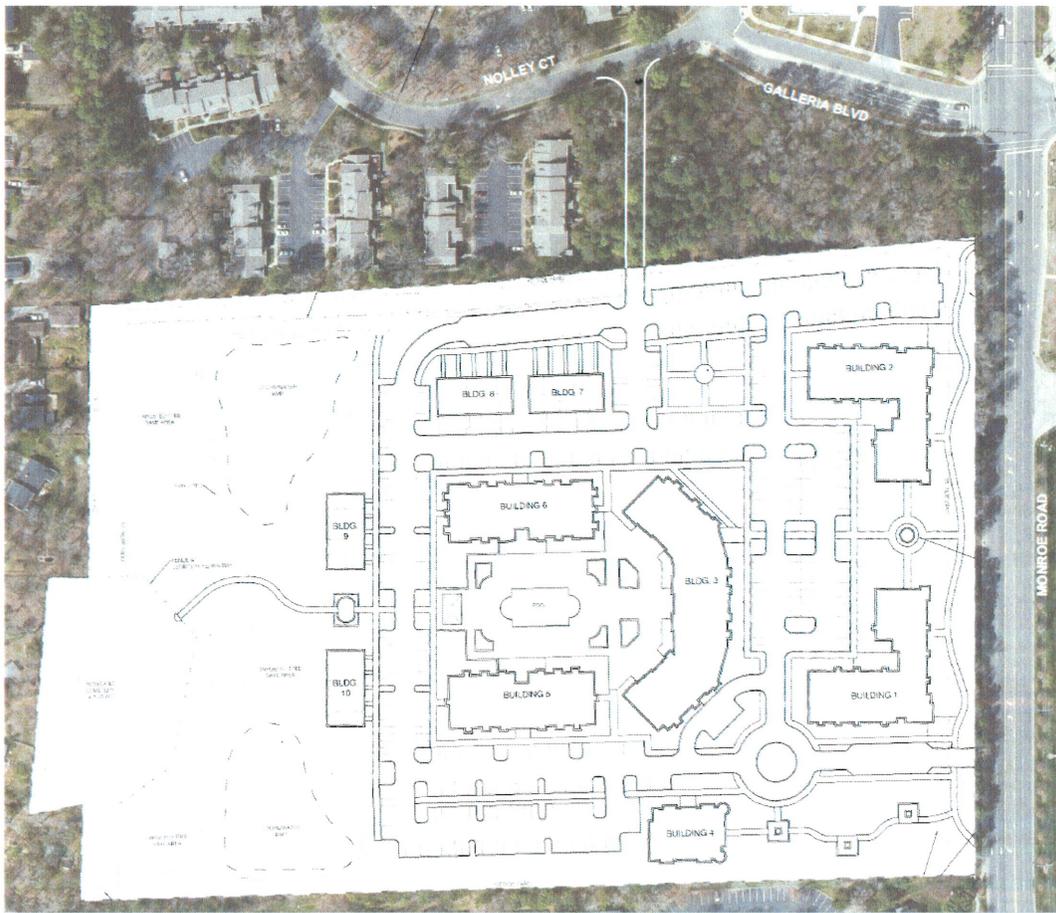


TRAFFIC IMPACT ANALYSIS

RENFROW SITE

Monroe Road (SR 1009) Between Galleria Boulevard & Gander Cove Lane
Matthews, North Carolina

Zoning Application # 2016-652



for

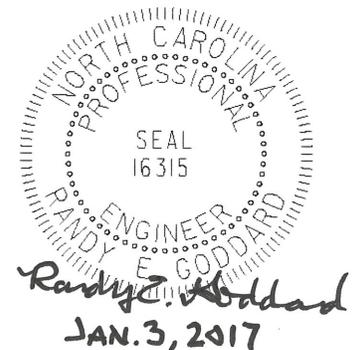
Taft Development Group

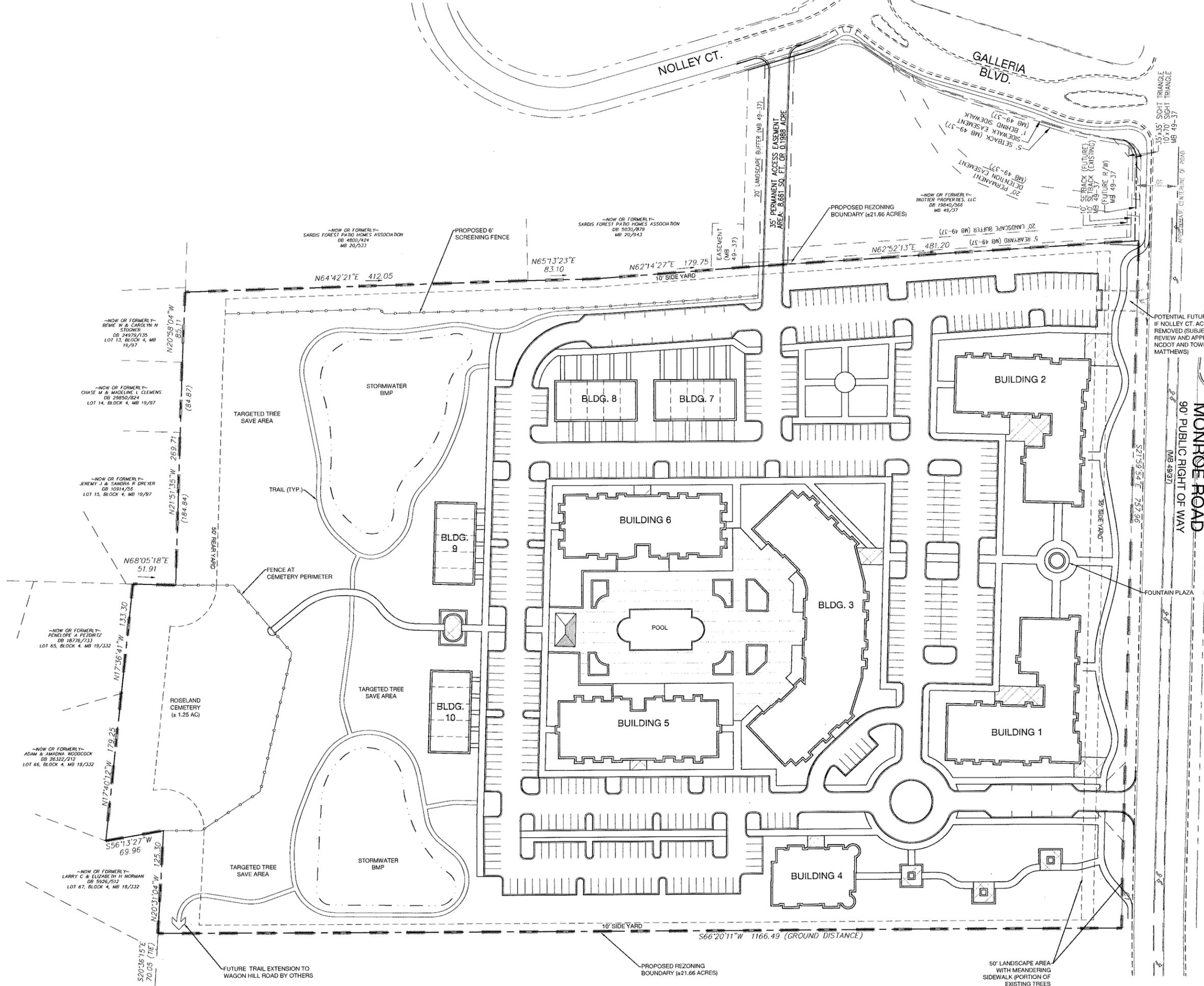
January 2017

652-001 (C-2165)

2459 Wilkinson Boulevard, Suite 200
Charlotte, NC 28208

o 704.343.0608
w www.drgrp.com





NOLLEY CT.

GALLERIA BLVD.

MONROE ROAD
90' PUBLIC RIGHT OF WAY
(MB 49/37)

POTENTIAL FUTURE ACCESS
IF NOLLEY CT. ACCESS IS
REMOVED (SUBJECT TO
REVIEW AND APPROVAL BY
NCDOT AND TOWN OF
MATTHEWS)

FOUNTAIN PLAZA

~NOW OR FORMERLY~
SARDIS FOREST PATIO HOMES ASSOCIATION
DB 4800/424
MB 20/333

~NOW OR FORMERLY~
SARDIS FOREST PATIO HOMES ASSOCIATION
DB 5030/879
MB 20/443

~NOW OR FORMERLY~
TROTTER PROPERTIES, LLC
DB 19840/566
MB 49/37

~NOW OR FORMERLY~
BENNY W & CAROLYN M
STOONER
DB 24979/135
LOT 13, BLOCK 4, MB 19/97

~NOW OR FORMERLY~
CHASE M & MADELINE L CLEMENS
DB 29850/824
LOT 14, BLOCK 4, MB 19/97

~NOW OR FORMERLY~
JEREMY J & SANDRA R DREYER
DB 10914/56
LOT 15, BLOCK 4, MB 19/97

~NOW OR FORMERLY~
FENELORE A FEJEWITZ
DB 18776/733
LOT 65, BLOCK 4, MB 19/332

~NOW OR FORMERLY~
ADAM & AMADNA WOODCOCK
DB 28322/212
LOT 66, BLOCK 4, MB 19/332

~NOW OR FORMERLY~
LARRY C & ELIZABETH H NORMAN
DB 5262/512
LOT 67, BLOCK 4, MB 19/332

S20°36'15"E
70.05 (TIE)

FUTURE TRAIL EXTENSION TO
WAGON HILL ROAD BY OTHERS

PROPOSED REZONING
BOUNDARY (#21.66 ACRES)

50' LANDSCAPE AREA
WITH MEANDERING
SIDEWALK (PORTION OF
EXISTING TREES)

S66°20'11"W 1166.49 (GROUND DISTANCE)

N64°42'21"E 412.05

N65°13'23"E 83.10

N62°14'27"E 179.75

N62°52'13"E 481.20

S27°59'54"E 757.96

N20°58'04"W 35.17

N21°51'35"W 269.71

N68°05'18"E 51.91

N17°36'41"W 133.30

N17°40'12"W 179.25

S56°13'27"W 69.96

N20°31'04"W 125.30

20' LANDSCAPE BUFFER (MB 49-37)

35' PERMANENT ACCESS EASEMENT
AREA: 6.661 SQ. FT. OR 0.1988 ACRE

EASEMENT
(MB 49-37)

PROPOSED REZONING
BOUNDARY (#21.66 ACRES)

5' SETBACK (MB 49-37)
1' BEHIND SIDEWALK
SIDEWALK EASEMENT
(MB 49-37)
20' PERMANENT
DETENTION EASEMENT
(MB 49-37)

10' SETBACK (FUTURE)
5' SETBACK (EXISTING)
(FUTURE R/W)
(MB 49-37)

35'x35' SIGHT TRIANGLE
10'x70' SIGHT TRIANGLE
MB 49-37

APPROXIMATE CENTERLINE OF ROAD

36' SIDE YARD

10' SIDE YARD

50' REAR YARD

FENCE AT
CEMETERY PERIMETER

50' REAR YARD

TARGETED TREE
SAVE AREA

TRAIL (TYP.)

