

Weldon Village
Traffic Impact Analysis
Knightdale, North Carolina

TRAFFIC IMPACT ANALYSIS

FOR

WELDON VILLAGE

LOCATED

IN

KNIGHTDALE, NC

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OCTOBER 2022

RKA Project No. 22418



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TRAFFIC IMPACT ANALYSIS
WELDON VILLAGE
KNIGHTDALE, NORTH CAROLINA

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Weldon Village development in accordance with the Knightdale (Town) Unified Development Ordinance (UDO) and North Carolina Department of Transportation (NCDOT) capacity analysis guidelines. The proposed development is to be located north of Horton Road and to the east of Lucas Road in Knightdale, North Carolina. The proposed development is expected to be a maximum of 124 single-family homes, 32 townhomes, 8,000 s.f. of general office, and 8,000 s.f. of strip retail plaza and estimated to be built out in 2029. Site access is proposed via one full movement driveway that will form the fourth leg at the intersection of Horton Road and Old Knight Road and via connection to the existing Conway Ridge Crossing.

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

- 2022 Existing Traffic Conditions
- 2029+1 No-Build Traffic Conditions
- 2029+1 Build Traffic Conditions
- 2029+10 Build Traffic Conditions

2. Existing Traffic Conditions

The study area for the TIA was determined through coordination with the Town and NCDOT and consists of the following existing intersections:

- Horton Road and Lucas Road
- Horton Road and Old Knight Road / Access A
- Horton Road and Buffaloe Road
- Lucas Road and Buffaloe Road
- Horton Mill Drive and Horton Road

- Horton Road and Marks Creek Road

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersection listed below, in August of 2022 by RKA during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods:

- Horton Road and Lucas Road
- Horton Road and Old Knight Road / Access A
- Horton Road and Buffaloe Road
- Lucas Road and Buffaloe Road
- Horton Mill Drive and Horton Road
- Horton Road and Marks Creek Road

The traffic counts at the intersection of Knightdale Boulevard and North First Avenue were counted in June of 2022 during the same peak hours while schools were in session. Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate.

3. Site Trip Generation

The proposed development is assumed to consist of 124 single family homes, 32 townhomes, 8,000 s.f. general office, and 8,000 s.f. of strip retail plaza. 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*, 11th Edition. Table 3 provides a summary of the trip generation potential for the site.

Table E-1: Site Trip Generation

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single Family Detached (210)	124 DU	1,230	24	67	77	45
Townhomes (215)	32 DU	193	3	8	8	7
General Office (710)	8 KSF	546	14	10	31	32
Strip Retail Plaza (822)	8 KSF	122	16	2	3	16
Total Trips		2,091	57	87	119	100
<i>Internal Capture (6% AM & 2% PM)*</i>			-3	-5	-1	-2
Total External Trips			54	82	118	98
<i>Pass-By Trips</i>			0	0	-3	-3
Total Primary Trips			54	82	115	95

4. Future Traffic Conditions

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 3% would be used to generate 2030 projected weekday AM and PM peak hour traffic volumes. The following adjacent developments were identified to be considered under future conditions:

- Buffalo Road Assemblage
- Forestville Village
- Haywood Glen
- Marks Creek

5. Capacity Analysis Summary

The analysis considered weekday AM and PM peak hour traffic for 2022 existing, 2030 no-build, 2030 build, and 2039 build conditions. Refer to Section 7 of the TIA for the capacity analysis summary performed at each study intersection.

6. Recommendations

Based on the findings of this study, specific geometric and traffic control improvements have been identified at study intersections. The improvements are summarized below and are illustrated in Figure E-1.

Improvements to Meet Town's UDO

Marks Creek Road and Horton Road

- Monitor intersection for signalization and install traffic signal when warranted.

Recommended Improvements by Developer

Marks Creek Road and Horton Road

- Construct southbound right turn lane with 100 feet of storage and appropriate decel and taper.

Horton Road and Old Knight Road / Site Access A

- Construct southbound approach as one ingress lane and one egress lane.
- Provide stop-control for southbound approach.

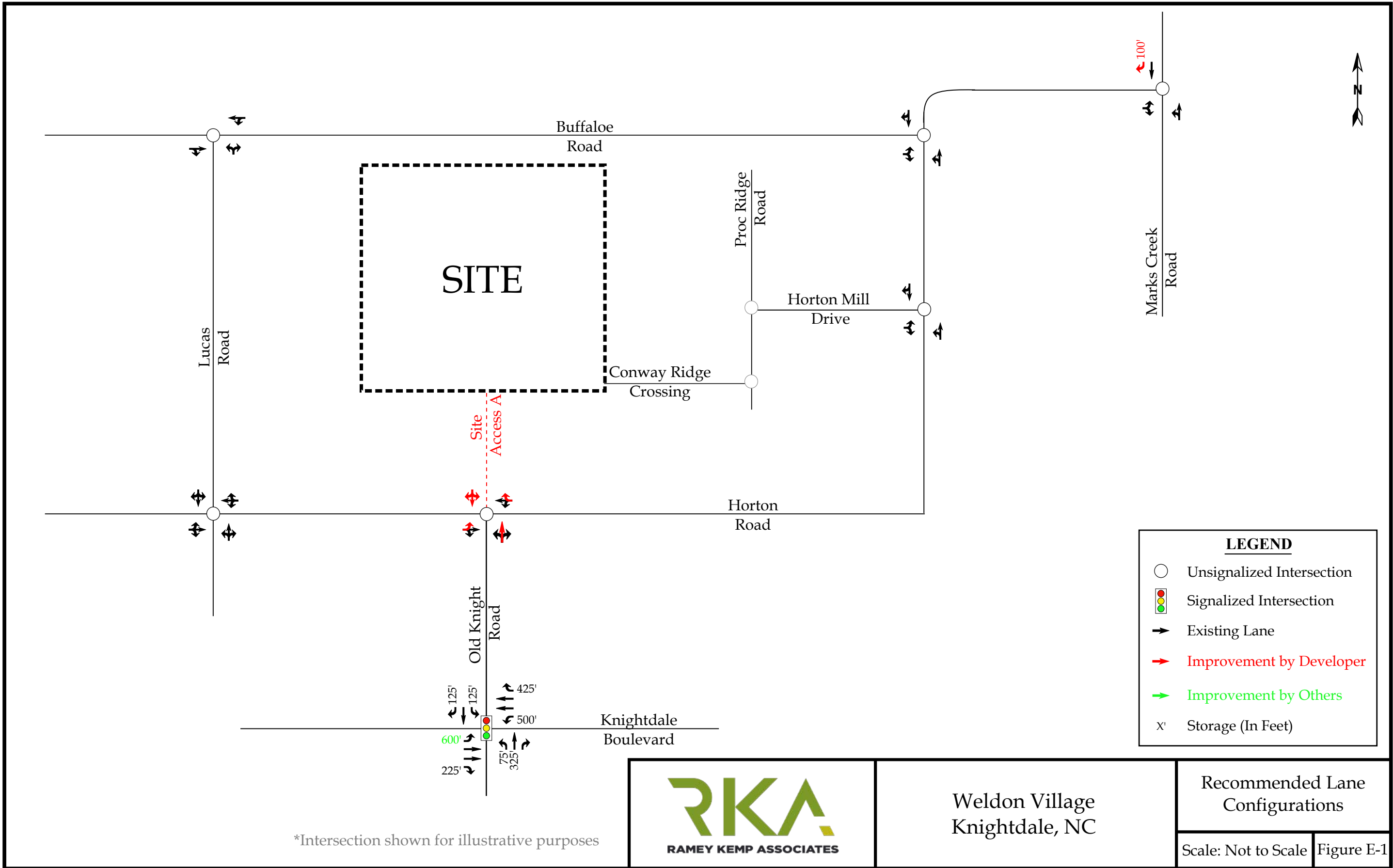


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TRAFFIC IMPACT ANALYSIS
WELDON VILLAGE
KNIGHTDALE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Weldon Village development to be located north of Horton Road and to the east of Lucas 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 2029, is assumed to consist of the following uses:

- 124 single family homes
- 32 townhomes
- 8,000 square foot (s.f.) general office
- 8,000 square foot (s.f.) strip retail plaza

Per the Town of Knightdale (Town) Unified Development Ordinance (UDO), future analysis should include the build year + 1, as well as a future (build year + 10 years) scenario. The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2029+1 No-Build Traffic Conditions
- 2029+1 Build Traffic Conditions
- 2029+10 Build Traffic Conditions

1.1. Site Location and Study Area

The development is proposed to be located north of Horton Road and to the east of Lucas 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 and Lucas Road
- Horton Road and Old Knight Road / Access A
- Horton Road and Buffaloe Road
- Lucas Road and Buffaloe Road
- Horton Mill Drive and Horton Road
- Horton Road and Marks Creek Road
- Knightdale Boulevard and First Avenue / Old Knight Road

Refer to Appendix A for the approved scoping documentation.

1.2. Proposed Land Use and Site Access

The site is expected to be located north of Horton Road and to the east of Lucas Road. The proposed development, anticipated to be completed in 2029, is assumed to consist of the following uses:

- 124 single family homes
- 32 townhomes
- 8,000 square foot (s.f.) general office
- 8,000 square foot (s.f.) strip retail plaza

These land uses are assumed at this time. Site access is proposed via one full movement driveway that will form the fourth leg at the intersection of Horton Road and Old Knight Road and via connection to the existing Conway Ridge Crossing. 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 undeveloped land and residential development.

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 within the study area are shown in Figure 3. Table 1 provides a summary of this information, as well.

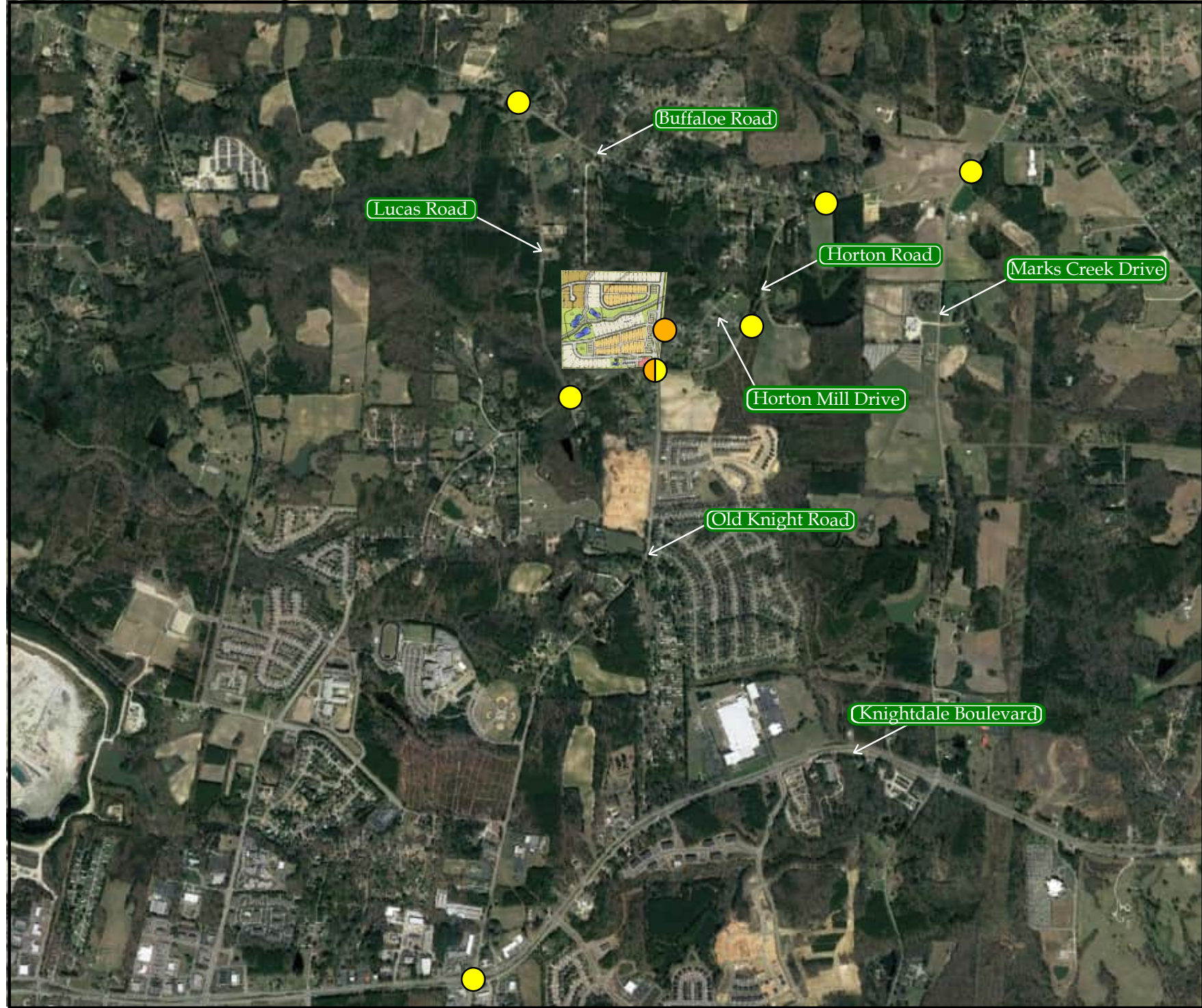
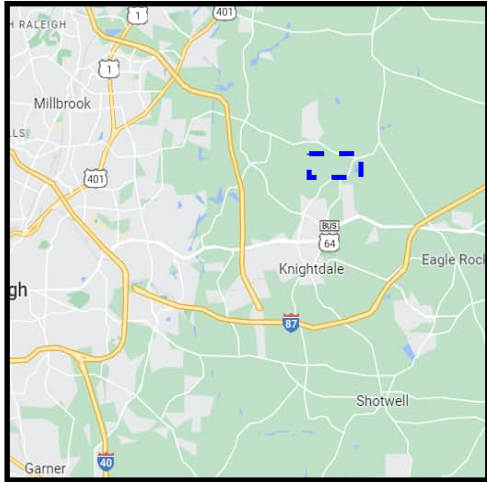
Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross Section	Speed Limit	2019 AADT (vpd)
Buffaloe Road	SR 2215	2-lane undivided	45 mph	3,800
Lucas Road	SR 2260	2-lane undivided	45 mph	860*
Horton Road	SR 2231	2-lane undivided	Not Posted	2,300
Old Knight Road	SR 2049	2-lane undivided	Not Posted	6,800**
Marks Creek Road	SR 2234	2-lane undivided	Not Posted	3,700
North 1 st Avenue	SR 2049	2-lane undivided	25 mph	7,500
Knightdale Boulevard	US 64	4-lane divided	45 mph	24,000
Horton Mill Drive	N/A	2-lane undivided	Not Posted	180*




*ADT from 2017

**ADT from 2015

**ADT based on the traffic counts from 2022 and assuming the weekday PM peak hour volume is 10% of the average daily traffic.



