TRAFFIC IMPACT ANALYSIS

Spencer Mountain

On both sides of Lowell Spencer Mountain Road, north of George Poston Soccer Field

Town of Lowell, North Carolina

for

Lennar

July 2023

640-012 (C-2165)

NORTH CAROLINA PROFESSIONAL SEAL 046606 7/25/2023 ENGINEER MICHAEL W. WICKLINE

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EXECUTIVE SUMMARY

Lennar proposes to develop a single-family subdivision with a total of 402 lots.

The development is located on both sides of Lowell Spencer Mountain Road, north of George Poston Soccer Field in Lowell, NC (see Figure 1). The development is expected to be completed in 2029.

Lowell Spencer Mountain Road facing north at Stanley Spencer Mountain Road

This report provides analysis of the traffic operations within the area of influence, according to the standards set by NCDOT's "*Policy on Street and Driveway Access to North Carolina Highways*, Chapter 4, Part C". It provides recommended access management for the site and intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

- Existing Conditions
- 2029 No Build Conditions
- 2029 Build Conditions

The area of influence of the site as defined by North Carolina Department of Transportation (NCDOT) staff includes three existing intersections and five accesses at three locations (see Appendix for the approved scoping information).

1. N Main Street & W 1st Street (Signalized)
2. N Main Street & McAdenville Road (Signalized)
3. Lowell Spencer Mountain Road & Stanley Spencer Mountain Road (Unsignalized)
4. Lowell Spencer Mountain Road & Access "A" (Unsignalized)
5. Lowell Spencer Mountain Road & Access "B"/Access "C" (Unsignalized)
6. Lowell Spencer Mountain Road & Access "D"/Access "E" (Unsignalized)

According to the site plan, access to the project is expected to occur via five accesses at three unsignalized locations:

- Proposed Access "A" (Full Movement) – unsignalized access located on Lowell Spencer Mountain Road, approximately 1.1 mile south of Stanley Spencer Mountain Road
- Proposed Access "B"/Access "C" (Full Movement) – unsignalized access located on Lowell Spencer Mountain Road, approximately 0.8 miles south of Stanley Spencer Mountain Road
- Proposed Access "D"/Access "E" (Full Movement) – unsignalized access located on Lowell Spencer Mountain Road, approximately 0.7 miles south of Stanley Spencer Mountain Road

The trip generation results indicate that the site is expected to generate 267 AM peak hour trips and 371 PM peak hour trips.

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

2029 Build Suggested Improvements:

1. N Main Street & W 1st Street (Signalized)

- Remark the southbound approach to provide a four-lane section which includes a right turn lane with 100 feet of storage on N. Main Street. The remarked lanes within the existing pavement width should be a minimum of 11 feet wide.

2. N. Main Street & McAdenville Road (Signalized)

- No suggested improvements.

3. Lowell Spencer Mountain Road & Stanley Spencer Mountain Road (Unsignalized)

- No suggested improvements.

4. Lowell Spencer Mountain Road & Access "A" (Unsignalized)

We propose the following full movement access configuration:

- One ingress lane and one egress lane (a terminating eastbound combined left-right turn lane) on proposed Access "A".
- Construct a northbound left turn lane with 100 feet of storage on Lowell Spencer Mountain Road.
- Provide a minimum 50-foot internal protected stem.

5. Lowell Spencer Mountain Road & Access "B"/Access "C" (Unsignalized)

- One ingress lane and one egress lane (a combined eastbound left/thru/right turn lane) on proposed Access "B".
- One ingress lane and one egress lane (a combined westbound left/thru/right turn lane) on proposed Access "C".
- Provide a minimum 50-foot internal protected stem.

6. Lowell Spencer Mountain Road & Access "D"/Access "E" (Unsignalized)

We propose the following full movement access configuration:

- One ingress lane and one egress lane (a combined eastbound left/thru/right turn lane) on proposed Access "D".
- One ingress lane and one egress lane (a combined westbound left/thru/right turn lane) on proposed Access "E".
- Provide a minimum 50-foot internal protected stem.

In conclusion, although the proposed Spencer Mountain single-family community will slightly increase the amount of vehicular traffic on the adjacent roadways/corridors, the project will not materially impact adjacent roadways, intersections, or the general public traveling in the area if the site is developed according to the proposed plan and includes the suggested intersection improvement and access configurations.

PROPOSED DEVELOPMENT

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Lowell Spencer Mountain Road facing north at Stanley Spencer Mountain Road

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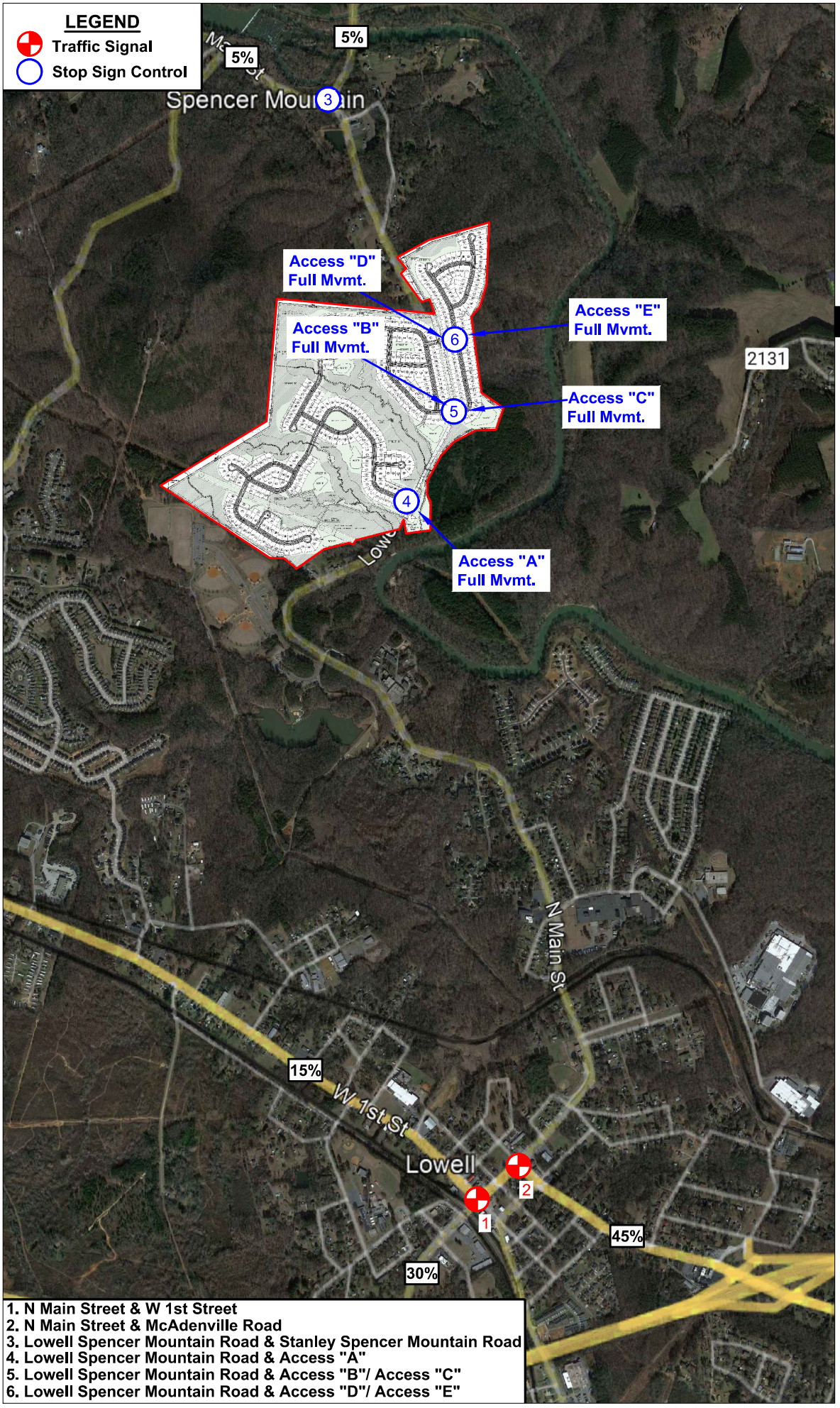
- Proposed Access "B"/Access "C" (Full Movement) – unsignalized access located on Lowell Spencer Mountain Road, approximately 0.8 miles south of Stanley Spencer Mountain Road
- Proposed Access "D"/Access "E" (Full Movement) – unsignalized access located on Lowell Spencer Mountain Road, approximately 0.7 miles south of Stanley Spencer Mountain Road



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SPENCER MOUNTAIN TIA

LOWELL, NC

LENNAR
6701 CARMEL ROAD, SUITE 425
CHARLOTTE, NC 28226

AREA OF INFLUENCE

0 900' 1800' N
SCALE: 1" = 1,800'

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2023

REVISIONS:
1.

