

**Transportation Impact Analysis for
Willows at Stallings
Stallings, North Carolina**

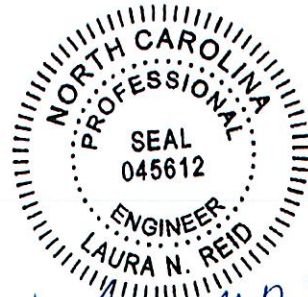
Prepared for:

**Town of Stallings
Stallings, North Carolina**

Prepared by:

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**November 2019
018273009**



Laura N. Reid
11/5/19

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1.0 Executive Summary

The purpose of this Transportation Impact Analysis (TIA) is to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed Willows at Stallings apartment development. The objectives of the study are:

- To estimate trip generation and distribution for the proposed development.
- To perform vehicular, pedestrian, and bicycle operations analyses for each of the identified study intersections.
- To determine the potential transportation impacts of the proposed development.
- To identify improvements to mitigate the proposed developments transportation impacts.

The proposed Willows at Stallings Apartments development is located on the south side of Stevens Mill Road approximately 3,000 feet west of its intersection with Stallings Road in Stallings, North Carolina. The ±22-acre site is currently undeveloped and zoned MU-2. The site is located within a Town Small Area Plan and will not be rezoned as a part of this development. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include up to 345 mid-rise apartment units. The overall site density did not meet North Carolina Department of Transportation's (NCDOT's) TIA threshold; however, it should be noted that coordination also occurred with NCDOT staff in review of the assumptions and methodology documented in this TIA.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2022. Based on the provided site plan, the proposed development will construct two Private Roads which will serve their two proposed access points, as outlined below.

- Access #1 – A full movement, unsignalized driveway connection to Public Road #1 with indirect access to Stevens Mill Road located approximately 1,800 feet east of Mt. Harmony Church Road
- Access #2 – A full movement, unsignalized driveway connection to Public Road #2 with indirect access to Stevens Mill Road located approximately 3,100 feet west of Stallings Road

A TIA scoping meeting was held with the Town of Stallings and representatives of the applicant in Stallings in June 2019, to obtain background information and to ascertain the scope and parameters to be included in this TIA. A TIA Memorandum of Understanding (MOU) was developed based on discussions from this meeting that documented all scoping parameters to be used for the TIA and was reviewed and agreed upon by the Town of Stallings, NCDOT, and the applicant. The approved MOU is included in the **Appendix**.

The following AM and PM peak-hour scenarios were analyzed to determine the proposed development's transportation impacts on the surrounding network:

- 2019 Existing Conditions
- 2022 Background Conditions
- 2022 Build Conditions
- 2027 Build Conditions +5 years

Based on coordination at the TIA scoping meeting, this TIA evaluates the vehicular, pedestrian, and bicycle operations under each of the AM and PM peak-hour scenarios above for the following study area intersections:

1. Stallings Road and Stevens Mill Road
2. Stallings Road and Monroe Expressway WB Ramp
3. Stallings Road and Monroe Expressway EB Ramp
4. Stallings Road and Matthews-Indian Trail Road
5. Stevens Mill Road and Mt. Harmony Church Road
6. Stevens Mill Road and Oakspring Road
7. Stevens Mill Road and Public Road #1
8. Stevens Mill Road and Public Road #2
9. Public Road #1 and Access #1
10. Public Road #2 and Access #2

Note the following modifications from the background data collected were applied to the capacity analyses to meet NCDOT Congestion Management Capacity Analysis Guidelines:

- Right-turn-on-red (RTOR) operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists.
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain a total lost time of 5 seconds for each movement.
- A minimum of 4 vehicles per hour were used for permissible movements, excluding movements into and out of the proposed site.

Kimley-Horn was retained to determine the potential transportation impacts of this development (in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and set forth by the Town of Stallings *TIA Ordinance*) and to identify transportation improvements that may be required to accommodate these impacts. This report presents trip generation, distribution, vehicular and multimodal analyses, crash analyses, and identified transportation improvements required to mitigate anticipated transportation demands produced by the subject development.

Based on vehicular, pedestrian, and bicycle operations analyses performed at each of the identified study intersections, along with the review of the auxiliary turn-lane warrants and crash analyses contained herein, the following improvements are identified to mitigate the impact of the proposed development on the surrounding transportation infrastructure:

Stallings Road and Stevens Mill Road

- Installation of a traffic signal (full signal warrant analysis may be required)
- Extension of the southbound left-turn lane to provide 225 feet of storage

Stevens Mill Road and Oakspring Road

- Construction of a northbound right-turn lane with 100 feet of storage

Stevens Mill Road and Public Road #1

- Construction of a two-lane cross-section on the northbound approach
- Construction of a westbound left-turn lane with a minimum of 50 feet of storage

Stevens Mill Road and Public Road #2

- Construction of a two-lane cross-section on the northbound approach
- Construction of a westbound left-turn lane with a minimum of 50 feet of storage

Public Road #1 and Access #1

- Construction of a single lane egress/ingress on the westbound approach with an internal protected stem of 100 feet

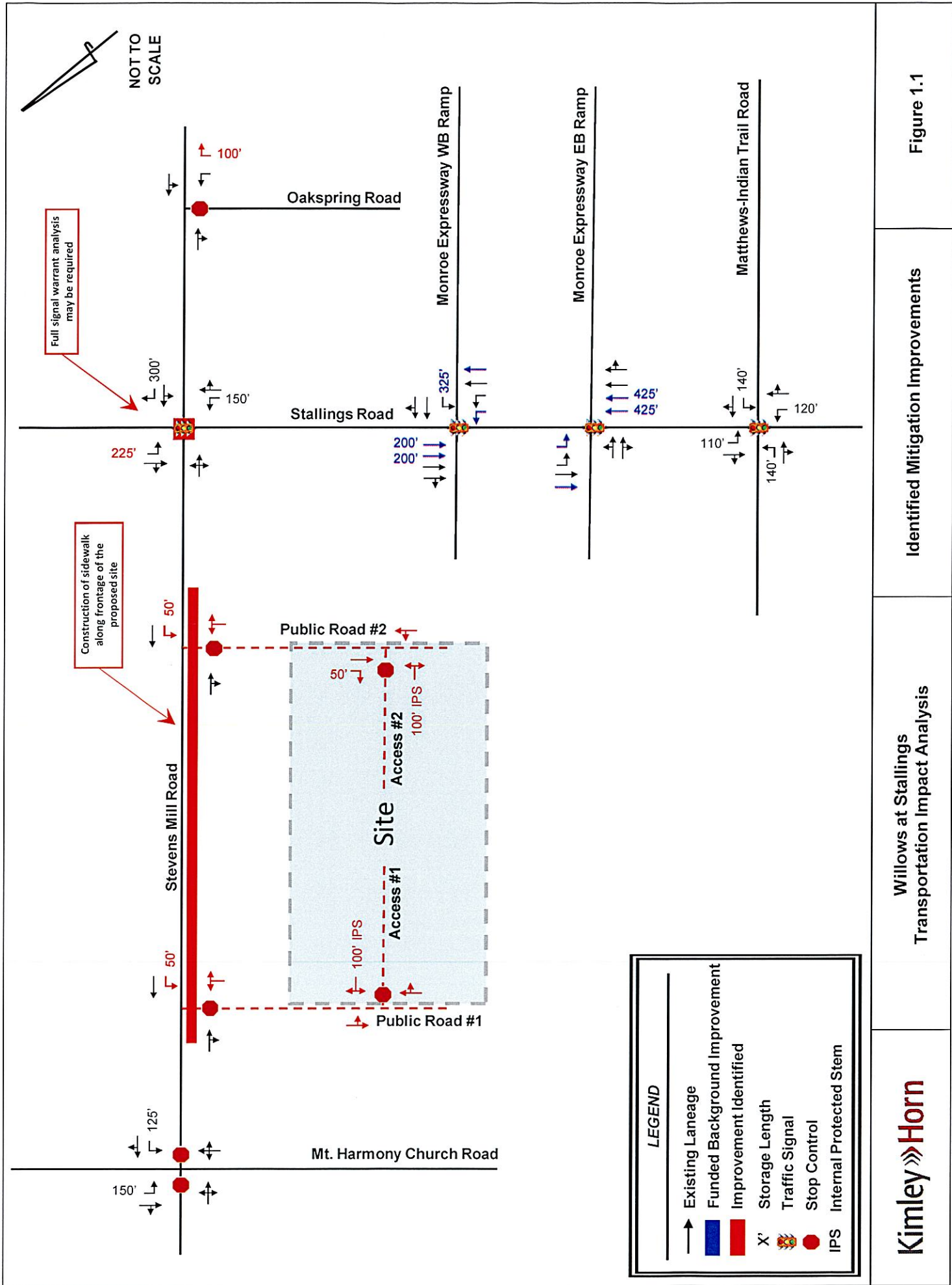
Public Road #2 and Access #2

- Construction of a single lane egress/ingress on the eastbound approach with an internal protected stem of 100 feet
- Construction of a southbound right-turn lane with a minimum of 50 feet of storage

Study Area Pedestrian and Bicycle Improvements

- Construction of a sidewalk along the frontage of the proposed site

The mitigation improvements identified within the study area are shown in **Figure 1.1**. The improvements shown on this figure are subject to approval by NCDOT and the Town of Stallings. All additions and attachments to the State and Town roadway system shall be properly permitted, designed and constructed in conformance to standards maintained by the agencies



2.0 Introduction

The proposed Willows at Stallings apartments development is located on the south side of Stevens Mill Road approximately 3,000 feet west of its intersection with Stallings Road in Stallings, North Carolina. The ±22-acre site is currently undeveloped and zoned MU-2. The site is located within a Town Small Area Plan and will not be rezoned as a part of this development. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include up to 345 mid-rise apartment units. The overall site density did not meet North Carolina Department of Transportation's (NCDOT's) TIA threshold; however, it should be noted that coordination also occurred with NCDOT staff in review of the assumptions and methodology documented in this TIA.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2022. Based on the provided site plan, the proposed development will construct two Private Roads which will served their two proposed access points, as outlined below.

- Access #1 – A full movement, unsignalized driveway connection to Public Road #1 with indirect access to Stevens Mill Road located approximately 1,800 feet east of Mt. Harmony Church Road
- Access #2 – A full movement, unsignalized driveway connection to Public Road #2 with indirect access to Stevens Mill Road located approximately 3,100 feet west of Stallings Road

A TIA scoping meeting was held with the Town of Stallings and representatives of the applicant in Stallings in June 2019, to obtain background information and to ascertain the scope and parameters to be included in this TIA. A TIA Memorandum of Understanding (MOU) was developed based on discussions from this meeting that documented all scoping parameters to be used for the TIA and was reviewed and agreed upon by the Town of Stallings, NCDOT, and the applicant. The approved MOU is included in the **Appendix**.

Kimley-Horn was retained to determine the potential transportation impacts of this development (in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and set forth by the *Town of Stallings TIA Ordinance*) and to identify transportation improvements that may be required to accommodate these impacts. This report presents trip generation, distribution, vehicular and multimodal analyses, crash analyses, and identified transportation improvements required to mitigate anticipated transportation demands produced by the subject development.

3.0 Existing Traffic Conditions

Existing traffic conditions were coordinated with Town of Stallings and NCDOT staff and collected through field observations, turning-movement counts, and tube counts to establish the existing conditions baseline analysis.

3.1 STUDY AREA

Based on coordination with the Town, NCDOT, and the applicant, the study area for this TIA includes the following intersections:

1. Stallings Road and Stevens Mill Road
2. Stallings Road and Monroe Expressway WB Ramp
3. Stallings Road and Monroe Expressway EB Ramp
4. Stallings Road and Matthews-Indian Trail Road
5. Stevens Mill Road and Mt. Harmony Church Road
6. Stevens Mill Road and Oakspring Road
7. Stevens Mill Road and Public Road #1
8. Stevens Mill Road and Public Road #2
9. Public Road #1 and Access #1
10. Public Road #2 and Access #2

Figure 3.1 shows the study area intersections and the site location, **Figure 3.2** shows the proposed site plan for the development as provided by the applicant, and **Figure 3.3** shows the existing roadway geometry at the study intersections. A full-sized site plan to scale is provided in the **Appendix**.

The primary roadways in the vicinity of the site are US 74/Monroe Expressway, Stallings Road, Stevens Mill Road, Matthews-Indian Trail Road, Mt. Harmony Church Road, and Oakspring Road. **Table 3.1** shows facility type, 2018 NCDOT average daily traffic (ADT) volumes in vehicles per day (vpd), and speed limits, based on the NCDOT Speed Limits Map, for these study area roadways.

Roadway	Facility type	ADT	Speed Limit
US 74/ Monroe Expressway	6-lane divided	72,500 W of Stallings Road 58,500 E of Stallings Road	45 mph
Stallings Road	2-lane undivided	12,500 S of US 74 6,400 N of US 74	45/35 mph
Stevens Mill Road	2-lane undivided	8,400 W of Stallings Road 2,900 E of Stallings Road	45 mph/35 mph
Matthews-Indian Trail Road	2-lane undivided	2,800 W of Indian Trail Road	45/25 mph
Mt. Harmony Church Road	2-lane undivided	1,500 N of Stevens Mill Road (2016)	35 mph
Oakspring Road	2-lane undivided	N/A	35 mph

US 74/Monroe Expressway is a six-lane divided roadway and is classified by NCDOT as a principal arterial with a posted speed limit of 45 miles per hour (mph). US 74 has a NCDOT 2018 ADT volume of 72,500 vpd west of Stallings Road and 58,500 vpd east of Stallings Road. Given

that this is a US route with control of access, there are no sidewalks and bike lanes along the roadway in the project vicinity.