LEGEND

-  Study Intersection
-  Proposed Site Access
-  Study Area

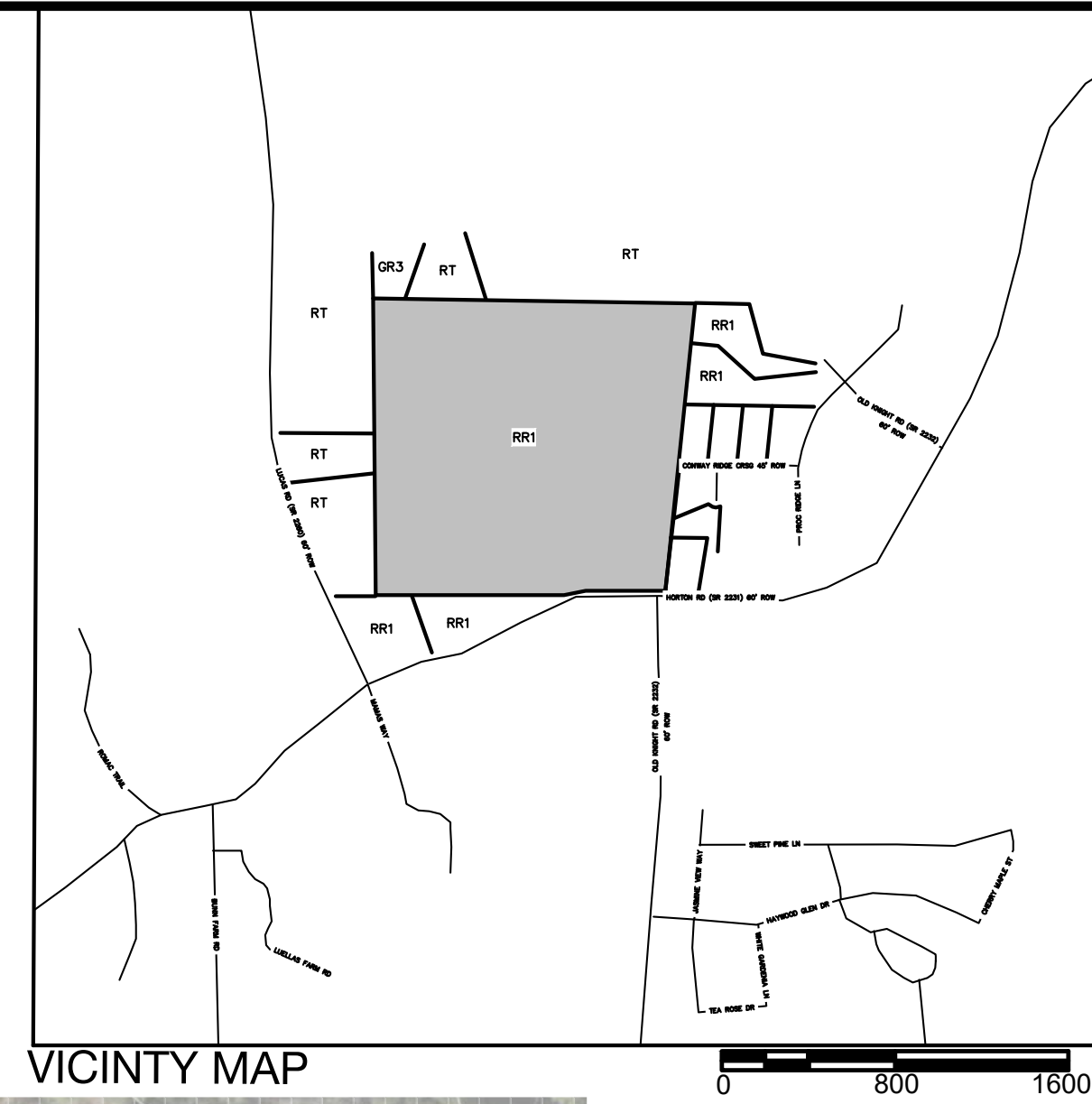
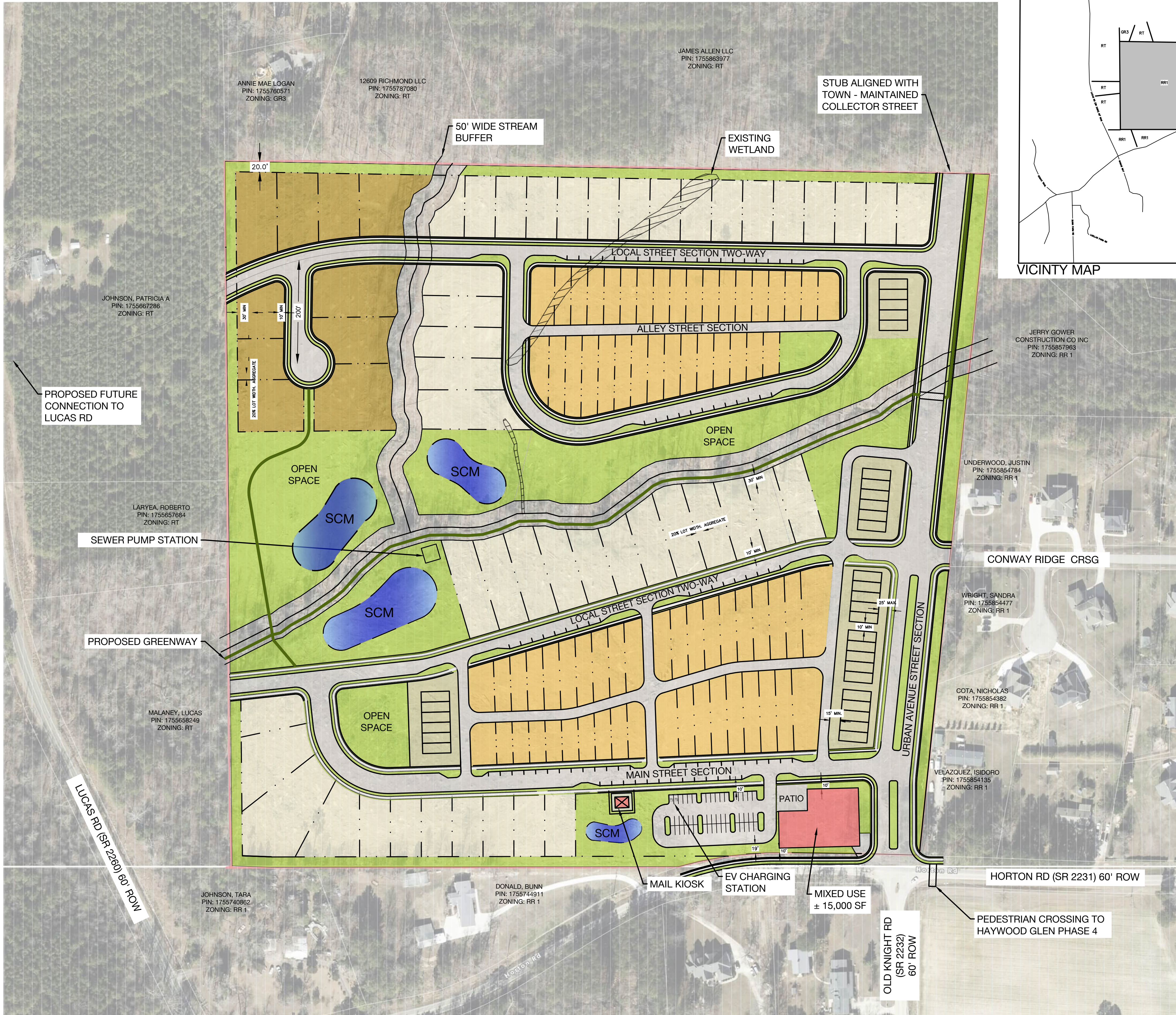



RKA
RAMEY KEMP ASSOCIATES

Weldon Village
Knightdale, NC

Site Location Map

Scale: Not to Scale	Figure 1
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SITE DATA

TAX PARCEL ID #: 1755757607
 TOTAL SITE AREA: ± 41 AC
 EXISTING ZONING: RR1
 PROPOSED ZONING: RMX-PUD
 WATERSHED CLASSIFICATION: N/A

DEVELOPMENT SUMMARY

RESIDENTIAL MIX

- 80' WIDE SINGLE FAMILY FRONT LOADED - 10 PARCELS
 - 60' WIDE SINGLE FAMILY FRONT LOADED - 44 PARCELS
 - 32' X 70' WIDE SINGLE FAMILY REAR LOADED - 72 PARCELS
 - TOWNHOMES - 32 UNITS
- TOTAL - 158 DWELLING UNITS

COMMERCIAL

- ± 1.5 AC OUTPARCEL
- ± 15,000 SF
- PARKING REQUIRED ± 51 - 103 SPACES
- PARKING PROVIDED : 51 SPACES

***OPEN SPACE:**

- OPEN SPACE REQUIRED ± 5.8 AC (50% PASSIVE - 50% ACTIVE)
- LAND DEDICATED FOR OPEN SPACE ± 8.4 AC

*TO FULFILL KNIGHTDALE COMMUNITY, RECREATION, PUBLIC, ENVIRONMENTAL AND CREATIVE PROGRAMMING REQUIREMENTS

CONNECTIVITY INDEX

- 1.40 LINK/NODE RATIO

TREE COVER AREA

- REQUIRED - ± 5522.7 LF (PERIMETER) X 20 = 110,454 SF = 2.5 AC
- PROVIDED - ± 120,118 SF (RIVER BUFFER) = 2.75 AC

WATER ALLOCATION

WATER ALLOCATION POINTS - MAJOR SUBDIVISION

- MAJOR SUBDIVISION BASE POINTS - 15 POINTS
- RESIDENTIAL ARCHITECTURAL STANDARDS - 15 POINTS
- CONSTRUCT MORE THAN 2000 LINEAR FT OF 10FT WIDE PATH - 6 POINTS
- CONSTRUCT A FOUNTAIN WITHIN THE BMP - 4 POINTS
- DECK/PATIO (3000 SF) - 3 POINTS
- PROVISION OF ON-STREET PUBLIC PARKING - 4 POINTS
- IPEMA CERTIFIED PLAYGROUND EQUIPMENT - 4 POINTS
- OUTDOOR DISPLAY OF PUBLIC ART - 4 POINTS
- TOTAL - 55 POINTS

WATER ALLOCATION POINTS - SINGLE USE RETAIL

- SINGLE USE RETAIL BASE POINTS - 41 POINTS
- OUTDOOR DISPLAY OF PUBLIC ART - 4 POINTS
- DECK/PATIO (3000 SF) - 3 POINTS
- CONSTRUCT A FOUNTAIN WITHIN THE BMP - 4 POINTS
- PROVISION OF ON STREET PUBLIC PARKING - 4 POINTS
- TOTAL - 56 POINTS

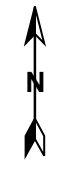
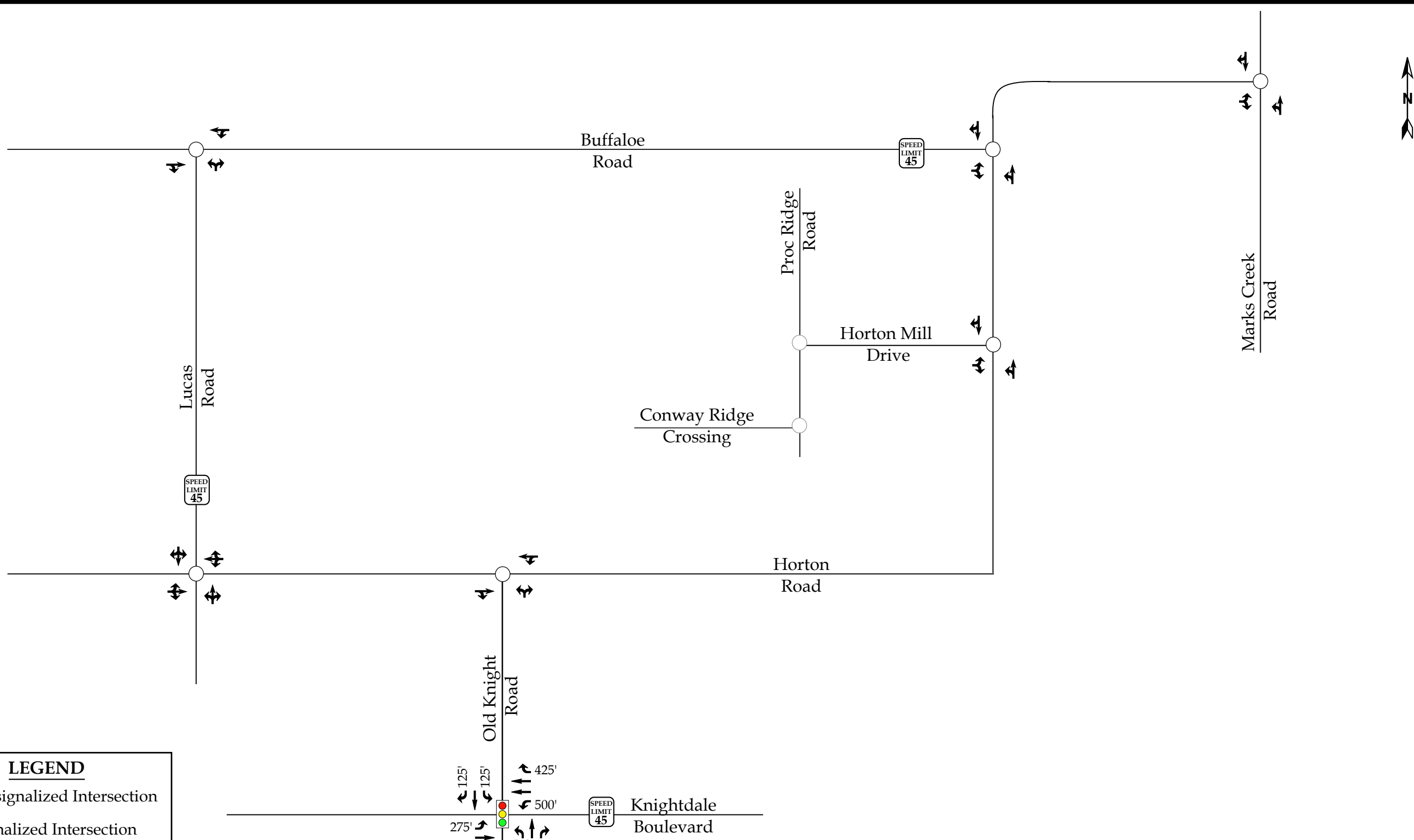
NOTES

1. THIS PLAN IS CONCEPTUAL IN NATURE AND IS SUBJECT TO CHANGE.
2. THIS EXHIBIT WAS PREPARED USING AVAILABLE RECORD INFORMATION, GIS MAPS, RECORD PLANS, AERIAL IMAGERY, AND LAND RECORDS
3. THIS PLAN WILL BE SUBJECT TO REVIEW AND APPROVAL BY LOCAL AND STATE PLANNING AND ENGINEERING REVIEW AGENCIES.
4. THE WORK OF THIS PRODUCT IS THE PROPERTY OF URBAN DESIGN PARTNERS, PLLC. NO USE OR REPRODUCTION OF THIS PLAN IS PERMITTED WITHOUT WRITTEN AUTHORIZATION FROM URBAN DESIGN PARTNERS, PLLC.



