

# Traffic Impact Analysis Forestville Village Knightdale, North Carolina



# TRAFFIC IMPACT ANALYSIS

FOR

## FORESTVILLE VILLAGE

LOCATED

IN

## KNIGHTDALE, NORTH CAROLINA

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RKA Project No. 19296

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**TRAFFIC IMPACT ANALYSIS**  
**FORESTVILLE VILLAGE DEVELOPMENT**  
**KNIGHTDALE, NORTH CAROLINA**

**1. INTRODUCTION**

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Forestville Village development, formerly the Old Knight Road mixed use development, to be located west of Old Knight Road and north of Forestville Road in Knightdale, 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 2025 was analyzed under build year +1 and build + 10 year conditions, per the Town of Knightdale (Town) requirements. This development is assumed to consist of the following uses:

- 92 single-family detached homes
- 177 townhomes
- 40,000 square foot (s.f.) shopping center

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

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions
- Combined (2026) Traffic Conditions
- Combined (2026) Traffic Conditions with Improvements
- Future (2035) Traffic Conditions - Per Town Requirements

During scoping of the TIA, the Town requested that the school PM peak hour be included in the analysis due to the proposed sites proximity to multiple public schools.

### **1.1. Site Location and Study Area**

The development is proposed to be located west of Old Knight Road and north of Forestville Road in Knightdale, 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 the Town and consists of the following existing intersections:

- Horton Road / Smithfield Road and Forestville Road
- Forestville Road and Old Knight Road
- Old Knight Road and US Highway 64 Business
- Forestville Road and Lawson Ridge Road / Cassia Lane
- Forestville Road and Pebblebrook Lane
- Forestville Road and Western Church Driveway
- Old Knight Road and Bryan Chalk Lane

Refer to Appendix A for the approved Memorandum of Understanding (MOU).

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

The proposed development, anticipated to be completed in 2025 was analyzed under build year +1 and build + 10 year conditions, per the Town requirements. This development is assumed to consist of the following uses:

- 92 single-family detached homes
- 177 townhomes
- 40,000 s.f. shopping center

Site access is proposed via one full movement intersection and one right-in / right-out intersection along Forestville Road. Site access will also be provided via one right-in / right-out intersection and one full movement intersection along Old Knight Road and via one full movement intersection along Lawson Ridge Road. The proposed development will also be providing an internal connection for bike and pedestrian use between the development and Knightdale High School. 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 site will provide internal connection with Knightdale High School for bike and pedestrian use.

### 1.4. Existing Roadways

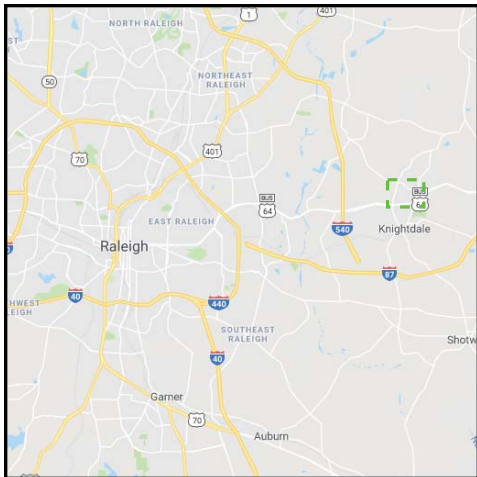
Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information was collected through field reconnaissance by Ramey Kemp & Associates, Inc. (RKA). Table 1 provides a summary of the field data collected. Refer to Figure 3 for an illustration of the existing lane configurations within the study area.

**Table 1: Existing Roadway Inventory**




Road Name	Route Number	Typical Cross Section	Speed Limit	Maintained By	2017 AADT (vpd)
US Highway 64 Business / Knightdale Boulevard	US 64 BUS	4-lane divided	45 mph	NCDOT	23,000
Old Knight Road	SR 2049	2-lane undivided	45 mph	NCDOT	6,800**
Horton Road / Smithfield Road	SR 2231/2233	2-lane undivided	35 mph	NCDOT	4,100
Forestville Road	SR 2049	2-lane undivided	45 mph	NCDOT	3,400
Lawson Ridge Road / Cassia Lane	N/A	2-lane undivided	25 mph (assumed)	Local	1,500*
Bryan Chalk Lane	N/A	2-lane undivided	25 mph (assumed)	Local	1,600*
Pebblebrook Drive	N/A	2-lane undivided	25 mph (assumed)	Local	200*

\* ADT based on the traffic counts from 2019 and assuming the weekday PM peak hour volume is 10% of the average daily traffic.

\*\* 2015 AADT Information



**LEGEND**

-  Proposed Site Location
-  Study Intersection
-  Study Area



Forestville Village  
Knightdale, NC

Site Location Map

Scale: Not to Scale

Figure 1

# FORESTVILLE VILLAGE SKETCH PLAN

LOCATED IN  
KNIGHTDALE, NORTH CAROLINA

**ENGINEERING FIRM:**  
ESP ASSOCIATES, INC.  
2200 GATEWAY CENTRE BLVD., SUITE 216  
MORRISVILLE, NC 27560  
PHONE: (919) 678-9070  
MOBILE: (919) 576-5400  
FAX: (919) 678-9070  
WWW.ESPASSOCIATES.COM

**PROJECT:**  
FORESTVILLE VILLAGE  
3002 CARRINGTON HILL BLVD., STE 100  
MORRISVILLE, NC 27560  
PHONE: (919) 699-2191  
MOBILE: (919) 699-2191  
CONTACT: JEFF PALMER

**REVIEW AGENCY:**  
TOWN OF KNIGHTDALE, NC  
100 W. MARKET STREET, 2ND FLOOR  
KNIGHTDALE, NC 27545  
PHONE: (919) 217-2500

**PROPERTY OWNERS:**  
PARCEL A:  
PIN: 175492829  
PARCEL SIZE: 15.46 ACRES  
OWNER: KNIGHTDALE, TOWN OF  
ADDRESS: 900 STEPLE SQUARE CT.  
KNIGHTDALE, NC 27545-1655  
PHONE: (919) 217-4208

PARCEL B:  
PIN: 175498927  
PARCEL SIZE: 40.59 ACRES  
OWNER: SIGGS, JANE P.  
ADDRESS: 1507 TRAILWOOD DR  
RALEIGH, NC 27606-3720  
PHONE: (919) 217-4208

INDEX OF SHEETS		
SHEET NO.	SHEET NAME	REVISION DATE
C1.0	COVER SHEET	08-16-2019
C1.0	EXISTING CONDITIONS / NATURAL RESOURCES INVENTORY	08-16-2019
C2.0	SKETCH PLAN	08-16-2019
A1.0	ARCHITECTURAL ELEVATIONS	08-16-2019

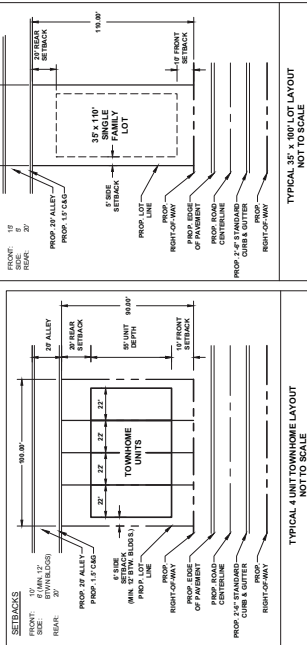


PROPOSED LOT / UNIT COUNTS FOR FORESTVILLE VILLAGE

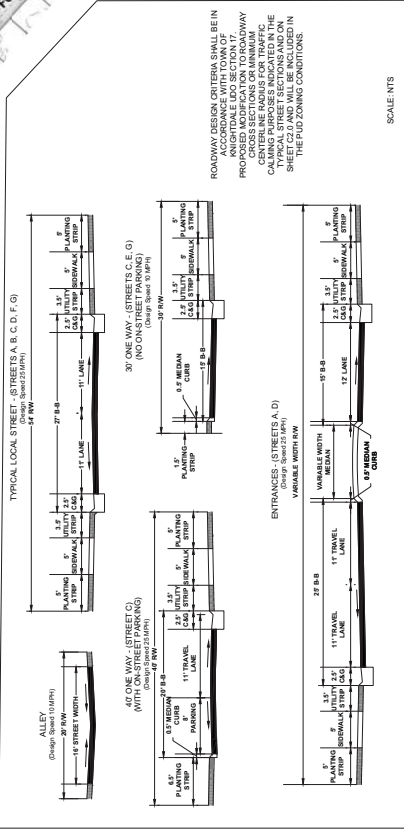
TOTAL POTENTIAL LOTS: 284 LOTS/UNITS  
TOWNHOMES: 172 UNITS  
POTENTIAL DENSITY: ~16.5 UNITS/AC (NET ACRES)

## FORESTVILLE VILLAGE PUD SPECIFIC ELEMENTS

### TYPICAL LOT / UNIT LAYOUTS

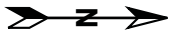


### TYPICAL STREET SECTIONS



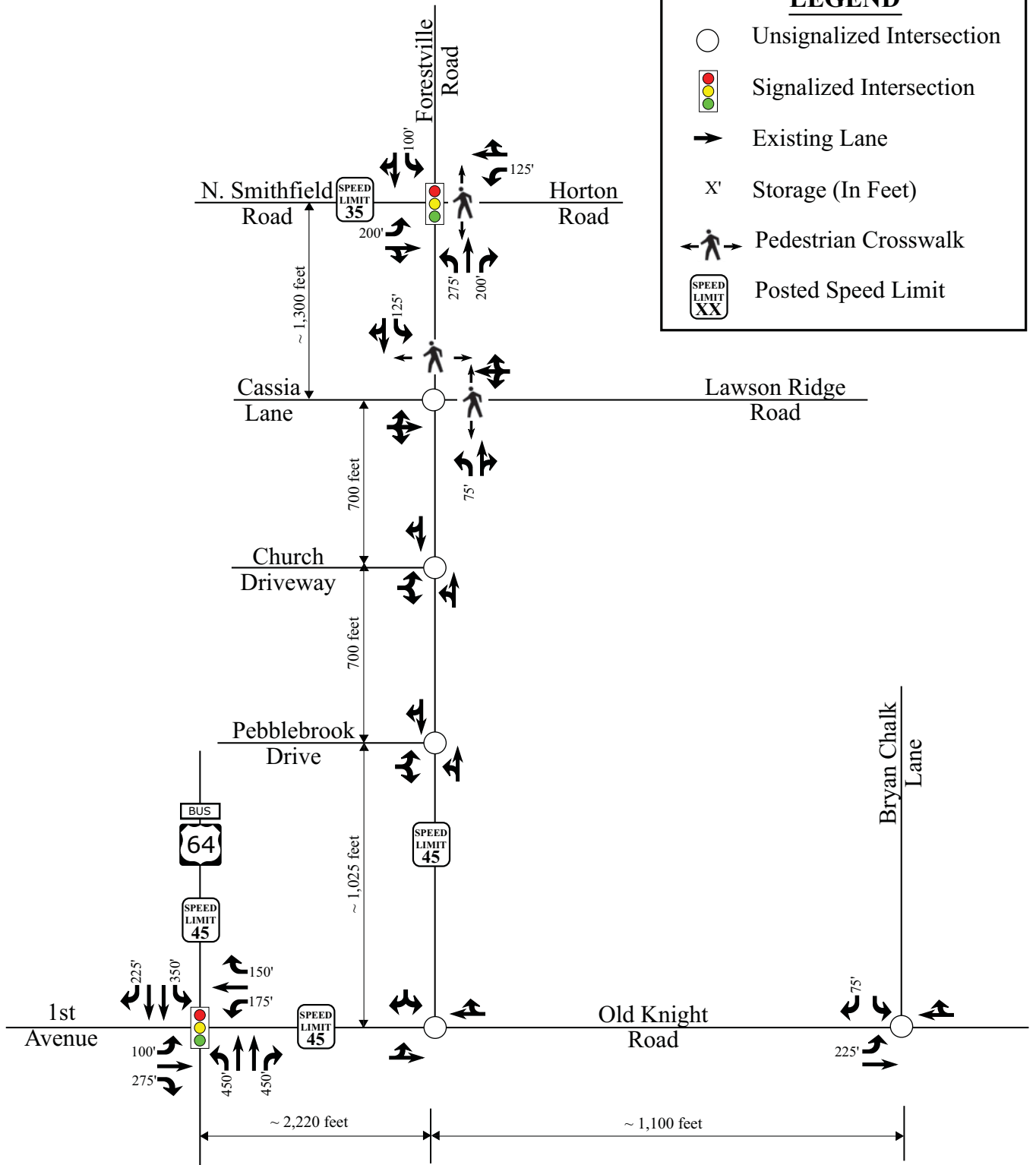
SCALE: 1" = 1,000'

THIS SET IS CURRENT THROUGH SHEET DATE 08/27/2019



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- ➔ Existing Lane
- X' Storage (In Feet)
- ➔ Pedestrian Crosswalk
- ◫ SPEED LIMIT XX Posted Speed Limit



Forestville Village  
Knightdale, NC

Existing  
Lane Configurations

Scale: Not to Scale

Figure 3

## **2. EXISTING (2019) PEAK HOUR CONDITIONS**

### **2.1. Existing (2019) Peak Hour Traffic**

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in September of 2019 by RKA during a typical weekday AM (7:00 AM – 9:00 AM), school PM (2:00 – 4:00 PM), and weekday PM (4:00 PM – 6:00 PM) peak periods, while schools were in session:

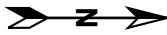
- Horton Road / Smithfield Road and Forestville Road
- Forestville Road and Old Knight Road
- Old Knight Road and US Highway 64 Business
- Forestville Road and Lawson Ridge Road / Cassia Lane
- Forestville Road and Pebblebrook Lane
- Forestville Road and Western Church Driveway
- Old Knight Road and Bryan Chalk Lane
- Smithfield Road and US Highway 64 Business\*

\*Provided for informational purposes only, at the request of the Town. During scoping it was discussed that the proposed development did not need to analyze this intersection.

Per coordination with the Town staff at the TIA scoping meeting, traffic counts were not balanced between study intersections due to the proximity to multiple schools. The peak demand for each intersection was utilized with the imbalances that are a result of differing peak hour times. Refer to Figure 4 for existing (2019) weekday AM and PM peak hour traffic volumes. A copy of the count data is located in Appendix B of this report.

### **2.2. Analysis of Existing (2019) Peak Hour Traffic**

The existing (2019) 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 C. The results of the analysis are presented in Section 7 of this report.

