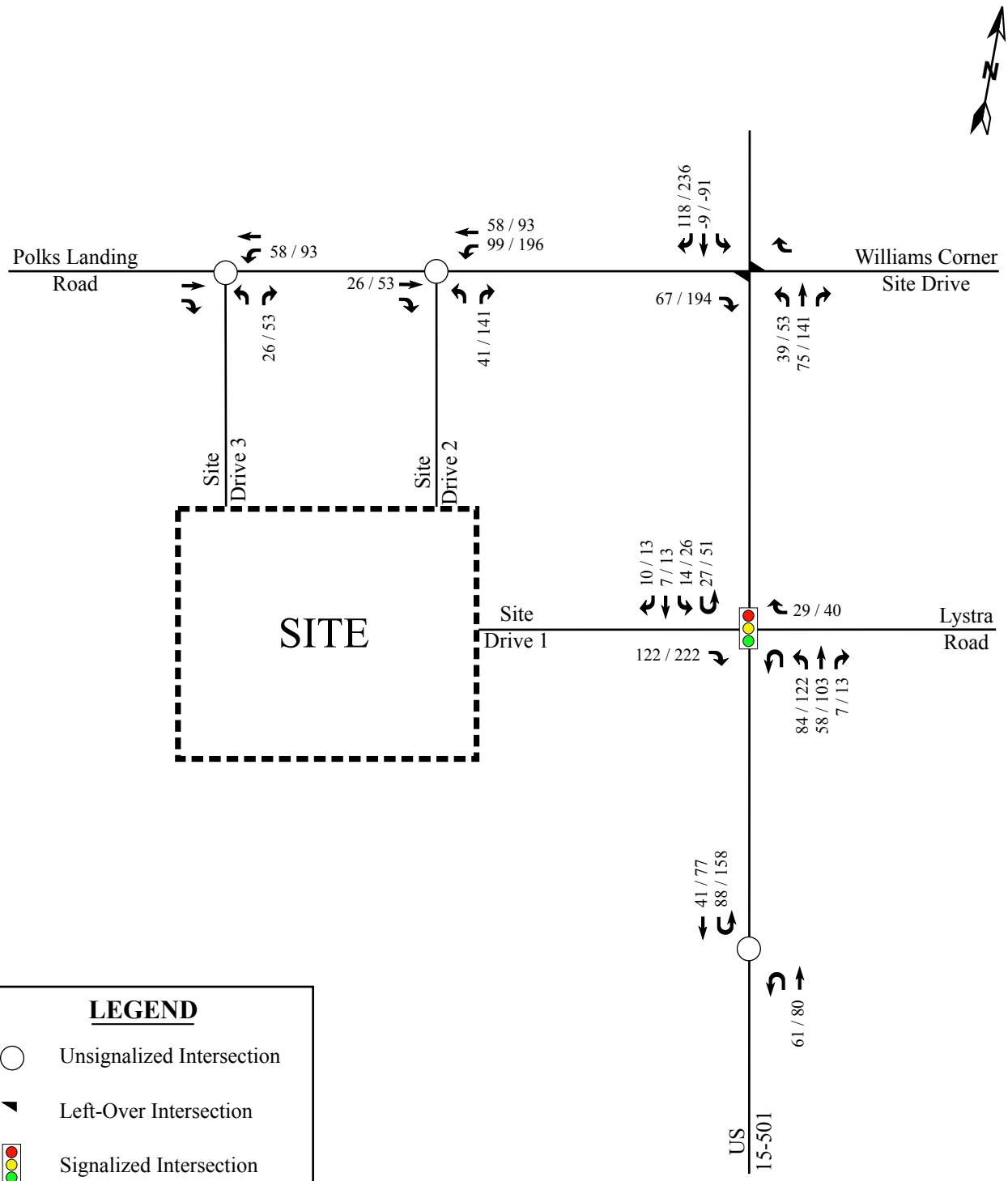
Chatham County
Grocery Store
Chatham County, NC

Total Site
Trip Assignment without
Synchronized Street

Scale: Not to Scale | Figure 12a



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Total Site
Trip Assignment with
Synchronized Street

