TRAFFIC IMPACT ANALYSIS

Summer Dunes Single Family

Locust, North Carolina

AUGUST 9, 2023

IMPACT DESIGNS, INC.
Prepared by: Nicholas Burns, PE

TRAFFIC IMPACT ANALYSIS

Summer Dunes Single Family

LOCUST, NORTH CAROLINA

Nicholas E. Burns 8/9/23

REPORT PREPARED FOR:
M/I Homes of Charlotte, LLC
5350 77 Center Drive, Suite 100
Charlotte, NC 28217

REPORT PREPARED BY
Impact Designs, Inc.
PO Box 3728
Mooresville, NC 28117
nick@impactdesignsinc.com

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EXECUTIVE SUMMARY

A traffic impact study was conducted for the proposed Summer Dunes single family development in accordance NCDOT guidelines. The proposed development is located on the west side of NC-200, north of Maple Street, in Locust, North Carolina. The development is expected to consist of up to 184 single family homes to be completed in 2026. Access to the site is to be provided via a full movement connection to NC-200, a full movement connection to Meadow Creek Church Road, and via an extension of Foxworth Drive.

The study was determined through coordination with NCDOT and consists of the following intersections:

- NC-200 & Meadow Creek Church Road/Bethel Church Road
- NC-200 & Maple Street
- Maple Street & Foxworth Drive
- NC-200 & Access A
- Meadow Creek Church Road & Access B

For the purpose of this analysis, the study intersections listed above were analyzed under the following scenarios:

- Existing (2023) Conditions
- No-Build (2026) Conditions
- Build (2026) Conditions

Traffic operations during the AM and PM peak hours were modeled for each scenario. The results of each scenario were compared to determine impacts from background traffic growth and the proposed development.

The capacity analysis indicates that all movements are expected to operate at LOS C or better under existing and future scenarios with the exception of the eastbound Meadow Creek Church Road approach at NC-200. Under No-Build conditions, this approach is anticipated to operate at LOS C or D, and with the addition of site traffic, the level of service would drop to LOS D or E in the Build scenario. However, the delay is not expected to increase by more than 25 percent, and queueing on Meadow Creek Church Road is anticipated to be similar under Build conditions to No-Build conditions. As such, no mitigation is recommended.

The queueing analysis indicates that the queues under Build conditions are expected to be similar to No-Build conditions. No movements are anticipated to experience excessive queueing.

<u>Recommendations:</u>

- Construct a northbound left turn lane with 50 feet of storage and appropriate taper on NC-200 at Access A.

1. INTRODUCTION

The purpose of this report is to summarize the traffic impact analysis that was completed for the proposed Summer Dunes single family development in Locust, North Carolina. The study was developed in accordance with NCDOT guidelines. The purpose of the study is to determine the potential impact to the surrounding transportation system caused by the traffic generated by the development. This report summarizes the procedures and findings of the traffic impact study.

1.1. Project Summary

The proposed development is located on the west side of NC-200, north of Maple Street, in Locust, North Carolina. The development is expected to consist of up to 184 single family homes to be completed by 2026. This traffic impact study analyzes the effects of the additional traffic associated with the proposed development during the weekday AM (7:00 AM - 9:00 AM) and the weekday PM (4:00 PM - 6:00 PM) peak periods. The study area for the purpose of the analysis includes:

- NC-200 & Meadow Creek Church Road/Bethel Church Road
- NC-200 & Maple Street
- Maple Street & Foxworth Drive
- NC-200 & Access A
- Meadow Creek Church Road & Access B

Refer to Figures 1 and 2 for the site location and the conceptual site plan.

For the purpose of this analysis, the study intersections listed above were analyzed under the following scenarios:

- Existing (2023) Conditions
- No-Build (2026) Conditions
- Build (2026) Conditions

Refer to Appendix A for a copy of the NCDOT TIA Scoping Checklist.

1.2. Existing Roadway Conditions

The primary roadways within the study area are NC-200, Meadow Creek Church Road, and Maple Street. A summary of their existing characteristics is shown in Table 1.

Table 1 – Study Area Summary

Facility Name	Route #	Typical Cross Section	Posted Speed Limit	Maintained By	AADT
N. Central Avenue	NC-200	2-lane undivided	45 MPH	NCDOT	5,500 (2021)
Meadow Creek Church Road	SR 1200	2-lane undivided	35 MPH	NCDOT	1,800 (2016)
Maple Street	N/A	2-lane undivided	25 MPH	Local	No Data

Refer to Figure 3 for an illustration of the existing lane geometry and traffic control at the study intersections.

1.3. Driveway Location

Access to the site is to be provided via a full movement access onto NC-200, a full movement access onto Meadow Creek Church Road, and via an extension of Foxworth Drive.