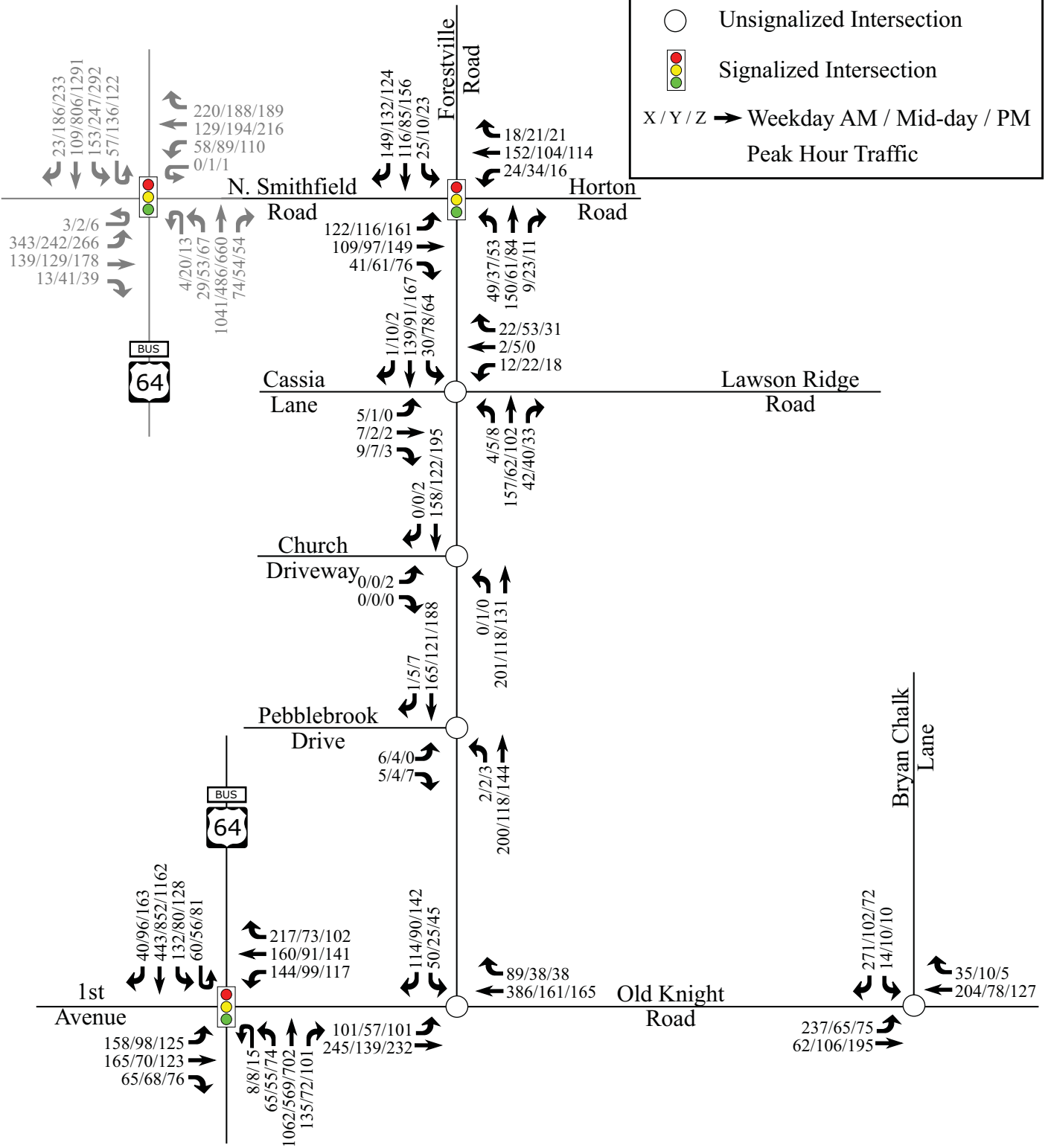


**LEGEND**

○ Unsignalized Intersection

◫ Signalized Intersection

X/Y/Z → Weekday AM / Mid-day / PM  
Peak Hour Traffic



Forestville Village  
Knightdale, NC

Existing (2019)  
Peak Hour Traffic

Scale: Not to Scale

Figure 4

### **3. BACKGROUND (2026 / 2035) 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 Town and NCDOT, it was determined that an annual growth rate of 3% would be used to generate projected (2026 / 2035) weekday AM and PM peak hour traffic volumes. Refer to Figure 5a for projected (2026) peak hour traffic and Figure 5b for projected (2035) peak hour traffic.

#### **3.2. Adjacent Development Traffic**

Through coordination with the NCDOT and Town, the Haywood Glen development was identified to be included as an adjacent development in this study. Haywood Glen is a proposed residential development that is expected to consist of 129 single family homes located along Old Knight Road. Per coordination with the Town, this development is expected to be fully built-out and operational by the build-out of the Forestville Village development. Since a TIA was not conducted for the Haywood Glen development, a trip generation was conducted and distributed through the study area. The assumptions of this trip distribution were reviewed and approved in the MOU. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix D.

#### **3.3. Future Roadway Improvements**

Based on coordination with the NCDOT and the Town, it was determined there were no future roadway improvements to consider with this study.

#### **3.4. Background (2026 / 2035) Peak Hour Traffic Volumes**

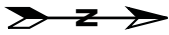
The background (2026 / 2035) traffic volumes were determined by projecting the existing (2019) peak hour traffic to the years 2026 and 2035 and adding the adjacent development trips.

Refer to Figures 7a and 7b for an illustration of the peak hour traffic volumes under background (2026) and background (2035) conditions, respectively.

### **3.5. Analysis of Background (2026 / 2035) Peak Hour Traffic Conditions**

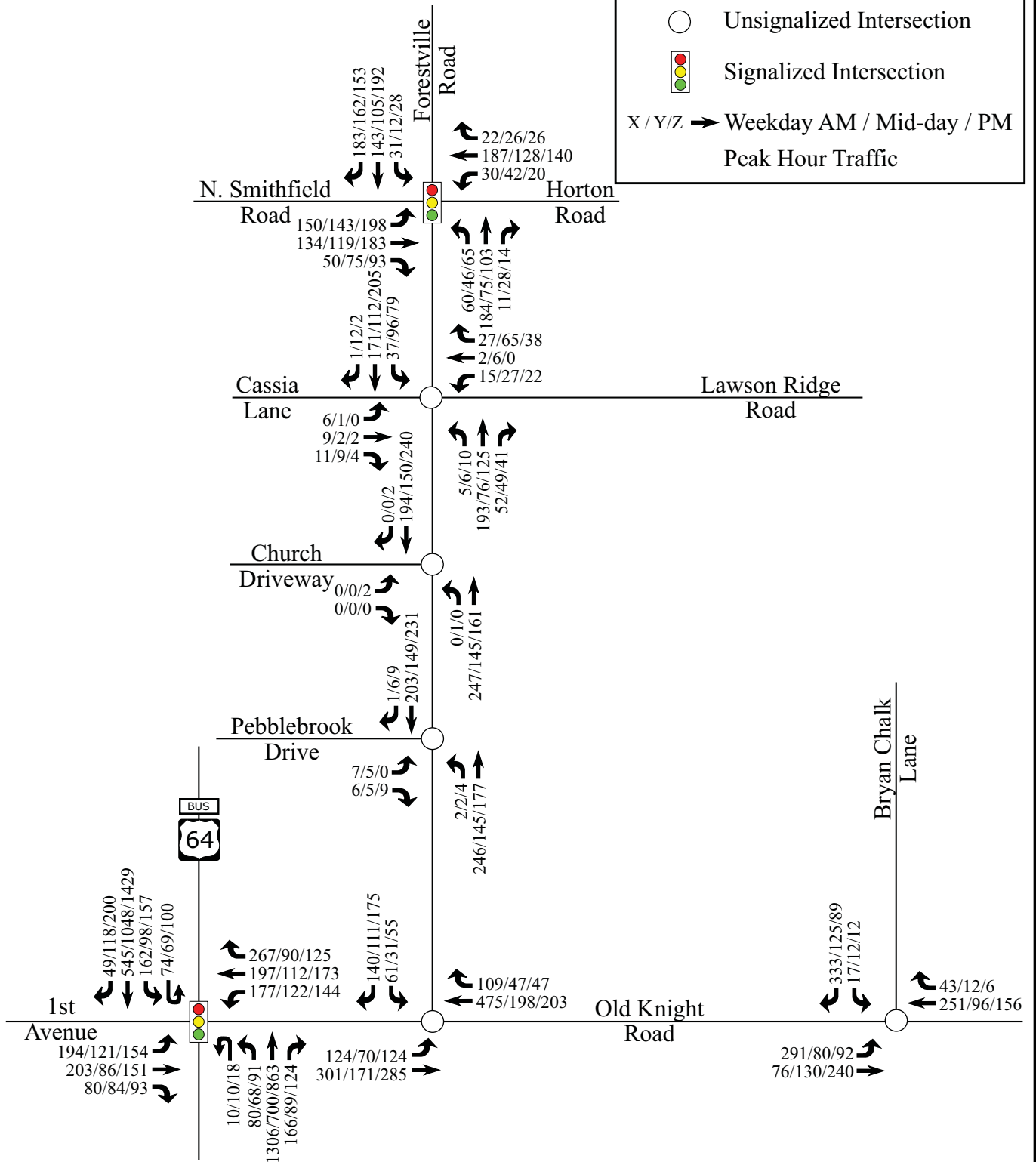
The background (2026 / 2035) AM and PM peak hour traffic volumes at the study intersections were analyzed with future geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.





**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X / Y / Z → Weekday AM / Mid-day / PM Peak Hour Traffic

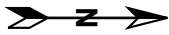


Forestville Village  
Knightdale, NC

Projected (2026)  
Peak Hour Traffic

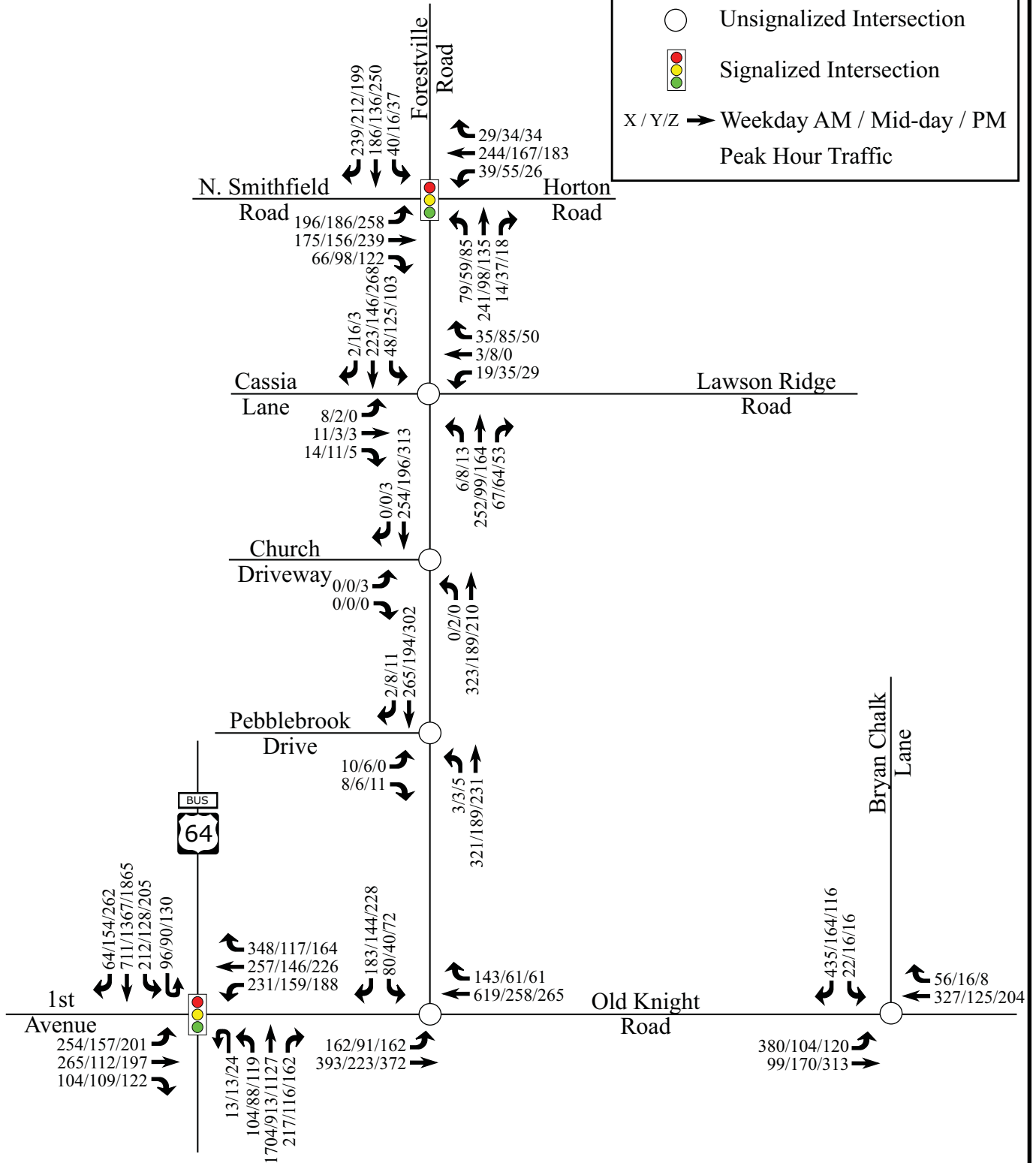
Scale: Not to Scale

Figure 5a



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X / Y / Z → Weekday AM / Mid-day / PM Peak Hour Traffic