Scale: Not to Scale

Figure 12b

5. COMBINED (2019) TRAFFIC CONDITIONS

5.1. Combined (2019) Peak Hour Traffic Volumes

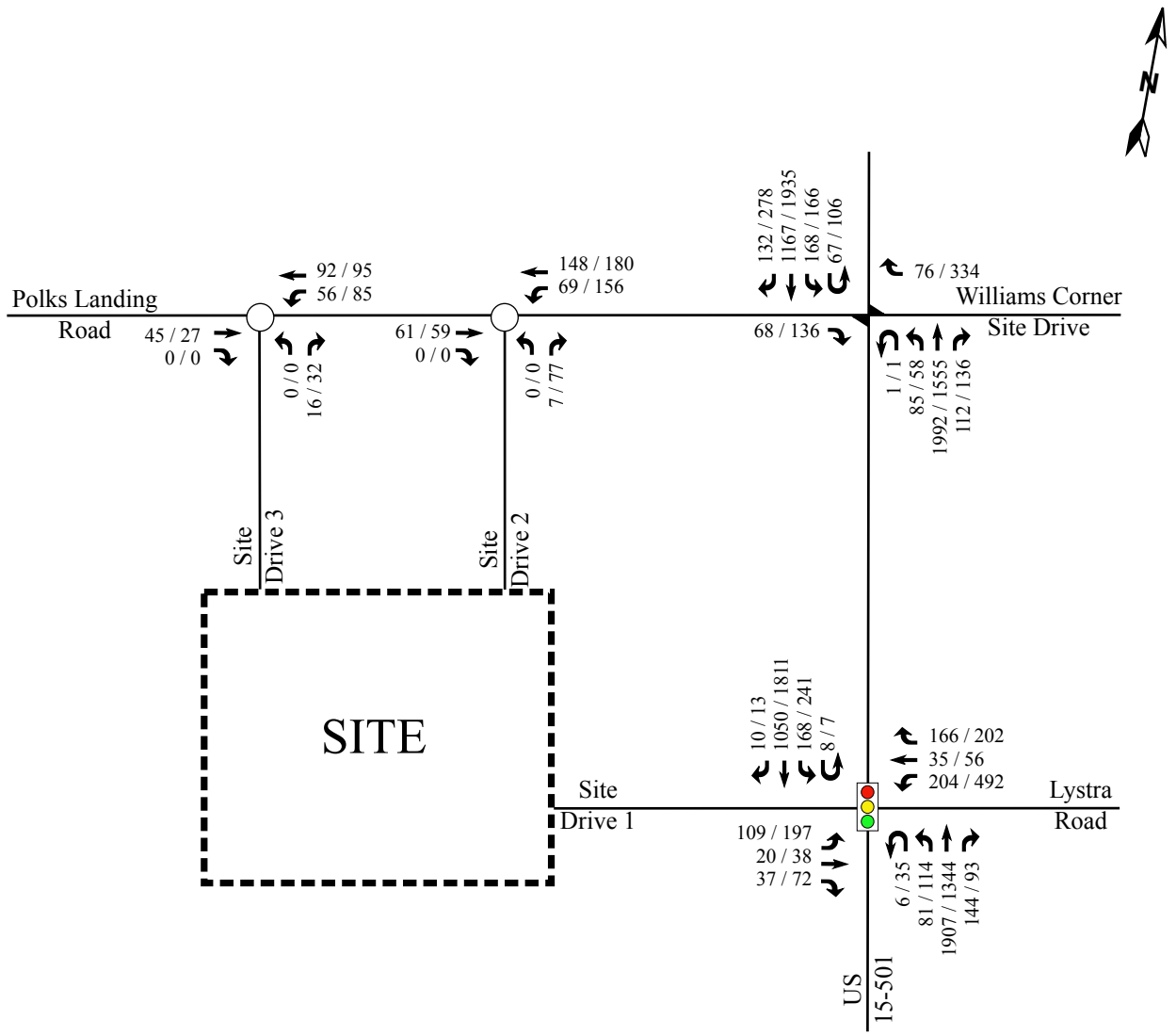
To estimate traffic conditions with the site fully built-out, the total site trips were added to the background (2019) traffic volumes to determine the combined (2019) traffic volumes. Refer to Figure 13a for an illustration of the combined (2019) peak hour traffic volumes with the proposed site fully developed without the synchronized street and Figure 13b with the synchronized street.