NORTH

LEGEND

Proposed Site Location

Site Access

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Locust, NC

Site Location Map

Scale: Not to Scale	Figure	1

PRELIMINARY SITE PLAN

SUMMER DUNES (MIH) - June 30, 2023

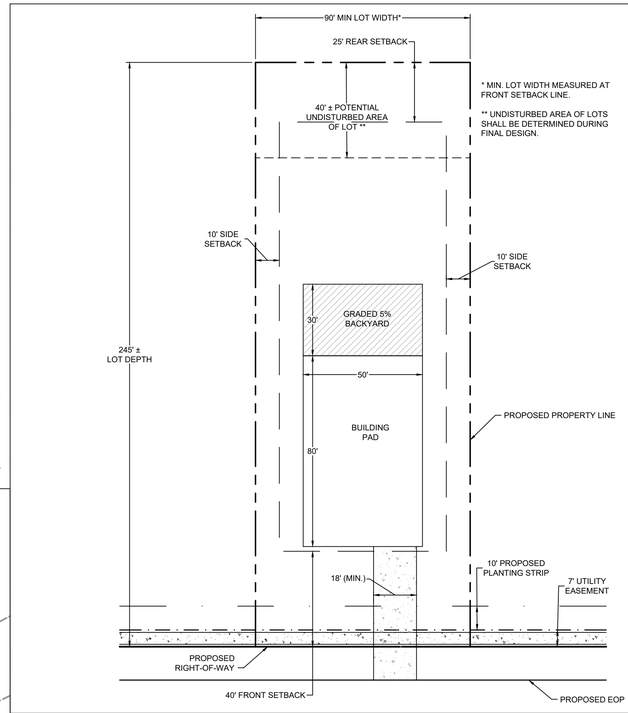
ZONING SUMMARY

PARCEL NUMBERS	557501382519
EXISTING ZONING	OPS (OPEN SPACE DISTRICT) - CITY OF LOCUST, NC
PROPOSED ZONING	OPS (CD) OPEN SPACE DISTRICT (CONDITIONAL DISTRICT)
PROPOSED USE	SF DETACHED RESIDENTIAL
PARCEL AREA	217.23 ± AC
TOTAL PROPOSED LOTS	184 UNITS
DENSITY PROVIDED	184 UNITS / 217.23 AC = 0.85 DUA
MIN. LOT SIZE REQ.	30,000 SF
MIN. LOT SIZE PROV.	22,000 SF (CONDITIONAL)
AVERAGE LOT SIZE PROV.	25,000 SF
MIN. LOT WIDTH:	90'
TYPICAL LOT SIZE PROV.	90' X 245'
REQUIRED SETBACKS	
SIDE SETBACK	10' MIN.
CORNER SETBACK	20' MIN.
FRONT SETBACK	40' MIN.
REAR SETBACK	25' MIN.
UNDISTURBED AREA:	71.7± ACRES (33% OF PROJECT AREA)

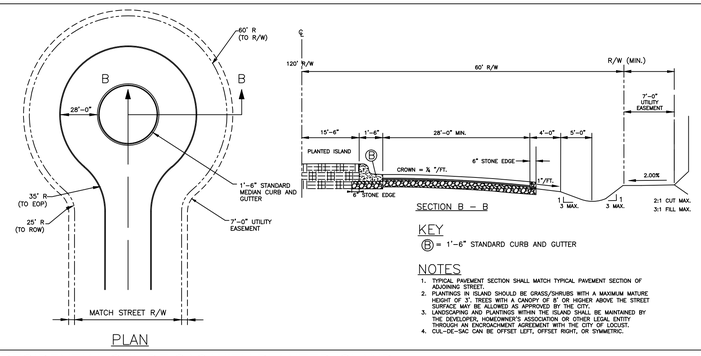
POTENTIAL UNDISTURBED COMMON OPENS SPACE AREA*

POTENTIAL DISTURBED COMMON OPEN SPACE AREA*

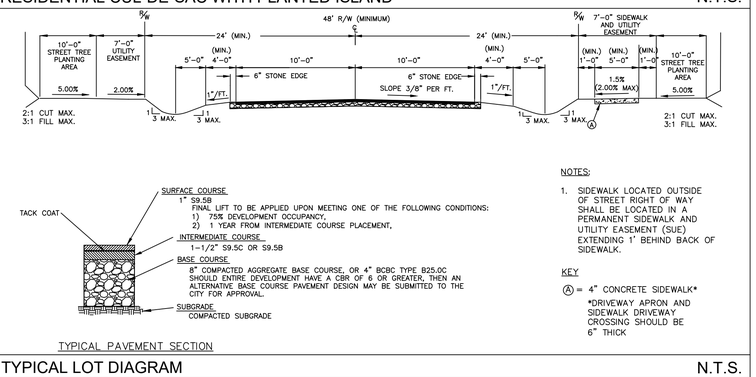
*LOCATION SHALL BE FINALIZED DURING FULL DESIGN PHASE



TYPICAL LOT DIAGRAM 1" = 30'



RESIDENTIAL CUL-DE-SAC WITH PLANTED ISLAND N.T.S.



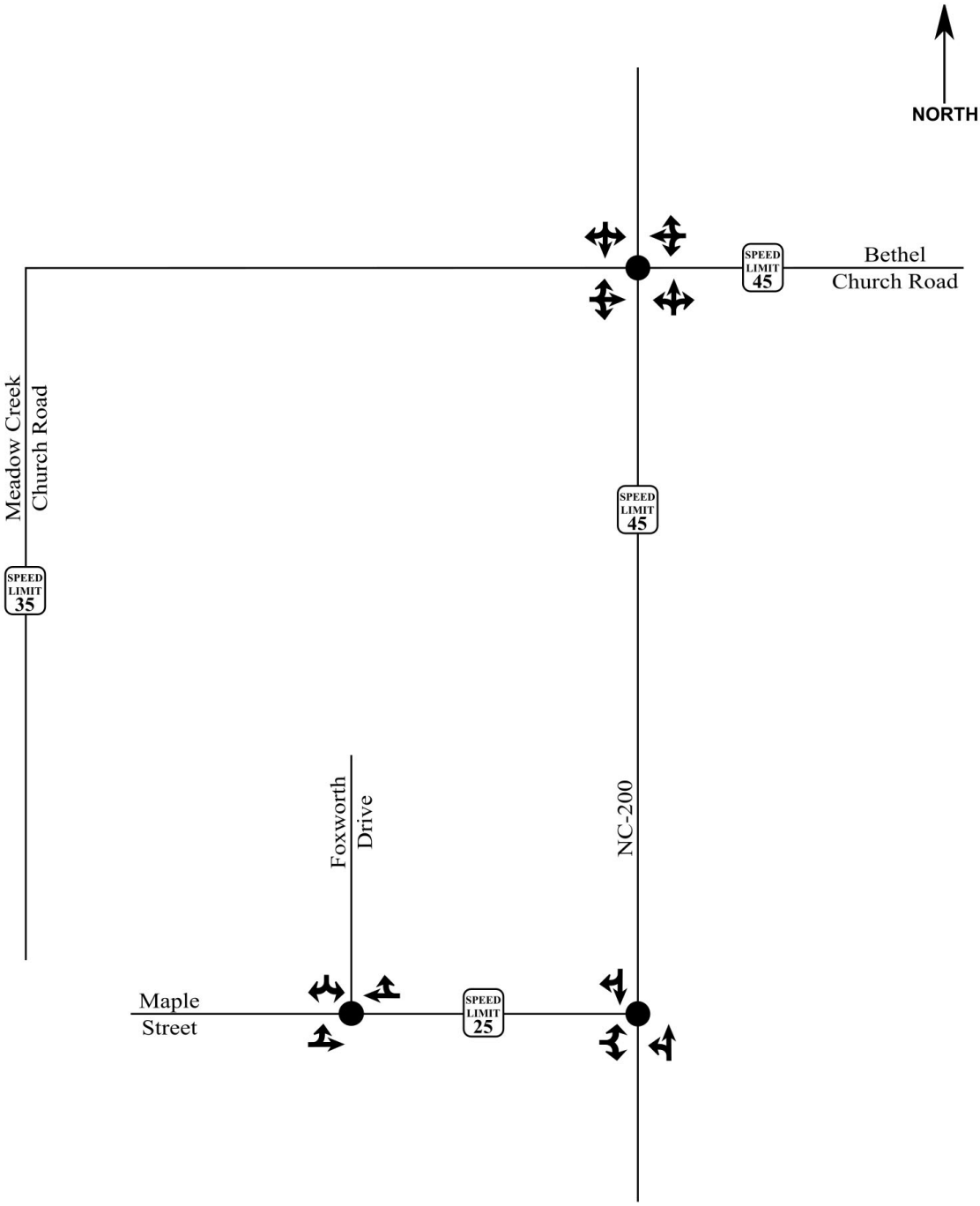
TYPICAL LOT DIAGRAM N.T.S.

