

Transportation Impact Analysis for
Chestnut Farm
Stallings, North Carolina

Prepared for:

Town of Stallings
Stallings, North Carolina

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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 Chestnut Farm 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 Chestnut Farm development is located west of the Matthews-Weddington Road and Chestnut Lane intersection in Stallings, North Carolina. The 30-acre site is currently undeveloped and zoned SFR-1 and is planned to be rezoned. Based on the site plan provided by the applicant, the development is proposed to consist of 325 multifamily dwelling units.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2021. Based on the provided site plan, the proposed development will be accessed via three access points:

- Driveway #1 – A full-movement driveway connection creating the 4th leg of the Matthews-Weddington Road and Chestnut Lane intersection.
- Driveway #2 – A right-in/right-out driveway connection to Matthews-Weddington Road south of Chestnut Lane.
- Driveway #3 – a right-in/right-out driveway connection to Matthews-Weddington Road north of Chestnut Lane

A TIA scoping meeting was held with the Town of Stallings, North Carolina Department of Transportation (NCDOT), and representatives of the applicant in Stallings on November 29, 2018, 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:

- 2018 Existing Conditions
- 2021 Background Conditions
- 2021 Build Conditions
- 2026 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. Matthews-Weddington Road and Chestnut Lane/Driveway #1
2. Matthews-Weddington Road and Antioch Church Road
3. Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road
4. Weddington Road and McKee Road
5. Potter Road and Chestnut Lane
6. Matthews-Weddington Road and Driveway #2
7. Matthews-Weddington Road and Driveway #3

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.

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:

Matthews-Weddington Road and Chestnut Lane/Site Access #1

- Construction of an eastbound approach to the roundabout (U-6091) that will operate as a shared left/through/right lane and serve as the main driveway to the proposed development.
- Contribution of \$87,500 (equivalent to 25% of the Town's \$350,000 contribution to the planned roundabout).

Matthews-Weddington Road and Antioch Church Road

- Implementation of a westbound right-turn overlap phase.

Matthews-Weddington Road and Driveway #2

- Construction of a right-in/right-out driveway.
- Construction of a southbound right-turn lane; storage length subject to NCDOT.

Matthews-Weddington Road and Driveway #3

- Construction of a right-in/right-out driveway.

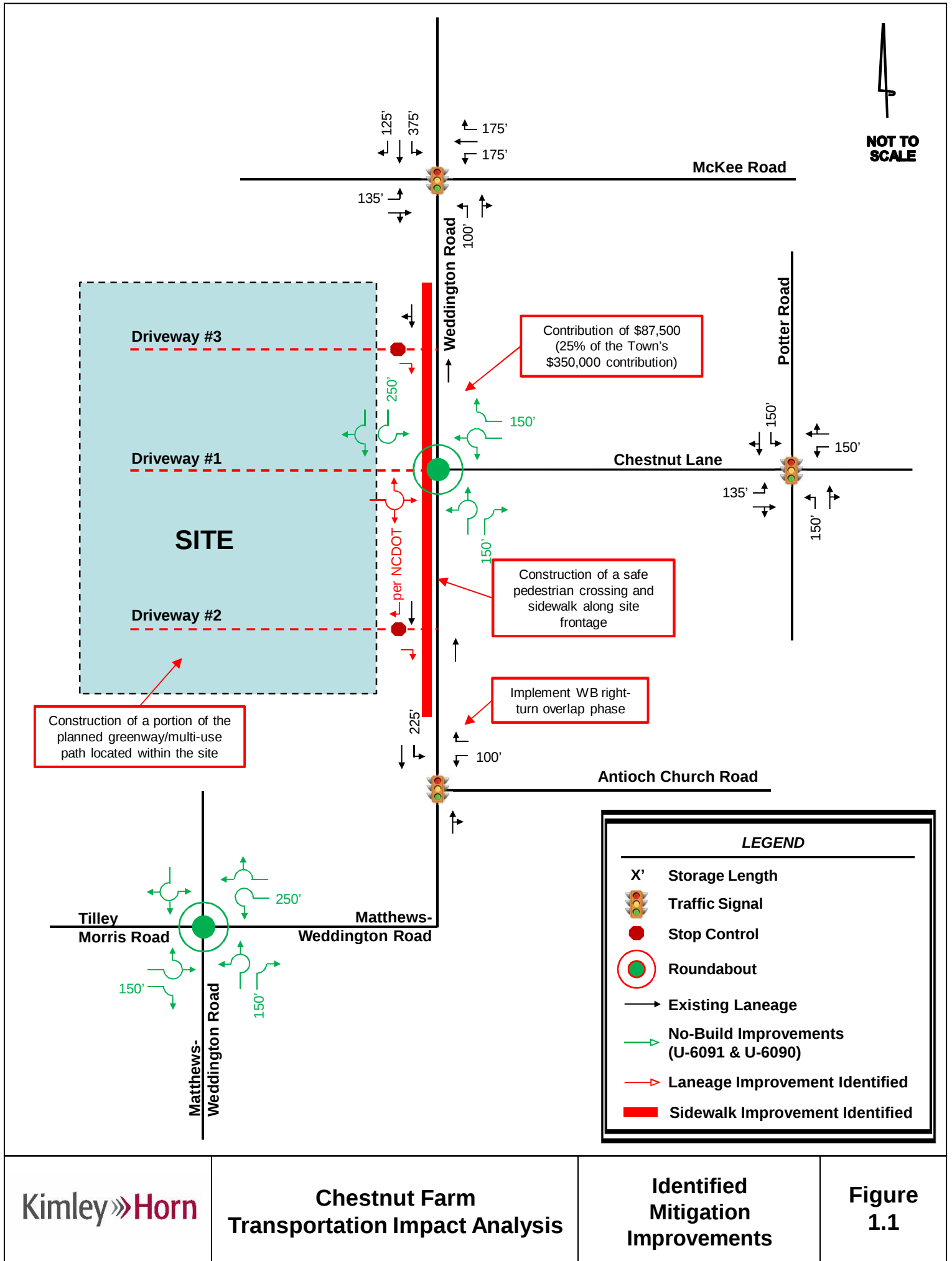
Study Area Pedestrian and Bicycle Improvements

- Construction of a safe pedestrian crossing of Matthews-Weddington Road (to be coordinated with U-6091)
- Construction of sidewalk along the frontage of the site along Matthews-Weddington Road

- Construction of greenway/multi-use path through the proposed site consistent with the planned Francis Beatty Trail as determined by Town staff; Applicant should coordinate with the Town early in the planning process to determine the appropriate alignment and cross-section of this trail

Per discussion with the Town, the pedestrian plan is currently being updated. These identified improvements should be coordinated with the Town to ensure consistency with the pedestrian plan under development. It should also be noted that a greenway/multi-use path is already shown on the site plan provided by the Applicant.

The mitigation improvements identified within the study area are shown on **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 Chestnut Farm development is located west of the Matthews-Weddington Road and Chestnut Lane intersection in Stallings, North Carolina. The 30-acre site is currently undeveloped and zoned SFR-1 and is planned to be rezoned. Based on the site plan provided by the applicant, the development is proposed to consist of 325 multifamily dwelling units.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2021. Based on the provided site plan, the proposed development will be accessed via three access points:

- Driveway #1 – A full-movement driveway connection creating the 4th leg of the Matthews-Weddington Road and Chestnut Lane intersection.
- Driveway #2 – A right-in/right-out driveway connection to Matthews-Weddington Road south of Chestnut Lane.
- Driveway #3 – A right-in/right-out driveway connection to Matthews-Weddington Road north of Chestnut Lane.

A TIA scoping meeting was held with the Town of Stallings, North Carolina Department of Transportation (NCDOT), and representatives of the applicant in Stallings on November 29, 2018, 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 and turning-movement counts to establish the existing conditions baseline analysis. A general field visit to observe existing conditions was performed January 8, 2019.

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. Matthews-Weddington Road and Chestnut Lane/Driveway #1
2. Matthews-Weddington Road and Antioch Church Road
3. Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road
4. Weddington Road and McKee Road
5. Potter Road and Chestnut Lane
6. Matthews-Weddington Road and Driveway #2
7. Matthews-Weddington Road and Driveway #3

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 Matthews-Weddington Road, Chestnut Lane, Tilley Morris Road, Antioch Church Road, Potter Road, and McKee Road. **Table 3.1** shows facility type, 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
Matthews-Weddington Road	2-lane undivided	12,000 S of Chestnut Lane (2016)	45 mph
Chestnut Lane	2-lane undivided	7,700 W of Potter Road (2017)	35/45 mph
Tilley Morris Road	2-lane undivided	12,000 W of Matthews-Weddington Road (2016)	45 mph
Antioch Church Road	2-lane undivided	8,600 E of Matthews-Weddington Road (2015)	45 mph
Potter Road	2-lane undivided	12,000 S of Chestnut Lane (2016)	35 mph
McKee Road	2-lane undivided	17,000 W of Matthews-Weddington Road	45 mph

Matthews-Weddington Road is a two-lane undivided NCDOT minor arterial with a posted speed limit of 45 miles per hour (mph), and a NCDOT 2016 average daily traffic (ADT) volume of 12,000 vehicles per day (vpd) just south of the proposed site. There are non-continuous stretches of sidewalk along both sides of the roadway north of the proposed site to McKee Road. There are no bike lanes along the roadway in the project vicinity.

Chestnut Lane is a two-lane undivided roadway with turn lanes and is classified by NCDOT as a minor collector. Chestnut Lane has a posted speed limit of 45 mph east of Matthews-Weddington Road and a posted speed limit of 35 mph west of Potter Road. There are segments of non-continuous sidewalk on both sides of the roadway between Matthews-Weddington Road and Potter Road. No bike lanes are present on the roadway in the project vicinity. Chestnut Lane has a 2016 NCDOT ADT volume of 7,700 vpd just west of Potter Road.

Tilley Morris Road is a two-lane undivided NCDOT minor collector with a posted speed limit of 45 miles per hour (mph), and a NCDOT 2016 average daily traffic (ADT) volume of 12,000 vehicles per day (vpd) west of Matthews-Weddington Road. There are small segments of sidewalk along both sides of the roadway and no bicycle lanes near the project vicinity.

Antioch Church Road is a two-lane undivided roadway with a TWLTL near the project vicinity. The roadway is classified by NCDOT as a minor collector with a posted speed limit of 45 mph and a NCDOT 2016 ADT volume of 8,600 vpd. There are short segments of sidewalk along the westbound side of Antioch Church Road near the project vicinity. There are no bicycle facilities along the roadway.