TARGETED TREE
SAVE AREA

TARGETED TREE
SAVE AREA

STORMWATER
BMP

STORMWATER
BMP

BLDG. 8

BLDG. 7

BUILDING 6

BLDG. 3

BUILDING 5

BUILDING 4

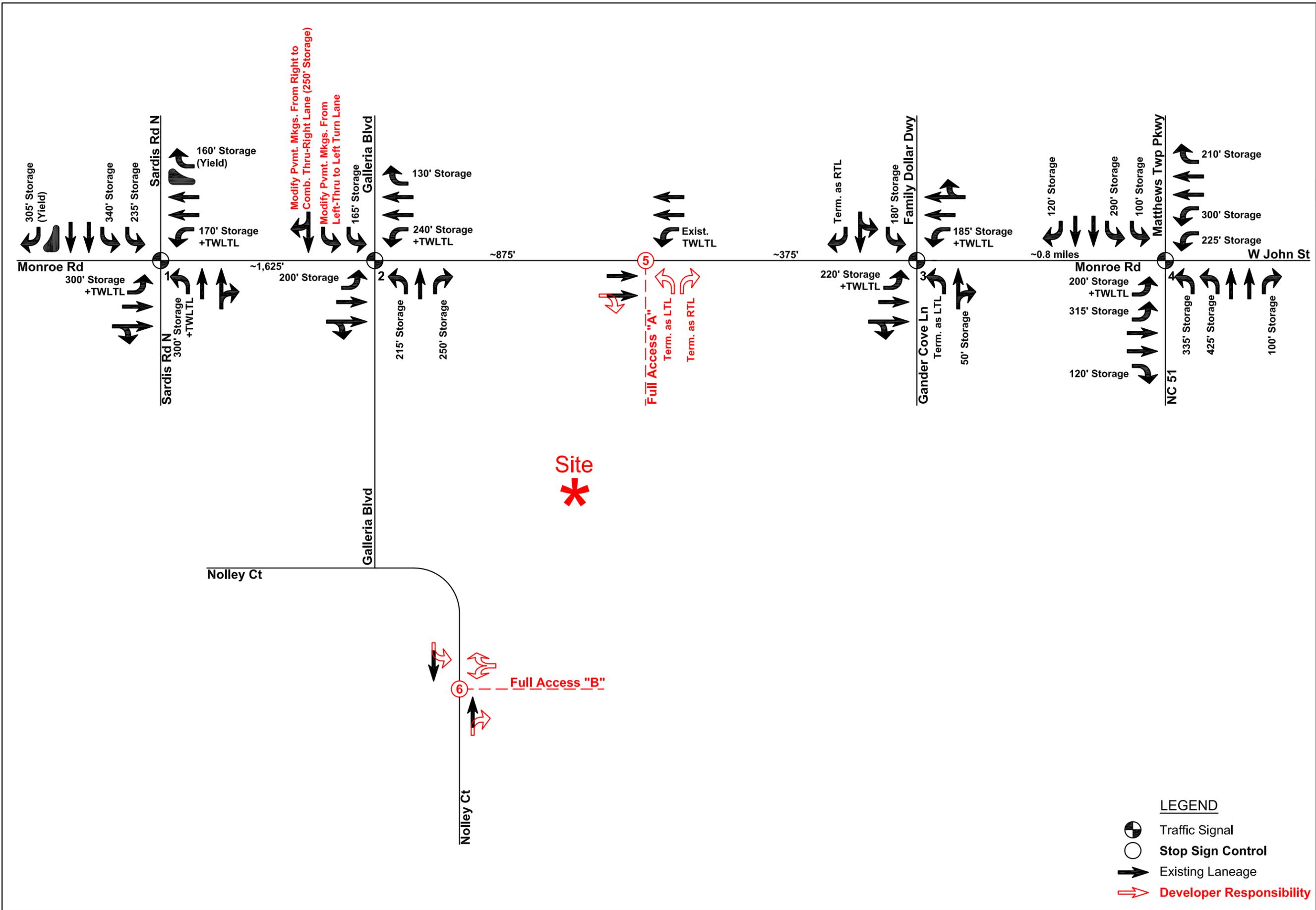
BUILDING 2

BUILDING 1

BLDG. 9

BLDG. 10

FOUNTAIN PLAZA



RENFROW SITE TIA
MATTHEWS, NC

TAFT DEVELOPMENT GROUP
2217 STANTONSBURG ROAD
GREENVILLE, NC 27834
252-916-2691

**SUGGESTED
LANEAGE**



PROJECT #: 652-001
DRAWN BY: MWW
CHECKED BY: REG

SEPTEMBER 2016

REVISIONS:
1, 01/04/17 Imps, per NCDOT comments on DRAFT TIA

Randy Goddard

From: Randy Goddard
Sent: Wednesday, October 19, 2016 11:20 AM
To: 'Epperson, Sean M'
Cc: Taylor, Wendy A; CJ O'Neill; John Zotter (john@drgrp.com); Michael Wickline
Subject: RE: Renfrow Site TIA

Sean,

Your request for signal and southbound approach modifications are reasonable and I understand the access revision and will pass this along to the developer.

Thank you,

RANDY E. GODDARD > PE managing principal
P 704.343.0608 x313 M 704.654.9619 F 704.358.3093

From: Epperson, Sean M [<mailto:smepperson@ncdot.gov>]
Sent: Wednesday, October 19, 2016 11:14 AM
To: Randy Goddard
Cc: Taylor, Wendy A; CJ O'Neill
Subject: Renfrow Site TIA

Randy,

In looking over this TIA I realized it was the same site as the Matthew Galleria TIA submitted by DRG in 2014. A couple of the differences though are the amount of development and number of access drives being requested on Monroe Rd. The previous site had only one access connection to Monroe Rd where this new site has two. We are not agreeable to allowing 2 access drives to Monroe Rd. The RI/RO access point will need to be removed from the site plan. The last TIA you did for this parcel had a recommendation for an eastbound right turn lane on Monroe Rd at Galleria. This new TIA has dropped this as a recommended mitigation. While we are OK with that we do feel that some changes are needed to the Monroe Rd and Galleria Rd signal. We are asking that this developer modify the signal and southbound approach from a left only, thru/left and right only lane to a left only, left only and thru right lane. This will allow the signal to become unsplit phased and increase the efficiency of the signal and overall reduce delay at the intersection.

Sean Epperson, PE
Division Traffic Engineer
NCDOT
Division 10 Traffic

704 983 4400 office
smepperson@ncdot.gov

716 W. Main St
Albemarle, NC 28001



TRAFFIC IMPACT ANALYSIS

RENFROW SITE

Monroe Road (SR 1009) Between Galleria Boulevard & Gander Cove Lane
Matthews, North Carolina

Zoning Application # TBD



for

Taft Development Group

September 2016

652-001 (C-2165)



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EXECUTIVE SUMMARY

Taft Development Group proposes to rezone (Zoning Application #TBD) approximately 22 Acres to construct 230 apartments and 20 townhomes. The site is located on the west side of Monroe Road (SR 1009), between Galleria Boulevard and Gander Cove Lane in Matthews, NC. The site is expected to be fully developed in 2019.



**Monroe Road Facing North
Along Site**

This report provides analysis of the traffic operations within the area of influence, according to the standards set by the Town of Matthews (which follows the North Carolina Department of Transportation's (NCDOT) "Policy on Street and Driveway Access to North Carolina Highways, Chapter 4 Part C" guidelines). It provides intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

- 2016 Existing Conditions
- 2019 No Build
- 2019 Buildout

The area of influence of the study site as indicated by the Town of Matthews staff includes the following four existing signalized intersections:

1. Monroe Road (SR 1009) & Sardis Road N.
2. Monroe Road (SR 1009) & Galleria Boulevard
3. Monroe Road (SR 1009) & Gander Cove Lane/Family Dollar Access
4. Monroe Road (SR 1009)/W. John Street & NC 51 (Matthews Township Parkway)

According to the site plan, access to the development is expected to occur via three locations:

- Proposed Full Movement Access "A" is to be located on Monroe Road (SR 1009) on the east side of the site, approximately 850 feet south of Galleria Boulevard.
- Proposed Full Movement Access "B" is to be located on Nolley Court on the north side of the site, west of Galleria Boulevard.
- Proposed Right-In/Right-Out (RI/RO) Access "C" is to be located on Monroe Road (SR 1009) on the east side of the site, approximately 250 feet south of Galleria Boulevard.

The proposed trip generation results indicate that the residential development is expected to generate 130 AM peak hour trips and 160 PM peak hour trips.

Morning and afternoon peak period turning movement counts were previously conducted at the four existing intersections in October/November 2014. In lieu of collecting new intersection counts (and with the approval of Matthews/NCDOT), these volumes were increased using a 2 percent per year growth rate to represent 2016 background volumes. It should be noted that these new background volumes were balanced to within 5% to account for mid-block driveways/streets, different peak hours, and the inclusion of two recently constructed developments:



- QuikTrip #1028 - located on Monroe Road, between NC 51 and the Family Dollar Access (south of the proposed Renfrow Site). The convenience store with gas pumps contains 20 fueling positions and is assumed to generate 121 new AM peak hour trips and 129 new PM peak hour trips (after passby reductions).
- Sam's Mart Express Wash – located on Monroe Road, between NC 51 and the Family Dollar Access (south of the proposed Renfrow Site [adjacent to the QuikTrip site described above]). The automated car wash is assumed to generate 44 AM peak hour trips and 48 PM peak hour trips.

Currently, two of the four signalized intersections operate at a LOS “C” or better during both peak hours. The intersection of Monroe Road & Sardis Road N operates with a LOS “C” in the AM peak hour and an “F” in the PM peak hour; the intersection of NC 51 & Monroe Road/John Street operates with a LOS “E” in both peak hours. Typically, an intersection is said to be operating at capacity at a volume-to-capacity (v/c) ratio of 1.00 and acceptable at a LOS “D” or better.

ANALYSIS REQUIREMENTS - In order to determine the mitigation responsibility of the developer, this study compares 2019 Build results to the 2019 No Build results.

Chapter 5, Section J of the *July 2003 NCDOT Policy on Street and Driveway Access to North Carolina Highways*, the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- *The total average delay at an intersection or an individual approach increases by 25% or greater, while maintaining the same level of service,*
- *The Level of Service (LOS) degrades by at least one level at an intersection or an individual approach,*
- *Or the Level of Service is “F” for an intersection or an individual approach.*

This section of the access policy also states that, *mitigation improvements shall be identified when the analysis indicates that the 95th percentile queue exceeds the storage capacity of the existing lane.*

With the results of our analyses (specifics are described in the Traffic Analysis section of this report) we suggest the following recommendations at the proposed accesses:

2019 Build Suggested Recommendations:

5. Monroe Road (SR 1009) & Full Movement Access “A” (unsignalized)

The intersection layout we recommend includes:

- The existing two-way left-turn lane on Monroe Road should remain as is (i.e. no pavement re-mark [due to the existing adjacent Family Dollar driveway to the south]).



- Construct the eastbound approach (Full Movement Access “A”) for one ingress and two egress lanes (separate left and right lanes – to a proposed internal roundabout [approximately 200 feet of storage]).
- Install a R1-1 “Stop” sign.

6. Nolley Court & Full Movement Access “B” (unsignalized)

The intersection layout we recommend includes:

- Construct the northbound approach (Full Movement Access “B”) for one ingress and one egress lane. No turn lanes on Nolley Court should be necessary based on the minimal traffic volumes associated with this driveway.
- Install a R1-1 “Stop” sign.