Stallings Road is a two-lane undivided roadway and is classified by NCDOT as a minor collector. Stallings Road has a posted speed limit of 45 mph north of US 74 and a posted speed limit of 35 mph south of US 74. There is sidewalk on the east side of the roadway between US 74 and Gribble Road. No bike lanes are present on the roadway in the project vicinity. Stallings Road has a 2018 NCDOT ADT volume of 12,500 vpd south of US 74 and 6,400 vpd north of US 74.

Stevens Mill Road Road is a two-lane undivided NCDOT major collector with a posted speed limit of 45 mph within the Town of Stallings and 35 mph in the vicinity of Mt. Harmony Church Road, and a NCDOT 2018 ADT volume of 8,400 vpd west of Stallings Road and 2,900 vpd east of Stallings Road. There is sidewalk along the south side of the roadway east of Stallings Road and no bicycle lanes near the project vicinity. There is also a sidewalk along the north side of the roadway along the frontage of the Matthews Charter Academy.

Matthews-Indian Trail Road is a two-lane undivided local roadway with a posted speed limit of 45 mph in the vicinity of Stallings Road. Matthews-Indian Trail Road has a NCDOT 2018 ADT volume of 2,800 vpd east of Stallings Road. There are no sidewalks or bike lanes along the roadway in the project vicinity.

Mt. Harmony Church Road is a two-lane undivided local roadway with a posted speed limit of 35 mph in the vicinity of Stevens Mill Road. Mt. Harmony Church Road has a NCDOT 2016 ADT volume of 1,500 vpd north of Stevens Mill Road and I-485. There is sidewalk along the east side of Mt. Harmony Church Road between Stevens Mill Road and the Matthews Charter Academy driveway.

Oakspring Road is a two-lane undivided local roadway with a posted speed limit of 35 mph in the vicinity of Stevens Mill Road. There is no available NCDOT ADT data for this roadway. There are no sidewalks or bike lanes along the roadway in the project vicinity.

3.2 EXISTING TRAFFIC VOLUME DEVELOPMENT

As a part of a traffic study previously completed for a nearby development, peak-hour intersection turning-movement, heavy-vehicle, pedestrian, and bicycle counts were performed by Quality Counts from 6:00 AM to 9:00 AM and from 4:00 PM to 7:00 PM on Tuesday, February 5, 2019, at the following study intersections while local schools were in session:

- Stallings Road and Stevens Mill Road
- Stallings Road and Monroe Expressway WB Ramp
- Stallings Road and Monroe Expressway EB Ramp
- Stallings Road and Matthews-Indian Trail Road

Additionally, turning movement counts were performed by Quality Counts from 6:00 AM to 9:00 AM and from 4:00 PM to 7:00 PM on Tuesday, September 10, 2019 at the following study intersections:

- Stevens Mill Road and Mt. Harmony Church Road
- Stevens Mill Road and Oakspring Road

Additionally, a 24-hour tube count was performed on September 10, 2019 on Stevens Mill Road immediately west of Blackberry Lane to establish through volumes at the proposed Public Road #1 and Public Road #2.

The peak hour at each intersection was used in the capacity analysis documented herein. Four of the six intersections had an AM peak hour between 7:30-8:30 AM and all intersections with the exception of Stevens Mill Road and Mt. Harmony Church Road had a PM peak hour between 5:00-6:00 PM. The peak hours for each of the intersections are shown in **Table 3.2**.

Intersection	AM Peak Hour	PM Peak Hour
1. Stallings Road and Stevens Mill Road	7:15 - 8:15	5:00 - 6:00
2. Stallings Road and Monroe Expressway WB Ramp	7:30 - 8:30	5:00 - 6:00
3. Stallings Road and Monroe Expressway EB Ramp	7:30 - 8:30	5:00 - 6:00
4. Stallings Road and Matthews-Indian Trail Road	7:30 - 8:30	5:00 - 6:00
5. Stevens Mill Road and Mt. Harmony Church Road	7:00 - 8:00	4:30 - 5:30
6. Stevens Mill Road and Oakspring Road	7:15 - 8:15	5:00 - 6:00

Volume balancing was performed along Stallings Road between the Monroe Expressway WB Ramp and the Monroe Expressway EB Ramp. No volume balancing was performed between the other study area intersections due to the presence of multiple commercial and residential driveways, spacing between each of the study intersections, and the time between the count collection dates. Peak-hour intersection turning-movement count data is provided in the **Appendix**.

Figure 3.4 shows the 2019 existing AM and PM peak-hour traffic volumes.





OWNER:
GATEWAY COUNTIES
CONTACT: DAVE HANSEN RD
ADDRESS: 6701 CARMEL ROAD #118
CHARLOTTE, NC 28226
PHONE: 704-732-8650
EMAIL: DAVE@GATEWAYCOUNTIES.COM

DESIGNER: LUDWIG & LANDSCAPE ARCHITECT
CURRANT DESIGN PARTNERS
CONTACT: PAUL PINNEL, PLA
ADDRESS: 1318 E6 CENTRAL AVENUE
CHARLOTTE, NC 28205
OWNER: 704-334-3303 FAX: 704-334-3305
EMAIL: PAUL@CURRANTDESIGNPARTNERS.COM

02/20/2018 & 02/20/2019	27.79 AC	RESIDENTIAL MAX 1 FAMILY	15.15 SELLING UNITS / AC	10.89 AC (41.27%)	41.27 AC (65.77%)	6 N X 1.36 AC 10 N X 0.79 AC 10 N X 0.79 AC 11.84 A & B	125 UNITS = 15 BUILDINGS 225 UNITS = BUILDINGS 345 UNITS TOTAL	21 318 275	41' MAX	YES	YES	YES	469 SPACES REQUIRED + 150 (21 AC MAX) 469 SPACES REQUIRED	723 SPACES PROVIDED	46 SPACES TO BE GROUND	46 SPACES TO BE GROUND	
TAX PARCEL # 0-1	TOTAL SITE AREA	EXISTING ZONING	PROPOSED USE	PROPOSED DENSITY	SUBTYPED AREA	SPONSOR NAME	FREE CONSTRUCTION AREA REQUIRED PROVIDED	45-240' MAX DISTANCE TO ADJACENT BUILDINGS TOTAL LOTS	MINIMUM HEIGHT: PROP. DENSITY HAS ADEQUATE SITE DISTANCE	MINIMUM HEIGHT: PROP. DENSITY HAS ADEQUATE SITE DISTANCE	MINIMUM HEIGHT: PROP. DENSITY HAS ADEQUATE SITE DISTANCE	MINIMUM HEIGHT: PROP. DENSITY HAS ADEQUATE SITE DISTANCE	REQUIRED + 150 (21 AC MAX) TOTAL	PROVIDED	RECYCLE PARKING AREA	% OF REQUIRED PARKING PROVIDED	PROVIDED

CONSTRUCTION TO BEGIN: JANUARY 2020
UP TO 3 PHASES

Site Plan
Stallings, NC

NO	DATE	BY	REVISIONS
1	05/21/19	UCP	PER IFC COMMENTS

Project No: 19-010
Date: 04.02.2019
Designed by: UDP
Drawn By: UDP
Sheet No:

SP-1.0

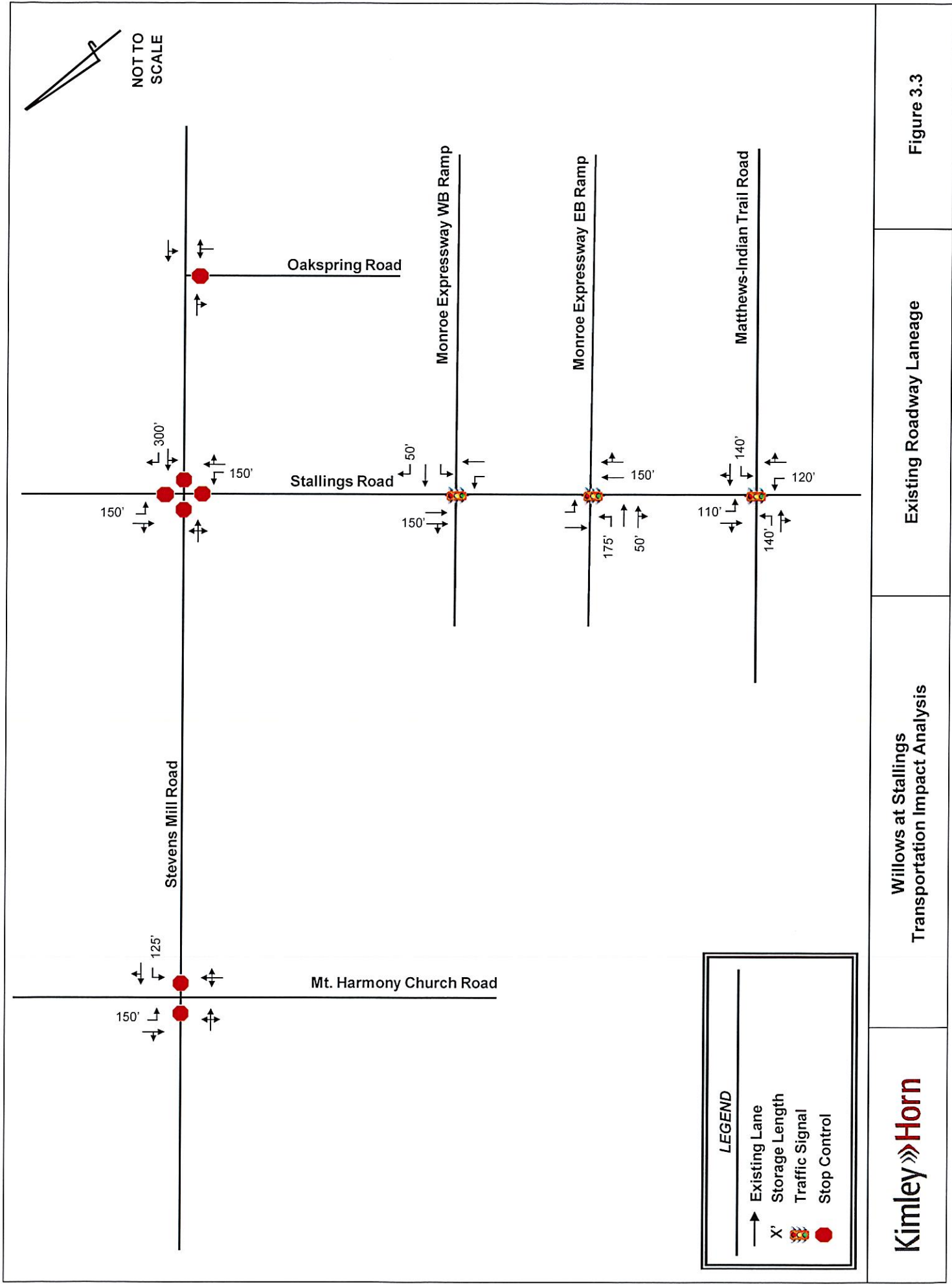


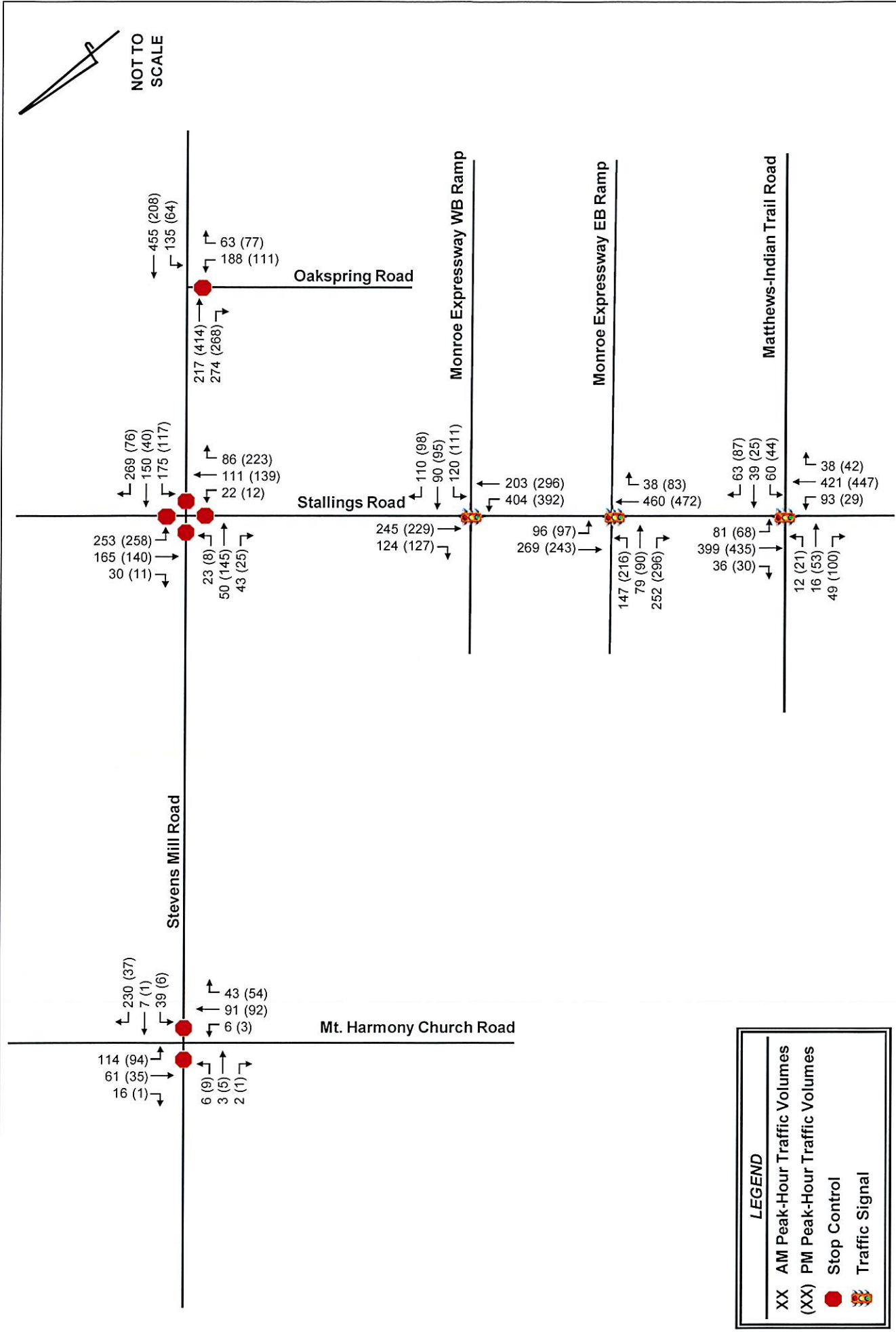
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Willows at Stallings Transportation Impact Analysis