Figure 1

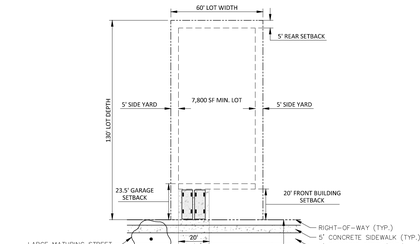
SITE DATA

PREPARED BY:	
MCADAMS	
3430 TORINGDON WAY, SUITE 110	
CHARLOTTE, NC 28277	
TAX PARCEL NUMBER:	136564, 210660 + PORTIONS OF 135144, 202166, 202774
PROPOSED ZONING:	SFR-4 (C)
TOTAL DEVELOPMENT	
AREA:	± 223.41 AC
SINGLE FAMILY (60' x 130')	406 LOTS
DENSITY ALLOWED:	4.00 LOTS/AC
DENSITY PROVIDED:	1.82 LOTS/AC
MIN. LOT SIZE REQUIRED:	7,800 SF
MIN. LOT SIZE PROVIDED:	7,800 SF
MIN. LOT WIDTH REQUIRED:	60'
MIN. LOT WIDTH PROVIDED:	60'
SETBACK REQUIREMENTS	
MIN. FRONT YARD SETBACK REQUIRED:	20'
MIN. FRONT YARD SETBACK PROVIDED:	20'
MIN. REAR YARD SETBACK REQUIRED:	5'
MIN. REAR YARD SETBACK PROVIDED:	5'
MIN. SIDE YARD SETBACK REQUIRED:	5'
MIN. SIDE YARD SETBACK PROVIDED:	5'
MIN. CORNER YARD SETBACK REQUIRED:	10'
MIN. CORNER YARD SETBACK PROVIDED:	10'
MIN. GARAGE FRONT SETBACK REQUIRED:	23.5'
MIN. GARAGE FRONT SETBACK PROVIDED:	23.5'
MIN. GARAGE CORNER SETBACK REQUIRED:	11.5'
MIN. GARAGE CORNER SETBACK PROVIDED:	11.5'
PARKING REQUIREMENTS	
MIN. OFF-STREET PARKING REQUIRED:	812 (2/UNIT)
MIN. OFF-STREET PARKING PROVIDED:	812 (2/UNIT)
MIN. ON-STREET PARKING REQUIRED:	0
MIN. ON-STREET PARKING PROVIDED:	56
OPEN SPACE REQUIREMENTS	
MIN. OPEN SPACE REQUIRED:	11.17 AC (5% OF SITE AREA)
MIN. OPEN SPACE PROVIDED:	111.44 AC
ACTIVE OPEN SPACE:	3.20 AC
NATURAL OPEN SPACE:	63.52 AC
PASSIVE OPEN SPACE:	44.72 AC
INACCESSIBLE OPEN SPACE:	5.08 AC
MIN. TREE SAVE SPACE REQUIRED:	13.40 AC (6% OF EXISTING TREES)
MIN. TREE SAVE SPACE PROVIDED:	63.52 AC
STORMWATER DETENTION PROVIDED:	±5.13 AC

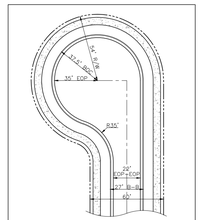
NOTES:
- PROPERTY INFORMATION BASED ON GASTON COUNTY GIS
- ALL PROPOSED STREETS HAVE A 60' PUBLIC RIGHT OF WAY AND ARE TOWN MAINTAINED
- T = TURNDOWN
- B = BASEMENT

TYPICAL LOT DIMENSIONS

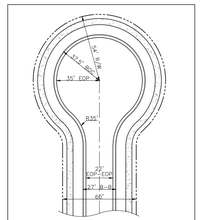
SCALE: 1' = 40'



*NOTE: CORNER LOTS REQUIRE A 10' SIDE YARD SETBACK WITH AN 11.5' GARAGE SETBACK.



OFFSET CUL-DE-SAC
VALLEY CURB AND GUTTER
N.T.S



CUL-DE-SAC
VALLEY CURB AND GUTTER
N.T.S

ADJACENT PROPERTY OWNERS

	PARCEL	DEED	OWNER	ADDRESS	ZONING
1	136566	2133-708	DORIS B TALLENT	2306 RYAN CONLEY CT , GASTONIA, NC 28056	RS-20
2	136565	2411-777	DORIS B TALLENT	2306 RYAN CONLEY CT , GASTONIA, NC 28056	RS-20
3	136557	1891-116	TALLENT DRUM COMPANY	PO BOX 675 , LOWELL, NC 28098-0000	RS-20
4	136558	1454-363	DORIS B TALLENT	2306 RYAN CONLEY CT , GASTONIA, NC 28056	RS-20
5	135132	4963-030	EUNICE H CARPENTER ETAL	129 SUTTON CARPENTER RD , GASTONIA, NC 28056-7852	R-1
6	135137	4514-2463	GAIL REDDICK BARKER	2940 ALARKA RD , BRYSON CITY, NC 28713-	R-1
7	135141	4684-697	DANIEL A DAVIS	1405 LOWELL SPENCER MTN RD , GASTONIA, NC 28056-7841	R-1
8	135134	4975-2031	JEFFREY A LITTLE ETAL	1421 LOWELL SPENCER MTN ROAD , GASTONIA, NC 28056	R-1
9	135133	4693-2468	TAMMY S SCHRONCE	2408 KALLOTTE LN , GASTONIA, NC 28054-6407	C-1
10	135138	2286-634	RACHEL MANN MOORE	1429 LOWELL SPENCER MTN RD , GASTONIA, NC 28056-7841	R-1
11	135129	2371-490	CHARLES FRANKLIN MORROW ETAL	104 FLOWERS RD , GASTONIA, NC 28056	R-1
12	135128	0010-551	EDITH C MAY ETAL	C/O JEFFERY SCOTT BEASLEY 114 FLOWERS RD, GASTONIA, NC 28056-6647	R-1
13	135127	1432-802	DOROTHY MAY BROWN	126 FLOWERS RD , GASTONIA, NC 28056-0000	R-1
14	135108	4467-1512	GERALD THOMAS FLOWERS & TERI LYN FLOWERS	138 HALL RD , GASTONIA, NC 28056-7825	R-1

LINEAR FOOTAGE OF STREETS:

STREET 'A':	3,861'
STREET 'B':	363'
STREET 'C':	876'
STREET 'D':	3,788'
STREET 'E':	666'
STREET 'F':	1,656'
STREET 'G':	548'
STREET 'H':	210'
STREET 'I':	2,203'
STREET 'J':	206'
STREET 'K':	1,054'
STREET 'L':	598'
STREET 'M':	2,260'
STREET 'N':	225'

GENERAL NOTES:

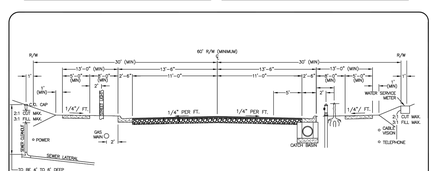
1. BASED ON AN ALTA/NSPS LAND TITLE SURVEY COMPLETED BY MCADAMS.
2. BEARINGS ARE RELATIVE TO NC GRID NORTH NAD 83 (2011).
3. FLOOD NOTE: FLOOD ZONE INFORMATION IS PER FEMA F.I.R.M. MAP NO. 3710357600J, DATED SEPTEMBER 28, 2007.
4. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.
5. ANY PROPERTY DEDICATED AS COMMON OPEN SPACE SHALL BE MAINTAINED BY A DULY CREATED HOME OWNER'S ASSOCIATION.
6. STREET TREES ALONG GROVES STREET AND INTERNAL SUBDIVISION STREETS WILL BE PLANTED IN ACCORDANCE WITH SECTION 11.6-3 OF THE LOWELL UDO.

SITE LEGEND

PROPERTY LINE
RIGHT-OF-WAY LINE
LOT LINE
EASEMENT LINE
STORM SEWER EASEMENT LINE
PHASE LINE
BUFFER LINE
CENTERLINE
SANITARY SEWER
SANITARY SEWER MANHOLE
STORM SEWER
FLARED END SECTION
ENDWALL SECTION
CATCH BASIN
DROP INLET
JUNCTION BOX
WATERLINE
FORCE MAIN
RETAINING WALL
TREE CONSERVATION AREA (FINAL LOCATIONS TBD)
OPEN SPACE (FINAL LOCATIONS TBD)
WETLAND AREA
BUFFER AREA

EXISTING LEGEND

CABLE BOX
FIBER OPTIC VAULT
SANITARY SEWER MANHOLE
WATER VALVE
WATER METER
FIRE HYDRANT
POWER POLE
CURB INLET
STORM DRAINAGE MANHOLE
EXISTING IRON PIPE/REBAR
IRON PIPE SET
CALCULATED POINT
SD — STORM DRAIN PIPE
OU — OVERHEAD UTILITY LINES
W — WATER LINE
SS — SANITARY SEWER LINE
G — GAS LINE
X — X — FENCE LINE

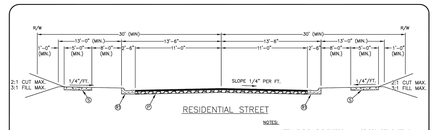


TYPICAL UTILITY PLACEMENT

NOTES:
1. ALL DIMENSIONS NOTED AS MINIMUM ARE SUBJECT TO APPLICABLE STANDARDS.
2. WATER AND SEWER MAY BE REVERSED FROM LOCATION SHOWN ABOVE.
3. WATER AND SEWER SEPARATION SHALL BE IN ACCORDANCE WITH SECTION .0900 OF THE RULES GOVERNING PUBLIC WATER SYSTEMS.
4. WATER AND SEWER SHALL BE INSTALLED UNDER PAVEMENT TO MINIMIZE DISRUPTION TO PRIVATE PROPERTY DURING MAINTENANCE ACTIVITIES.
5. TELEPHONE, CABLE TV, AND POWER SHALL BE LOCATED JUST INSIDE THE STREET RIGHT-OF-WAY (COLOCATION IS REQUIRED).