SCALE 1"=200'

0 200' 400'

TIMMONS GROUP

YOUR VISION ACHIEVED THROUGH OURS.



LEGEND

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

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Locust, NC

Existing Lane Configurations and Traffic Control

Scale: Not to Scale	Figure	3

2. TRAFFIC VOLUME DEVELOPMENT

2.1. Existing Traffic Volumes

Existing turning movement counts were conducted at the intersections during the weekday AM (7:00 AM to 9:00 AM) and weekday PM (4:00 PM to 6:00 PM) peak periods in May of 2023. The existing (2023) traffic volumes are illustrated in Figure 4. Refer to Appendix B for a copy of the raw traffic count data.

2.2. Projected Traffic Volumes

Based on coordination with NCDOT, a 2% annual growth was applied to the 2023 counts to project traffic volumes for the future year (2026). This growth rate was applied to account for all background growth in the area without any adjacent and/or the proposed developments. Refer to Figure 5 for an illustration of the No-Build (2026) traffic volumes.

2.3. Proposed Development Traffic Volumes

As mentioned previously, the proposed development is expected to consist of up to 184 single family homes to be completed by 2026. The trip generation potential for the development was estimated utilizing methodology contained within the ITE's *Trip Generation Manual*, 11th Edition. Utilizing ITE equations for ITE Code 210 traffic volumes were generated for the weekday daily, the weekday AM peak hour, and the weekday PM peak hour. Refer to Table 2 for a summary of the trip generation potential of the proposed development.

Table 2 – Trip Generation

ITE Land Use (Code)	Density	Independent Variable	Daily Traffic	AM Peak		PM Peak	
				Enter	Exit	Enter	Exit
Single Family Detached Housing (ITE Code 210)	184	Dwelling Units	1,768	32	98	111	65

It is estimated that the proposed development could generate a total of 1,768 trips (in and out) during a typical 24-hour weekday period with 130 trips (32 entering and 98 exiting) generated during the AM peak hour and 176 trips (111 entering and 65 exiting) generated during the PM peak hour at full build-out in 2026.

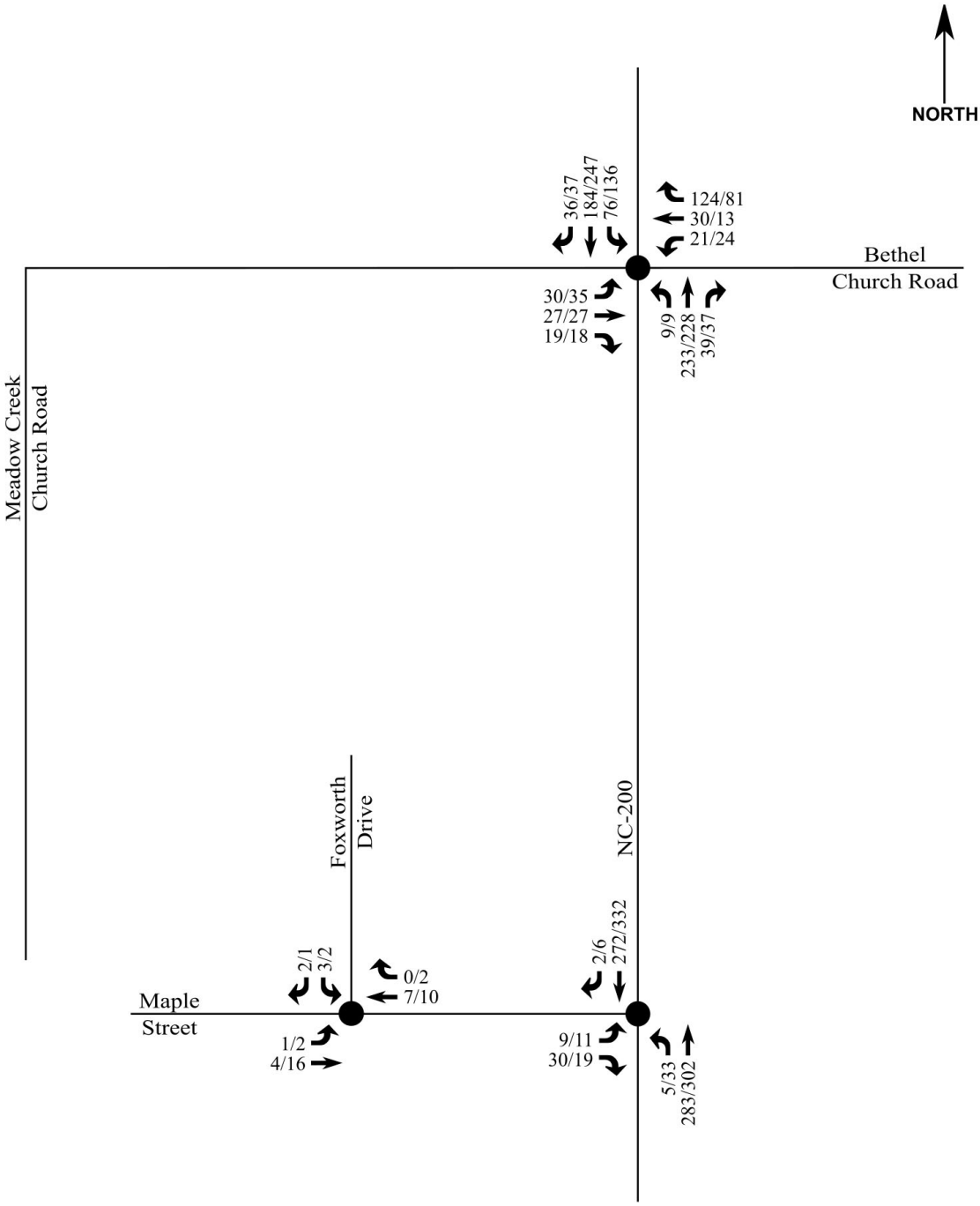
Site traffic associated with the proposed development was distributed and assigned to the roadway network based upon existing travel patterns and are summarized below:

- 25% to/from the north via NC-200
- 55% to/from the south via NC-200
- 20% to/from the south via Meadow Creek Church Road

Refer to Figures 6 and 7 for illustrations of the site trip distributions and assignments for the proposed development.

2.4. Future Build Traffic Volumes

The site generated traffic volumes were added to the No-Build traffic volumes to determine the Build traffic volumes. The Build (2026) volumes are illustrated in Figures 8.



LEGEND

Signalized Intersection

Unsignalized Intersection

X / Y → AM / PM Peak Hour Traffic

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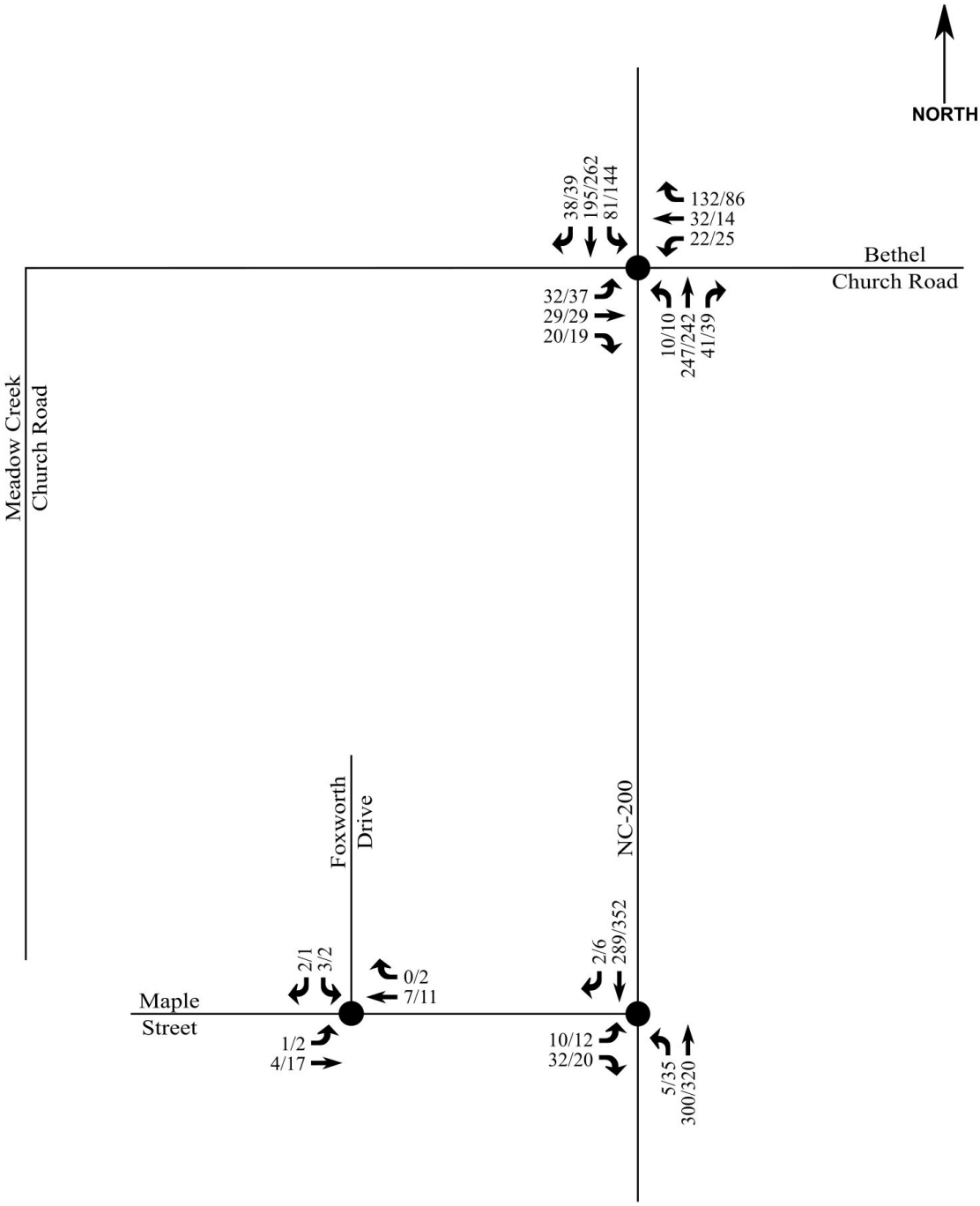
Existing (2023)
Traffic Volumes