5.2. Analysis of Combined (2019) Peak Hour Traffic

Study intersections were analyzed with the combined (2019) traffic volumes using the same methodology previously discussed for existing and background traffic conditions. Intersections were analyzed with improvements necessary to accommodate future traffic volumes. The results of the capacity analysis for each intersection are presented in Section 7 of this report.

It should be noted that because the background (2019) analysis is conservative due to the likelihood of the proposed site being constructed before all of the adjacent developments are constructed, the combined analysis is also conservative.

It should also be noted that combined analysis may also be conservative as internal capture rates were not considered between the adjacent developments, namely the Polks Village and Williams Corner developments, and the proposed site was not considered. It is anticipated that trips between sites will overlap as they are traveling between residential, office, retail, and restaurant land uses. The interaction between sites is expected to decrease the total traffic volumes on the roadway network, which is expected to improve intersection operations during all future (2019) analysis scenarios.



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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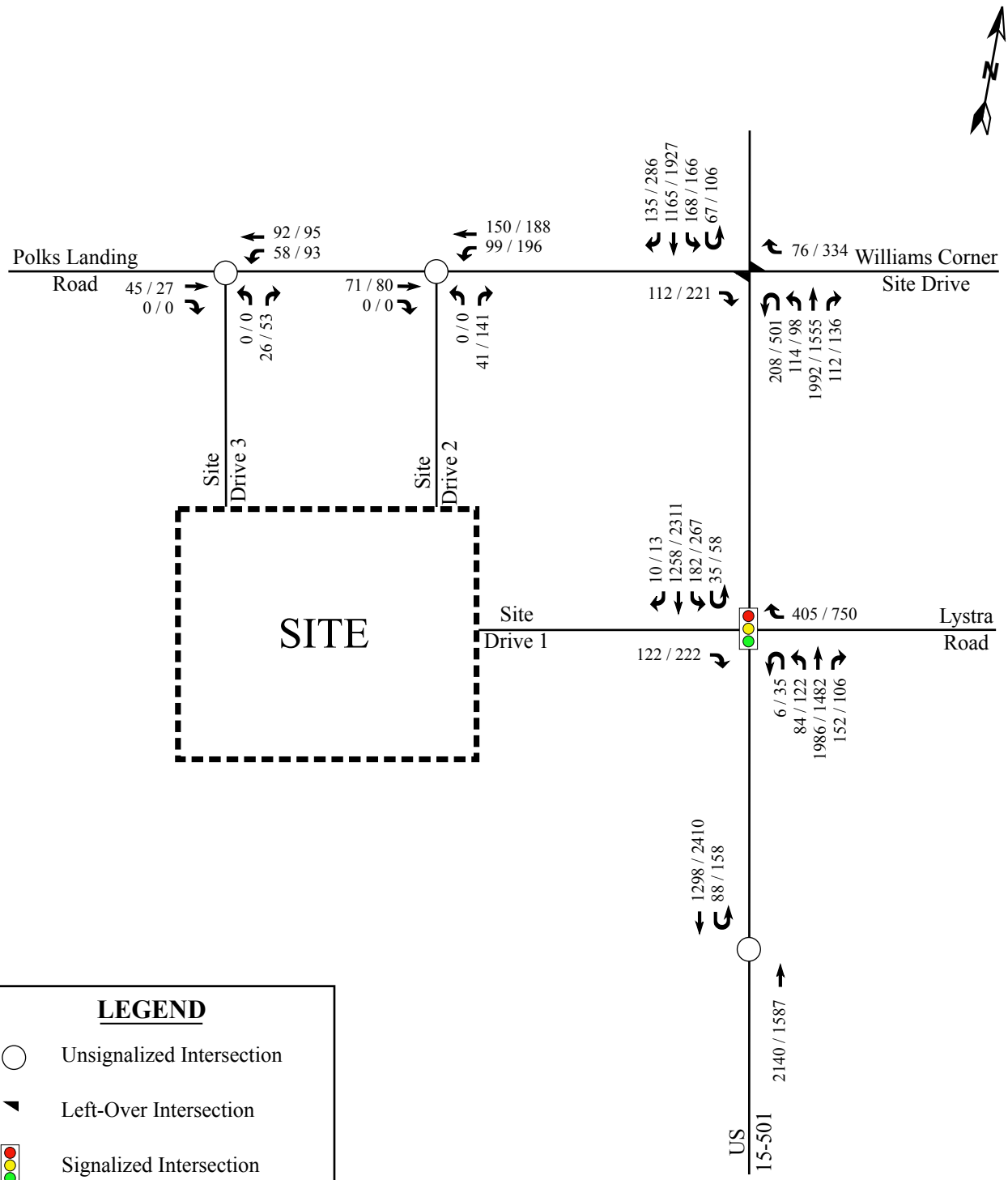
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Combined (2019)
Peak Hour Traffic Volumes
without Synchronized Street