Monroe Road (SR 1009) & Proposed RI/RO Access “C” (unsignalized)

- Construct Proposed RI/RO Access “C” with one ingress lane and one egress lane that terminates as a right turn lane at Monroe Road.
- Due to an existing major access driveway for the Family Dollar distribution center located on the east side of Monroe Road immediately south of the Proposed RI/RO Access “C” we recommend a “pork-chop” island (in lieu of the typical recommendation for the installation of a raised median on Monroe Road) to prohibit left entering and left exiting vehicular movements.
- Install appropriate R3-2 “No Left Turn” and R1-1 “Stop” signs.

The proposed multifamily development is not expected to create extensive roadway/intersection issues, especially given the minor amount of traffic associated with the site.



PROPOSED DEVELOPMENT

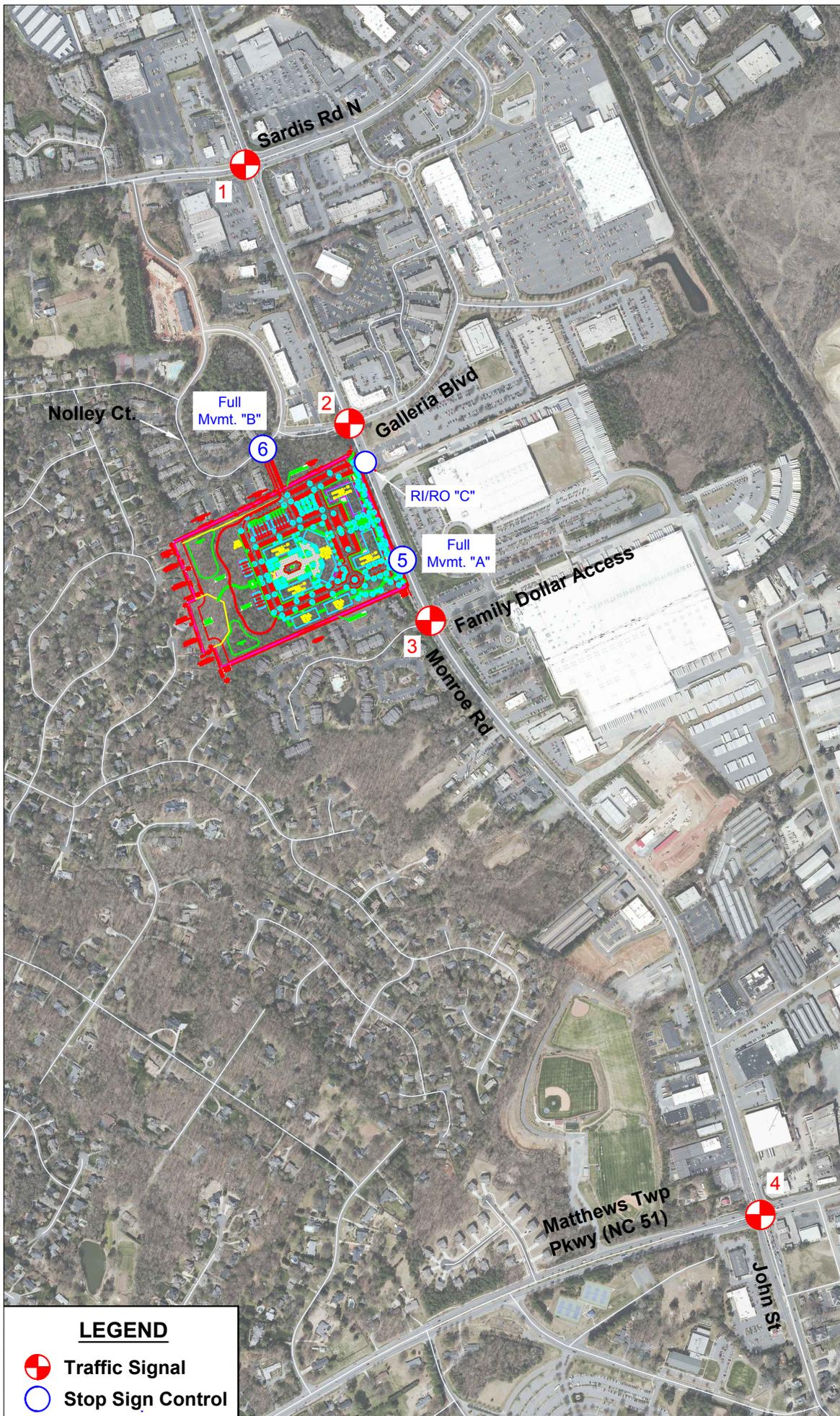
Taft Development Group proposes to rezone (Zoning Application #TBD) approximately 22 Acres to construct 230 apartments and 20 townhomes. The site is located on the west side of Monroe Road (SR 1009), between Galleria Boulevard and Gander Cove Lane in Matthews, NC (see Figure 1). The site is expected to be fully developed in 2019.

According to the latest site plan (by Urban Design Partners), access to the development is expected to occur via three locations (see Rezoning Site Plan):

- Proposed Full Movement Access “A” is to be located on Monroe Road (SR 1009) on the east side of the site, approximately 850 feet south of Galleria Boulevard.
- Proposed Full Movement Access “B” is to be located on Nolley Court on the north side of the site, west of Galleria Boulevard.
- Proposed Right-In/Right-Out (RI/RO) Access “C” is to be located on Monroe Road (SR 1009) on the east side of the site, approximately 250 feet south of Galleria Boulevard.



**Monroe Road Facing South
Along Site**



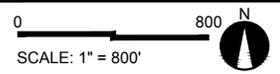
LEGEND

-  Traffic Signal
-  Stop Sign Control

RENFROW SITE TIA
 MATTHEWS, NC

Taft Development Group
 2217 STANTONSBURG ROAD
 GREENVILLE, NC 27834
 252-916-2691

**AREA of
 INFLUENCE**

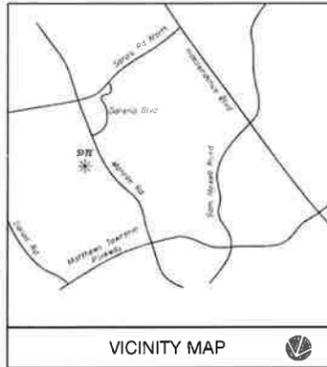


PROJECT #: 652-001
 DRAWN BY: MWW
 CHECKED BY: REG

SEPTEMBER 2016

REVISIONS:

Figure 1



DEVELOPMENT SUMMARY	
TAX PARCEL ID #:	21323101
TOTAL SITE AREA:	± 21.66 ACRES
EXISTING ZONING:	R-VS
PROPOSED ZONING:	R-12 MF(CD)
PROPOSED UNITS:	230 UNITS
APARTMENTS:	20 UNITS
TOWNHOME:	250 UNITS
TOTAL:	
PROPOSED DENSITY:	11.5 D.U.A.
VEHICULAR PARKING:	
SURFACE:	388 SPACES
GARAGE:	20 SPACES
TOTAL:	408 SPACES (1.6/UNIT)



**URBAN
DESIGN
PARTNERS**

1318-W6 Central Ave. P. 704.334.3303
Charlotte, NC 28205 F. 704.334.3355
urban@designpartners.com

Mr. Dustin Mills
Mr. Mike McCarthy

Taft Development Group
2217 Stantonsburg Road
Greenville, NC 27835

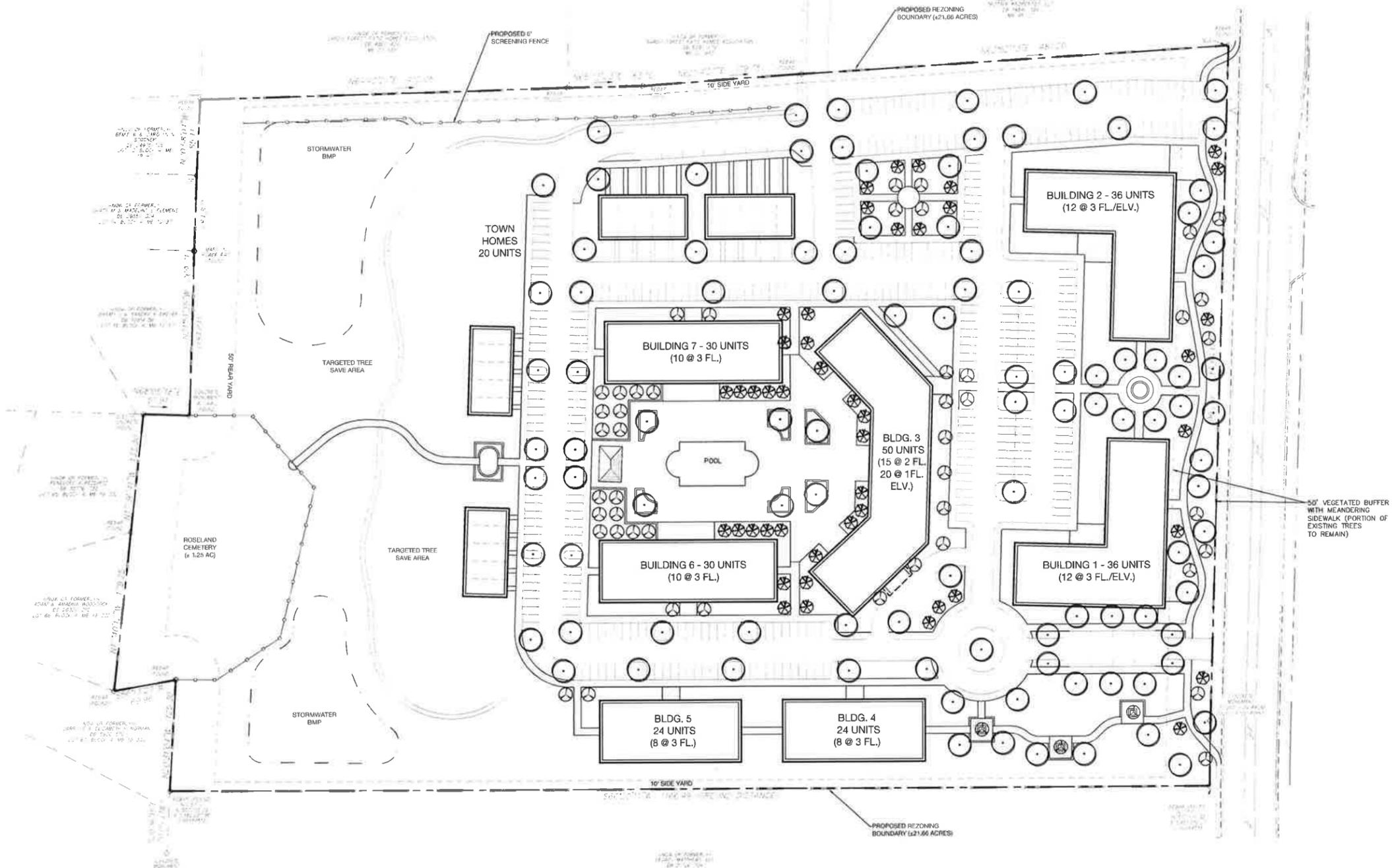
Renfrow Site

Rezoning Site Plan
Mathews, North Carolina

NO. DATE BY: REVISIONS:

Project No: 15-128
Date: January 2016
Designed by: udp
Drawn By: udp
Scale: 1"=60'
Sheet No:

RZ-1





AREA CONDITIONS

The area of influence of the study site as indicated by the Town of Matthews staff includes the following four existing signalized intersections:

1. Monroe Road (SR 1009) & Sardis Road N.
2. Monroe Road (SR 1009) & Galleria Boulevard
3. Monroe Road (SR 1009) & Gander Cove Lane/Family Dollar Access
4. Monroe Road (SR 1009)/W. John Street & NC 51 (Matthews Township Parkway)



**Monroe Road Facing North
Along Site**



**Nolley Court Facing East
Along Site**

As indicated on the most current Charlotte Regional Transportation Planning Organization (CRTPO) Thoroughfare Plan, Monroe Road (SR 1009) is a major thoroughfare (located on the east side of the site). According to the Urban Street Design Guide (USDG) for roadway classifications, Monroe Road is a boulevard north of the proposed Renfrow Site. Monroe Road is a two-way roadway five lanes wide (two lanes in each direction with occasional left turn lanes in a two-way left-turn lane) with a posted speed limit of 45 mph (35 mph to the south at a point north of NC 51). The roadway includes curb/gutter on both sides; sidewalk is present on the west (site) side. CATS bus stops (routes 27 and 65x) are located on both sides of Monroe Road along or adjacent to the site. Sight distance in both directions at the access location on Monroe Road is adequate, meeting or exceeding normal NCDOT requirements for a 45 mph posted roadway (50 mph design speed = 500 feet of sight distance).

