Lakeview Farms

Transportation Impact Analysis

South Point Road
Belmont, North Carolina

Prepared for:
City of Belmont

April 2022

DRAFT Transportation Impact Analysis for
Lakeview Farms
South Point Road
Belmont, North Carolina

Prepared for:

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Belmont, North Carolina

Prepared by:

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April 2022
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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 Lakeview Farms residential development. The primary objectives of the study are:

- To estimate trip generation and distribution for the proposed development.
- To perform intersection capacity 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 development's transportation impacts.

The proposed Lakeview Farms development is located on the southern peninsula in southeastern Gaston County along the west side of S Point Road in the vicinity of Reese Wilson Road (https://goo.gl/maps). The undeveloped 221-acre site is currently zoned R-1 (Scenic View Overlay & Highway Corridor Overlay) within Gaston County's limits, and is proposed to be annexed into the City of Belmont and rezoned as Conditional District S-R. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA:

- 201 single-family homes
- 145 age-restricted single-family homes
- 139 townhomes

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2026. Based on the provided site plan, the proposed development is currently planned to be accessed via two (2) access points along S Point Road:

- Access 1 – full-movement connection to S Point Road approximately 375 feet south of Reese Wilson Road
- Access 2 – full-movement connection to S Point Road approximately 750 feet south of Access 1

A TIA Scoping Meeting was held with the City of Belmont, North Carolina Department of Transportation (NCDOT), and representatives of the applicant on January 12, 2021, to obtain background information and to ascertain the scope and parameters to be included in this TIA. The City's 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 City of Belmont, 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:

- 2021 Existing Conditions
- 2026 Background Conditions
- 2026 Build-out Conditions
- 2031 Build-out Conditions + 5 years

Based on the City's TIA Ordinance along with the expected site trip generation and discussions of projected travel patterns for the proposed site trips in context with the surrounding area, this TIA evaluated operations under each of the AM and PM peak-hour scenarios above for the following study area intersections as agreed upon at the TIA Scoping Meeting:

1. S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road
2. S New Hope Road (NC 279) and Armstrong Road (NC 273)
3. S Point Road (NC 273) and Belmont Middle School
4. S Point Road (NC 273) and South Point HS/Red Raider Run
5. S Point Road (NC 273) and R L Stowe Road/Nixon Road
6. S Point Road and Access 1
7. S Point Road 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 or is planned.
- 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, with the exception of site access movements.

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 *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis)* and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity analyses, crash analyses and identified transportation improvements required to mitigate anticipated transportation demands produced by the subject development.

Based on the capacity 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 adjacent street network:

1. S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road

- Installation of a multi-lane roundabout with the following lanes:
  - Southbound right-turn slip lane along S Point Road (NC 273) with a minimum of 200 feet of storage
  - Eastbound approach along Armstrong Road (NC 273) with an exclusive left-turn lane and a shared left/through/right lane with a minimum of 200 feet of storage
  - Two (2) receiving lanes northbound along S Point Road (NC 273) with a minimum of 600 feet of storage

Since this intersection has already been identified as needing improvements under existing conditions (single-lane roundabout as part of TIP Project No. U-6150), the applicant should partner with NCDOT, City of Belmont and potentially Gaston County towards implementation of mitigation improvements to this intersection.

3. S Point Road (NC 273) and Belmont Middle School

- Additional northbound through lane along S Point Road (NC 273) that provides a minimum of 500 feet of storage and extends to R L Stowe Road
- Additional southbound through lane along S Point Road (NC 273) that extends a minimum of 500 feet south of this intersection, serving as a drop lane extending from R L Stowe Road

4. S Point Road (NC 273) and South Point HS/Red Raider Run

- Additional northbound through lane along S Point Road (NC 273)
- Additional southbound through lane along S Point Road (NC 273)

5. S Point Road (NC 273) and R L Stowe Road/Nixon Road

- Additional westbound left-turn lane along R L Stowe Road (creating dual left-turn lanes) and provide a minimum of 275 feet of storage for the westbound shared through/right-turn lane along with proper signing/striping (*see below)
- Restripe the existing southbound right-turn lane along S Point Road (NC 273) to provide a shared through/right lane and extends through the Belmont Middle School signalized intersection
    - The appropriate storage for southbound through/right lane should be coordinated with City and NCDOT staff to determine if the existing turn lane should also be extended (from 150 feet to 200 feet) in addition to being restriped.
- Extension of the existing northbound right-turn lane along S Point Road (NC 273) to the Belmont Middle School signalized intersection to serve as the additional northbound through lane along S Point Road (NC 273) and drop as the right-turn lane at R L Stowe Road

*Given the westbound approach volumes where the left-turn movement is significantly higher than the through/right combination, along with the existing concrete median in place for the left-over at Belmont Town Center that restricts extension of the inside left-turn lane, consideration should be given to allowing the additional left-turn lane to become the drop lane from R L Stowe Road. This would require the westbound through/right lane drivers to shift over a lane as they approach S Point Road (NC 273), which would not be normal driver expectation for a through movement. Therefore, if allowed by the City and NCDOT, proper signing and striping is recommended to alleviate the potential driver expectation concern

6. S Point Road and Access 1

- Single eastbound egress lane and single ingress lane along Access 1
- Provide a 100-foot internal protected stem (IPS) along Access 1
- Southbound right-turn lane along S Point Road with 100 feet of storage

7. S Point Road and Access 2

- Single eastbound egress lane and single ingress lane along Access 2
- Provide a 100-foot IPS along Access 2

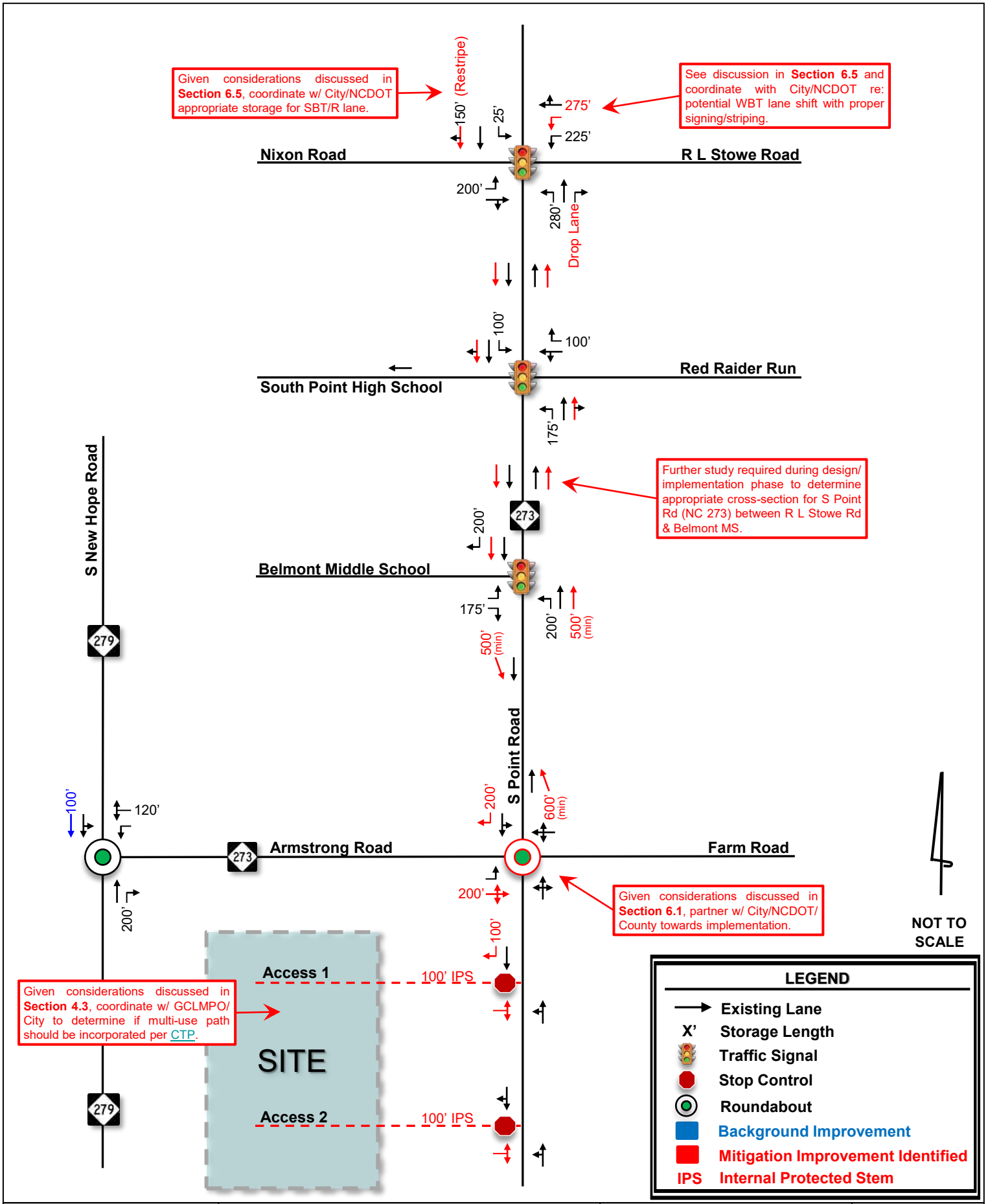
Multi-Use Path

- The applicant should coordinate with GCLMPO and the City of Belmont to determine if the multi-use path recommended in GCLMPO's CTP through the northeastern portion of the proposed site should be incorporated, along with the specific alignment and cross-section if required.

Overall Corridor

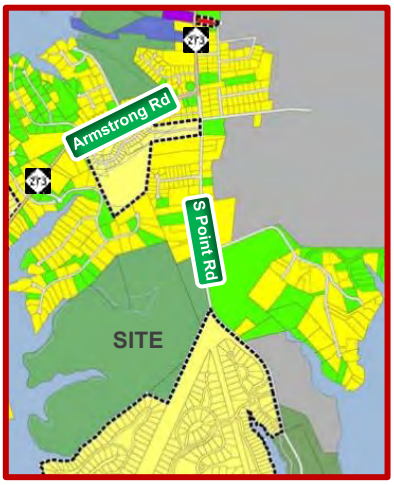
Given the northbound and southbound through-lane capacity improvements identified to mitigate the impacts of the site along S Point Road (NC 273) between Belmont Middle School and R L Stowe Road, a four (4)-lane section is identified for mitigation. Further study will be required during the design and implementation phase to determine the preferred cross-section for this ~½-mile corridor.

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 City of Belmont. All additions and attachments to the State and City roadway system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	Identified Mitigation Improvements	Figure 1.1

2.0 Introduction



The proposed Lakeview Farms residential development is located on the southern peninsula in southeastern Gaston County along the west side of S Point Road in the vicinity of Reese Wilson Road (https://goo.gl/maps). The undeveloped 221-acre site is currently zoned R-1 (Scenic View Overlay & Highway Corridor Overlay) within Gaston County's limits, and is proposed to be annexed into the City of Belmont and rezoned as Conditional District S-R. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA:

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For the purposes of this TIA, the development is assumed to be completed (built-out) in 2026. Based on the provided site plan, the proposed development is currently planned to be accessed via two (2) access points along S Point Road:

- Access 1 – full-movement connection to S Point Road approximately 375 feet south of Reese Wilson Road
- Access 2 – full-movement connection to S Point Road approximately 750 feet south of Access 1

A TIA Scoping Meeting was held with the City of Belmont, NCDOT and representatives of the applicant on January 12, 2021, to obtain background information and to ascertain the scope and parameters to be included in this TIA. The City's 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 City of Belmont, 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 *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis)* and to identify transportation improvements that may be required to mitigate these impacts. This report presents trip generation, distribution, capacity 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 City of Belmont and NCDOT staff and collected through field observations and turning-movement counts to establish the existing conditions baseline analysis.

3.1 STUDY AREA

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

1. S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road
2. S New Hope Road (NC 279) and Armstrong Road (NC 273)
3. S Point Road (NC 273) and Belmont Middle School
4. S Point Road (NC 273) and South Point HS/Red Raider Run
5. S Point Road (NC 273) and R L Stowe Road/Nixon Road

The study area was based on the *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis*, which states "The limits of the study area shall be based on the location, size and extent of the proposed project, and an understanding of existing and future land uses and traffic conditions surrounding the site. The limits of the study area for the TIA shall be reviewed and approved by the City and NCDOT staff at the mandatory scoping meeting. At a minimum, the study area shall include all streets and signalized intersections within a 1-mile radius of the proposed site and/or where site traffic estimated for build-out of the project will constitute 10% or more of any signalized intersection approach during the peak hour. Unsignalized intersections between the required signalized intersections will be added to the scope as directed by the City." Given the expected site trip generation and based on discussions of projected travel patterns for the proposed site trips in context with the surrounding area, the study area listed above was agreed upon at the TIA Scoping Meeting and reviewed and approved by the City of Belmont, NCDOT and the applicant as documented in the approved MOU included in the **Appendix**.

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 S Point Road (NC 273), Armstrong Road (NC 273), R L Stowe Road, Nixon Road, and S New Hope Road (NC 279). The information below describes existing conditions for portions of these roadways within the vicinity of the site.

S Point Road (NC 273) is a two-lane, undivided state highway that serves as the primary north/south route along the peninsula formed between the Catawba River and South Fork River where portions of Belmont and Gaston County exist. S Point Road (NC 273) is classified as a minor arterial by NCDOT's functional classification system and classified by Gaston-Cleveland-Lincoln Metropolitan Planning Organization (GCLMPO) as a boulevard. Based on 2018 NCDOT annual average daily traffic (AADT) maps, S Point Road (NC 273) carries 17,000 vehicles per day (vpd) south of R L Stowe Road, 14,000 vpd south of Belmont Middle School and 9,500 vpd in the vicinity of Plant Allen Road. During the AM peak hour, the traffic flow is heavily distributed northbound towards I-85, Belmont, Charlotte and Gastonia, and the heavy southbound flow is

experienced more during the evening peak hour. S Point Road (NC 273) has a posted speed limit of 45 mph south of Stowe Road and 35 mph north of Stowe Road.

R L Stowe Road is a two-lane, undivided roadway that connects S Point Road (NC 273) to Keener Boulevard (NC 273). R L Stowe Road has a posted speed limit of 35 mph near its intersection with S Point Road (NC 273). Based on 2018 NCDOT AADT maps, R L Stowe Road carries 10,000 vpd east of S Point Road (NC 273). R L Stowe is classified as a local road by NCDOT's functional classification system and as a boulevard by GCLMPO.

Nixon Road is a two-lane, undivided roadway that primarily carries residential and school traffic to-and-from South Point High School. Nixon Road has a posted speed limit of 35 mph; however, there is a 25-mph school zone near its intersection with S Point Road (NC 273). Based on 2018 NCDOT AADT maps, Nixon Road carries 3,500 vpd west of S Point Road (NC 273). Nixon Road is classified as a local road by NCDOT's functional classification system and as a minor thoroughfare by GCLMPO.

S New Hope Road (NC 279) is a two-lane, undivided roadway that connects Pole Branch Road (SC 274) in Lake Wylie, SC to Armstrong Road (NC 273) in Belmont, NC. This route serves both North Carolina and South Carolina commuters via a bridged connection to York County, South Carolina. Based on 2018 NCDOT AADT Maps, S New Hope Road (NC 279) carries 8,100 vpd south of Armstrong Road (NC 273) and 5,300 vpd north of Armstrong Road (NC 273). S New Hope Road (NC 279) is classified as a minor arterial by NCDOT's functional classification system and as a boulevard by the GCLMPO.

3.2 EXISTING INTERSECTION VOLUME DEVELOPMENT

Based on coordination with City and NCDOT staff beginning with the TIA Scoping Meeting on January 12, 2021, it was determined that new peak-hour turning movement counts (TMCs) on their own may not be indicative of "typical" traffic operations due to COVID-19 and its associated impacts to work and school schedules at the time of this TIA. Therefore, existing traffic volumes were developed based on the alternative methodology outlined below (in which new TMCs were collected on two (2) separate occasions in 2021) and as documented in the approved MOU included in the **Appendix** .