Scale: Not to Scale

Figure 13a



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TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Combined (2019)
Peak Hour Traffic Volumes
with Synchronized Street

Scale: Not to Scale

Figure 13b

6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *2010 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 9.1), was used to complete the analyses for most of the study area intersections. 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 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 LOS "D" operation at the intersection.

Table 2: Highway Capacity Manual – Levels-of-Service and Delay

UNSIGNALIZED 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

6.1. Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to the NCDOT Congestions Management Guidelines.

7. CAPACITY ANALYSIS

7.1. US 15-501 and Lystra Road / Site Drive 1

The existing signalized intersection of US 15-501 and Lystra Road / Site Drive 1 was analyzed under existing (2017), background (2019), and combined (2019) traffic conditions with the lane configurations shown in Table 3. Refer to Table 3 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

Table 3: Analysis Summary of US 15-501 and Lystra Road/ Site Drive 1

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2017) Conditions	WB NB SB	1 LT, 1 RT 1 UT, 2 TH, 1 RT 1 LT, 2 TH	C B A	B (10)	C B A	B (12)
Background (2019) Conditions without Synchronized Street	EB WB NB SB	1 LT, 1 RT 1 UT, 2 TH, 1 RT 1 LT, 2 TH	E C B	C (32)	F C C	D (50)
Combined (2019) Conditions without Synchronized Street without RTOR allowed	**EB** WB NB SB	**2 LT, 1 TH, 1 RT** **2 LT**, **1 TH**, 1 RT 1 UT-**LT**, 2 TH, 1 RT 1 LT, 2 TH, **1 RT**	E F D C	D (46)	E F D E	E (68)
Combined (2019) Conditions without Synchronized Street	**EB** WB NB SB	**2 LT, 1 TH, 1 RT** **2 LT**, **1 TH**, 1 RT 1 UT-**LT**, 2 TH, 1 RT 1 LT, 2 TH, **1 RT**	D D C C	C (34)	E E D D	D (53)
Background (2019) Conditions with Synchronized Street	WB NB SBU*	2 RT 2 TH, 1 RT 1 UT-LT	D B C	C (21)	C B B	C (23)
	SB NBU**	2 TH 1 UT	A B	A (2)	A D	A (9)
Combined (2019) Conditions with Synchronized Street	WB NB SBU*	2 RT 2 TH, 2 RT 1 UT-LT	E B D	C (26)	D B B	C (24)
	EB SB NBU**	**1 RT** 2 TH, 1 RT 1 UT-**LT**	B A B	A (10)	F C D	C (35)

*Southbound U-turn analyzed as EB approach due to Synchro limitations.
** Northbound U-turn analyzed as WB approach due to Synchro limitations.

Capacity analysis of existing (2017) traffic conditions indicates the intersection of US 15-501 and Lystra Drive is expected to operate at an overall LOS B during both the AM and PM peak hours. Under background (2019) without synchronized street traffic conditions, the intersection is expected to operate at an overall LOS D or better. Under combined (2019) conditions without synchronized street, the intersection is expected to operate at an overall LOS D during the weekday AM peak hour and LOS E during the weekday PM peak hour.

It should be noted that the intersection operates with Right-Turn-On-Red (RTOR) allowed under existing (2017) traffic conditions and is expected to operate with RTOR allowed during future conditions. Under combined (2019) without synchronized street and with RTOR allowed, the intersection is expected to operate at LOS C during the weekday AM peak hour and LOS D during the weekday PM peak hour.

Under background (2019) and combined (2019) with synchronized street traffic conditions, the intersection is expected to operate at an overall LOS C or better during both the weekday AM and PM peak hours.