According to the most current Charlotte Adopted Collectors Map, Nolley Court (within the City of Charlotte limits) is a minor collector roadway with a posted speed limit of 25 mph in the vicinity of the proposed site. The roadway has no USDG classification and is a two-lane facility with multiple speed humps; curb/gutter, planting strip and sidewalk is present on both sides of the street.

Morning (7:00-9:00 AM) and afternoon (4:30-6:30 PM) peak period turning movement counts were previously conducted at the four existing intersections on Wednesday October 22, Tuesday October 28, or November 4, 2014. In lieu of collecting new intersection counts (and with the approval of Matthews/NCDOT), these volumes were increased using a 2% per year growth rate to represent 2016 background volumes. It should be noted that these volumes were balanced to within 5% to account for mid-block driveways/streets, different peak hours, and the inclusion of two recently constructed developments (specifics are discussed later in this report) (see Figures 2 and 3).



In addition to the intersection turning movement counts, NCDOT is the source for average annual two-way daily traffic (AADT) volumes within the area of influence. The latest (2014) AADT volumes are depicted in Table 1.

Table 1: Average Annual Daily Traffic Volumes (veh. per day)

Roadway	2014 AADT
Monroe Rd. north of Sardis Rd.	31,000
Monroe Rd. south of Sardis Rd.	27,000
Sardis Rd. west of Monroe Rd.	13,000
Sardis Rd. east of Monroe Rd.	20,000
Monroe Rd. north of Matthews Township Pkwy. (NC 51)	34,000
W John St. south of Matthews Township Pkwy. (NC 51)	19,000
NC 51 west of Monroe Rd.	37,000
NC 51 east of Monroe Rd.	28,000

Table 2 lists the data collected by NCDOT and CDOT for the number of reported crashes at various intersections/roadway segments:

Table 2: High Frequency Crash Locations

Intersection/Roadway	# of Reported Accidents (Years)-Agency
Monroe Rd. & Sardis Rd.	48 (2007-11)-N
Monroe Rd. & Galleria Blvd.	27 (2007-11)-N
Monroe Rd. & NC 51	29 (2010-14)-C
Monroe Rd. north of Sardis Rd.	32 (2007-11)-N
Monroe Rd. between Sardis Rd. & Galleria Blvd.	44 (2007-11)-N
Monroe Rd. bet. Galleria Blvd. & Gander Cove Ln./Family Dollar Dwy.	37 (2007-11)-N
Monroe Rd. bet. Gander Cove Ln./Family Dollar Dwy. & Industrial Dr.	22 (2007-11)-N
Monroe Rd. between Industrial Dr. & NC 51	41 (2007-11)-N
NC 51 between Monroe Rd./John St. & Covenant Church Ln.	38 (2007-11)-N
NC 51 between Monroe Rd./John St. & Covenant Church Ln.	18 (2007-11)-N

C = CDOT, N = NCDOT

Figure 4 shows the directional distribution for the site (which were derived from a previously approved project by Matthews/NCDOT).

RENFROW SITE TIA
MATTHEWS, NC

TAFT DEVELOPMENT GROUP
2217 STANTONSBURG ROAD
GREENVILLE, NC 27834
252-916-2691

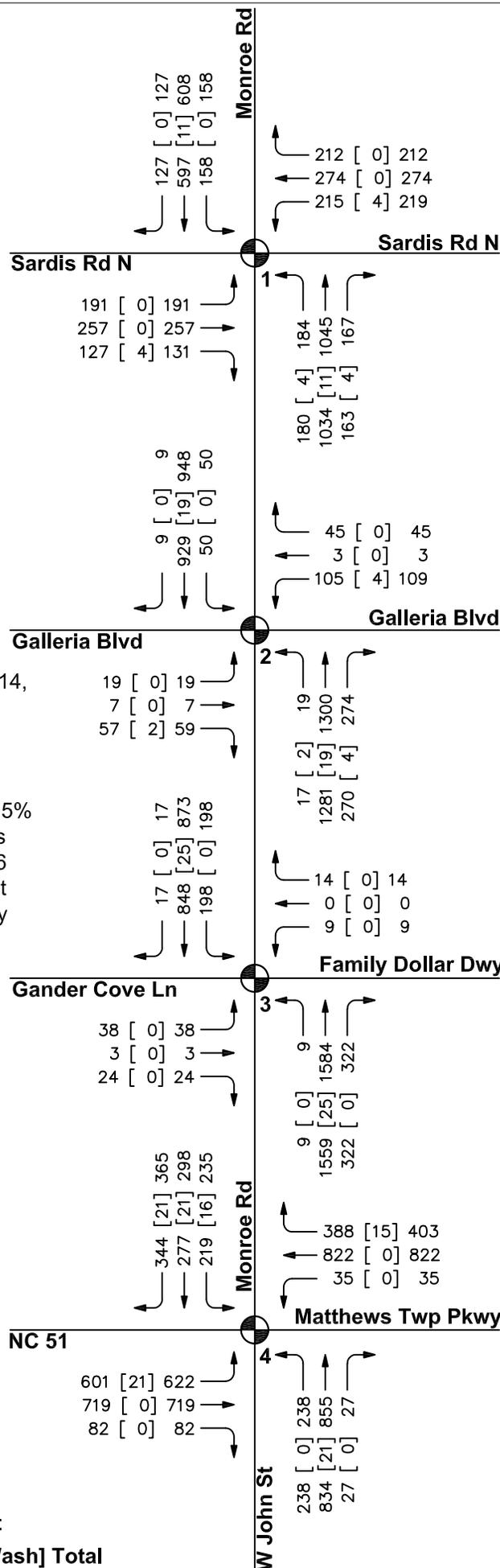
2016 AM PEAK
HOUR TRAFFIC
VOLUMES



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CHECKED BY: REG

SEPTEMBER 2016

REVISIONS:



- Counts collected Wed. 10/22/14,
Tues. 10/28/14, and
Tues. 11/04/14
-All counts grown by 2% for 2
years to represent 2016 base
traffic volumes and balanced ± 5%
-Volumes for QT/Sams Express
Car Wash added to grown 2016
background volumes to account
for traffic currently generated by
these sites

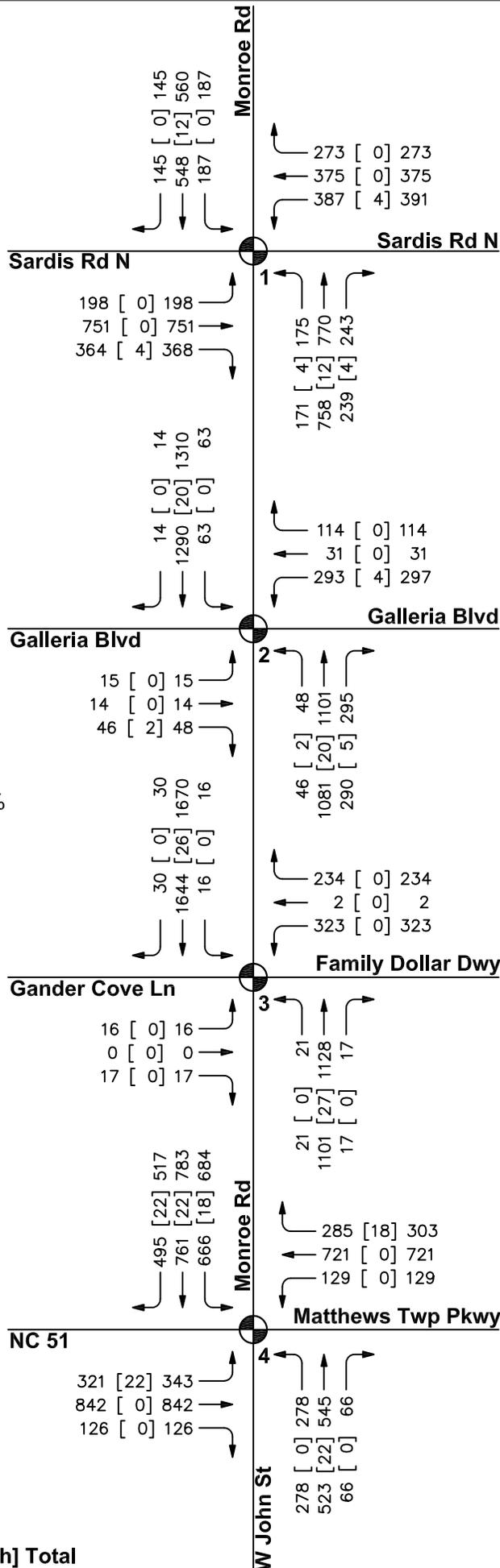
LEGEND

- Traffic Signal
- Directional Movement

VOLUMES: Bkgd. [QT/Car Wash] Total

Figure 2

- Counts collected Wed. 10/22/14,
Tues. 10/28/14, and
Tues. 11/04/14
-All counts grown by 2% for 2
years to represent 2016 base
traffic volumes and balanced ± 5%
-Volumes for QT/Sams Express
Car Wash added to grown 2016
background volumes to account
for traffic currently generated by
these sites