Scale: Not to Scale	Figure	4



LEGEND

Signalized Intersection

Unsignalized Intersection

X / Y → AM / PM Peak Hour Traffic

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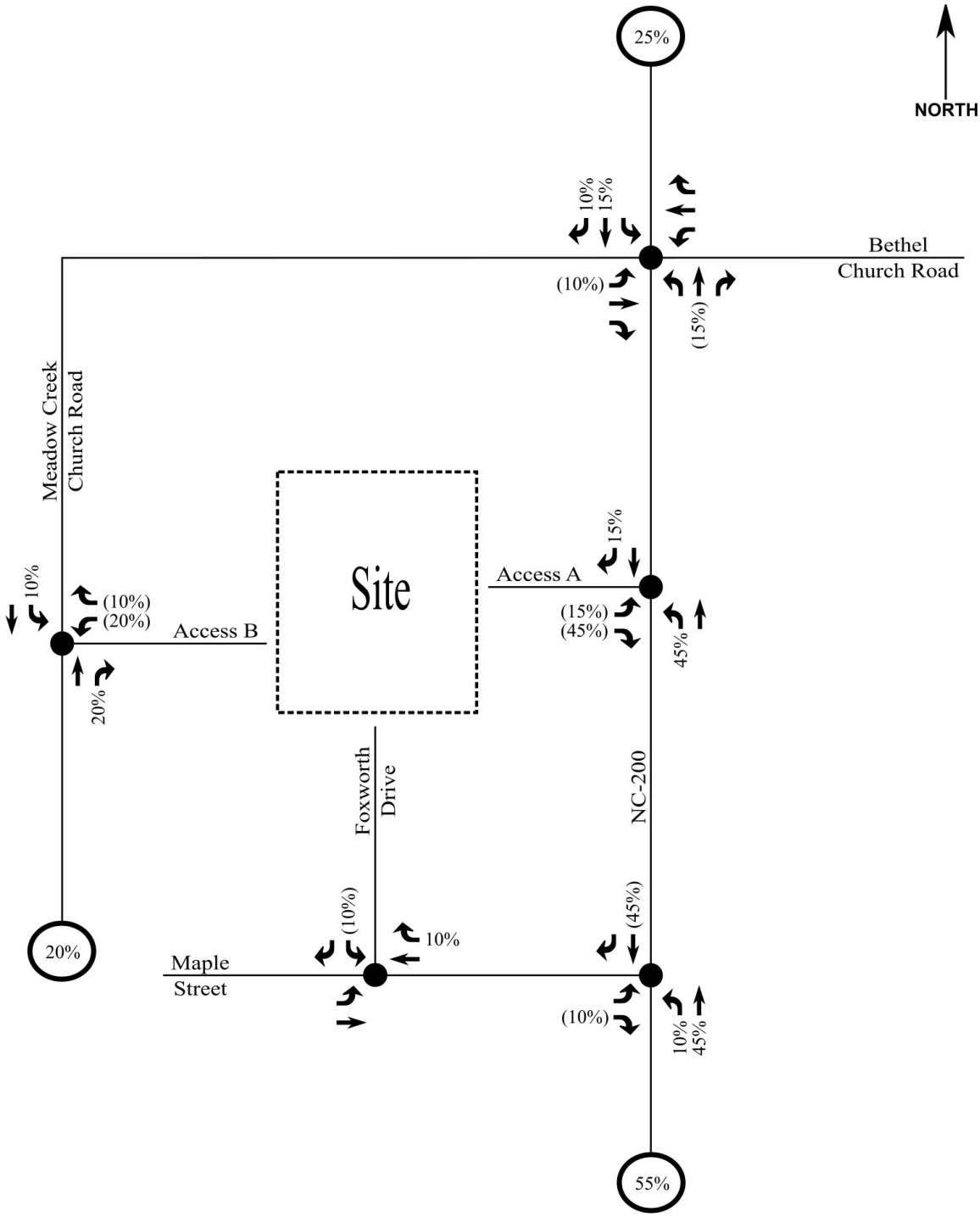
No-Build (2026)
Traffic Volumes