It should also be noted that the intersection analysis results are conservative as the Fearrington Retail and Williams Corner developments have not begun construction despite their respective TIA build-years being 2009 and 2010. If these developments continue to delay construction, it is likely that they will not be constructed before the proposed site. Without the additional background traffic associated with these two developments, the intersection is expected to operate with better LOS and delay than illustrated in Table 3 under all future 2019 traffic conditions.

Under all scenarios, the minor-street right-turns were analyzed as permitted only phasing because overlap phasing creates conflicts with the northbound and southbound U-turn movements in Synchro. It is expected that the intersection will operate as permitted + overlap under all future (2019) traffic conditions.

7.2. US 15-501 and Polks Landing Road / Williams Corner Site Drive

The existing unsignalized intersection of US 15-501 and Polks Landing Road / Williams Corner Site Drive was analyzed under existing (2017), background (2019), and combined (2019) traffic conditions with the lane configurations shown in Table 4. Refer to Appendix F for the Synchro capacity analysis reports.

Table 4: Analysis Summary of US 15-501 and Polks Landing Road / Williams Corner Site Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Existing (2017) Conditions	EB NBU* SB	1 RT 1 UT-LT 2 TH, 1 RT	B[2] C[1] --	N/A	C[2] E[1] --	N/A
	NB SBU**	2 TH 1 UT	-- C[1]	N/A	-- B[1]	N/A
Background (2019) Conditions without Synchronized Street	EB NBU* SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	D[2] F[1] --	N/A
	WB NB SBU**	1 RT 2 TH, 1 RT 1 UT-LT	D[2] -- F[1]	N/A	F[2] -- F[1]***	N/A
Combined (2019) Conditions without Synchronized Street	EB NBU* SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	F[2] F[1] --	N/A
	WB NB SBU**	1 RT 2 TH, 1 RT 1 UT-LT	D[2] -- F[1]	N/A	F[2] -- F[1]***	N/A

*Southbound U-turn analyzed as EB approach due to Synchro limitations.
** Northbound U-turn analyzed as WB approach due to Synchro limitations.
*** Southbound U-turn LOS is assumed during the PM peak hour due to Synchro limitations.
Background improvements associated with the Williams Corner development are shown underlined.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Background (2019) Conditions with Synchronized Street	EB NBU SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	D[2] F[1] --	N/A
	WB NB SBU	1 RT 2 TH, 1 RT 1 UT-LT	D[2] -- F[1]	N/A	F[2] -- F[1]***	N/A
Combined (2019) Conditions with Synchronized Street	EB NBU SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	F[2] F[1]*** --	N/A
	WB NB SBU	1 RT 2 TH, 1 RT 1 UT-LT	D[2] -- F[1]	N/A	F[2] -- F[1]***	N/A

*Southbound U-turn analyzed as EB approach due to Synchro limitations.
** Northbound U-turn analyzed as WB approach due to Synchro limitations.
Background improvements associated with the Williams Corner development are shown underlined.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of existing (2017) traffic conditions indicates the minor-street approach is expected to operate at LOS C or better during both weekday AM and PM peak hours. The southbound U-turn movement is expected to operate at LOS C or better during both weekday AM and PM peak hours and the northbound U-turn / left-turn movement is expected to operate at LOS C during the weekday AM peak hour and LOS E during the weekday PM peak hour.

Capacity analysis of both background (2019) without and with synchronized street traffic conditions indicates the eastbound minor-street approach is expected to operate at LOS D or better during both weekday AM and PM peak hours. The westbound approach is expected to operate at LOS D during the weekday AM peak hour and LOS F during the weekday PM peak hour. The southbound and northbound U-turn / left-turn movements are expected to operate at LOS F during both weekday AM and PM peak hours.

Capacity analysis of both combined (2019) without and with synchronized street traffic conditions indicates the eastbound minor-street approach is expected to operate at LOS C during the weekday AM peak hour and LOS F during the weekday PM peak hour. The westbound approach is expected to operate at LOS D during the weekday AM peak hour and LOS F during the weekday PM peak hour. The southbound and northbound U-turn / left-turn movements are expected to operate at LOS F during both weekday AM and PM peak hours.