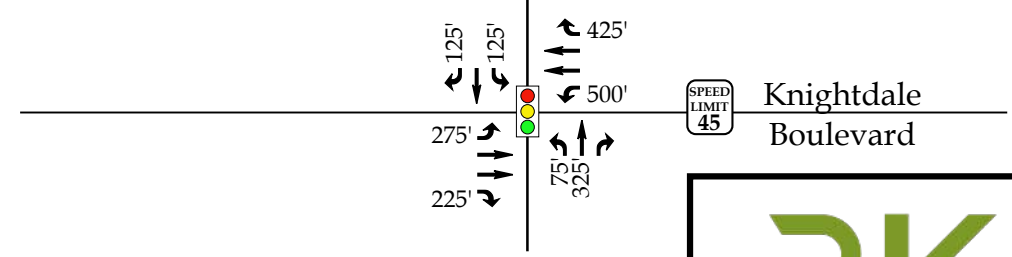
WELDON VILLAGE MIXED USE | YIELD STUDY

KNIGHTDALE, NC



LEGEND

- Unsignalized Intersection
- Signalized Intersection
- ➔ Existing Lane
- x' Storage (In Feet)
- Ⓢ SPEED LIMIT XX Posted Speed Limit



Weldon Village
Knightdale, NC

2022 Existing
Lane Configurations

Scale: Not to Scale Figure 3

2. 2022 EXISTING PEAK HOUR CONDITIONS

2.1. 2022 Existing Peak Hour Traffic Volumes

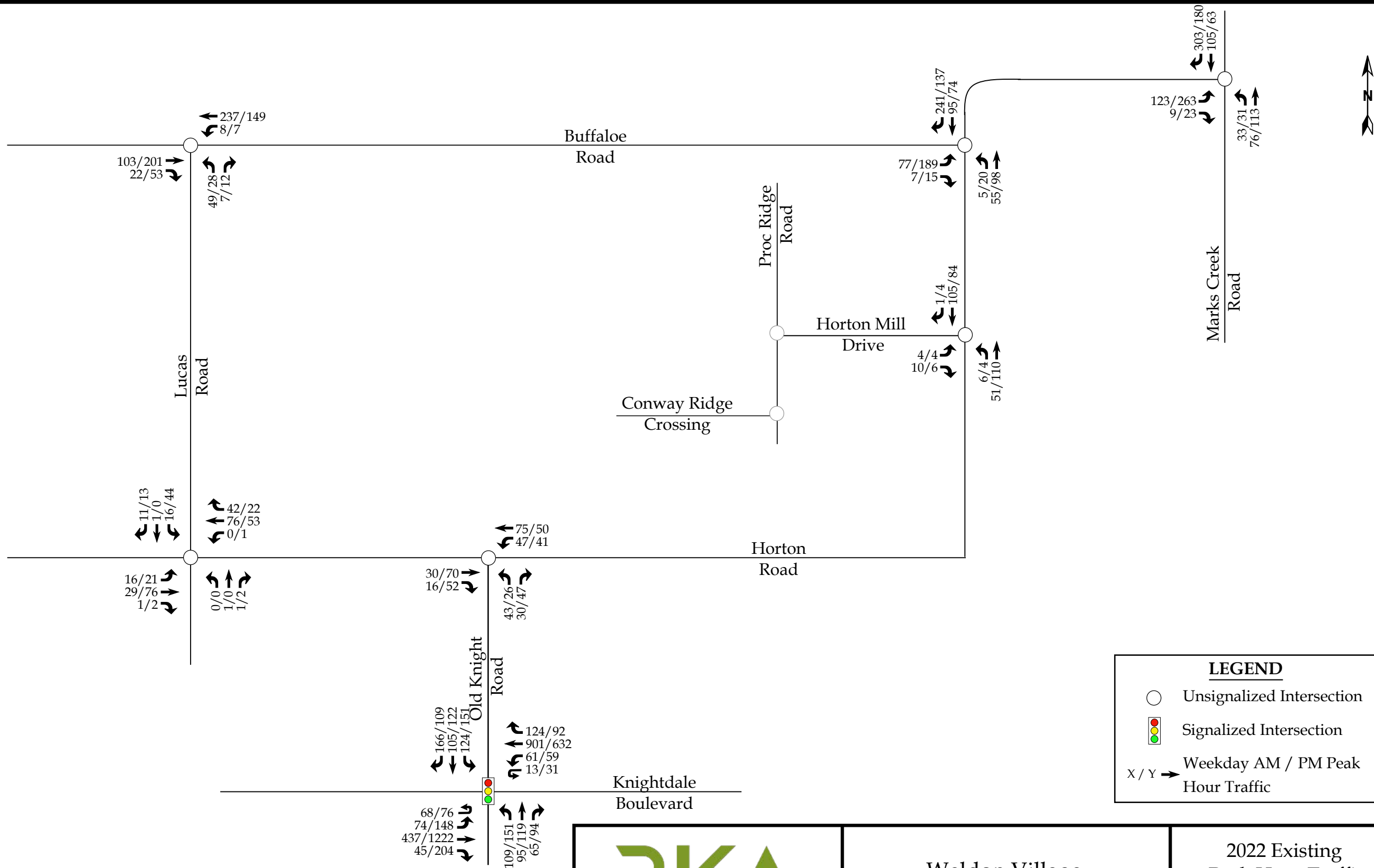
Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in August of 2022 by RKA and Burns Service, Inc. during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods while schools were in session:

- Horton Road and Lucas Road
- Horton Road and Old Knight Road / Access A
- Horton Road and Buffaloe Road
- Lucas Road and Buffaloe Road
- Horton Mill Drive and Horton Road
- Horton Road and Marks Creek Road

The traffic counts at the intersection of Knightdale Boulevard and North First Avenue were counted in June of 2022 during the same peak hours while schools were in session. Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for 2022 existing 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 2022 Existing Peak Hour Traffic Conditions

The 2022 existing 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 → Weekday AM / PM Peak Hour Traffic

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



Weldon Village
Knightdale, NC

2022 Existing
Peak Hour Traffic

Scale: Not to Scale Figure 4

3. 2030 NO-BUILD PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, no-build traffic projections are needed. No-build 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. No-build 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 2030 projected weekday AM and PM peak hour traffic volumes. Refer to Figure 5 for 2030 projected peak hour traffic.

3.2. Adjacent Development Traffic

Through coordination with the Town and NCDOT, the following adjacent developments were identified to be included as an approved adjacent development in this study:

- Buffalo Road Assemblage
- Forestville Village
- Haywood Glen
- Marks Creek

Table 2, on the following page, provides a summary of the adjacent developments.

Table 2: Adjacent Development Information

Development Name	Location	Build-Out Year	Land Use / Intensity	TIA Performed
Buffaloe Road Assemblage	South of Buffaloe Road, east of Old Crews Road	2027	799 single family homes and 514 townhomes	RKA
Forestville Village	West of Old Knight Road, north of Forestville Road	2025	90 single family homes, 190 townhomes, and 40,000 s.f. of shopping center	RKA
Haywood Glen	Southeastern quadrant of the Old Knight Road and Horton Road intersection	2024	112 single family homes	Timmons Group
Marks Creek	West of Marks Creek Road, north of US 64 Business	2028	246 single family homes and 121 apartments	RKA

It should be noted that including trips from the above adjacent developments on top of an annually compounded growth rate is anticipated to provide conservative results in this area, as local development growth is the most impactful for more rural areas. Additionally, there is expected to be interaction between some of the adjacent developments and the proposed development based on the different land uses; however, no reduction in adjacent development trips was proposed to provide a conservative estimation of future traffic volumes. It should be noted that the adjacent developments were approved, during scoping, by the Town and NCDOT. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix D.

3.3. Future Roadway Improvements

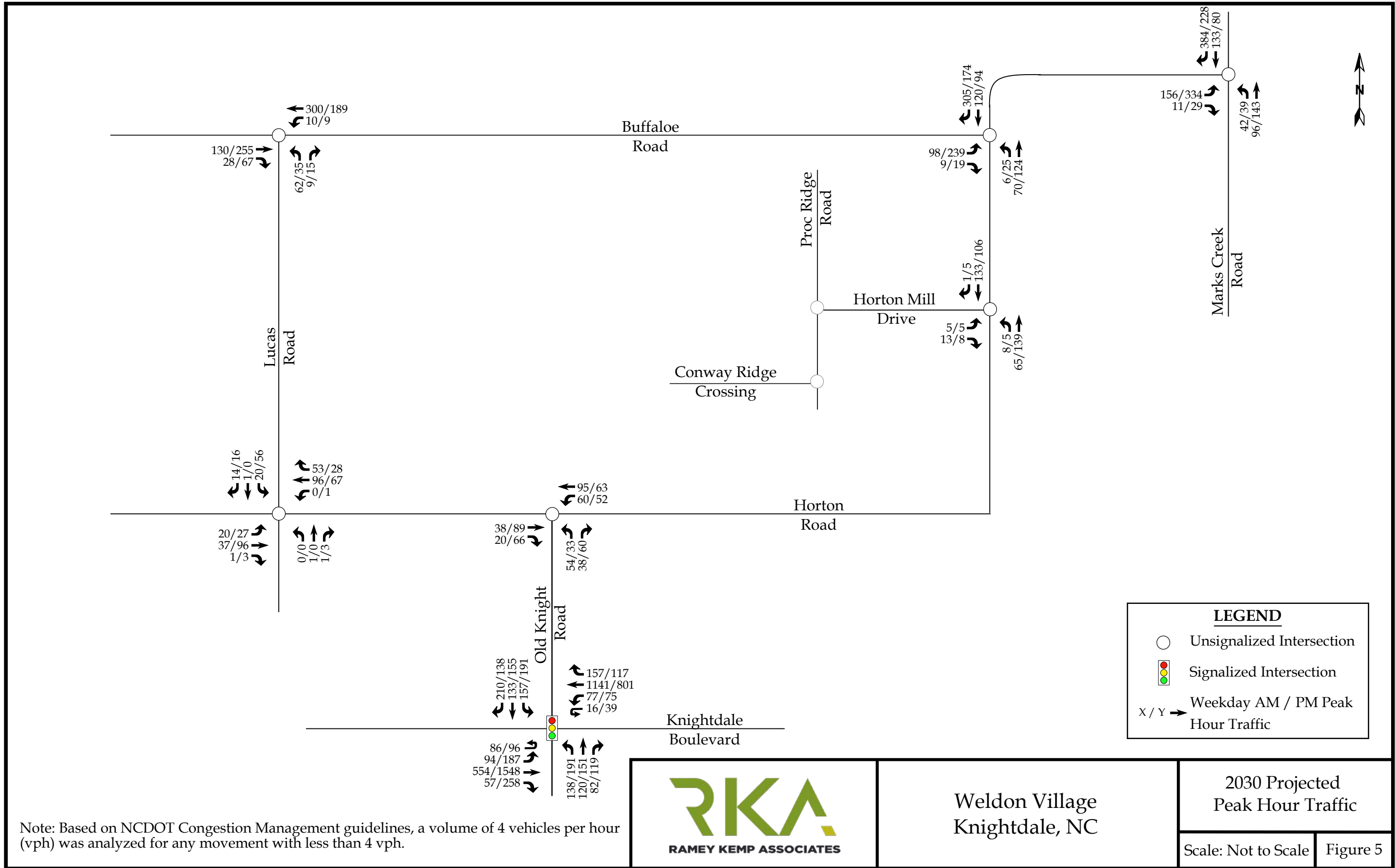
Based on coordination with the Town and NCDOT, two roundabouts are expected along Old Knight Road. Site trips are anticipated to be primarily through traffic at both of these roundabouts which would have minimal impacts on the capacity of the intersection. Due to the minimal impacts anticipated, and the conservative design of the roundabouts, neither roundabout will be included in the study.