Potter Road is a two-lane undivided roadway with turn lanes and classified by NCDOT as a major collector. The roadway has a posted speed limit of 35 mph and a NCDOT 2016 ADT volume of 12,000 vpd, south of Chestnut Lane. There are sidewalk segments along both sides of Potter Road near Chestnut Lane. No bicycle lanes are present along the roadway in the project vicinity.

McKee Road is a two-lane undivided roadway with turn lanes and a posted speed limit of 45 mph. McKee Road is classified by NCDOT as a minor arterial west of Matthews-Weddington Road and classified as a minor collector east of Matthew-Weddington Road. The roadway has a NCDOT 2016 ADT volume of 17,000 vpd, just west of Matthews-Weddington Road. There are sidewalks along the developments on McKee Road close to the project vicinity, however, no bicycle lanes are striped along the roadway.

3.2 EXISTING TRAFFIC VOLUME 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 Thursday, November 15, 2018, at the following study intersections while local schools were in session:

- Matthews-Weddington Road and Chestnut Lane
- Matthews-Weddington Road and Antioch Church Road
- Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road
- Weddington Road and McKee Road
- Potter Road and Chestnut Lane

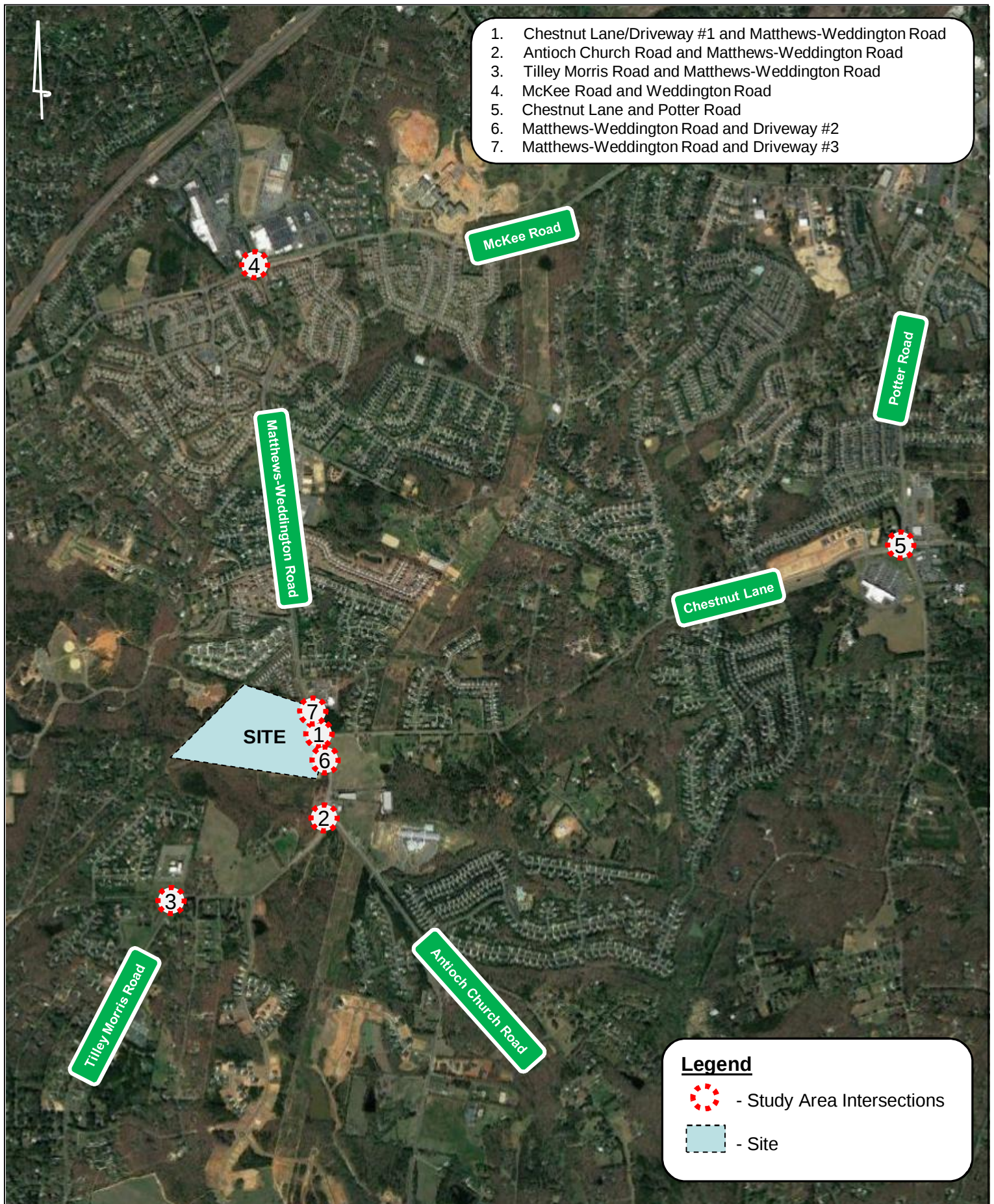
The peak hour at each intersection was used in the capacity analysis documented herein. Five of the six intersections had an AM peak hour between 7:00-8:00 AM; while the PM peak hour varied by intersection between the hours of 4:30-6:00 PM. The peak hours for each of the intersections are shown in **Table 3.2**.

Table 3.2 – AM & PM Intersection Peak Hours

Intersection	AM Peak Hour	PM Peak Hour
1. Matthews-Weddington Road and Chestnut Lane	7:00 AM - 8:00 AM	4:45 PM - 5:45 PM
2. Matthews-Weddington Road and Antioch Church Road	7:00 AM - 8:00 AM	4:45 PM - 5:45 PM
3. Matthews-Weddington Road and Tilley Morris Road	7:00 AM - 8:00 AM	4:30 PM - 5:30 PM
4. Weddington Road and McKee Road	7:30 AM - 8:30 AM	5:00 PM - 6:00 PM
5. Chestnut Lane and Potter Road	7:00 AM - 8:00 AM	4:45 PM - 5:45 PM

No volume balancing was performed throughout the study area due to the presence of multiple commercial and residential driveways between each of the study intersections. Peak-hour intersection turning-movement count data is provided in the **Appendix**.

Figure 3.4 shows the 2018 existing AM and PM peak-hour traffic volumes.



SITE DATA
FEBRUARY 21, 2019

APARTMENT UNITS:

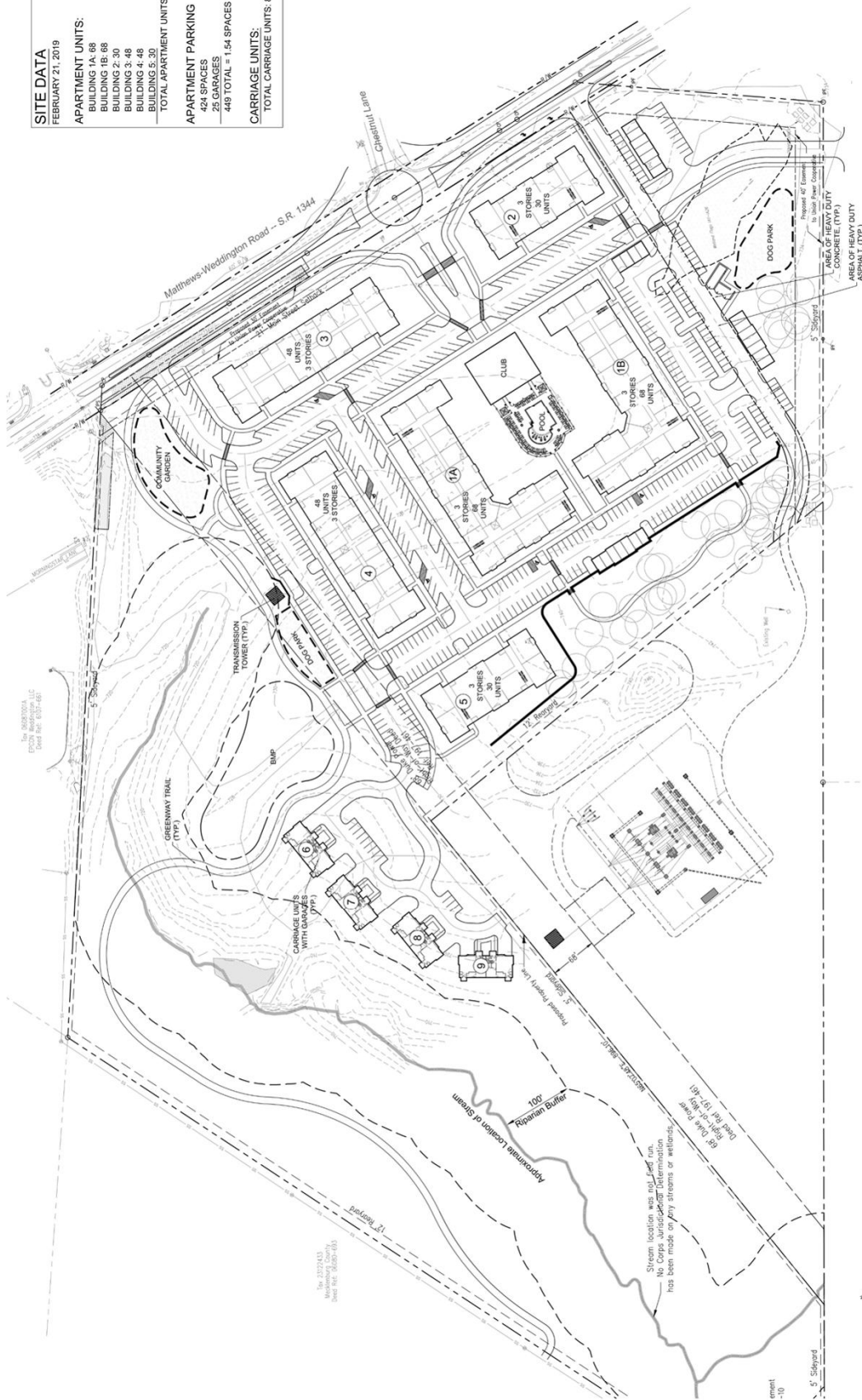
BUILDING 1A: 68
BUILDING 1B: 68
BUILDING 2: 30
BUILDING 3: 48
BUILDING 4: 48
BUILDING 5: 30
TOTAL APARTMENT UNITS: 292