A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). It should be noted that a traffic signal was warranted during the weekday AM and PM peak hours under combined (2019) traffic conditions. It is anticipated that a 4- or 8-hour signal warrant would not be met, which NCDOT favors for the installation of a traffic signal. Additionally, the intersection is less than 800 feet away from the adjacent signalized intersection, which typically is too short of a distance to have a second traffic signal installed.

It should be noted that the high southbound left-turn delays can be attributed to the Williams Corner development, which has not begun construction despite its TIA build year being 2010. If this development continues to delay construction, it is likely that it will not be constructed before the proposed site. Without the additional background traffic associated with this development, the intersection is expected to operate with better LOS and delay than illustrated in Table 4 under all future 2019 traffic conditions. It should also be noted that the Williams Corner development TIA analyzed the intersection of US 15-501 and Polks Landing Drive / Williams Corner Site Drive as a full movement intersection. Under existing (2017) traffic conditions, the intersection operates as a synchronized street intersection (left-over intersection). It is likely that if the Williams Corner development is constructed the trip distribution would be different than illustrated in the TIA that was sealed in 2005.

7.3. Polks Landing Drive and Site Drive 2

The proposed unsignalized intersection of Polks Landing Drive and Site Drive 2 was analyzed under combined (2019) traffic conditions the lane configuration shown in table 5. Refer to Table 5 for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports.

Table 5: Analysis Summary of Polks Landing Drive and Site Drive 2

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Combined (2019) Conditions without Synchronized Street	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A
Combined (2019) Conditions with Synchronized Street	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A

Improvements to lane configurations shown in bold.

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

Capacity analysis of combined (2019) traffic conditions indicates the minor-street approach and major-street left-turn movement at the intersection of Polks Landing Drive and Site Drive 2 are expected to operate at LOS A during both weekday AM and PM peak hours under both scenarios with and without synchronized street improvements.

7.4. Polks Landing Drive and Site Drive 3

The unsignalized intersection of Polks Landing Drive and Site Drive 3 was analyzed under combined (2019) traffic conditions with the lane configuration shown in Table 6. Refer to Table 6 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports.

Table 6: Analysis Summary of Polks Landing Drive and Site Drive 3

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Combined (2019) Conditions without Synchronized Street	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A
Combined (2019) Conditions with Synchronized Street	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A

Improvements to lane configuration shown in bold.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of combined (2019) traffic conditions indicates the minor-street approach and major-street left-turn movement at the intersection of Polks Landing Drive and Site Drive 3 are expected to operate at LOS A during both weekday AM and PM peak hours under both scenarios with and without synchronized street improvements.

7.5. US 15-501 and Southbound U-turn

The unsignalized intersection of US 15-501 and Southbound U-turn was analyzed under combined (2019) traffic conditions with the lane configuration shown in Table 7. Refer to Table 7 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports.

Table 7: Analysis Summary of US 15-501 and Southbound U-turn

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Background (2019) Conditions Synchronized Street	NB SBU*	2 TH 1 UT	-- C[1]	N/A	-- C[1]	N/A
Combined (2019) Conditions with Synchronized Street	NB SBU*	2 TH 1 UT	-- E[1]	N/A	-- E[1]	N/A

*Southbound U-turn analyzed as EB approach due to Synchro limitations.
1. Level of service for major-street U-turn movement.

Capacity analysis of background (2019) with synchronized street traffic conditions indicates the major-street U-turn movement at the intersection of US 15-501 and Southbound U-turn is expected to operate at LOS C during both weekday AM and PM peak hours. It should be noted that under background conditions, no traffic was routed to this U-turn location and a volume of 4 vehicles per hour was used per congestion management guidelines. Under combined (2019) with synchronized street traffic conditions, the southbound U-turn movement is expected to operate at LOS E during both the weekday AM and PM peak hours. These levels of service are not uncommon for unsignalized intersections with heavy mainline volumes.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Chatham County Grocery development to be located in the southwest quadrant of the intersection of US 15-501 and Polks Landing Road in Chatham County, North Carolina. The proposed development is expected to consist of a 12,200 sq. ft. shopping center, 49,100 sq. ft. grocery store, 4,000 sq. ft. drive-in bank, and a 4,000 sq. ft. fast-food restaurant with drive-thru window and be built out in 2019. Site access is proposed via two full movement intersections on Polks Landing Road and one full movement intersection along US 15-501.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- Existing (2017) Traffic Conditions
- Background (2019) Traffic Conditions without Synchronized Street
- Background (2019) Traffic Conditions with Synchronized Street
- Combined (2019) Traffic Conditions without Synchronized Street
- Combined (2019) Traffic Conditions with Synchronized Street