Site Plan

Figure 3.2





4.0 Background Traffic Volume Development

Projected background (non-project) traffic is defined as the expected growth or change in traffic volumes on the surrounding roadway network between the year the existing counts were collected (2019) and the expected build-out years (2022, 2027), absent the construction and opening of the proposed project. This includes both non-specific general growth based on historical increase in local traffic volumes (historical background growth), along with specific growth and/or change in traffic volumes caused by future off-site developments that are not yet fully-constructed and/or planned transportation projects specifically identified within the vicinity of the proposed development.

4.1 HISTORICAL BACKGROUND GROWTH TRAFFIC

Historical background growth is the increase in existing traffic volumes due to usage increases and non-specific growth throughout the area, and accounts for growth that is independent of specific approved developments. Historical background growth traffic is calculated using an annual growth rate, which is applied to the existing traffic volumes up to the future horizon years. As shown in the approved TIA MOU, based on a review of historical ADT data available for study area roadways, a growth rate of 3.5% per year was applied to 2019 existing traffic volumes to calculate base 2022 and 2027 background traffic volumes. **Table 4.1** shows the data used to determine the 3.5% annual growth rate, which was approved by NCDOT staff, consistent with adjacent TIAs performed in the area.

Table 4.1 - Historical Growth			
ADT Count Location	2016	2010	Growth Rate (between 2016 & 2010)
Stallings Road (south of US 74)	11000	9400	2.7%
Stallings Road (north of US 74)	5900	5100	2.5%
Matthews-Indian Trail Rd	5200	3500	6.8%
AVERAGE			4.0%

4.2 FUTURE OFF-SITE DEVELOPMENT TRIPS

Based on input from Town of Stallings and NCDOT staff, the Atrium Stallings approved development is expected to impact traffic volumes within the study area and is included in the background traffic volumes for this TIA.

Table 4.2 – Approved Developments				
Development	Land Use/Intensity	% Build-out	TIA Included?	Required Improvements
Atrium Stallings	160,000 SF Hospital 60,000 SF MOB	0%	Yes	None in Study Area

Figure 4.1 and **Figure 4.2** show the 2022 background AM and PM peak-hour traffic volumes, respectively.

4.3 PLANNED TRANSPORTATION PROJECTS

Based on a review of the adopted transportation plans for the area, ten future transportation projects have been identified within the study area, two of which are currently funded through construction based on the current planning documents.

1. John Street/Old Monroe Road Widening (U-4714) – Funded (outside TIA study area)
2. Chestnut Lane Connector (U-5808) – Funded (outside TIA study area)
3. Enhanced Intersection at Stallings Road and Stevens Mill Road (C-5)
4. Enhanced Intersection at Stallings Road and US 74 (C-7)
5. Crossing at Stallings Rd. and Rail Road (C-13)
6. Crossing of Stallings Rd. at North Fork Creek (South branch) (C-18)
7. Stallings Rd., part 1 (4,700' sidewalk facilities) (S-5)
8. Stallings Rd., part 2 (2,100' sidewalk facilities) (S-9)
9. Smith Farm Rd., north side (4,600' sidewalk facilities) (S-13)
10. North Fork Trail (T-3)

Note that the eight unfunded projects (Project Numbers 3-10 above) were not included in the operations analyses discussed in Sections 6.0 and 8.0 since funding nor schedule have been identified.

There are two funded NCDOT roadway projects near the identified study area:

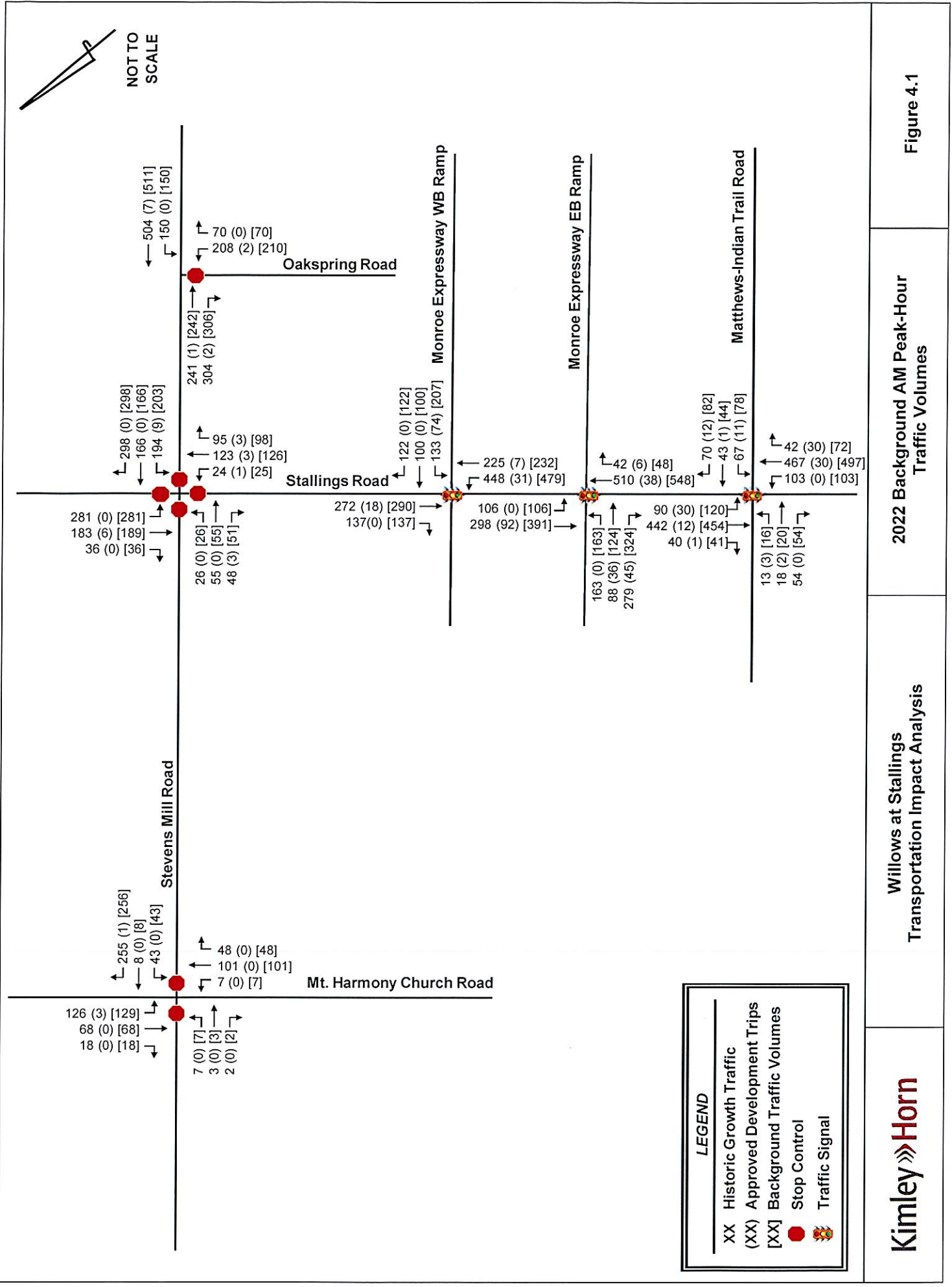
- John Street/Old Monroe Road Widening (U-4714) – *Outside TIA study area*
 - Widen to multi-lanes from Trade Street to Wesley Chapel-Stouts Road (superstreet on some locations)
 - Right-of-way in fiscal year (FY) 2020-2021
 - Construction in FY 2022-2025
- Chestnut Lane Connector (U-5808) – *Outside TIA study area*
 - Construct new roadway from Matthews-Indian Trail Road to Gribble Road
 - Right-of-way in FY 2020
 - Construction in FY 2021-2022

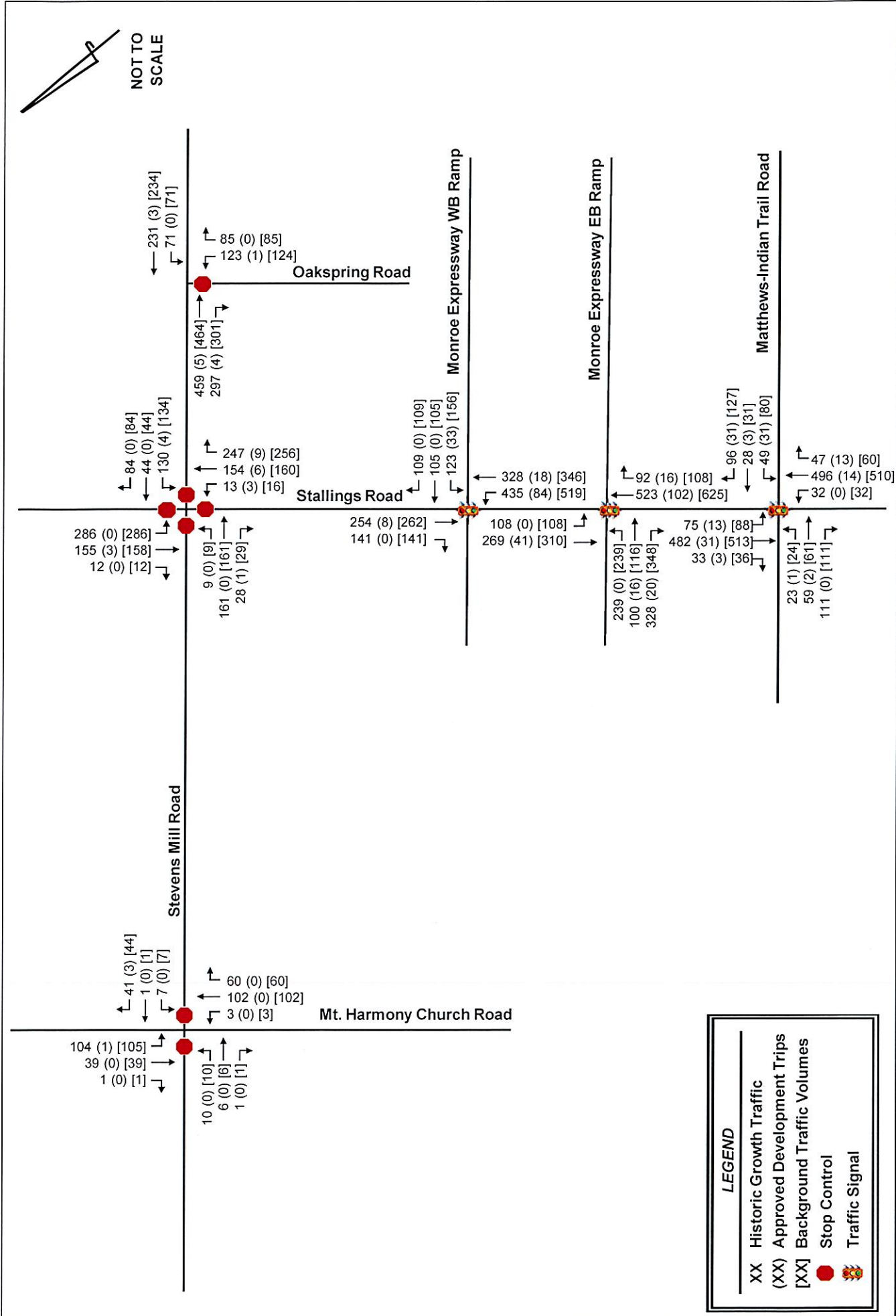
These projects fall outside the TIA study area and were therefore not included in future year analysis.