APARTMENT PARKING

424 SPACES
125 SPACES
449 TOTAL = 549 SPACES / UNIT

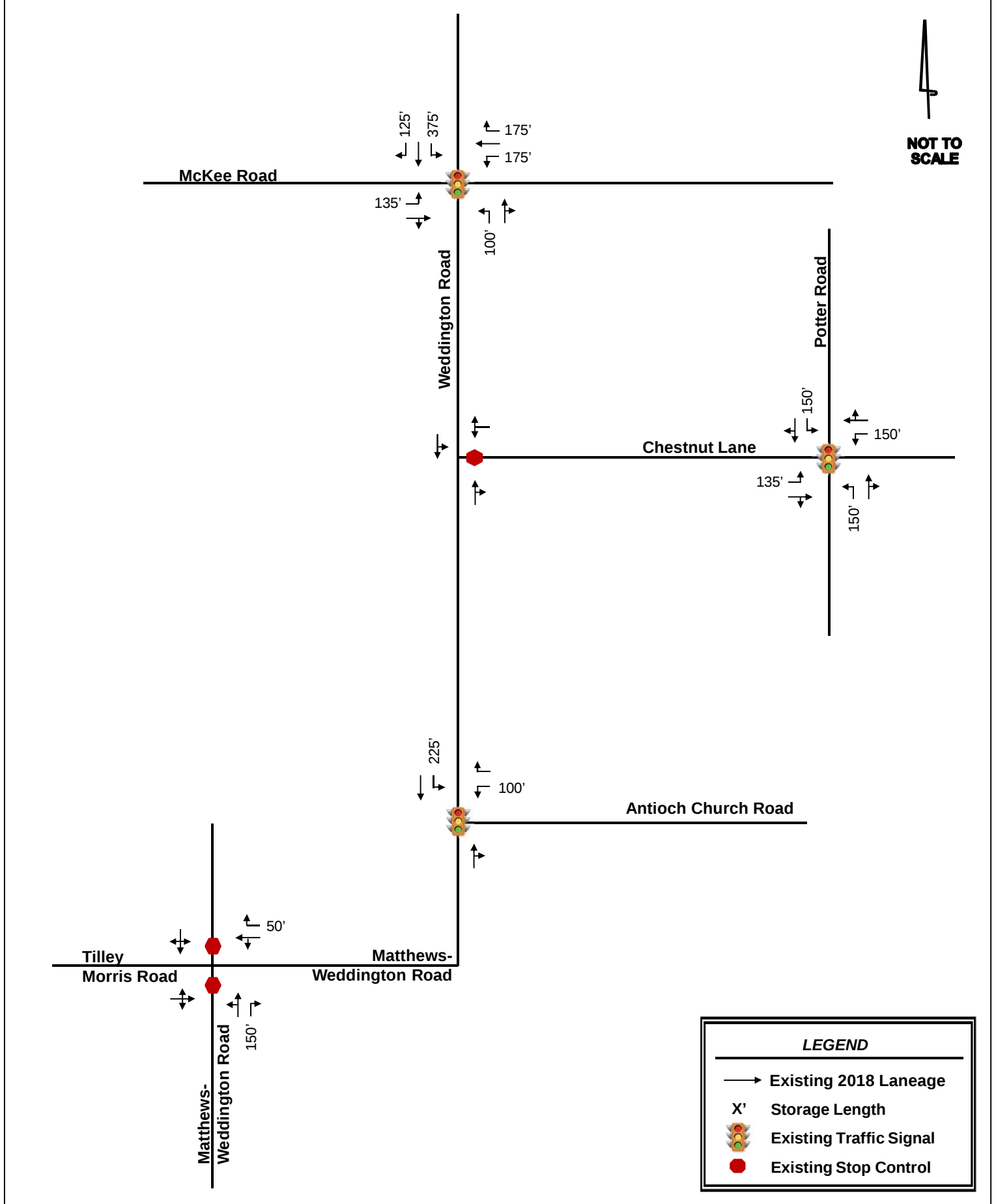
CARRIAGE UNITS:

TOTAL CARRIAGE UNITS: 8



SOLIS CHESTNUT FARM
STALLINGS, NORTH CAROLINA





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 (2018) and the expected build-out year (2021), 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 2018 existing traffic volumes to calculate base 2021 and 2026 background traffic volumes. **Table 4.1** shows the data used to determine the 3.5% annual growth rate, which was approved by NCDOT staff.

Table 4.1 - Historical Growth			
ADT Count Location	2016	2010	Growth Rate (between 2016 & 2010)
Matthews-Weddington Road (south of Chestnut Lane)	12000	12000	0.0%
Matthews-Weddington Road (south of McKee Road)	14000	12000	2.6%
Matthews-Weddington Road (south of Tilley Morris Road)	7300	5400	5.2%
Potter Road	12000	9900	3.3%
Chestnut Lane	7700	5200	6.8%
AVERAGE			3.6%

4.2 FUTURE OFF-SITE DEVELOPMENT TRIPS

Based on input from Town of Stallings and NCDOT staff, one future off-site development, Union Day School Expansion, was included in the background traffic volumes for this TIA. Union Day School currently operates on the north side of the Matthews-Weddington Road and Tilley Morris Road intersection; it is planned to be expanded in its current location.

There was no TIA completed for the Union Day School Expansion at the time this TIA was completed. Therefore, a trip generation analysis was performed using the NCDOT Municipal School Transportation Assistance (MSTA) calculator to determine the afternoon trip generation potential of the site. Per NCDOT, the school is proposed to be expanded to 725 students, 2 buses, and 35 staff members. To determine PM peak hour trips (as compared to the School

afternoon peak calculated by the MSTA calculator), *Trip Generation* (Institute of Transportation Engineers, 10th Edition) k-factors were applied to factor the MSTA trip generation. Given that there is an existing portion of the school that is operational, the additional trips to add to the network were determined by calculating the difference between the expansion trip generation and the existing traffic counts. Expansion site trips were applied to the network based on existing traffic splits. Future off-site development calculations can be seen in the **Appendix**.

It should be noted that a TIA is being performed currently for the Union Day School Expansion in conjunction with the analysis for U-6090 (as discussed in **Section 4.3**). Volumes for this future off-site development and associated improvements are subject to change based on the outcomes of this TIA.

Figures 4.1 and 4.2 show the 2021 background AM and PM peak-hour traffic volumes.

4.3 PLANNED TRANSPORTATION PROJECTS

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

1. Matthews-Weddington Road and Chestnut Lane Roundabout (U-6091) – Funded
2. Matthews-Weddington Road and Tilley Morris Road Roundabout (U-6090) – Funded
3. Enhanced intersection at Potter Road and Chestnut Lane (C-6)
4. Crossing at Antioch Church Road on Weddington-Matthews Road (C-10)
5. Crossing at Weddington Road and Chestnut Lane (C-16)
6. Weddington Road Sidewalks (S-6) – 2,700' sidewalk facilities
7. Potter/Chestnut Sidewalks (S-12) – 1,100' sidewalk facilities
8. Francis Beatty Trail (T-5) – 1.2 miles of trail facilities

Note that the six unfunded projects (Project Numbers 3-8 above) were not included in the operations analyses discussed in Sections 6 and 8 since funding nor schedule have been identified.

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

- Matthews-Weddington Road and Chestnut Lane Roundabout (U-6091)
 - Installation of a roundabout
 - Right-of-way in FY 2019
 - Construction in FY 2020
 - State match with Spot Safety funds
- Matthews-Weddington Road and Tilley Morris Road Roundabout (U-6090)
 - Installation of a roundabout
 - Right-of-way in FY 2019
 - Construction in FY 2020
 - State match with Spot Safety funds

Current roadway plans for both of these projects can be found in **Appendix**.

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

- Enhanced Intersection at Potter Road and Chestnut Lane (C-6)
 - Provide safe pedestrian crossing opportunities at the center of the Chestnut Node.

- Coordinate improvements with development of the Grove and neighboring parcels.
- Crossing at Antioch Church Road on Weddington-Matthews Road (C-10)
 - Provide a safe pedestrian crossing at the center of the Antioch Node.
 - Improvements at proposed intersection are to be concurrent with realignment of Antioch Church Road.
- Crossing at Weddington Road and Chestnut Lane (C-16)
 - Provide a safe pedestrian crossing at a prominent intersection of the Antioch Node.
 - Coordinate crosswalk improvements with other intersection improvements.
- Weddington Road Sidewalks (S-6) – 2,700' sidewalk facilities
 - Connect Antioch Node to the Francis Beatty Park entrance, the Strawberry community, and Twelve-Mile Creek Trail (project T-1).
 - Provide pedestrian link along Matthews-Weddington Rd. from proposed realignment of Antioch Church Rd. (at project C-10), to crosswalk at Chestnut Ln. (project C-16), and connect to existing sidewalk on Matthews-Weddington Rd.
 - Provide additional sidewalk connection along Chestnut Ln. to meet existing sidewalk.
 - Coordinate project with Town of Weddington, and Union County in unincorporated areas.
- Potter/Chestnut Sidewalks (S-12) – 1,100' sidewalk facilities
 - Continue existing Potters Rd. sidewalk around to Chestnut Ln. to connect to Twelve-Mile Creek Trail (project T-1), serve the Chestnut Node, and connect to adjacent community.
- Francis Beatty Trail (T-5) – 1.2 miles of trail facilities
 - Provide connections within the Antioch Node to existing Francis Beatty Park trails and proposed Matthews-Weddington Rd. sidewalk (project C-16), thereby linking the Antioch Node to the Chestnut Node and the Downtown Node.
 - Begin trail at proposed realigned intersection of Antioch Church Rd. and Weddington-Matthews Rd. (project C-10) in Town of Weddington. Follow creek northwestward into Stallings to edge of Francis Beatty Park. Follow creek along park edge and southeastward to crosswalk at Chestnut Ln. (project C-16). Loop trail back along west side of Matthews-Weddington Rd. to starting point.

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 be accessed via three access points:

- Driveway #1 – A full-movement driveway connection creating the 4th leg of the Matthews-Weddington Road and Chestnut Lane intersection.
- Driveway #2 – A right-in/right-out driveway connection to Matthews-Weddington Road south of Chestnut Lane.
- Driveway #3 – A right-in/right-out driveway connection to Matthews-Weddington Road north of Chestnut Lane.

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, the trip generation was performed for 325 new multifamily apartments.

Table 5.1 summarizes the projected trip generation for the proposed development. During a typical weekday, the proposed development has the potential to generate 109 and 137 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 - (Condos/Apartments)	325 DU	1,770	109	28	81	137	84	53
Net New External Trips		1,770	109	28	81	137	84	53

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.

The overall site traffic distribution and assignment are shown in **Figure 5.1**.