CITY OF LOWELL, NC	STREET SECTION WITH UTILITIES 60' (MIN.) RIGHT-OF-WAY	STD. 1.02

REVISIONS NO.	DATE	BY	COMMENT



RESIDENTIAL STREET

NOTES:
1. AN ALTERNATIVE PAVEMENT DESIGN MAY BE REQUIRED BASED ON SPECIFIC TRAFFIC PARAMETERS.
2. ALL DIMENSIONS NOTED AS MINIMUMS ARE SUBJECT TO STANDARDS REQUIRED BY CITY OF LOWELL DEVELOPMENT ORDINANCE.

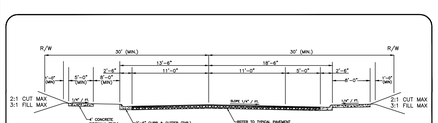
KEY
A 2'-6" CURB AND GUTTER
B 4" CONCRETE SIDEWALK
C TYPICAL PAVEMENT SECTION

TYPICAL MINIMUM PAVEMENT SECTION (MINIMUM)

NOT TO SCALE

CITY OF LOWELL, NC	STREET SECTION 60' (MIN.) RIGHT-OF-WAY	STD. 1.01

REVISIONS NO.	DATE	BY	COMMENT



NOT TO SCALE

STREET SECTION WITH PARALLEL PARKING
60' (MIN.) RIGHT-OF-WAY

Know what's below. Call before you dig.

CONTRACTOR SHALL NOTIFY "NC811" (811) OR (1-800-632-4949) AT LEAST 3 FULL BUSINESS DAYS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. CONTRACTOR SHALL CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCATOR SERVICES INDEPENDENT OF "NC811". REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY.

GRAPHIC SCALE
0 100 200 400
1 inch = 200 ft.

PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

McADAMS
The John R. McAdams Company, Inc.
2100 South Tryon Street
Suite 400
Charlotte, NC 28203
phone 704. 527. 0800
fax 919. 361. 2269
license number: C-0293, C-187
www.mcadamsco.com

CLIENT

JASON GALLOWAY
LENNAR
6701 CARMEL ROAD SUITE 245
CHARLOTTE, NC 28226

SPENCER RIDGE
PRELIMINARY PLAT
LOWELL SPENCER MOUNTAIN ROAD
LOWELL, NORTH CAROLINA, 28098

NORTH CAROLINA CERTIFICATE OF AUTHORIZATION
THE JOHN R. McADAMS COMPANY, INC.
C-0293

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046788
STEVEN M. MEINTER
STEVEN M. MEINTER
NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AND SEALED BY ROBERT A. WOODARD

REVISIONS

NO.	DATE

PLAN INFORMATION

PROJECT NO.	LEN-23006
FILENAME	LEN23006-PP-OAS1
CHECKED BY	SAW
DRAWN BY	MOM
SCALE	1" = 200'
DATE	05.30.2023

SHEET

OVERALL PRELIMINARY PLAT

PL-1

M:\Projects\LEN\23006\04 Production\Engineering\Construction Drawings\Civil\Current Drawings\LEN23006-PP-OAS1.dwg, 5/31/2023 2:37:22 PM, Ryan Reimer

AREA CONDITIONS

The area of influence of the site as defined by North Carolina Department of Transportation (NCDOT) staff includes three existing intersections and five accesses at three locations (see Appendix for the approved scoping information).

1. N Main Street & W 1st Street (Signalized)
2. N Main Street & McAdenville Road (Signalized)
3. Lowell Spencer Mountain Road & Stanley Spencer Mountain Road (Unsignalized)
4. Lowell Spencer Mountain Road & Access "A" (Unsignalized)
5. Lowell Spencer Mountain Road & Access "B"/Access "C" (Unsignalized)
6. Lowell Spencer Mountain Road & Access "D"/Access "E" (Unsignalized)

N Main Street facing north at W 1st Street

N Main Street facing north at McAdenville Road

Morning (7:00-9:00 AM) and afternoon (4:00-6:00 PM) peak period turning movement counts (TMCs) were collected at all intersections on Wednesday, August 31, 2022 (while local schools were in session). See Appendix for raw count data sheets.

According to NCDOT's Functional Classification for roadways, Lowell Spencer Mountain Road is a Minor Arterial with a posted speed limit of 45 mph (within the vicinity of the study area). The roadway is a two-lane undivided facility, with no bike lanes, curb/gutter, planting strip, or sidewalk present on either side of the roadway.

According to NCDOT's Functional Classification for roadways, Stanley Spencer Mountain Road is a Minor Arterial with a posted speed limit of 45 mph (in the vicinity of the study area). The roadway is a two-lane undivided facility, with no bike lanes, curb/gutter, planting strip, or sidewalk present on either side of the roadway.

In addition to the intersection TMCs, geospatial information provided by NCDOT's ArcGIS portal (*Go! NC*) was considered to further evaluate area conditions, such as capacity and safety.

Annual average daily traffic (AADT) for two-way volumes on roadways within the area of influence are depicted in Table 1 based on latest data.

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

Roadway	AADT (Year)
N Main Street north of W 1st Street	10,500 (2021)
S Main Street south of W 1st Street	5,000 (2021)
W 1st Street west of S Main Street	9,200 (2021)
E 1st Street east of N Main Street	5,300 (2021)
McAdenville Road east of N Main Street	7,600 (2021)
N Main Street north of McAdenville Road	8,400 (2021)
Lowell Spencer Mountain Road south of Stanley Spencer Mountain Road	3,400 (2021)
Stanley Spencer Mountain Road west of Lowell Spencer Mountain Road	5,200 (2021)
Stanley Spencer Mountain Road east of Lowell Spencer Mountain Road	5,500 (2021)

Crash frequency per intersection is reported in Table 2 with data ranging from January 1, 2017, to December 31, 2021.

Table 2: Crash Data from 2017-2021

Intersection	Severity Type			Total Crashes
	K & A Injury Crashes	B & C Injury Crashes	PDO Crashes	
N Main Street & McAdenville Road	**0**	**0**	**5**	**5**
Lowell Spencer Mountain Road & Main Street /Stanley Spencer Mountain Road	**0**	**1**	**7**	**8**

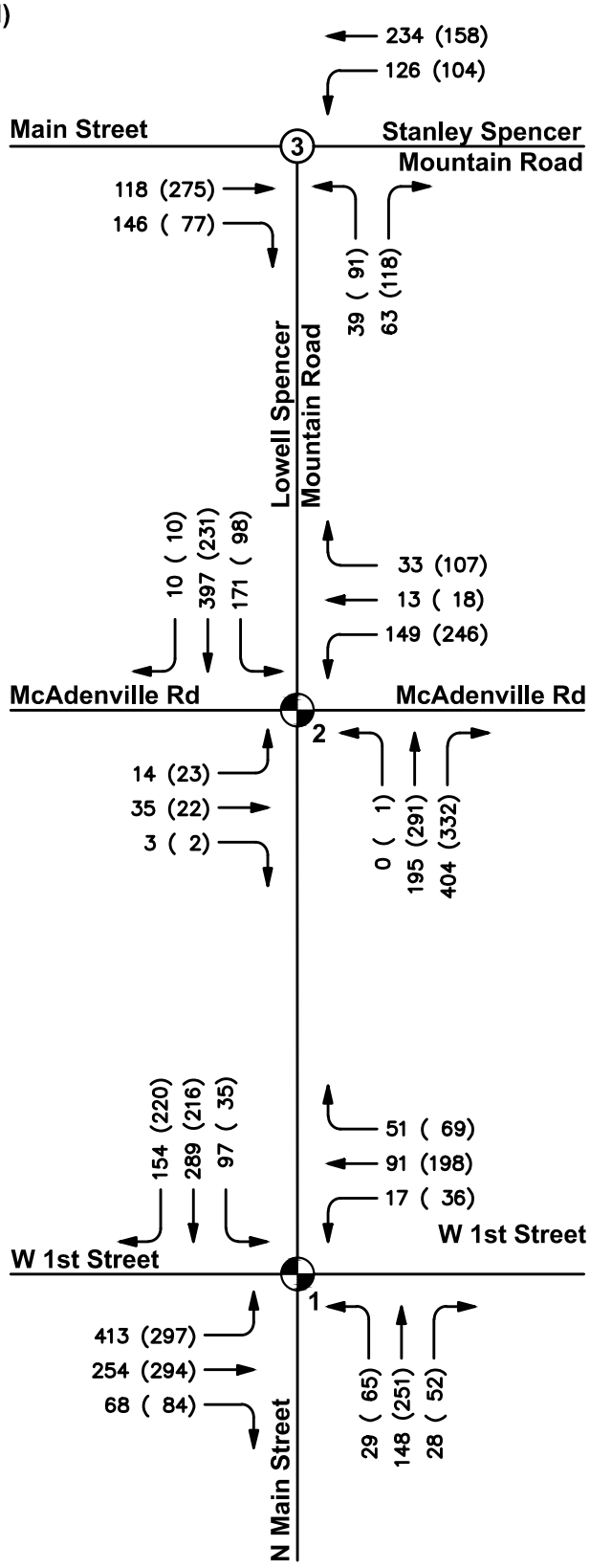
Notes: **K**: Fatality **A:** A injury type (disabling) **B:** B injury type (evident) **C:** injury type (possible) **PDO:** Property Damage Only