Peak period (6:30-8:30 AM and 4:30-7:00 PM) turning-movement, heavy-vehicle, pedestrian, and bicycle counts (TMCs) were collected by Quality Counts, LLC on Thursday, May 20, 2021, at the following intersections:

1. S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road
2. S New Hope Road (NC 279) and Armstrong Road (NC 273)
3. S Point Road (NC 273) and South Point HS/Red Raider Run
4. S Point Road (NC 273) and R L Stowe Road/Nixon Road

Note that the new signal at Belmont Middle School was not collected in May 2021 as the new middle school did not open until Fall 2021.

Historical TMCs for the four (4) intersections listed above were obtained from prior traffic studies and were collected by National Data & Surveying Services and Quality Counts, LLC on the dates shown below:

1. S Point Rd (NC 273) and Armstrong Rd (NC 273)/Farm Rd - Wednesday, 12/13/2017

2. S New Hope Rd (NC 279) and Armstrong Rd (NC 273) – Tuesday, 5/2/2018
3. S Point Rd (NC 273) and S Point HS/Red Raider Run – Tuesday, 5/22/2018 (AM peak), Thursday, 1/10/2019 (PM peak)
4. S Point Rd (NC 273) and R L Stowe Rd/Nixon Rd - Tuesday, 5/22/2018 (AM peak), Thursday, 1/10/2019 (PM peak)

An annual growth rate of three percent (3%) was applied to the historic counts to reflect base 2021 traffic volumes for comparison purposes.

As documented in the approved MOU, "the new 2021 TMCs will be compared to available historic TMCs at the study area intersections (2017-2019). Given the potential changes in typical traffic patterns due to the COVID-19 pandemic, the higher of the new 2021 TMCs or the historic TMCs will be utilized in this TIA. This will be coordinated with the City & NCDOT."

Based on a comparison of the historic counts (from 2017- 2019) and the May 2021 counts, the total study area volumes in May 2021 were 33% lower in the AM and 14% lower in the PM than the historic counts, with the lower volumes primarily focused in the vicinity of South Point High School as well attributable to reduced commuter traffic to/from South Carolina. These findings were coordinated with the City, NCDOT and the applicant, and it was determined that new TMCs should be recollected in Fall 2021 to account for Belmont Middle School traffic with hopes that COVID impacts would also be lessened.

New peak period (6:30-8:30 AM and 4:30-7:00 PM) TMCs were recollected by Quality Counts, LLC at the same study intersections listed above on Wednesday, September 8, 2021.

Based on a comparison of the historic counts (from 2017- 2019) and the recollected September 2021 counts, the total study area volumes in September 2021 were 19% lower in the AM and 14% lower in the PM than the historic counts. These findings were coordinated with the City, NCDOT and the applicant, including Belmont Planning Board. Based on City input, Planning Board supported using the historic counts (from 2017-2019). Therefore, the historic counts were utilized to develop existing conditions traffic volumes in this TIA by applying an annual growth rate of three percent (3%). Correspondence that includes a summary of the count comparison findings along with detailed volume figures are included in the **Appendix**.

The AM and PM peak hours identified at each intersection were found to be relatively consistent where the AM peak hour was found to begin at 7:00 AM throughout the study area, and the PM peak hour was found to begin between 4:45 and 5:00 PM throughout the study area. The specific peak hour of each individual intersection was used as the baseline data to represent the highest collected traffic volumes within the specified count timeframes. The peak hours for each intersection are shown in **Table 3.1.**

Table 3.1 – AM & PM Intersection Peak Hours

Intersection	AM Peak Hour	PM Peak Hour
1. S Point Rd (NC 273)/Armstrong Rd/Farm Rd	7:00 - 8:00 AM	4:45 - 5:45 PM
2. S New Hope Rd (NC 279)/Armstrong Rd (NC 273)	7:00 - 8:00 AM	5:00 - 6:00 PM
3. S Point Rd (NC 273)/S Point HS/Red Raider Run	7:00 - 8:00 AM	5:00 - 6:00 PM
4. S Point Rd (NC 273)/R L Stowe Rd/Nixon Rd	7:00 - 8:00 AM	5:00 - 6:00 PM

Volumes were balanced along S Point Road (NC 273) between South Point HS/Red Raider Run and R L Stowe Road/Nixon Road due to the limited number of driveways between these intersections. No other volume balancing was performed between the remaining study area

intersections due to the presence of public streets and other commercial and residential driveways. Peak-hour intersection turning-movement count data is provided in the **Appendix**.

Given the determination to utilize historic 2017-2019 counts for the basis of the traffic volumes, recent nearby developments that were not operational at time of the historic counts (and therefore not reflected in the counts) would need to be accounted for in the 2021 existing traffic volumes. Based on coordination with City and NCDOT staff, there are two (2) off-site developments within the study area that were substantially or nearly built-out/open at the time of this TIA, but were not open and operational at the time of the historic counts. As documented in the approved MOU, "if previously collected counts (prior to 2021) are used for the basis of this TIA, both developments will be assumed to be 0% built-out and 100% of the associated site trips will be included as approved developments in the development of the existing 2021 traffic volumes". These two (2) off-site developments are listed below:

- **Belmont Middle School** – 1,200-student middle school located Belmont immediately west of the S Point Road (NC 273) and south of McKee Farm Lane
- **Amberley** – 188 single-family homes located in Belmont west of Nixon Road and South Point High School

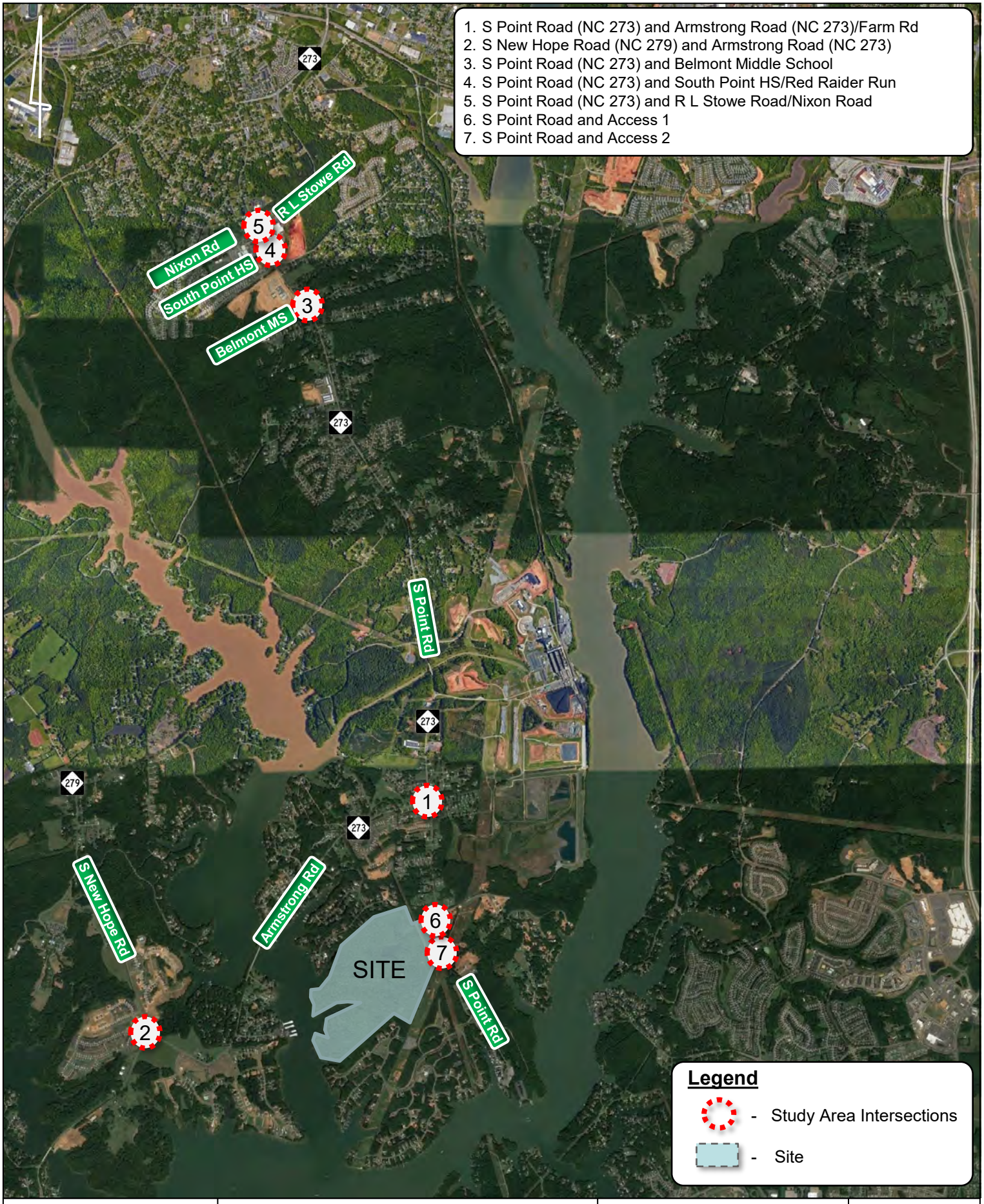
The site volumes for both developments were obtained from the *Belmont Middle School TIA* (September 2018) and *Amberley TIA* (May 2019).

Existing turning-movement splits were used to carry and assign the site volumes appropriately at study area intersections that were not included in the approved studies.

Note that the PM peak hour for the approved Belmont Middle School was analyzed as an afternoon peak between 2:30-4:30 PM. A factor was applied to the Belmont Middle School traffic volumes to convert afternoon PM site volumes (2:30-4:30) to evening PM site volumes (4:30-6:30). The factor was determined by comparing ITE's average rate for PM Peak of Adjacent Street Traffic (0.17) to ITE's average rate for PM Peak Hour of Generator (0.35) for ITE 530 (Middle School/Junior High School).

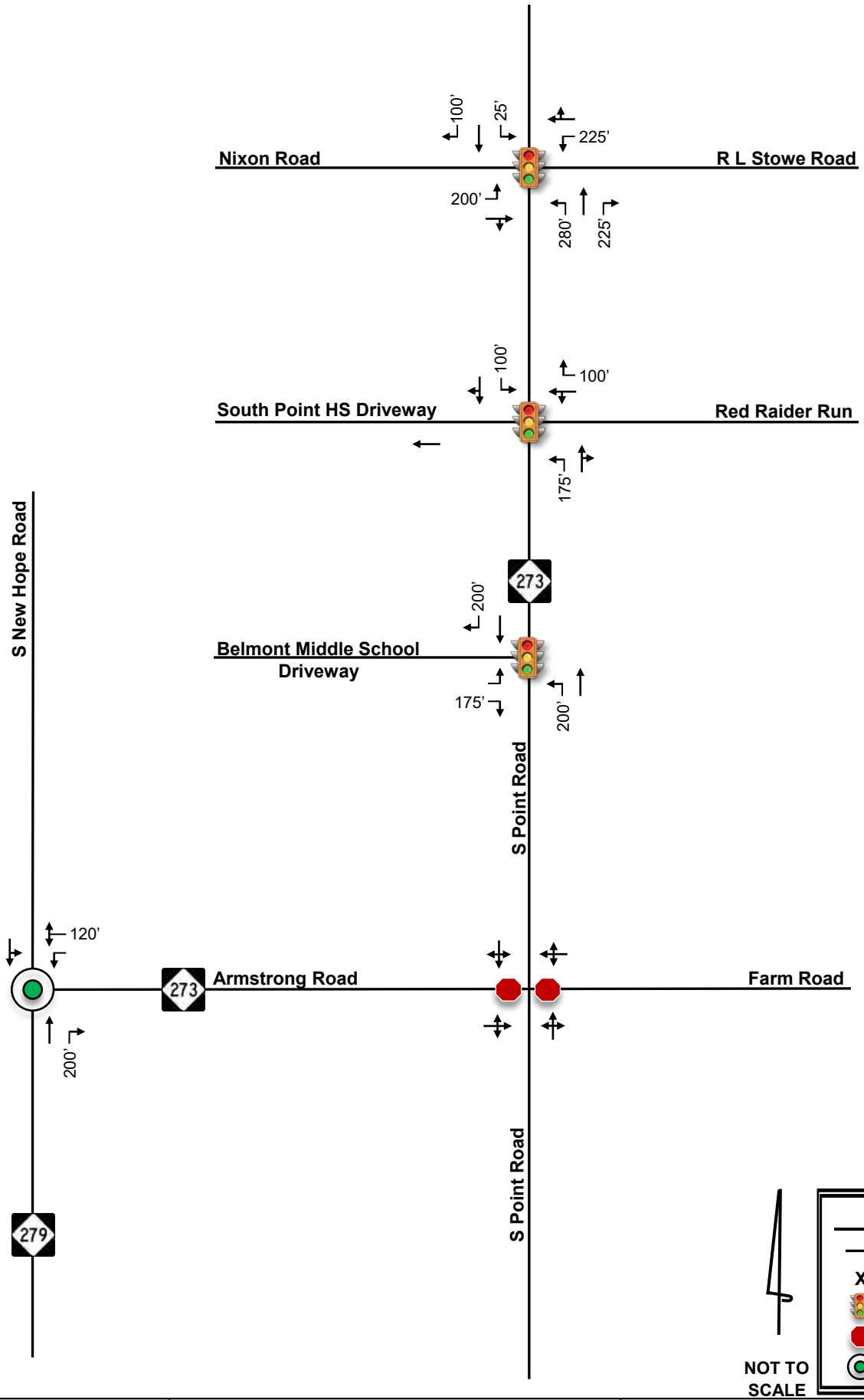
The required mitigation for the Amberley development (southbound right-turn lane along S Point Road (NC 273) at Nixon Road) has already been installed and was therefore included in the analyses in this TIA.

Figures 3.4 and **3.5** show the 2021 existing AM and PM peak-hour traffic volumes, respectively, that include the 2017-2019 counts, historical growth to 2021, and off-site development trips as described above.