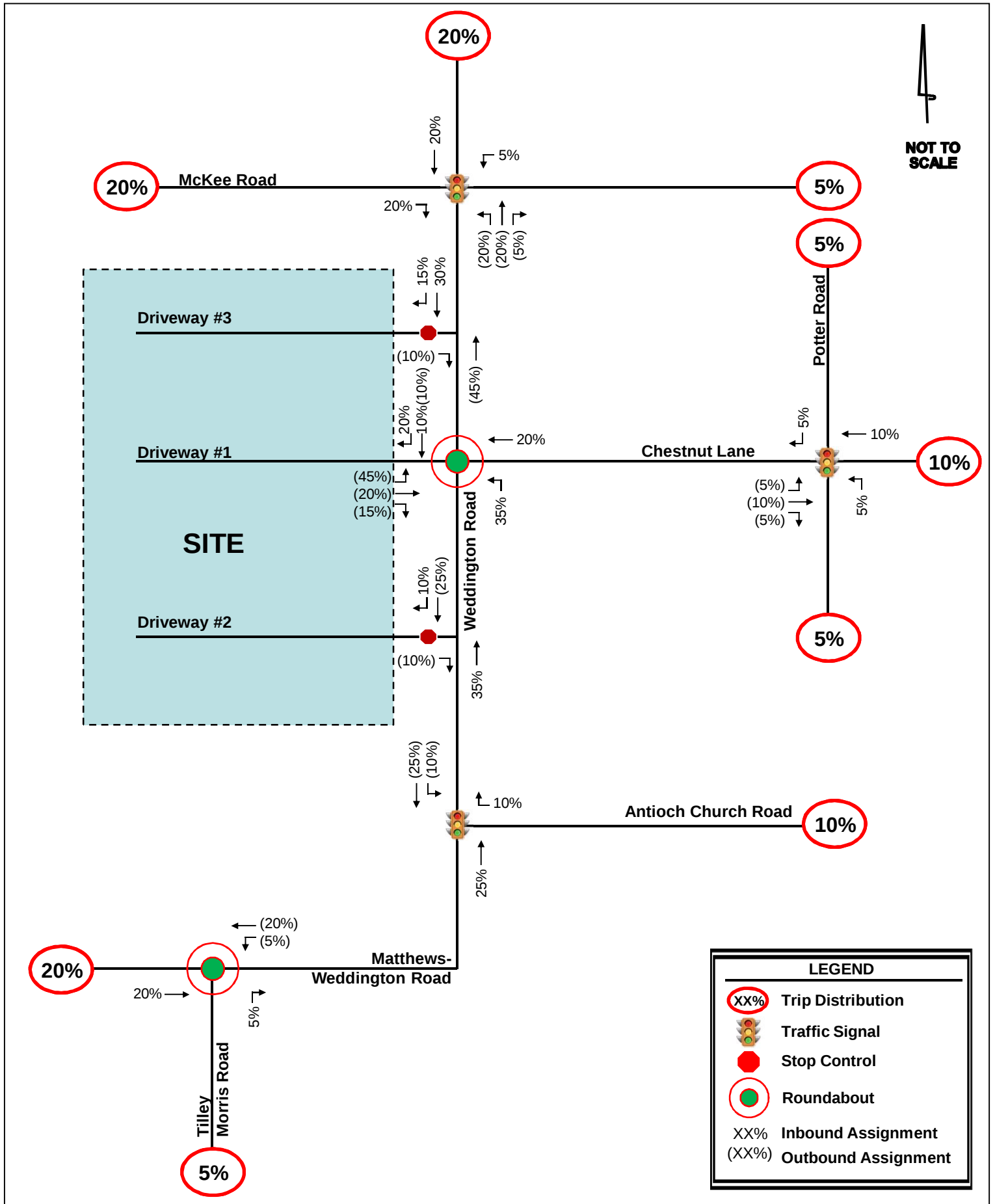
5.4 2021 BUILD-OUT TRAFFIC

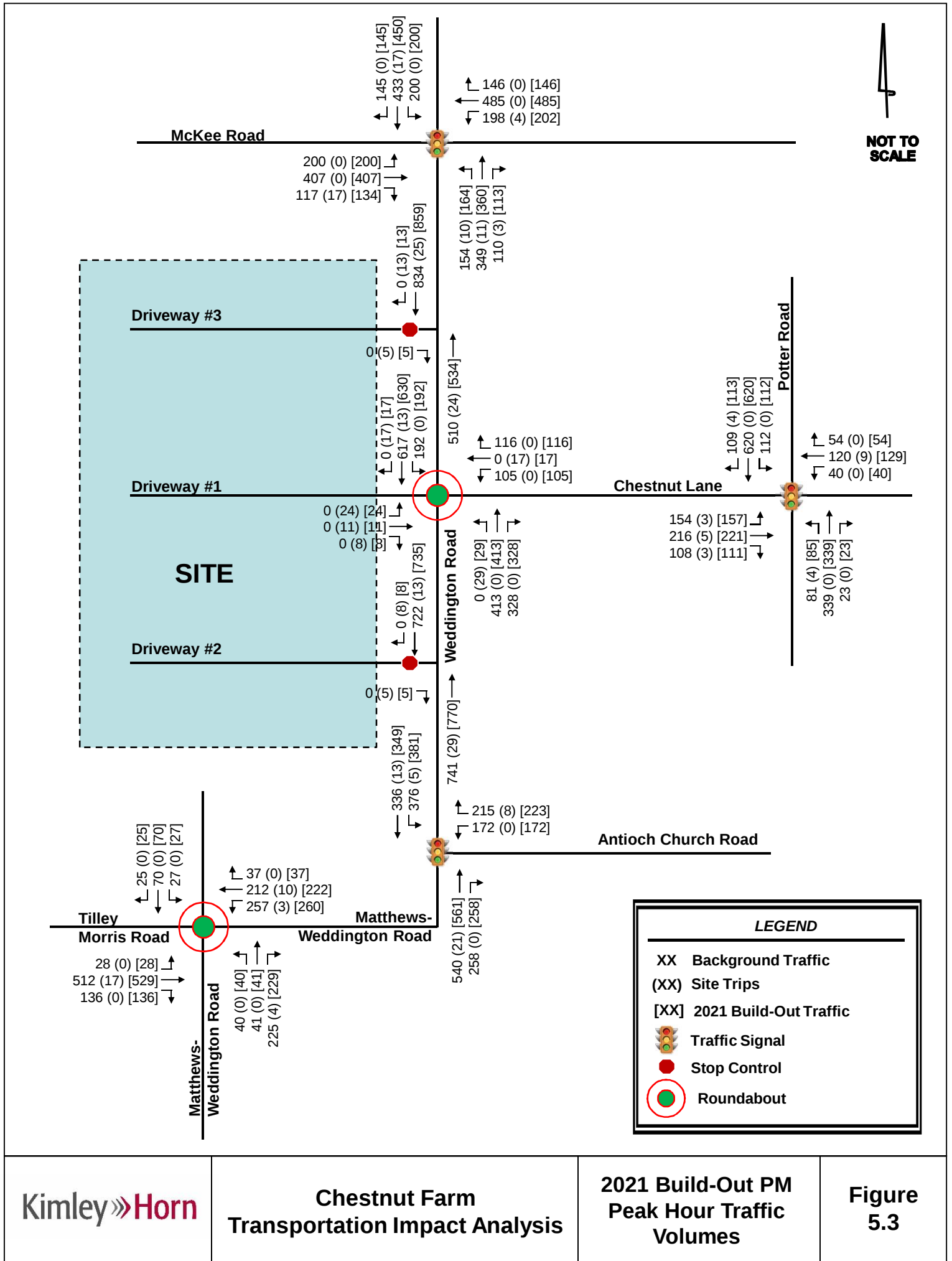
The 2021 build-out traffic volumes include the 2021 background traffic volumes and site traffic volumes. **Figures 5.2 and 5.3** show the projected 2021 build-out traffic volumes for the AM and PM peak-hours, respectively.

5.5 2026 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 2026 build-out traffic volumes include the assignment of the proposed site traffic generation added to the 2026 base background traffic volumes. **Figure 5.4** shows the projected 2026 build-out traffic volumes for the AM and PM peak-hours.

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





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 each of the following AM and PM peak-hour scenarios:

- 2018 Existing Conditions
- 2021 Background Conditions
- 2021 Build-out Conditions
- 2026 Build-out Conditions + 5 years

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. SIDRA 8 software was used to determine operating characteristics, level-of-service (LOS) and delay for the proposed roundabout intersections. SIDRA is typically used to analyze roundabout operations using a macroscopic model that uses gap acceptance and lane utilization to determine capacity, where capacity is based on the size of time gaps between vehicles that motorists choose when entering a roundabout. These software programs use 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.

LOS for roundabout intersections is also reported for the intersection as a whole, but uses the same control delay thresholds as the stop-controlled intersections. However, if the volume-to-capacity ratio on an approach of the intersection is greater than 1.0, that approach or intersection is reported as LOS F regardless of the reported control delay.

Table 6.0-A and **6.0-B** list the LOS control delay thresholds published in the HCM for unsignalized (TWSC and roundabout) 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.

Splits and offsets were optimized under background conditions at Antioch Church Road/Matthews-Weddington Road and McKee Road/Weddington Road due to the protected-only phasing that was modeled. Cycle lengths were maintained in each analysis scenario. Signal and time-of-day 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. In the AM peak-hour, a weighted PHF was calculated to account for lower PHFs expected at intersections near Union Day Charter School and Antioch Elementary School. In the weighted PHF calculations, it was assumed that Union Day Charter School Expansion traffic would have a PHF of 0.5 and Chestnut Farm site trips would have a PHF of 0.9. In the PM peak-hour, 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 2021 build-out conditions were compared to the 2021 background conditions. 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:

- the total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same LOS,
- the LOS degrades by at least one level,
- or the LOS is "D" is at 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 MATTHEWS-WEDDINGTON ROAD AND CHESTNUT LANE/DRIVEWAY #1

Table 6.1A summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection of Matthews-Weddington Road and Chestnut Lane. This intersection is planned to be converted to a roundabout in future years.