Figure 2 presents the existing TMCs for the AM and PM peak hours. Figure 3 presents the site directional distribution. These directional distribution percentages were approved by NCDOT and Town of Lowell staff per existing traffic patterns.

LEGEND

- Traffic Signal
- Stop Sign Control
- Directional Movement

VOLUMES: AM (PM)



Turning Movement Counts (TMCs) were collected at all study intersection on Wednesday, August 31, 2022.

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SPENCER MOUNTAIN TIA

LOWELL, NC

LENNAR
6701 CARMEL ROAD, SUITE 425
CHARLOTTE, NC 28226

EXISTING PEAK HOUR TRAFFIC VOLUMES

0' XX XX N

SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2023

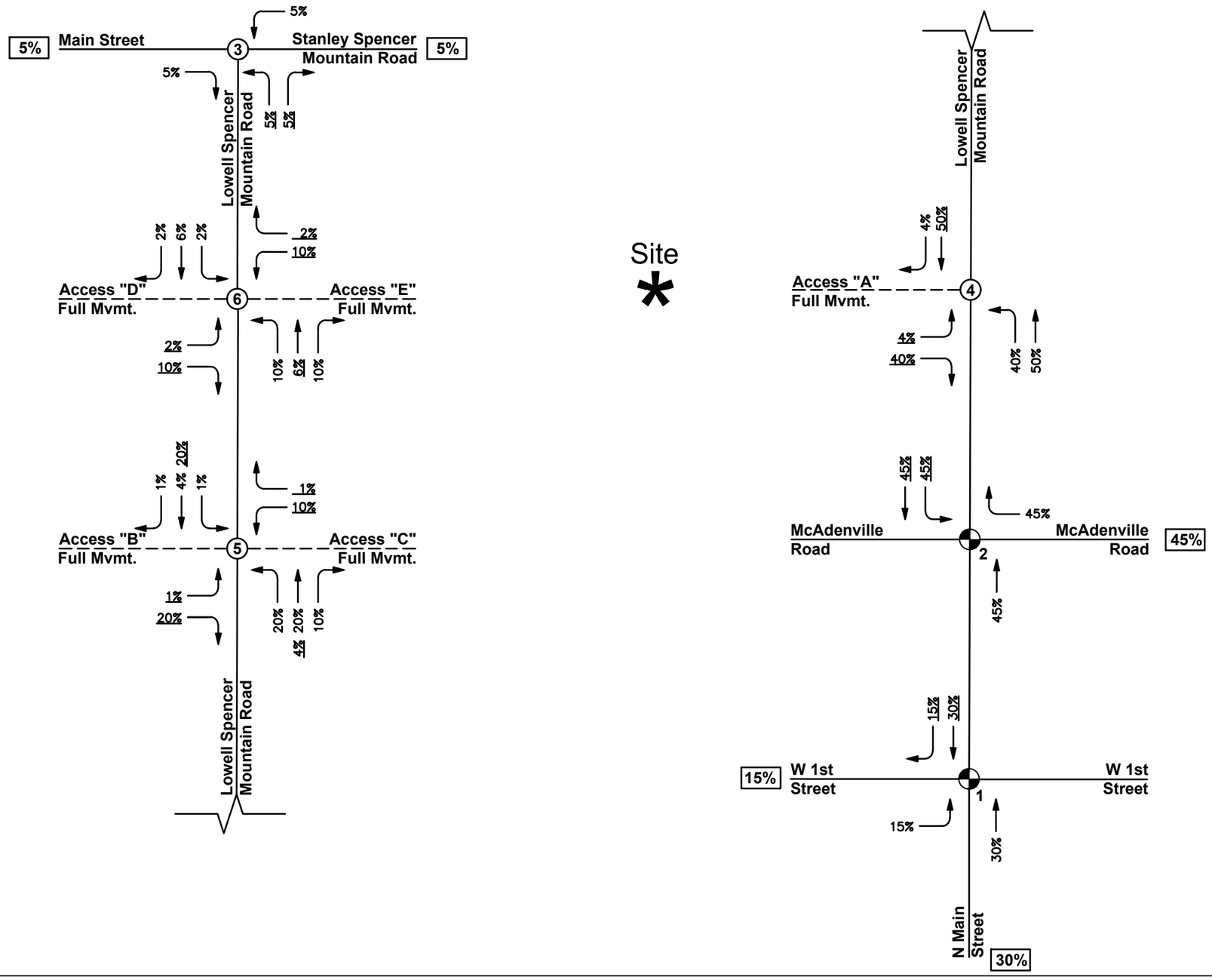
REVISIONS:

Figure 2

LEGEND

- Traffic Signal
- Stop Sign Control
- Directional Movement

xx%/ xx% Enter/Exit Distribution Percentage



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SITE DIRECTIONAL DISTRIBUTION

0' XX XX N
SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2022

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Figure 3

PROJECTED TRAFFIC

The daily and peak-hour-trip-generation data for the site is presented in Table 3. Values derived for the anticipated trips generated by the site are obtained from the Institute of Transportation Engineers, Trip Generation Manual, 11th Edition, 2021.

Table 3: Site Trip Generation

Land Use [ITE Code]			Daily	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Proposed Development									
Single Family Detached Housing [210]	406	DU	3,662	67	200	267	234	137	371

References:
Trip Generation, 11th Edition, Institute of Transportation Engineers, Washington, DC. 2021.

The trip generation results indicate that the site is expected to generate 267 AM peak hour trips and 371 PM peak hour trips.

The projected background traffic volumes used in the future year analyses were developed from the existing peak hour TMCs. Per NCDOT and Lowell staff, a 1% compounded annual growth rate was used for the background volumes. The 2029 No Build volumes for the AM and PM peak hours are presented in Figure 4.

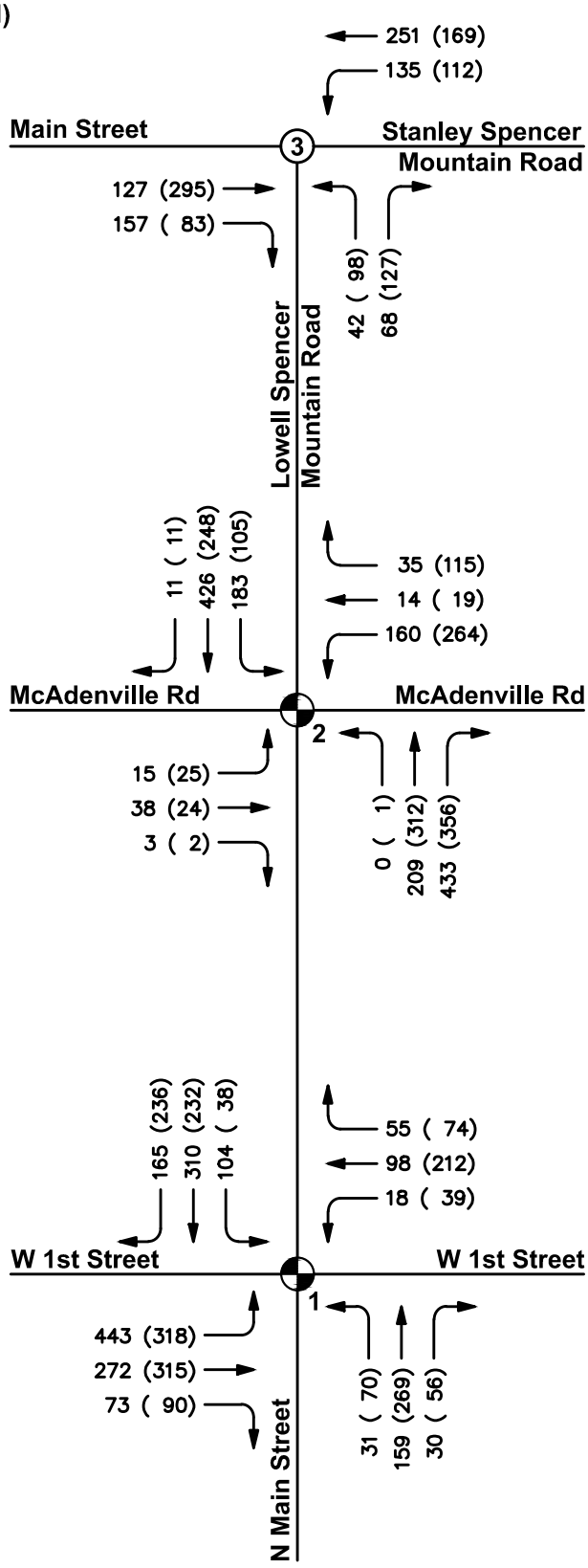
The 2029 AM and PM Build conditions peak hour traffic volumes are presented in Figures 5 and 6, respectively. The No Build traffic is indicated to the far left of the movement arrows, followed by the site in parentheses. The volumes are added to obtain the projected total traffic for that movement:

No Build + (Site) = Total

LEGEND

- Traffic Signal
- Stop Sign Control
- Directional Movement

VOLUMES: AM (PM)



Existing volumes were grown by 1% compounded annually in order to obtain 2029 No Build volumes.

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2029 NO BUILD PEAK HOUR TRAFFIC VOLUMES

0' XX XX N
SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

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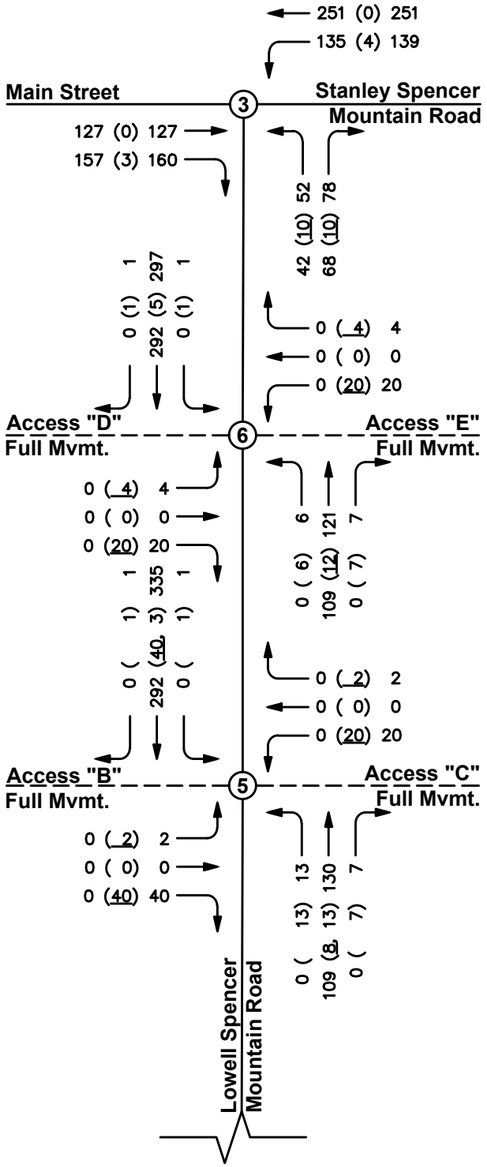
Figure 4

LEGEND

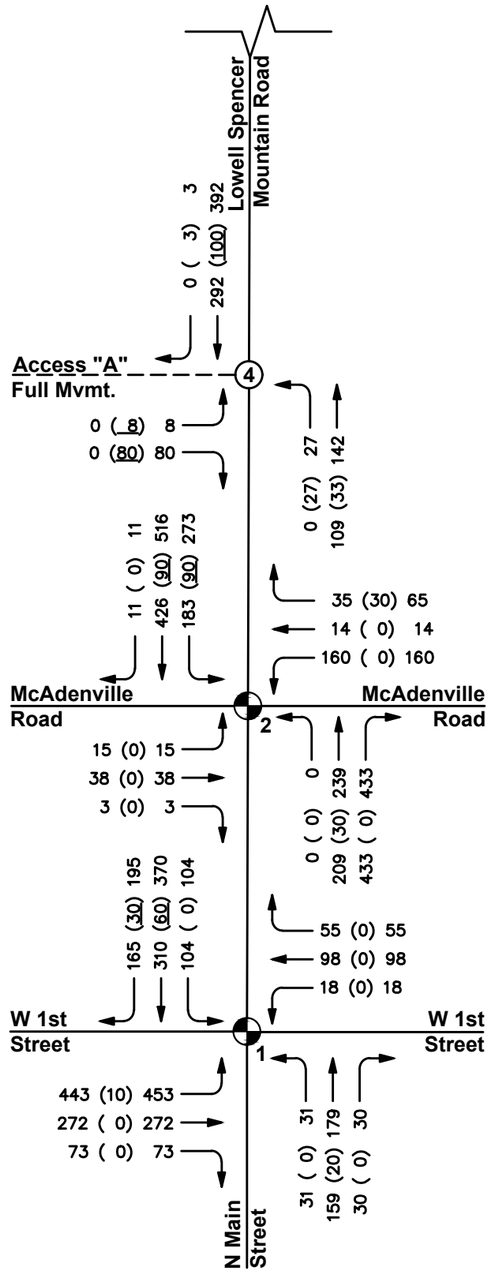
- Traffic Signal
- Stop Sign Control
- Directional Movement

VOLUMES: No Build (Site) Total



Site

AM Trips
Enter 67
Exit 200



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2029 BUILD AM PEAK HOUR TRAFFIC VOLUMES

0' XX XX N

SCALE: NTS

PROJECT #: 640-012
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Figure 5

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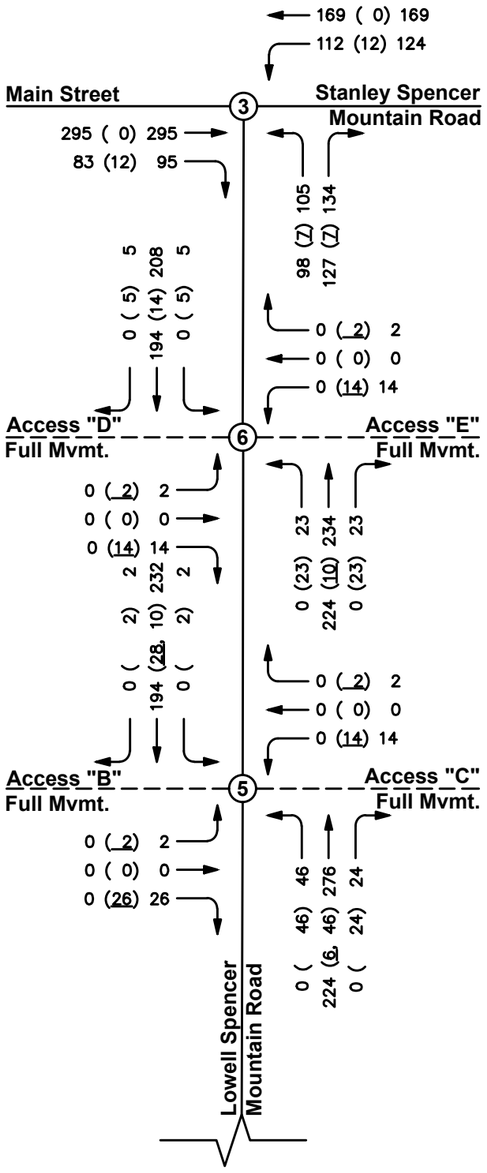
LEGEND

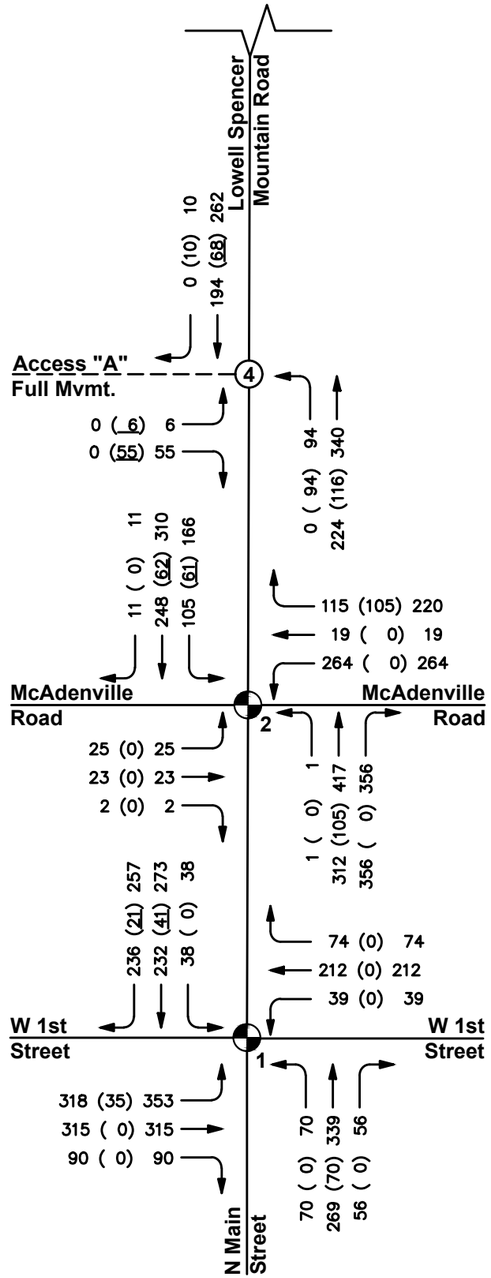
- Traffic Signal
- Stop Sign Control
- Directional Movement

VOLUMES: No Build (Site) Total



Site

PM Trips
Enter 234
Exit 137



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2029 BUILD PM PEAK HOUR TRAFFIC VOLUMES

0' XX XX N
SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2023

REVISIONS:

Figure 6

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 full build-out in 2029.