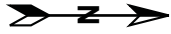


Forestville Village  
Knightdale, NC

Projected (2035)  
Peak Hour Traffic

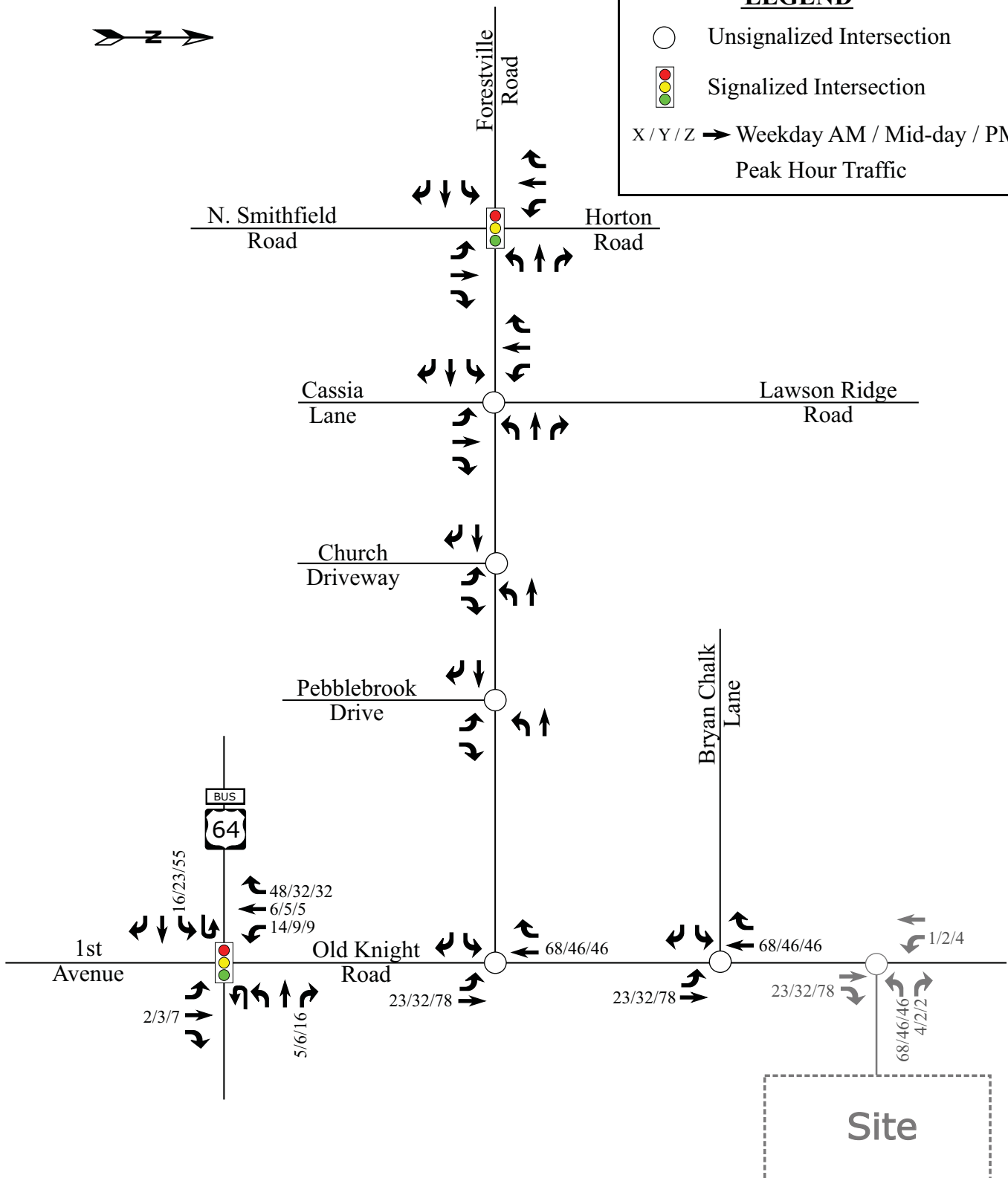
Scale: Not to Scale

Figure 5b



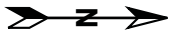
**LEGEND**

- Unsignalized Intersection
- 🚦 Signalized Intersection
- X / Y / Z → Weekday AM / Mid-day / PM Peak Hour Traffic



Site

	<p>Forestville Village Knightdale, NC</p>	<p>Adjacent Development Peak Hour Traffic Volumes</p>	
		<p>Scale: Not to Scale</p>	<p>Figure 6</p>

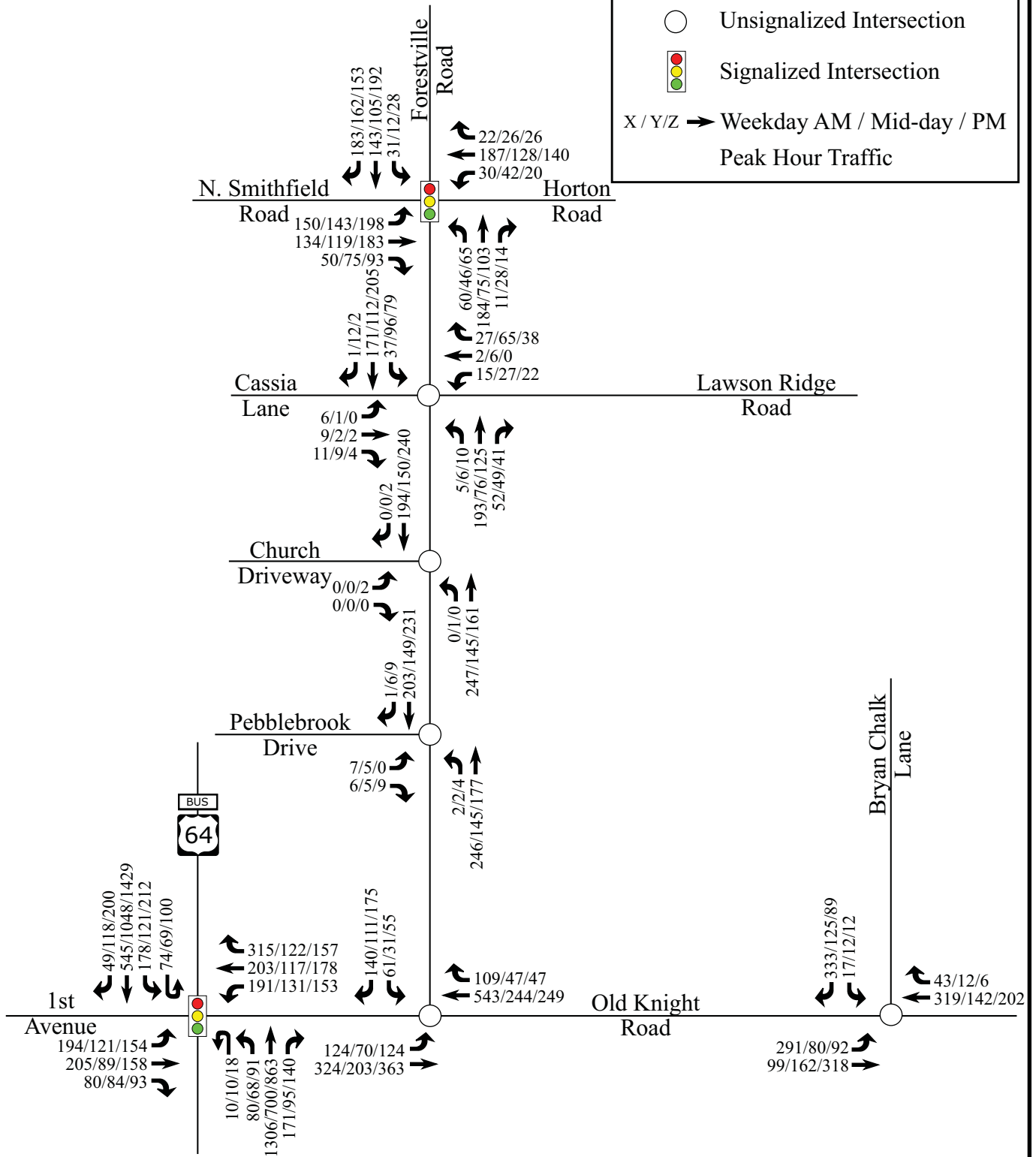


### LEGEND

○ Unsignalized Intersection

⬆️⬆️⬆️ Signalized Intersection

X / Y / Z → Weekday AM / Mid-day / PM  
Peak Hour Traffic

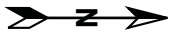


Forestville Village  
Knightdale, NC

Background (2026)  
Peak Hour Traffic

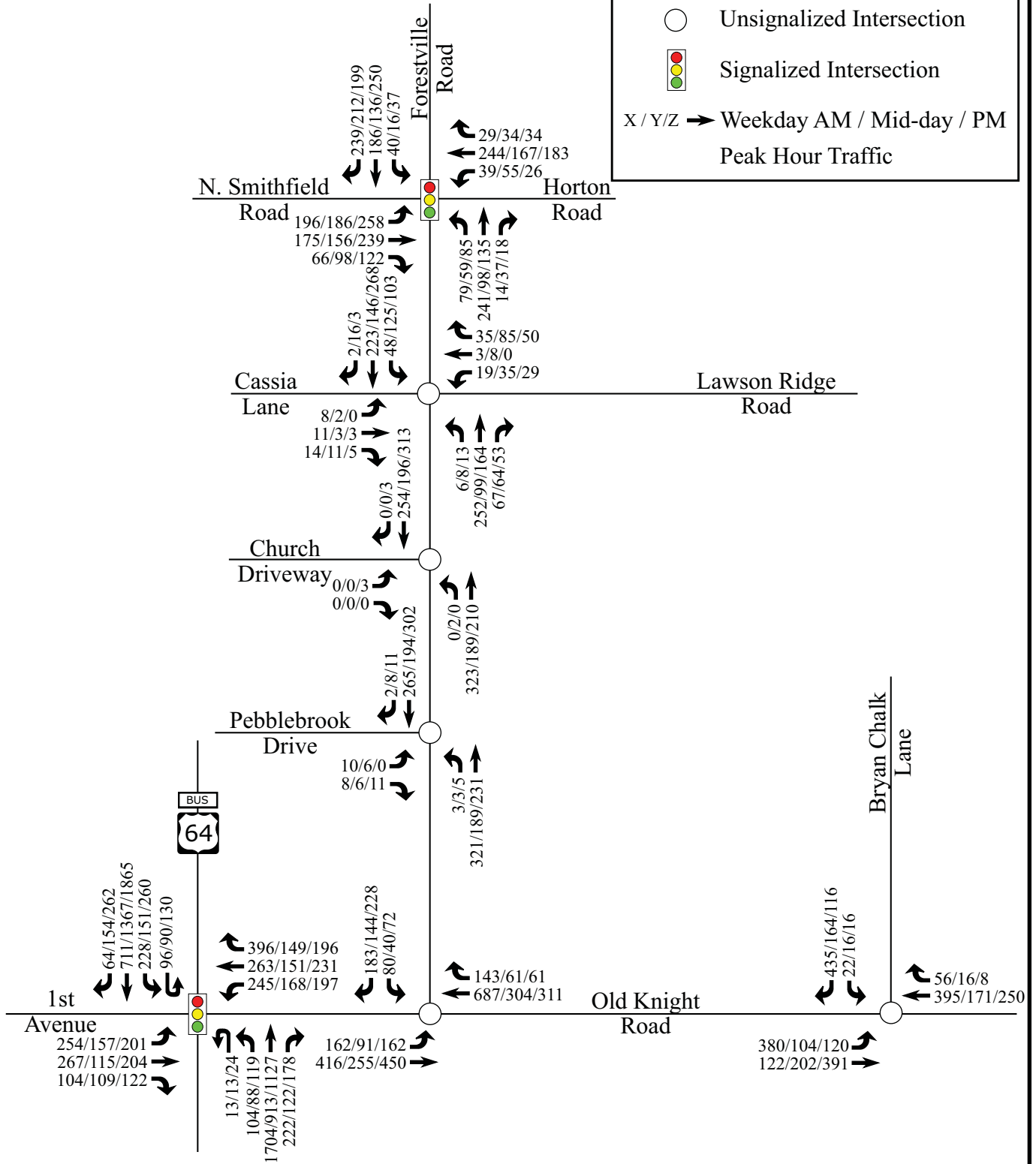
Scale: Not to Scale

Figure 7a



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X / Y / Z → Weekday AM / Mid-day / PM Peak Hour Traffic



Forestville Village  
Knightdale, NC

Background (2035)  
Peak Hour Traffic

Scale: Not to Scale

Figure 7b

#### 4. SITE TRIP GENERATION AND DISTRIBUTION

##### 4.1. Trip Generation

The proposed development is assumed to consist of approximately 92 single-family homes, 177 townhomes, and a 40,000 s.f. shopping center. Average weekday daily, AM peak hour, school PM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Although not included in this TIA, the potential for multi-modal trip reductions is also possible due to the proposed sidewalk connections and bike/pedestrian connection to the adjacent Knightdale High School. The multi-modal reductions were omitted from this study for a conservative analysis. Table 2 provides a summary of the trip generation potential for the site.

**Table 2: Trip Generation Summary**

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		School PM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	92 dwellings	970	18	52	25*	35*	59	35
Multifamily Housing (Low-Rise) (220)	177 dwellings	1,300	19	63	34*	47*	62	36
Shopping Center (820)	40,000 s.f.	3,230	107	65	116*	121*	132	144
<b>Total Site Trips</b>		<b>5,500</b>	<b>144</b>	<b>180</b>	<b>175</b>	<b>203</b>	<b>253</b>	<b>215</b>
<i>Internal Capture (1% AM, 11% School PM**, 21% PM)</i>			-1	-2	-19	-22	-53	-45
<b>Total External Trips</b>			<b>143</b>	<b>178</b>	<b>156</b>	<b>181</b>	<b>200</b>	<b>170</b>
<i>Pass-By Trips: Shopping Center (17% School PM**, 34% PM)</i>			--	--	-18	-18	-37	-37
<b>Primary Total Site Trips</b>			<b>143</b>	<b>178</b>	<b>138</b>	<b>163</b>	<b>163</b>	<b>133</b>

\*Based on 2pm daily traffic percentages gathered by RKA at similar residential development.

\*\*Based on average of weekday AM and weekday PM peak rates.

It is estimated that the proposed development will generate approximately 5,500 total site trips during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 324 trips (144 entering and 180 exiting) will occur during the weekday AM peak hour, 378 trips (175 entering and 203 exiting) will occur during the school PM peak hour, and 466 trips (253 entering and 215 exiting) will occur during the weekday PM peak hour.

Internal capture of trips between the office, residential, and retail uses was considered in this study. Internal capture is the consideration for trips that will be made within the site between different land uses, so the vehicle technically never leaves the internal site but can still be considered as a trip to that specific land use. Internal capture typically only considers trips between residential, office, and retail/restaurant land uses. Based on the NCHRP 684 Report, a weekday AM peak hour internal capture rate of 1%, a school PM peak hour internal capture rate of 11%, and a weekday PM peak hour internal capture rate of 21% was applied to the total trips. The school PM peak hour internal capture rate was determined via an average of the weekday AM and weekday PM peak hour results. The internal capture reductions are expected to account for approximately 3 trips (1 entering and 2 exiting) during the weekday AM peak hour, 41 trips (19 entering and 22 exiting) during the school PM peak hour, and 98 trips (53 entering and 45 exiting) trips during the weekday PM peak hour.