RENFROW SITE TIA
MATTHEWS, NC

Taft Development Group
2217 Stantonsburg Road
Greenville, NC 27834
252-916-2691

2016 PM PEAK
HOUR TRAFFIC
VOLUMES

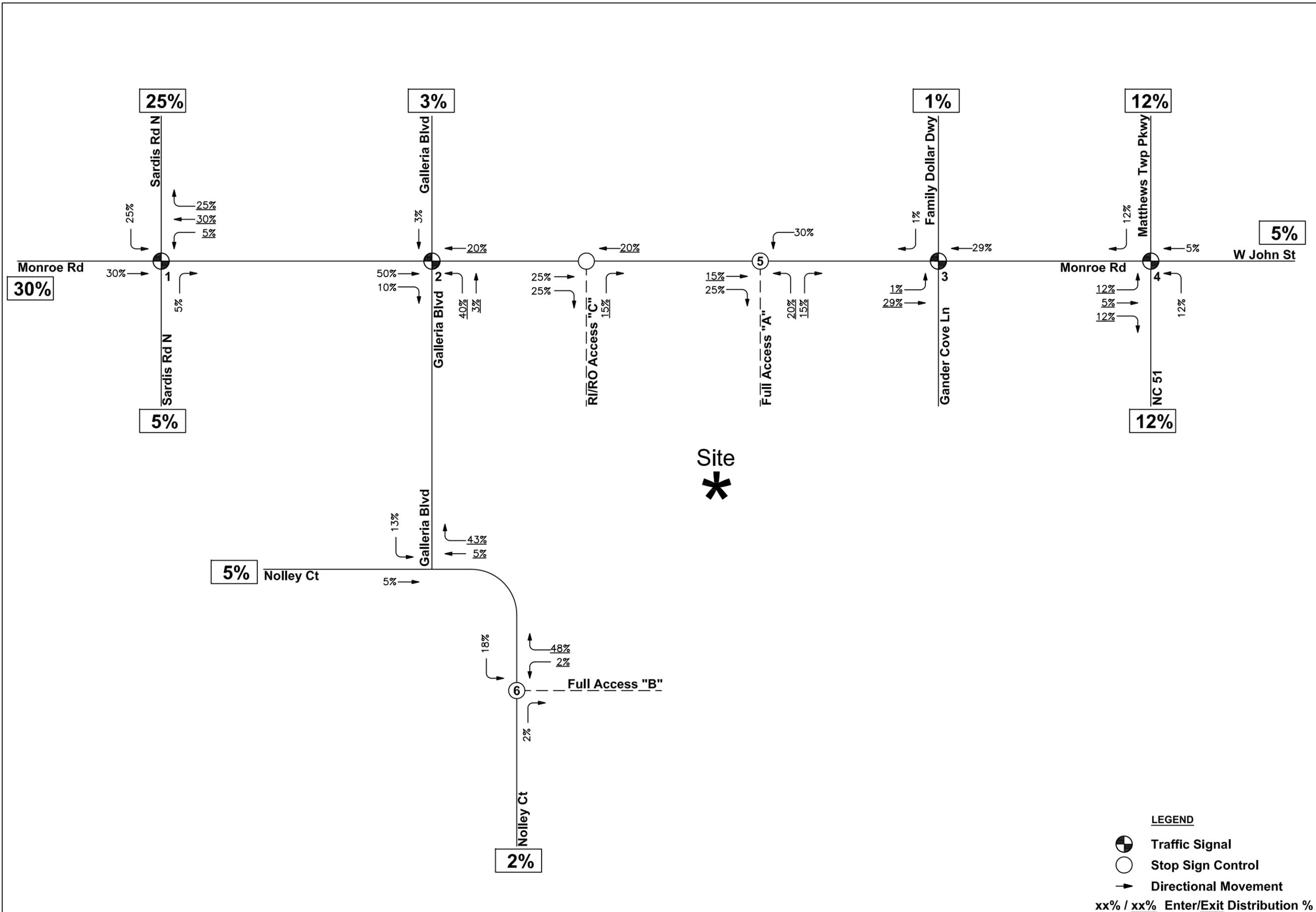


PROJECT #: 652-001
DRAWN BY: MWW
CHECKED BY: REG

SEPTEMBER 2016

REVISIONS:

Figure 3



LEGEND

- Traffic Signal
- Stop Sign Control
- Directional Movement
- xx% / xx%** Enter/Exit Distribution %

RENFROW SITE TIA
 MATTHEWS, NC

TAFT DEVELOPMENT GROUP
 2217 STANTONSBURG ROAD
 GREENVILLE, NC 27834
 252-916-2691

SITE DIRECTIONAL DISTRIBUTION



PROJECT #: 652-001
 DRAWN BY: MWW
 CHECKED BY: REG

SEPTEMBER 2016

REVISIONS:

Figure 4



PROJECTED TRAFFIC

The projected background traffic volumes used in the analyses were developed from year 2014 peak-hour-turning-movement-count data. These volumes were increased using a 2 percent per year growth rate to obtain 2016 and 2019 background volumes, which was approved by NCDOT/Matthews.

The daily and peak-hour-trip-generation data for the site is presented in Table 3. The values for the trips generated by the residential land use are obtained from the Institute of Transportation Engineers, Trip Generation Manual, 9th Edition, 2012.

Table 3: Site Trip Generation

Land Use [ITE Code]			Weekday Daily	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Apartments [220]	230	DUs	1,517	23	93	116	94	50	144
Townhomes [230]	20	DUs	159	2	12	14	11	5	16
Total Trips			1,676	25	105	130	105	55	160

Reference: Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC. 2012.

The proposed trip generation results indicate that the residential development is expected to generate 130 AM peak hour trips and 160 PM peak hour trips.

Two recently constructed developments were added to the existing 2016 background volumes (see Table 4):

- QuikTrip #1028 - located on Monroe Road, between NC 51 and the Family Dollar Access (south of the proposed Renfrow Site). The convenience store with gas pumps contains 20 fueling positions and is assumed to generate 121 new AM peak hour trips and 129 new PM peak hour trips (after passby reductions).
- Sam's Mart Express Wash – located on Monroe Road, between NC 51 and the Family Dollar Access (south of the proposed Renfrow Site [adjacent to the QuikTrip site described above]). The automated car wash is assumed to generate 44 AM peak hour trips and 48 PM peak hour trips.

Table 4: New Development Trip Generation

Land Use [ITE Code]			Weekday Daily	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
QuikTrip #1028 – East Side of Monroe Rd. Between Family Dollar Driveway & NC 51									
Convenience Market w/Gas Pumps [853]	20	FP	10,852	165	166	331	190	191	381
<i>63% AM/66% PM Passby Reduction</i>			<i>-462</i>	<i>-105</i>	<i>-105</i>	<i>-210</i>	<i>-126</i>	<i>-126</i>	<i>-252</i>
Total New Trips			10,390	60	61	121	64	65	129
Sam's Mart Express Wash - East Side of Monroe Rd. Between Family Dollar Driveway & NC 51									
Automated Car Wash [948] *	3,372	SF	277	22	22	44	24	24	48
Total New Development Trips			10,667	82	83	165	88	89	177

Reference: Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC. 2012.

Passby taken in accordance with ITE (NCDOT) Trip Generation Guidelines

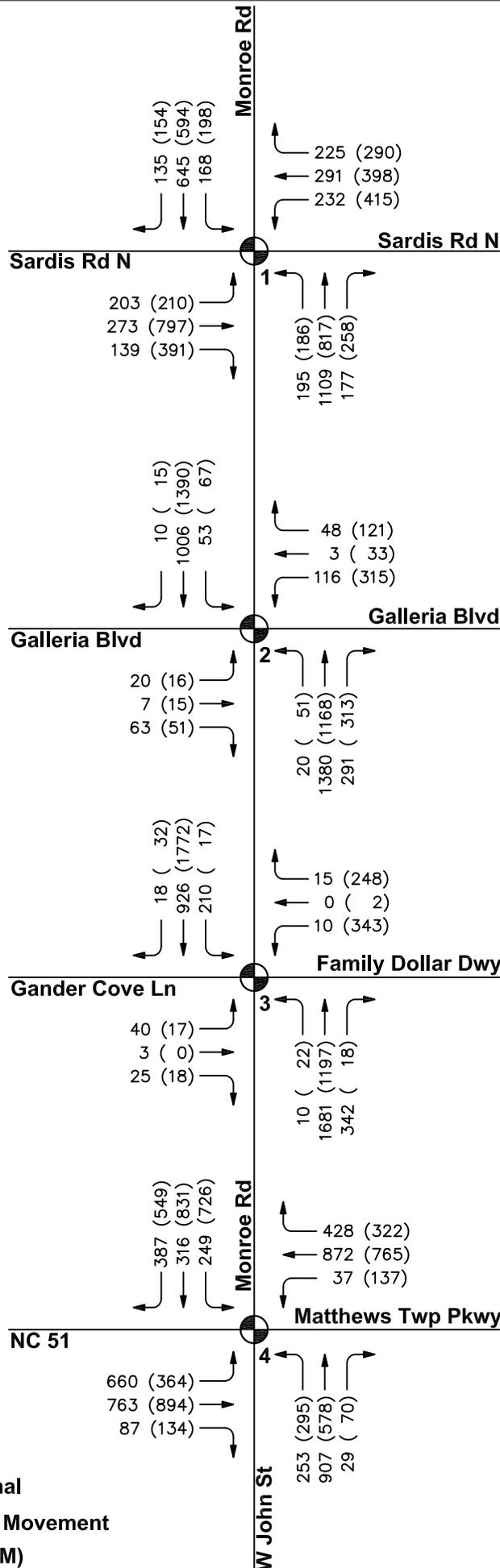
* Daily and AM peak derived from comparable existing 3,600 SF automated car wash (data available for PM peak)

Note: Info. for both offsites derived from previous DRG studies



The trip assignments for the 2019 morning and afternoon peak hour traffic volumes are presented in Figures 5 through 7 (depending on scenario). The background traffic is indicated to the far left of the movement arrows, followed by the site traffic in parentheses. The one or two volumes (depending on scenario) are added to obtain the projected total traffic for that movement:

$$\underline{\text{Background} + (\text{Site}) = \text{Total}}$$



RENFROW SITE TIA
MATTHEWS, NC

Taft Development Group
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Greenville, NC 27834
252-916-2691