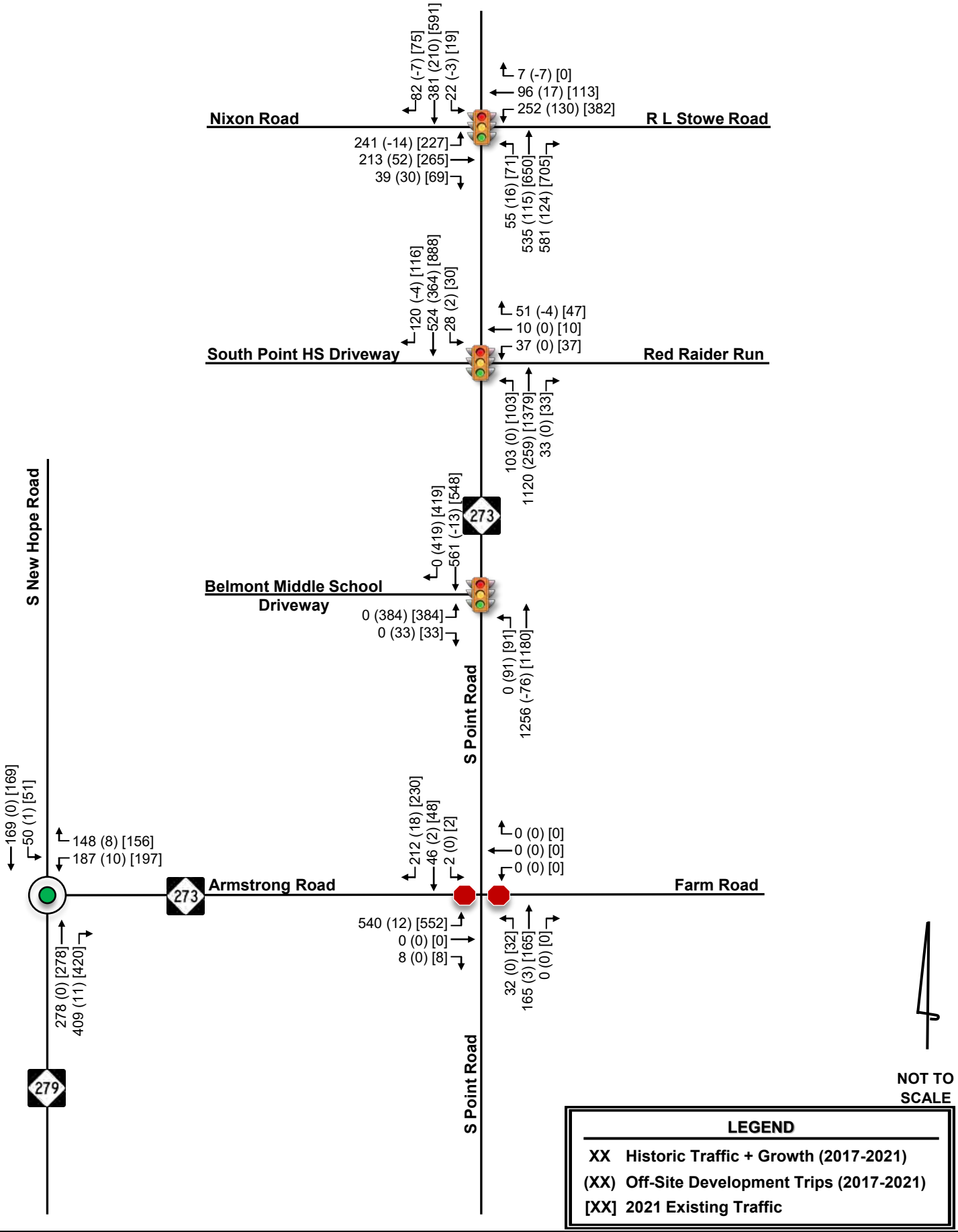


BELMONT NORTH CAROLINA Kimley»Horn	**Lakeview Farms Transportation Impact Analysis**	**Study Area/ Site Location**	**Figure 3.1**

BELMONT NORTH CAROLINA Kimley»Horn	**Lakeview Farms** **Transportation Impact Analysis**	**Proposed Site Plan**	**Figure** **3.2**



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	Existing Laneage	Figure 3.3



NOT TO SCALE

LEGEND

XX	Historic Traffic + Growth (2017-2021)
(XX)	Off-Site Development Trips (2017-2021)
[XX]	2021 Existing Traffic

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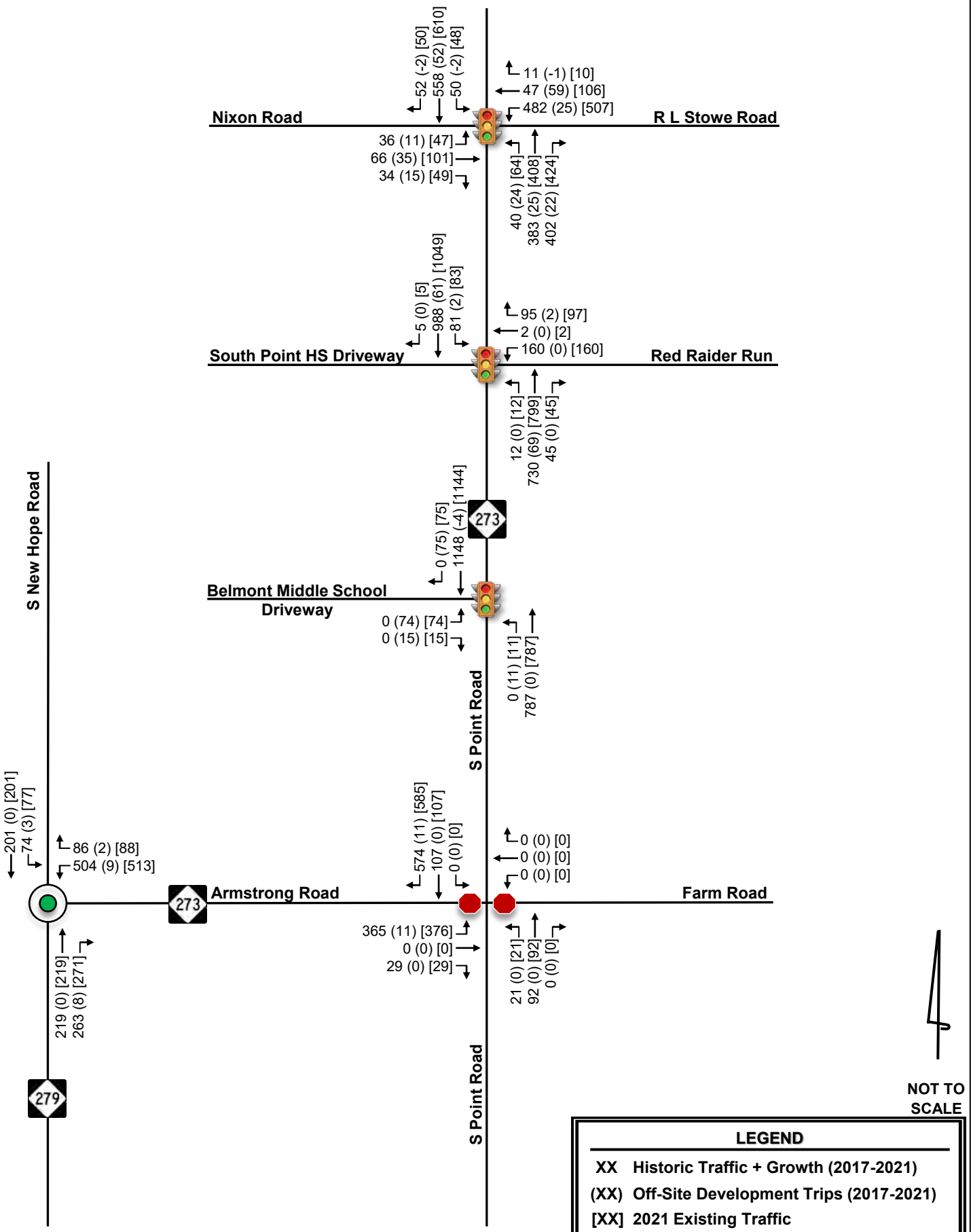
Lakeview Farms
Transportation Impact Analysis

2021 Existing AM Peak-Hour Traffic Volumes

Figure 3.4



NOT TO SCALE

LEGEND

XX	Historic Traffic + Growth (2017-2021)
(XX)	Off-Site Development Trips (2017-2021)
[XX]	2021 Existing Traffic

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Lakeview Farms
Transportation Impact Analysis

2021 Existing PM Peak-Hour Traffic Volumes

Figure 3.5

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 (2017-2019) and the expected build-out year (2026) 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 approved 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 off-site developments or planned transportation projects. 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 MOU, an annual growth rate of three percent (3%) was applied to the 2021 existing peak-hour traffic volumes to calculate base 2026 and 2031 background traffic volumes. This growth rate was determined based on review of historical NCDOT AADT maps, specifically along S Point Road between 2008 and 2018, in coordination with NCDOT and City of Belmont, along with consideration of the additional specific traffic being added by the two (2) recent and six (6) approved developments discussed in **Sections 3.2** and **4.2**, respectively.

4.2 APPROVED DEVELOPMENTS

Based on input from the City of Belmont and NCDOT staff, six (6) nearby approved developments expected to impact traffic volumes within the study area were included in the background traffic volumes for this TIA. The land uses, intensities, approximate build-out percentages at the time the counts were collected and required transportation improvements at overlapping study intersections are outlined in **Table 4.1**.

Table 4.1 – Approved Developments

Development	Land Use/Intensity	% Build-out	TIA Included?	Required Improvements
Rivermist (N of Bowen Rd)	86 SF units	0%	No	No required IMPS at study intersections
Belmont Town Center (Btwn Stowe Rd & R L Stowe Rd)	16 SF units 92 Townhome units 27.8k SF General Office 21.6k SF Specialty Retail 53k SF Supermarket 4.33k SF FF Restaurant 14 FP Gas Station	60% [1]	Yes	*Required IMPs at study intersections have already been constructed*
McLean (Armstrong Rd/S New Hope Rd)	810 SF units 100 MF units 125k SF Shopping Center	20% [1]	Yes	*Required IMPs at study intersections have already been constructed*
Worrells River (S New Hope Rd)	209 SF units	0%	Yes	**NC 279/NC 273** - SBT w/ 100'
Riverside [2] (SE of S New Hope/Armstrong Ford)	930 SF units 140 Townhome units 100k SF Office 80k SF Retail	0%	Yes	**NC 279/NC 273** - WBR w/100' - Restripe WBLR to WBL
South Fork – Phase 1 (S of Armstrong Ford Rd)	400 age-restricted SF units	0%	Yes	No required IMPs at study intersections
South Fork – Phases 2+3 [2]	408 age-restricted SF units 130k SF commercial	0%	Yes	**NC 273/R L Stowe Rd/Nixon Rd** - EBR w/100'

[1] As documented in the approved MOU, the build-out percentages of these developments were lowered to reflect the approximate build-out percentages at the time of the historic counts utilized in this TIA.
[2] Included in 2031 Build +5 Conditions only.

Site volumes for approved developments were obtained from their respective TIA's with the exception of Rivermist. A TIA was not performed for the Rivermist development; therefore, site trips for the Rivermist development were obtained from the Amberley TIA (May 2019), in which a trip generation analysis was performed to determine the number of AM and PM peak-hour trips, which were then assigned throughout the network based on the residential trip distribution.

Existing turning-movement splits were used to carry and assign the site volumes appropriately at study area intersections that were not included in the approved studies. Site traffic volume figures from the approved studies are included in the **Appendix**.

Figures 4.1 and **4.2** show the projected 2026 background AM and PM peak-hour traffic volumes, respectively, that include the historical growth traffic and approved development trips.

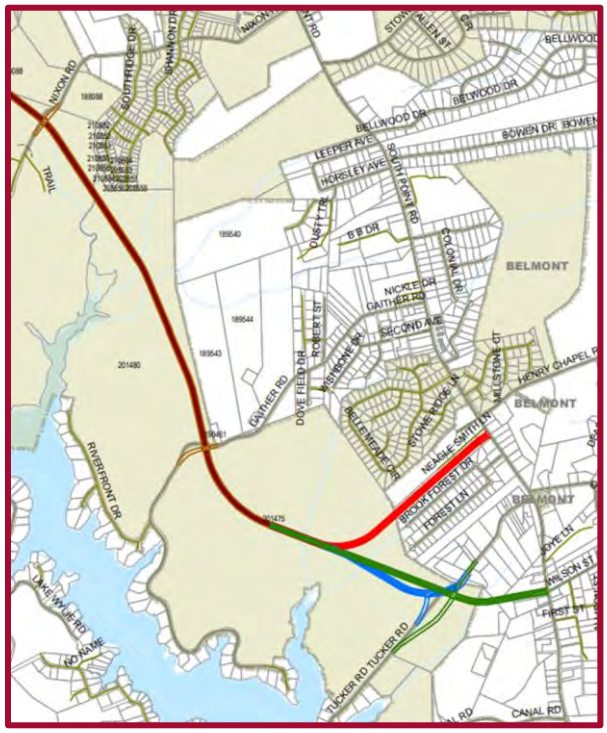
4.3 PLANNED TRANSPORTATION PROJECTS

Based on review of the adopted transportation plans for the area, seven (7) future transportation projects have been identified within the study area, along with a number of other surrounding roads identified as needing improvements based on the City's adopted transportation planning documents, GCLMPO's Comprehensive Transportation Plan (CTP) and 2050 Metropolitan Transportation Plan (MTP):

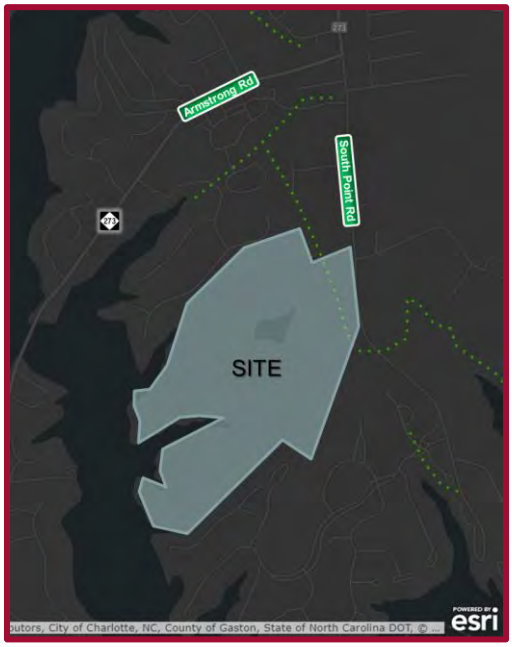
1. **S Point Rd (NC 273) and Armstrong Rd (NC 273) Roundabout (U-6150)**
    - Funded for ROW/Utilities FY 2028
    - Construction currently unfunded (beyond 10-year funded STIP window)
    - Based on input at TIA Scoping Meeting and given the current schedule with CNST unfunded, U-6150 will not be included in background conditions.
2. **S Point Road (NC 273) Widening (H184813)**
    - Widen to 4-lanes from **R L Stowe Rd to Henry Chapel Rd**
    - Included in:
        - 2050 MTP (Unfunded project list)
        - Belmont Comprehensive Land Use Plan (CLUP) (2018)
        - GCLMPO CTP (2021)
3. **S Point Road (NC 273) Widening (H193391)**
    - Widen to 4-lanes from **Henry Chapel Rd to Armstrong Rd**
    - Included in:
        - 2050 MTP (Unfunded project list)
        - Belmont CLUP (2018)
        - GCLMPO CTP (2021)
4. **S New Hope Road (NC 279) Widening (H184892)**
    - Widen to 4 lanes from Union New Hope Rd to the South Carolina state line
    - Included in:
        - 2050 MTP (Unfunded project list)
        - GCLMPO CTP (2021)
5. **Catawba Crossings**
    - Recommended 4-lane boulevard that connects I-485 in Mecklenburg County to S New Hope Rd (NC 279) in Gaston County
    - Bike/ped accommodations planned for new alignment
    - Currently undergoing Feasibility Study, but no current funding for construction
    - Included in:
        - 2050 MTP (Unfunded project list)
        - Belmont CLUP (2018)
        - GCLMPO CTP (2021)
6. **Belmont-Mount Holly Loop (South Fork Parkway) (H190754)**
    - Recommended 4-lane boulevard that ultimately connects South Point Rd (NC 273) in Belmont to N Main St (NC 273) in Mt Holly
    - Bike/ped accommodations planned for new alignment
    - GCLMPO has developed a Functional Design
    - Included in:
        - 2050 MTP (Unfunded project list)
        - Belmont CLUP (2018)
        - GCLMPO CTP (2021)

7. **Multiuse Path through proposed site**
    - Recommended multi-use path through northeastern portion of proposed site
    - Included in:
        - GCLMPO CTP (2021)