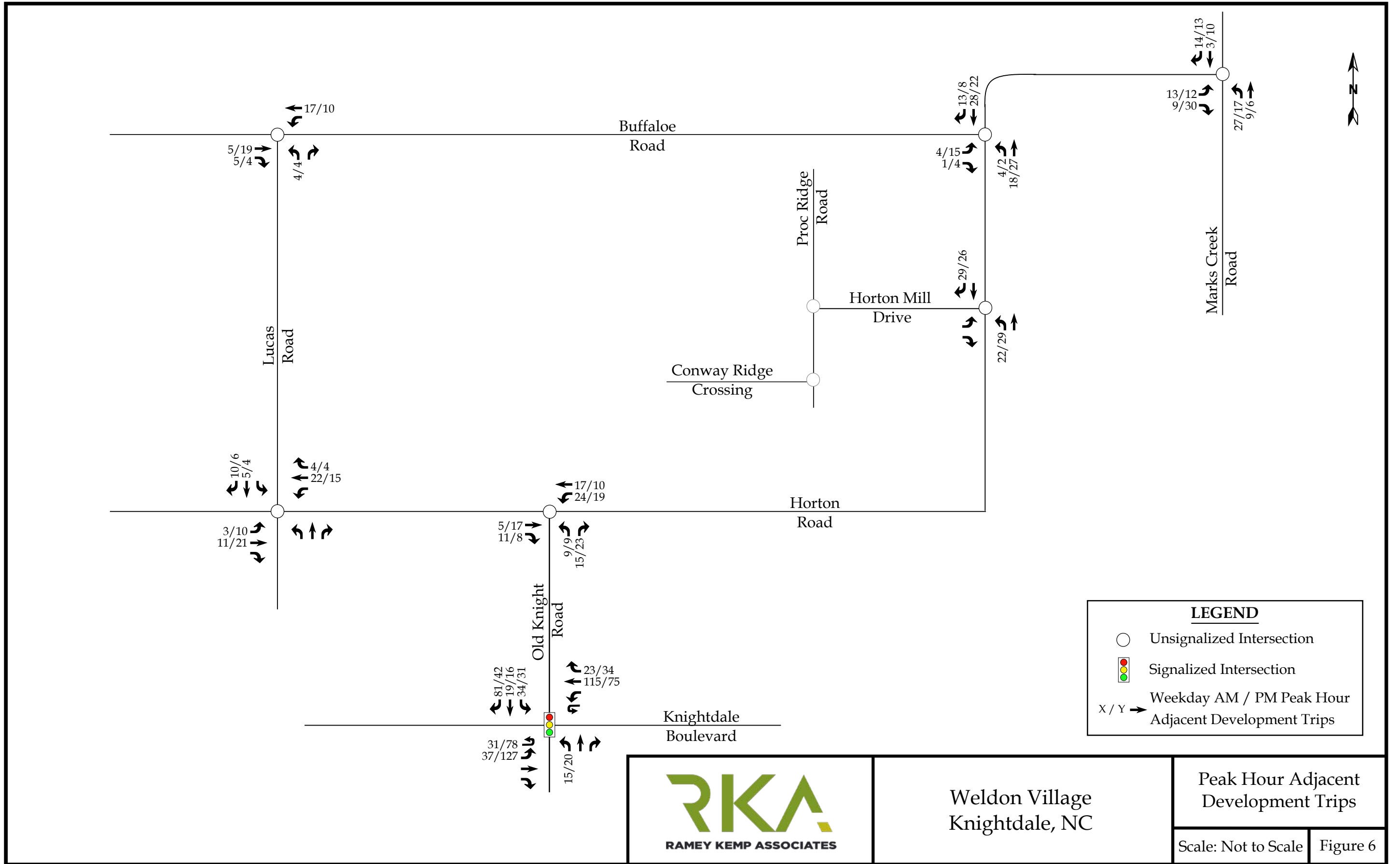
3.4. 2030 No-Build Peak Hour Traffic Volumes

The 2030 no-build traffic volumes were determined by projecting the 2022 existing peak hour traffic to the year 2030, and adding the adjacent development trips. Refer to Figure 7 for an illustration of the 2030 no-build peak hour traffic volumes at the study intersections.

3.5. Analysis of 2030 No-Build Peak Hour Traffic Conditions

The 2030 no-build 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.

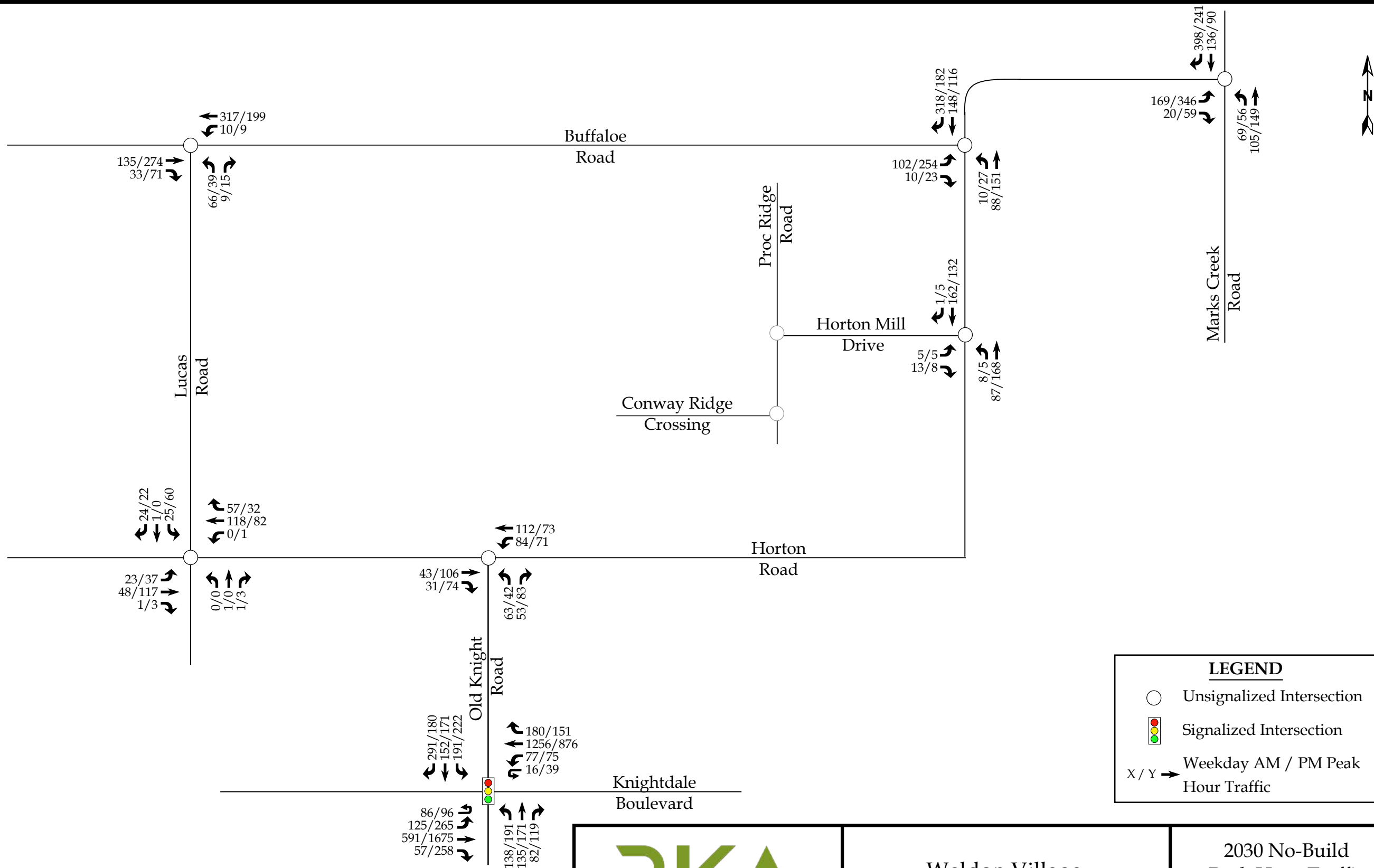
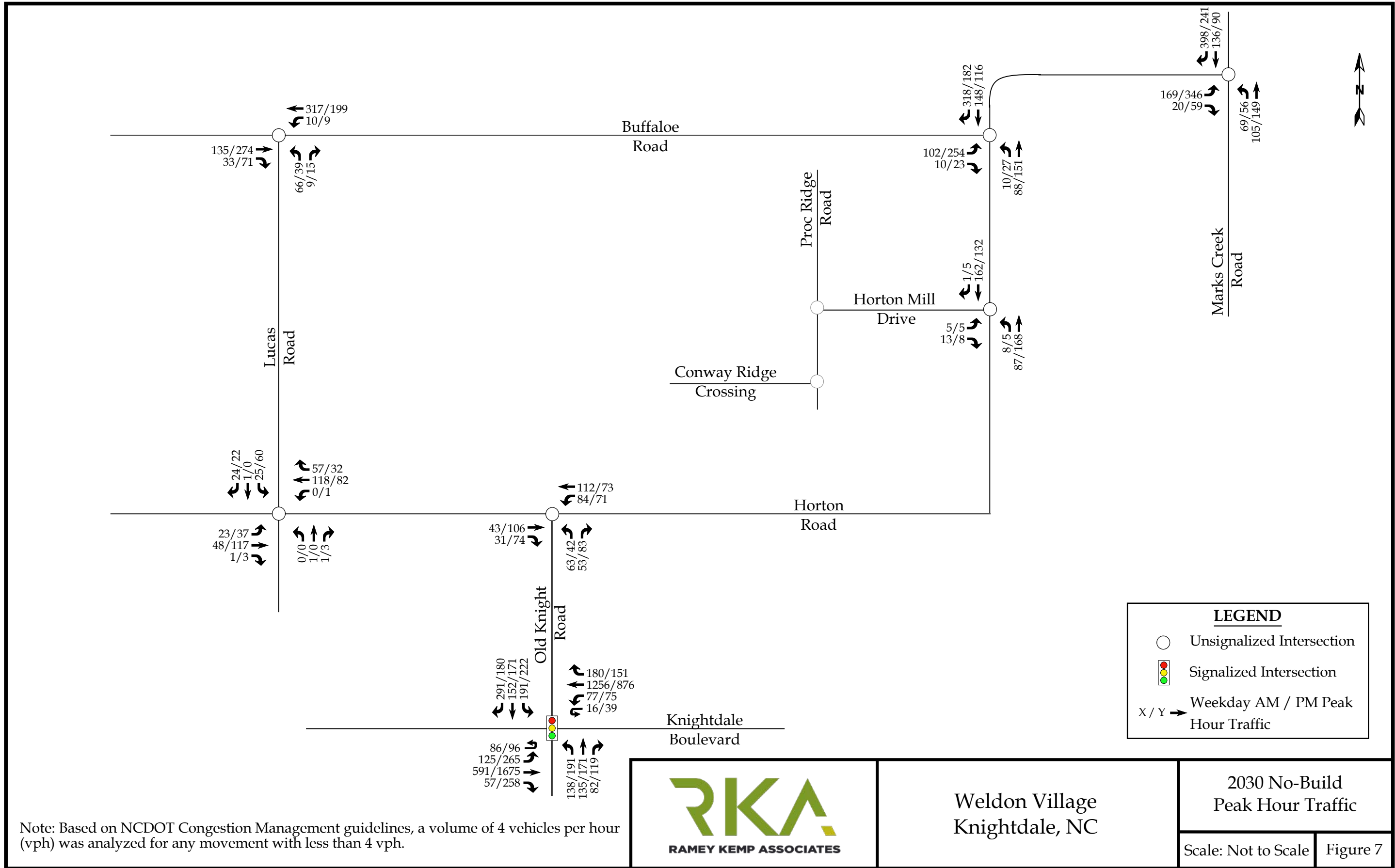




Weldon Village
Knightdale, NC

Peak Hour Adjacent
Development Trips

Scale: Not to Scale Figure 6



4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

The proposed development is assumed to consist of 124 single family homes, 32 townhomes, 8,000 s.f. general office, and 8,000 s.f. of strip retail plaza. 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*, 11th Edition. Table 3 provides a summary of the trip generation potential for the site.

Table 3: 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
Single Family Detached (210)	124 DU	1,230	24	67	77	45
Townhomes (215)	32 DU	193	3	8	8	7
General Office (710)	8 KSF	546	14	10	31	32
Strip Retail Plaza (822)	8 KSF	122	16	2	3	16
Total Trips		2,091	57	87	119	100
<i>Internal Capture (6% AM & 2% PM)*</i>			-3	-5	-1	-2
Total External Trips			54	82	118	98
<i>Pass-By Trips</i>			0	0	-3	-3
Total Primary Trips			54	82	115	95

*Utilizing methodology contained in the NCHRP Report 684.