2019 NO BUILD
PEAK HOUR
TRAFFIC VOLUMES

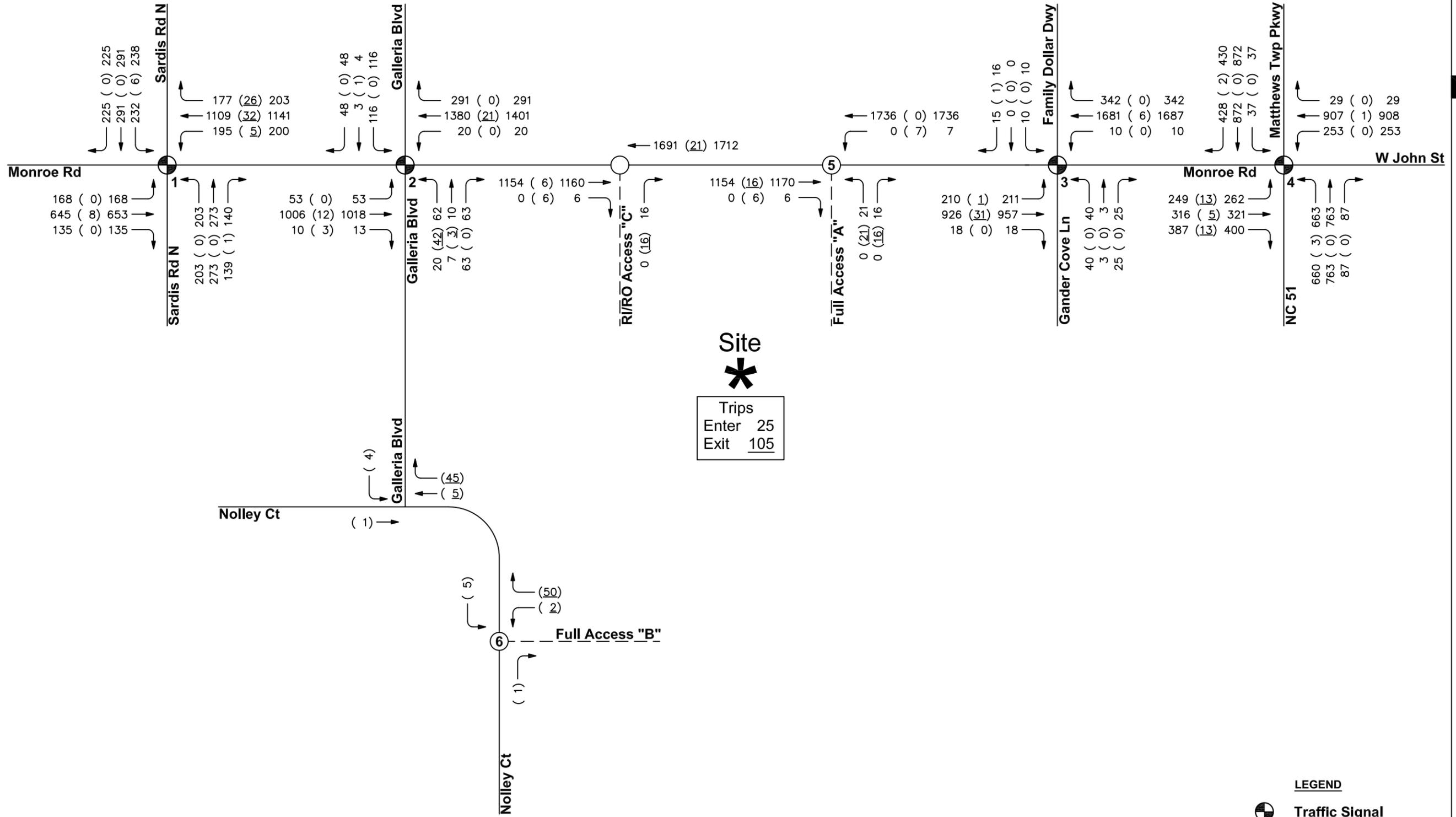


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Figure 5



LEGEND

- Traffic Signal
- Stop Sign Control
- Directional Movement

VOLUMES: Bkgd. (Site) Total

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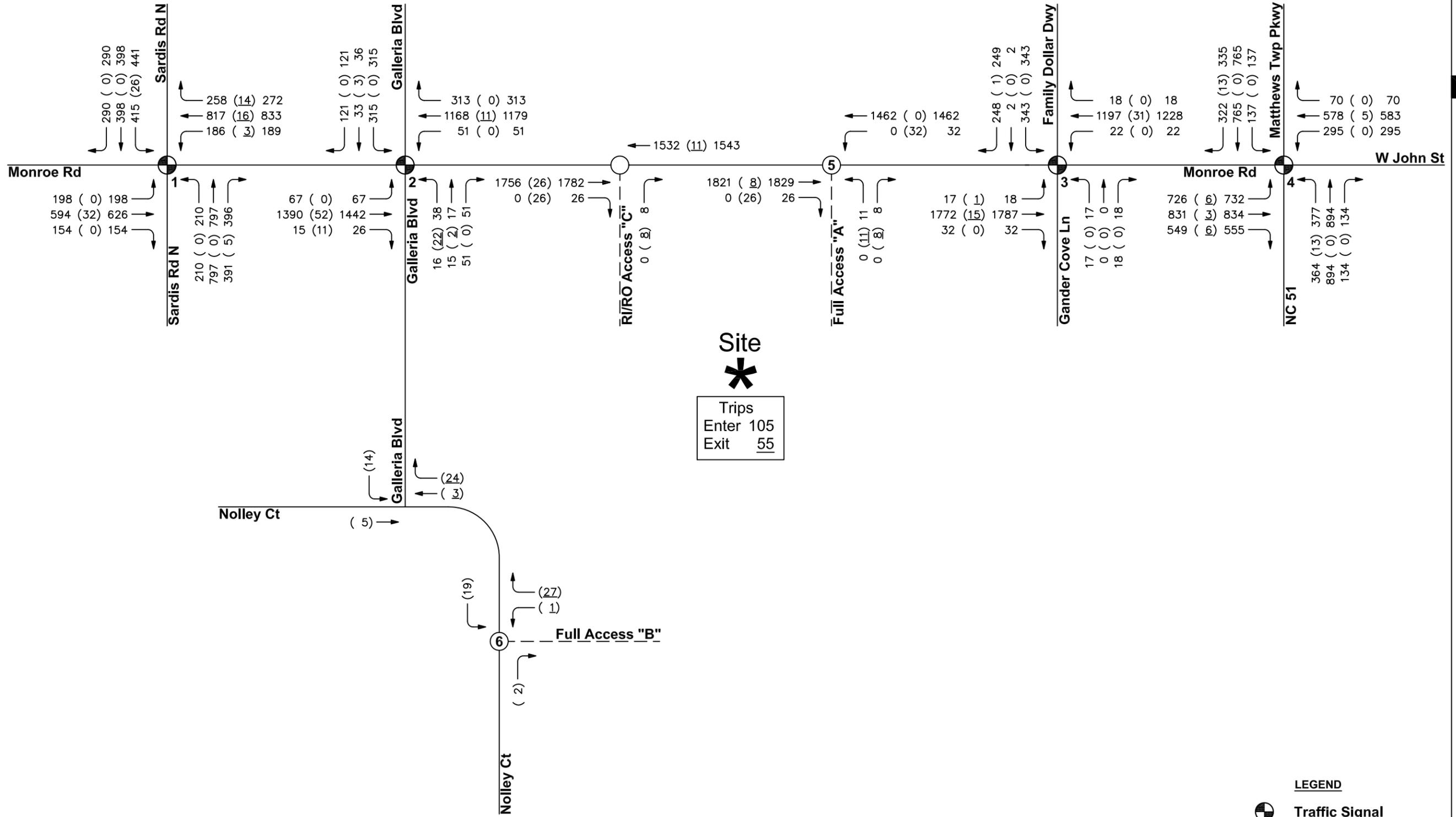
2019 BUILD AM
PEAK HOUR
TRAFFIC VOLUMES



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SEPTEMBER 2016
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Figure 6



RENFROW SITE TIA
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 GREENVILLE, NC 27834
 252-916-2691

2019 BUILD PM
 PEAK HOUR
 TRAFFIC VOLUMES

0 NTS
 SCALE: NTS

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LEGEND
 ● Traffic Signal
 ○ Stop Sign Control
 → Directional Movement
VOLUMES: Bkgd. (Site) Total

Figure 7



TRAFFIC ANALYSIS

The intersections identified within the area of influence were analyzed to identify the traffic impact that the site development has under the build scenario. The traffic analysis is based on the LOS analysis at the identified intersections. The intersections were analyzed assuming buildout of the site in 2019.

LOS is a qualitative measurement of traffic operations. It is a measure of delay time. The Transportation Research Board's Highway Capacity Manual¹ (HCM) defines six levels of service for intersections with LOS "A" representing the best operating condition and LOS "F" the worst. Table 16-2 of the HCM gives the criteria for signalized intersections.

HCM Table 16-2	
Signalized LOS	Signal Delay per Vehicle (sec/vehicle)
A	≤10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	>80.0

SYNCHRO Pro 9.1 was the software tool used in determining the delay and corresponding level of service at the study intersections. The intersection worksheet reports are provided in the Appendix.

For the analysis of unsignalized intersections, the vehicular movements that must stop at the intersection experience delay (i.e. the minor leg of the intersection). For descriptive purposes:

- LOS results between "A" and "C" for the side (minor) street approach are assumed to represent short vehicle delays
- LOS results between "D" and "E" for the side (minor) street approach are assumed to represent moderate delays
- LOS results of "F" for the side (minor) street approach is assumed to represent long delays.

It should be noted that stop sign controlled streets/driveways intersecting major streets typically experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. Table 17-2 gives the criteria for unsignalized intersections.

¹ National Research Council. Transportation Research Board. Highway Capacity Manual, Washington, DC. 2002. Chapters 2, 16, and 17.



HCM Table 17-2	
Unsignalized LOS	Stopped Delay per Vehicle (sec/vehicle)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

This report provides analysis of the traffic operations within the area of influence, according to the standards set by the Town of Matthews (which follows the North Carolina Department of Transportation's (NCDOT) "Policy on Street and Driveway Access to North Carolina Highways, Chapter 4 Part C" guidelines). It provides intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

- 2016 Existing Conditions
- 2019 No Build
- 2019 Buildout

Currently, two of the four signalized intersections operate at a LOS "C" or better during both peak hours. The intersection of Monroe Road & Sardis Road N operates with a LOS "C" in the AM peak hour and an "F" in the PM peak hour; the intersection of NC 51 & Monroe Road/John Street operates with a LOS "E" in both peak hours. Typically, an intersection is said to be operating at capacity at a volume-to-capacity (v/c) ratio of 1.00 and acceptable at a LOS "D" or better. The results of the analysis scenarios are presented in Table 5.



Table 5: Levels of Service

Intersection	Intersection/ Approach	AM Peak			PM Peak		
		Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)	LOS
2016 Existing Conditions							
1. Monroe Rd. & Sardis Rd. N		29.5	0.73	C	97.2	1.51	F
2. Monroe Rd. & Galleria Blvd.		18.7	0.64	B	21.8	0.69	C
3. Monroe Rd. & Gander Cove Ln./ Family Dollar Access		30.6	0.98	C	27.6	0.87	C
4. NC 51 & Monroe Rd./John St.		66.6	0.95	E	61.3	0.92	E
2019 No Build							
Intersection		46.9	0.87	D	74.7	1.15	E
1. Monroe Rd. & Sardis Rd. N	Northbound	37.1	-	D	50.2	-	D
	Southbound	50.3	-	D	82.8	-	F
	Eastbound	70.1	-	E	105.4	-	F
	Westbound	43.1	-	D	56.7	-	E
Intersection		11.9	0.67	B	23.2	0.81	C
2. Monroe Rd. & Galleria Blvd.	Northbound	6.1	-	A	14.1	-	B
	Southbound	11.9	-	B	22.9	-	C
	Eastbound	39.2	-	D	41.9	-	D
	Westbound	55.3	-	E	50.5	-	D
Intersection		26.1	1.23	C	23.6	0.90	C
3. Monroe Rd. & Gander Cove Ln./Family Dollar Access	Northbound	19.5	-	B	14.9	-	B
	Southbound	35.0	-	D	17.8	-	B
	Eastbound	61.0	-	E	54.2	-	D
	Westbound	49.2	-	D	57.7	-	E
Intersection		61.5	1.07	E	48.3	0.98	D
4. NC 51 & Monroe Rd./John St.	Northbound	79.1	-	E	57.3	-	E
	Southbound	46.5	-	D	33.4	-	C
	Eastbound	62.4	-	E	61.9	-	E
	Westbound	55.6	-	E	51.5	-	D



Table 5: Levels of Service (cont.)