The following projects have been identified, but are unfunded within the identified study area:

- Enhanced Intersection at Stallings Road and Stevens Mill Road (C-5)
 - Provide safe pedestrian crossing opportunities at the center of the Stallings School Node.
 - Coordinate improvements with Stallings Elementary School and the Monroe Bypass project.
- Enhanced Intersection at Stallings Road and US 74 (C-7)
 - Provide safe pedestrian crossing opportunities to improve the pedestrian connection of the north and south sides of Town.
 - Coordinate improvements with Monroe Expressway project.
- Crossing at Stallings Rd. and Rail Road (C-13)

- Provide a safe pedestrian crossing along Stallings Rd. to serve the primary industrial employment destinations and adjacent businesses.
- Coordinate improvements with Stallings Rd. widening (TIP# U-3825).
- Crossing of Stallings Rd. at North Fork Creek (South branch) (C-18)
 - Provide a safe pedestrian crossing for the North Fork Trail (project T-3) at Stallings Road at the south end of the Stallings School Node.
- Stallings Rd., part 1 (4,700' sidewalk facilities) (S-5)
 - Connect existing sidewalk along Stallings Road south of US 74 (at project C-7), and North Fork Trail (project T-3) to Stevens Mill Rd., along east side of Stallings Rd. This will create a continuous sidewalk link from Stevens Mill Rd. to St Johns Road and connect the Stallings School Node to the Downtown Node.
- Stallings Rd., part 2 (2,100' sidewalk facilities) (S-9)
 - Connect the Stallings School Node to Fairhaven Park, the North Fork Trail (project T-3), adjacent residential areas, and the existing Stevens Mill sidewalk.
- Smith Farm Rd., north side (4,600' sidewalk facilities) (S-13)
 - Provide pedestrian link from sidewalk at Stallings Rd. to Town limit near Matthews-Indian Trail Rd. with the goal of connecting to Indian Trail sidewalk system.
- North Fork Trail (T-3)
 - Connect the Stallings School Node to residential neighborhoods and Fairhaven Park, existing sidewalks, and areas south of US 74





Kimley»Horn

Willows at Stallings Transportation Impact Analysis

2022 Background PM Peak-Hour Traffic Volumes

Figure 4.2

5.0 Site Traffic Volume Development

Site traffic developed for this TIA is defined as the site-generated trips expected to be added to the study area by the construction of the proposed development, and the distribution and assignment of that traffic throughout the surrounding network.

5.1 SITE ACCESS

Based on the provided site plan, the proposed development will construct two Private Roads which will serve their two proposed access points, as outlined below.

- Access #1 – A full movement, unsignalized driveway connection to Public Road #1 with indirect access to Stevens Mill Road located approximately 1,800 feet east of Mt. Harmony Church Road
- Access #2 – A full movement, unsignalized driveway connection to Public Road #2 with indirect access to Stevens Mill Road located approximately 3,100 feet west of Stallings Road

5.2 TRAFFIC GENERATION

The traffic generation potential of the proposed development was determined using the trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, 10th Edition) for all land uses.

Based on the most recent site plan, provided by the applicant, the proposed development is envisioned to included up to 345 apartment style dwelling units.

Table 5.1 summarizes the projected trip generation for the proposed development. During a typical weekday, the proposed development has the potential to generate 115 and 145 net new external trips during the AM and PM peak hours, respectively.

Table 5.1 - Trip Generation								
Land Use	Intensity	Daily	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
Multifamily Housing Mid-Rise [ITE 221]	345 DU	1,879	115	30	85	145	88	57
Net New External Trips		1,879	115	30	85	145	88	57

5.3 SITE TRAFFIC DISTRIBUTION

The proposed development's trips were assigned to the surrounding network based on existing peak-hour turning movements, surrounding land uses, and population densities in the area. The site traffic distribution was reviewed and approved as part of the TIA MOU by the Town of Stallings, NCDOT, and the applicant:

- 15% to/from the north along Mt. Harmony Church Road
- 10% to/from the north along Stallings Road
- 5% to/from the east along Stevens Mill Road
- 5% to/from the south along Oakspring Road
- 25% to/from the west on Monroe Expressway
- 25% to/from the east on Monroe Expressway
- 5% to/from the east along Matthews-Indian Trail Road
- 10% to/from the south along Stallings Road

These distributions are also detailed in **Figure 5.1**

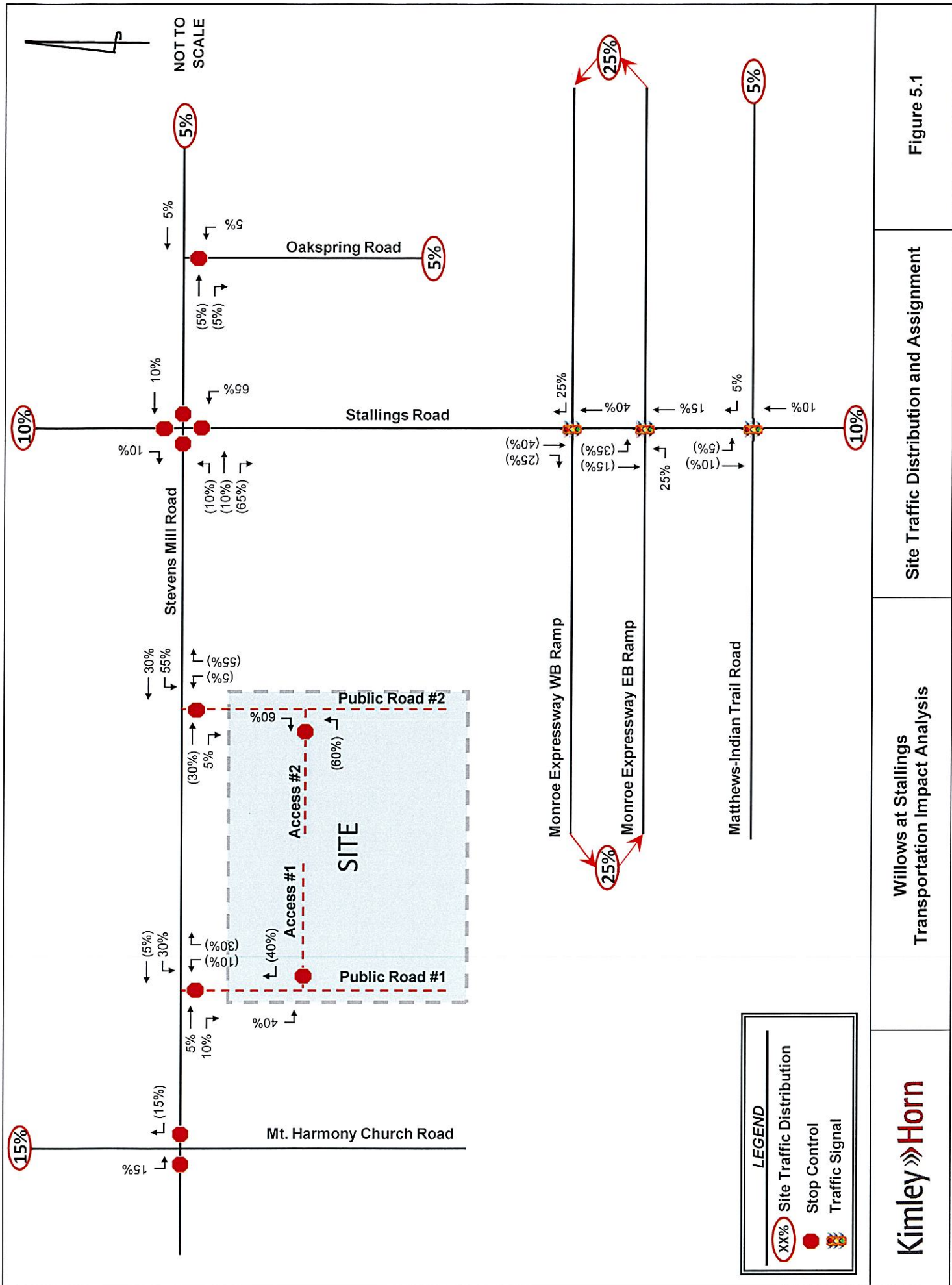
5.4 2022 BUILD-OUT TRAFFIC

The 2022 build-out traffic volumes include the 2022 background traffic volumes and site traffic volumes. **Figures 5.2 - 5.3** show the projected 2022 build-out traffic volumes for the AM and PM peak-hours.

5.5 2027 BUILD-OUT TRAFFIC

As required by the Town of Stallings *TIA Ordinance*, an analysis scenario of five years after the build-out year was performed. The 2027 build-out traffic volumes include the assignment of the proposed site traffic generation added to the 2027 base background traffic volumes. **Figure 5.4** shows the projected 2027 build-out traffic volumes for the AM and PM peak-hours.

Intersection volume development worksheets are provided in the **Appendix**.