Table 6.1A - Matthews-Weddington Road and Chestnut Lane/Driveway #1									
Condition	Measure	EB	WB		NB		SB		Intersection
		EBLTR	WBLT	WBR	NBLT	NBR	SBL	SBTR	LOS (Delay)
AM Peak Hour									
2018 Existing	LOS (Delay)	-	F (Err)		A (0.0)		A (4.0)		-
	Synchro 95th Q	-	Err		0'		12'	-	-
2021 Background	LOS (Delay)	-	C (26.4)		A (5.9)		A (8.1)		B (11.2)
	SIDRA 95th Q	-	247'	37'	262'	35'	20'	78'	
2021 Build-out	LOS (Delay)	B (13.9)	D (36.3)		A (7.5)		A (8.2)		B (14.4)
	SIDRA 95th Q	20'	351'	43'	302'	34'	21'	84'	
2021 Build-out IMP	LOS (Delay)	B (13.9)	C (34.8)		A (7.5)		A (8.2)		B (14.0)
	SIDRA 95th Q	20'	334'	45'	297'	34'	20'	80'	
2026 Build-out +5	LOS (Delay)	B (13.8)	F (197.2)		C (30.4)		A (7.9)		E (62.3)
	SIDRA 95th Q	20'	1701'	85'	1237'	43'	22'	92'	
PM Peak Hour									
2018 Existing	LOS (Delay)	-	F (573.8)		A (0.0)		A (5.7)		-
	Synchro 95th Q	-	522'		0'		23'	-	-
2021 Background	LOS (Delay)	-	A (9.5)		A (5.8)		A (6.9)		A (6.8)
	SIDRA 95th Q	-	16'	16'	52'	41'	28'	94'	
2021 Build-out	LOS (Delay)	B (13.2)	A (9.6)		A (6.2)		A (7.1)		A (7.2)
	SIDRA 95th Q	12'	18'	20'	59'	43'	30'	102'	
2021 Build-out IMP	LOS (Delay)	B (13.2)	A (9.6)		A (7.1)		A (6.2)		A (7.2)
	SIDRA 95th Q	12'	18'	20'	28'	102'	59'	43'	
2026 Build-out +5	LOS (Delay)	B (14.9)	B (10.2)		A (6.6)		A (7.4)		A (7.6)
	SIDRA 95th Q	15'	25'	27'	80'	58'	38'	143'	
Existing/Background Storage				150'		150'	250'		

Per the zoning surrounding this intersection and the Town of Stallings *TIA Ordinance*, the vehicular LOS threshold at this intersection is LOS D.

Table 6.1A shows that the westbound approach currently operates at LOS F during both the AM and PM peak hours. This delay is likely due to the heavy traffic traveling northbound and southbound along Matthews-Weddington Road, allowing for minimal gaps for left-turning traffic on the westbound approach.

As noted in **Section 4.0**, NCDOT project U-6091 plans to reconstruct the intersection into a single lane roundabout with one turn-lane on each approach. The current roadway plans for this project can be seen in the **Appendix**. With this roundabout in place under background conditions, the intersection is expected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour.

Under build-out conditions, the eastbound approach of the roundabout will be constructed to serve as the main driveway for the proposed development and will operate as a shared left/through/right lane. The roundabout is projected to operate at LOS B in the AM peak hour and LOS A in the PM peak hour. Although the overall intersection is projected to operate at an acceptable LOS, the westbound approach is expected to drop one level of service in the AM peak

hour due to the addition of site traffic. Further, a volume to capacity ratio (v/c) of 0.843 is anticipated in the AM peak hour with site traffic. Therefore, mitigation efforts were reviewed for this intersection.

Due to the significant left-turn queue for the westbound approach, the addition of an exclusive left-turn lane was considered on this approach. By modifying the proposed roundabout lane configuration to operate as an exclusive left-turn lane with a shared through-right lane, the westbound approach is expected to operate at LOS C in the AM peak hour and LOS A in the PM peak hour. Under the improved conditions, the intersection as a whole is expected to operate at LOS B in the AM peak hour and LOS A in the PM peak hour. The roundabout is anticipated to operate with a v/c of 0.841 in the AM peak hour.

Due to coordination with NCDOT and the Town, although this modification to the westbound approach would improve LOS on that approach it would also require an additional circulating lane on the north of the roundabout and would require significant redesign of the current TIP project U-6091. In lieu of this modification, the developer will make a \$87,500 contribution towards this intersection, equivalent to 25% of the \$350,000 the Town has already committed to the Roundabout. This percent contribution is based on the percent increase in v/c from the background condition to the build-out improved condition in the PM peak hour if the dedicated left-turn lane was required, as shown in **Table 6.1B**.

Table 6.1B		
Matthews-Weddington Road and Chestnut Lane/Driveway #1		
v/c Comparison		
	AM	PM
2021 Background	0.808	0.481
2021 Build-out	0.843	0.522
2021 Build-out IMP	0.841	0.599
Increase from Background	0.033	0.118
% Increase from Background	4%	25%

It should be noted that in the 2026 Build+5 scenario, the roundabout is projected to operate with a v/c of 1.4 with long delays and queues on the westbound approach. An additional westbound left-turn lane and a receiving lane south of the roundabout are not needed to mitigate the impact of the proposed site but may be needed as additional development occurs in this area.

6.2 MATTHEWS-WEDDINGTON ROAD AND ANTIOCH CHURCH ROAD

Table 6.2 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Matthews-Weddington Road and Antioch Church Road.

Table 6.2 - Matthews-Weddington Road and Antioch Church Road							
Condition	Measure	WB		NB	SB		Intersection
		WBL	WBR	NBTR	SBL	SBT	LOS (Delay)
AM Peak Hour							
2018 Existing	LOS (Delay)	E (59.7)		E (69.7)	D (39.3)		E (56.9)
	Synchro 95th Q	229'	312'	#646'	#154'	203'	
2021 Background	LOS (Delay)	F (144.5)		F (150.8)	E (69.2)		F (125.5)
	Synchro 95th Q	#311'	#446'	#872'	#250'	214'	
2021 Build-out	LOS (Delay)	F (147.3)		F (155.4)	E (73.5)		F (128.7)
	Synchro 95th Q	#311'	#451'	#881'	#265'	228'	
2021 Build-out IMP WBR overlap	LOS (Delay)	F (99.4)		F (103.1)	D (46.4)		F (85.4)
	Synchro 95th Q	#394'	314'	#834'	#241'	183'	
2026 Build-out +5	LOS (Delay)	F (164.0)		F (177.8)	E (69.8)		F (141.4)
	Synchro 95th Q	#490'	#442'	#1035'	#296'	228'	
PM Peak Hour							
2018 Existing	LOS (Delay)	D (53.0)		D (37.2)	C (32.1)		D (38.4)
	Synchro 95th Q	155'	#227'	#605'	#318'	78'	
2021 Background	LOS (Delay)	F (89.6)		E (71.3)	E (55.3)		E (69.0)
	Synchro 95th Q	#210'	#295'	#783'	#445'	85'	
2021 Build-out	LOS (Delay)	F (96.6)		E (79.8)	E (56.7)		E (74.5)
	Synchro 95th Q	#210'	#308'	#813'	#451'	89'	
2021 Build-out IMP WBR overlap	LOS (Delay)	E (57.2)		E (62.8)	D (47.9)		E (56.1)
	Synchro 95th Q	#245'	162'	#789'	#439'	73'	
2026 Build-out +5	LOS (Delay)	F (81.1)		F (131.6)	F (81.6)		F (102.6)
	Synchro 95th Q	#297'	193'	#994'	#545'	89'	
Existing/Background Storage		100'			225'		
Exceeds storage							

95th percentile volume exceeds capacity, queue may be longer

Per the zoning surrounding this intersection and the Town of Stallings TIA Ordinance, the vehicular LOS threshold at this intersection is LOS E.

As shown in **Table 6.2**, the intersection currently operates at LOS E in the AM peak hour and LOS D in the PM peak hour. Additionally, under existing conditions, the westbound left-turn lane queues beyond the available storage lane length of 100 feet in both peak hours. The southbound left-turn lane queues beyond the available storage length of 225 feet in the PM peak hour.

Under background conditions, the signalized intersection is expected to operate at LOS F in the AM peak hour and LOS E in the PM peak hour. Under build-out conditions, the intersection continues to operate at the same LOS as background conditions, however, delay is increased in both peak hours. Due to the increase in delay beyond the Town vehicular LOS threshold, mitigation efforts were considered.

The existing southbound approach operates with a permitted-protected left-turn phase, which would allow for the implementation of an overlap phase on the westbound approach. With the implementation of this overlap phasing, after intersection signal timings were optimized, the intersection is anticipated to operate at LOS F and LOS E in the AM and PM peak hours, respectively, with less delay than the background condition in both peaks.

In build-out improved conditions, the westbound left-turn lane and southbound left-turn lane are queueing beyond their storage capacities. It should be noted that the westbound left-turn lane currently extends into a two-way-left-turn-lane (TWLTL) along Antioch Church Road. It is expected that although vehicles exceed the designated left-turn lane storage, left-turning traffic will still queue in the TWLTL and not block additional westbound traffic. The southbound left-turn lane is currently limited in storage length by an access driveway to a gas station along Matthews-Weddington Road. If the Town chooses to extend a continuous southbound left-turn lane in the future, the access point for the business will need to be considered. This should also be considered in conjunction with spacing to the proposed Matthews-Weddington Road and Chestnut Lane roundabout (U-6091).

6.3 MATTHEWS-WEDDINGTON ROAD/UNION DAY SCHOOL DRIVEWAY AND TILLEY MORRIS ROAD

Table 6.3 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection of Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road. This intersection is planned to be converted to a roundabout in future years.

Table 6.3 - Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road									
Condition	Measure	EB		WB		NB		SB	Intersection
		EBL	EBTR	WBLT	WBR	NBLT	NBR	SBLTR	LOS (Delay)
AM Peak Hour									
2018 Existing	LOS (Delay)	A (1.7)		A (4.6)		F (Err)		F (Err)	-
	Synchro 95th Q	3'		20'	0'	Err	0'	Err	-
2021 Background	LOS (Delay)	B (11.2)		D (44.3)		A (9.3)		F (275.5)	F (83.8)
	SIDRA 95th Q	57'	12'	128'	904'	146'	115'	2751'	
2021 Build-out	LOS (Delay)	B (11.2)		D (48.4)		A (9.4)		F (280.3)	F (85.9)
	SIDRA 95th Q	60'	12'	133'	990'	149'	118'	2779'	
2026 Build-out +5	LOS (Delay)	B (12.7)		F (157.5)		B (11.7)		F (349.2)	F (135.9)
	SIDRA 95th Q	82'	15'	264'	2752'	220'	192'	3400'	
PM Peak Hour									
2018 Existing	LOS (Delay)	A (0.6)		A (6.7)		F (600.0)		F (435.2)	-
	Synchro 95th Q	2'		29'	0'	0'	646'	263'	-
2021 Background	LOS (Delay)	A (8.7)		A (8.3)		A (8.8)		A (3.4)	A (8.2)
	SIDRA 95th Q	119'	26'	29'	31'	20'	45'	14'	
2021 Build-out	LOS (Delay)	A (8.9)		A (8.2)		A (9.0)		A (3.5)	A (8.3)
	SIDRA 95th Q	130'	27'	29'	32'	21'	48'	14'	
2026 Build-out +5	LOS (Delay)	B (12.3)		A (8.3)		B (10.1)		A (3.8)	B (10.0)
	SIDRA 95th Q	246'	37'	37'	41'	31'	77'	18'	
Existing/Background Storage		150'			50'/150'		150'		
Exceeds storage									

This intersection falls outside the Town of Stallings. Per NCDOT guidelines, the vehicular LOS threshold at this intersection is LOS D.