Pass-by trips were also 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 percentages are applied to site trips after adjustments for internal capture. Pass-by trips are expected to account for approximately 36 trips (18 entering and 18 exiting) during the school PM peak hour and 74 trips (37 entering and 37 exiting) 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 reduction due to pass-by trips was calculated after the reduction due to internal capture was considered.

The total primary site trips are the calculated site trips after the reduction for internal capture and pass-by trips. Of the daily traffic volume, it is anticipated that primary site trips are expected to generate approximately 321 trips (143 entering and 178 exiting) during the

weekday AM peak hour, 301 trips (138 entering and 163 exiting) during the school PM peak hour, and 296 trips (163 entering and 133 exiting) during the weekday PM peak hour.

#### **4.2. 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 residential trips will be distributed as follows:

- 5% to/from the north via Old Knight Road
- 10% to/from the east via US 64 Business
- 40% to/from the west via US 64 Business
- 5% to/from the south via 1<sup>st</sup> Avenue
- 15% to/from the south via N. Smithfield Road
- 15% to/from the west via Forestville Road
- 10% to/from the north via Lawson Ridge Road

It is estimated that commercial trips will be distributed as follows:

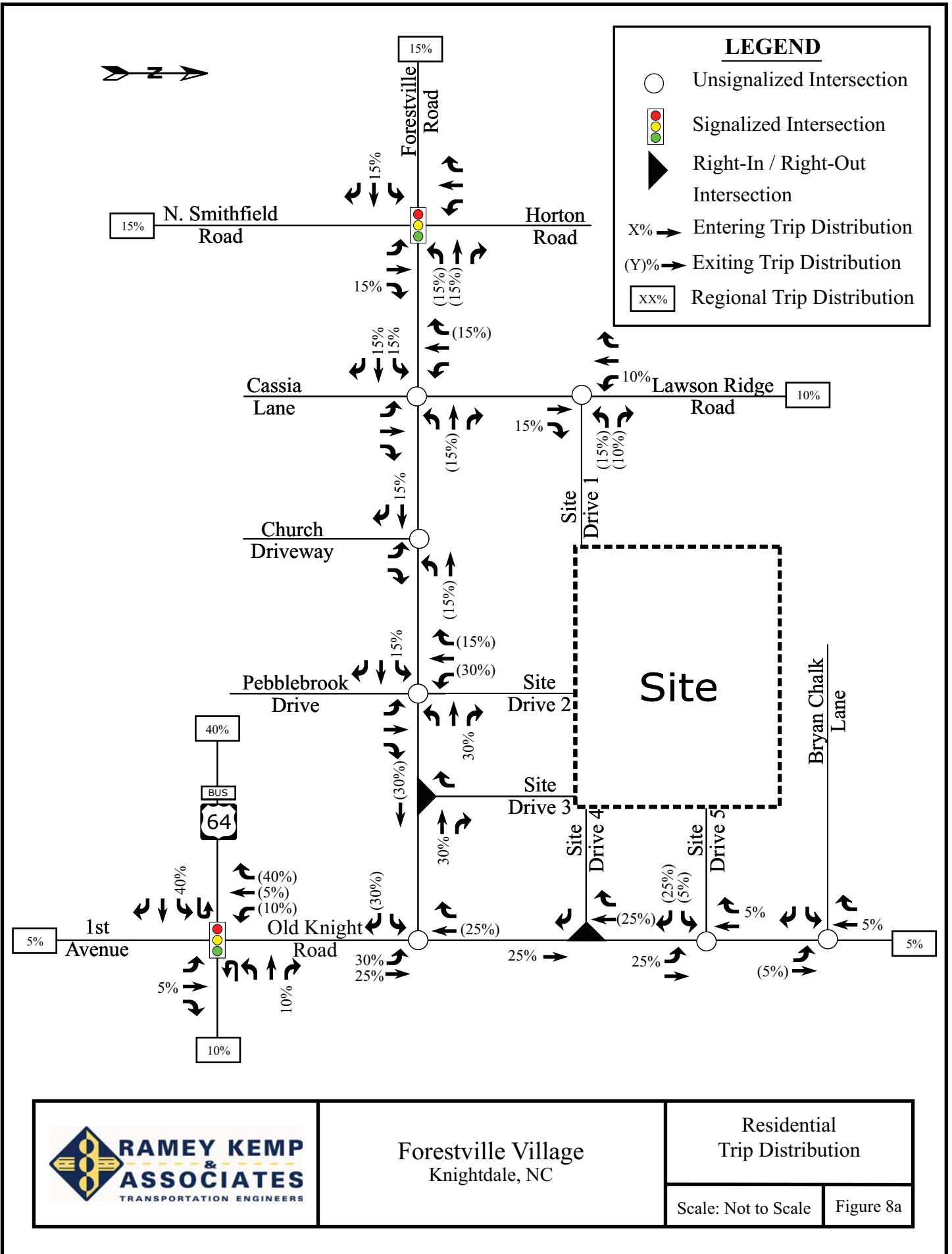
- 15% to/from the north via Horton Road
- 20% to/from the north via Old Knight Road
- 10% to/from the east via US 64 Business
- 10% to/from the west via US 64 Business
- 10% to/from the south via 1<sup>st</sup> Avenue
- 5% to/from the south via Cassia Lane
- 5% to/from the south via Pebblebrook Lane
- 10% to/from the south via N. Smithfield Road
- 15% to/from the west via Forestville Road

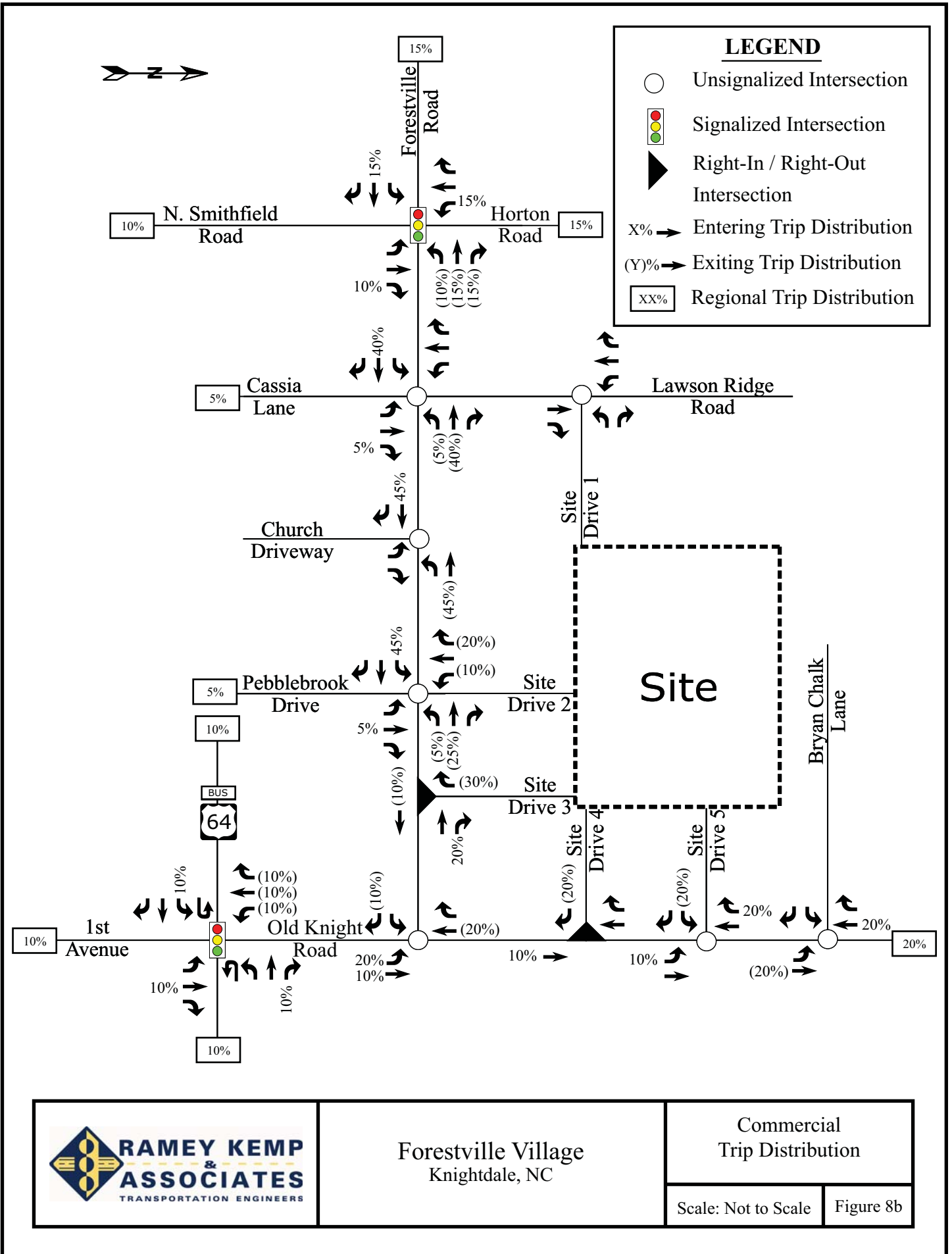
The residential and commercial site trip distribution is shown in Figure 8a and Figure 8b, respectively. Refer to Figure 9a for the residential site trip assignment and Figure 9b for the commercial site trip assignment.



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 10 for the pass-by site trip distribution. Pass-by site trips are shown in Figure 11.

The total site trips were determined by adding the primary site trips and the pass-by site trips. Refer to Figure 12 for the total peak hour site trips at the study intersections.



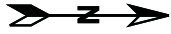


Forestville Village  
Knightdale, NC

Commercial  
Trip Distribution

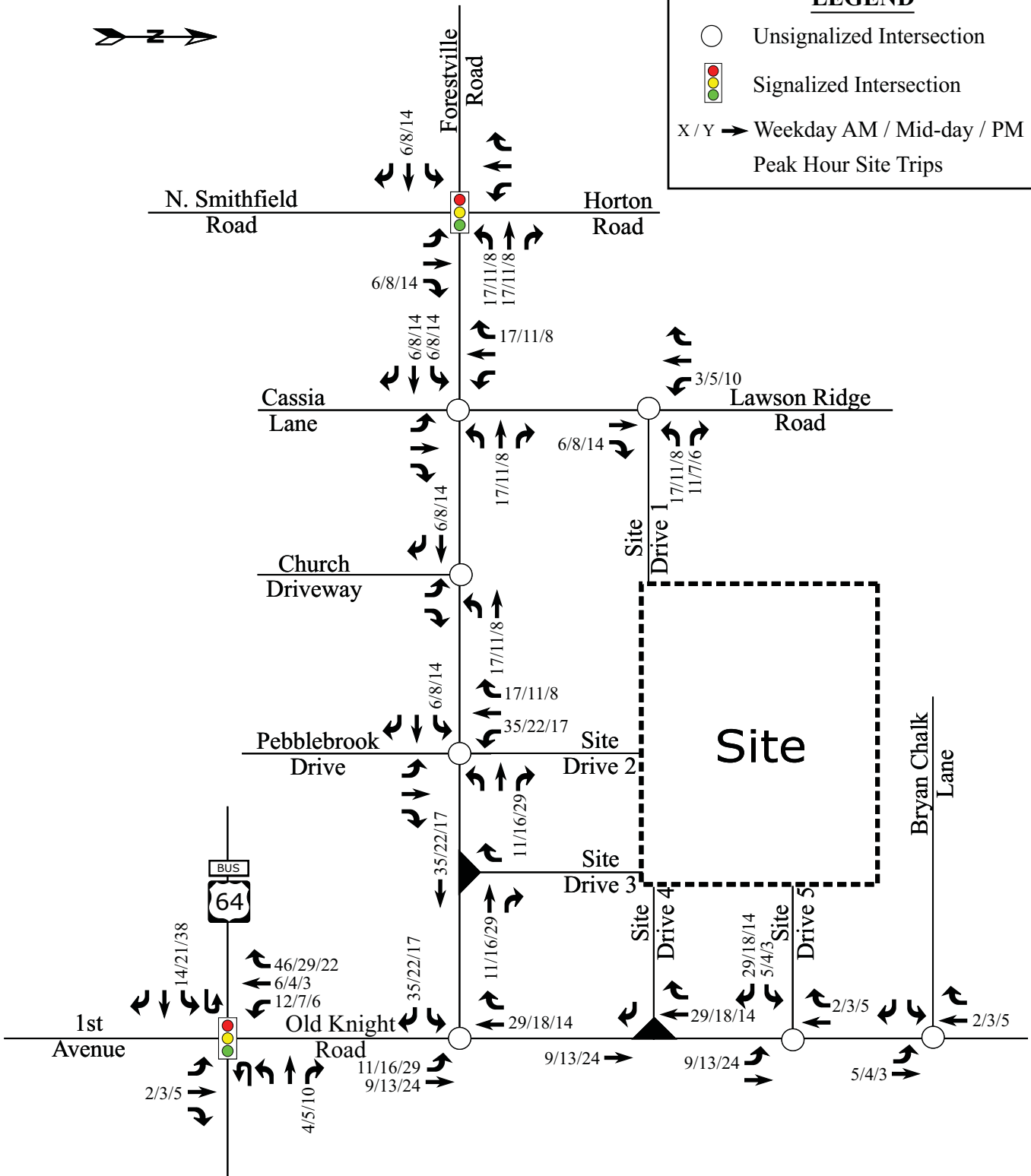
Scale: Not to Scale

Figure 8b



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X/Y → Weekday AM / Mid-day / PM Peak Hour Site Trips