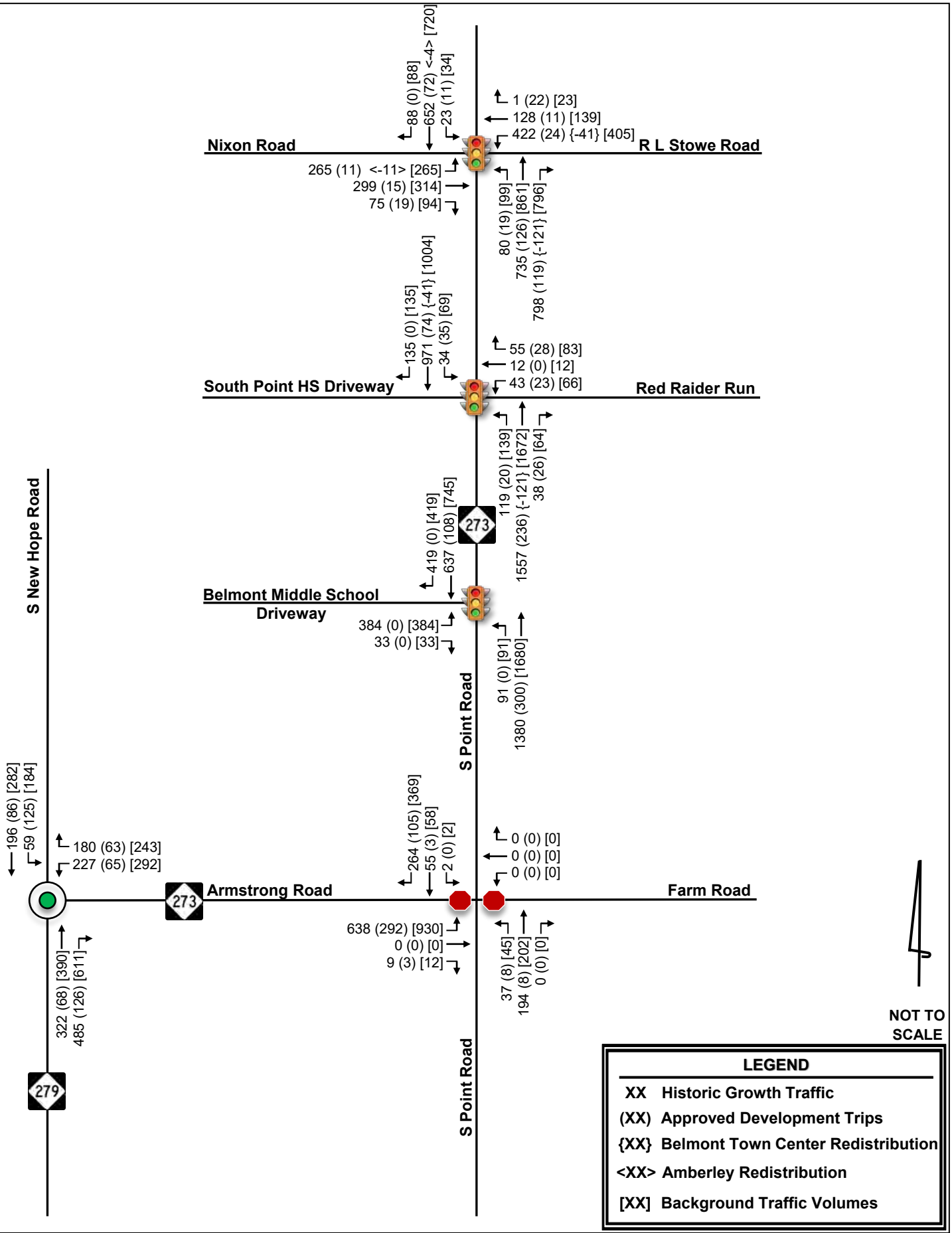
NCDOT State Transportation Improvement Program (STIP) Project No. U-6150 is planned to improve the intersection of Armstrong Road (NC 273) and S Point Road (NC 273) by constructing a single-lane roundabout. Based on the current NCDOT STIP as of March 2022, the schedule for U-6150 indicates right-of-way and utilities are funded for FY 2028 and construction is shown beyond the 10-year funded STIP window. Based on City and NCDOT input at the TIA Scoping Meeting, since construction is currently unfunded, future intersection improvements associated with U-6150 were not assumed to be in place in the future year analyses summarized in **Section 6**.



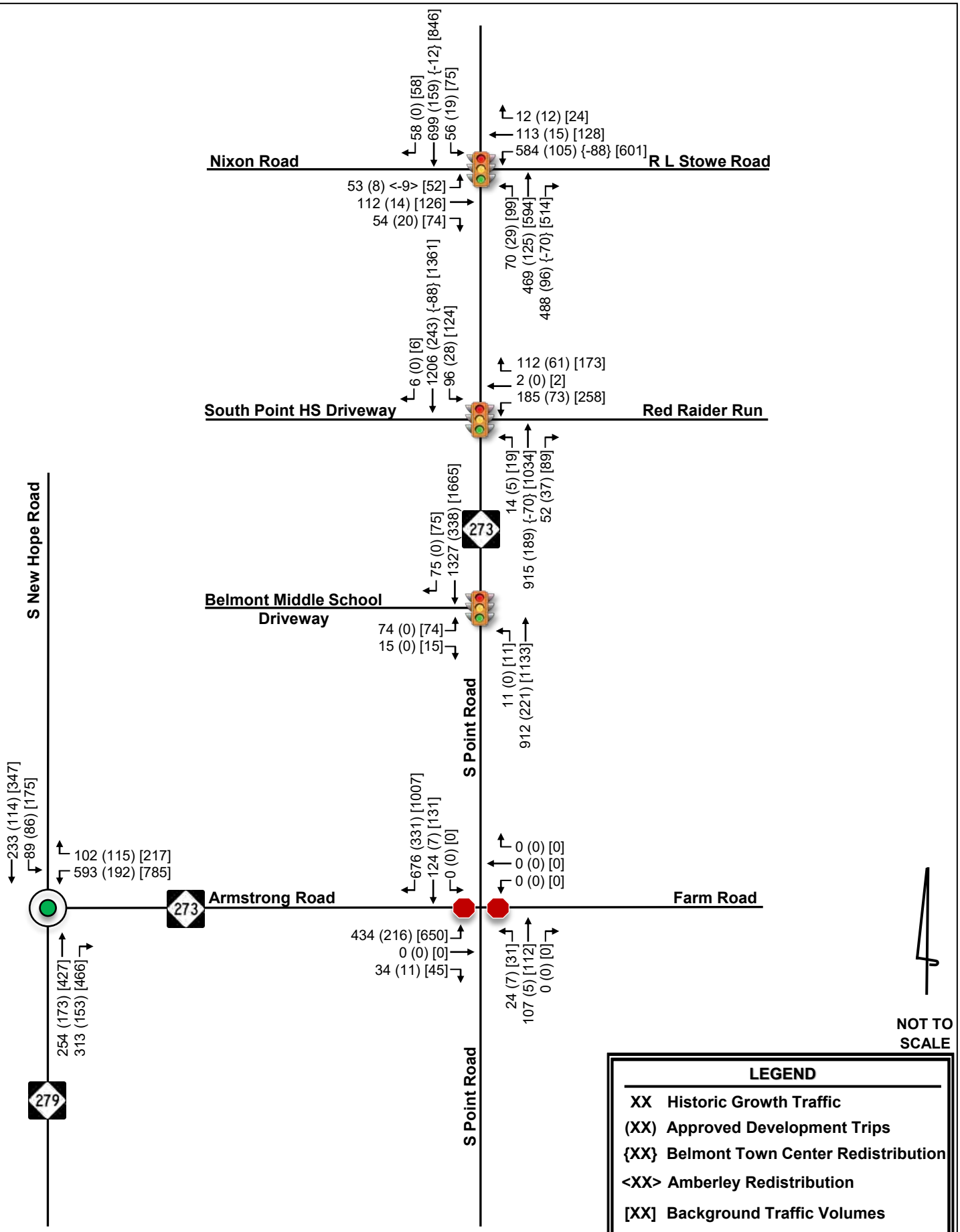
As described in GCLMPO's 2050 MTP as well as *Belmont's Comprehensive Land Use Plan*, the Belmont-Mt. Holly Loop (interchangeably referred to as the South Fork Parkway) has been identified as a new four-lane boulevard and multi-use path ultimately connecting S Point Road (NC 273) in Belmont to N Main Street (NC 273) in Mount Holly. GCLMPO has specifically developed preliminary functional design (shown in the image to the right) for the southern portion of the Belmont-Mt. Holly Loop as it has been identified as one of the corridors most threatened by development. The intent of the boulevard is to alleviate traffic and reduce congestion along S Point Road (NC 273) by providing a new north/south alternative as the southern portion of the peninsula continues to develop. Since this project is not currently funded, the future boulevard was not included in the future year analyses summarized in **Section 6**.



Based on GCLMPO's CTP (as shown in the image to the right) a multiuse path has been identified to traverse the northeastern portion of the proposed Lakeview Farms site. **The applicant should coordinate with GCLMPO and the City of Belmont to determine if a multi-use path should be incorporated within the site, along with the specific alignment and cross-section if required.**



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2026 Background AM Peak-Hour Traffic Volumes	Figure 4.1



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2026 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 vehicular 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 is currently planned to be accessed via two (2) access points along S Point Road:

- Access 1 – full-movement connection to S Point Road approximately 375 feet south Reese Wilson Road
- Access 2 – full-movement connection to S Point Road approximately 750 feet south of Access 1

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, Tenth Edition, 2017).

Based on the site plan provided by the applicant, the proposed development is currently envisioned to include the following land uses and intensities for the purposes of this TIA:

- 201 single-family homes
- 145 age-restricted single-family homes
- 139 townhomes

Table 5.1 summarizes the projected trip generation for the proposed development. During a typical weekday, the proposed development has the potential to generate 267 and 342 net new external trips during the AM and PM peak hours, respectively.

Table 5.1 - Trip Generation

ITE LUC	Land Use	Intensity		Daily	AM Peak Hour			PM Peak Hour		
					Total	In	Out	Total	In	Out
210	Single-Family Homes	201	DU	1,976	148	37	111	199	125	74
251	Senior Adult Housing - Detached	145	DU	780	54	18	36	64	39	25
220	Multifamily Housing Low-Rise - (Townhomes)	139	DU	1,010	65	15	50	79	50	29
Net New External Trips				**3,766**	**267**	**70**	**197**	**342**	**214**	**128**

5.3 SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

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

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

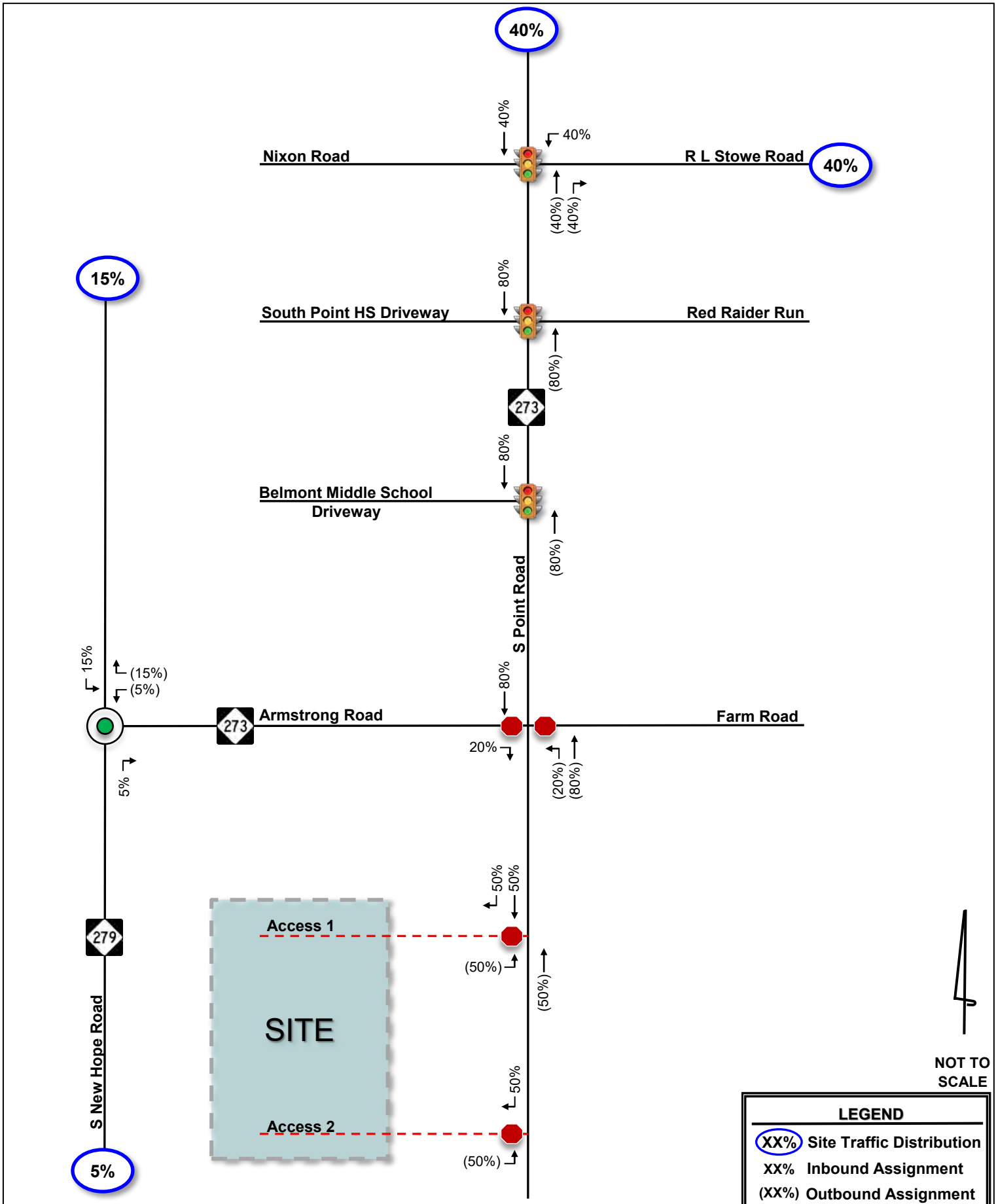
5.4 2026 BUILD-OUT TRAFFIC VOLUMES

The 2026 build-out traffic volumes include the assignment of the projected site traffic generation added to the 2026 background traffic volumes. **Figures 5.2** and **5.3** show the projected 2026 build-out traffic volumes for the AM and PM peak hours, respectively.

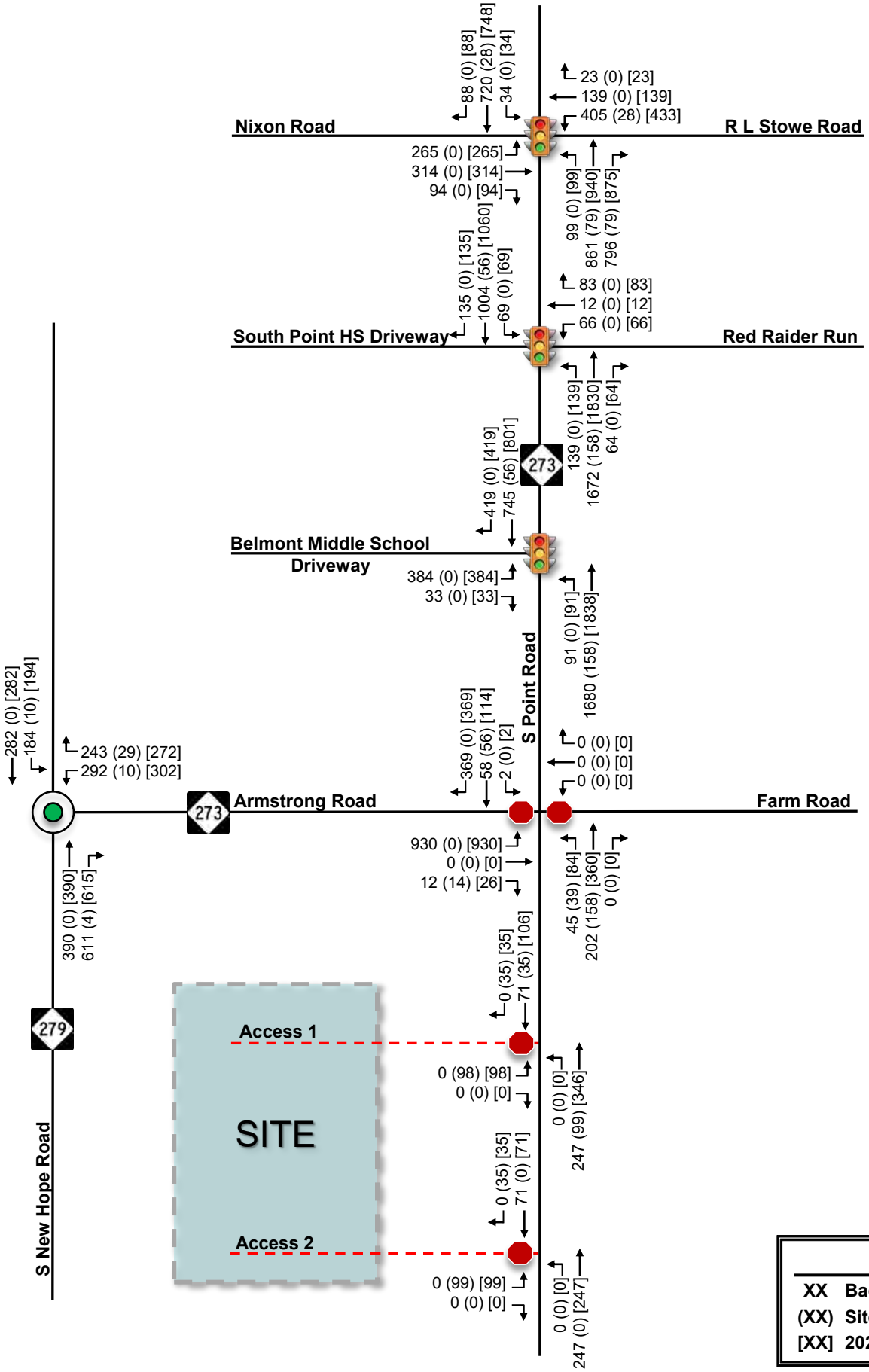
5.5 2031 BUILD-OUT +5 TRAFFIC VOLUMES

As required by the *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis*, an analysis scenario of five (5) years after the build-out year was performed. The 2031 build-out +5 traffic volumes include assignment of the proposed site traffic generation along with the approved development traffic added to the 2031 base background traffic volumes. Note that as discussed in **Section 4.2**, two (2) approved developments were added only to the 2031 build-out +5 conditions scenario, Riverside and South Fork Phases 2 and 3.