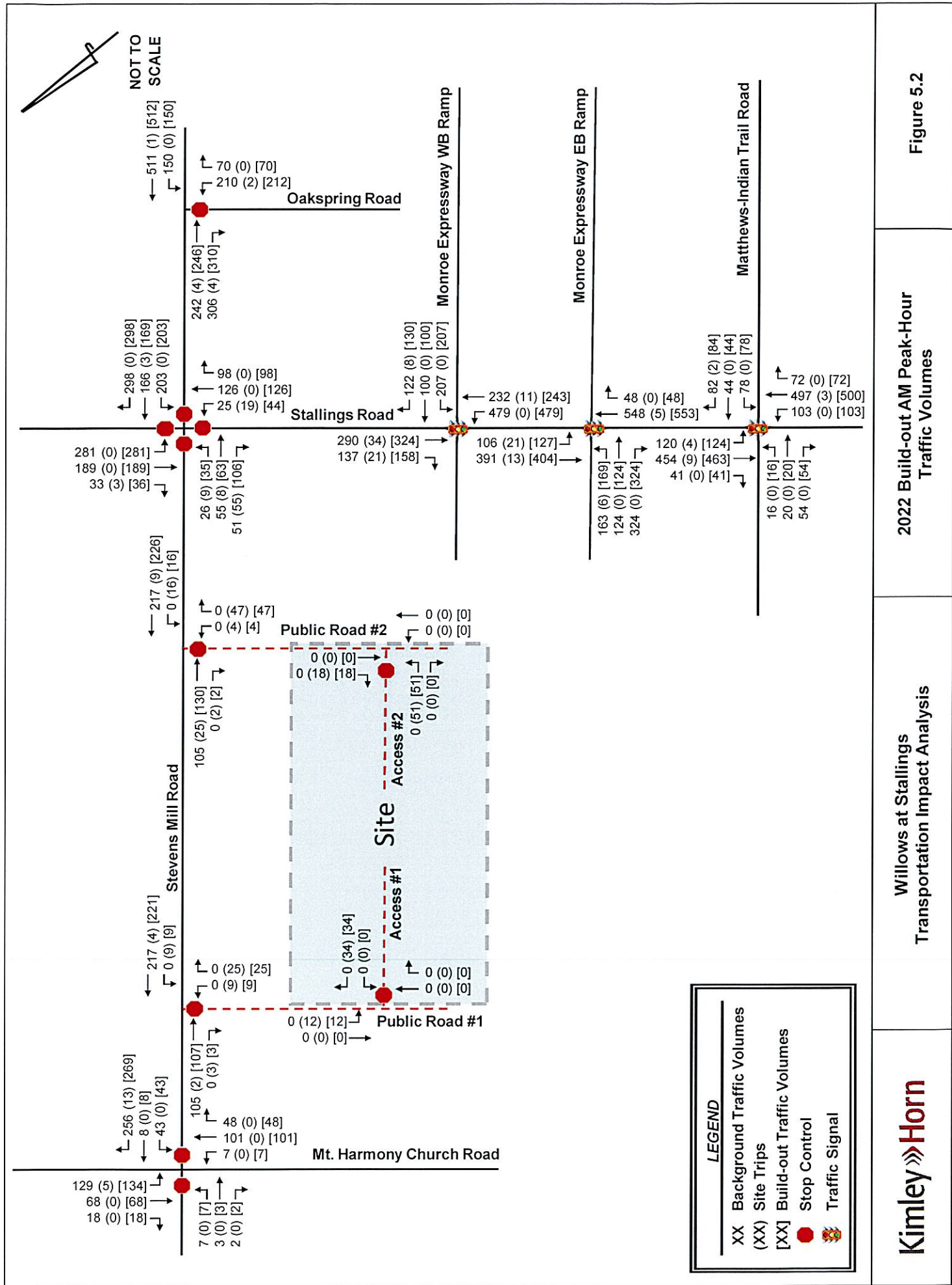


Figure 5.2

2022 Build-out AM Peak-Hour Traffic Volumes

Willows at Stallings Transportation Impact Analysis

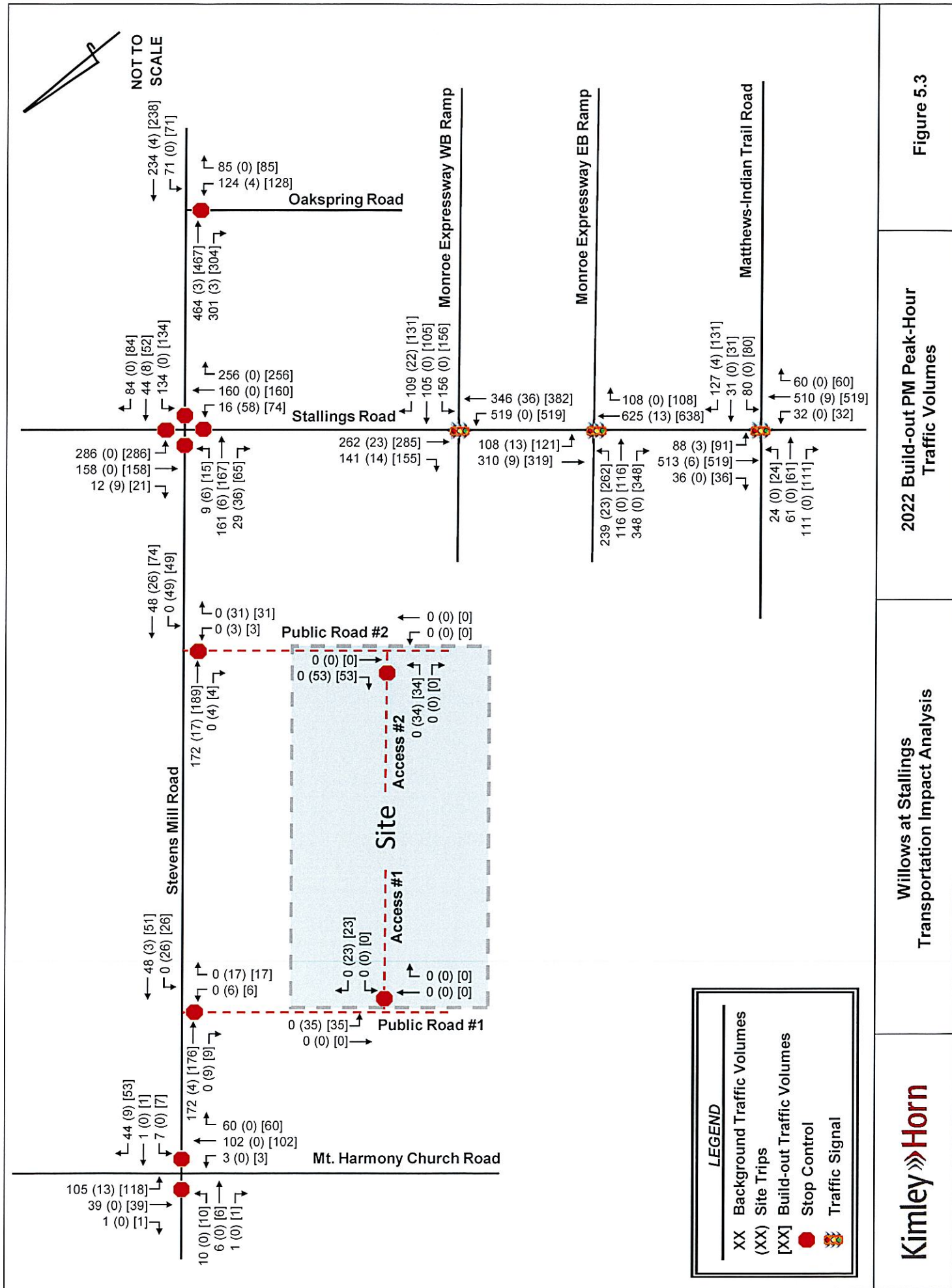


Figure 5.3

2022 Build-out PM Peak-Hour
Traffic Volumes

Willows at Stallings
Transportation Impact Analysis

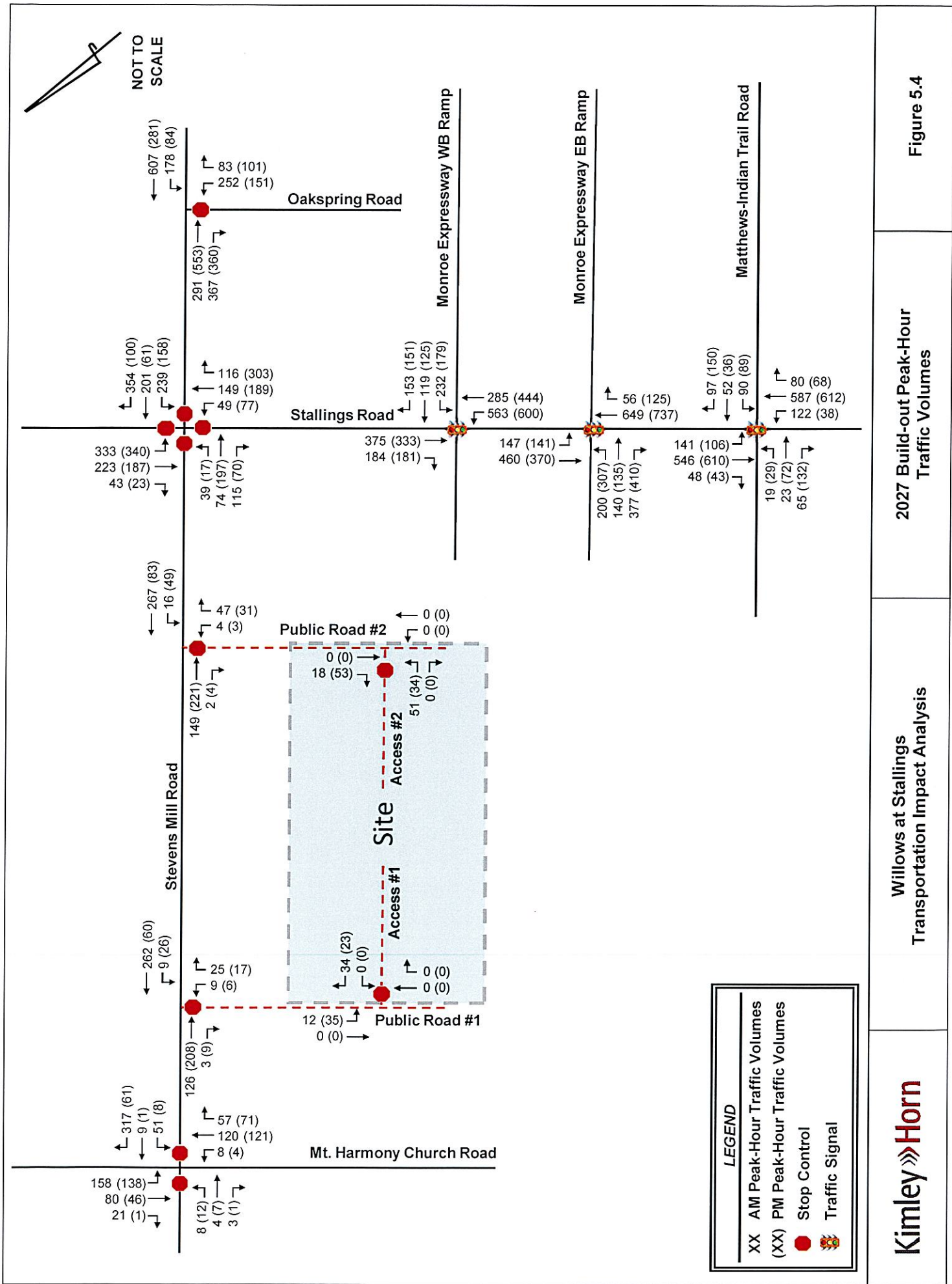


Figure 5.4

2027 Build-out Peak-Hour Traffic Volumes

Willows at Stallings Transportation Impact Analysis

6.0 Vehicular Capacity Analysis

Based on the requirements set forth by the Town of Stallings *TIA Ordinance* and in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways*, vehicular capacity analyses were performed at the study area intersections for the AM and PM peak-hour scenarios.

Vehicular capacity analyses were performed for the AM and PM peak hours using the Synchro Version 10 software to determine the operating characteristics at the signalized and stop-controlled intersections of the adjacent street network and to evaluate the impacts of the proposed development. Capacity is defined as the maximum number of vehicles that can pass over a particular road segment, or through a particular intersection, within a specified period of time under prevailing operational, geometric and controlling conditions within a set time duration. This software program uses methodologies contained in the *Highway Capacity Manual* (HCM) to determine the operating characteristics of an intersection.

The HCM defines LOS as a “quantitative stratification of a performance measure or measures representing quality of service” and is used to “translate complex numerical performance results into a simple A-F system representative of travelers’ perceptions of the quality of service provided by a facility or service”. The HCM defines six levels of service, LOS A through LOS F, with A having the best operating conditions from the traveler’s perspective and F having the worst. However, it must be understood that “the LOS letter result hides much of the complexity of facility performance”, and that “the appropriate LOS for a given system element in the community is a decision for local policy makers”. According to the HCM, “for cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A.”

LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay and is reported for the side-street approaches, typically during the highest volume periods of the day, the AM and PM peak periods. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

LOS for signalized intersections is reported for the intersection as a whole, and typically during the highest volume periods of the day, the AM and PM peak periods. One or more movements at an intersection may experience a low level-of-service, while the intersection as a whole may operate acceptably.

Table 6.0-A and **6.0-B** list the LOS control delay thresholds published in the HCM for unsignalized and signalized intersections, respectively, as well as the unsignalized operational descriptions assumed herein.

Table 6.0-A Vehicular LOS Control Delay Thresholds for <u>Unsignalized</u> Intersections		
Level-of-Service	Average Control Delay per Vehicle [sec/veh]	
A	≤ 10	Short Delays
B	$> 10 - 15$	
C	$> 15 - 25$	
D	$> 25 - 35$	Moderate Delays
E	$> 35 - 50$	
F	> 50	Long Delays

Table 6.0-B Vehicular LOS Control Delay Thresholds for <u>Signalized</u> Intersections		
Level-of-Service	Average Control Delay per Vehicle [sec/veh]	
A	≤ 10	
B	$> 10 - 20$	
C	$> 20 - 35$	
D	$> 35 - 55$	
E	$> 55 - 80$	
F	> 80	

NCDOT staff provided the signal geometric plans for the signalized study area intersections, which were used in the development of the existing conditions Synchro network. The cycle length and splits were optimized given the timing inputs in the existing conditions network and in accordance with NCDOT Congestion Management guidelines.

The following modifications from the background data collected were applied to the capacity analyses to meet NCDOT *Congestion Management Capacity Analysis Guidelines*:

- Right-turn-on-red (RTOR) operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists.
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain at total lost time of 5 seconds for each movement.
- A minimum of 4 vehicles per hour were used for permissible movements, excluding movements into and out of the proposed site.

Splits were optimized under background conditions at Old Monroe Road and Stallings Road/Potter Road due to the protected-only phasing that was modeled. Signal plans for the study area intersections are included in the **Appendix**.

Peak-hour factors (PHFs) were taken directly from the count data for the existing conditions scenario. A PHF of 0.9 was assumed for all future scenarios.

Heavy vehicle percentages were taken directly from field observations, subject to a 2% minimum.

Mitigation for vehicular traffic impacts caused by the proposed development were noted and identified based on Town of Stallings and NCDOT mitigation requirements. When determining the proposed development's vehicular traffic impact to the study area intersections, the build-out conditions were compared to the background conditions for each analysis scenario.

NCDOT Mitigation Requirements

Based on the NCDOT's *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 individual approach increases by 25% or greater, while maintaining the same level of service
- the Level of Service degrades by at least one level,
- or Level of Service is 'F'."

Town of Stallings Mitigation Requirements

Based on the Town of Stallings *TIA Ordinance*, "the applicant shall be required to identify mitigation improvements to the transportation network if at least one of the following conditions exists when comparing the multimodal operations of future year background conditions to future year build-out conditions:

- a) the total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same LOS,
- b) the LOS degrades by at least one level,
- c) or the LOS is "D" or below the LOS threshold dictated by the zoning (as outlined in Table 6.0-C) in the background conditions and the proposed project shows a negative impact on the intersection or approach"

Table 6.0-C – LOS Thresholds		
Zoning	Vehicular LOS Threshold	Bike/Ped LOS Threshold
AG, CIV	C	E
SFR, MFT, VSR, IND	D	D
TC, MU, C-74, CP-485, CZ, CUP	E	C
Within a Small Area Plan Boundary	E	C
All Other	D	D

Capacity analysis reports generated by Synchro Version 10 software are included in the **Appendix**. Additionally, queuing and blocking reports generated by the SimTraffic microsimulation model are included in the **Appendix**.

Pedestrian and bicycle operations analyses is later discussed in **Section 8.0**.

6.1 STALLINGS ROAD AND STEVENS MILL ROAD

Table 6.1 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, all-way stop intersection of Stallings Road and Stevens Mill Road.

Table 6.1 - Stallings Road and Stevens Mill Road									
Condition	Measure	EB	WB		NB		SB		Intersection
		EBLTR	WBLT	WBR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour									
2019 Existing	LOS (Delay)	C (17.1)	E (42.9)		C (21.1)		E (37.1)		-
	SimTraffic Max Q	67'	290'	116'	29'	109'	147'	112'	
2022 Background	LOS (Delay)	C (19.3)	F (77.3)		D (26.4)		F (52.7)		-
	SimTraffic Max Q	104'	184'	161'	52'	194'	246'	154'	
2022 Build-out	LOS (Delay)	D (27.5)	F (89.2)		D (28.0)		F (61.7)		-
	SimTraffic Max Q	136'	222'	250'	249'	350'	250'	392'	
2022 Build-out IMP	LOS (Delay)	B (18.5)	C (35.0)		B (12.6)		C (29.4)		C (27.8)
	SimTraffic Max Q	121'	#257'	151'	26'	105'	154'	89'	
2027 Build-out	LOS (Delay)	C (30.8)	E (73.3)		B (15.2)		E (68.8)		E (58.2)
	SimTraffic Max Q	185'	#392'	221'	33'	148'	#290'	125'	
PM Peak Hour									
2019 Existing	LOS (Delay)	C (17.7)	C (15.7)		D (31.5)		C (19.1)		-
	SimTraffic Max Q	60'	72'	70'	48'	171'	111'	85'	
2022 Background	LOS (Delay)	C (19.7)	C (16.3)		E (49.5)		C (24.2)		-
	SimTraffic Max Q	119'	54'	88'	250'	288'	171'	86'	
2022 Build-out	LOS (Delay)	D (26.1)	C (18.4)		F (58.1)		D (28.7)		-
	SimTraffic Max Q	167'	155'	54'	250'	343'	250'	364'	
2022 Build-out IMP	LOS (Delay)	C (22.2)	C (27.0)		B (10.7)		C (22.1)		B (19.2)
	SimTraffic Max Q	150'	#154'	57'	31'	159'	#220'	61'	
2027 Build-out	LOS (Delay)	C (28.7)	E (62.9)		B (11.8)		D (46.8)		D (35.2)
	SimTraffic Max Q	199'	#239'	75'	35'	221'	#330'	78'	
Existing/Background Storage		-	-	300'	150'	-	150'	-	

95th percentile volume exceeds capacity, queue may be longer

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Stallings Elementary School small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, in the AM peak hour, the westbound and southbound approaches are expected to operate at LOS F. In the PM peak hour, the northbound approach is expected to operate at LOS E.