Intersection	Intersection/ Approach	AM Peak			PM Peak		
		Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)	LOS
2019 Build							
1. Monroe Rd. & Sardis Rd. N	Intersection	46.8	0.88	D	79.1	1.16	E
	Northbound	36.4	-	D	52.6	-	D
	Southbound	50.6	-	D	88.0	-	F
	Eastbound	71.1	-	E	107.8	-	F
	Westbound	43.6	-	D	66.2	-	E
2. Monroe Rd. & Galleria Blvd.	Intersection	13.1	0.72	B	25.2	0.89	C
	Northbound	7.2	-	A	16.2	-	B
	Southbound	12.0	-	B	25.2	-	C
	Eastbound	45.3	-	D	42.3	-	D
	Westbound	54.8	-	D	50.4	-	D
3. Monroe Rd. & Gander Cove Ln./Family Dollar Access	Intersection	26.0	1.24	C	23.1	0.91	C
	Northbound	19.7	-	B	14.9	-	B
	Southbound	34.3	-	C	16.7	-	B
	Eastbound	61.0	-	E	54.2	-	D
	Westbound	49.0	-	D	57.9	-	E
4. NC 51 & Monroe Rd./John St.	Intersection	62.5	1.07	E	48.7	0.99	D
	Northbound	79.2	-	E	57.6	-	E
	Southbound	50.2	-	D	33.1	-	C
	Eastbound	63.3	-	E	64.1	-	E
	Westbound	55.7	-	E	51.3	-	D
5. Monroe Rd. & Full Mvmt. Access "A" ¹	Intersection	12.2	23/522	B	34.7	12/133	D
	Northbound	0.0	-	A	0.4	-	A
	Southbound	0.0	-	A	0.0	-	A
	Eastbound	12.2	-	B	34.7	-	D
6. Nolley Ct. & Full Mvmt. Access "B" ²	Intersection	8.8	58/1014	A	8.7	31/1015	A
	Northbound	8.8	-	A	8.7	-	A
	Eastbound	0.0	-	A	0.0	-	A
	Westbound	1.8	-	A	2.1	-	A

¹ Laneage on Full Mvmt. Access "A" includes a WB entering lane and separate EB left and right exit lanes. Laneage on Monroe Rd. includes a NB left turn lane (within the TWLTL).

² Laneage on Full Mvmt. Access "B" includes a SB entering lane and a NB exiting lane.

Tables 6 shows the 2019 maximum queue lengths calculated by SimTraffic 9, a traffic simulation software application for unsignalized and signalized intersections (results are based on an average of four corridor simulations), or the calculated 95th % queue in Synchro 9, - whichever produced the higher length. It should be noted that due to reported excessive vehicle queues for the minor leg of Proposed Full Movement Access "A" (unsignalized intersection - a software issue according to previous discussions with Trafficware on other projects), the average queues were reported accordingly.



Table 6: 2019 Vehicle Queue Lengths

Intersection/Approach	Exist. (Prop.) Storage		AM Peak Queue Length (ft)			PM Peak Queue Length (ft)			
	Left	Right	Left	Thru	Right	Left	Thru	Right	
2019 No Build									
1. Monroe Rd. & Sardis Rd. N	NB	170' +TWLTL	160' Yield	307'	622'x2	270'	304'	1257'x2	270'
	SB	300' +TWLTL	-	309'	494'x2		360'	923'x2	
	EB	300' +TWLTL	-	358'	364'x2		300'	1222'x2	
	WB	235'/340'	305' Yield	193'x2	192'x2	210'	378'x2	700'x2	173'
2. Monroe Rd. & Galleria Blvd.	NB	240' +TWLTL	150'	57'	532'x2	248'	239'	699'x2	250'
	SB	210'	-	294'	499'x2		291'	777'x2	
	EB	215'	250'	83'	31'	115'	58'	53'	96'
	WB	165'+TL	250'	125'x2		102'	231'x2		154'
3. Monroe Rd. & Gander Cove Ln./ Family Dollar Access	NB	185' +TWLTL	-	117'	1284'x2		184'	478'x2	
	SB	220' + TWLTL	-	439'	1173'x2		176'	975'x2	
	EB	Term.	50' TR	73'	105'		63'	87'	
	WB	180' +TL	Term.	34'x2		51'	331'x2		242'
4. NC 51 & Monroe Rd./John St.	NB	240'x2	210'	278'x2	970'x2	390'	259'x2	322'x2	73'
	SB	200'/315' +TWLTL	120'	284'x2	205'x2	370'	457'x2	480'x2	407'
	EB	325'x2	100'	506'x2	955'x2	264'	325'x2	530'x2	265'
	WB	100'/240'	120'	156'x2	584'x2	386'	243'x2	468'x2	280'
2019 Build									
1. Monroe Rd. & Sardis Rd. N	NB	170' +TWLTL	160' Yield	318'	583'x2	270'	283'	1553'x2	270'
	SB	300' +TWLTL	-	309'	464'x2		360'	818'x2	
	EB	300' +TWLTL	-	358'	333'x2		300'	1228'x2	
	WB	235'/340'	305' Yield	195'x2	194'x2	233'	378'x2	1225'x2	200'
2. Monroe Rd. & Galleria Blvd.	NB	240' +TWLTL	150'	55'	655'x2	192'	192'	709'x2	195'
	SB	210'	-	294'	703'x2		294'	788'x2	
	EB	215'	250'	112'	42'	118'	95'	47'	124'
	WB	165'+TL	250'	121'x2		70'	233'x2		160'
3. Monroe Rd. & Gander Cove Ln./ Family Dollar Access	NB	185' +TWLTL	-	80'	1285'x2		184'	740'x2	
	SB	220' + TWLTL	-	447'	319'x2		133'	990'x2	
	EB	Term.	50' TR	74'	121'		57'	79'	
	WB	180' +TL	Term.	39'x2		62'	338'x2		244'
4. NC 51 & Monroe Rd./John St.	NB	240'x2	210'	280'x2	1048'x2	390'	290'x2	328'x2	63'
	SB	200'/315' +TWLTL	120'	375'x2	374'x2	395'	478'x2	423'x2	405'
	EB	325'x2	100'	510'x2	969'x2	265'	272'x2	530'x2	265'
	WB	100'/240'	120'	154'x2	694'x2	389'	251'x2	468'x2	280'
5. Monroe Rd. & Full Mvmt. Access "A" ¹	NB	100'+TWLTL	-	36'	0'x2	-	95'	0'x2	-
	SB	-	-	-	0'x2		-	0'x2	
	EB	???	Term.	#39'	-	#75'	#17'	-	#8'
6. Nolley Ct. & Full Mvmt. Access "B" ²	NB	-	-	55'			48'		
	EB	-	-	-	0'		-	0'	
	WB	-	-	0'		-	23'		-
7. Monroe Rd. & RI/RO Access	EB	-	Term.	-	-	121'	-	-	40'

¹ Laneage on Full Mvmt. Access "A" includes a WB entering lane and separate EB left and right exit lanes. Laneage on Monroe Rd. includes a NB left turn lane (within the TWLTL).

² Laneage on Full Mvmt. Access "B" includes a SB entering lane and a NB exiting lane.

Avg. queue length reported



2019 Build Results/Suggested Recommendations:

When comparing the results of the 2019 No Build traffic and the 2019 Build traffic, all four existing study intersections are within the allowable parameters during both of the peak hours.

ANALYSIS REQUIREMENTS - In order to determine the mitigation responsibility of the developer, this study compares 2019 Build results to the 2019 No Build results.

Chapter 5, Section J of the *July 2003 NCDOT Policy on Street and Driveway Access to North Carolina Highways*, the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- *The total average delay at an intersection or an individual approach increases by 25% or greater, while maintaining the same level of service,*
- *The Level of Service (LOS) degrades by at least one level at an intersection or an individual approach,*
- *Or the Level of Service is “F” for an intersection or an individual approach.*

This section of the access policy also states that, *mitigation improvements shall be identified when the analysis indicates that the 95th percentile queue exceeds the storage capacity of the existing lane.*

1. Monroe Road (SR 1009) & Sardis Road N. (signalized)

When comparing the impact of the 2019 Build to the 2019 No Build conditions the intersection LOS remains a “D” in the AM peak hour and an “E” in the PM peak hour (all of the approaches remained the same LOS and were within the allowable increase in delay during both peak hours). The increase in intersection delay between the No Build and Build scenario is 0% in the AM peak hour and 6% in the PM peak hour. It should be noted that some of the calculated vehicle queues exceeded their existing storage lengths; however, these conditions occurred initially in the No Build scenario (the site produced minimal increases in these calculated queue lengths). **Based on the results no roadway improvements should be deemed necessary.**

The intersection already includes pedestrian amenities such as crosswalks, pedestrian signal heads and pushbuttons on all legs of the intersection, which is adequate.

2. Monroe Road (SR 1009) & Galleria Boulevard (signalized)

When comparing the impact of the 2019 Build to the 2019 No Build conditions the intersection LOS remains a “B” in the AM peak hour and a “C” in the PM peak hour (all of the approaches remained the same LOS and were within the allowable increase in delay during both peak hours). The increase in intersection delay between the No Build and Build scenario is 10% in the AM peak hour and 9% in the PM peak hour. It should be noted that some of the calculated vehicle queues exceeded their existing storage lengths; however, these conditions occurred initially in the No Build scenario (the site produced minimal increases in these calculated queue lengths). **Based on the results no roadway improvements should be deemed necessary.**



The intersection already includes pedestrian amenities such as crosswalks, pedestrian signal heads and pushbuttons on all legs of the intersection, which is adequate.

3. Monroe Road (SR 1009) & Gander Cove Lane/Family Dollar Driveway (signalized)

When comparing the impact of the 2019 Build to the 2019 No Build conditions the intersection LOS remains a “C” in both peak hours (all of the approaches remained the same LOS and were within the allowable increase in delay during both peak hours). The increase in intersection delay between the No Build and Build scenario is 0% in both peak hours. It should be noted that some of the calculated vehicle queues exceeded their existing storage lengths; however, these conditions occurred initially in the No Build scenario (the site produced minimal increases in these calculated queue lengths). **Based on the results no roadway improvements should be deemed necessary.**

The intersection already includes pedestrian amenities such as crosswalks, pedestrian signal heads and pushbuttons on the appropriate legs of the intersection, which is adequate.

4. Matthews Township Parkway (NC 51) & Monroe Road (SR 1009)/W. John Street (signalized)

When comparing the impact of the 2019 Build to the 2019 No Build conditions the intersection LOS remains an “E” in the AM peak hour and a “D” in the PM peak hour (all of the approaches remained the same LOS and were within the allowable increase in delay during both peak hours). The increase in intersection delay between the No Build and Build scenario is 2% in the AM peak hour and 1% in the PM peak hour. It should be noted that some of the calculated vehicle queues exceeded their existing storage lengths; however, these conditions occurred initially in the No Build scenario (the site produced minimal increases in these calculated queue lengths). **Based on the results no roadway improvements should be deemed necessary.**

The intersection already includes pedestrian amenities such as crosswalks, pedestrian signal heads and pushbuttons on all legs of the intersection, which is adequate.

5. Monroe Road (SR 1009) & Full Movement Access “A” (unsignalized)

The intersection LOS is a “B” in the AM peak hour and a “D” in the PM peak hour (considerably under capacity for both peak hours). The intersection layout we recommend includes:

- The existing two-way left-turn lane on Monroe Road should remain as is (i.e. no pavement re-mark [due to the existing adjacent Family Dollar driveway to the south]).
- Construct the eastbound approach (Full Movement Access “A”) for one ingress and two egress lanes (separate left and right lanes – to a proposed internal roundabout [200 feet of storage]).