Level of service (LOS) of an intersection or approach is a qualitative MOE of traffic operations. It is a measure of average control delay in time within a peak period. The Transportation Research Board's Highway Capacity Manual[1] (HCM) defines the LOS thresholds established for signalized and unsignalized intersections per the following exhibits:

Intersection LOS	Exhibit 19-8 Signalized Intersection Control Delay per Vehicle (sec/vehicle)	Exhibit 20-2 Unsignalized Intersection Control Delay per Vehicle (sec/vehicle)
A	≤10.0	≤ 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	>80.0	> 50.0

For the analysis of unsignalized intersections, intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. It should be noted that stop sign-controlled streets/driveways intersecting major streets typically experience long delays during peak hours, while most of the traffic moving through the intersection on the major street experiences little or no delay.

This report provides analysis of the traffic operations within the area of influence, according to the standards set by NCDOT's "*Policy on Street and Driveway Access to North Carolina Highways*, Chapter 4, Part C". It provides recommended access management for the site and intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

- Existing Conditions
- 2029 No Build Conditions
- 2029 Build Conditions

1 National Research Council. Transportation Research Board. Highway Capacity Manual 6th Ed., Washington, DC. 2016.

NCDOT ANALYSIS REQUIREMENTS - To determine the mitigation responsibility of the developer, this study compares 2029 Build results to the 2029 No Build results.

- Per Chapter 5, Section J of the *August 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 NCDOT 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.*

SYNCHRO 11 was the software tool used in determining the delay, capacity, and corresponding LOS at the study intersections. SimTraffic 11, a traffic simulation software application for unsignalized and signalized intersections, was used to calculate the maximum queue lengths at the study intersections. The Synchro and SimTraffic results of each scenario are displayed per intersection and are presented in Tables 4 – 15.

Base assumptions for the analysis scenarios include:

- A 1% per year background growth rate between the existing and future 2029 conditions
- All study intersections and movements assume a 0.90 peak hour factor (PHF)
- Observed heavy vehicle (H.V) percentages (from TMCs) were used in all analysis for all intersections, a minimum of 2% was applied to proposed intersections and to approaches with less than 2% H.V.
- A minimum volume of 4 vehicles per hour for all allowable movements
- Existing signal operations were used in the existing conditions. See Appendix for existing signal plans
- All permitted/protected left turns were adjusted to protected only in No Build and Build scenarios where applicable
- Signal timings were optimized in all scenarios based on NCDOT parameters
    - Yellow, red, and lost times were adjusted to NCDOT parameters (5,2, -2)
    - RTOR was disable for all scenarios

1. *N Main Street & W 1st Street (Signalized)*

Table 4: N Main St & W 1st St Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
Existing Conditions						
Intersection	C	21.5	0.88	B	19.9	0.86
Eastbound - W 1st St	C	25.4	-	C	27.2	-
Westbound - W 1st St	A	9.7	-	B	14.0	-
Northbound - N Main St	B	15.1	-	B	14.0	-
Southbound - N Main St	C	22.1	-	B	17.7	-
2029 No Build Conditions						
Intersection	C	25.2	0.94	C	21.9	0.89
Eastbound - W 1st St	C	31.9	-	C	28.8	-
Westbound - W 1st St	B	10.2	-	B	13.4	-
Northbound - N Main St	B	14.9	-	B	15.8	-
Southbound - N Main St	C	24.2	-	C	22.2	-
2029 Build Conditions						
Intersection	C	33.4	1.00	C	27.2	0.98
Eastbound - W 1st St	D	40.3	-	D	37.6	-
Westbound - W 1st St	B	10.9	-	B	13.7	-
Northbound - N Main St	B	15.0	-	B	17.9	-
Southbound - N Main St	D	37.4	-	C	28.8	-
2029 Build with Improvements Conditions						
Intersection	C	21.1	0.88	B	19.0	0.86
Eastbound - W 1st St	C	23.0	-	C	23.4	-
Westbound - W 1st St	A	8.0	-	B	10.7	-
Northbound - N Main St	B	18.1	-	B	19.8	-
Southbound - N Main St	C	23.3	-	B	17.2	-

Existing Conditions

Currently, the intersection operates at LOS “C” during the AM peak hour and LOS “B” during the PM peak hour.

2029 No Build Conditions

With the inclusion of growth in the background traffic, the intersection operates at LOS “C” during both the AM and PM peak hours.

2029 Build Conditions

When comparing the impact of the 2029 Build to the 2029 No Build conditions, the intersection continues to operate at LOS “C” during both the AM and PM peak hours. The overall intersection delay decreases by approximately 33% in the AM peak hour and 24% in the PM peak hour.

2029 Build with Improvements Conditions

Based on NCDOT guidelines, the analysis results indicate the need to identify mitigation at the study intersection.

The following improvement was tested and is suggested:

- Remark the southbound approach to provide a four-lane section which includes a right turn lane with 100 feet of storage on N. Main Street. The remarked lanes within the existing pavement width should be a minimum of 11 feet wide.

Assuming this improvement in place, the intersection operates at LOS "C" during the AM peak hour and LOS "B" during the PM peak hour.

Table 5: N Main St & W 1st St Queue Lengths

	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 No Build Conditions					
Eastbound Left-Turn (W 1st St)	TERM.	#339'	633'	#253'	560'
Eastbound Thru/Right-Turn (W 1st St)	-	154'	466'	192'	478'
Westbound Left-Turn (W 1st St)	100'	14'	49'	26'	69'
Westbound Thru/Right-Turn (W 1st St)	-	66'	121'	128'	189'
Northbound Left-Turn (N Main St)	100'	28'	119'	55'	174'
Northbound Thru (N Main St)	-	84'	150'	135'	254'
Northbound Right-Turn (N Main St)	TERM.	23'	64'	35'	84'
Southbound Left-Turn (N Main St)	TERM.	m51'	120'	m19'	77'
Southbound Thru/Right-Turn (N Main St)	100'	#318'	425'	#319'	490'
2029 Build Conditions with Improvements					
Eastbound Left-Turn (W 1st St)	TERM.	#320'	440'	#259'	343'
Eastbound Thru/Right-Turn (W 1st St)	-	130'	218'	164'	256'
Westbound Left-Turn (W 1st St)	100'	12'	46'	22'	50'
Westbound Thru/Right-Turn (W 1st St)	-	56'	123'	109'	170'
Northbound Left-Turn (N Main St)	100'	29'	84'	52'	126'
Northbound Thru (N Main St)	-	105'	142'	197'	223'
Northbound Right-Turn (N Main St)	TERM.	25'	68'	39'	70'
Southbound Left-Turn (N Main St)	TERM.	m67'	462'	m22'	242'
Southbound Thru (N Main St)	100'	#248'	200'	m140'	199'
Southbound Right-Turn (E Main St)	100'	117'	150'	m#150'	150'

When comparing the Build with Improvements conditions to the No Build conditions from the queueing and blocking reports, no additional developer required improvements should be deemed necessary at this intersection.

2. *N Main Street & McAdenville Road (Signalized)*

Table 6: N Main St & McAdenville Rd Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
Existing Conditions						
Intersection	A	9.0	0.54	B	15.1	0.68
Eastbound - McAdenville Rd	B	18.3	-	B	14.0	-
Westbound - McAdenville Rd	C	24.4	-	C	22.7	-
Northbound - N Main St	A	4.1	-	B	12.9	-
Southbound - N Main St	A	7.9	-	B	10.8	-
2029 No Build Conditions						
Intersection	A	9.5	0.61	B	15.6	0.70
Eastbound - McAdenville Rd	B	19.8	-	B	13.4	-
Westbound - McAdenville Rd	C	27.6	-	C	22.2	-
Northbound - N Main St	A	4.0	-	B	13.8	-
Southbound - N Main St	A	8.1	-	B	11.8	-
2029 Build Conditions						
Intersection	B	10.1	0.61	B	17.1	0.74
Eastbound - McAdenville Rd	B	19.8	-	B	15.2	-
Westbound - McAdenville Rd	C	27.0	-	C	26.3	-
Northbound - N Main St	A	3.8	-	B	13.8	-
Southbound - N Main St	A	9.6	-	B	12.8	-

Existing Conditions

Currently the intersection operates at LOS “A” during the AM peak hour and LOS “B” during the PM peak hour.