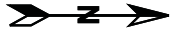


Forestville Village  
Knightdale, NC

Residential  
Site Trip Assignment

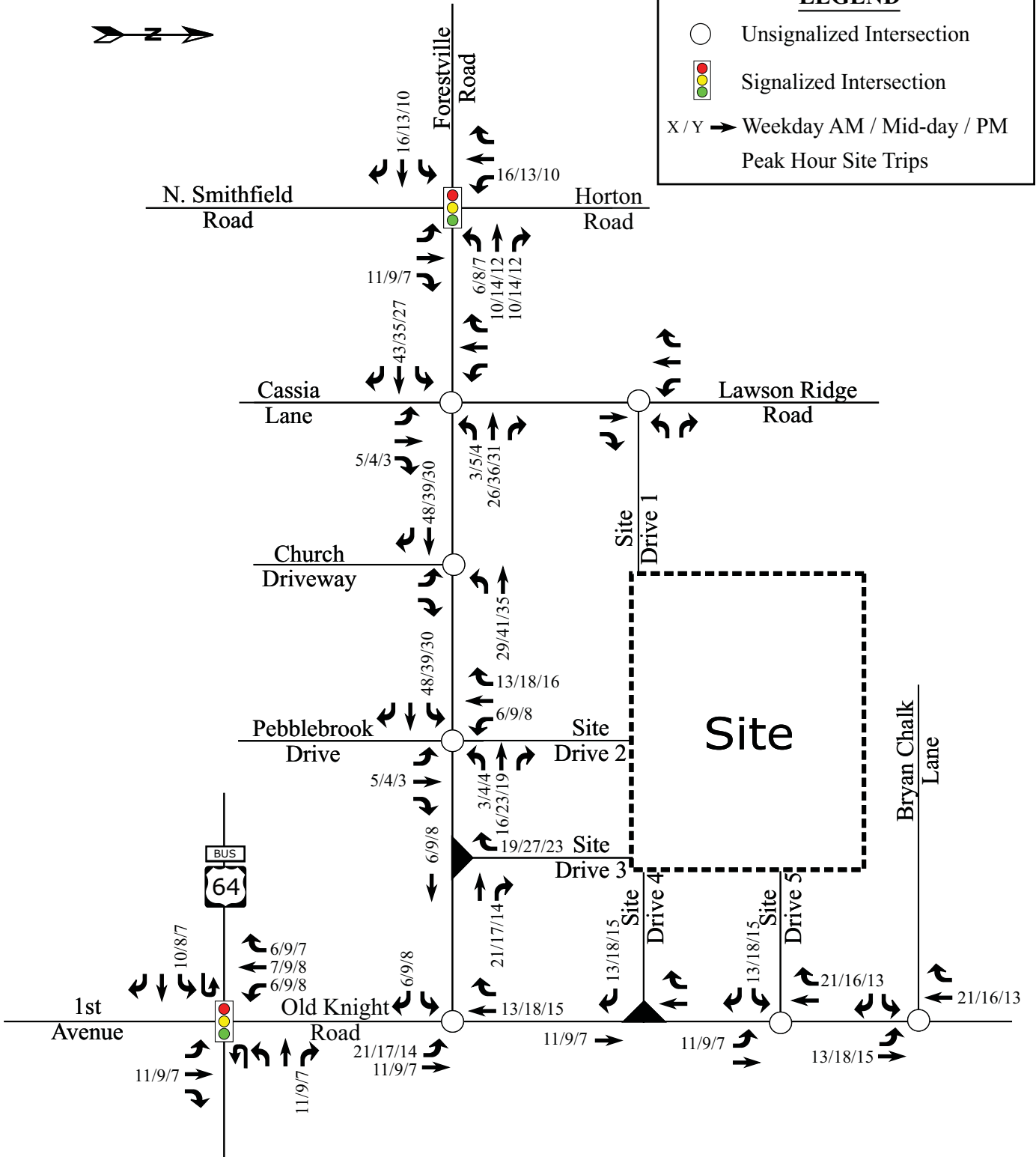
Scale: Not to Scale

Figure 9a

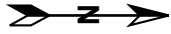


**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X/Y → Weekday AM / Mid-day / PM Peak Hour Site Trips

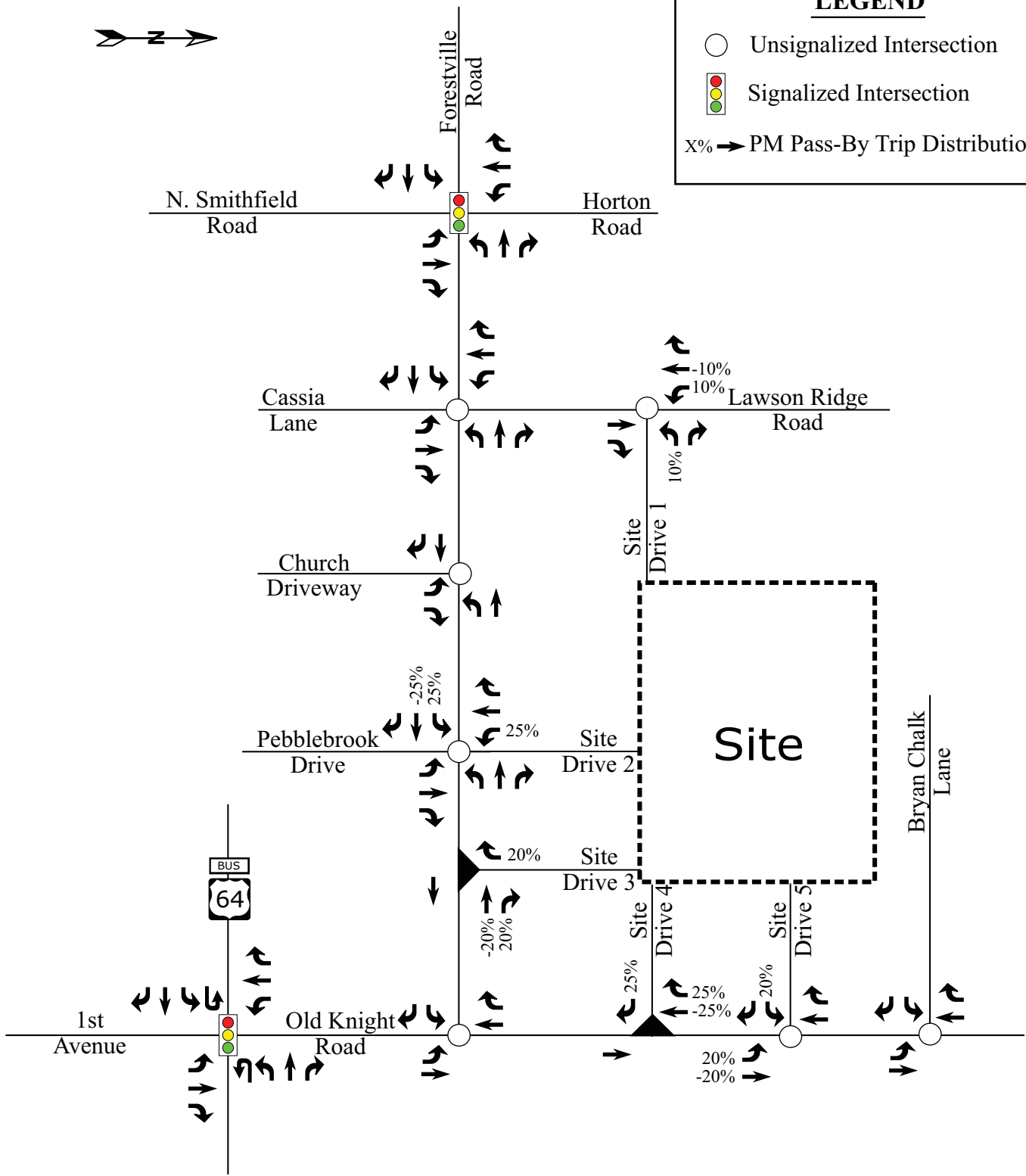


 <p><b>RAMEY KEMP &amp; ASSOCIATES</b> TRANSPORTATION ENGINEERS</p>	<p>Forestville Village Knightdale, NC</p>	<p>Retail Site Trip Assignment</p>	
			<p>Scale: Not to Scale    Figure 9b</p>

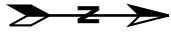


**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X% → PM Pass-By Trip Distribution

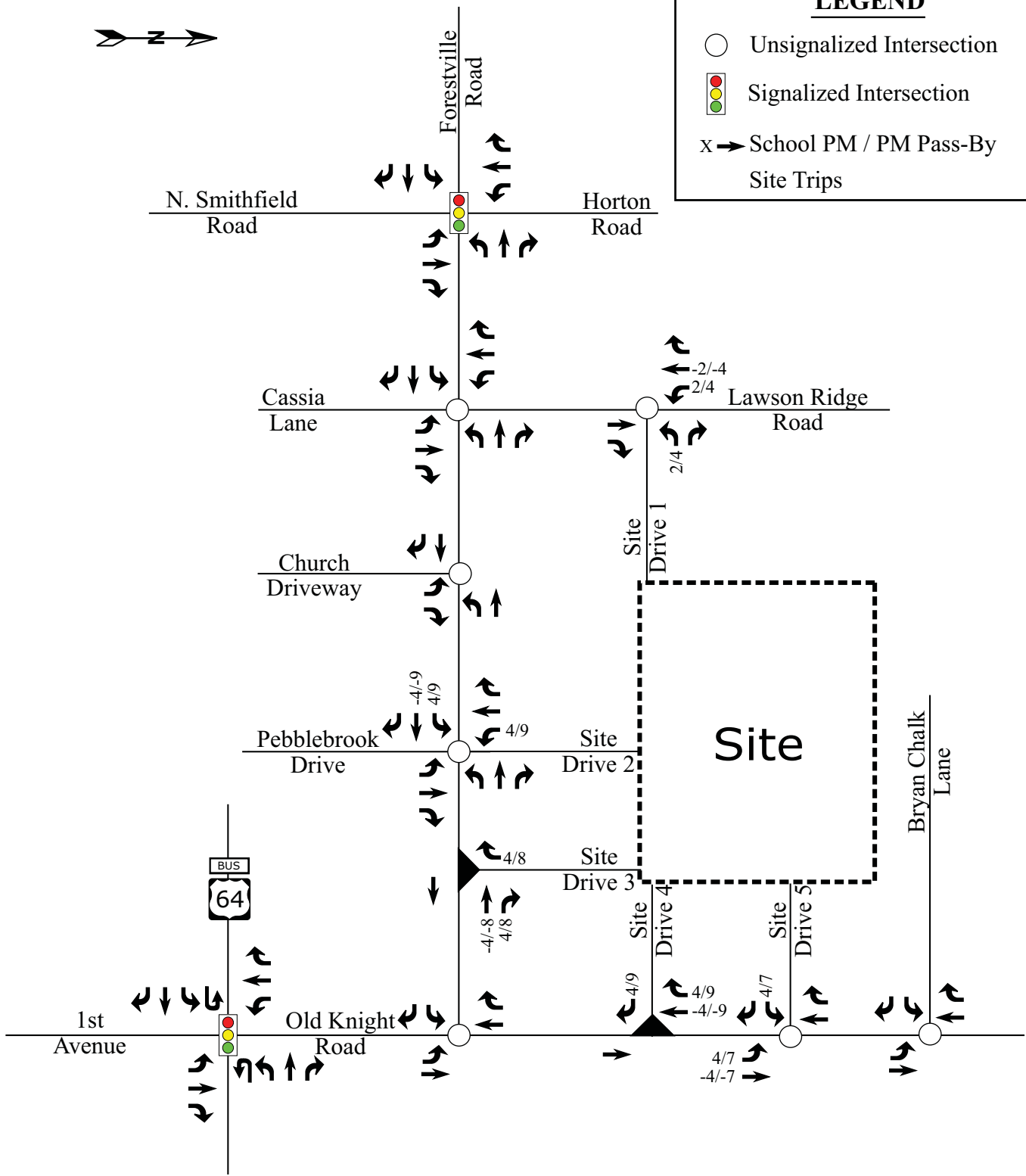


 <p><b>RAMEY KEMP &amp; ASSOCIATES</b> TRANSPORTATION ENGINEERS</p>	<p>Forestville Village Knightdale, NC</p>	<p>Pass-By Trip Distribution</p>	
		<p>Scale: Not to Scale</p>	<p>Figure 10</p>



**LEGEND**

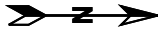
- Unsignalized Intersection
- ◫ Signalized Intersection
- X → School PM / PM Pass-By Site Trips



Forestville Village  
Knightdale, NC

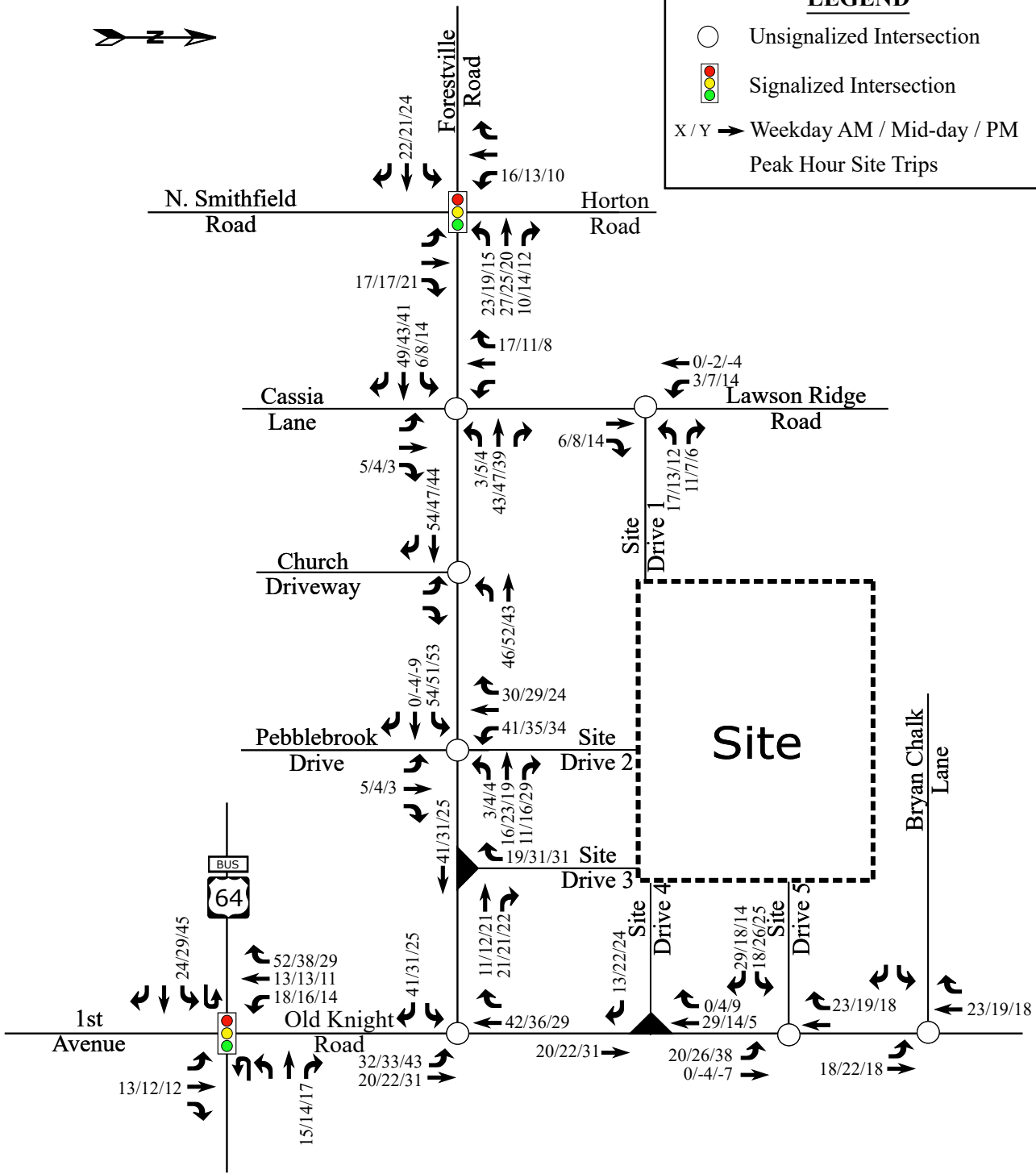
Pass-By  
Trip Assignment

Scale: Not to Scale	Figure 11
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**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X/Y → Weekday AM / Mid-day / PM Peak Hour Site Trips