Scale: Not to Scale	Figure	5



LEGEND

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

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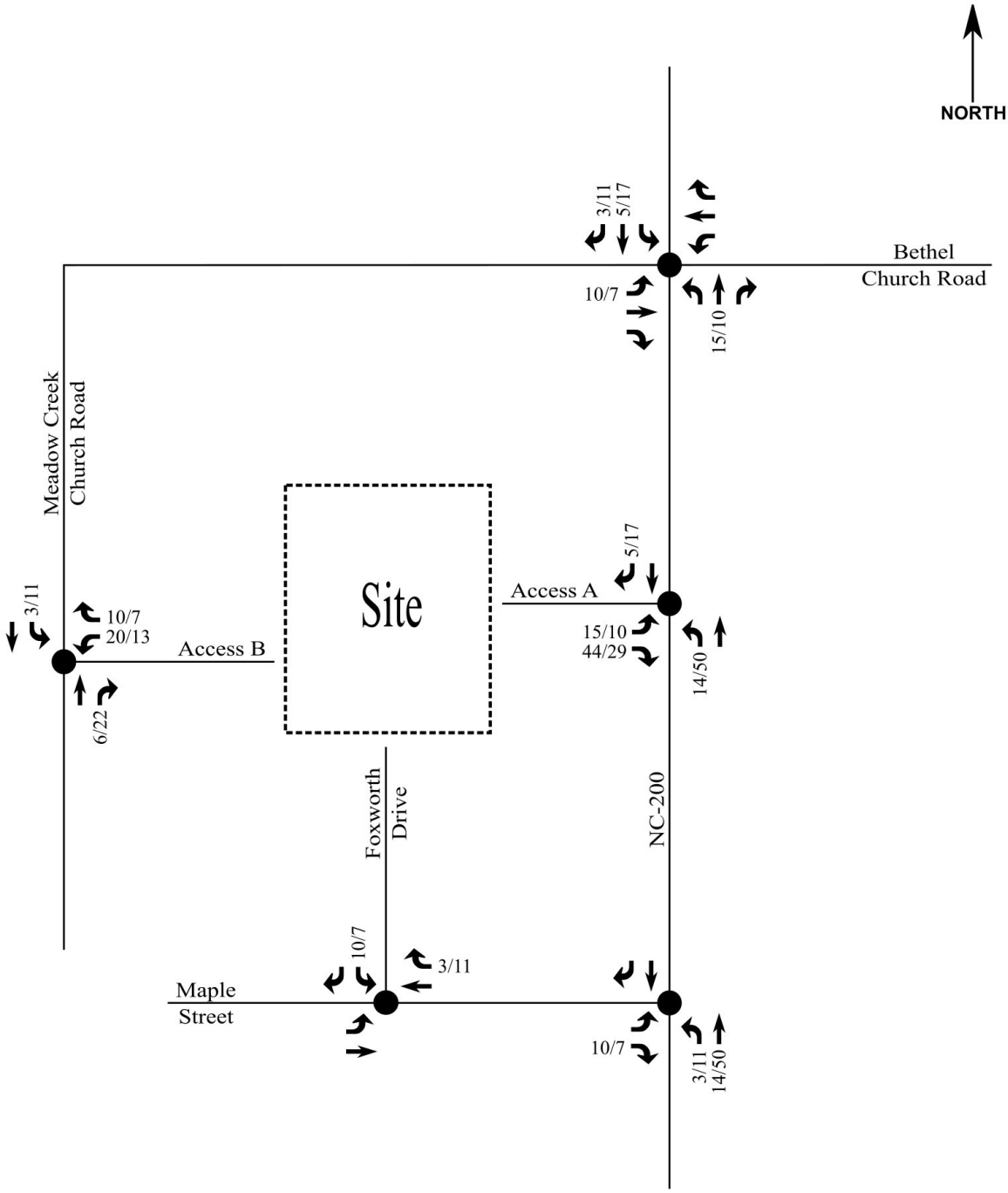
Site Trip Distribution

Scale: Not to Scale	Figure	6



LEGEND

Signalized Intersection

Unsignalized Intersection

X / Y → AM / PM Primary Trips

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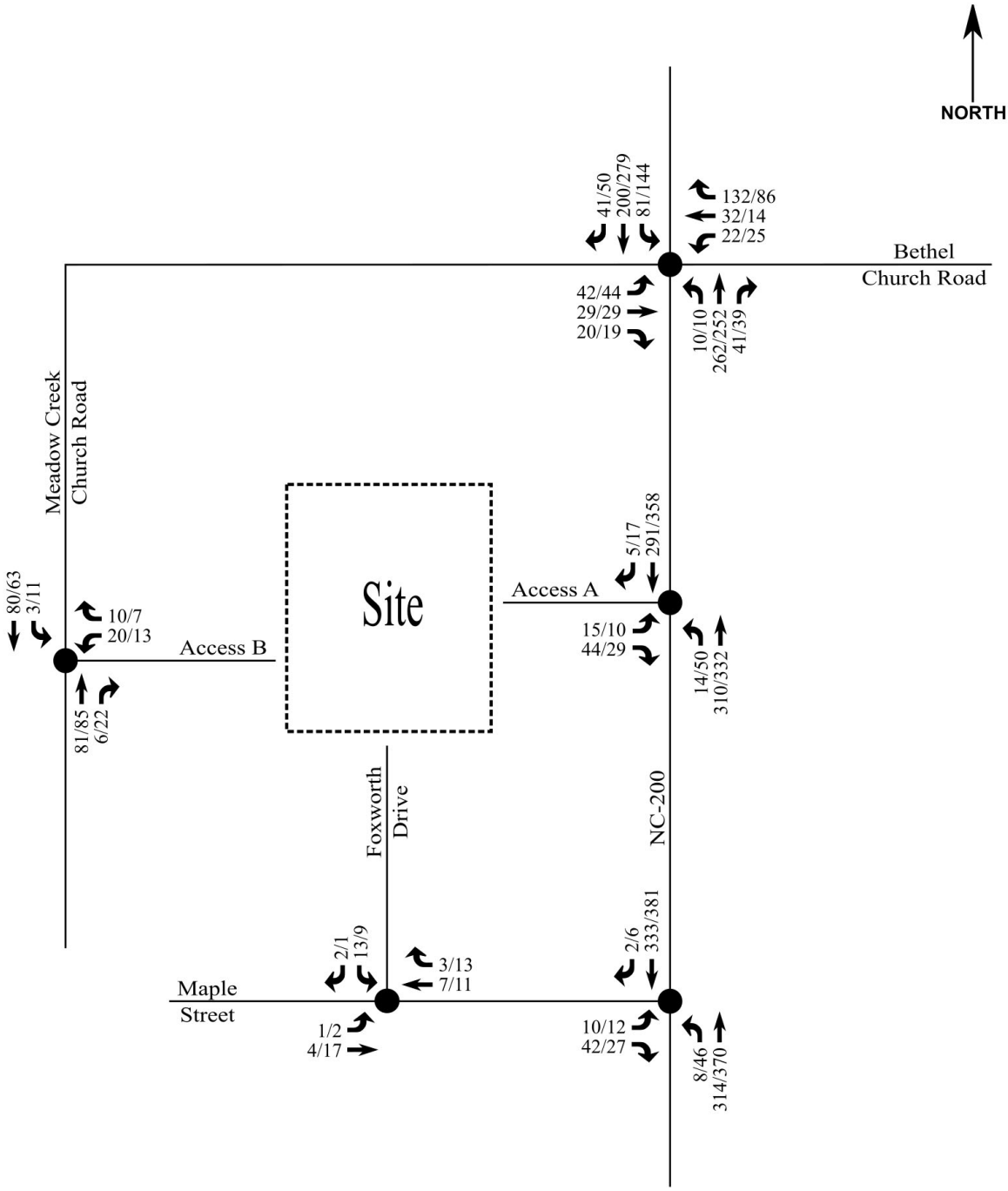
Primary Trip
Assignments

Scale: Not to Scale	Figure	7



LEGEND

Signalized Intersection

Unsignalized Intersection

X / Y → AM / PM Peak Hour Traffic

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Build (2026)
Traffic Volumes

Scale: Not to Scale	Figure	8

3. TRAFFIC IMPACT ANALYSIS

3.1. Turn Lane Analysis

A turn lane analysis was conducted for the site accesses utilizing the Build (2026) volumes. Based on build out volumes, a northbound left turn lane is warranted on NC-200 at Access A. It is recommended that a left turn lane be installed with at least 50 feet of storage and appropriate taper. Refer to Appendix C for the turn lane warrant charts with volumes graphed.