With the addition of site traffic, the failing approaches are expected to continue to fail with increases in delay. Further, the eastbound approach is expected to drop one level of service in both peak hours and the northbound and southbound approaches are expected to drop one level of service in the PM peak hour.

To mitigate these drops in delay, the addition of turn lanes was considered. However, given that the northbound, southbound, and westbound approaches already have turn lanes, additional turn lanes could create a safety concern at this intersection. Further, some approaches would require dual turn lanes to mitigate site impact which would not be able to operate under stop-control conditions.

6.1 STALLINGS ROAD AND STEVENS MILL ROAD

Table 6.1 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized, all-way stop intersection of Stallings Road and Stevens Mill Road.

Table 6.1 - Stallings Road and Stevens Mill Road									
Condition	Measure	EB	WB		NB		SB		Intersection
		EBLTR	WBLT	WBR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour									
2019 Existing	LOS (Delay)	C (17.1)	E (42.9)		C (21.1)		E (37.1)		-
	SimTraffic Max Q	67'	290'	116'	29'	109'	147'	112'	
2022 Background	LOS (Delay)	C (19.3)	F (77.3)		D (26.4)		F (52.7)		-
	SimTraffic Max Q	104'	184'	161'	52'	194'	246'	154'	
2022 Build-out	LOS (Delay)	D (27.5)	F (89.2)		D (28.0)		F (61.7)		-
	SimTraffic Max Q	136'	222'	250'	249'	350'	250'	392'	
2022 Build-out IMP	LOS (Delay)	B (18.5)	C (35.0)		B (12.6)		C (29.4)		C (27.8)
	SimTraffic Max Q	121'	#257'	151'	26'	105'	154'	89'	
2027 Build-out	LOS (Delay)	C (30.8)	E (73.3)		B (15.2)		E (68.8)		E (58.2)
	SimTraffic Max Q	185'	#392'	221'	33'	148'	#290'	125'	
PM Peak Hour									
2019 Existing	LOS (Delay)	C (17.7)	C (15.7)		D (31.5)		C (19.1)		-
	SimTraffic Max Q	60'	72'	70'	48'	171'	111'	85'	
2022 Background	LOS (Delay)	C (19.7)	C (16.3)		E (49.5)		C (24.2)		-
	SimTraffic Max Q	119'	54'	88'	250'	288'	171'	86'	
2022 Build-out	LOS (Delay)	D (26.1)	C (18.4)		F (58.1)		D (28.7)		-
	SimTraffic Max Q	167'	155'	54'	250'	343'	250'	364'	
2022 Build-out IMP	LOS (Delay)	C (22.2)	C (27.0)		B (10.7)		C (22.1)		B (19.2)
	SimTraffic Max Q	150'	#154'	57'	31'	159'	#220'	61'	
2027 Build-out	LOS (Delay)	C (28.7)	E (62.9)		B (11.8)		D (46.8)		D (35.2)
	SimTraffic Max Q	199'	#239'	75'	35'	221'	#330'	78'	
Existing/Background Storage		-	-	300'	150'	-	150'	-	

95th percentile volume exceeds capacity, queue may be longer

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Stallings Elementary School small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, in the AM peak hour, the westbound and southbound approaches are expected to operate at LOS F. In the PM peak hour, the northbound approach is expected to operate at LOS E.

With the addition of site traffic, the failing approaches are expected to continue to fail with increases in delay. Further, the eastbound approach is expected to drop one level of service in both peak hours and the northbound and southbound approaches are expected to drop one level of service in the PM peak hour.

To mitigate these drops in delay, the addition of turn lanes was considered. However, given that the northbound, southbound, and westbound approaches already have turn lanes, additional turn lanes could create a safety concern at this intersection. Further, some approaches would require dual turn lanes to mitigate site impact which would not be able to operate under stop-control conditions.

As an alternative to turn lanes, to mitigate the site impacts, the following mitigation is recommended at this intersection:

- Installation of a traffic signal
- Extension of the southbound left-turn lane to provide 225 feet of storage

This intersection is expected to meet signal warrants in both peak hours under background and build-out conditions. It should be noted that NCDOT may require a full, thirteen-hour signal warrant analysis be performed at this intersection prior to installation of a traffic signal.

The addition of a traffic signal at this location is consistent with the Stallings Elementary School small area plan. This improvement would also provide safe pedestrian crossings to and from the elementary school.

Turn lane additions and modifications have been recommended at this intersection by adjacent developments. Further coordination with the Town and NCDOT relative to these overlapping requirements may be needed.

6.2 STALLINGS ROAD AND MONROE EXPRESSWAY WB RAMP

Table 6.2 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Stallings Road and Monroe Expressway WB Ramp.

Table 6.2 - Stallings Road and Monroe Expressway WB Ramp								
Condition	Measure	WB			NB		SB	Intersection
		WBL	WBT	WBR	NBL	NBTR	SBTR	LOS (Delay)
AM Peak Hour								
2019 Existing	LOS (Delay)	E (56.9)			C (20.5)		C (34.6)	C (34.1)
	Synchro 95th Q	159'	121'	149'	395'	7'	180'	
2022 Background	LOS (Delay)	D (49.7)			B (13.9)		D (40.5)	C (31.4)
	Synchro 95th Q	245'	120'	-	178'	4'	115'	
2022 Build-out	LOS (Delay)	D (49.2)			B (13.5)		D (41.4)	C (31.7)
	Synchro 95th Q	245'	123'	-	177'	4'	130'	
2027 Build-out	LOS (Delay)	D (51.0)			C (25.2)		D (43.7)	D (37.8)
	Synchro 95th Q	275'	144'	-	m211'	m5'	150'	
PM Peak Hour								
2019 Existing	LOS (Delay)	E (58.4)			B (19.4)		D (35.6)	C (32.0)
	Synchro 95th Q	145'	132'	139'	354'	8'	193'	
2022 Background	LOS (Delay)	D (52.1)			B (14.7)		D (37.6)	C (28.8)
	Synchro 95th Q	198'	127'	-	207'	5'	111'	
2022 Build-out	LOS (Delay)	D (52.8)			B (14.5)		D (38.2)	C (29.2)
	Synchro 95th Q	198'	139'	-	204'	5'	120'	
2027 Build-out	LOS (Delay)	D (54.5)			C (29.0)		D (40.2)	D (37.6)
	Synchro 95th Q	226'	161'	-	m239'	m7'	138'	
m Volume for 95th percentile queue is metered by upstream signal								

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Monroe Bypass Corridor small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, the overall intersection is projected to operate at LOS C in both peak hours, with all approaches operating at LOS D or better. With the addition of site traffic, the overall intersection and its approaches are expected to continue to operate acceptably with no changes in LOS. Since the overall intersection operates under capacity and the delay is expected to increase minimally, no improvements are recommended at this intersection for capacity purposes.

6.3 STALLINGS ROAD AND MONROE EXPRESSWAY EB RAMP

Table 6.3 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection of Stallings Road and Monroe Expressway EB Ramp.

Table 6.3 - Stallings Road and Monroe Expressway EB Ramp							
Condition	Measure	EB		NB	SB		Intersection
		EBL	EBTR	NBTR	SBL	SBT	LOS (Delay)
AM Peak Hour							
2019 Existing	LOS (Delay)	D (41.2)		C (33.9)	A (7.4)		C (29.8)
	Synchro 95th Q	145'	138'	266'	93'	15'	
2022 Background	LOS (Delay)	D (42.9)		D (41.3)	A (3.8)		C (31.3)
	Synchro 95th Q	-	280'	172'	31'	5'	
2022 Build-out	LOS (Delay)	D (43.1)		D (41.9)	A (4.0)		C (31.2)
	Synchro 95th Q	-	285'	173'	37'	11'	
2027 Build-out	LOS (Delay)	D (48.1)		D (46.3)	A (4.4)		C (34.9)
	Synchro 95th Q	-	343'	200'	54'	20'	
PM Peak Hour							
2019 Existing	LOS (Delay)	D (39.0)		D (37.1)	A (9.0)		C (31.9)
	Synchro 95th Q	198'	156'	294'	95'	23'	
2022 Background	LOS (Delay)	D (40.5)		D (38.9)	A (4.4)		C (31.7)
	Synchro 95th Q	-	341'	202'	49'	8'	
2022 Build-out	LOS (Delay)	D (40.3)		D (39.7)	A (4.6)		C (31.9)
	Synchro 95th Q	-	358'	205'	55'	7'	
2027 Build-out	LOS (Delay)	D (44.5)		D (44.8)	A (5.0)		D (35.5)
	Synchro 95th Q	-	442'	235'	68'	17'	

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Monroe Bypass Corridor small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, the overall intersection is projected to operate at LOS C in both peak-hours, with all approaches operating at LOS D or better. With the addition of site traffic, the overall intersection and its approaches are expected to continue to operate acceptably with no changes in LOS. Since the overall intersection operates under capacity and the delay is expected to increase minimally, no improvements are recommended at this intersection for capacity purposes.

6.4 STALLINGS ROAD AND MATTHEWS-INDIAN TRAIL ROAD

Table 6.4 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Stallings Road and Matthews-Indian Trail Road.

Table 6.4 - Stallings Road and Matthews-Indian Trail Road										
Condition	Measure	EB		WB		NB		SB		Intersection LOS (Delay)
		EBL	EBTR	WBL	WBTR	NBL	NBTR	SBL	SBTR	
AM Peak Hour										
2019 Existing	LOS (Delay)	B (14.4)		B (16.7)		A (9.1)		A (8.3)		B (10.3)
	Synchro 95th Q	13'	36'	38'	56'	35'	161'	32'	145'	
2022 Background	LOS (Delay)	B (17.9)		C (21.7)		A (10.0)		A (8.7)		B (11.8)
	Synchro 95th Q	18'	48'	56'	77'	39'	213'	54'	167'	
2022 Build-out	LOS (Delay)	B (18.0)		C (22.0)		B (10.0)		A (8.8)		B (11.9)
	Synchro 95th Q	18'	48'	56'	79'	39'	216'	56'	171'	
2027 Build-out	LOS (Delay)	C (20.6)		C (27.6)		B (15.2)		B (13.9)		B (16.9)
	Synchro 95th Q	20'	55'	64'	90'	56'	284'	#120'	221'	
PM Peak Hour										
2019 Existing	LOS (Delay)	B (16.5)		B (16.3)		A (9.8)		A (9.2)		B (11.6)
	Synchro 95th Q	19'	99'	30'	62'	13'	188'	29'	165'	
2022 Background	LOS (Delay)	B (18.8)		B (18.5)		A (9.5)		A (9.2)		B (11.8)
	Synchro 95th Q	24'	107'	58'	99'	15'	208'	38'	197'	
2022 Build-out	LOS (Delay)	B (19.0)		B (18.9)		A (9.6)		A (9.3)		B (11.9)
	Synchro 95th Q	24'	108'	59'	103'	15'	213'	40'	200'	
2027 Build-out	LOS (Delay)	C (22.3)		C (21.9)		B (10.8)		B (10.6)		B (13.6)
	Synchro 95th Q	28'	135'	69'	124'	18'	276'	55'	258'	

95th percentile volume exceeds capacity, queue may be longer

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Monroe Bypass Corridor small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, in both peak hours, the overall intersection is expected to operate at LOS B and each approach is expected to operate at LOS C or better. With the addition of site traffic, in the AM peak-hour, the northbound approach is projected to drop from LOS A to LOS B, however the increase in delay is expected to be less than 0.1 seconds.

Since the overall intersection operates under capacity and the delay is expected to increase minimally, no improvements are recommended at this intersection for capacity purposes.

6.5 STEVENS MILL ROAD AND MT. HARMONY CHURCH ROAD

Table 6.5 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection of Stevens Mill Road and Mt. Harmony Church Road.