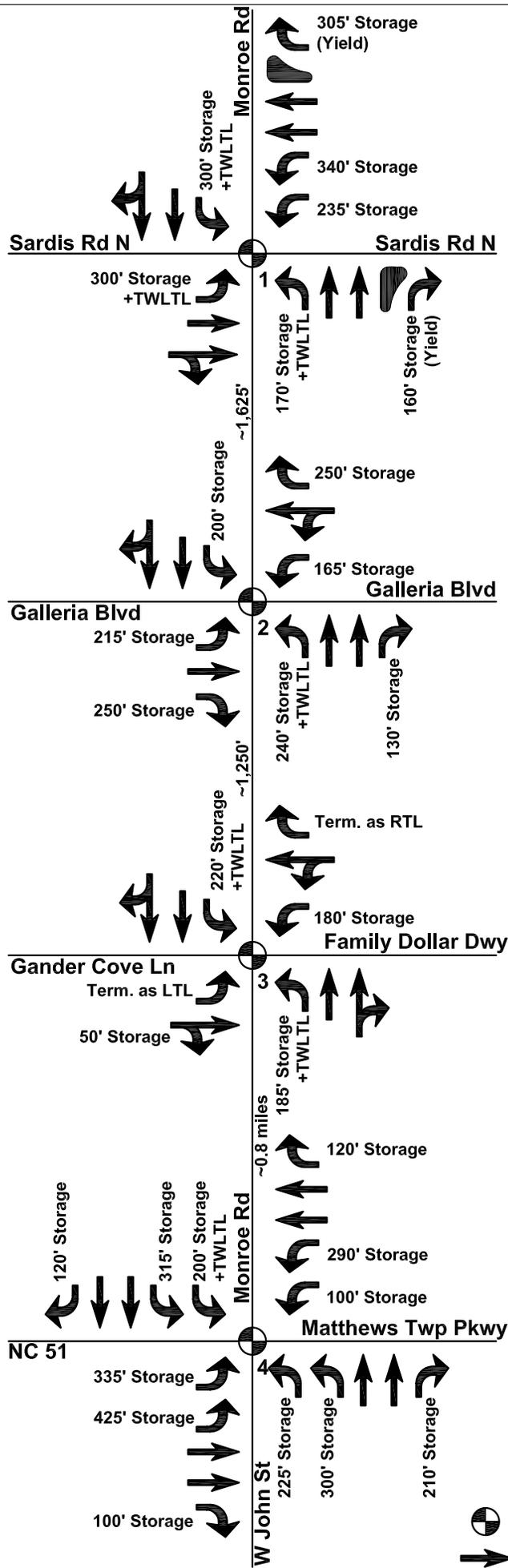


6. Nolley Court & Full Movement Access “B” (unsignalized)

The intersection LOS is an “A” in both peak hours (considerably under capacity for both peak hours). The intersection layout we recommend includes:

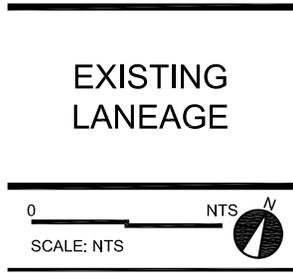
- Construct the northbound approach (Full Movement Access “B”) for one ingress and one egress lane. No turn lanes on Nolley Court should be necessary based on the minimal traffic volumes associated with this driveway.

The existing and suggested laneage is shown on Figures 8 and 9. Figure 10 shows the conceptual designs of the suggested improvements.



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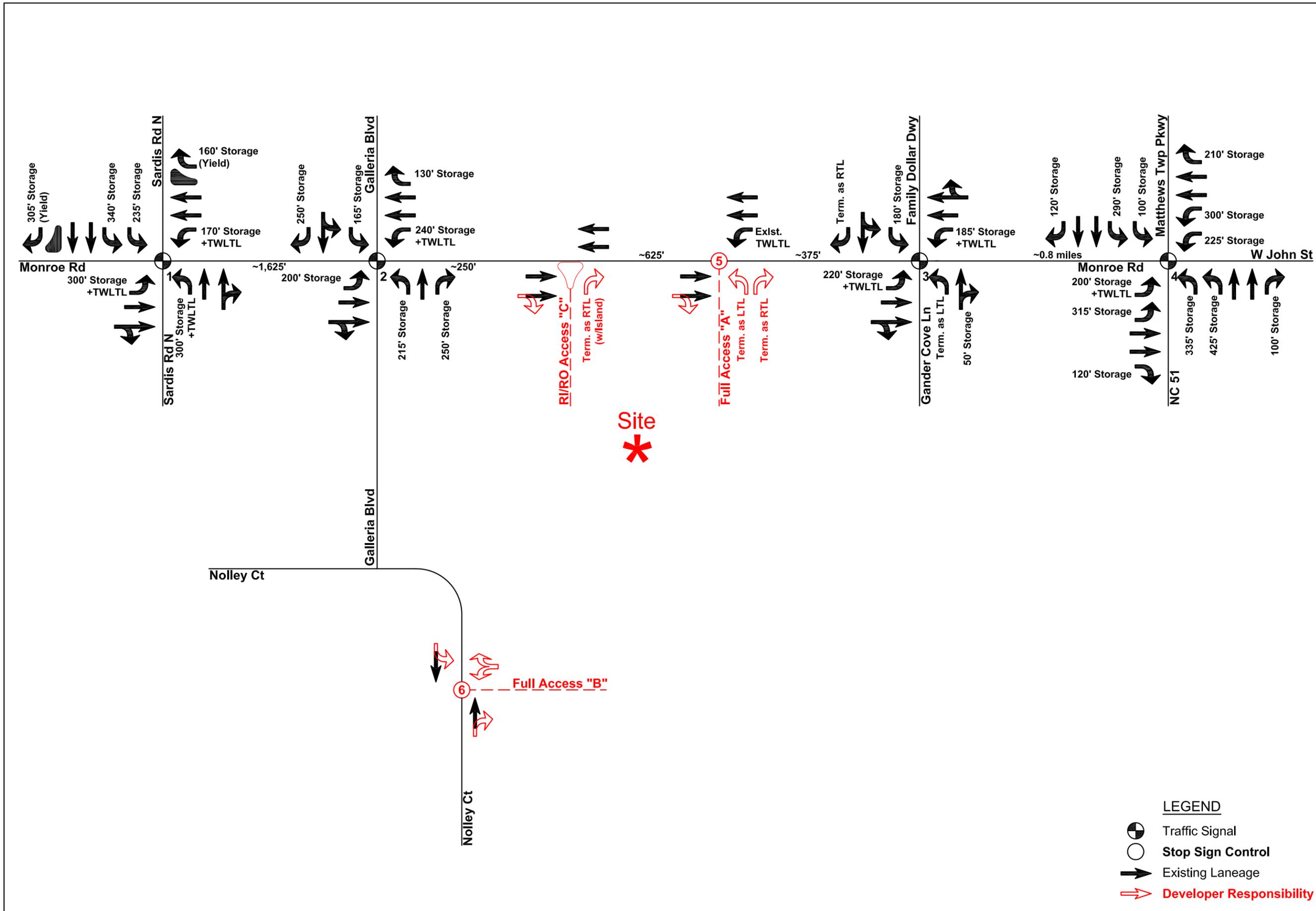


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Figure 8



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SUGGESTED LANEAGE



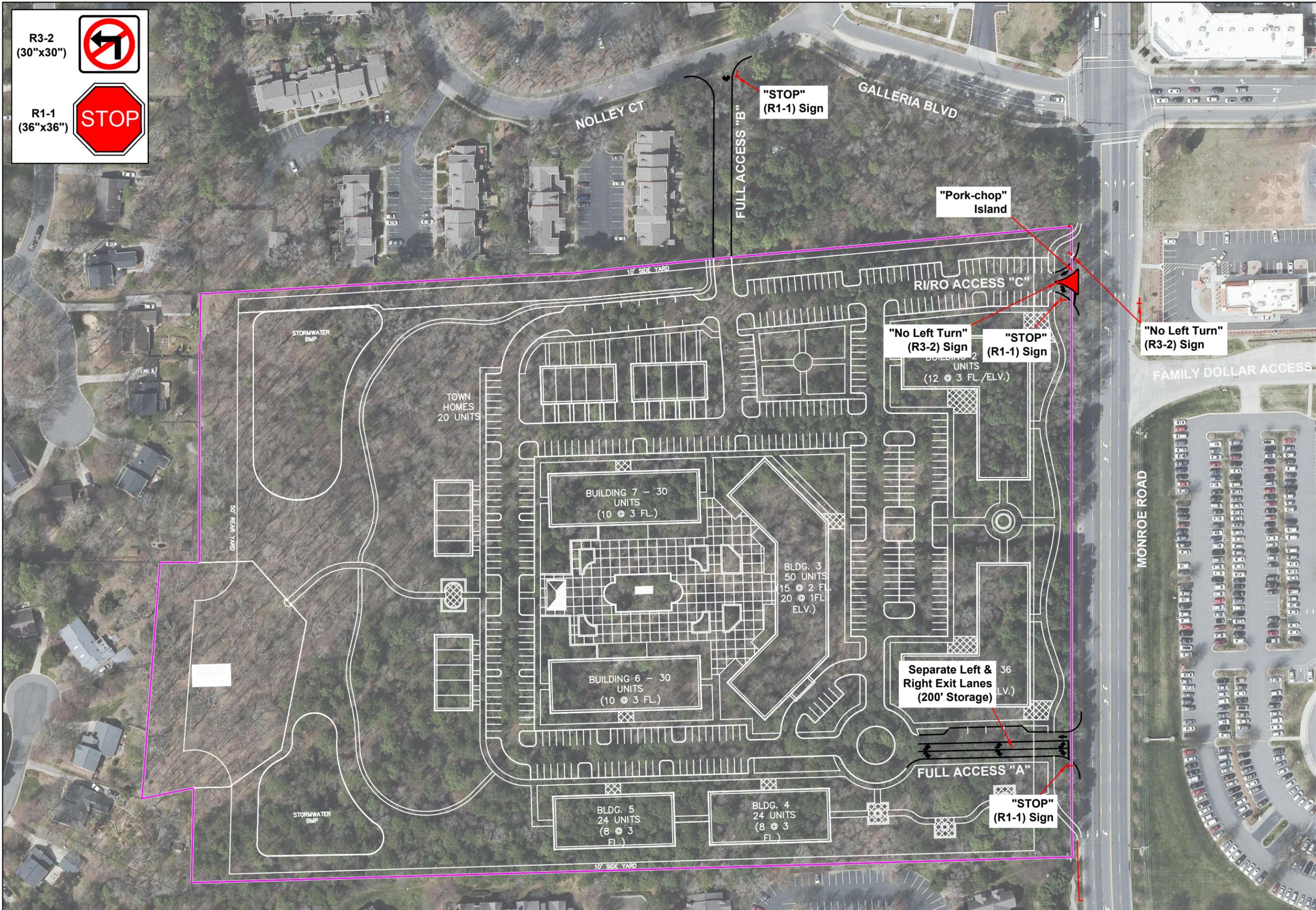
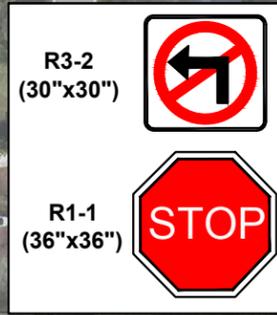
- LEGEND**
- Traffic Signal
 - Stop Sign Control
 - Existing Laneage
 - Developer Responsibility

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Figure 9



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CONCEPTUAL
IMPROVEMENTS



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Figure 10



CONCLUSION

In conclusion, the proposed multifamily development is not expected to create extensive roadway/intersection issues, especially given the minor amount of traffic associated with the site.

The suggested mitigation for the site accesses are illustrated in detail conceptually on Figure 10.



APPENDIX