It is estimated that the proposed development will generate approximately 2,091 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 144 trips (57 entering and 87 exiting) will occur during the weekday AM peak hour and 219 trips (119 entering and 100 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 NCHRP Report 684 methodology, a weekday AM peak hour internal capture of 6% and a weekday PM peak hour internal capture rate of 2% was applied to the total trips. The internal capture reductions are expected to account for approximately 8 (3 entering and 5 exiting) trips during the weekday AM peak hour and 3 (1 entering and 2 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 6 trips (3 entering and 3 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 total primary site trips are the calculated site trips after the reduction for internal capture and pass-by trips. Primary site trips are expected to generate approximately 136 trips (54 entering and 82 exiting) during the weekday AM peak hour and 210 trips (115 entering and 95 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 the residential site trips will be regionally distributed as follows:

- 20% to/from the north via Marks Creek Road
- 20% to/from the west via Buffalo Road
- 30% to/from the west via Horton Road

- 15% to/from the west via Knightdale Boulevard
- 15% to/from the east via Knightdale Boulevard

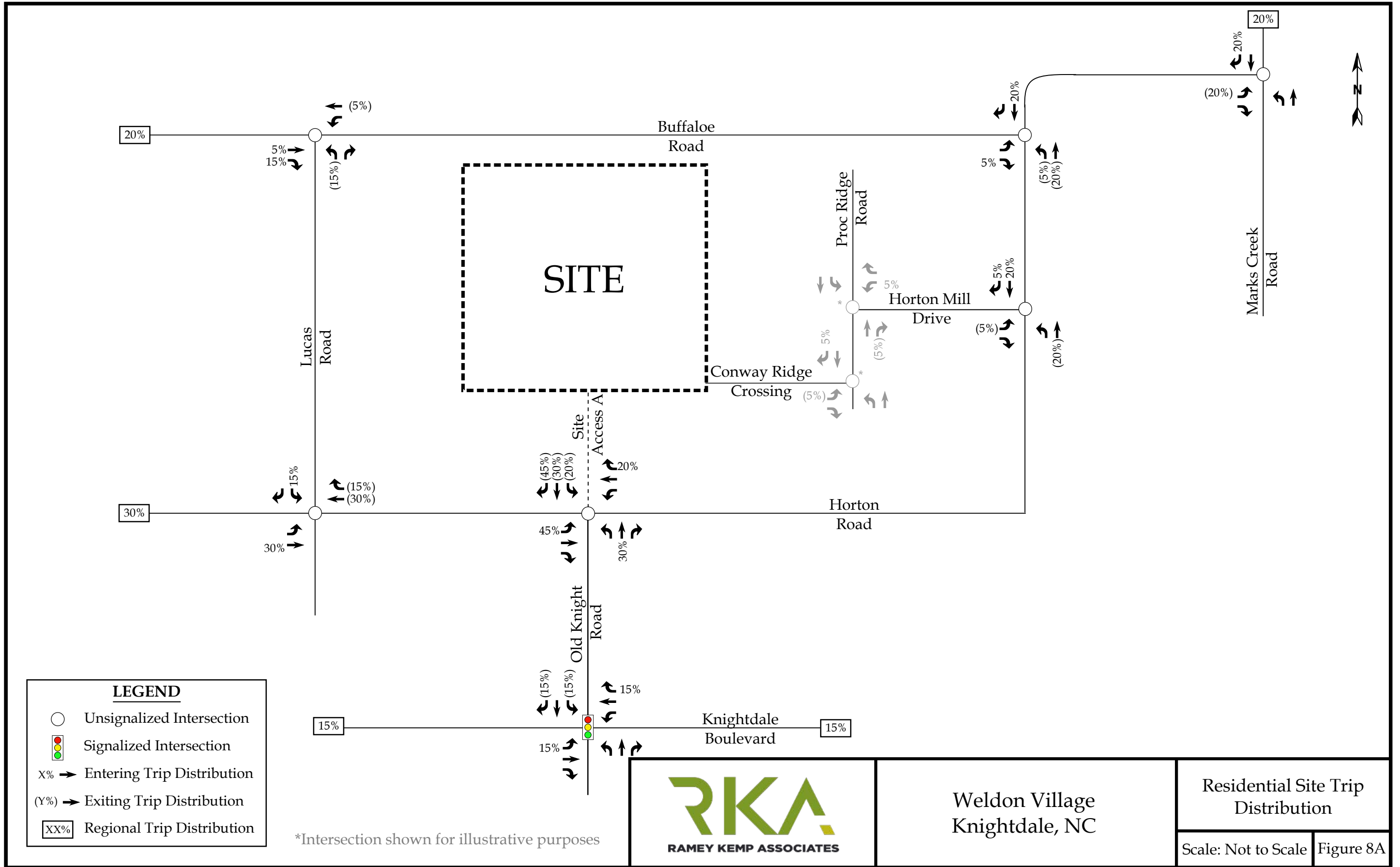
It is estimated that the office/retail site trips will be regionally distributed as follows:

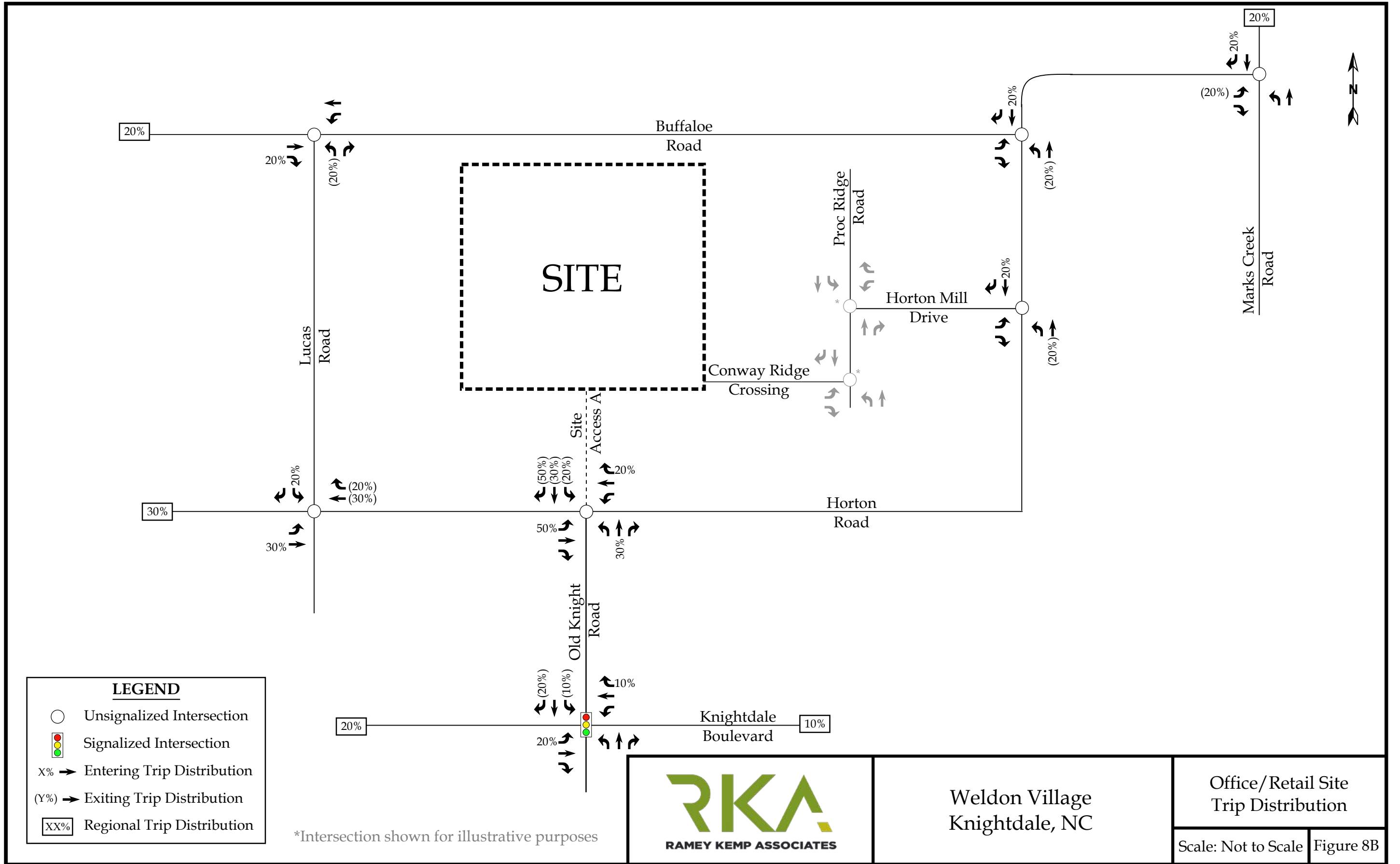
- 20% to/from the north via Marks Creek Road
- 20% to/from the west via Buffalo Road
- 30% to/from the west via Horton Road
- 20% to/from the west via Knightdale Boulevard
- 10% to/from the east via Knightdale Boulevard

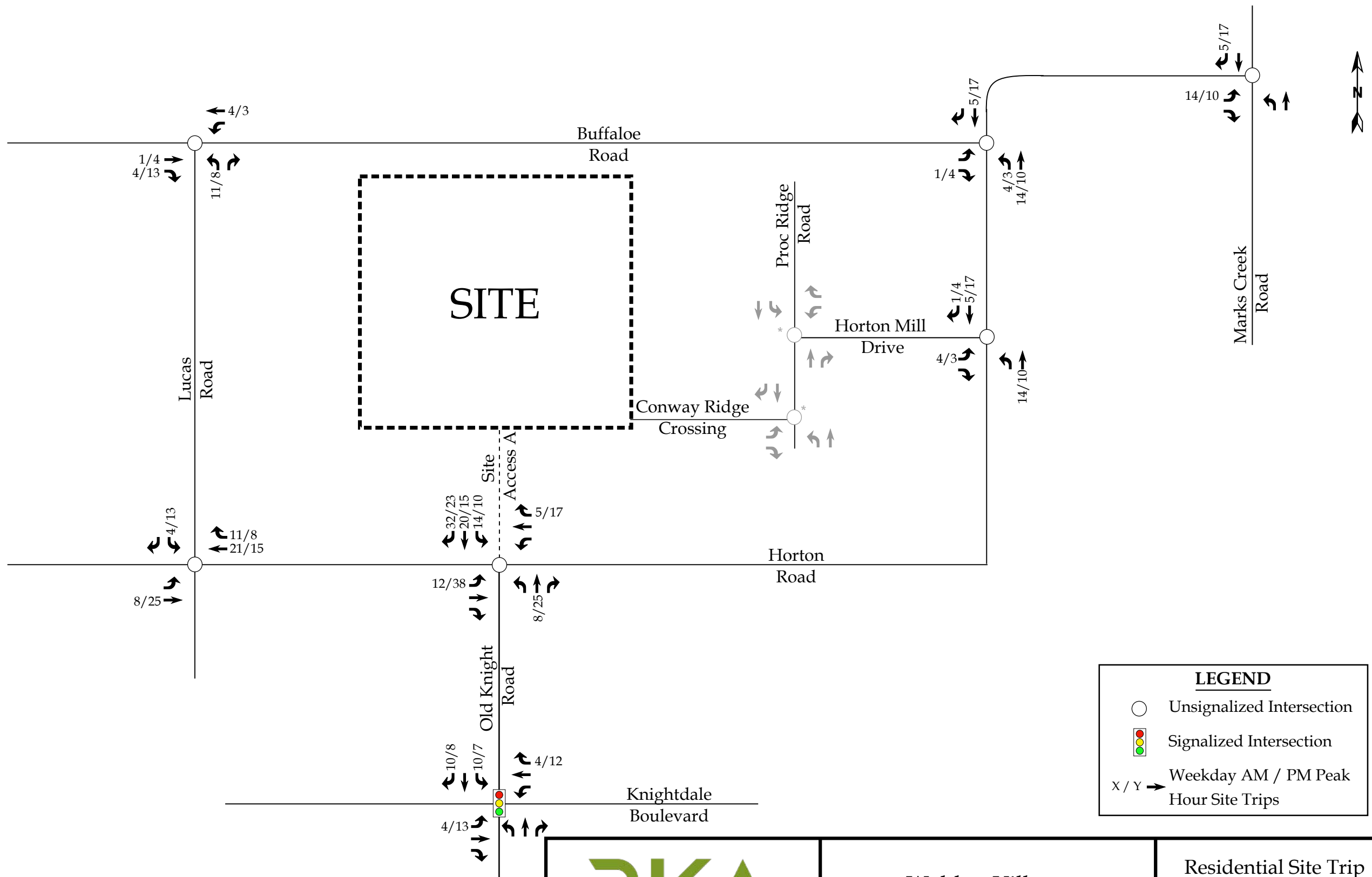
The residential site trip distribution is shown in Figure 8A, and the office/retail site trip distribution is shown in Figure 8B. Refer to Figure 9A for the residential site trip assignment, Figure 9B for office site trip assignment, and Figure 9C for the retail site trip assignment.

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.







LEGEND

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

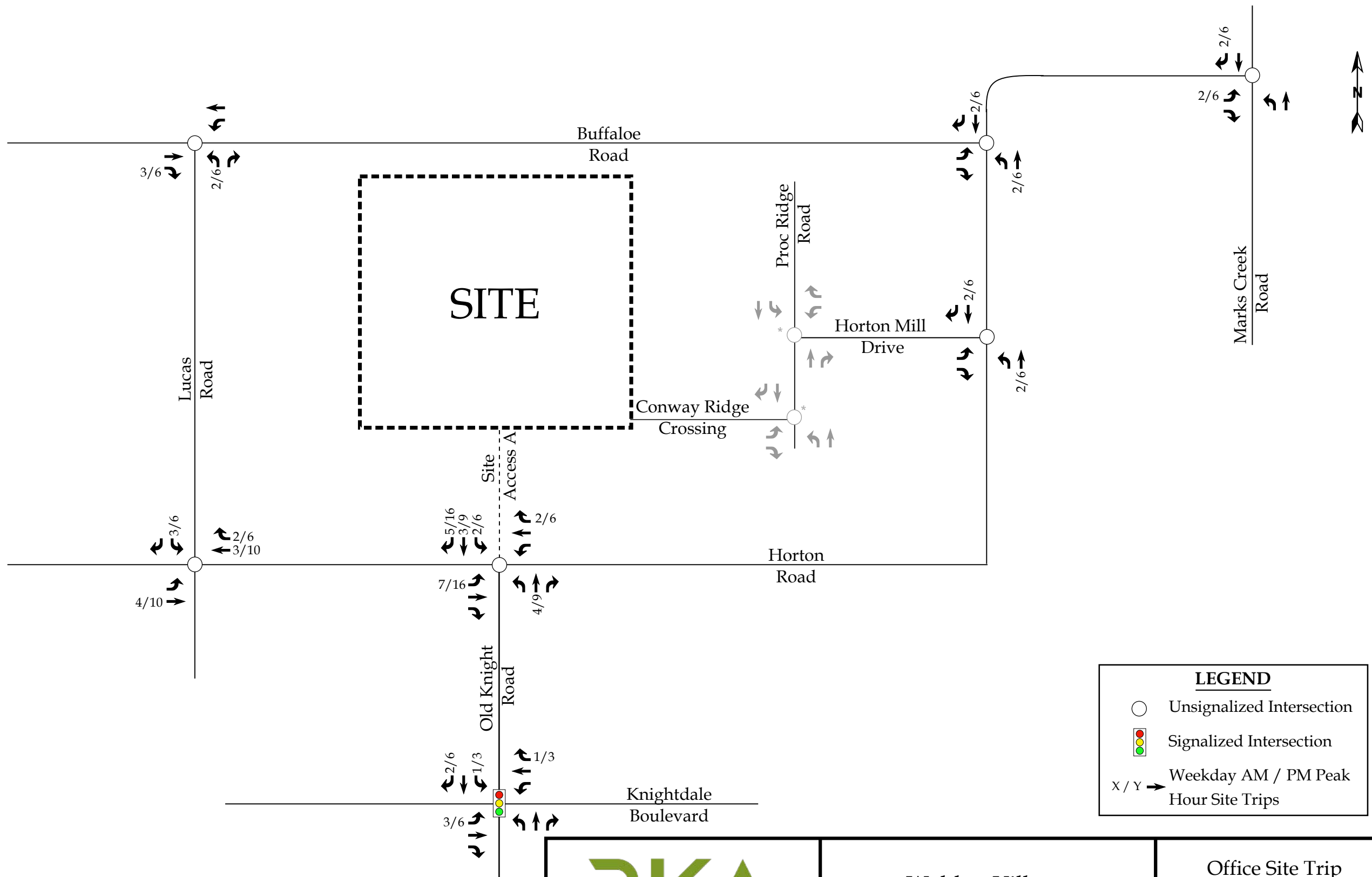
*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Residential Site Trip
Assignment