2029 No Build Conditions

With the inclusion of growth in the background traffic, the intersection operates at LOS “A” during the AM peak hour and LOS “B” during the PM peak hour.

2029 Build Conditions

When comparing the impact of the 2029 Build to the 2029 No Build conditions, the intersection drops to LOS “B” during the AM peak hour and continues to operate at LOS “B” during the PM peak hour. The overall intersection delay increases by approximately 6% in the AM peak hour and 10% in the PM peak hour.

Although the overall intersection LOS drops during the AM peak hour, the actual delay increase is only 0.6 seconds, and the intersection still operates well above acceptable standards. Therefore, no developer required improvements should be deemed necessary at this intersection.

Table 7: N Main St & McAdenville Rd Queue Lengths

	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 No Build Conditions					
Eastbound Left/Thru/Right-Turn (McAdenville Rd)	-	44'	84'	32'	73'
Westbound Left-Turn (McAdenville Rd)	TERM.	112'	222'	152'	250'
Westbound Thru/Right-Turn (McAdenville Rd)	300'	40'	106'	70'	124'
Northbound Thru/Left-Turn (N Main St)	-	m9'	87'	m119'	177'
Northbound Right-Turn (N Main St)	300'	m47'	180'	m162'	178'
Southbound Left-Turn (N Main St)	TERM.	67'	269'	61'	173'
Southbound Thru (N Main St)	-	148'	223'	118'	184'
2029 Build Conditions					
Eastbound Left/Thru/Right-Turn (McAdenville Rd)	-	44'	97'	36'	86'
Westbound Left-Turn (McAdenville Rd)	TERM.	112'	170'	#187'	245'
Westbound Thru/Right-Turn (McAdenville Rd)	300'	58'	149'	135'	224'
Northbound Thru/Left-Turn (N Main St)	-	m41'	91'	m201'	234'
Northbound Right-Turn (N Main St)	300'	m114'	181'	m175'	194'
Southbound Left-Turn (N Main St)	TERM.	112'	541'	102'	272'
Southbound Thru (N Main St)	-	192'	452'	133'	196'

When comparing the Build conditions to the No Build conditions from the queueing and blocking reports, no developer required improvements should be deemed necessary at this intersection.

3. Stanley Spencer Mountain Road & Lowell Spencer Mountain Road *(Unsignalized)*

Table 8: Stanley Spencer Mtn Rd & Lowell Spencer Mtn Rd Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
Existing Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Main St	A	0.0	-	A	0.0	-
Westbound - Stanley Spencer Mtn Rd	A	2.9	-	A	3.4	-
Northbound - Lowell Spencer Mtn Rd	B	13.8	-	C	20.1	-
2029 No Build Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Main St	A	0.0	-	A	0.0	-
Westbound - Stanley Spencer Mtn Rd	A	2.9	-	A	3.4	-
Northbound - Lowell Spencer Mtn Rd	B	14.8	-	C	23.6	-
2029 Build Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Main St	A	0.0	-	A	0.0	-
Westbound - Stanley Spencer Mtn Rd	A	3.0	-	A	3.7	-
Northbound - Lowell Spencer Mtn Rd	C	16.0	-	D	27.6	-

Existing Conditions

Currently the worst leg of the intersection (northbound) operates at LOS “B” during the AM peak hour and LOS “C” during the PM peak hour.

2029 No Build Conditions

With the inclusion of growth in the background traffic, the worst leg of the intersection (northbound) operates at LOS “B” during the AM peak hour and LOS “C” during the PM peak hour.

2029 Build Conditions

When comparing the impact of the 2029 Build to the 2029 No Build conditions, the worst leg of the intersection (northbound) drops to LOS “C” during the AM peak hour and LOS “D” during the PM peak hour. The delay increases by 8% in the AM peak hour and 17% in the PM peak hour.

Although the northbound approach LOS drops during the AM and PM peak hours, the actual delay increase is only 1.2 and 4.0 seconds, respectively, and the approach still operates at or above acceptable standards. Therefore, no developer required improvements should be deemed necessary at this intersection.

Table 9: Stanley Spencer Mtn Rd & Lowell Spencer Mtn Rd Queue Lengths

	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 No Build Conditions					
Westbound Thru/Left-Turn (Stanley Spencer Mtn Rd)	-	10'	126'	10'	138'
Northbound Left/Right-Turn (Lowell Spencer Mtn Rd)	TERM.	25'	112'	88'	184'
2029 Build Conditions					
Westbound Thru/Left-Turn (Stanley Spencer Mtn Rd)	-	10'	98'	10'	104'
Northbound Left/Right-Turn (Lowell Spencer Mtn Rd)	TERM.	33'	122'	108'	175'

When comparing the Build conditions to the No Build conditions from the queueing and blocking reports, no developer required improvements should be deemed necessary at this intersection.

4. Lowell Spencer Mountain Road & Access "A" (Unsignalized)

Table 10: Lowell Spencer Mtn Rd & Access "A" Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
2029 Build Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Access "A"	B	12.3	-	B	11.3	-
Northbound - Lowell Spencer Mtn Rd	A	1.3	-	A	1.8	-
Southbound - Lowell Spencer Mtn Rd	A	0.0	-	A	0.0	-

2029 Build Conditions

We propose the following full-movement access configuration:

- One ingress lane and one egress lane (a terminating eastbound combined left-right turn lane) on proposed Access "A".
- Construct a northbound left turn lane with 100 feet of storage on Lowell Spencer Mountain Road.
- Provide a minimum 50-foot internal protected stem.

Assuming this access configuration in place, the worst leg of the intersection (eastbound) operates at LOS "B" during both the AM and PM peak hours.

Table 11: Lowell Spencer Mtn Rd & Access "A" Queue Lengths

	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 Build Conditions					
Eastbound Left/Right-Turn (Access "A")	TERM.	15'	69'	10'	53'
Northbound Left-Turn (Lowell Spencer Mtn Rd)	100'	3'	52'	8'	61'

Based on the results from the queueing and blocking reports, no additional storage lanes should be deemed necessary at this intersection.

5. Lowell Spencer Mountain Road & Access "B"/Access "C" (Unsignalized)

Table 12: Lowell Spencer Mtn Rd & Access "B"/Access "C" Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
2029 Build Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Access "B"	B	11.4	-	B	11.4	-
Westbound - Access "C"	B	14.0	-	C	15.6	-
Northbound - Lowell Spencer Mtn Rd	A	0.7	-	A	1.0	-
Southbound - Lowell Spencer Mtn Rd	A	0.1	-	A	0.1	-

2029 Build Conditions

We propose the following full-movement access configuration:

- One ingress lane and one egress lane (a combined eastbound left/thru/right turn lane) on proposed Access "B".
- One ingress lane and one egress lane (a combined westbound left/thru/right turn lane) on proposed Access "C".
- Provide a minimum 50-foot internal protected stem.

Assuming this access configuration in place, the worst leg of the intersection (westbound) operates at LOS "B" during the AM peak hour and LOS "C" during the PM peak hour.

Table 13: Lowell Spencer Mtn Rd & Access "B"/Access "C" Queue Lengths

	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 Build Conditions					
Eastbound Approach (Access "B")	-	8'	69'	5'	58'
Westbound Approach (Access "C")	-	5'	35'	5'	44'
Northbound Approach (Lowell Spencer Mtn Rd)	-	0'	51'	3'	76'
Southbound Approach (Lowell Spencer Mtn Rd)	-	0'	50'	0'	38'

Although the turn lane warrant nomograph (see Appendix) suggests a northbound left turn lane with 50 feet of storage on Lowell Spencer Mountain Road, considering the AADT is less than 4,000 VPD and based on the results from the queueing and blocking reports, no additional storage lanes are suggested at this intersection.

6. *Lowell Spencer Mountain Road & Access "D"/Access "E" (Unsignalized)*

Table 14: Lowell Spencer Mtn Rd & Access "D"/Access "E" Analysis Results

Approach	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)
2029 Build Conditions						
Intersection	NA	NA	-	NA	NA	-
Eastbound - Access "D"	B	11.1	-	B	11.3	-
Westbound - Access "E"	B	12.8	-	B	13.5	-
Northbound - Lowell Spencer Mtn Rd	A	0.4	-	A	0.6	-
Southbound - Lowell Spencer Mtn Rd	A	0.1	-	A	0.2	-

2029 Build Conditions

We propose the following full-movement access configuration:

- One ingress lane and one egress lane (a combined eastbound left/thru/right turn lane) on proposed Access "D".
- One ingress lane and one egress lane (a combined westbound left/thru/right turn lane) on proposed Access "E".
- Provide a minimum 50-foot internal protected stem.

Assuming this access configuration in place, the worst leg of the intersection (westbound) operates at LOS "B" during both the AM and PM peak hours.