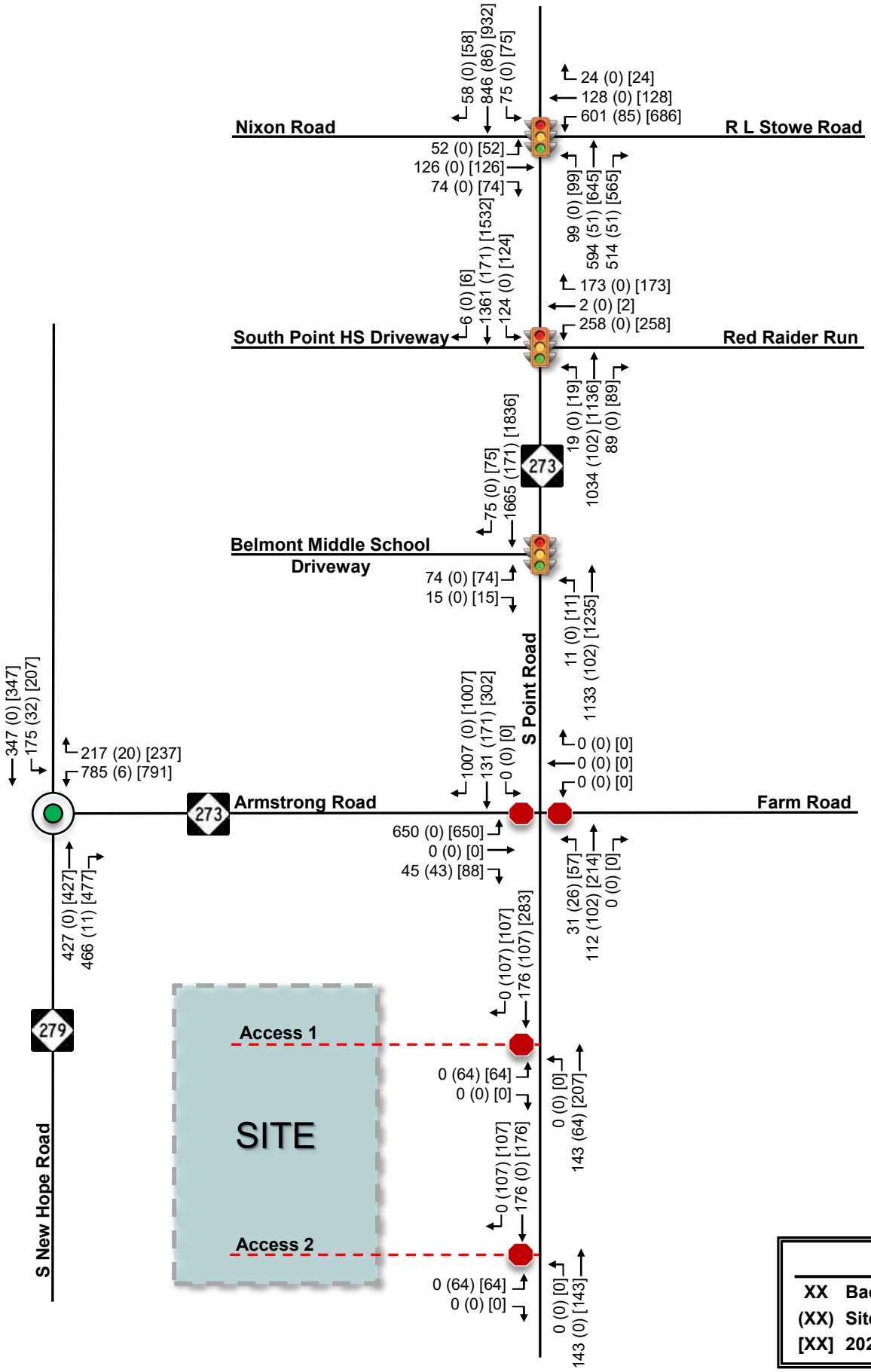
The projected 2031 AM and PM peak-hour build-out +5 volumes are shown in **Figures 5.4** and **5.5**, respectively. Intersection volume development worksheets for all intersections and driveways within the study network are provided in the **Appendix**.



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	Site Traffic Assignment and Distribution	Figure 5.1



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2026 Build-Out AM Peak-Hour Traffic Volumes	Figure 5.2

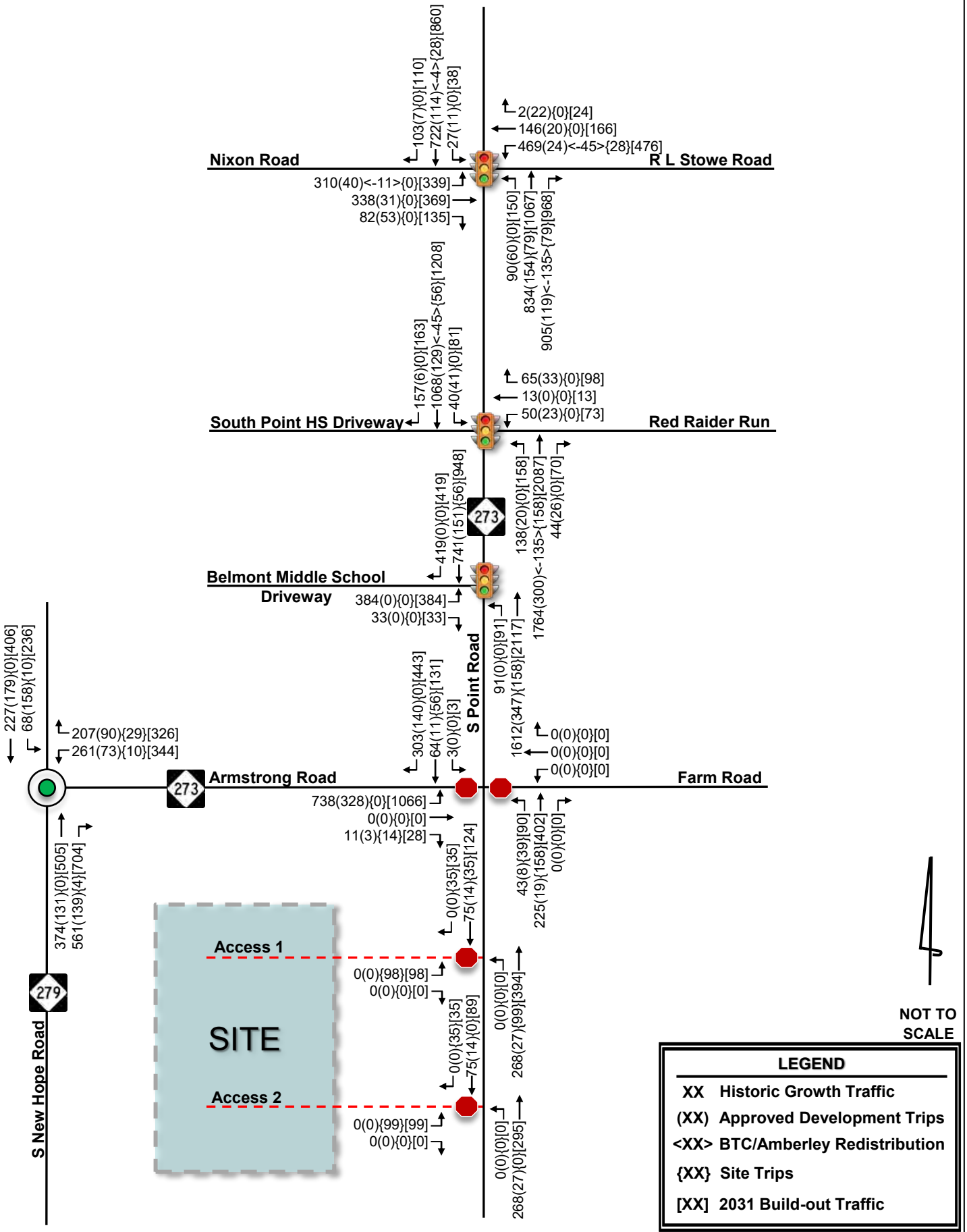


NOT TO SCALE

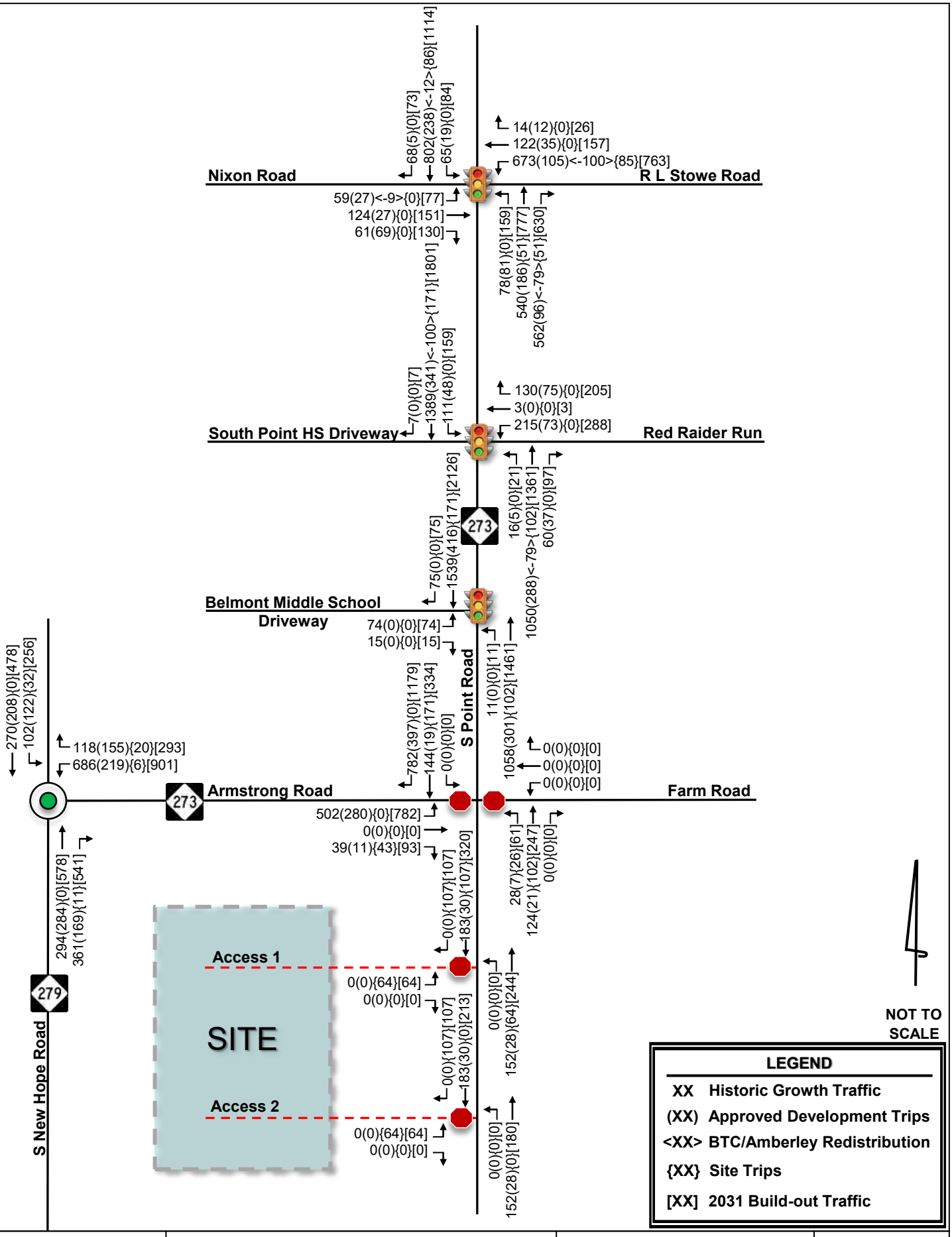
LEGEND

XX	Background Traffic
(XX)	Site Trips
[XX]	2026 Build-out Traffic

BELMONT NORTH CAROLINA / Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2026 Build-Out PM Peak-Hour Traffic Volumes	Figure 5.3



BELMONT NORTH CAROLINA Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2031 Build-out +5 AM Peak-Hour Traffic Volumes	Figure 5.4



BELMONT NORTH CAROLINA / Kimley»Horn	Lakeview Farms Transportation Impact Analysis	2031 Build-out +5 PM Peak-Hour Traffic Volumes	Figure 5.5

6.0 Capacity Analysis

Based on the requirements set forth by the *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis* and in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways*, capacity analyses were performed at the study area intersections for each of the following AM and PM peak-hour scenarios:

- 2021 Existing Conditions
- 2026 Background Conditions
- 2026 Build-out Conditions
- 2031 Build-out Conditions + 5 years

Capacity analyses were performed for the AM and PM peak hours using the Synchro Version 11 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 9 software was used to determine operating characteristics, level-of-service (LOS) and delay for the existing roundabout at S New Hope Road (NC 279) and Armstrong Road (NC 273), as well as the potential future roundabout identified at S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road. 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 (6) 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 lists the LOS control delay thresholds published in the HCM for unsignalized and signalized intersections, along with the operational descriptions for each LOS rating. The LOS grades shown below quantify and categorize the driver's discomfort, frustration, fuel consumption, and travel times experienced as a result of intersection control and the resulting traffic queuing.

Table 6.0 – Vehicular LOS Descriptions

LOS	Avg Control Delay [sec/veh]			Description
	Unsignalized		Signalized	
A	Short Delays	≤ 10	≤ 10	Minimal control delay: traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.
B		> 10 – 15	> 10 – 20	Minor control delay at signalized intersections; traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream.
C		> 15 – 25	> 20 – 35	Moderate control delay; movement within traffic stream more restricted than at LOS B; formation of queues contributes to lower avg travel speeds.
D	Moderate Delays	> 25 – 35	> 35 – 55	Considerable control delay that may be substantially increased by small increases in flow; average travel speeds continue to decrease.
E		> 35 – 50	> 55 – 80	High control delay; average travel speed no more than 33 percent of free flow speed.
F	Long Delays	> 50	> 80	Extremely high control delay: extensive queuing and high volumes create exceedingly restricted traffic flow.

NCDOT provided the signal geometric plans for each of the following signalized intersections, which were used in the development of the existing conditions Synchro network:

- S Point Road (NC 273) and Belmont Middle School
- S Point Road (NC 273) and South Point HS/Red Raider Run (**NC 273 CLS**)
- S Point Road (NC 273) and R L Stowe Road/Nixon Road (**NC 273 CLS**)

Based on the provided signal plans, the recently added signal at Belmont Middle School is operating as an isolated signal, while the other two (2) are operating as part of the NC 273 Closed Loop Signal System (CLS). The cycle lengths and splits for these two (2) signalized study intersections were optimized as a system given the timing inputs in the existing conditions network and in accordance with NCDOT *Congestion Management Capacity Analysis Guidelines*. The cycle lengths and splits at the isolated intersection were optimized under existing conditions network given the timing inputs and in accordance with NCDOT guidelines.