Scale: Not to Scale Figure 9A



LEGEND

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

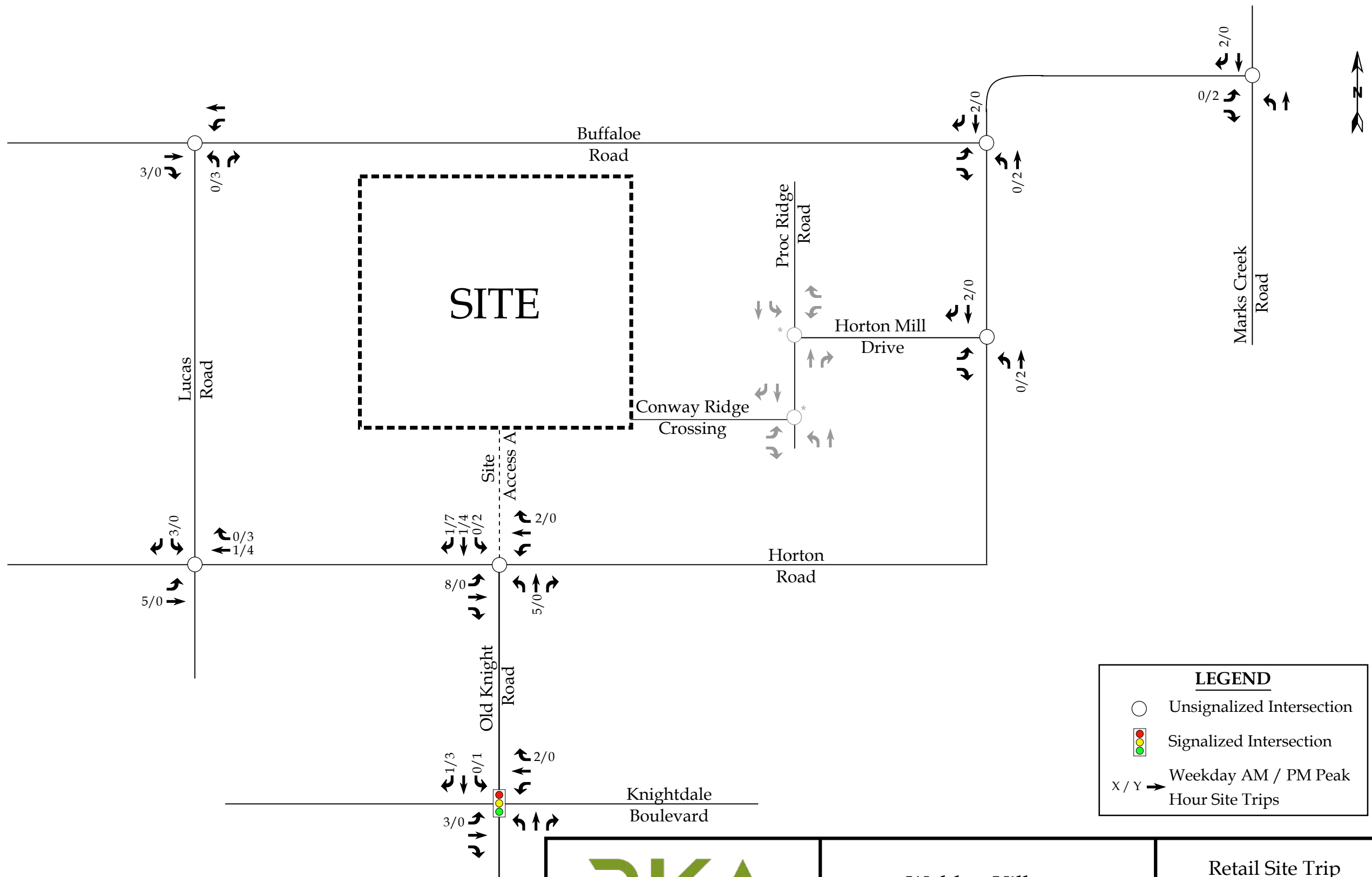
*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Office Site Trip
Assignment

Scale: Not to Scale | Figure 9B



LEGEND

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

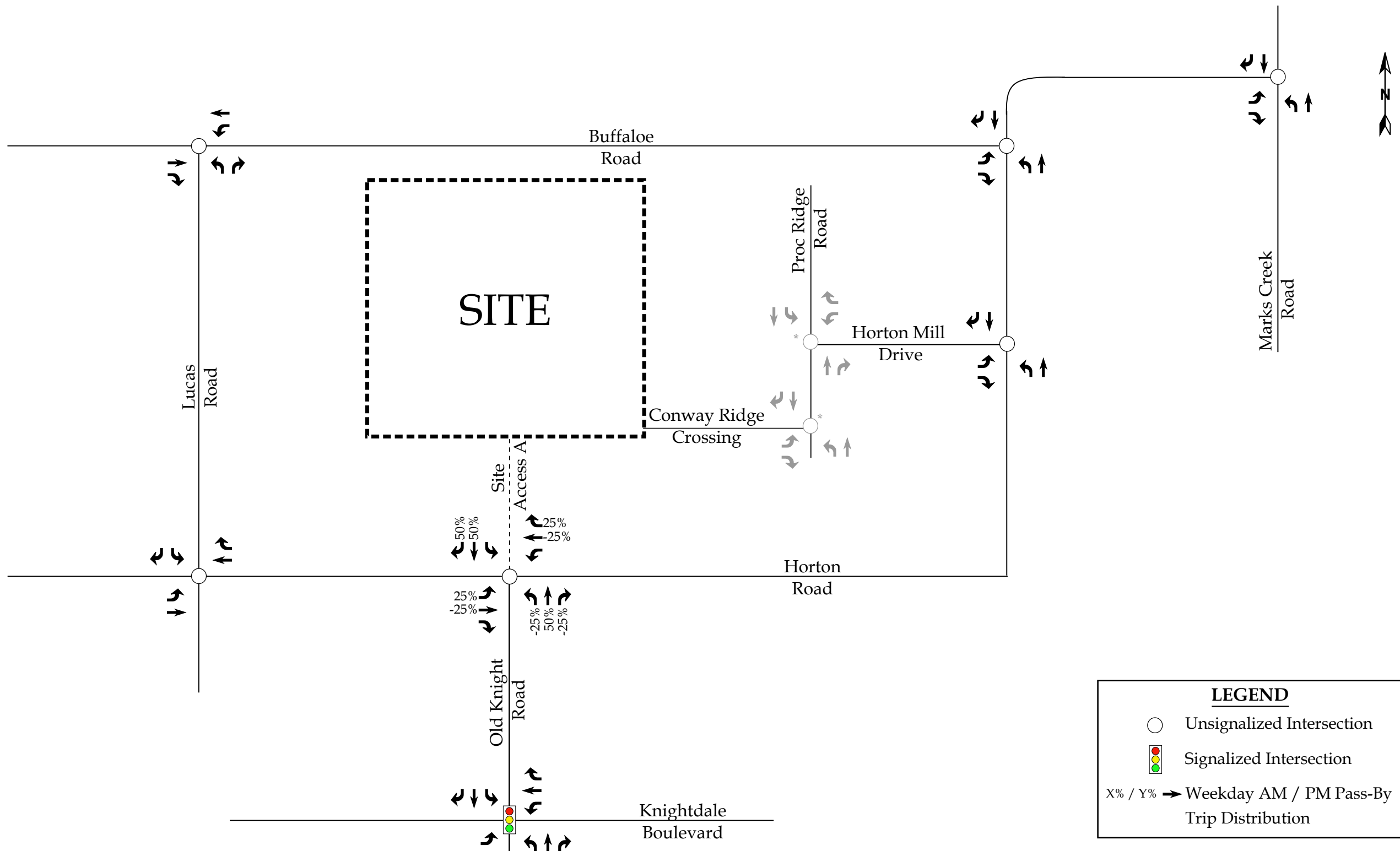
*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Retail Site Trip
Assignment

Scale: Not to Scale | Figure 9C



LEGEND

- Unsignalized Intersection
- 🚦 Signalized Intersection
- X% / Y% → Weekday AM / PM Pass-By Trip Distribution

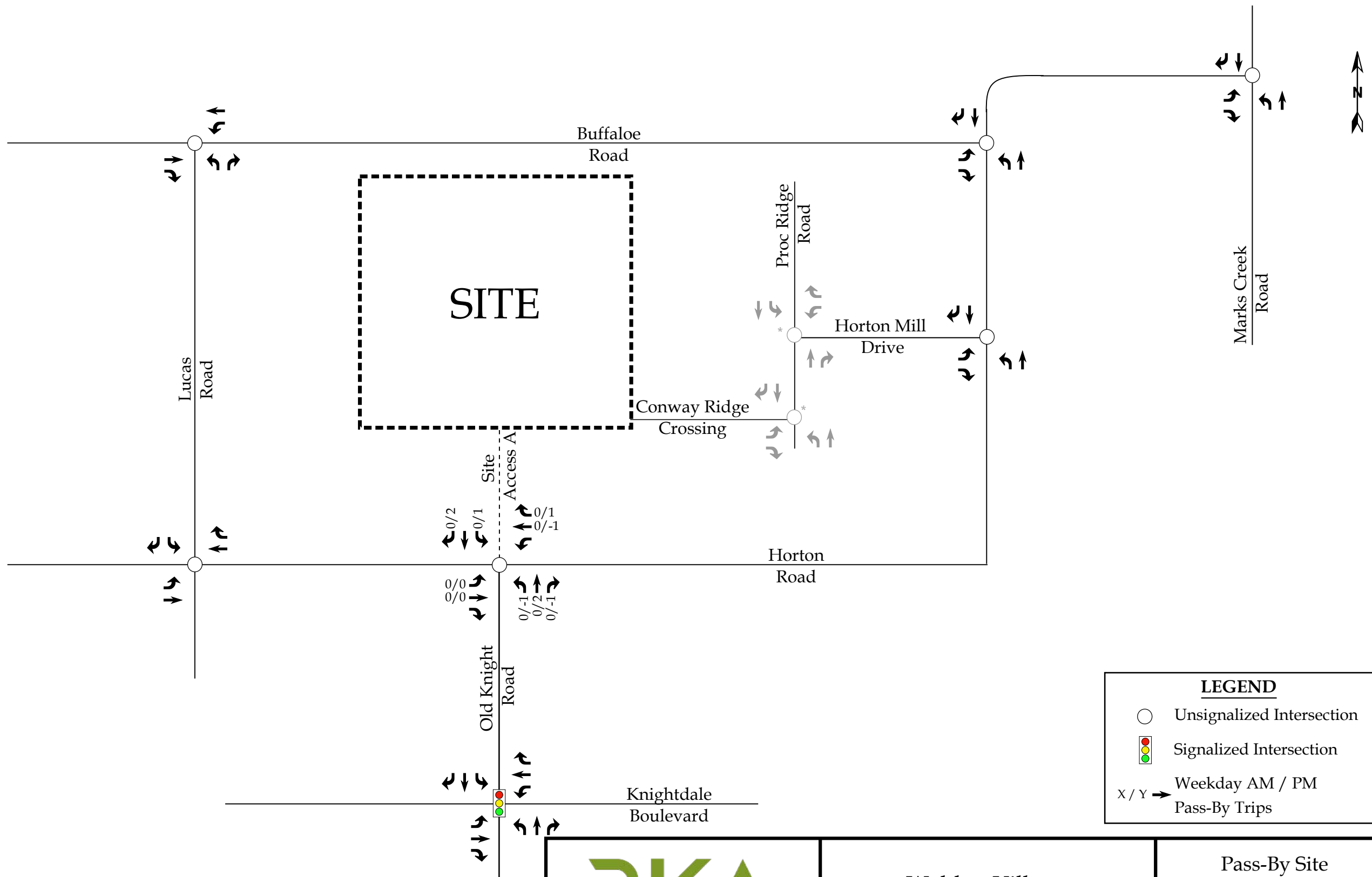
*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Pass-By Site
Trip Distribution