Table 6.5 - Stevens Mill Road and Mt. Harmony Church Road							
Condition	Measure	EB	WB		NB	SB	
		EBLTR	WBL	WBTR	NBLTR	SBL	SBTR
AM Peak Hour							
2019 Existing	LOS (Delay)	D (25.6)	B (14.2)		A (0.6)	A (4.9)	
	Synchro 95th Q	20'	19'	53'	1'	11'	0'
2022 Background	LOS (Delay)	E (35.0)	C (15.9)		A (0.6)	A (5.0)	
	Synchro 95th Q	29'	26'	69'	1'	13'	0'
2022 Build-out	LOS (Delay)	E (37.2)	C (16.2)		A (0.6)	A (5.0)	
	Synchro 95th Q	31'	26'	73'	1'	14'	0'
2027 Build-out	LOS (Delay)	F (91.4)	C (21.6)		A (0.7)	A (5.2)	
	Synchro 95th Q	64'	47'	117'	1'	17'	0'
PM Peak Hour							
2019 Existing	LOS (Delay)	B (13.0)	B (11.3)		A (0.5)	A (5.4)	
	Synchro 95th Q	8'	3'	7'	1'	7'	0'
2022 Background	LOS (Delay)	B (13.0)	A (10.0)		A (0.2)	A (5.6)	
	Synchro 95th Q	4'	1'	5'	0'	7'	0'
2022 Build-out	LOS (Delay)	B (13.5)	A (10.0)		A (0.2)	A (5.8)	
	Synchro 95th Q	4'	1'	6'	0'	8'	0'
2027 Build-out	LOS (Delay)	C (16.0)	B (10.1)		A (0.2)	A (6.0)	
	Synchro 95th Q	5'	2'	7'	0'	10'	0'

This intersection falls outside of the Town of Stallings. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, the eastbound stop-controlled approach is projected to operate at LOS E with long delays during the AM peak hour.

With the addition of site traffic, the eastbound stop-controlled approach is expected to continue to operate at LOS E with slight increases in delay in the AM peak hour (2.2 seconds). This approach is projected to have 12 vehicles in the AM peak hour and 17 vehicles in the PM peak hour, with no site trips added. Due to the low projected increase in delays and the low volumes on this approach, no improvements are recommended at this intersection for capacity purposes.

6.6 STEVENS MILL ROAD AND OAKSPRING ROAD

Table 6.6 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection of Stevens Mill Road and Oakspring Road.

Table 6.6 - Stevens Mill Road and Oakspring Road					
Condition	Measure	EB	WB	NB	
		EBTR	WBLT	NBLR	NBR
AM Peak Hour					
2019 Existing	LOS (Delay)	A (0.0)	A (4.4)	F (563.2)	
	Synchro 95th Q	0'	17'	585'	-
2022 Background	LOS (Delay)	A (0.0)	A (5.4)	F (Err)	
	Synchro 95th Q	0'	21'	Err	-
2022 Build-out	LOS (Delay)	A (0.0)	A (5.4)	F (Err)	
	Synchro 95th Q	0'	21'	Err	-
2022 Build-out IMP	LOS (Delay)	A (0.0)	A (5.8)	F (Err)	
	Synchro 95th Q	0'	23'	Err	Err
2027 Build-out	LOS (Delay)	A (0.0)	A (9.4)	F (Err)	
	Synchro 95th Q	0'	36'	Err	Err
PM Peak Hour					
2019 Existing	LOS (Delay)	A (0.0)	A (3.2)	F (58.7)	
	Synchro 95th Q	0'	8'	191'	-
2022 Background	LOS (Delay)	A (0.0)	A (3.3)	F (66.4)	
	Synchro 95th Q	0'	9'	183'	-
2022 Build-out	LOS (Delay)	A (0.0)	A (3.3)	F (72.6)	
	Synchro 95th Q	0'	9'	196'	-
2022 Build-out IMP	LOS (Delay)	A (0.0)	A (3.3)	E (40.2)	
	Synchro 95th Q	0'	9'	127'	127'
2027 Build-out	LOS (Delay)	A (0.0)	A (4.5)	F (280.1)	
	Synchro 95th Q	0'	13'	429'	429'

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it falls within the Stallings Elementary School small area plan. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Under 2022 background conditions, the northbound stop-controlled approach is projected to operate at LOS F with long delays and queues during both peak hours.

With the addition of site traffic, the northbound stop-controlled approach is expected to continue to operate at LOS F with increases in delay in both peak-hours. To mitigate this increase in delay, the following improvement is recommended:

- Construction of a northbound right-turn lane with 100 feet of storage

With this improvement in place, the northbound stop-controlled approach is expected to operate with less delay than the background condition.

6.7 STEVENS MILL ROAD AND PUBLIC ROAD #1

Table 6.7 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed full-movement intersection of Stevens Mill Road and Public Road #1.

Table 6.7 - Stevens Mill Road and Public Road 1				
Condition	Measure	EB	WB	NB
		EBTR	WBLT	NBLR
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (0.4)	A (9.7)
	Synchro 95th Q	0'	1'	4'
2027 Build-out	LOS (Delay)	A (0.0)	A (0.3)	B (10.0)
	Synchro 95th Q	0'	1'	4'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (2.7)	A (9.8)
	Synchro 95th Q	0'	2'	3'
2027 Build-out	LOS (Delay)	A (0.0)	A (2.5)	B (10.0)
	Synchro 95th Q	0'	2'	3'

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it is zoned MU-2. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Based on the site plan shown in **Figure 3.2**, the northbound lane was assumed to include a single lane. The northbound stop-controlled approach of this intersection is expected to operate with short delays and queues under build-out conditions; therefore, no mitigation is identified for this proposed public road for capacity purposes.

6.8 STEVENS MILL ROAD AND PUBLIC ROAD #2

Table 6.8 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed full-movement intersection of Stevens Mill Road and Public Road #2.

Table 6.8 - Stevens Mill Road and Public Road 2				
Condition	Measure	EB	WB	NB
		EBTR	WBLT	NBLR
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (0.6)	A (9.6)
	Synchro 95th Q	0'	1'	5'
2027 Build-out	LOS (Delay)	A (0.0)	A (0.6)	A (9.8)
	Synchro 95th Q	0'	1'	6'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (0.0)	A (3.3)	A (9.7)
	Synchro 95th Q	0'	3'	4'
2027 Build-out	LOS (Delay)	A (0.0)	A (3.1)	A (10.0)
	Synchro 95th Q	0'	3'	4'

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it is zoned MU-2. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Based on the site plan shown in **Figure 3.2**, the northbound lane was assumed to include a single lane. The northbound stop-controlled approach of this intersection is expected to operate with short delays and queues under build-out conditions; therefore, no mitigation is identified for this proposed public road for capacity purposes.

6.9 PUBLIC ROAD #1 AND ACCESS #1

Table 6.9 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed full-movement intersection of Public Road #1 and Access #1.

Table 6.9 - Public Road 1 and Access 1				
Condition	Measure	WB	NB	SB
		WBLR	NBTR	SBTL
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (8.4)	A (0.0)	A (7.2)
	Synchro 95th Q	3'	0'	1'
2027 Build-out	LOS (Delay)	A (8.4)	A (0.0)	A (7.2)
	Synchro 95th Q	3'	0'	1'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (8.4)	A (0.0)	A (7.3)
	Synchro 95th Q	2'	0'	2'
2027 Build-out	LOS (Delay)	A (8.4)	A (0.0)	A (7.3)
	Synchro 95th Q	2'	0'	2'

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it is zoned MU-2. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Based on the site plan shown in **Figure 3.2**, the westbound egress lane was assumed to include a single lane. The westbound stop-controlled approach of this intersection is expected to operate with short delays and queues under build-out conditions; therefore, no mitigation is identified for this proposed access for capacity purposes.

Minimal queueing is expected on the westbound approach; therefore, a minimum internal protected stem of 100 feet is recommended.

6.10 PUBLIC ROAD #2 AND ACCESS #2

Table 6.10 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed full-movement intersection of Public Road #2 and Access #2.

Table 6.10 - Public Road 2 and Access 2				
Condition	Measure	EB	NB	SB
		EBLR	NBLT	SBTR
AM Peak Hour				
2022 Build-out	LOS (Delay)	A (8.8)	A (0.0)	A (0.0)
	Synchro 95th Q	4'	0'	0'
2027 Build-out	LOS (Delay)	A (8.8)	A (0.0)	A (0.0)
	Synchro 95th Q	4'	0'	0'
PM Peak Hour				
2022 Build-out	LOS (Delay)	A (8.8)	A (0.0)	A (0.0)
	Synchro 95th Q	3'	0'	0'
2027 Build-out	LOS (Delay)	A (8.8)	A (0.0)	A (0.0)
	Synchro 95th Q	3'	0'	0'

Per the Town of Stallings mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS E**, since it is zoned MU-2. Per NCDOT mitigation thresholds, the mitigation threshold for vehicular LOS at this intersection is **LOS D**.

Based on the site plan shown in **Figure 3.2**, the eastbound egress lane was assumed to include a single lane. The eastbound stop-controlled approach of this intersection is expected to operate with short delays and queues under build-out conditions; therefore, no mitigation is identified for this proposed access for capacity purposes.

Minimal queueing is expected on the eastbound approach; therefore, a minimum internal protected stem of 100 feet is recommended.

7.0 Auxiliary Turn Lane Warrants

Warrants for additional turn-lane improvements for unsignalized intersections beyond those necessary for capacity were determined based on a review of the figure titled 'Warrant for Left and Right-Turn Lanes' found on page 80 in the *NCDOT Policy On Street And Driveway Access to North Carolina Highways*, included in the **Appendix**.

The following auxiliary turn lanes are warranted under background and build-out conditions:

Background

Stevens Mill Road and Mt. Harmony Church Road

- Northbound right-turn lane with 50 feet of storage
- Southbound left-turn lane with 100 feet of storage

Stevens Mill Road and Oakspring Road

- Eastbound right-turn lane with 200 feet of storage
- Westbound left-turn lane with 150 feet of storage

Build-Out

Stevens Mill Road and Mt. Harmony Church Road

- Northbound right-turn lane with 50 feet of storage
- Southbound left-turn lane with 100 feet of storage

Since these turn lanes are warranted in the background conditions, no auxiliary turn lanes are recommended at this intersection.

Stevens Mill Road and Oakspring Road

- Eastbound right-turn lane with 200 feet of storage
- Westbound left-turn lane with 150 feet of storage

Since these turn lanes are warranted in the background conditions, no auxiliary turn lanes are recommended at this intersection.

Stevens Mill Road and Public Road #1

- Westbound left-turn lane with 50 feet of storage

Stevens Mill Road and Public Road #2

- Westbound left-turn lane with 50 feet of storage

Public Road #2 and Access #2

- Southbound right-turn lane with 50 feet of storage

A minimum right-turn storage length of 100 feet and a minimum left-turn storage length of 150 feet may be required for auxiliary turn lanes. Minimum warranted turn lanes are reported in this TIS and associated mitigation laneage figures. Final required turn lane lengths should be confirmed with Town and NCDOT staff.

8.0 Pedestrian and Bicycle Operations Analysis

In addition to vehicular capacity analyses, the Town of Stallings also requires non-vehicular operations analyses, including pedestrian and bicycle analyses, to allow for the safe and convenient travel for all transportation modes.

Pedestrian Operations Analysis

The *Highway Capacity Manual 6th Edition* was used to evaluate the pedestrian LOS at the study intersections. The HCM provides methodology for calculating the pedestrian LOS for TWSC intersections and signalized intersections based on geometric data, demand data and signal control data including, but not limited to:

- Number of lanes on the major street
- Crossing distance
- Traffic volumes
- Motorist yielding rates to pedestrians
- Cycle length
- Walk time
- Presence of pedestrian phase

It should be noted that pedestrian delay and LOS calculation methodology for TWSC intersections in the HCM only applies to the major street, free-flow crossings. It is stated in the HCM that "approaches where conflicting traffic is stop-controlled are assumed to result in negligible delay for pedestrians, as vehicles are required to stop and wait for conflicting vehicle and pedestrian traffic before proceeding."

Tables 8.0-A and **8.0-B** list the pedestrian LOS thresholds published in the HCM for unsignalized and signalized intersections, respectively.

Table 8.0-A Pedestrian LOS Thresholds for Unsignalized Intersections	
Level-of-Service	Average Control Delay (seconds per pedestrian)
A	0 – 5
B	5 – 10
C	10 – 20
D	20 – 30
E	30 – 45
F	> 45

Table 8.0-B Pedestrian LOS Thresholds for Signalized Intersections	
Level-of-Service	LOS Score
A	≤ 1.50
B	> 1.50 – 2.50
C	> 2.50 – 3.50
D	> 3.50 – 4.50
E	> 4.50 – 5.50
F	> 5.50

The pedestrian LOS calculation worksheets are included in the **Appendix**.

Table 8.1 summarizes the LOS and control delay (seconds per pedestrian) at the study area intersections for each of the analysis scenarios. The LOS and delay are reported for pedestrians crossing the free-flow approaches only at the TWSC intersections and reported for all approaches at signalized intersections.