Per NCDOT *Congestion Management Capacity Analysis Guidelines*, protected only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists at the following intersections:

4. S Point Road (NC 273) and South Point HS/Red Raider Run
5. S Point Road (NC 273) and R L Stowe Road/Nixon Road

At intersections where protected/permitted phasing was changed to protected phasing and/or laneage improvements are planned as part of an approved development or TIP project, splits were optimized under 2026 background conditions. Note that the cycle lengths and offsets were maintained as part of the NC 273 CLS. Cycle lengths, splits, and offsets were maintained at all study intersections between 2026 background and 2026 build-out conditions.

Signal geometric plans are included in the **Appendix.**

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

- RTOR operations were not allowed.
- Protected-only left-turn phasing was used for analysis of future operations where protected/permitted left-turn phasing exists or is planned.
- 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, with the exception of site access movements.

Field-observed peak-hour factors (PHFs) were used in the 2021 existing conditions analysis, whereas a 0.9 PHF was used in all future-year conditions in accordance with NCDOT *Congestion Management Capacity Analysis Guidelines*. Heavy-vehicle percentages collected with the counts were used and maintained for all scenarios, subject to a two-percent (2%) minimum.

Mitigation for traffic impacts caused by the proposed development were identified based on City of Belmont and NCDOT mitigation requirements. When determining the proposed development's transportation impact to the study area intersections, the 2026 build-out conditions were compared to the 2026 background conditions. Based on the *City of Belmont Land Development Code – Section 16.14 Transportation Impact Analysis*, "the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing 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 worse in background conditions and the proposed project shows a negative impact on the intersection or approach"

Capacity analysis reports generated by Synchro Version 11 software are included in the **Appendix** along with queuing and blocking reports generated by the SimTraffic microsimulation model.

6.1 S POINT RD (NC 273) AND ARMSTRONG RD (NC 273)/FARM RD

Table 6.1 summarizes the LOS, control delay and 95th percentile queue lengths at the currently unsignalized, TWSC intersection of S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road.

Table 6.1 - S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road

Condition	Measure	EB		WB	NB		SB			Intersection
		EBL	EBLTR	WBLTR	NBL*	NBLTR	SBL*	SBT	SBR	LOS (Delay)
AM Peak Hour										
2021 Existing	LOS (Delay)	F ($458.2)		B (13.7)	A (8.1)	A (0.0)	A (7.7)	A (0.0)		-
	Synchro 95th Q	-	1275'	3'	5'	0'	0'	0'	-	
2026 Background	LOS (Delay)	F ($804.2)		B (14.0)	A (8.5)	A (0.0)	A (7.7)	A (0.0)		-
	Synchro 95th Q	-	2190'	3'	3'	0'	0'	0'	-	
*2026 Background Single-LN Rdbt**	*LOS (Delay)*	*C (19.9)*		*B (11.0)*	*C (22.5)*		*A (6.4)*			*C (16.7)*
	Sidra 95th Q	*-*	*365'*	*4'*	*-*	*95'*	*-*	*60'*	*-*	
2026 Build-out	LOS (Delay)	F ($1743.8)		C (20.1)	A (8.8)	A (0.0)	A (8.1)	A (0.0)		-
	Synchro 95th Q	-	2728'	5'	8'	0'	0'	0'		
2026 Build-out IMP Opt 2 - Signal	LOS (Delay)	F (223.8)		B (11.9)	F (165.6)		E (58.2)			F (166.6)
	Synchro 95th Q	-	#1369'	13'	-	#691'	-	#611'	-	
2026 Build-out IMP Opt 3 - Single-LN Rdbt	LOS (Delay)	D (28.4)		B (13.3)	F (97.9)		A (7.5)			E (39.3)
	Sidra 95th Q	-	1087'	4'	-	679'	-	76'	-	
2026 Build-out IMP Opt 4 - Multi-LN Rdbt	LOS (Delay)	B (12.9)		B (14.2)	F (50.7)		A (4.0)			C (19.5)
	Sidra 95th Q	66'	66'	3'	-	269'	-	11'	0'	
2031 Build-out +5	LOS (Delay)	C (15.9)		C (16.9)	F (116.2)		A (4.4)			E (35.6)
	Sidra 95th Q	84'	84'	4'	-	773'	-	13'	0'	
PM Peak Hour										
2021 Existing	LOS (Delay)	F (147.7)		B (14.8)	A (9.5)	A (0.0)	A (7.5)	A (0.0)		-
	Synchro 95th Q	-	490'	3'	3'	0'	0'	0'	-	
2026 Background	LOS (Delay)	F ($1060.0)		C (23.8)	B (12.1)	A (0.0)	A (7.5)	A (0.0)		-
	Synchro 95th Q	-	1785'	5'	5'	0'	0'	0'	-	
*2026 Background Single-LN Rdbt**	*LOS (Delay)*	*B (12.7)*		*A (7.0)*	*A (9.0)*		*E (39.0)*			*D (27.4)*
	Sidra 95th Q	*-*	*157'*	*2'*	*-*	*27'*	*-*	*2170'*	*-*	
2026 Build-out	LOS (Delay)	F ($2585.3)		E (46.5)	B (14.2)	A (0.0)	A (7.7)	A (0.0)		-
	Synchro 95th Q	-	2270'	10'	13'	0'	0'	0'	-	
2026 Build-out IMP Opt 2 - Signal	LOS (Delay)	F (332.3)		C (30.6)	C (27.1)		F (278.1)			F (264.7)
	Synchro 95th Q	-	#1420'	23'	-	294'	-	#2267'	-	
2026 Build-out IMP Opt 3 - Single-LN Rdbt	LOS (Delay)	C (23.0)		A (8.1)	B (13.4)		F (98.6)			F (64.2)
	Sidra 95th Q	-	545'	3'	-	74'	-	4433'	-	
2026 Build-out IMP Opt 4 - Multi-LN Rdbt	LOS (Delay)	B (10.3)		A (8.6)	C (15.2)		A (8.5)			A (9.6)
	Sidra 95th Q	53'	53'	2'	-	53'	-	31'	0'	
2031 Build-out +5	LOS (Delay)	B (12.7)		B (10.3)	C (20.5)		B (11.3)			B (12.4)
	Sidra 95th Q	88'	88'	2'	-	81'	-	38'	0'	

95th percentile volume exceeds capacity, queue may be longer
$ Delay exceeds 300s
m Volume for 95th percentile queue is metered by upstream signal
** Shown for info purposes only since TIP No. U-6150 is not funded for CNST (see text below)*

This intersection is currently unsignalized with TWSC on the eastbound and westbound approaches of Armstrong Road (NC 273) and Farm Road, and operates similar to a tee-intersection, since the westbound approach of Farm Road serves as a low-volume, residential driveway. As shown in **Figures 3.4** and **3.5**, the highest demand is seen on the southbound and eastbound approaches, which align with the Highway 273 designation that runs from north to south along S Point Road until it intersects Armstrong Road where it turns and runs from east to west towards S New Hope Road (NC 279) and South Carolina. **Table 6.1** highlights the issue in which

the heavy eastbound left-turn volume (primarily serving traffic from South Carolina, McLean, and other parts of Gaston County commuting to Charlotte and eastern Gaston County for work) is forced to stop, creating long delays and queues. As discussed in **Section 4.3**, this intersection is planned to be converted to a single-lane roundabout as part of NCDOT TIP Project No. U-6150 to better accommodate the unbalanced approaches. However, based on the current NCDOT STIP as of March 2022, although right-of-way and utilities are funded for FY 2028, there is no current funding for construction as it is shown beyond the 10-year funded STIP window. Based on City and NCDOT input at the TIA Scoping Meeting, since construction is currently unfunded, future intersection improvements associated with U-6150 were not assumed to be in place in the future year analyses.

A single-lane roundabout was instead evaluated under 2026 background conditions for informational purposes to identify the operational improvement of this TIP project without the proposed Lakeview Farms development in place. **Table 6.1** shows that the roundabout would provide significant improvement to the eastbound approach, with the intersection operating at LOS C and LOS D during the AM and PM peak hours, respectively. Note that since this STIP project is not fully funded, this improvement was not carried into the build-out scenario.

Table 6.1 shows the stop-controlled eastbound approach of Armstrong Road (NC 273) is expected to operate with long delays and queues during both peak hours under 2026 background conditions. The increase in delay on the eastbound approach between existing and background conditions is due to the reduction in the gaps available to be able to turn onto the S Point Road mainline, primarily caused by the non-specific background growth and nearby approved development traffic. When the proposed site traffic is added to the 2026 background volumes, available gaps for the eastbound approach traffic to be able to turn onto the mainline are further reduced, thus significantly increasing the approach delay and queues. With the proposed site located south of this intersection and located on a peninsula with no other route options, all site traffic is forced to travel through this intersection; as shown in **Figures 5.2** and **5.3**, the northbound approach volume is projected to increase by 80-90% with the addition of Lakeview Farms site traffic. Given the significant increase in delay, identification of potential mitigation improvements is required. Four (4) mitigation improvement options were considered and evaluated at this intersection to potentially mitigate the operational impact and accommodate the added site traffic, while minimizing disruption to the background traffic:

- Option 1 – Realignment
- Option 2 – Traffic signal
- Option 3 – Single-lane roundabout
- Option 4 – Multi-lane roundabout

Option 1 – Realignment

As mentioned above and shown in **Figures 3.4** and **3.5**, the eastbound left- and southbound right-turn movements facilitate the highest demand, which align with the Highway 273 designation that turns from east/west along Armstrong Road to north/south along S Point Road at this intersection. Therefore, a realignment of this intersection has been previously considered that would improve traffic flow by allowing the eastbound Armstrong Road to northbound S Point Road movement (and vice versa) to traverse this intersection as the free-flowing, major street through movements, with the minor streets tying in as stop-controlled. This realignment was submitted by the City of Belmont to GCLMPO and NCDOT in 2017 for proposed inclusion into the 2045 MTP. The alignment concept prepared at the time is shown in the image on the following page, showing two (2) alignment options depending on the design speed.

Based on input from NCDOT, there is a community well in place at the northwest corner of the intersection highlighted in the blue area in the image below right. This existing well limits opportunity for realignment and would create permitting constraints. Therefore, a single-lane roundabout was progressed to avoid impacts to the well and included in the MTP, which ultimately became TIP Project No. U-6150 previously discussed. Based on input from NCDOT at a TIA review meeting on January 12, 2022, the realignment should not be considered for mitigation given the impacts to the community well.

Option 2 – Traffic Signal

Currently operating as a stop-controlled intersection, a change in operational control (such as a traffic signal or roundabout) would be needed to significantly reduce the side-street approach delay at this intersection during the peak hours; therefore, installation of a traffic signal with the existing intersection configuration was evaluated. **Table 6.1** Option 2 reflects signalization of the intersection with the current laneage, resulting in LOS F during both peak hours. Given the high turn volumes, further analysis showed that multiple lanes would be needed to provide acceptable operations for the eastbound left, southbound right, and potentially the northbound approach, requiring multiple receiving lanes for a sufficient distance on both S Point Road (NC 273) and Armstrong Road (NC 273). Given these results, along with the planned roundabout configuration at this intersection, Options 3 and 4 were evaluated for potential mitigation.

Option 3 – Single-lane Roundabout

Option 3 evaluated installation of a single-lane roundabout as currently planned as part of NCDOT TIP Project No. U-6150 (although construction is not currently funded for this TIP project as previously discussed). **Table 6.1** shows that with the proposed site traffic added and a single-lane roundabout in place, the overall intersection is expected to operate at LOS E during the AM peak hour and LOS F during the PM peak hour, with extensive queueing for the eastbound and northbound approaches during the AM peak hour and the southbound approach (nearly one mile) during the PM peak hour.

Under a single-lane roundabout configuration, the northbound approach is required to yield to the eastbound left-turn traffic that would already be in the roundabout. Given the heavy eastbound left-turn volume during the AM peak hour, very limited gaps are available for the added Lakeview Farms residential traffic exiting the development during the AM peak hour. Conversely during the PM peak hour, the proposed site is projected to add significant southbound through volume, increasing

the heavy southbound approach that is over capacity for a single lane. Based on the results shown for Option 3, a single-lane roundabout is not recommended for mitigation.

Option 4 – Multi-lane Roundabout

Based on the operational/capacity issues described in Option 3, additional capacity is needed for the eastbound and southbound approaches. Therefore, Option 4 evaluated a multi-lane roundabout with a two (2)-lane eastbound approach (including an exclusive left-turn lane and a shared left-through-right lane, creating dual left-turn lanes) and a two (2)-lane southbound approach (including a right-turn slip lane). With this configuration in place, **Table 6.1** shows significant operational improvement is expected with the overall intersection and each approach operating at LOS C or better with the exception of the northbound approach during the AM peak hour in which the delay is just above (0.7 seconds) the LOS F demarcation at 50.0 seconds.

Based on review of the potential mitigation options described above, the following improvements are identified to mitigate the operational impact and accommodate the addition of proposed Lakeview Farms site traffic, while minimizing disruption to the background traffic:

- **Installation of a multi-lane roundabout with the following lanes:**
  - **Southbound right-turn slip lane along S Point Road (NC 273) with a minimum of 200 feet of storage**
  - **Eastbound approach along Armstrong Road (NC 273) with an exclusive left-turn lane and a shared left-through-right lane with a minimum of 200 feet of storage**
  - **Two (2) receiving lanes northbound along S Point Road (NC 273) with a minimum of 600 feet of storage**

Since this intersection has already been identified as needing improvements under existing conditions (single-lane roundabout as part of TIP Project No. U-6150), the applicant should partner with NCDOT, City of Belmont and potentially Gaston County towards implementation of the mitigation improvements.

Note that the multi-lane roundabout configuration identified above would look and operate similarly to the existing multi-lane roundabout to the west at S New Hope Road (NC 279) and Armstrong Road (NC 273) (with the exception of the fourth approach), which serves similar traffic movements and volumes as this intersection at S Point Road (NC 273).

6.2 S NEW HOPE RD (NC 279) AND ARMSTRONG RD (NC 273)

Table 6.2 summarizes the LOS, control delay and 95th percentile queue lengths at the roundabout intersection of S New Hope Road (NC 279) and Armstrong Road (NC 273).

Table 6.2 - S New Hope Road (NC 279) and Armstrong Road (NC 273)								
Condition	Measure	WB		NB		SB		Intersection
		WBL	WBLR	NBT	NBR	SBLT	SBT	LOS (Delay)
AM Peak Hour								
2021 Existing	LOS (Delay)	A (7.9)		A (5.0)		A (6.1)		A (6.0)
	Sidra 95th Q	29'	29'	37'	0'	31'	-	
2026 Background	LOS (Delay)	A (9.3)		A (6.7)		A (6.8)		A (7.4)
	Sidra 95th Q	37'	37'	52'	0'	29'	30'	
2026 Build-out	LOS (Delay)	A (9.7)		A (6.8)		A (6.9)		A (7.6)
	Sidra 95th Q	41'	41'	53'	0'	30'	31'	
2031 Build-out +5	LOS (Delay)	A (9.4)		A (8.7)		A (8.9)		A (8.9)
	Sidra 95th Q	24'	64'	105'	0'	45'	48'	
PM Peak Hour								
2021 Existing	LOS (Delay)	A (8.4)		A (3.9)		A (8.3)		A (6.8)
	Sidra 95th Q	37'	37'	23'	0'	40'	-	
2026 Background	LOS (Delay)	C (17.6)		A (6.1)		B (14.3)		B (12.6)
	Sidra 95th Q	155'	155'	58'	0'	63'	63'	
2026 Build-out	LOS (Delay)	C (18.1)		A (6.4)		B (14.9)		B (13.1)
	Sidra 95th Q	166'	166'	60'	0'	70'	71'	
2031 Build-out +5	LOS (Delay)	C (18.9)		A (8.7)		D (27.9)		C (17.3)
	Sidra 95th Q	151'	59'	153'	0'	168'	154'	
Background Storage			120'		200'		100'	

Table 6.2 shows the overall intersection currently operates at LOS A during both peak hours.