Table 6.3 shows that the northbound and southbound approaches of Matthews-Weddington Road and Union Day School Driveway operate at LOS F with long delays in both the AM and PM peak hours. This is likely due to the heavy amount of mainline traffic along Tilley-Morris Road, creating minimal gaps for northbound and southbound turning traffic operating at stop-control. This heavy mainline traffic creates even longer excessive delay in the AM peak hour due to the Union Day school student drop-off along the southbound approach.

As noted in **Section 4.0**, NCDOT project U-6090 plans to replace the existing two-way stop control intersection with a single lane roundabout. The current roadway plans for this project can be seen in the **Appendix**.

With the planned improvements for U-6090, the intersection is anticipated to operate at LOS F during the AM peak hour and LOS A in the PM peak hour under background conditions.

Upon build-out of the site, the intersection is anticipated to continue operating at LOS F during the AM peak hour. The excessive delay is due to the heavy amount of school drop-off traffic exiting Union Day School along the southbound approach. Significant queueing is also expected for westbound right-turning vehicles entering the school in the AM peak hour.

The proposed development's traffic is not anticipated to significantly contribute to intersection delay, and this intersection falls outside of the Town of Stallings, therefore no mitigation efforts are recommended at the intersection.

It should be noted that a TIA is being performed currently for the Union Day School Expansion which will review laneage requirements at this intersection in conjunction with U-6090. Based on a review of the SIDRA analysis contained within this TIA, a southbound right-turn lane could be considered by the Union Day School Expansion to improve the LOS at this intersection in the AM peak hour.

6.4 WEDDINGTON ROAD AND MCKEE ROAD

Table 6.4 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Weddington Road and McKee Road.

Condition	Measure	EB			WB			NB			SB			Intersection LOS (Delay)
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour														
2018 Existing	LOS (Delay)	D (49.9)			D (49.7)			D (46.2)			C (21.0)			D (41.8)
	Synchro 95th Q	#215'	309'		105'	#381'	116'	87'	#701'		49'	221'	112'	
2021 Background	LOS (Delay)	F (93.0)			F (90.7)			F (81.5)			D (35.6)			E (75.3)
	Synchro 95th Q	#344'	#379'		#223'	#470'	131'	184'	#894'		#134'	312'	153'	
2021 Build-out	LOS (Delay)	F (95.3)			F (91.0)			F (89.6)			D (36.4)			E (78.7)
	Synchro 95th Q	#344'	#390'		#225'	#470'	131'	203'	#933'		#134'	319'	153'	
2021 Build-out IMP - EBR w/ overlap	LOS (Delay)	E (70.5)			F (85.4)			F (92.0)			C (34.7)			E (72.6)
Synchro 95th Q	#344'	249'	88'	#189'	#470'	131'	#227'	#933'		#134'	302'	142'		
2021 Build-out IMP - NBR w/ overlap	LOS (Delay)	E (69.4)			E (76.5)			E (60.6)			D (38.3)			E (60.9)
Synchro 95th Q	#321'	350'		#225'	#445'	127'	#210'	#740'	79'	#134'	323'	150'		
2026 Build-out +5	LOS (Delay)	F (96.4)			F (128.0)			F (154.3)			D (39.1)			F (109.1)
EBR w/ overlap	Synchro 95th Q	#422'	298'	101'	#241'	#597'	154'	#284'	#1168'		#162'	366'	171'	
2026 Build-out +5	LOS (Delay)	F (102.2)			F (118.5)			F (94.5)			D (43.9)			F (89.9)
NBR w/ overlap	Synchro 95th Q	#398'	#458'		#276'	#573'	150'	#272'	#940'	92'	#162'	391'	181'	
PM Peak Hour														
2018 Existing	LOS (Delay)	D (51.3)			D (47.4)			E (61.4)			E (55.4)			D (53.0)
	Synchro 95th Q	166'	463'		121'	438'	107'	#135'	#508'		#247'	#457'	107'	
2021 Background	LOS (Delay)	F (96.9)			E (73.8)			F (92.2)			E (67.1)			F (81.5)
	Synchro 95th Q	#328'	#716'		#337'	#637'	119'	#264'	#635'		#338'	#549'	119'	
2021 Build-out	LOS (Delay)	F (105.6)			E (74.9)			F (101.3)			E (70.1)			F (86.8)
	Synchro 95th Q	#328'	#751'		#343'	#637'	119'	#286'	#664'		#338'	#581'	119'	
2021 Build-out IMP - EBR w/ overlap	LOS (Delay)	E (64.9)			E (77.8)			F (88.4)			E (64.8)			E (73.4)
Synchro 95th Q	#328'	#526'	120'	#320'	#662'	123'	#286'	#640'		#338'	#557'	114'		
2021 Build-out IMP - NBR w/ overlap	LOS (Delay)	F (86.1)			E (65.2)			E (74.6)			E (73.8)			E (74.6)
Synchro 95th Q	#328'	#716'		#343'	#599'	111'	#298'	#477'	106'	#327'	#606'	123'		
2026 Build-out +5	LOS (Delay)	F (97.9)			F (122.7)			F (139.9)			F (95.2)			F (112.9)
EBR w/ overlap	Synchro 95th Q	#405'	#673'	138'	#399'	#834'	146'	#346'	#801'		#416'	#711'	135'	
2026 Build-out +5	LOS (Delay)	F (142.4)			F (99.6)			F (106.6)			F (113.8)			F (115.4)
NBR w/ overlap	Synchro 95th Q	#405'	#901'		#422'	#772'	131'	#358'	#604'	123'	#404'	#761'	145'	
Existing/Background Storage		135'		125'	175'		175'	100'		125'	375'		125'	

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

This intersection falls outside the Town of Stallings. Per NCDOT guidelines, the vehicular LOS threshold at this intersection is LOS D.

As shown in **Table 6.4**, the intersection of Weddington Road and McKee Road currently operates at LOS D during both the AM and PM peak hours.

Under background conditions, the intersection is expected to operate at LOS E in the AM peak hour and LOS F in the PM peak hour. With the addition of site traffic, the intersection is projected to continue to operate at the same levels of service the AM and PM peak hours, with total delay increasing about 3 seconds in the AM peak hour and 5 seconds in the PM peak hour. Due to the increase in delay at LOS F, mitigation efforts were considered at this intersection.

Two mitigation scenarios were considered at this intersection:

- Eastbound right-turn lane
- Northbound right-turn lane

Eastbound Right-Turn Lane

The first scenario analyzed for mitigation was the addition of an eastbound right-turn lane and right-turn overlap phasing. With this improvement in place, the eastbound approach delay is expected to decrease by about 25 seconds in the AM peak hour and 40 seconds in the PM peak hour. The intersection as a whole is anticipated to operate as LOS E in both the AM and PM peak hour.

Northbound Right-Turn Lane

The second scenario examined for mitigation was the addition of a northbound right-turn lane and right-turn overlap phasing. With this improvement in place, the northbound approach delay is expected to decrease by about 29 seconds in the AM peak hour and 27 seconds in the PM peak hour. The intersection as a whole is anticipated to operate as LOS E in both the AM and PM peak hour.

After discussions with the Town and NCDOT, since this intersection is located outside of the Town jurisdiction, neither of these identified improvements will be required.

6.5 POTTER ROAD AND CHESTNUT LANE

Table 6.5 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection of Potter Road and Chestnut Lane.

Table 6.5 - Potter Road and Chestnut Lane										
Condition	Measure	EB		WB		NB		SB		Intersection
		EBL	EBTR	WBL	WBTR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour										
2018 Existing	LOS (Delay)	C (20.3)		B (16.7)		B (15.1)		B (13.0)		B (16.0)
	Synchro 95th Q	53'	156'	11'	94'	57'	250'	47'	111'	
2021 Background	LOS (Delay)	C (24.3)		B (18.5)		B (17.4)		B (17.1)		B (19.1)
	Synchro 95th Q	61'	179'	12'	106'	69'	194'	61'	126'	
2021 Build-out	LOS (Delay)	C (25.1)		B (18.4)		B (17.7)		B (17.5)		B (19.5)
	Synchro 95th Q	64'	187'	12'	108'	70'	294'	62'	127'	
2026 Build-out +5	LOS (Delay)	D (37.3)		C (22.1)		C (22.5)		D (47.1)		C (32.0)
	Synchro 95th Q	81'	#261'	14'	128'	94'	#454'	#122'	156'	
PM Peak Hour										
2018 Existing	LOS (Delay)	C (26.0)		B (17.6)		B (11.1)		B (17.1)		B (18.1)
	Synchro 95th Q	91'	179'	32'	91'	43'	121'	44'	299'	
2021 Background	LOS (Delay)	C (27.6)		B (19.1)		B (12.6)		C (21.4)		C (20.7)
	Synchro 95th Q	103'	#203'	35'	102'	#84'	134'	50'	#451'	
2021 Build-out	LOS (Delay)	C (28.2)		B (19.3)		B (13.5)		C (22.0)		C (21.3)
	Synchro 95th Q	105'	#225'	35'	107'	#91'	134'	50'	#455'	
2026 Build-out +5	LOS (Delay)	D (38.9)		C (21.8)		C (23.0)		D (39.5)		C (33.7)
	Synchro 95th Q	#153'	#286'	45'	125'	#124'	166'	65'	#583'	
Existing/Background Storage		135'		150'		150'		150'		

Exceeds storage

95th percentile volume exceeds capacity, queue may be longer

Per the zoning surrounding this intersection and the Town of Stallings TIA Ordinance, the vehicular LOS threshold at this intersection is LOS E.

As shown in **Table 6.5**, the intersection of Potter Road and Chestnut Lane currently operates at LOS B during both the AM and PM peak hours.

Under background conditions, the intersection is expected to operate at LOS B in the AM peak hour and LOS C in the PM peak hour. With build-out traffic conditions, the intersection is expected to continue to operate at an acceptable LOS in both peak hours.

Due to the acceptable LOS operations and minimal impact of proposed development traffic, no mitigation efforts are recommended at the intersection to accommodate projected site traffic.