Forestville Village  
Knightdale, NC

Total Site Trip Assignment	
Scale: Not to Scale	Figure 12



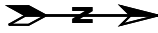
## **5. COMBINED (2026) / FUTURE (2035) TRAFFIC CONDITIONS**

### **5.1. Combined (2026) / Future (2035) Peak Hour Traffic Volumes**

To estimate traffic conditions with the site fully built-out, the total site trips were added to the background (2026 / 2035) traffic volumes to determine the combined (2026) / future (2035) traffic volumes. Refer to Figures 13a and 13b for an illustration of the peak hour traffic volumes with the proposed site fully developed under combined (2026) and future (2035) conditions, respectively,

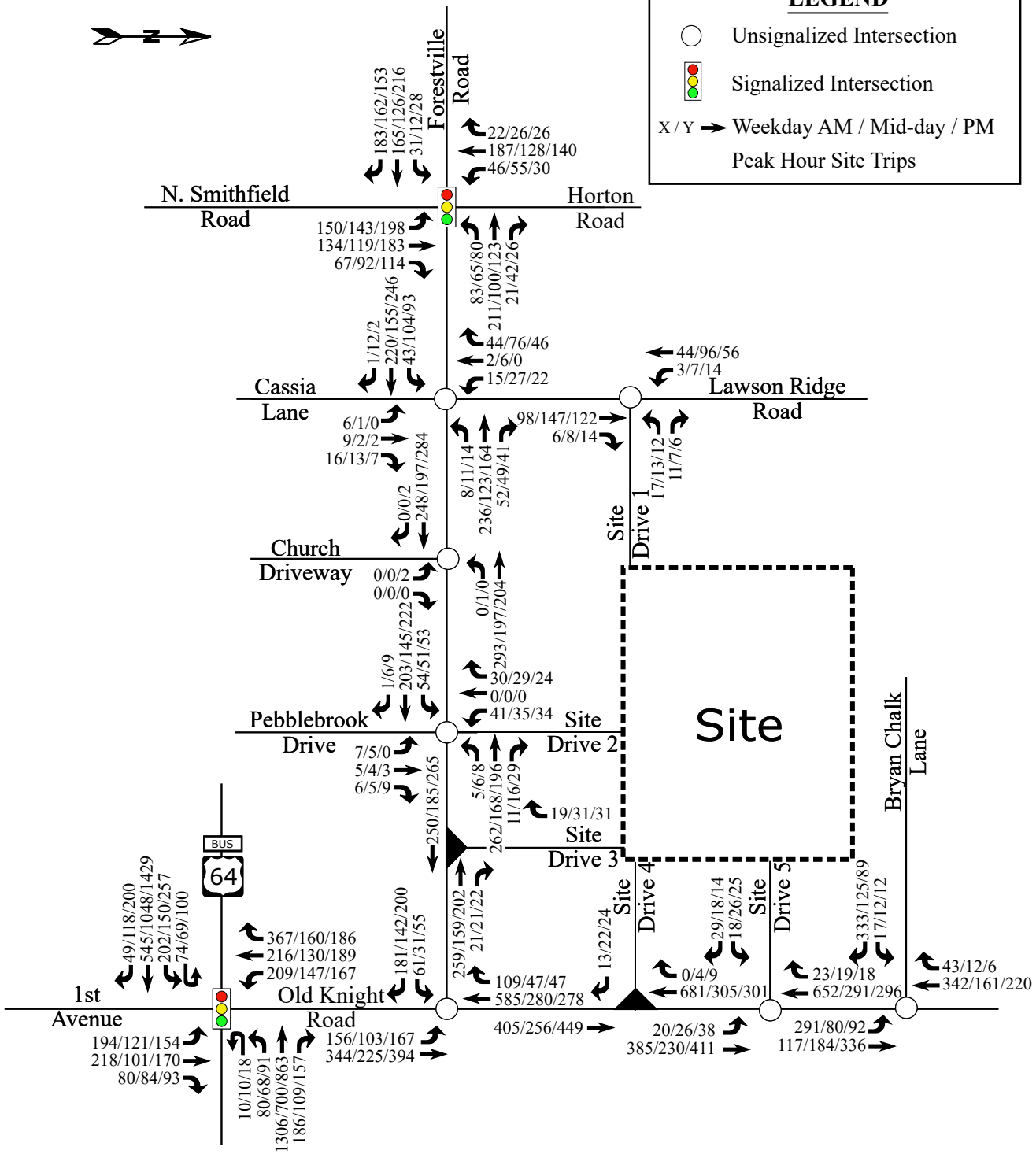
### **5.2. Analysis of Combined (2026) / Future (2035) Peak Hour Traffic**

Study intersections were analyzed with the combined (2026) / future (2035) 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.



**LEGEND**

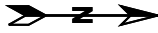
- Unsignalized Intersection
- ◫ Signalized Intersection
- X/Y → Weekday AM / Mid-day / PM Peak Hour Site Trips



Forestville Village  
Knightdale, NC

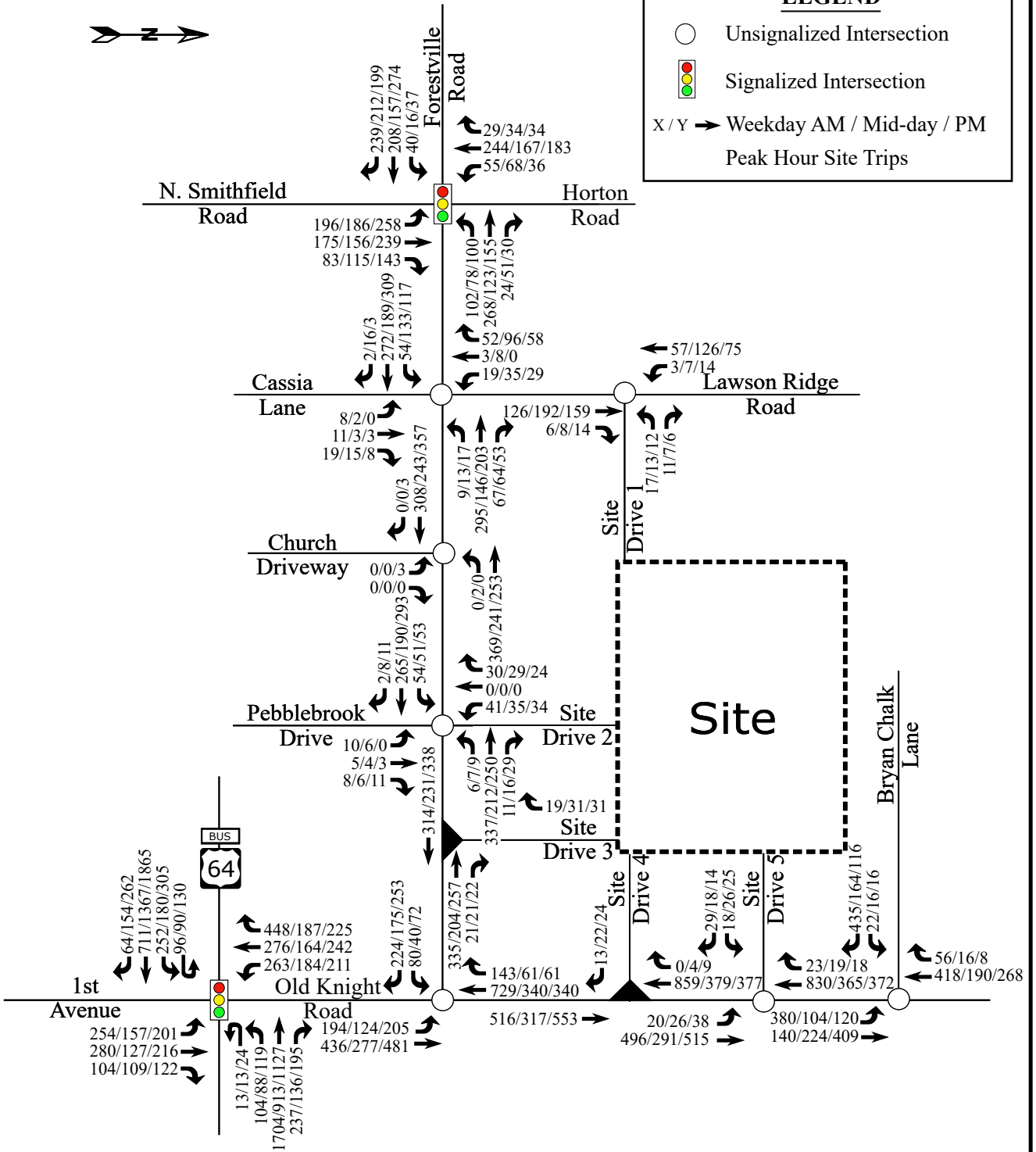
Combined (2026)  
Peak Hour Traffic

Scale: Not to Scale      Figure 13a



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- X/Y → Weekday AM / Mid-day / PM Peak Hour Site Trips



Forestville Village  
Knightdale, NC

Future (2035)  
Peak Hour Traffic

Scale: Not to Scale

Figure 13b

**6. TRAFFIC ANALYSIS PROCEDURE**

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual, 6<sup>th</sup> Edition* (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 10.3), 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 3 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 3: 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 and Town of Knightdale Unified Development Ordinance (UDO).

**7. CAPACITY ANALYSIS**

**7.1. Horton Road / Smithfield and Forestville Road**

The existing signalized intersection of Horton Road / Smithfield Road and Forestville Road was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 4. Refer to Table 4 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

**Table 4: Analysis Summary of Horton Road / Smithfield Road and Forestville Road**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	B C C C	C (23)	B B B B	B (15)	B B B B	B (16)
Background (2026) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	B C F C	E (61)	B B B B	B (18)	B B C B	C (22)
Combined (2026) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	B C F D	E (77)	B B C C	C (21)	B B D C	C (25)
Combined (2026) Conditions – w/ Signal Timing Adjustments	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	D D D C	D (43)	B B C C	C (21)	C C C C	C (25)
Future (2035) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	C C F F	F (247)	B C F F	E (63)	B C F E	F (99)
Future (2035) Conditions – w/ Improvements	EB WB NB SB	1 LT, 1 TH, <u>1 RT</u> 1 LT, 1 TH, 1 RT 1 LT, 1 TH, <u>2 RT</u> 1 LT, 1 TH, <u>1 RT</u>	D E D E	D (54)	B B B C	B (18)	B C C C	B (19)

Per the Town UDO, improvements needed to operate at acceptable level-of-service under future conditions are underlined.

Capacity analysis of existing (2019) traffic conditions indicates the intersection of Horton Road / Smithfield Road and Forestville Road currently operates at an overall LOS of C or better during the weekday AM, school PM, and weekday PM peak hour. Under background (2026) and combined (2026) traffic conditions the intersection is expected to operate at an overall LOS E during the weekday AM peak hour and an overall LOS C or better during both the school PM and weekday PM peak hours. Signal timing adjustments were considered under combined (2026) traffic conditions in order to bring the overall level-of-service to acceptable conditions. These adjustments are expected to improve the intersection to an overall LOS of D or better during all peak hours studied.

Per the Town UDO, an additional analysis scenario 10 years beyond buildout was included. Under future (2035) traffic conditions with no improvements or adjustments, the intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours and an overall LOS E during the school PM peak hour. Exclusive eastbound and southbound right-turn lanes and two exclusive northbound right-turn lanes were considered at this intersection under future (2035) traffic conditions. These additional lanes are expected to improve the overall level-of-service at the intersection to LOS D during the weekday AM peak hour and LOS B during the school and weekday PM peak hours. It should be noted that these improvements and analysis scenario are provided for the Town's information / planning purposes only and do not accurately depict the impacts of the proposed development.

**7.2. Forestville Road and Old Knight Road**

The existing unsignalized intersection of Forestville Road and Old Knight Road was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 5. Refer to Table 5 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports.

**Table 5: Analysis Summary of Forestville Road and Old Knight Road**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB NB SB	1 LT-RT 1 LT-TH 1 TH- RT	F <sup>2</sup> B <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A	E <sup>2</sup> A <sup>1</sup> --	N/A
Background (2026) Conditions	EB NB SB	1 LT-RT 1 LT-TH 1 TH- RT	F <sup>2</sup> B <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A	F <sup>2</sup> A <sup>1</sup> --	N/A
Combined (2026) Conditions	EB NB SB	1 LT-RT 1 LT-TH 1 TH- RT	F <sup>2</sup> C <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A	F <sup>2</sup> B <sup>1</sup> --	N/A
Combined (2026) Conditions w/ <b>Improvements and Signalization</b>	EB NB SB	1 LT, <b>1 RT</b> <b>1 LT</b> , 1 TH 1 TH, <b>1 RT</b>	D B C	<b>C</b> (27)	C B C	<b>C</b> (21)	C B C	<b>B</b> (19)
Future (2035) Conditions	EB NB SB	1 LT, <b>1 RT</b> <b>1 LT</b> , 1 TH 1 TH, <b>1 RT</b>	F C D	<b>D</b> (49)	D B C	<b>C</b> (27)	C B C	<b>C</b> (23)

1. Level of service for major-street left-turn movement.
  2. Level of service for minor-street approach.
- Improvements by Developer in **bold**.