As discussed in **Section 4.2**, the following mitigation improvement is required to be installed at this intersection as part of the approved Worrells River development and was assumed to be in place under future-year conditions:

- Southbound through-lane along S New Hope Road (NC 279) with 100 feet of storage

With this improvement in place, the overall intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour under 2026 background conditions, and continue to operate with similar operations under 2026 build-out conditions with minimal increases in approach and overall intersection delays. **Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for the proposed Lakeview Farms development.**

As discussed in **Section 4.2**, the Riverside development and Phases 2 & 3 of the South Fork development were each included in the 2031 build-out +5 conditions only based on input from the City and NCDOT and documented in the approved MOU included in the **Appendix**. As required for mitigation of the approved Riverside development, the westbound approach of Armstrong Road (NC 273) will be reconfigured to include dual westbound left-turn lanes along with an exclusive right-turn lane. These improvements were assumed to be in place, along with the added site traffic, under 2031 build-out +5 conditions as reflected in **Table 6.2**.

6.3 S POINT ROAD (NC 273) AND BELMONT MIDDLE SCHOOL

Table 6.3 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized, tee-intersection of S Point Road (NC 273) and Belmont Middle School.

Table 6.3 - S Point Road (NC 273) and Belmont Middle School								
Condition	Measure	EB		NB		SB		Intersection
		EBL	EBR	NBL	NBT	SBT	SBR	LOS (Delay)
AM Peak Hour								
2021 Existing	LOS (Delay)	F (115.1)		E (70.4)		B (13.2)		E (56.0)
	Synchro 95th Q	#685'	54'	48'	#1579'	435'	83'	
2026 Background	LOS (Delay)	F (162.6)		F (190.4)		B (18.5)		F (127.2)
	Synchro 95th Q	#732'	52'	161'	#2667'	787'	126'	
2026 Build-out	LOS (Delay)	F (162.6)		F (245.0)		C (21.1)		F (158.8)
	Synchro 95th Q	#732'	52'	161'	#3013'	910'	126'	
2026 Build-out lMP 2 NBTs, 2 SBTs	LOS (Delay)	E (59.2)		C (31.3)		B (17.0)		C (29.7)
	Synchro 95th Q	#567'	44'	161'	986'	367'	126'	
2031 Build-out +5	LOS (Delay)	E (74.0)		D (46.0)		B (18.1)		D (39.4)
	Synchro 95th Q	#567'	44'	161'	#1432'	460'	126'	
PM Peak Hour								
2021 Existing	LOS (Delay)	D (47.0)		A (4.6)		B (16.5)		B (13.3)
	Synchro 95th Q	#107'	25'	3'	190'	#958'	14'	
2026 Background	LOS (Delay)	F (141.2)		A (7.9)		F (105.1)		E (68.8)
	Synchro 95th Q	#202'	40'	35'	441'	#2491'	12'	
2026 Build-out	LOS (Delay)	F (141.3)		B (10.9)		F (157.7)		F (100.9)
	Synchro 95th Q	#202'	40'	35'	641'	#2870'	12'	
2026 Build-out lMP 2 NBTs, 2 SBTs	LOS (Delay)	D (49.3)		A (4.7)		B (13.3)		B (11.0)
	Synchro 95th Q	117'	32'	31'	183'	642'	13'	
2031 Build-out +5	LOS (Delay)	E (64.0)		A (5.1)		B (16.5)		B (13.2)
	Synchro 95th Q	136'	37'	35'	245'	951'	12'	
Background Storage			175'	200'			200'	

95th percentile volume exceeds capacity, queue may be longer

Table 6.3 shows that the overall intersection is expected to operate at LOS F during the AM peak hour and LOS E during the PM peak hour under 2026 background conditions. When the proposed site traffic is added to the 2026 background volumes, the overall intersection is expected to significantly increase in delay during the AM peak hour and drop from LOS E to LOS F during the PM peak hour. Given the increased delay and LOS degradation, identification of potential mitigation improvements is required.

Table 6.3 shows that the northbound approach is expected to operate with an average delay of over four (4) minutes per vehicle for nearly 2,000 vehicles during the AM peak hour, with a 95th percentile queue length expected to extend over 3,000 feet. Similarly, the southbound approach is expected to operate with an average delay of over two and one-half (2.5) minutes per vehicle for nearly 2,000 vehicles during the PM peak hour, with a 95th percentile queue length expected to extend nearly 3,000 feet. In addition, the eastbound approach for the Belmont Middle School driveway is expected to operate with similar delays during both peak hours. The capacity deficiencies are further evidenced based on review of the volume to capacity (v/c) ratios, in which the northbound through movement is shown to project a 1.50 v/c along with a 1.23 v/c for the eastbound left-turn movement during the AM peak hour, and a 1.31 v/c for the southbound through movement during the PM peak hour. A v/c ratio of greater than 1.0 is considered over capacity. The volume, LOS/delay, and v/c ratios for these approaches support the need for additional through

lanes along S Point Road (NC 273) to significantly improve operations at this intersection and along this corridor. Three (3) potential mitigation options were each initially evaluated in isolation:

1. Dual eastbound left-turn lanes exiting Belmont Middle School
2. Dual northbound through lanes along S Point Road (NC 273)
3. Dual southbound through lanes along S Point Road (NC 273)

Table 6.3A below summarizes the overall intersection LOS and delay (in seconds per average vehicle) for each of these three (3) potential mitigation options in isolation under 2026 build-out conditions.

Table 6.3A – Individual Mitigation Options

	AM Peak Hour	PM Peak Hour
1. Dual EBLs	F (114.1)	F (98.9)
2. Dual NBTs	C (34.7)	F (97.9)
3. Dual SBTs	F (155.6)	B (12.6)

As shown in **Table 6.3A**, widening only the northbound approach does not mitigate the impacts caused by the site traffic during the PM peak hour, while widening only the southbound approach does not mitigate impacts of the site traffic during the AM peak hour. Therefore, both mainline approaches along S Point Road (NC 273) are in need of additional capacity in order to mitigate the site traffic impacts.

The following improvements are identified to mitigate the operational impact and accommodate the addition of proposed Lakeview Farms site traffic, while minimizing disruption to the background traffic:

- **Additional northbound through lane along S Point Road (NC 273) that provides a minimum of 500 feet of storage and extends to R L Stowe Road**
- **Additional southbound through lane along S Point Road (NC 273) that extends a minimum of 500 feet south of this intersection, serving as a drop lane extending from R L Stowe Road**

Table 6.3 shows that with these improvements in place, the operational impacts caused by the proposed site at this intersection are mitigated during both peak hours and capacity along S Point Road (NC 273) is significantly improved. The overall intersection is expected to operate at LOS C during the AM peak hour and LOS B during the PM peak hour. This mitigation improvement addresses the mainline capacity issues discussed above, improving the v/c ratio for the northbound through movement during the AM peak hour from 1.50 to 0.92 and the southbound through movement during the PM peak hour from 1.31 to 0.82.

Additionally, with consideration for the identified improvements described in **Sections 6.4** and **6.5** along S Point Road (NC 273), the benefit from the increase in throughput capacity would only be fully realized if the additional through lanes along S Point Road (NC 273) were extended to a logical terminus where a significant amount of traffic is dispersed. Northbound traffic volumes do not significantly disperse away from S Point Road (NC 273) until the R L Stowe Road intersection. Furthermore, two (2) southbound receiving lanes are required to accommodate the improvements at R L Stowe, in which the two (2) southbound lanes should extend through the Belmont Middle School signal to provide the necessary capacity to accommodate and mitigate the added site traffic at this intersection.

Based on further evaluation of the SimTraffic model, the four (4)-lane section (two northbound through and two southbound through lanes) is recommended to extend a minimum of 500 feet south of the Belmont Middle School signalized intersection. This determination was based on an iterative process of reviewing the operations of several storage lengths at 100-foot increments in order to determine the effects on lane utilization through SimTraffic simulation runs during both peak hours. This process showed that increasing the storage beyond 500' resulted in similar and consistent operations, and vehicles were shown to enter the added lane at a steady rate to be effectively used as additional capacity through the intersection.

6.4 S POINT RD (NC 273) AND SOUTH POINT HS /RED RAIDER RUN

Table 6.4 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S Point Road (NC 273) and South Point High School/Red Raider Run. Red Raider Run serves as a signalized driveway to the approved (and still developing) Belmont Town Center. Note that the eastbound approach serves as an entrance only for South Point High School; therefore, there is no exiting volume, and thus no operations reported for the eastbound approach.

Table 6.4 - S Point Road (NC 273) and South Point High School/Red Raider Run

Condition	Measure	WB		NB		SB		Intersection
		WBLT	WBR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour								
2021 Existing	LOS (Delay)	E (70.4)		E (74.0)		C (29.0)		E (55.7)
	Synchro 95th Q	66'	82'	38'	#2032'	m2'	m443'	
2026 Background	LOS (Delay)	E (70.6)		F (183.3)		E (58.1)		F (131.1)
	Synchro 95th Q	139'	133'	#308'	#2786'	m66'	m445'	
2026 Build-out	LOS (Delay)	E (70.6)		F (233.9)		E (60.3)		F (162.8)
	Synchro 95th Q	139'	133'	#308'	#3133'	m63'	m450'	
2026 Build-out IMP 2 NBTs, 2 SBTs	LOS (Delay)	E (68.7)		C (22.2)		B (11.9)		C (20.6)
	Synchro 95th Q	139'	129'	223'	837'	m100'	m317'	
2031 Build-out +5	LOS (Delay)	E (68.5)		D (49.3)		B (12.8)		D (36.8)
	Synchro 95th Q	151'	148'	252'	#1361'	m105'	m353'	
PM Peak Hour								
2021 Existing	LOS (Delay)	E (56.2)		B (18.1)		C (20.4)		C (23.8)
	Synchro 95th Q	105'	110'	6'	681'	m7'	m491'	
2026 Background	LOS (Delay)	E (69.7)		F (82.1)		F (94.2)		F (86.2)
	Synchro 95th Q	#396'	192'	43'	#1348'	m75'	m406'	
2026 Build-out	LOS (Delay)	E (70.1)		F (116.7)		F (156.7)		F (130.6)
	Synchro 95th Q	#401'	192'	43'	#1532'	m66'	m415'	
2026 Build-out IMP 2 NBTs, 2 SBTs	LOS (Delay)	D (51.8)		C (22.7)		B (15.1)		C (22.7)
	Synchro 95th Q	308'	158'	43'	525'	m109'	m369'	
2031 Build-out +5	LOS (Delay)	D (52.3)		C (31.2)		B (19.3)		C (27.9)
	Synchro 95th Q	#365'	188'	45'	#717'	m132'	m#409'	
Background Storage			100'	175'		100'		

95th percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signal

Table 6.4 shows that the overall intersection is expected to operate at LOS F during both peak hours under 2026 background conditions. When the proposed site traffic is added to the 2026 background volumes, the overall intersection is expected to significantly increase in delay while already operating at LOS F during both peak hours. Given the increased delay while already operating at LOS F, identification of potential mitigation improvements is required.

Table 6.4 shows that the northbound approach is expected to operate with an average delay of nearly four (4) minutes per vehicle for over 2,000 vehicles during the AM peak hour, with a 95th percentile queue length expected to extend over 3,000 feet. Similarly, the southbound approach is expected to operate with an average delay of over two and one-half (2.5) minutes per vehicle for over 1,600 vehicles during the PM peak hour. The capacity deficiencies are further evidenced based on review of the volume to capacity (v/c) ratios, in which the northbound through movement is shown to project a 1.48 v/c during the AM peak hour and a 1.32 v/c for the southbound through movement during the PM peak hour. A v/c ratio of greater than 1.0 is considered over capacity. The volume, LOS/delay, and v/c ratios for these approaches support the need for additional through lanes along S Point Road (NC 273) to significantly improve operations at this intersection and along this corridor. As discussed in **Section 6.4**, widening only the northbound approach does not mitigate the impacts caused by the site traffic during the PM peak hour, while widening only the southbound approach does not mitigate impacts of the site traffic during the AM peak hour. **The following improvements are identified to mitigate the operational impact and accommodate the addition of proposed Lakeview Farms site traffic, while minimizing disruption to the background traffic:**

- **Additional northbound through lane along S Point Road (NC 273)**
- **Additional southbound through lane along S Point Road (NC 273)**

Table 6.4 shows that with these improvements in place, the operational impacts caused by the proposed site at this intersection are mitigated during both peak hours and capacity along S Point Road (NC 273) is significantly improved. The overall intersection is expected to operate at LOS C during both peak hours.

Additionally, with consideration for the identified improvements described in **Sections 6.3** and **6.5** along S Point Road (NC 273), the benefit from the increase in throughput capacity would only be fully realized if the additional through lanes along S Point Road (NC 273) were extended to a logical terminus where a significant amount of traffic is dispersed. Therefore, the two (2) northbound and two (2) southbound through lanes along S Point Road (NC 273) are recommended to extend through the South Point High School/Red Raider Run intersection.

6.5 S POINT ROAD (NC 273) AND R L STOWE RD/NIXON RD

Table 6.5 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of S Point Road (NC 273) and R L Stowe Road/Nixon Road.

Table 6.5 - S Point Road (NC 273) and R L Stowe Road/Nixon Road

Condition	Measure	EB			WB		NB			SB			Intersection
		EBL	EBT	EBTR	WBL	WBTR	NBL	NBT	NBR	SBL	SBT	SBR	LOS (Delay)
AM Peak Hour													
2021 Existing	LOS (Delay)	F (118.5)			F (116.1)		D (50.1)			F (99.3)			F (84.1)
	Synchro 95th Q	325'	#626'	-	#692'	153'	m56'	m502'	m267'	36'	#815'	51'	
2026 Background	LOS (Delay)	F (123.8)			F (135.6)		E (75.5)			F (130.2)			F (104.9)
	Synchro 95th Q	#408'	#755'	-	#758'	229'	m83'	m551'	m220'	#110'	#1200'	66'	
2026 Build-out	LOS (Delay)	F (123.8)			F (160.9)		F (104.5)			F (146.1)			F (124.9)
	Synchro 95th Q	#408'	#755'	-	#825'	229'	m76'	m556'	m221'	#110'	#1265'	66'	
2026 Build-out IMP Dual WBLs, 2 SBTs	LOS (Delay)	F (106.4)			F (89.3)		E (56.7)			D (44.2)			E (67.1)
	Synchro 95th Q	381'	#731'	-	#361'	252'	m129'	#1413'	#328'	#110	495'	-	
2031 Build-out +5	LOS (Delay)	F (80.9)			F (106.8)		F (87.2)			D (52.7)			F (81.4)
	Synchro 95th Q	#569'	#596'	105'	#414'	#303'	m179'	m#1669	m#1263	#122'	604'	-	
PM Peak Hour													
2021 Existing	LOS (Delay)	E (65.5)			F (96.8)		B (14.7)			E (61.7)			E (55.2)
	Synchro 95th Q	64'	197'	-	#698'	129'	m33'	276'	161'	53'	#768'	40'	
2026 Background	LOS (Delay)	E (68.0)			F (214.4)		C (30.1)			F (194.7)			F (127.1)
	Synchro 95th Q	80'	#281'	-	#941'	173'	m#104'	m321'	m171'	#123'	#1241'	43'	
2026 Build-out	LOS (Delay)	E (68.0)			F (291.7)		C (31.4)			F (252.1)			F (164.9)
	Synchro 95th Q	80'	#281'	-	#1100'	173'	m#88'	m319'	m176'	#155'	#1400'	43'	
2026 Build-out IMP Dual WBLs, 2 SBTs	LOS (Delay)	E (68.0)			E (59.3)		C (23.8)			D (44.9)			D (42.1)
	Synchro 95th Q	80'	#281'	-	#413'	177'	m#161'	#348'	253'	#138'	#550	-	
2031 Build-out +5	LOS (Delay)	D (46.6)			E (75.6)		D (47.7)			F (113.1)			E (74.1)
	Synchro 95th Q	109'	195'	83'	#487'	210'	m#249'	m#928'	m307'	#174'	#738'	-	
Background Storage		200'			225'		280'		225'	25'		100'	

95th percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signal

The operations and LOS for this intersection play a vital role in the overall mobility along the peninsula because of its location. This intersection is located where a major portion of northbound traffic disperses away from S Point Road (NC 273), either east towards Charlotte (turn onto R L Stowe Road) or north/west towards downtown Belmont or Gastonia (continue north along S Point Road). It is also the intersection where two (2) heavy traffic streams combine onto S Point Road (NC 273) heading southbound. This combination creates a capacity issue in which these two (2) heavy movements (the southbound through and westbound left) conflict with one another. The heavy southbound volume demands green time from the signal, which reduces the amount available for the westbound approach, and vice versa. As traffic increases from the proposed Lakeview Farms development, nearby approved developments and other non-specific growth throughout the area (including South Carolina traffic), the congestion at this intersection will continue to worsen under its current configuration.