Table 15: Lowell Spencer Mtn Rd & Access "D"/Access "E" Queue Lengths

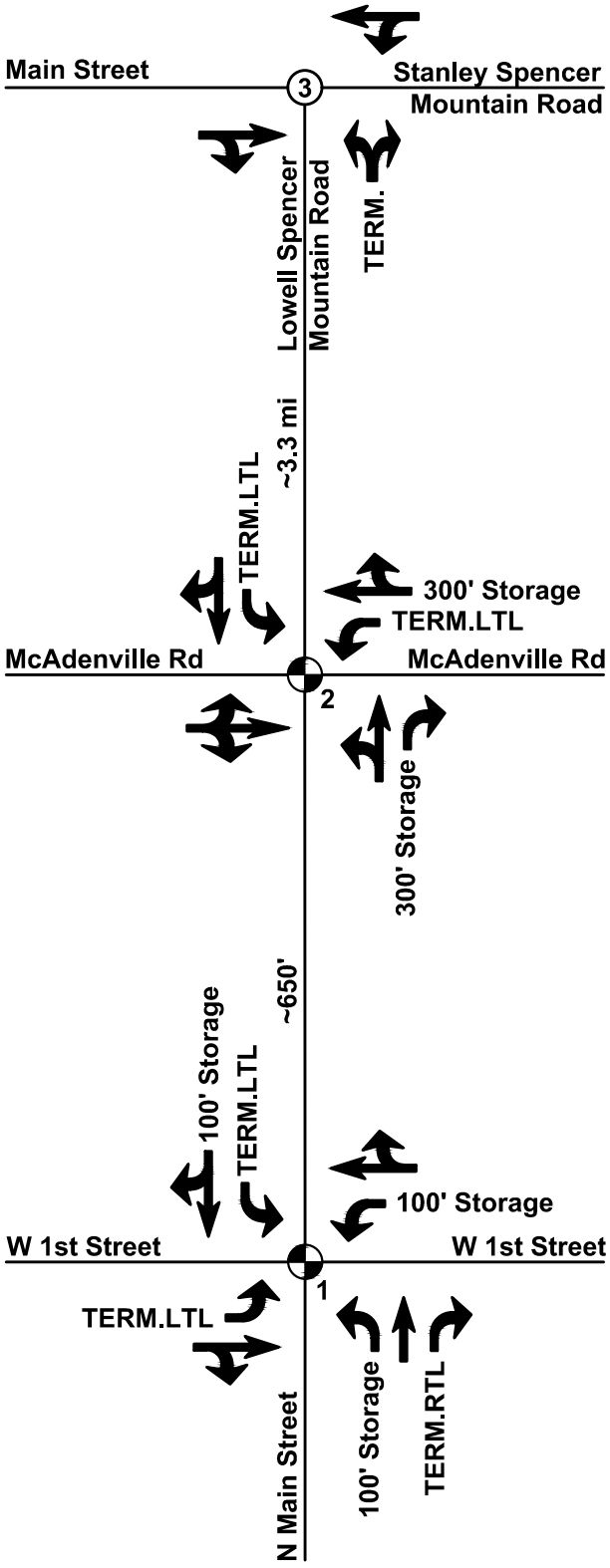
	Storage (ft)	AM PEAK		PM PEAK	
		95th % Queue	Max Queue	95th % Queue	Max Queue
2029 Build Conditions					
Eastbound Approach (Access "D")	-	5'	29'	3'	31'
Westbound Approach (Access "E")	-	5'	36'	5'	36'
Northbound Approach (Lowell Spencer Mtn Rd)	-	0'	32'	3'	62'
Southbound Approach (Lowell Spencer Mtn Rd)	-	0'	12'	0'	12'

Although the turn lane warrant nomograph (see Appendix) suggests a northbound left turn lane with 25 feet of storage on Lowell Spencer Mountain Road, considering the AADT is less than 4,000 VPD and based on the results from the queueing and blocking reports, no additional storage lanes are suggested at this intersection.

The existing and suggested laneage are shown in Figures 7 and 8, respectively. Analysis software result reports per scenario are provided in the Appendix.

LEGEND

- Traffic Signal
- Stop Sign Control
- Existing Laneage



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SPENCER MOUNTAIN TIA

LOWELL, NC

LENNAR
6701 CARMEL ROAD, SUITE 425
CHARLOTTE, NC 28226

EXISTING LANEAGE

0' XX XX N

SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2023

REVISIONS:

Figure 7

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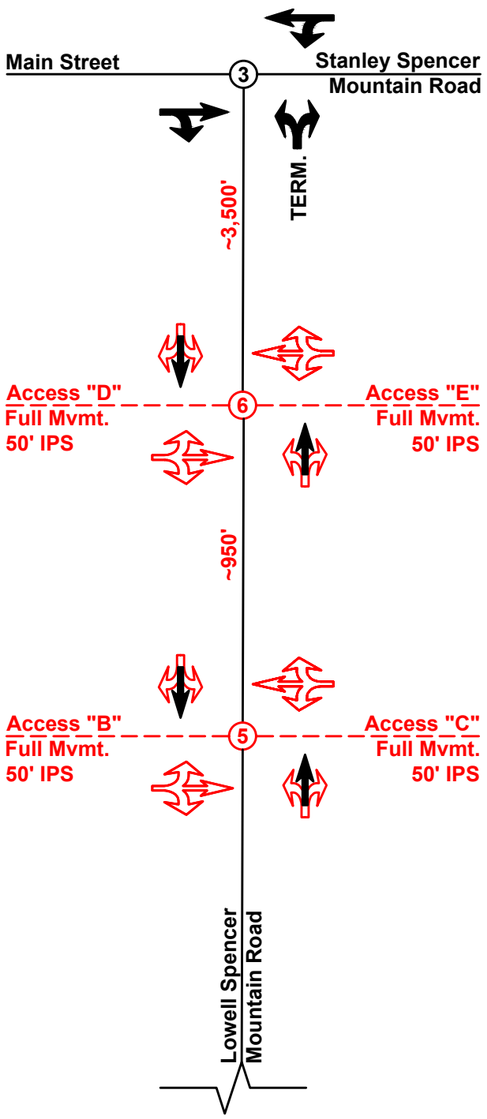
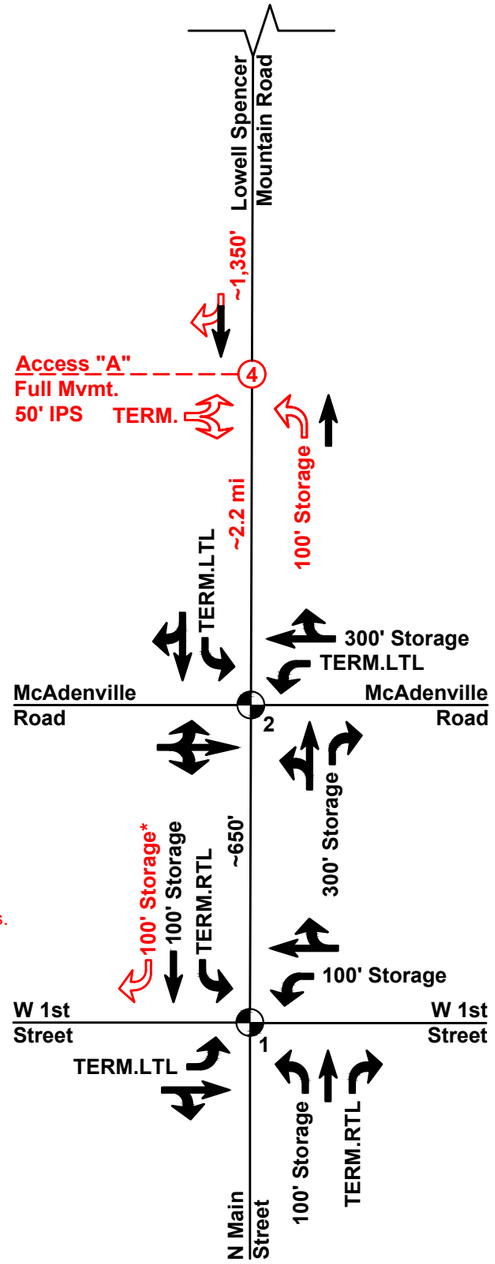
LEGEND

- Traffic Signal
- Stop Sign Control
- Existing Laneage
- Suggested Laneage



Site

*Remark the southbound approach to provide a four-lane section within the existing pavement with minimum 11' lanes.



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SUGGESTED LANEAGE

0' XX XX N
SCALE: NTS

PROJECT #: 640-012
DRAWN BY: MA
CHECKED BY: REG

JULY 2023

REVISIONS:

Figure 8

CONCLUSION

In conclusion, although the proposed Spencer Mountain single-family community will slightly increase the amount of vehicular traffic on the adjacent roadways/corridors, the project will not materially impact adjacent roadways, intersections, or the general public traveling in the area if the site is developed according to the proposed plan and includes the suggested intersection improvement and access configurations.

APPENDIX