Capacity analysis of existing (2019), background (2026), and combined (2026) traffic conditions indicates the major-street left-turn movement at Forestville Road and Old Knight Road is expected to operate at LOS C or better during the weekday AM, school PM, and weekday PM peak hours, while the minor-street approach is expected to operate at LOS F during all peak hours with the exception of the school PM and weekday PM peak hours under



existing (2019) traffic conditions.

Exclusive eastbound and southbound right-turn lanes, an exclusive northbound left-turn lane, and a traffic signal was considered at this intersection. Combined (2026) traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD) and determined to not meet any peak hour signal warrants with the proposed laneage. These improvements are expected to improve this intersection's level-of-service to an overall LOS of C during all peak hours analyzed. It should be noted that due to the high volume of residential and school uses in the area, which typically generates trips during two peak hours each day, it is anticipated that the 4- and 8-hour signal warrant would also not be met. Despite the lack of signal warrants, monitoring this intersection for signalization through buildout of the proposed development is recommended due to the significant delay expected on the minor street approach under unsignalized conditions.

Under future (2035) conditions, with the recommended developer improvements, the subject intersection is expected to operate at an overall LOS D or better during the weekday AM, school PM, and weekday PM peak hours.

**7.3. Old Knight Road and US Highway 64 Business**

The existing unsignalized intersection of Old Knight Road and US Highway 64 Business was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 6. Refer to Table 6 for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports.

**Table 6: Analysis Summary of Old Knight Road and US Highway 64 Business**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, 2 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	D E E E	E (63)	C C E E	D (39)	D D E D	D (46)
Background (2026) Conditions	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, 2 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	F F F F	F (132)	D D E E	D (45)	F D F D	F (85)
Combined (2026) Conditions	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, 2 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	F F F F	F (157)	E D D D	D (51)	F D F D	F (106)
Combined (2026) Conditions w/ Improvements	EB WB NB SB	<u>2</u> LT, 2 TH, 1 RT 1 LT, 2 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	D F F F	F (133)	D C E E	D (46)	E D F D	E (68)
Future (2035) Conditions	EB WB NB SB	1 LT, 2 TH, 1 RT 1 LT, 2 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	F F F F	F (344)	F D F E	F (90)	F F F E	F (215)
Future (2035) Conditions w/ Improvements	EB WB NB SB	<u>3</u> LT, <u>3</u> TH, 1 RT <u>2</u> LT, <u>4</u> TH, <u>2</u> RT <u>2</u> LT, <u>2</u> TH, 1 RT <u>2</u> LT, <u>2</u> TH, <u>3</u> RT	D D E E	D (55)	C C E E	D (37)	D C E D	D (41)

Per the Town UDO, improvements needed to operate at acceptable level-of-service under future conditions are underlined.

Capacity analysis of existing (2019) traffic conditions indicates the intersection of Old Knight Road and US Highway 64 Business is expected to operate at an overall LOS E during the weekday AM peak hour and LOS D during both the school PM and weekday PM peak hours. Under background (2026) and combined (2026) traffic conditions, the intersection is expected to operate at LOS F during both the weekday AM and PM peak hours and LOS D during the school PM peak hour.

An additional eastbound left-turn lane was considered and analyzed under combined (2026) traffic conditions. This improvement is expected to improve the delay during the weekday AM and school PM peak hour to near background (2026) traffic conditions (within one second of delay) and improves to overall level-of-service to LOS E during the weekday PM peak hour. The proposed development is expected to account for approximately 4% of the total traffic at this intersection during the weekday AM and school PM peak hours and 3% of the total traffic during the weekday PM peak hour. Due to the relatively low percentage of traffic being added to this intersection by the proposed development, these improvements are not recommended by the Forestville Village development.

Under future (2035) traffic conditions, the intersection is expected to operate at an overall LOS of F during all peak hours analyzed. Additional left, right, and through lanes were considered at nearly all approaches during the future (2035) traffic conditions and these improvements are expected to improve the intersection to operate at LOS D during all peak hours analyzed. It should be noted that these improvements and analysis scenario are provided for the Town's information / planning purposes only and do not accurately depict the impacts of the proposed development. By 2035 it is recommended that an alternative intersection design (i.e. reduced conflict intersection or interchange) be explored at this intersection and along the US Highway 64 Business corridor.

The subject intersection is part of a coordinated signal system, therefore signal timing modifications were not included under background or combined conditions. Under future (2035) with improvement conditions, due to the extended analysis year and significant improvements being considered, signal timing modifications were included in the analysis.

**7.4. Forestville Road and Lawson Ridge Road / Cassia Lane**

The unsignalized intersection of Forestville Road and Lawson Ridge Road / Cassia Lane was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 7. Refer to Table 7 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports.

**Table 7: Analysis Summary of Forestville Road and Lawson Ridge Road / Cassia Lane**

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A
Background (2026) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> E <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A
Combined (2026) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	A <sup>1</sup> A <sup>1</sup> D <sup>2</sup> E <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> D <sup>2</sup> F <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> D <sup>2</sup>	N/A
Future (2035) Conditions	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT	A <sup>1</sup> A <sup>1</sup> F <sup>2</sup> F <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> F <sup>2</sup> F <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> E <sup>2</sup> F <sup>2</sup>	N/A

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

Capacity analysis of existing (2019) traffic conditions indicates all minor-street approaches and major-street left-turn movements at the intersection of Forestville Road and Lawson Ridge Road / Cassia Lane are expected to operate at LOS C or better during the weekday AM, school PM, and weekday PM peak hours. Under background (2026) and combined (2026) conditions the southbound minor street approach is expected to degrade to LOS E or F during the

weekday AM and school PM peak hours due to the high volume of school traffic that utilize this intersection. Under future (2035) conditions the northbound minor street approach is expected to also degrade to LOS E or F under all analysis scenarios. It is not unusual for a stop controlled minor-street approach to operate at a poor level of service during the peak hours with a high volume of through traffic on the main-line approach. A traffic signal as considered according to MUTCD methodology but was not expected to meet the weekday AM, school PM, or weekday PM peak hour warrants for signalization. Additionally, Lawson Ridge Road serves a high volume of school traffic, which operate during two distinct peak periods. Outside of these peak times, this roadway is expected to serve a much lower volume of traffic. Due to these reasons, no improvements are recommended at this intersection by the proposed development.

**7.5. Old Knight Road and Bryan Chalk Lane**

The existing unsignalized intersection of Old Knight Road and Bryan Chalk Lane was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown Table 8. Refer to Table 8 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports.

**Table 8: Analysis Summary of Old Knight Road and Bryan Chalk Lane**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH-RT	E <sup>2</sup> B <sup>1</sup> --	N/A	B <sup>2</sup> A <sup>1</sup> --	N/A	B <sup>2</sup> A <sup>1</sup> --	N/A
Background (2026) Conditions	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH-RT	F <sup>2</sup> C <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A
Combined (2026) Conditions	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH-RT	F <sup>2</sup> C <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A
Future (2035) Conditions	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH-RT	F <sup>2</sup> F <sup>1</sup> --	N/A	E <sup>2</sup> A <sup>1</sup> --	N/A	D <sup>2</sup> A <sup>1</sup> --	N/A
Future (2035) Conditions – <u>w/ Improvements</u>	EB NB SB	1 LT, 1 RT 1 LT, 1 TH 1 TH, <u>1 RT</u>	D E E	E (62)	D B B	C (31)	B B B	B (16)

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

2. Level of service for minor-street approach.

Per the Town UDO, improvements needed to operate at acceptable level-of-service under future conditions are underlined.

Capacity analysis of existing (2019), background (2026), and combined (2026) traffic conditions indicates the major-street left-turn movement at the intersection of Old Knight Road and Bryan Chalk Lane is expected to operate at LOS C or better during all peak hours analyzed. Under those same traffic conditions, the minor-street approach at the intersection is expected to operate at LOS F (with the exception of existing (2019) traffic conditions, which

operates at LOS E) during the weekday AM peak hour and LOS C or better during the school PM and weekday PM peak hours. Under future (2035) conditions the minor-street approach is expected to operate at LOS F during the weekday AM peak hour and LOS E during the school PM peak hour. The major-street left-turn movement is expected to operate at LOS F during the weekday AM peak hour and LOS A during the school PM and weekday PM peak hours. Due to the poor level of service expected under future (2035) conditions, improvements were considered to improve the intersection to acceptable levels of service. With a signal and southbound right-turn lane the subject intersection is expected to operate at an overall LOS E or better during the weekday AM, school PM, and weekday PM peak hours under future (2035) conditions. It should be noted that these improvements and analysis scenario are provided for the Town's information / planning purposes only and do not accurately depict the impacts of the proposed development. It should also be noted that the proposed development is expected to account for less than 8% of the total traffic at the subject intersection during the weekday AM, school PM, and weekday PM peak hours.

**7.6. Forestville Road and Pebblebrook Lane / Site Drive 2**

The intersection of Forestville Road and Pebblebrook Lane / Site Drive 2 was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 9. Refer to Table 9 for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports.

**Table 9: Analysis Summary of Forestville Road and Pebblebrook Lane / Site Drive 2**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A
Background (2026) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> C <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A
Combined (2026) Conditions	EB WB NB SB	<b>1 LT</b> , 1 TH-RT 1 LT, 1 TH, <b>1 RT</b> 1 LT- <b>TH-RT</b> <b>1 LT-TH-RT</b>	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> B <sup>2</sup> B <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> B <sup>2</sup> C <sup>2</sup>	N/A
Future (2035) Conditions	EB WB NB SB	<b>1 LT</b> , 1 TH-RT 1 LT, 1 TH, <b>1 RT</b> 1 LT- <b>TH-RT</b> <b>1 LT-TH-RT</b>	A <sup>1</sup> A <sup>1</sup> E <sup>2</sup> E <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> C <sup>2</sup> C <sup>2</sup>	N/A	A <sup>1</sup> A <sup>1</sup> B <sup>2</sup> D <sup>2</sup>	N/A

1. Level of service for major-street left-turn movement.
  2. Level of service for minor-street approach.
- Improvements by Developer in **bold**.

Capacity analysis of existing (2019), background (2026), and combined (2026) traffic conditions indicates both the major-street left-turn movements and the minor-street approaches at the intersection of Forestville Road and Pebblebrook Lane / Site Drive 2 are expected to operate at LOS C or better during the weekday AM, school PM, and weekday PM peak hours. Under future (2035) traffic conditions, the minor-street approaches are expected to operate at LOS E during the weekday AM peak hour and LOS D or better during the school and weekday



PM peak hour.

Although not necessary from a level of service standpoint, turn lanes are recommended along Forestville Road according to the *Warrant for Left and Right-Turn Lanes at Grade, Unsignalized Intersections* chart, contained within the NCDOT Driveway Manual.

**7.7. Forestville Road and Western Church Driveway**

The existing unsignalized intersection of Forestville Road and Western Church Driveway was analyzed under existing (2019), background (2026), combined (2026), and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 10. Refer to Table 10 for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports.

**Table 10: Analysis Summary of Forestville Road and Western Church Driveway**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Existing (2019) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A
Background (2026) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A
Combined (2026) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A
Future (2035) Conditions	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A <sup>1</sup> C <sup>2</sup>	N/A	-- A <sup>1</sup> B <sup>2</sup>	N/A	-- A <sup>1</sup> C <sup>2</sup>	N/A

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

Capacity analysis of existing (2019), background (2026), combined (2026), and future (2035) traffic conditions indicates the major-street left-turn movement and minor-street approach at the intersection of Old Knight Road and Western Church Driveway are expected to operate at LOS C or better during the weekday AM, school PM, and weekday PM peak hours.

**7.8. Lawson Ridge Road and Site Drive 1**

The proposed unsignalized intersection of Lawson Ridge Road and Site Drive 1 was analyzed under combined (2026) and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 11. Refer to Table 11 for a summary of the analysis results. Refer to Appendix L for the Synchro capacity analysis reports.

**Table 11: Analysis Summary of Lawson Ridge Road and Site Drive 1**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Combined (2026) Conditions	WB NB SB	<b>1 LT-RT</b> 1 TH-RT <b>1 LT-TH</b>	A <sup>2</sup> -- A <sup>1</sup>	N/A	A <sup>2</sup> -- A <sup>1</sup>	N/A	A <sup>2</sup> -- A <sup>1</sup>	N/A
Future (2035) Conditions	WB NB SB	<b>1 LT-RT</b> 1 TH-RT <b>1 LT-TH</b>	A <sup>2</sup> -- A <sup>1</sup>	N/A	B <sup>2</sup> -- A <sup>1</sup>	N/A	B <sup>2</sup> -- A <sup>1</sup>	N/A

1. Level of service for major-street left-turn movement.
  2. Level of service for minor-street approach.
- Improvements by Developer in **bold**.

Capacity analysis of combined (2026) and future (2035) traffic conditions indicates both the major-street left-turn movement and the minor-street approach at the intersection of Lawson Ridge Road and Site Drive 1 are expected to operate at LOS B or better during the weekday AM, School PM, and weekday PM peak hours.

Turn lanes along Lawson Ridge Road were considered according to the *Warrant for Left and Right-Turn Lanes at Grade, Unsignalized Intersections* chart, contained in the NCDOT Driveway Manual, but are not recommended as Lawson Ridge Road is not expected to carry a daily traffic volume greater than 4,000 vehicles per day.

**7.9. Forestville Road and Site Drive 3**

The proposed right-in / right-out intersection of Forestville Road and Site Drive 3 was analyzed under combined (2026) and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 12. Refer to Table 12 for a summary of the analysis results. Refer to Appendix M for the Synchro capacity analysis reports.

**Table 12: Analysis Summary of Forestville Road and Site Drive 3**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Combined (2026) Conditions	EB WB SB	1 TH 1 TH, 1 RT 1 RT	-- -- A <sup>1</sup>	N/A	-- -- A <sup>1</sup>	N/A	-- -- A <sup>1</sup>	N/A
Future (2035) Conditions	EB WB SB	1 TH 1 TH, 1 RT 1 RT	-- -- B <sup>1</sup>	N/A	-- -- A <sup>1</sup>	N/A	-- -- B <sup>1</sup>	N/A

1. Level of service for minor-street approach. Improvements by Developer in **bold**.

Capacity analysis of combined (2026) and future (2035) traffic conditions indicates the minor-street approach at the intersection of Forestville Road and Site Drive 3 is expected to operate at LOS B or better during the weekday AM, school PM and weekday PM peak hours.