Trip Generation

It is estimated that the proposed development will generate approximately 9,340 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 440 trips (251 entering and 189 exiting) will occur during the AM peak hour and 840 (424 entering and 416 exiting) will occur during the PM peak hour.

Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to NCDOT Congestion Management Guidelines. Refer to section 6.1 of this report for a detailed description of any adjustments to these guidelines made throughout the analysis.

Due to the long delays experienced at the unsignalized U-turns during the scenarios with the synchronized street improvements, it is recommended to maintain the intersection of US 15-501 and Lystra Road as a full-movement intersection.

Intersection Capacity Analysis Summary

All the study area intersections (including the proposed site driveways) are expected to operate at acceptable levels-of-service under existing and future year conditions with the exception of the intersections listed below. A summary of the study area intersections that are expected to need improvements are as follows:

US 15-501 and Lystra Drive / Site Drive 1

It should be noted that the intersection operates with Right-Turn-On-Red (RTOR) allowed under existing (2017) traffic conditions and is expected to operate with RTOR allowed during the future conditions. Under combined (2019) without synchronized street and with RTOR allowed, the intersection is expected to operate at LOS C during the weekday AM peak hour and LOS D during the weekday PM peak hour. It is recommended to maintain the intersection of US 15-501 and Lystra Road as a full-movement intersection.

US 15-501 and Polks Landing Road / Williams Corner Site Drive

The poor level of service at this intersection is due to it being an unsignalzed intersection with a mainline (US 15-501) with heavy through volumes. A traffic signal was considered at this intersection, and combined traffic volumes were analyzed utilizing the criteria contained in the MUTCD. It should be noted that a traffic signal was warranted during the weekday AM and PM peak hours under combined (2019) traffic conditions. It is anticipated that a 4- or 8-hour signal warrant would not be met, which NCDOT favors for the installation of a traffic signal. Additionally, the intersection is less than 800 feet away from the adjacent signalized intersection, which typically is too short of a distance to have a second traffic signal installed.

It should be noted that the high southbound left-turn delays can be attributed to the Williams Corner development, which has not begun construction despite its TIA build year being 2010. If this development continues to delay construction, it is likely that it will not be constructed before the proposed site. Without the additional background traffic associated with this development, the intersection is expected to operate with better LOS and delay than illustrated in Table 4 under all future 2019 traffic conditions. It should also be noted that the Williams Corner development TIA analyzed the intersection of US 15-501 and Polks Landing Drive /

Williams Corner Site Drive as a full movement intersection. Under existing (2017) traffic conditions, the intersection operates as a synchronized street intersection (left-over intersection). It is likely that if the Williams Corner development is constructed the trip distribution would be different than the TIA that was sealed in 2005.

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 14 for an illustration of the recommended lane configuration. Refer to Appendix D for an illustration of the recommended lane configuration with the synchronized street improvements.

Due to the long delays experienced at the unsignalized U-turns during the scenarios with the synchronized street improvements, it is recommended to maintain the intersection of US 15-501 and Lystra Road as a full-movement intersection.