Scale: Not to Scale Figure 10



LEGEND

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

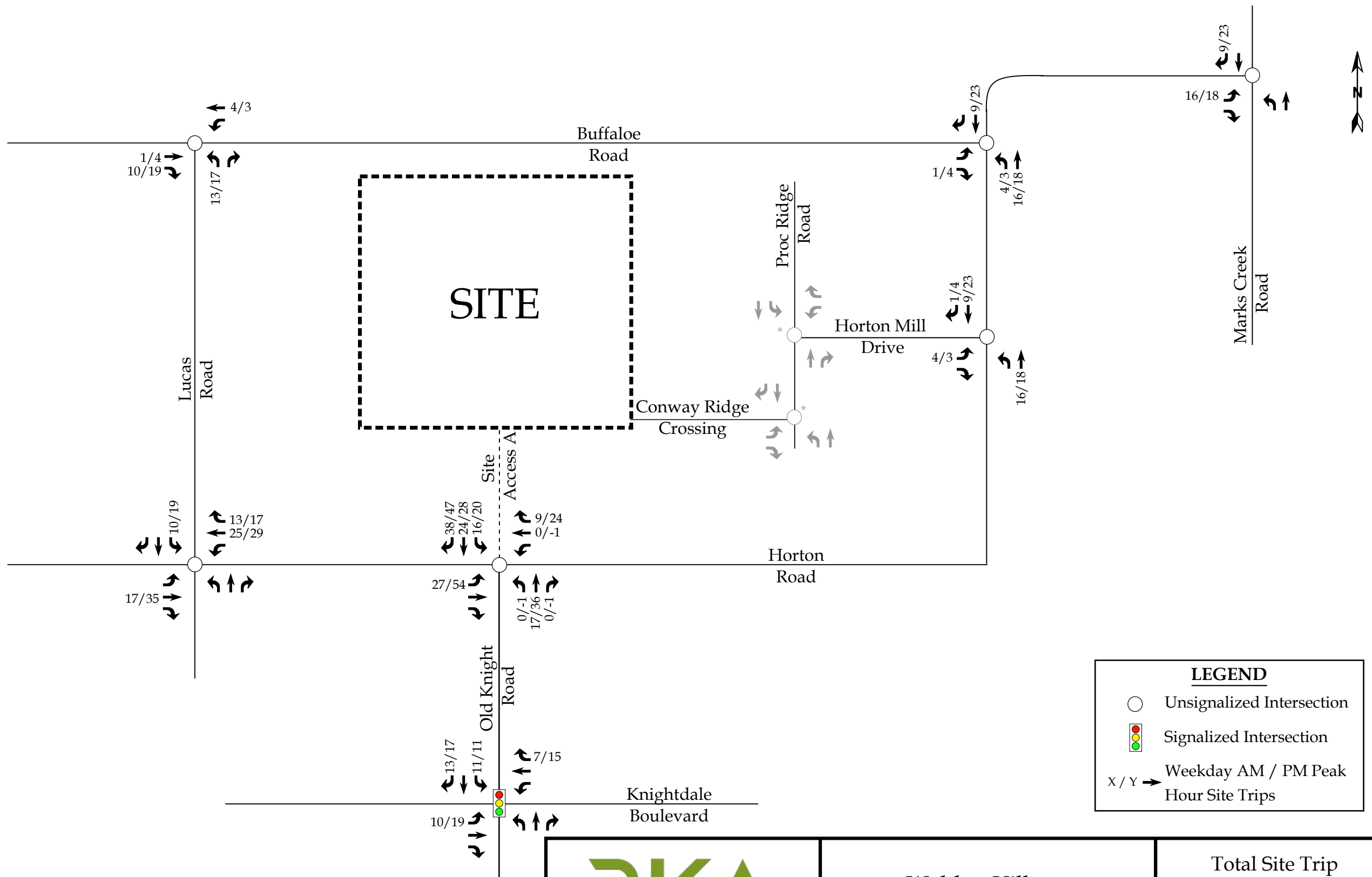
*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Pass-By Site
Trip Assignment

Scale: Not to Scale Figure 11



LEGEND

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

*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Total Site Trip
Assignment

Scale: Not to Scale Figure 12

5. 2030/2039 BUILD TRAFFIC CONDITIONS

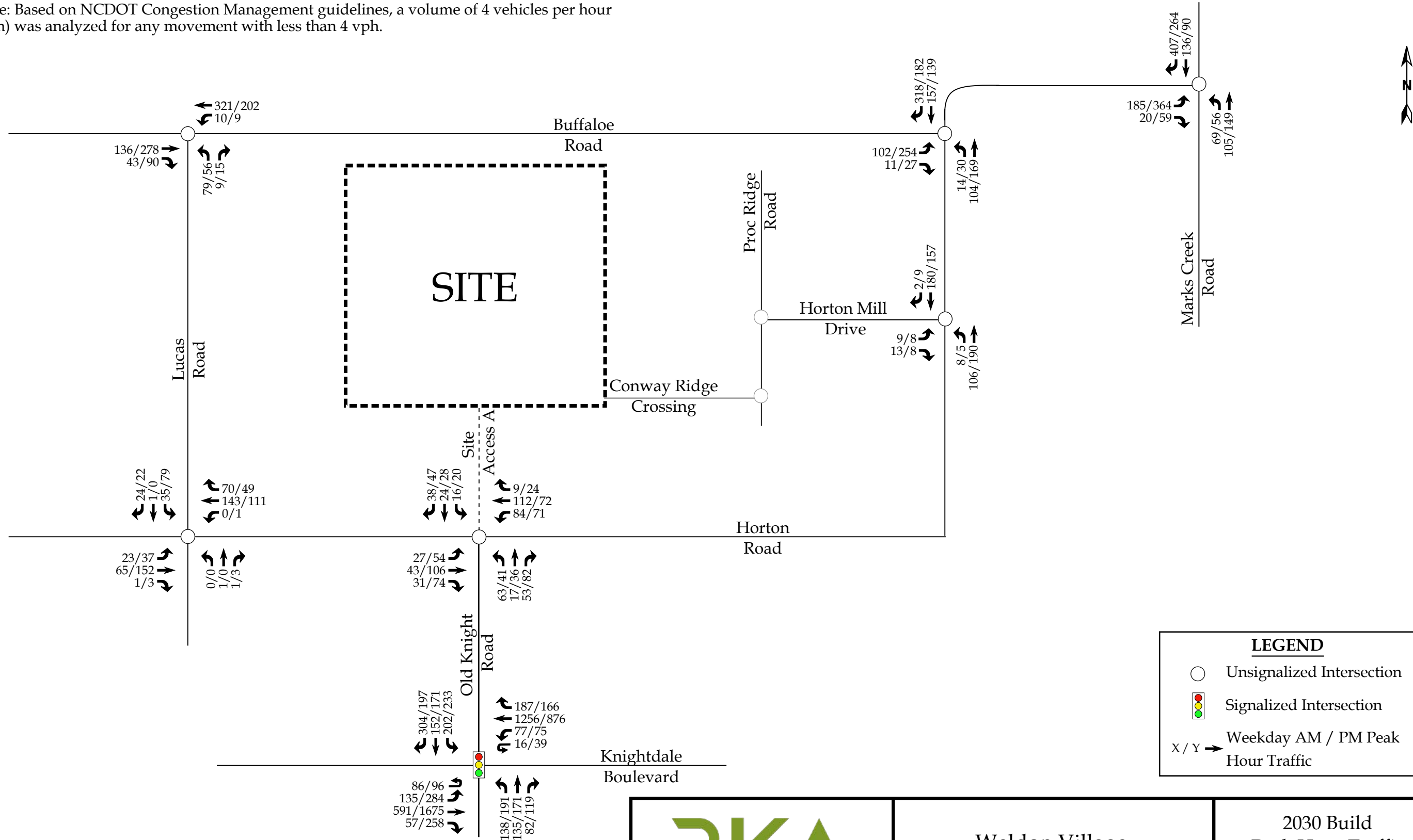
5.1. 2030/2039 Build Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the 2030 no-build traffic volumes to determine the 2030 build traffic volumes. The 2039 build traffic volumes were developed using the same methodology as the 2030 build traffic volumes; however, background volumes were grown to the year 2039 rather than 2030. Refer to Figure 13A for an illustration of the 2030 build peak hour traffic volumes with the proposed site fully developed and Figure 13B for an illustration of the 2039 build peak hour traffic volumes.

5.2. Analysis of 2030/2039 Build Peak Hour Traffic Conditions

Study intersections were analyzed with the 2030/2039 build traffic volumes using the same methodology previously discussed for existing and no-build 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.

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



*Intersection shown for illustrative purposes

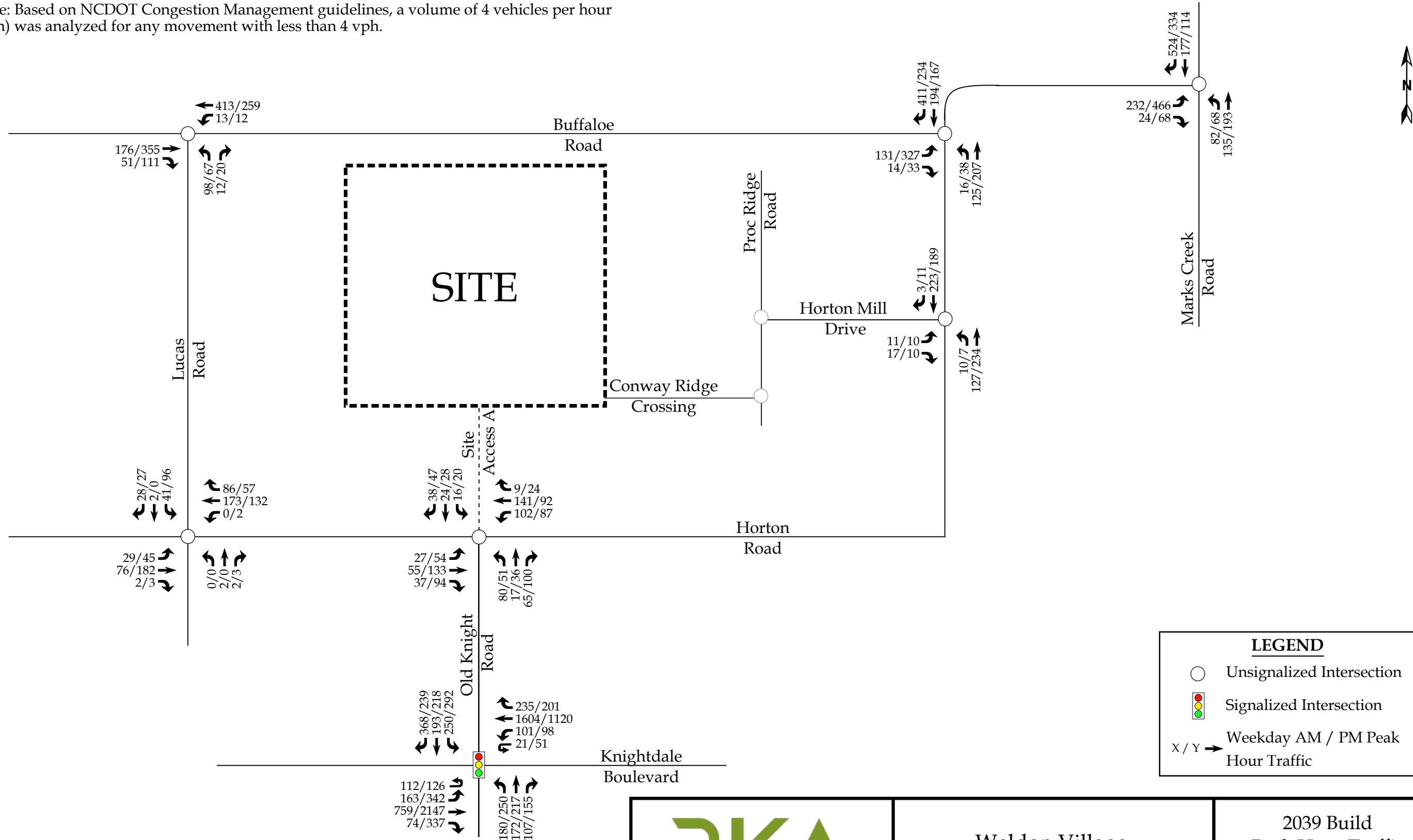


Weldon Village
Knightdale, NC

2030 Build
Peak Hour Traffic

Scale: Not to Scale | Figure 13A

Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.



*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

2039 Build
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* (HCM), 6th Edition 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 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 4 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 4: 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 Congestion Management Guidelines.

7. CAPACITY ANALYSIS

7.1. Buffalo Road [EB-WB] and Lucas Road [NB]

The existing unsignalized intersection of Buffalo Road and Lucas Road was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with lane configurations and traffic control shown in Table 5. Refer to Table 5 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

Table 5: Analysis Summary of Buffalo Road and Lucas Road

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)
2022 Existing	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ B ²	N/A
2030 No-Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ B ²	N/A
2030 Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ B ²	N/A	-- A ¹ B ²	N/A
2039 Build	EB WB NB	1 TH-RT 1 LT-TH 1 LT-RT	-- A ¹ C ²	N/A	-- A ¹ C ²	N/A

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Buffalo Road and Lucas Road is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B under all analysis scenarios during both weekday AM and PM peak hours. No significant queues are expected.

7.2. Horton Road [NB-SB] and Buffalo Road [EB]

The existing unsignalized intersection of Horton Road and Buffalo Road was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with existing lane configurations and traffic control. Refer to Table 6 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports.

Table 6: Analysis Summary of Horton Road and Buffalo Road

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)
2022 Existing	EB	1 LT- RT	B ²	N/A	B ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 No-Build	EB	1 LT- RT	B ²	N/A	C ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 Build	EB	1 LT- RT	B ²	N/A	C ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2039 Build	EB	1 LT- RT	C ²	N/A	F ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2039 Build - to Meet UDO	EB	1 LT, 1 RT	B ²	N/A	D ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH, 1 RT	--		--	

Improvements to lane configurations are shown in bold.

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Horton Road and Buffalo Road is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS C or better under all 2030 analysis scenarios during both weekday AM and PM peak hours.

Per the Town’s UDO requirements to show improvements necessary that would allow the intersection to operate at acceptable levels of service (D or better), an analysis scenario with

the improvements necessary to bring the intersection back to LOS D or better is shown under 2039 Build - to Meet UDO. Under this scenario the eastbound approach is expected to operate at LOS D or better during the AM and PM peak hours. To obtain this LOS, the intersection would require an additional right turn lane on the eastbound and southbound approaches.

Site traffic is expected to only account for approximately 4% of the total volume for the intersection during either the weekday AM or PM peak hour under 2039 build conditions. Additionally, under the 2039 build conditions, a majority of the impacts are caused by the background growth expected in the 10 years after the site its built. Due to the minimal impact by the proposed site, no improvements by the developer are recommended.

7.3. Marks Creek Road [NB-SB] and Horton Road [EB]

The existing unsignalized intersection of Marks Creek Road and Horton Road was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build 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 G for the Synchro capacity analysis reports.