Although not necessary from a level of service standpoint, a right-turn lane is recommended along Forestville Road according to the *Warrant for Left and Right-Turn Lanes at Grade, Unsignalized Intersections* chart, contained within the NCDOT Driveway Manual.

**7.10. Old Knight Road and Site Drive 4**

The proposed right-in / right-out intersection of Old Knight Road and Site Drive 4 was analyzed under combined (2026) and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 13. Refer to Table 13 for a summary of the analysis results. Refer to Appendix N for the Synchro capacity analysis reports.

**Table 13: Analysis Summary of Old Knight Road and Site Drive 4**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Combined (2026) Conditions	EB NB SB	<b>1 RT</b> 1 TH <b>1 TH, 1 RT</b>	B <sup>1</sup> -- --	N/A	B <sup>1</sup> -- --	N/A	B <sup>1</sup> -- --	N/A
Future (2035) Conditions	EB NB SB	<b>1 RT</b> 1 TH <b>1 TH, 1 RT</b>	C <sup>1</sup> -- --	N/A	B <sup>1</sup> -- --	N/A	B <sup>1</sup> -- --	N/A

1. Level of service for minor-street approach. Improvements by Developer in **bold**.

Capacity analysis of combined (2026) and future (2035) traffic conditions indicates the minor-street approach at the intersection of Old Knight Road and Site Drive 4 is expected to operate at LOS C or better during the weekday AM, school PM, and weekday PM peak hours.

Although not necessary from a level of service standpoint, a right-turn lane is recommended along Old Knight Road according to the *Warrant for Left and Right-Turn Lanes at Grade, Unsignalized Intersections* chart, contained within the NCDOT Driveway Manual.

**7.11. Old Knight Road and Site Drive 5**

The proposed unsignalized intersection of Old Knight Road and Site Drive 5 was analyzed under combined (2026) and future (2035) traffic conditions with the lane configurations and traffic control shown in Table 14. Refer to Table 14 for a summary of the analysis results. Refer to Appendix O for the Synchro capacity analysis reports.

**Table 14: Analysis Summary of Old Knight Road and Site Drive 5**

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY SCHOOL PM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (Seconds)	Approach	Overall (seconds)
Combined (2026) Conditions	EB NB SB	<b>1 LT-RT</b> <b>1 LT, 1 TH</b> <b>1 TH, 1 RT</b>	C <sup>2</sup> A <sup>1</sup> --	N/A	B <sup>2</sup> A <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A
Future (2035) Conditions	EB NB SB	<b>1 LT-RT</b> <b>1 LT, 1 TH</b> <b>1 TH, 1 RT</b>	D <sup>2</sup> B <sup>1</sup> --	N/A	B <sup>2</sup> A <sup>1</sup> --	N/A	C <sup>2</sup> A <sup>1</sup> --	N/A

1. Level of service for major-street left-turn movement.
  2. Level of service for minor-street approach.
- Improvements by Developer in **bold**.

Capacity analysis of combined (2026) and future (2035) traffic conditions indicates both the major-street left-turn movement and the minor-street approach at the intersection of Old Knight Road and Site Drive 5 are expected to operate at LOS D or better during the weekday AM, school PM, and weekday PM peak hours.

Although not necessary from a level of service standpoint, turn lanes are recommended along Forestville Road according to the *Warrant for Left and Right-Turn Lanes at Grade, Unsignalized Intersections* chart, contained within the NCDOT Driveway Manual.

## 8. CRASH DATA ANALYSIS

The NCDOT was able to provide the crash data for the most recent five-year period, which was August 1, 2014 through August 31, 2019. A summary of crash results is provided for the study intersections in Table 15 and Table 16. Refer to Appendix P for the crash analysis reports.

**Table 15: Crash Analysis Summary for Intersections**

Intersection	Number of Crashes						Total Crashes
	2014 <sup>1</sup>	2015	2016	2017	2018	2019 <sup>2</sup>	
Forestville Road at Horton Road	1	1	5	1	4	2	14
Forestville Road at Old Knight Road	0	0	1	2	3	0	6
US 64 Business at Old Knight Road	4	18	11	15	10	12	70
Old Knight Road at Bryan Chalk Lane	0	0	0	0	2	0	2
Forestville Road at Lawson Ridge Road/Cassia Lane	0	0	0	0	0	1	1

1 – August 1 through December 31 (5 months of data)

2 – January 1 through August 31 (8 months of data)

Of the 93 crashes reported at the study intersections for the 5 years analyzed, none were fatal. The intersection of US 64 Business and Old Knight Road experiences a much larger quantity of crashes than the other intersections. Heavy traffic on US 64 Business is the primary reason for the high crash rates.

**Table 16: Crash Type Summary for Intersections**

Intersection	Type of Crash						Total Crashes
	Angle	Left-turn	Rear End	Sideswipe	Head On	Other	
Forestville Road at Horton Road	4	2	4	2	1	1	14
Forestville Road at Old Knight Road	1	0	4	0	0	1	6
US 64 Business at Old Knight Road	22	2	32	6	0	8	70
Old Knight Road at Bryan Chalk Lane	0	0	0	0	0	2	2
Forestville Road at Lawson Ridge Road/Cassia Lane	0	0	0	0	0	1	1
<b>Total Crashes</b>	<b>27</b>	<b>4</b>	<b>40</b>	<b>8</b>	<b>1</b>	<b>13</b>	<b>93</b>
<b>Percent of Total Crashes</b>	<b>29%</b>	<b>4%</b>	<b>43%</b>	<b>9%</b>	<b>1%</b>	<b>14%</b>	<b>--</b>

Table 16, above, outlines the type of crashes experienced at the study intersections. It was noted that roughly 43% of the crashes at the study intersections are the result of a rear-end collision. This is typical for roadways with heavy volumes, such as US 64 Business. The addition of the proposed development is not expected to have a significant impact on crash types or frequency within the study area due to the proposed turn-lanes recommended at multiple study intersections, which reduce the conflicts of mainline through volumes and mainline turning traffic.



## 9. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Forestville Village development, formerly the Old Knight Road mixed use development, to be located west of Old Knight Road and north of Forestville Road in Knightdale, North Carolina. The proposed development is expected to be a mixed-use development and be built out in 2025. Per the Town of Knightdale UDO, the background and combined analyses were conducted for build year + 1 year conditions. Site access is proposed via one full movement intersection and one right-in / right-out intersection along Forestville Road. Site access will also be provided via one right-in / right-out intersection and one full movement intersection along Old Knight Road. The proposed development will also be providing an internal connection for bike and pedestrian use between the development and Knightdale High School, to the north.

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

- Existing (2019) Traffic Conditions
- Background (2026) Traffic Conditions
- Combined (2026) Traffic Conditions
- Combined (2026) Traffic Conditions with Improvements
- Future (2035) Traffic Conditions – Per Town Requirements

### Trip Generation

It is estimated that the proposed development will generate approximately 5,500 total site trips during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 324 trips (144 entering and 180 exiting) will occur during the weekday AM peak hour, 378 trips (175 entering and 203 exiting) will occur during the school PM peak hour, and 466 trips (253 entering and 215 exiting) will occur during the weekday PM peak hour.

### Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to the Town's UDO and NCDOT Congestion Management Guidelines.

### 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:

The intersection of Old Knight Road and Forestville Road is expected to operate at poor level of service under combined conditions with significant delay on the minor street approach. In order to mitigate the impacts by the proposed development and improve this intersection to acceptable levels of service, geometric improvements and signalization are recommended. With these improvements in place, the intersection is expected to operate at an overall LOS C or better during the weekday AM, school PM, and weekday PM peak hours.

The intersection of Old Knight Road and US 64 Business is expected to operate at poor level of service under background and combined conditions. Per the Town UDO, improvements were considered to mitigate these impacts to acceptable levels of service; however, the proposed development is expected to account for less 4% or less of the total traffic at this intersection during the peak hours studied. Due to this relatively low percentage of traffic, no improvements are recommended by the proposed development to mitigate the existing capacity issues at this intersection.

## 10. 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 for the proposed development.

### **Recommended Improvements by Developer:**

#### Forestville Road and Old Knight Road

- Construct a southbound right-turn lane on Old Knight Road with a minimum of 100 feet of full width storage and appropriate taper.
- Construct a northbound left-turn lane on Old Knight Road with a minimum of 125 feet of full width storage and appropriate taper.
- Construct an eastbound right-turn lane on Forestville Road with a minimum of 100 feet of full width storage and appropriate taper.
- Monitor for signalization and install once warranted and approved by NCDOT.

#### Lawson Ridge Road and Site Drive 1

- Construct Site Drive 1 as a full movement intersection with stop control on the westbound approach of the driveway.
- Provide one (1) ingress lane and one (1) egress lane on Site Drive 1.

#### Forestville Road and Pebblebrook Drive / Site Drive 2

- Construct Site Drive 2 as a full movement intersection with stop control on the southbound approach of the driveway.
- Provide one (1) ingress lane and one (1) egress lane on Site Drive 2.
- Construct an eastbound left-turn lane on Forestville Road with a minimum of 100 feet of full width storage and appropriate taper.
- Construct a westbound left-turn lane on Forestville Road with a minimum of 50 feet of full width storage and appropriate taper.
- Construct a westbound right-turn lane on Forestville Road with a minimum of 50 feet of full width storage and appropriate taper.

Forestville Road and Site Drive 3

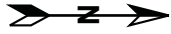
- Construct Site Drive 3 as a right-in/right-out intersection with stop control on the southbound approach of the driveway.
- Provide one (1) ingress lane and one (1) egress lane on Site Drive 3.
- Construct a westbound right-turn lane on Forestville Road with a minimum of 50 feet of full width storage and appropriate taper.

Old Knight Road and Site Drive 4

- Construct Site Drive 4 as a full movement intersection with stop control on the eastbound approach of the driveway.
- Provide one (1) ingress lane and one (1) egress lane on Site Drive 4.
- Construct a southbound right-turn lane on Old Knight Road with a minimum of 50 feet of full width storage and appropriate taper.

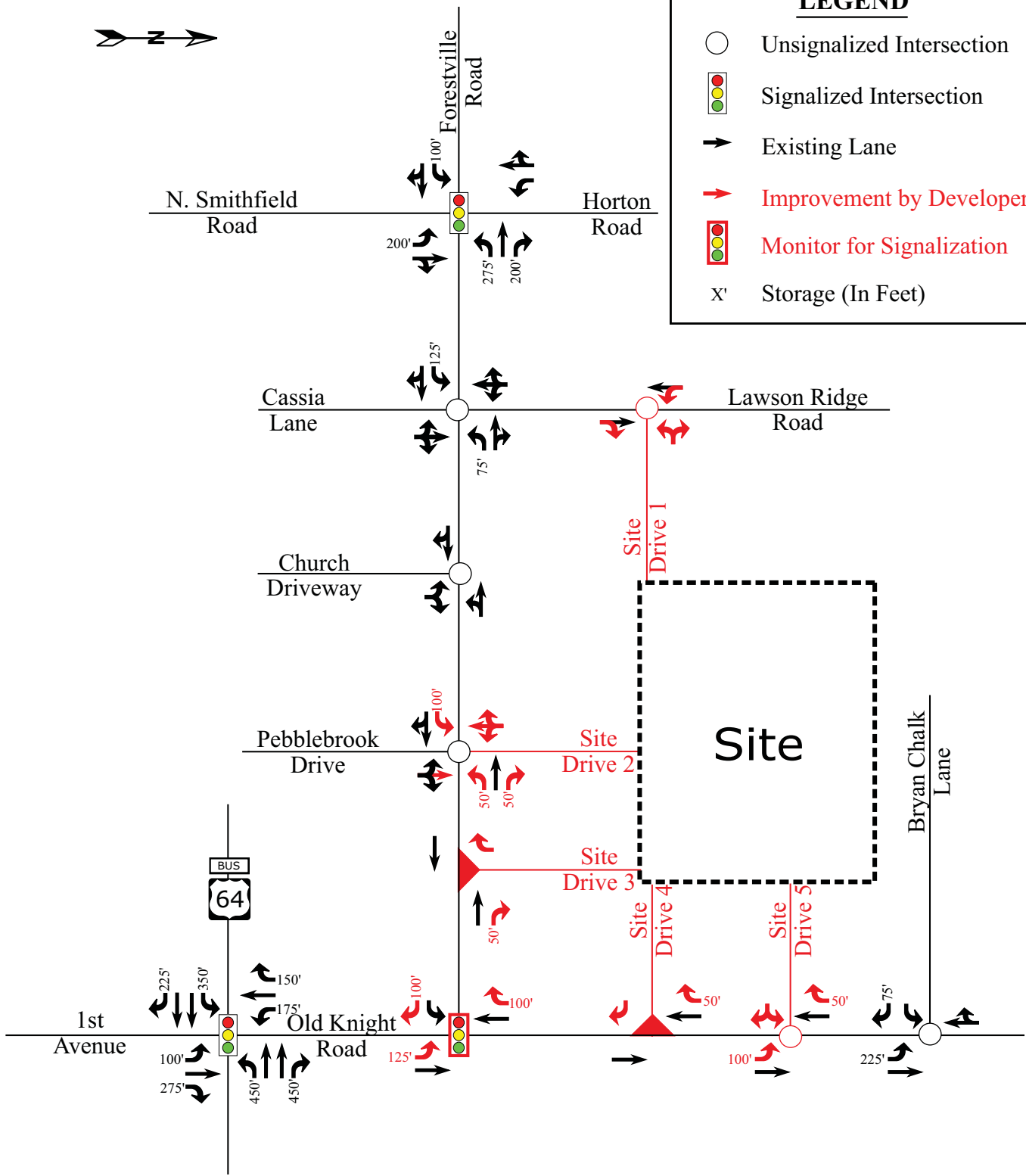
Old Knight Road and Site Drive 5

- Construct Site Drive 5 as a full movement intersection with stop control on the eastbound approach of the driveway.
- Provide one (1) ingress lane and one (1) egress lane on Site Drive 5.
- Construct a southbound right-turn lane on Old Knight Road with a minimum of 50 feet of full width storage and appropriate taper.
- Construct a northbound left-turn lane on Old Knight Road with a minimum of 100 feet of full width storage and appropriate taper.



**LEGEND**

- Unsignalized Intersection
- ◫ Signalized Intersection
- Existing Lane
- Improvement by Developer
- ◫ Monitor for Signalization
- X' Storage (In Feet)



Forestville Village  
Knightdale, NC

Recommended  
Lane Configurations

Scale: Not to Scale

Figure 14



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