Recommended Improvements by Developer – without Synchronized Street

US 15-501 and Lystra Road / Site Drive 1

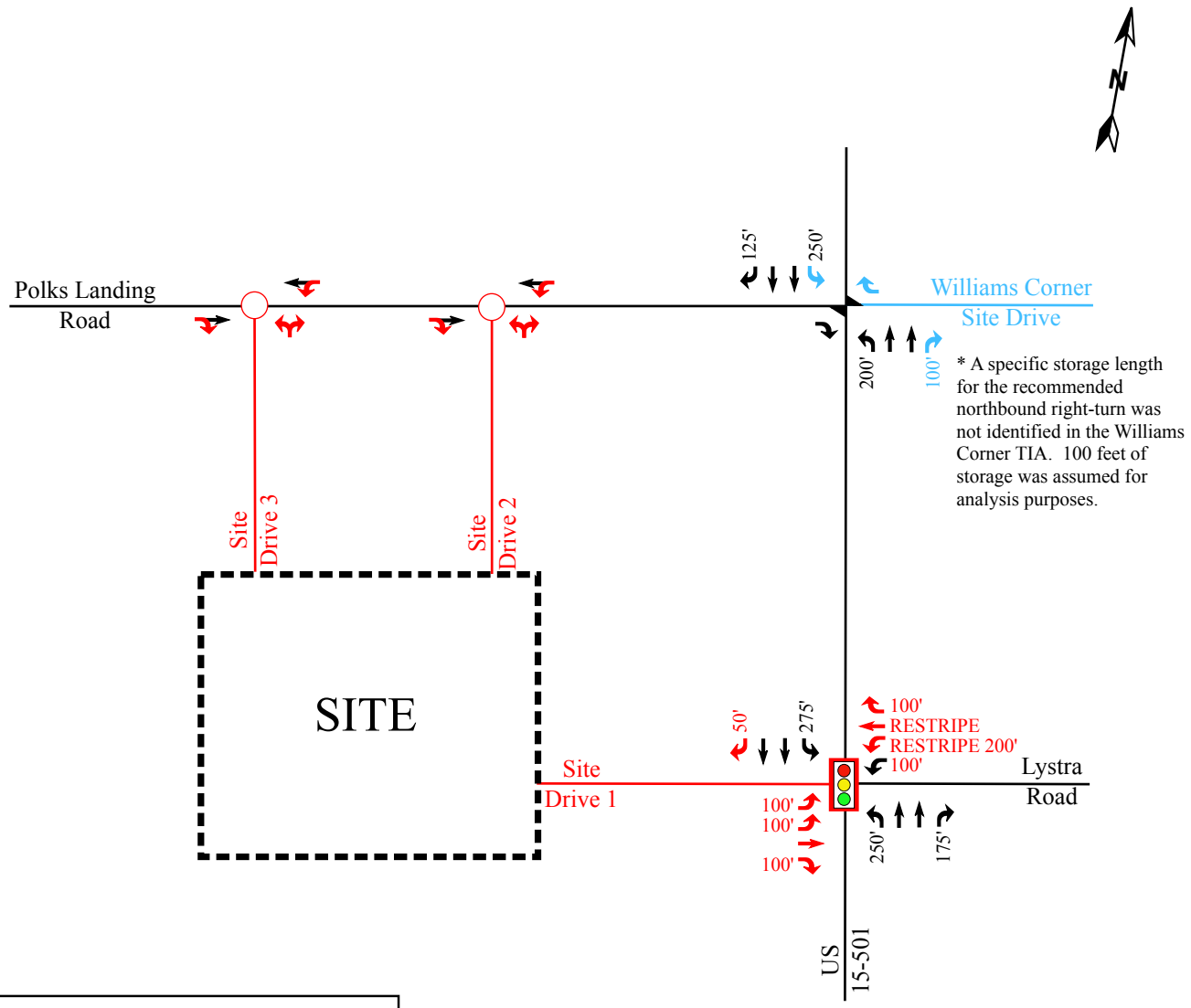
- Provide site access via an eastbound approach with one (1) ingress lane and four (4) egress lanes striped as two (2) left-turn lanes, one (1) through lane, and one (1) right-turn lane at the existing full-movement intersection.
- Provide an exclusive southbound right-turn lane on US 15-501 with at least 50 feet of storage and appropriate taper.
- Retripe and widen the westbound pavement to provide two (2) left-turn lanes with at least 200 feet of storage each and appropriate taper, one (1) through lane, and one (1) right-turn lane with 100 feet of storage and appropriate taper.
- Develop a signal modification plan to accommodate the new eastbound leg.

Polks Landing Drive and Site Drive 2

- Provide site access via a northbound approach with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the northbound approach.

Polks Landing Drive and Site Drive 3

- Provide site access via a northbound approach with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the northbound approach.



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- x' Storage (In Feet)
- Existing Lane
- Improvement by Developer
- Background Improvements
- Signal Modifications

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Recommended
Lane Configurations
without Synchronized Street

Scale: Not to Scale

Figure 14