6.6 MATTHEWS-WEDDINGTON ROAD AND DRIVEWAY #2

Table 6.6 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed unsignalized intersection of Matthews-Weddington Road and Driveway #2.

Table 6.6 - Matthews-Weddington Road and Driveway #2				
Condition	Measure	EB	NB	SB
		EBR	NBT	SBTR
AM Peak Hour				
2021 Build-out	LOS (Delay)	B (14.2)	A (0.0)	A (0.0)
	Synchro 95th Q	2'	0'	0'
2026 Build-out +5	LOS (Delay)	C (15.9)	A (0.0)	A (0.0)
	Synchro 95th Q	2'	0'	0'
PM Peak Hour				
2021 Build-out	LOS (Delay)	B (14.8)	A (0.0)	A (0.0)
	Synchro 95th Q	1'	0'	0'
2026 Build-out +5	LOS (Delay)	C (17.0)	A (0.0)	A (0.0)
	Synchro 95th Q	1'	0'	0'

The proposed intersection of Matthews-Weddington Road and Driveway #2 will provide limited access to the proposed development, operating as a right-in/right-out, two-way stop-controlled intersection. The northbound and southbound approaches along Matthews-Weddington Road will continue to operate in free-flow conditions, and a proposed curbed median in the roadway will prevent northbound left-turning vehicles into the site. The eastbound approach will operate as stop control, with the curbed median preventing vehicles turning left to travel northbound along Matthews-Weddington Road.

Per the zoning surrounding this intersection and the Town of Stallings *TIA Ordinance*, the vehicular LOS threshold at this intersection is LOS D.

As shown in **Table 6.6**, under build-out conditions, the northbound and southbound approaches will operate at LOS A and the eastbound approach will operate at LOS B in both the AM and PM peak hours.

A turn-lane warrant was reviewed for the proposed intersection in accordance with *NCDOT Policy on Street and Driveway Access to North Carolina Highways*. Upon review, no turn lanes were warranted at the intersection. Details of the turn-lane warrant can be found in **Section 7.0**.

6.7 MATTHEWS-WEDDINGTON ROAD AND DRIVEWAY #3

Table 6.7 summarizes the LOS, control delay, and 95th percentile queue lengths at the proposed unsignalized intersection of Matthews-Weddington Road and Driveway #3.

Table 6.7 - Matthews-Weddington Road and Driveway #3				
Condition	Measure	EB	NB	SB
		EBR	NBT	SBTR
AM Peak Hour				
2021 Build-out	LOS (Delay)	B (12.1)	A (0.0)	A (0.0)
	Synchro 95th Q	1'	0'	0'
2026 Build-out +5	LOS (Delay)	B (13.1)	A (0.0)	A (0.0)
	Synchro 95th Q	2'	0'	0'
PM Peak Hour				
2021 Build-out	LOS (Delay)	C (16.8)	A (0.0)	A (0.0)
	Synchro 95th Q	1'	0'	0'
2026 Build-out +5	LOS (Delay)	C (20.0)	A (0.0)	A (0.0)
	Synchro 95th Q	2'	0'	0'

The proposed intersection of Matthews-Weddington Road and Driveway #3 will provide limited access to the proposed development, operating as a right-in/right-out, two-way stop-controlled intersection. The northbound and southbound approaches along Matthews-Weddington Road will continue to operate in free-flow conditions, and a proposed curbed median in the roadway will prevent northbound left-turning vehicles into the site. The eastbound approach will operate as stop control, with the curbed median preventing vehicles turning left to travel northbound along Matthews-Weddington Road.

Per the zoning surrounding this intersection and the Town of Stallings *TIA Ordinance*, the vehicular LOS threshold at this intersection is LOS D.

As shown in **Table 6.7**, under build-out conditions, the northbound and southbound approaches will operate at LOS A and the eastbound approach will operate at LOS B and LOS C in the AM and PM peak hours, respectively.

A turn-lane warrant was reviewed for the proposed intersection in accordance with *NCDOT Policy on Street and Driveway Access to North Carolina Highways*. Upon review, no turn lanes were warranted at the intersection. Details of the turn-lane warrant can be found in **Section 7.0**.

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**.

No turn lanes were warranted under 2021 build-out conditions at the study area intersections. It should be noted that a southbound right-turn lane is not warranted at Driveway #2 but will be required by NCDOT. Storage length requirements for this turn lane are subject to NCDOT.

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

Table 8.1A - Pedestrian Operations at Unsignalized Intersections					
Condition	Peak Hour	EB	WB	NB	SB
1 - Matthews-Weddington Road and Driveway #1/Chestnut Lane					
2018 Existing	AM	-	-	E (35.8)	D (29.5)
	PM	-	-	E (34.8)	D (28.8)
2021 Background	AM	A (0.0)	A (0.0)	D (25.4)	D (21.8)
	PM	A (0.0)	A (0.0)	D (22.8)	C (19.6)
2021 Build-out	AM	A (1.4)	A (1.4)	D (25.4)	D (21.8)
	PM	A (0.5)	A (0.5)	D (22.8)	C (19.6)
2026 Build-out +5	AM	A (1.4)	A (1.4)	E (34.7)	D (29.4)
	PM	A (0.5)	A (0.5)	E (31.4)	D (26.7)
3 - Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road					
2018 Existing	AM	B (8.8)	C (18.5)	-	-
	PM	C (12.6)	D (27.9)	-	-
2021 Background	AM	B (7.8)	C (14.9)	F (188.1)	B (9.3)
	PM	C (10.4)	D (20.5)	D (26.9)	A (2.2)
2021 Build-out	AM	B (7.8)	C (14.9)	F (188.1)	B (9.3)
	PM	C (10.4)	D (20.5)	D (26.9)	A (2.2)
2026 Build-out +5	AM	C (10.4)	D (20.5)	F (188.1)	B (9.3)
	PM	C (13.3)	D (27.0)	D (26.9)	A (2.2)
6 - Matthews-Weddington Road and Driveway #2					
2021 Build-out	AM	-	-	F (142.1)	F (142.1)
	PM	-	-	F (118.8)	F (118.8)
2026 Build-out +5	AM	-	-	F (262.8)	F (262.8)
	PM	-	-	F (217.2)	F (217.2)
7 - Matthews-Weddington Road and Driveway #3					
2018 Existing	AM	-	-	F (75.6)	F (75.6)
	PM	-	-	F (92.8)	F (92.8)
2021 Background	AM	-	-	F (124.5)	F (124.5)
	PM	-	-	F (161.1)	F (161.1)

Table 8.1B - Pedestrian Operations and Signalized Intersections					
Condition	Peak Hour	EB	WB	NB	SB
2 - Matthews-Weddington Road and Antioch Church Road					
2018 Existing	AM	-	C (2.67)	C (2.97)	C (2.59)
	PM	-	C (2.83)	C (2.72)	C (2.61)
2021 Background	AM	-	C (2.77)	C (3.18)	C (2.67)
	PM	-	C (2.93)	C (2.82)	C (2.67)
2021 Build-out	AM	-	C (2.79)	C (3.19)	C (2.69)
	PM	-	C (2.94)	C (2.83)	C (2.68)
2026 Build-out +5	AM	-	C (2.96)	C (3.41)	C (2.79)
	PM	-	C (3.14)	C (3.00)	C (2.78)
4 - Weddington Road and McKee Road					
2018 Existing	AM	C (2.67)	C (2.57)	C (2.68)	C (2.89)
	PM	C (2.81)	C (2.91)	C (2.80)	C (2.88)
2021 Background	AM	C (2.76)	C (2.61)	C (2.81)	C (2.99)
	PM	C (2.92)	C (3.00)	C (2.90)	C (2.97)
2021 Build-out	AM	C (2.79)	C (2.62)	C (2.83)	C (2.99)
	PM	C (2.94)	C (3.00)	C (2.93)	C (2.98)
2026 Build-out +5	AM	C (2.94)	C (2.70)	C (2.98)	C (3.14)
	PM	C (3.12)	C (3.16)	C (3.12)	C (3.14)
5 - Chestnut Lane and Potter Road					
2018 Existing	AM	B (2.30)	B (2.18)	B (2.32)	B (2.43)
	PM	B (2.25)	B (2.21)	B (2.37)	C (2.58)
2021 Background	AM	B (2.36)	B (2.21)	B (2.36)	B (2.49)
	PM	B (2.29)	B (2.25)	B (2.42)	C (2.66)
2021 Build-out	AM	B (2.37)	B (2.22)	B (2.36)	C (2.50)
	PM	B (2.31)	B (2.26)	B (2.42)	C (2.66)
2026 Build-out +5	AM	B (2.46)	B (2.29)	B (2.45)	C (2.60)
	PM	B (2.38)	B (2.33)	C (2.52)	C (2.80)

As shown in **Table 8.1A**, Matthews-Weddington Road and Chestnut Lane currently operate at LOS E during both peak hours along the northbound approach, and LOS D during both peak hours along the southbound approach. Upon construction of the proposed roundabout (U-6091) in 2021 background scenarios, operations improve to LOS D during both peak hours along the northbound approach and LOS D in the AM peak of the southbound approach, and LOS C in the PM peak hour. In 2021 build-out conditions, pedestrian LOS is expected to operate the same as 2021 background conditions. Per the Town TIA Ordinance, the pedestrian LOS Threshold at this intersection is LOS D; therefore, no pedestrian mitigation is recommended at this intersection.

Currently, the eastbound and westbound approaches of Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road operate at acceptable LOS, with the exception of the PM peak hour along the westbound approach (LOS D). Through 2021 background and 2021 build-out conditions, the eastbound and westbound approaches are projected to operate at the same LOS as the 2018 existing condition. Upon construction of the proposed roundabout (U-6090) in the 2021 background scenarios, the northbound and southbound approaches were analyzed for pedestrian LOS. In 2021 background conditions, the northbound approach is expected to operate at LOS F in the AM peak hour and LOS D in the PM peak hour. The southbound approach is anticipated to operate at LOS B in the AM peak hour and LOS A in the PM peak hour. 2021 build-

out conditions reflect no change from 2021 background operations in pedestrian LOS at the study intersection. It should be noted that this intersection falls outside the Town of Stallings.