Table 8.1 - Pedestrian Operations					
Condition	Peak Hour	EB	WB	NB	SB
1 - Stallings Road and Stevens Mill Road (No Pedestrian LOS for All-Way Stop)					
2 - Stallings Road and Monroe Expressway WB Ramp					
2019 Existing	AM	C (2.64)	B (2.39)	C (2.5)	B (2.02)
	PM	C (2.65)	B (2.44)	C (2.8)	B (2.01)
2022 Background	AM	C (3.22)	C (2.72)	B (2.02)	B (2.07)
	PM	C (3.17)	C (2.76)	C (2.93)	B (2.04)
2022 Build	AM	C (3.23)	C (2.74)	C (2.85)	B (2.07)
	PM	C (3.18)	C (2.78)	C (2.94)	B (2.05)
2027 Build+5	AM	C (3.29)	C (2.77)	C (3.06)	B (2.11)
	PM	C (3.25)	C (2.82)	C (3.15)	B (2.08)
3 - Stallings Road and Monroe Expressway EB Ramp					
2019 Existing	AM	B (2.32)	C (2.61)	B (2.03)	B (1.85)
	PM	B (2.33)	C (2.71)	B (2.08)	B (1.91)
2022 Background	AM	C (2.69)	C (3.11)	B (2.13)	B (1.93)
	PM	C (2.69)	C (3.22)	B (2.15)	B (1.97)
2022 Build	AM	C (2.69)	C (3.13)	B (2.13)	B (1.97)
	PM	C (2.7)	C (3.27)	B (2.16)	B (1.99)
2027 Build+5	AM	C (2.73)	C (3.21)	B (2.15)	B (2.03)
	PM	C (2.74)	C (3.36)	B (2.17)	B (2.05)
4 - Stallings Road and Matthews-Indian Trail Road					
2019 Existing	AM	B (2.36)	B (2.27)	B (2.26)	B (2.07)
	PM	B (2.35)	B (2.31)	B (2.16)	B (2.06)
2022 Background	AM	B (2.47)	B (2.36)	B (2.29)	B (2.18)
	PM	B (2.49)	B (2.4)	B (2.19)	B (2.14)
2022 Build	AM	B (2.47)	B (2.37)	B (2.29)	B (2.18)
	PM	B (2.49)	B (2.41)	B (2.19)	B (2.15)
2027 Build+5	AM	B (2.57)	B (2.45)	B (2.34)	B (2.23)
	PM	B (2.59)	B (2.51)	B (2.23)	B (2.2)

5 - Mt Harmony Church Rd and Stevens Mill Road					
2019 Existing	AM	-	-	C (13.6)	D (21.0)
	PM	-	-	C (10.8)	C (16.4)
2022 Background	AM	-	-	C (15.8)	D (24.6)
	PM	-	-	C (12.3)	C (18.9)
2022 Build	AM	-	-	C (15.8)	D (24.6)
	PM	-	-	C (12.3)	C (18.9)
2027 Build+5	AM	-	-	D (20.1)	E (31.9)
	PM	-	-	C (15.5)	D (24.1)
6 - Oakspring and Stevens Mill Road					
2019 Existing	AM	D (20.1)	D (20.1)	-	-
	PM	C (17.5)	C (17.5)	-	-
2022 Background	AM	D (25.0)	D (25.0)	-	-
	PM	D (21.6)	D (21.6)	-	-
2022 Build	AM	D (25.3)	D (25.3)	-	-
	PM	D (22.0)	D (22.0)	-	-
2022 Build Improved	AM	D (25.3)	D (25.3)	-	-
	PM	D (22.0)	D (22.0)	-	-
2027 Build+5	AM	E (36.2)	E (36.2)	-	-
	PM	E (30.8)	E (30.8)	-	-
7 - Public Road 1 and Stevens Mill Rd					
2019 Existing	AM	C (16.0)	C (16.0)	-	-
	PM	B (9.3)	B (9.3)	-	-
2022 Background	AM	C (19.1)	C (19.1)	-	-
	PM	C (10.9)	C (10.9)	-	-
2022 Build	AM	C (19.7)	C (19.7)	-	-
	PM	C (11.4)	C (11.4)	-	-
2027 Build+5	AM	D (26.1)	D (26.1)	-	-
	PM	C (14.5)	C (14.5)	-	-
8 - Public Road 2 and Stevens Mill Rd					
2019 Existing	AM	C (16.0)	C (16.0)	-	-
	PM	B (9.3)	B (9.3)	-	-
2022 Background	AM	C (19.1)	C (19.1)	-	-
	PM	C (10.9)	C (10.9)	-	-
2022 Build	AM	D (22.5)	D (22.5)	-	-
	PM	C (14.1)	C (14.1)	-	-
2027 Build+5	AM	D (29.6)	D (29.6)	-	-
	PM	C (17.5)	C (17.5)	-	-
9 - Public Road 1 and Access 1					
2019 Existing	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2022 Background	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2022 Build	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2027 Build+5	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
10 - Public Road 2 and Access 2					
2019 Existing	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2022 Background	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2022 Build	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)
2027 Build+5	AM	-	-	A (0.0)	A (0.0)
	PM	-	-	A (0.0)	A (0.0)

As shown in **Table 8.1**, the following intersections do not warrant mitigation based on Town of Stallings pedestrian mitigation thresholds:

- Stallings Road and Stevens Mill Road (No pedestrian LOS reported for all-way stop control)
- Stallings Road and Monroe Expressway WB Ramp
- Stallings Road and Monroe Expressway EB Ramp
- Stallings Road and Matthews-Indian Trail Road
- Stevens Mill Road and Mt. Harmony Church Road
- Stevens Mill Road and Oakspring Road
- Stevens Mill Road and Public Road #1
- Public Road #1 and Access #1
- Public Road #2 and Access #2

At the intersections of Stevens Mill Road and Public Road #2, the eastbound and westbound approaches are expected to operate at LOS C in the background condition. With the addition of site traffic, the LOS is projected to drop to LOS D. The pedestrian mitigation threshold at this intersection is LOS C.

To mitigate these increased pedestrian delays, the following pedestrian improvements should be implemented, consistent with the current Town pedestrian plan:

- Construction of a sidewalk along the frontage of the proposed site

Bicycle Operations Analysis

The HCM does not provide methodology to analyze the operations of bicyclists at unsignalized intersections. As shown in the approved MOU, the Charlotte Department of Transportation's (CDOT) Bicycle LOS Worksheet was used to determine the bicycle levels-of-service. The CDOT Bicycle LOS Worksheet assesses bicyclists' comfort based on geometric and traffic signal features including, but not limited to:

- Number of lanes crossed
- Presence of conflicting turning movements
- Presence of bike lanes
- Left-turn phase treatment (permitted green, protected green, leading green)

Intersection features are assigned points, as identified by CDOT in the worksheet. LOS for each approach is calculated based on the accumulation of points for each geometric and traffic signal feature identified in the worksheet. A higher number of points correlates to a better LOS. The LOS thresholds for CDOT's Bicycle LOS Worksheet are shown in **Table 8.2**.

Table 8.2 Bicycle LOS Thresholds	
Level-of-Service	Points
A	93+
B	74 – 92
C	55 – 73
D	37 – 54
E	19 – 36
F	0 – 18

CDOT's Bicycle LOS Worksheet was originally developed to assess the operations of bicycles at signalized intersections. Based on review of the inputs related to traffic signals, the worksheet was used to evaluate bicycle LOS at unsignalized intersections in this study using the following assumptions to better reflect unsignalized operations:

- Opposing vehicle left-turns were permitted (made on Green Ball only)
- Right-turn-on-red was permitted

Table 8.3 summarizes the LOS for bicyclists at the study area intersections. CDOT's Bicycle LOS Worksheet does not take into account demand volumes; therefore, the bicycle LOS does not adjust or differ between AM and PM peak hours, nor does it differ for future-year scenarios unless the intersection laneage is modified. The bicycle LOS calculation worksheets are included in the **Appendix**.

Table 8.3 - Bicycle Operations						
Condition	Condition	EB	WB	NB	SB	Intersection
1. Stallings Road and Stevens Mill Road	Existing, Background, & Build	E (25)	E (25)	E (25)	E (25)	E (25)
	Build Improved	F (10)	F (10)	F (10)	F (10)	F (10)
2. Stallings Rd at Monroe Expressway WB Ramp	Existing	-	D (45)	C (60)	E (25)	D (43)
	Background & Build	-	E+ (35)	C (60)	E (25)	D- (40)
3. Stallings Rd at Monroe Expressway EB Ramp	Existing	D (45)	-	D (50)	C (60)	E+ (35)
	Background & Build	E+ (35)	-	D (50)	C (60)	E (32)
4. Stallings Rd at Matthews-Indian Trail Rd	All Scenarios	F (5)	E (30)	E (30)	E (30)	E (30)
5. Mt Harmony Church Rd and Stevens Mill Road	All Scenarios	D (45)	D (45)	E (30)	E (30)	D- (38)
6. Oakspring Rd and Stevens Mill Road	All Scenarios	F (5)	D- (40)	D (50)	-	E (32)
7. Public Road 1 and Stevens Mill Road	Build	F (5)	D- (40)	C+ (70)	-	D- (38)
8. Public Road 2 and Stevens Mill Road	Build	F (5)	D- (40)	C+ (70)	-	D- (38)
9. Public Road 1 and Access 1	Build	-	C+ (70)	D (50)	B (85)	C (68)
10. Public Road 2 and Access 2	Build	C+ (70)	-	B (85)	D (50)	C (68)

Table 8.3 shows that all intersections are projected to operate in the LOS C to LOS F range under all analysis scenarios. The poor LOS along Stallings Road, Matthews-Indian Trail Road,

Willows at Stallings

Transportation Impact Analysis

and Oakspring Road is primarily attributed to speeds greater than 30 mph, lack of bicycle facilities and bicyclist conflicts with left- and right-turning vehicular movements. It should be noted that based on existing counts, very few bicyclists currently navigate routes through the study area intersections.

8.1 TRANSIT FACILITIES

There are currently no transit stops in the proximity of the study area.

9.0 Crash Data Analysis

Crash data was obtained at the study intersections for crashes that occurred between August 1, 2016 and July 31, 2019. Over this three-year period, 120 total crashes were reported at the existing study intersections. The summaries below only reflect crashes reported at the existing study intersections. The breakdown of crashes at these study intersections by severity, frequency and crash type are shown in the tables below.

Table 9.1 – Crash Severity Summary

Crash Type	Number of Crashes
Fatal Crashes	0
Class A	0
Class B	6
Class C	13
Property Damage Only	101
Total	120

Table 9.1 above displays the total number of crashes by severity type from most to least severe. As shown, there were no fatal crashes reported and 11% of the crashes involved injury or possible injury at the study intersections over the past three years. The crash types are defined as follows:

- Class A - crashes where serious injury is suspected and can include significant loss of blood or broken bones.
- Class B - crashes where minor injury is suspected, such as bruises or minor cuts.
- Class C - crashes wherein possible injuries occur, which are injuries reported by the person or indicated by his/her behavior, but no wounds or injuries are physically present, such as limping or complaint of neck pain.
- Property Damage Only (PDO) – crashes where no injury is reported.

Table 9.2 – Crash Frequency Summary

Location	Crashes/100 MEV
Stallings Road and Stevens Mill Road	58.63
Stallings Road and US 74	100.20
Stallings Road and Matthews-Indian Trail Road	103.88
Stevens Mill Road and Mt. Harmony Church Road	110.80
Stevens Mill Road and Oakspring Road	125.57
Average	98.81

Table 9.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 98.81 crashes per 100 million entering vehicles (MEV), with the highest rate occurring at the signalized intersection of Stevens Mill Road and Oakspring Road. There have been 11 reported crashes over this three-year period at this intersection.

Table 9.3 – Crash Type Summary

	Stallings Road and Stevens Mill Road	Stallings Road and US 74	Stallings Road and Matthews-Indian Trail Road	Stevens Mill Road and Mt. Harmony Church Road	Stevens Mill Road and Oakspring Road
Angle	3	11	11	3	1
Animal	0	0	1	0	0
Backing Up	0	2	0	0	0
Left-Turn, Different Roadways	1	0	0	1	0
Left-Turn, Same Roadway	0	2	0	0	0
Ran off Road - Straight	0	0	0	0	6
Ran off Road - Left	0	0	0	0	1
Ran off Road - Right	1	0	0	0	0
Rear End, Slow or Stop	0	50	5	0	2
Right-Turn, Same Roadway	0	0	1	0	0
Sideswipe, Same Direction	1	13	0	0	0
Sideswipe, Opposite Direction	1	1	1	0	1
Total	7	79	19	4	11

The most common crash types reported at the study area intersections were rear-end collisions caused by slowing or stopping vehicles (48%) and angle crashes (24%). These types of crashes are often associated with increased congestion at both signalized and unsignalized intersections. As shown in **Table 9.3**, rear-end collisions occurred at three of the five existing study area intersections and angle collisions occurred at all five of the existing study area intersections.

Crash data provided by NCDOT is included in the **Appendix**.

10.0 Identified Mitigation Improvements

Based on the vehicular, pedestrian, and bicycle operations analyses performed at each of the identified study intersections, along with review of the auxiliary turn-lane warrants and crash analyses contained herein, the following improvements are identified to mitigate the impact of the proposed development on the surrounding transportation infrastructure:

Stallings Road and Stevens Mill Road

- Installation of a traffic signal (full signal warrant analysis may be required)
- Extension of the southbound left-turn lane to provide 225 feet of storage

Stevens Mill Road and Oakspring Road

- Construction of a northbound right-turn lane with 100 feet of storage

Stevens Mill Road and Public Road #1

- Construction of a two-lane cross-section on the northbound approach
- Construction of a westbound left-turn lane with a minimum of 50 feet of storage

Stevens Mill Road and Public Road #2

- Construction of a two-lane cross-section on the northbound approach
- Construction of a westbound left-turn lane with a minimum of 50 feet of storage

Public Road #1 and Access #1

- Construction of a single lane egress/ingress on the westbound approach with an internal protected stem of 100 feet

Public Road #2 and Access #2

- Construction of a single lane egress/ingress on the eastbound approach with an internal protected stem of 100 feet
- Construction of a southbound right-turn lane with a minimum of 50 feet of storage

Study Area Pedestrian and Bicycle Improvements

- Construction of a sidewalk along the frontage of the proposed site

The mitigation improvements identified within the study area are shown in **Figure 10.1**. The improvements shown on this figure are subject to approval by NCDOT and the Town of Stallings. All additions and attachments to the State and Town roadway system shall be properly permitted, designed and constructed in conformance to standards maintained by the agencies.