Table 7: Analysis Summary of Marks Creek Road and Horton Road

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)
2022 Existing	EB	1 LT- RT	B ²	N/A	C ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 No-Build	EB	1 LT- RT	C ²	N/A	E ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 Build	EB	1 LT- RT	C ²	N/A	F ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 Build with Improvements	EB	1 LT- RT	C ²	N/A	D ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH, 1 RT	--		--	
2039 Build	EB	1 LT- RT	F ²	N/A	F ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2039 Build - to Meet UDO	EB	1 LT- RT	C	B (16)	B	B (14)
	NB	1 LT-TH	A		C	
	SB	1 TH, 1 RT	B		A	

Improvements to lane configurations are shown in bold.

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Marks Creek Road and Horton Road is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to degrade from LOS E under 2030 no-build PM conditions to LOS F under 2030 build PM conditions. Queues are also expected to increase by approximately 100 feet when comparing these conditions. It is not uncommon for a minor-street approach at an

unsignalized intersection to experience high delays. In order to meet the Town UDO requirements under 2030 build conditions, a southbound right turn lane was considered. The additional turn lane is expected to reduce the eastbound LOS F to LOS D. A southbound right turn lane is recommended.

Per the Town's UDO requirements to show improvements necessary that would allow the intersection to operate at acceptable levels of service (D or better), an analysis scenario with the improvements necessary to bring the intersection back to LOS D or better is shown under 2039 Build - to Meet UDO. Under this scenario the overall intersection is expected to operate at LOS B during both the weekday AM and PM peak hours. All approaches are expected to operate at LOS C or better. To obtain this LOS, a traffic signal is proposed, as well as the additional southbound right proposed under 2030 build with improvements conditions.

Under 2039 build conditions, site traffic is expected to only account for approximately 3% of the total volume for the intersection during either the weekday AM or PM peak hour. Additionally, under the 2039 build conditions, a majority of the impacts are caused by the background growth expected in the 10 years after the site its built. Due to the minimal impact by the proposed site, no improvements by the developer are recommended under 2039 build conditions.

7.4. Horton Road [NB-SB] and Horton Mill Drive [EB]

The existing unsignalized intersection of Horton Road and Horton Mill Drive was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with existing lane configurations and traffic control. Refer to Table 8 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports.

Table 8: Analysis Summary of Horton Road and Horton Mill 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)
2022 Existing	EB	1 LT- RT	A ²	N/A	A ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 No-Build	EB	1 LT- RT	A ²	N/A	A ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2030 Build	EB	1 LT- RT	B ²	N/A	B ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	
2039 Build	EB	1 LT- RT	B ²	N/A	B ²	N/A
	NB	1 LT-TH	A ¹		A ¹	
	SB	1 TH-RT	--		--	

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement and minor-street approach is expected to operate at LOS B or better under all conditions. No significant queues are expected.

7.5. Horton Road [EB-WB] and Mama’s Way [NB] / Lucas Road [SB]

The existing unsignalized intersection of Horton Road and Lucas Road / Mama’s Way was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with existing lane configurations and traffic control. Refer to Table 9 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports.

Table 9: Analysis Summary of Horton Road and Mama’s Way / Lucas Road

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)
2022 Existing	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹			
	NB	1 LT-TH-RT	A ²			
	SB	1 LT-TH-RT	A ²			
2030 No-Build	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹			
	NB	1 LT-TH-RT	B ²			
	SB	1 LT-TH-RT	B ²			
2030 Build	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹			
	NB	1 LT-TH-RT	B ²			
	SB	1 LT-TH-RT	B ²			
2039 Build	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹			
	NB	1 LT-TH-RT	B ²			
	SB	1 LT-TH-RT	B ²			

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movements of Horton Road and Mama’s Way / Lucas Road is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B or better under 2030 no-build and 2030 build conditions during both weekday AM and PM peak hours. No significant queues are expected.

7.6. Horton Road [EB-WB] and Old Knight Road [NB] / Site Access A [SB]

The existing unsignalized intersection of Horton Road and Old Knight Road / Site Access A was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with existing lane configurations and traffic control. Refer to Table 10 for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports.

Table 10: Analysis Summary of Horton Road and Old Knight Road / Site Access A

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)
2022 Existing	EB	1 TH-RT	--	N/A	--	N/A
	WB	1 LT-TH	A ¹		A ¹	
	NB	1 LT-RT	A ²		A ²	
2030 No-Build	EB	1 TH-RT	--	N/A	--	N/A
	WB	1 LT-TH	A ¹		A ¹	
	NB	1 LT-RT	B ²		B ²	
2030 Build	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹		A ¹	
	NB	1 LT-TH-RT	B ²		C ²	
	SB	1 LT-TH-RT	B ²		B ²	
2039 Build	EB	1 LT-TH-RT	A ¹	N/A	A ¹	N/A
	WB	1 LT-TH-RT	A ¹		A ¹	
	NB	1 LT-TH-RT	C ²		C ²	
	SB	1 LT-TH-RT	B ²		C ²	

Improvements to lane configurations are shown in bold.

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

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Horton Road and Old Knight Road / Site Access A is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS C or better under all future conditions. No significant queues are expected.

7.7. US 64 (Knightdale Boulevard) and 1st Avenue / Old Knight Road

The proposed signalized intersection of US 64 (Knightdale Boulevard) and 1st Avenue / Old Knight Road was analyzed under 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions with lane configurations and traffic control shown in Table 11. Refer to Table 11 for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports.

Table 11: Analysis Summary of US 64 (Knightdale Boulevard) and 1st Avenue / Old Knight Road

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)
2022 Existing	EB	1 LT, 2 TH, 1 RT	C	C (31)	C	D (36)
	WB	1 LT, 2 TH, 1 RT	C			
	NB	1 LT, 1 TH, 1 RT	D			
	SB	1 LT, 1 TH, 1 RT	E			
2030 No-Build	EB	1 LT, 2 TH, 1 RT	C	D (39)	E	E (56)
	WB	1 LT, 2 TH, 1 RT	D			
	NB	1 LT, 1 TH, 1 RT	D			
	SB	1 LT, 1 TH, 1 RT	D			
2030 Build	EB	1 LT, 2 TH, 1 RT	C	D (41)	E	E (60)
	WB	1 LT, 2 TH, 1 RT	D			
	NB	1 LT, 1 TH, 1 RT	D			
	SB	1 LT, 1 TH, 1 RT	D			
2030 Build with Improvements	EB	1 LT, 2 TH, 1 RT	C	D (41)	E	D (55)
	WB	1 LT, 2 TH, 1 RT	D			
	NB	1 LT, 1 TH, 1 RT	D			
	SB	1 LT, 1 TH, 1 RT	D			
2039 Build	EB	1 LT, 2 TH, 1 RT	D	F (96)	F	F (158)
	WB	1 LT, 2 TH, 1 RT	F			
	NB	1 LT, 1 TH, 1 RT	D			
	SB	1 LT, 1 TH, 1 RT	E			

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates that each approach is expected to operate at LOS D or E under all future PM conditions. During the AM peak hour, all approaches are expected to operate at LOS C or LSO D. No significant increases in delay or queues are expected when comparing the 2030

no-build and 2030 build conditions. In order to meet the Town UDO, signal timings were modified and right turn on reds were allowed.

Under 2037 build conditions, the intersection is expected to continue to operate at an overall LOS F during the weekday AM and PM peak hours. The heavy overall delays under 2037 build conditions are anticipated to be primarily due to the background growth expected in the next 17 years and is not anticipated to be due to the traffic from the proposed development. Based on SimTraffic queuing results, heavy queuing is anticipated on Knightdale Boulevard during the weekday peak hour. Corridor level improvements would be required in order to meet the Town UDO under these conditions.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Weldon Village development to be located north of Horton Road and to the east of Lucas Road in Knightdale, North Carolina. The proposed development is expected to be a mixed-use development and be built out in 2029. Site access is proposed via one full movement driveway that will form the fourth leg at the intersection of Horton Road and Old Knight Road and via connection to the existing Conway Ridge Crossing.

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

- 2022 Existing Traffic Conditions
- 2029+1 No-Build Traffic Conditions
- 2029+1 Build Traffic Conditions
- 2029+10 Build Traffic Conditions

Trip Generation

It is estimated that the proposed development will generate approximately 144 primary trips (57 entering and 87 exiting) during the weekday AM peak hour and 219 primary trips (119 entering and 100 exiting) during the weekday 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.

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:

Marks Creek Road and Horton Road

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Marks Creek Road and Horton Road is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to degrade from LOS E under 2030 no-build PM conditions to LOS F under 2030 build PM conditions. Queues are also expected to increase by approximately 100 feet when comparing these conditions. It is not uncommon for a minor-street approach at an unsignalized intersection to experience high delays. In order to meet the Town UDO requirements under 2030 build conditions, a southbound right turn lane was considered. The additional turn lane is expected to reduce the eastbound LOS F to LOS D. A southbound right turn lane is recommended. Per the Town's UDO requirements to show improvements necessary that would allow the intersection to operate at acceptable levels of service (D or better), an analysis scenario with the improvements necessary to bring the intersection back to LOS D or better is shown under 2039 Build - to Meet UDO. Under this scenario the overall intersection is expected to operate at LOS B during both the weekday AM and PM peak hours. All approaches are expected to operate at LOS C or better. To obtain this LOS, a traffic signal is proposed, as well as the additional southbound right proposed under 2030 build with improvements conditions. Under 2039 build conditions, site traffic is expected to only account for approximately 3% of the total volume for the intersection during either the weekday AM or PM peak hour. Additionally, under the 2039 build conditions, a majority of the impacts are caused by the background growth expected in the 10 years after the site its built. Due to the minimal impact by the proposed site, no improvements by the developer are recommended under 2039 build conditions.

Horton Road and Old Knight Road / Site Access A

Capacity analysis of 2022 existing, 2030 no-build, 2030 build, and 2039 build traffic conditions indicates the major street left-turn movement of Horton Road and Old Knight Road / Site Access A is expected to operate at LOS A during both weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS C or better under all future conditions. No significant queues are expected.

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 for the proposed development.

Improvements to Meet Town's UDO

Marks Creek Road and Horton Road

- Monitor intersection for signalization and install traffic signal when warranted.

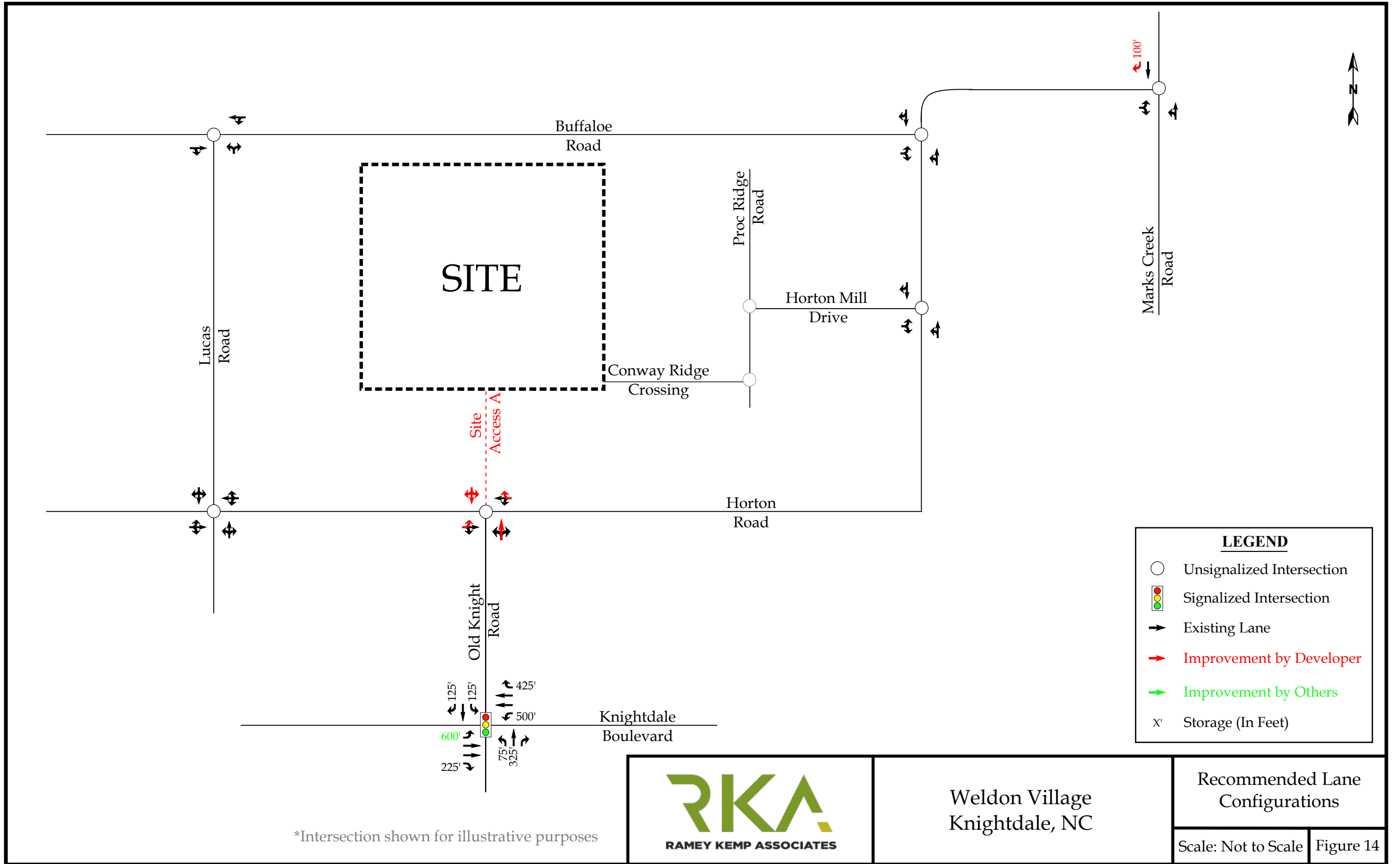
Recommended Improvements by Developer

Marks Creek Road and Horton Road

- Construct southbound right turn lane with 100 feet of storage and appropriate decel and taper.

Horton Road and Old Knight Road / Site Access A

- Construct southbound approach as one ingress lane and one egress lane.
- Provide stop-control for southbound approach.



*Intersection shown for illustrative purposes



Weldon Village
Knightdale, NC

Recommended Lane
Configurations

Scale: Not to Scale | Figure 14