Upon construction of Driveway #2 and Driveway #3, pedestrian LOS was analyzed for the northbound and southbound approaches along Matthews-Weddington Road. In 2021 build-out conditions, pedestrian LOS is expected to operate at LOS F in both peak hours, for both approaches. This is likely due to the heavy amount of mainline traffic along Matthews-Weddington Road, creating minimal gaps to allow pedestrians to cross. Per the Town of Stallings *TIA Ordinance*, the pedestrian LOS threshold at these intersections is LOS D. To mitigate the projected LOS F, the following pedestrian improvements should be implemented along this corridor, consistent with the current Town pedestrian plan:

- Construction of a safe pedestrian crossing of Matthews-Weddington Road (to be coordinated with U-6091)
- Construction of sidewalk along the frontage of the site along Matthews-Weddington Road
- Construction of greenway/multi-use path through the proposed site consistent with the planned Francis Beatty Trail as determined by Town staff; Applicant should coordinate with these agencies early in the planning process to determine the appropriate alignment and cross-section of this trail

Per discussion with the Town, the pedestrian plan is currently being updated. These improvements should be coordinated with the Town to ensure consistency with the pedestrian plan under development. It should be noted that the current site plan does show a planned greenway/multi-use path on the northern portion of the site.

As shown in **Table 8.1B**, all signalized intersections in the study area are expected to operate at LOS C or better during both peak hours through 2021 build-out conditions.

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 - Matthews-Weddington Road and Chestnut Lane	Existing	-	E (25)	F (5)	E (25)	F (14)
	Background	-	F (5)	F (5)	E (25)	F (9)
	Build-out	D (50)	F (5)	F (5)	F (5)	F (16)
	Build-out Improved	D (45)	F (5)	F (5)	F (5)	F (15)
2 - Matthews-Weddington Road and Antioch Church Road	All Scenarios	-	F (15)	F (10)	D- (40)	F (16)
3 - Matthews-Weddington Road and Union Day School Driveway/Tilley Morris Road	Existing	F (5)	F (5)	F (5)	D (50)	F (16)
	Background & Build-out	F (5)	F (5)	F (5)	D (50)	F (16)
4 - Matthews-Weddington Road and McKee Road	Existing, Background, & Build-out	F (10)	F (5)	F (5)	F (10)	F (8)
	Build-out Improved - EBR	F (10)	F (5)	F (5)	F (5)	F (6)
	Build-out Improved - NBR	F (5)	F (5)	F (5)	F (10)	F (6)
5 - Chestnut Lane and Potter Road	All Scenarios	E (30)	E (30)	E (30)	E (30)	E (30)
6 - Matthews-Weddington Road and Driveway #2	All Scenarios	C+ (70)	-	D- (40)	E- (20)	E (33)
7 - Matthews-Weddington Road and Driveway #3	All Scenarios	C+ (70)	-	D- (40)	E- (20)	E (33)

Table 8.3 shows that intersections of Matthews-Weddington Road at Chestnut Lane (1), Matthews-Weddington Road and Antioch Church Road (2), Matthews-Weddington Road and Union Day School/Tilley Morris Road (3), and Weddington Road and McKee Road (4) are all expected to operate at LOS F, through all scenarios. Chestnut Lane and Potter Road (5), Matthews-Weddington Road and Driveway #2 (6), and Matthews-Weddington Road and Driveway #3 (7) are expected to operate with an overall bicycle LOS E. The poor LOS along Matthews-Weddington Road is primarily attributed to speeds greater than 40 mph, lack of bicycle facilities and bicyclist conflicts with left- and right-turning vehicular movements; the relatively

lower vehicular demand at this intersection allows for a permitted left-turn phase on all approaches which introduces added conflict points between the vehicles and bicyclists.

As discussed in the Pedestrian Operations Analysis section above, a greenway/multi-use path, as identified in the Pedestrian Plan, should be incorporated into the site and is recommended to accommodate both pedestrians and bicyclists.

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 December 1, 2015, and November 30, 2018. Over this three-year period, 101 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	7
Class C	21
Property Damage Only	73
Total	101

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 28% 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
Matthews-Weddington Road and Chestnut Lane	149.17
Matthews-Weddington Road and Antioch Church Road	46.19
Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road	173.81
Weddington Road and McKee Road	74.23
Potter Road and Chestnut Lane	73.57
Average	97.51

Table 9.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 97.51 crashes per 100 million entering vehicles (MEV), with the highest rate occurring at the unsignalized intersection of Matthews-Weddington Road/Union Day School Drive at Tilley Morris Road. There have been 28 reported crashes over this three-year period at this intersection.

Table 9.3 – Crash Type Summary

	Matthews-Weddington Road and Chestnut Lane	Matthews-Weddington Road and Antioch Church Road	Matthews-Weddington Road/Union Day School Driveway and Tilley Morris Road	Weddington Road and McKee Road	Potter Road and Chestnut Lane
Angle	8	2	0	9	1
Backing Up	1	0	1	0	1
Fixed Object	0	0	0	0	1
Head On	1	0	0	0	0
Left-Turn, Different Roadways	4	0	2	0	1
Left-Turn, Same Roadway	0	1	2	0	3
Ran off Road - Straight	2	0	0	0	0
Ran off Road - Left	0	0	0	1	0
Rear End, Slow or Stop	10	4	19	12	8
Rear End, Turn	0	0	1	0	0
Sideswipe, Same Direction	0	1	2	1	0
Sideswipe, Opposite Direction	0	0	1	1	0
Total	26	8	28	24	15

The most common crash types reported at the study area intersections were rear-end collisions caused by slowing or stopping vehicles (52%) and angle crashes (20%). 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 each study intersection along Matthews-Weddington Road. As discussed in Section 4.3, NCDOT is currently planning to implement two roundabouts along Matthews-Weddington Road which could help reduce rear-end collisions caused by slowing or stopping.

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:

Matthews-Weddington Road and Chestnut Lane/Site Access #1

- Construction of an eastbound approach to the roundabout (U-6091) that will operate as a shared left/through/right lane and serve as the main driveway to the proposed development.
- Contribution of \$87,500 (equivalent to 25% of the Town's \$350,000 contribution to the planned roundabout).

Matthews-Weddington Road and Antioch Church Road

- Implementation of a westbound right-turn overlap phase.

Matthews-Weddington Road and Driveway #2

- Construction of a right-in/right-out driveway.
- Construction of a southbound right-turn lane; storage length subject to NCDOT.

Matthews-Weddington Road and Driveway #3

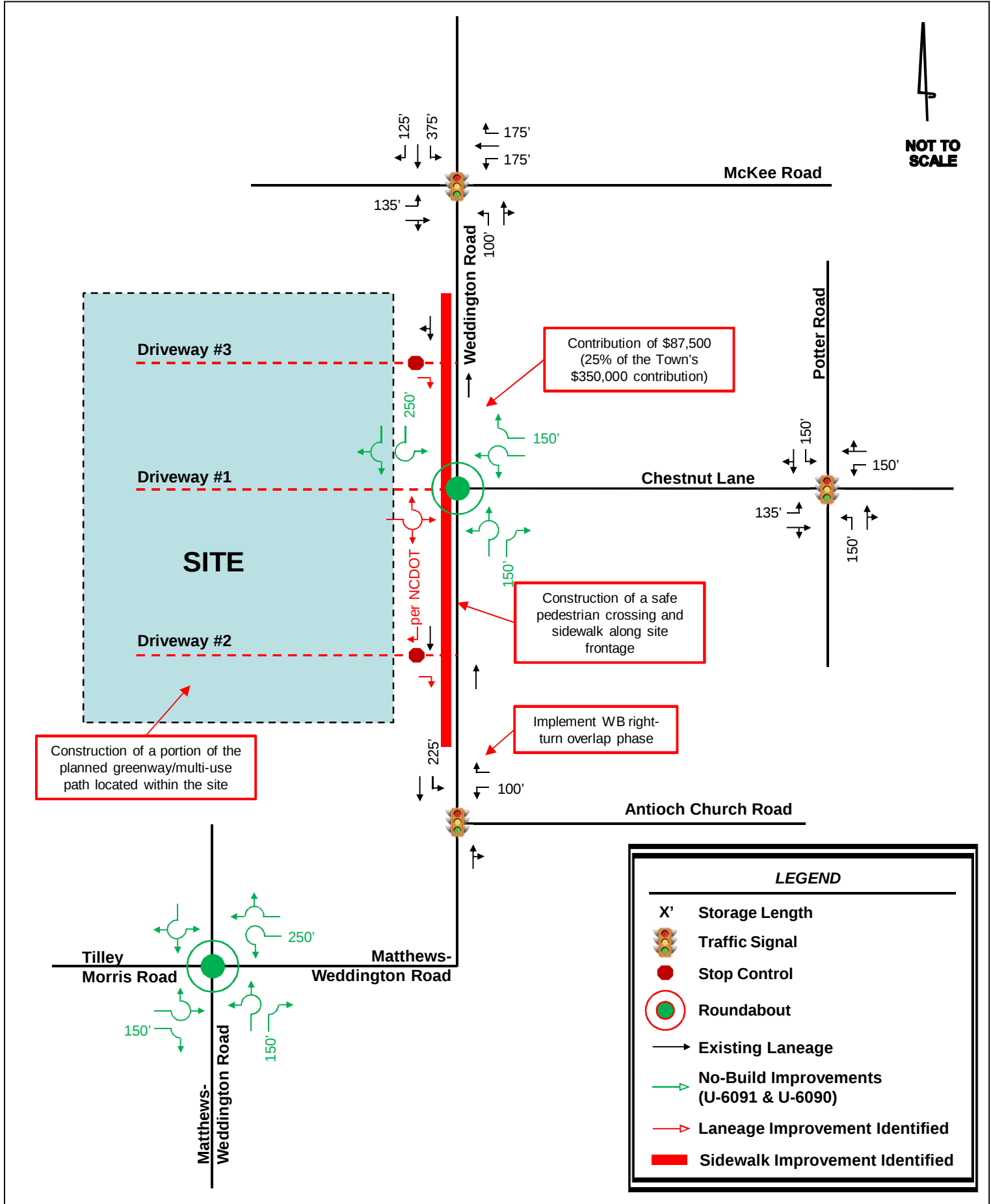
- Construction of a right-in/right-out driveway.

Study Area Pedestrian and Bicycle Improvements

- Construction of a safe pedestrian crossing of Matthews-Weddington Road (to be coordinated with U-6091)
- Construction of sidewalk along the frontage of the site along Matthews-Weddington Road
- Construction of greenway/multi-use path through the proposed site consistent with the planned Francis Beatty Trail as determined by Town staff; Applicant should coordinate with the Town early in the planning process to determine the appropriate alignment and cross-section of this trail

Per discussion with the Town, the pedestrian plan is currently being updated. These identified improvements should be coordinated with the Town to ensure consistency with the pedestrian plan under development. It should also be noted that a greenway/multi-use path is already shown on the site plan provided by the Applicant.

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.



APPENDIX