3.2. Intersection LOS Analysis

Using the existing, no-build, and build traffic volumes, intersection analyses were conducted for the study intersections under Existing (2023) conditions, No-Build (2026) conditions, and Build (2026) conditions. This analysis was conducted using the Transportation Research Board's *Highway Capacity Manual 6th Edition (HCM 6th Edition)* methodologies of the *Synchro*, Version 11 software.

Intersection level of service (LOS) grades range from LOS A to LOS F, which are directly related to the level of control delay at the intersection and characterize the operational conditions of the intersection traffic flow. LOS A operations typically represent ideal, free-flow conditions where vehicles experience little to no delays, and LOS F operations typically represent poor, forced-flow (bumper-to-bumper) conditions with high vehicular delays, and are generally considered undesirable. Table 3 summarizes the *HCM 6th Edition* control delay thresholds associated with each LOS grade for signalized and unsignalized intersections.

Table 3 – *HCM 6th Edition* LOS Criteria for Signalized & Unsignalized Intersections

Signalized Intersections		Unsignalized Intersections	
LOS	**Control Delay per Vehicle (seconds)**	**LOS**	**Control Delay per Vehicle (seconds)**
A	≤ 10	A	≤ 10
B	> 10 and ≤ 20	B	> 10 and ≤ 15
C	> 20 and ≤ 35	C	> 15 and ≤ 25
D	> 35 and ≤ 55	D	> 25 and ≤ 35
E	> 55 and ≤ 80	E	> 35 and ≤ 50
F	> 85	F	> 50

A PHF of 0.90 was applied and a heavy vehicle percentage of 2% was utilized for the purpose of this analysis. Existing signal data was obtained from NCDOT and was utilized for the purpose of this analysis. Additionally, a conservative approach was taken in which no right turns on red were permitted, although right turns on red are permitted on all intersections in the field. Additionally, all signals with protected-permitted left turn phasing were modeled as protected only in all scenarios.

3.3. Mitigation Requirements

NCDOT typically requires mitigation to be identified when developments are expected to impact the traffic operations as described below:

- Overall intersection or intersection approach delay increases by 25%.
- LOS degrades by at least one level.
- LOS is F.
- Synchro 95th or SimTraffic maximum queue results are greater than the existing turn lane storage length.

3.4. Capacity Analysis

The results of the capacity analysis for the study intersections under existing traffic control are summarized below in Table 4. Refer to Appendix D for the detailed capacity analysis reports.

Table 4 – Intersection Capacity Analysis Results

Intersections	Approach	LOS (Delay in seconds per vehicle)					
		Existing (2023)		No-Build (2026)		Build (2026)	
		AM	PM	AM	PM	AM	PM
NC-200 & Meadow Creek Church Road/ Bethel Church Road	EB	C (20.6)	D (28.7)	C (23.3)	D (34.2)	D (27.3)	E (41.5)
	WB	C (15.6)	C (17.6)	C (16.9)	C (19.5)	C (17.5)	C (20.7)
	NB	A (7.7)	A (7.9)	A (7.8)	A (8.0)	A (7.8)	A (8.0)
	SB	A (8.1)	A (8.2)	A (8.1)	A (8.3)	A (8.2)	A (8.3)
NC-200 & Maple Street	EB	B (11.0)	B (12.7)	B (11.3)	B (13.2)	B (11.8)	B (13.8)
	NB	A (7.9)	A (8.1)	A (7.9)	A (8.2)	A (8.1)	A (8.3)
	SB	-	-	-	-	-	-
Maple Street & Foxworthy Drive	EB	A (7.2)	A (7.3)	A (7.2)	A (7.3)	A (7.2)	A (7.3)
	WB	-	-	-	-	-	-
	SB	A (8.5)	A (8.6)	A (8.5)	A (8.6)	A (8.6)	A (8.7)
NC-200 & Access A	EB	*Analyzed under Build conditions ONLY*				B (11.8)	B (13.0)
	NB					A (8.0)	A (8.3)
	SB					-	-
Meadow Creek Church Road & Access B	WB	*Analyzed under Build conditions ONLY*				A (9.4)	A (9.4)
	NB					-	-
	SB					A (7.4)	A (7.5)

The capacity analysis indicates that all movements are expected to operate at LOS C or better under existing and future scenarios with the exception of the eastbound Meadow Creek Church Road approach at NC-200. Under No-Build conditions, this approach is anticipated to operate at LOS C or D, and with the addition of site traffic, the level of service would drop to LOS D or E in the Build scenario. However, the delay is not expected to increase by more than 25 percent, and queueing on Meadow Creek Church Road is anticipated to be similar under Build conditions to No-Build conditions. As such, no mitigation is recommended.

3.5. Queuing Analysis

A queuing analysis was also completed for all No-Build and Build traffic. Reported in Table 5 is the maximum value between the Synchro 95th percentile queue and the SimTraffic maximum queue for each turn lane at study intersections. Refer to Appendix D for detailed Synchro capacity analysis reports and Appendix E for detailed SimTraffic reports.

Table 5 – Queuing Analysis

Intersections	Lane Group	No-Build Storage (feet)	Max Queue (feet)			
			AM Peak Hour		PM Peak Hour	
			No-Build	Build	No-Build	Build
NC-200 & Meadow Creek Church Road/ Bethel Church Road	EB-LTR	Full	78	81	99	101
	WB-LTR	Full	90	88	95	84
	NB-LTR	Full	36	41	30	43
	SB-LTR	Full	72	64	95	105
NC-200 & Maple Street	EB-LR	Full	56	57	50	51
	NB-LT	Full	0	32	0	64
	SB-TR	Full	0	0	0	0
Maple Street & Foxworthy Drive	EB-LT	Full	0	0	3	3
	WB-TR	Full	0	0	0	0
	SB-LR	Full	31	31	31	36
NC-200 & Access A	EB-LR	Full	0	67	0	60
	NB-L	50	0	27	0	49
	SB-TR	Full	0	0	0	0
Meadow Creek Church Road & Access B	WB-LR	Full	0	43	0	38
	NB-TR	Full	0	0	0	0
	SB-LT	Full	0	8	0	23

The queueing analysis indicates that the queues under Build conditions are expected to be similar to No-Build conditions. No movements are anticipated to experience excessive queueing.

4. SUMMARY OF FINDINGS AND RECOMMENDATIONS

A traffic impact study was conducted for the proposed Summer Dunes single family development in accordance NCDOT guidelines. The proposed development is located on the west side of NC-200, north of Maple Street, in Locust, North Carolina. The development is expected to consist of up to 184 single family homes to be completed in 2026. Access to the site is to be provided via a full movement connection to NC-200, a full movement connection to Meadow Creek Church Road, and via an extension of Foxworth Drive.

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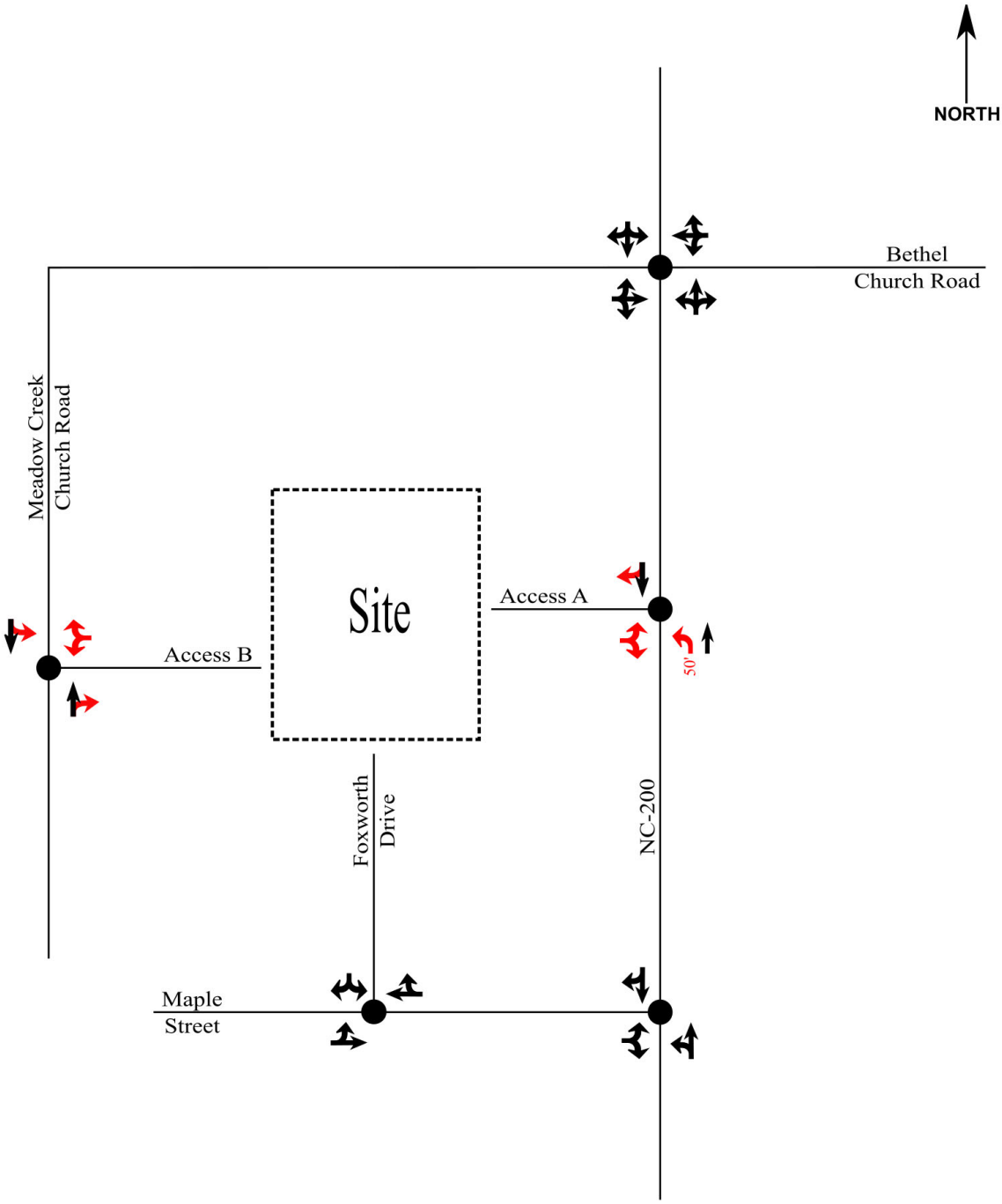
The queueing analysis indicates that the queues under Build conditions are expected to be similar to No-Build conditions. No movements are anticipated to experience excessive queueing.

<u>Recommendations:</u>

- Construct a northbound left turn lane with 50 feet of storage and appropriate taper on NC-200 at Access A.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Existing Lane
- Recommended Improvement
- X' Storage (In Feet)

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Summer Dunes Single Family
Locust, NC

Proposed Lane Configurations and Traffic Control

Scale: Not to Scale	Figure	9