Table 6.5 shows that the overall intersection is expected to operate at LOS F during both peak hours under 2026 background conditions. When the proposed site traffic is added to the 2026 background volumes, the overall intersection is expected to significantly increase in delay while already operating at LOS F during both peak hours, with significant increases in delay projected for the westbound, northbound and southbound approaches. As shown in **Figures 5.2** and **5.3**, the proposed site is expected to add a significant amount of traffic to the four (4) highest-volume movements at this intersection (westbound left, southbound through, northbound through and northbound right). Given the increased delay while already operating at LOS F, identification of potential mitigation improvements is required.

The following improvements are identified to mitigate the operational impact and accommodate the addition of proposed Lakeview Farms site traffic, while minimizing disruption to the background traffic:

- **Additional westbound left-turn lane along R L Stowe Road (creating dual left-turn lanes) and provide a minimum of 275 feet of storage for the westbound shared through/right-turn lane along with proper signing/striping (see discussion below)**
- **Restripe the existing southbound right-turn lane along S Point Road (NC 273) to provide a shared through/right lane and extends through the Belmont Middle School signalized intersection**
- **Extension of the existing northbound right-turn lane along S Point Road (NC 273) to the Belmont Middle School signalized intersection to serve as the additional northbound through lane along S Point Road (NC 273) and drop as the right-turn lane at R L Stowe Road**

Given the westbound approach volumes where the left-turn movement is significantly higher than the through/right combination, along with the existing concrete median in place for the left-over at Belmont Town Center that restricts extension of the inside left-turn lane, consideration should be given to allowing the additional left-turn lane to become the drop lane from R L Stowe Road. This would require the westbound through/right lane drivers to shift over a lane as they approach S Point Road (NC 273), which would not be normal driver expectation for a through movement. Therefore, if allowed by the City and NCDOT, proper signing and striping is recommended to alleviate the potential driver expectation concern.

Figure 5.2 shows the northbound right-turn movement is projected to serve 875 vehicles during the AM peak hour under 2026 build-out conditions. The northbound right-turn lane currently includes only 100 feet of storage. Extending this turn lane to serve as a second through lane through this portion of the study area is expected to significantly benefit this approach and specifically this movement.

Table 6.5 shows that with these improvements in place, the operational impacts to both the overall intersection and each approach caused by the proposed site at this intersection are mitigated during both peak hours. The overall intersection is expected to operate at LOS E during the AM peak hour and LOS D during the PM peak hour.

Given the added traffic to the southbound approach, additional southbound through capacity along S Point Road (NC 273) is identified to mitigate the added delay by restriping the existing right-turn lane to a shared through/right lane. This second southbound lane will require a second southbound receiving lane (which will also serve as the second receiving lane required for the dual westbound left-turn lanes) and extend through the Belmont Middle School signalized intersection as discussed in **Section 6.3**. Based on observation of the SimTraffic model, 200 feet of storage for the second southbound through lane prior to the R L Stowe/Nixon Road signal would provide appropriate distance to most effectively utilize the two (2) through lanes at the intersection. This determination was based on an iterative process of reviewing the operations of several storage lengths at 100-foot increments in order to determine the effects on lane utilization through SimTraffic simulation runs during both peak hours. This process showed that increasing the storage beyond 200' resulted in similar and consistent operations, and vehicles were shown to enter the added lane at a steady rate to be effectively used as additional capacity through the intersection. However, the existing

southbound right-turn lane provides approximately 150 feet of full width storage. **The appropriate storage for southbound through/right lane should be coordinated with City and NCDOT staff to determine if the existing turn lane should also be extended in addition to being restriped.**

Also note that based on review of the simulation, queueing issues were still seen on the southbound approach due to the existing 35' left-turn lane, which is operating under permitted phasing and opposing a heavy northbound through volume. An alternative analysis was performed to evaluate this movement under protected phasing. The delay for the overall intersection and remaining approaches is shown to greatly increase since another phase is added to the signal, thus taking away green time from other approaches. Therefore, protected phasing is not recommended. An extension of the southbound left-turn lane would be expected to address this background issue; however, this is not recommended as mitigation for the proposed site since the mitigation identified above is shown to fully mitigate the traffic impact caused by the proposed site. Additionally, the second through lane would allow an opportunity for southbound through traffic to bypass the left-turn traffic if spillback occurs.

As discussed in **Section 4.2**, the Riverside development and Phases 2 & 3 of the South Fork development were each included in the 2031 build-out +5 conditions only based on input from the City and NCDOT and documented in the approved MOU included in the **Appendix**. As required for mitigation for Phase 3 of the approved South Fork development, an eastbound right-turn lane along Nixon Road will be constructed. This improvement was assumed to be in place, along with the added site traffic, under 2031 build-out +5 conditions as reflected in **Table 6.5**.

6.6 S POINT ROAD AND ACCESS 1

Table 6.6 summarizes the LOS, control delay and 95th percentile queue lengths at the proposed full-movement, stop-controlled intersection of S Point Road and Access 1, located approximately 375 feet south of Reese Wilson Road.

Table 6.6 - S Point Road and Access 1

Condition	Measure	EB	NB		SB
		EBLR	NBL*	NBT	SBTR
AM Peak Hour					
2026 Build-out	LOS (Delay)	B (13.9)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	20'	0'	0'	0'
2031 Build-out +5	LOS (Delay)	C (15.1)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	23'	0'	0'	0'
PM Peak Hour					
2026 Build-out	LOS (Delay)	B (14.2)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	13'	0'	0'	0'
2031 Build-out +5	LOS (Delay)	C (15.5)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	15'	0'	0'	0'

* Conflicting left-turn movements are broken out NCDOT Congestion Management guidelines

Based on the site plan provided by the applicant, Access 1 is planned to serve as a full-movement connection to S Point Road located approximately 375 feet south of Reese Wilson Road. The eastbound egress was assumed to operate unsignalized with single-lane approaches.

Table 6.6 shows that the stop-controlled eastbound approach of Access 1 is expected to operate with short delays during both peak hours. **Therefore, no additional improvements beyond**

construction of Access 1 with a single egress and single ingress lane with a minimum internal protected stem (IPS) of 100 feet are recommended at this intersection for capacity purposes.

Note that the recommended IPS length is based on review of the SimTraffic maximum queue lengths and NCDOT minimums requirements. The IPS is defined as the length required to be protected along the driveway stem from S Point Road before any crossing or left-turn conflicts are allowed.

Review of auxiliary turn-lane warrants at this intersection is included in **Section 7.0**.

6.7 S POINT ROAD AND ACCESS 2

Table 6.7 summarizes the LOS, control delay and 95th percentile queue lengths at the proposed full-movement, stop-controlled intersection of S Point Road and Access 2, located approximately 750 feet south of proposed Access 1.

Table 6.7 - S Point Road and Access 2

Condition	Measure	EB	NB		SB
		EBLR	NBL*	NBT	SBTR
AM Peak Hour					
2026 Build-out	LOS (Delay)	B (11.9)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	15'	0'	0'	0'
2031 Build-out +5	LOS (Delay)	B (12.8)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	18'	0'	0'	0'
PM Peak Hour					
2026 Build-out	LOS (Delay)	B (11.9)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	10'	0'	0'	0'
2031 Build-out +5	LOS (Delay)	B (12.8)	A (0.0)	A (0.0)	A (0.0)
	Synchro 95th Q	13'	0'	0'	0'

* Conflicting left-turn movements are broken out NCDOT Congestion Management guidelines

Based on the site plan provided by the applicant, Access 2 is planned to serve as a full-movement connection to S Point Road located approximately 750 feet south of Access 1. The eastbound egress was assumed to operate unsignalized with single-lane approaches.

Table 6.7 shows that the stop-controlled eastbound approach of Access 2 is expected to operate with short delays during both peak hours. **Therefore, no additional improvements beyond construction of Access 2 with a single egress and single ingress lane with a minimum IPS of 100 feet are recommended at this intersection for capacity purposes.**

Note that the recommended IPS length is based on review of the SimTraffic maximum queue lengths and NCDOT minimums requirements. The IPS is defined as the length required to be protected along the driveway stem from S Point Road before any crossing or left-turn conflicts are allowed.

Review of auxiliary turn-lane warrants at this intersection is included in **Section 7.0**.

7.0 Auxiliary Turn-Lane Warrants

Warrants for additional turn-lane improvements for unsignalized driveways 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*. The results of the warrants for left and right-turn lanes under 2026 build-out conditions are summarized by intersection below and included in the **Appendix**.

2026 Build-out Conditions

6. S Point Road and Access 1

- Southbound right-turn lane along S Point Road with a minimum storage length of 75'

As shown in **Figure 5.3**, the proposed Lakeview Farms development is projected to more than double the PM peak southbound approach traffic along S Point Road at this intersection, with over 100 vehicles turning right into the site. A southbound right-turn lane would provide safe storage for Lakeview Farms residents and allow advancing through traffic to safely bypass the site traffic. Additionally, based on the site plan shown in **Figure 3.2**, it appears Access 1 (the northern access) is planned as the primary driveway for the site based on the driveway width and landscaping shown; therefore, more than 50% of the site traffic (as assumed for TIA purposes) could likely enter the site at Access 1, increasing the turn lane warrant to 100 feet. Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, full storage for both right- and left-turn lanes should accommodate a minimum of 100 feet; therefore, **a southbound right-turn lane along S Point Road with a minimum storage length of 100 feet is recommended**.

7. S Point Road and Access 2

- Southbound right-turn lane along S Point Road with a minimum storage length of 75'

Similar to the discussion above, as shown in **Figure 5.3**, there are over 100 vehicles projected to turn right into the proposed Lakeview Farms development during the PM peak hour. However, the projected southbound through traffic is much less than at Access 1 since a portion of the traffic turned into the site upstream. Additionally, based on the site plan shown in **Figure 3.2**, it appears Access 2 (the southern access) is planned as the secondary driveway for the site. Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, full storage for both right- and left-turn lanes should accommodate a minimum of 100 feet. Based on previous coordination with NCDOT staff, since the southbound right turn-lane warrant does not meet the 100-foot minimum and is not needed for capacity purposes, **a southbound right turn-lane is not recommended** as mitigation for the proposed Lakeview Farms residential development.

8.0 Crash Data Analysis

Crash data was obtained at the study intersections for crashes that occurred between July 1, 2018, and June 30, 2021. Over this three-year period, 39 total crashes were 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. Note that the intersection for the Belmont Middle School and S Point Road (NC 273) was not yet constructed and operational at the time of data collection.

Table 8.1 – Crash Severity Summary

Crash Type	Number of Crashes
Fatal Crashes	0
Class A	0
Class B	2
Class C	0
Property Damage Only	37
Total	***39***

Table 8.1 above shows the total number of crashes by severity type from most to least severe. As shown, 95% of the crashes over the past three (3) years at the study intersections had no injury reported. 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.

Note that the crash resulting in two (2) Class B injuries was the result of a crash at the roundabout of S New Hope Road (NC 279) and Armstrong Road (NC 273) in which a driver under the influence struck the roundabout island at 70 miles per hour.

Table 8.2 – Crash Frequency Summary

Location	Crashes/100 MEV
1. S Point Rd (NC 273) & Armstrong Rd (NC 273)	29.44
2. S New Hope Rd (NC 279) & Armstrong Rd (NC 273)	117.43
4. S Point Rd (NC 273) & S Point HS /Red Raider Run	31.28
5. S Point Rd (NC 273) & R L Stowe Rd/Nixon Rd	64.37
Average	***58.34***

Table 8.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 58.34 crashes per 100 million entering vehicles (MEV), with the highest rates occurring at the roundabout of S New Hope Road (NC 279) with Armstrong Road (NC 273) and the signalized intersection of S Point Road (NC 273) with R L Stowe Road/Nixon Road. 30 of the 39 crashes reported over this three-year period occurred at these intersections.

Table 8.3 – Crash Type Summary

Crash Type	1. S Point Rd (NC 273) & Armstrong Rd (NC 273)	2. S New Hope Rd (NC 279) & Armstrong Rd (NC 273)	4. S Point Rd (NC 273) & S Point HS /Red Raider Run	5. S Point Rd (NC 273) & R L Stowe Rd/Nixon Rd
Angle	0	8	0	6
Animal	0	1	0	0
Fixed Object	0	1	0	0
Head On	0	0	1	0
Left-Turn, Different	2	0	1	1
Other Non-Collision	0	0	0	1
Ran off Road - Right	0	1	0	0
Rear End, Slow or Stop	1	1	2	9
Right-Turn, Different	0	1	0	0
Sideswipe, Same Direction	0	0	2	0
Total	*3*	*13*	*6*	*17*

The most common crash types within the study area were angle and rear-end collisions, making up 36% and 33% of total crashes, respectively. As shown in **Table 8.3**, angle collisions were most prevalent at the roundabout of S New Hope Road (NC 279) with Armstrong Road (NC 273), whereas rear-end collisions were most prevalent at the signalized intersection of S Point Road (NC 273) with R L Stowe Road/Nixon Road.

Angle crashes are among the most common crashes reported at roundabouts, given that drivers in the roundabout have the right-of-way over those entering the roundabout, these collisions typically occur at the conflict point of vehicles entering the roundabout with those already in the roundabout. Note that this roundabout was constructed and opened in 2017, just prior to the study data collection period (2018 – 2021). While angle crashes are more common at the roundabout intersection within the study area than all other study area intersections, these crashes typically involve vehicles travelling at low circulating speeds within the roundabout, helping reduce the likelihood of fatal and injury crashes, an intended safety benefit of roundabouts. This has been proven at this roundabout intersection whereas none of the eight (8) angle crashes have resulted in injuries.

Rear-end collisions are often associated with higher levels of congestion and lack of available turn-lane storage at signalized intersections. As discussed in **Section 6.5**, the intersection of S Point Road (NC 273)/R L Stowe Road/Nixon Road is currently over capacity and mitigation improvements have been identified at this intersection, which are expected to address safety issues at this intersection by increasing capacity and improving mobility. Additionally, as discussed in **Section 4.3**, this intersection is including in the S Point Road (NC 273) corridor that has been recommended to be widened in multiple planning documents through the City of Belmont, GCLMPO and NCDOT.

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

9.0 Mitigation Improvements

Based on the capacity 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 adjacent street network:

1. S Point Road (NC 273) and Armstrong Road (NC 273)/Farm Road

- Installation of a multi-lane roundabout with the following lanes:
  - Southbound right-turn slip lane along S Point Road (NC 273) with a minimum of 200 feet of storage
  - Eastbound approach along Armstrong Road (NC 273) with an exclusive left-turn lane and a shared left/through/right lane with a minimum of 200 feet of storage
  - Two (2) receiving lanes northbound along S Point Road (NC 273) with a minimum of 600 feet of storage

Since this intersection has already been identified as needing improvements under existing conditions (single-lane roundabout as part of TIP Project No. U-6150), the applicant should partner with NCDOT, City of Belmont and potentially Gaston County towards implementation of mitigation improvements to this intersection.

3. S Point Road (NC 273) and Belmont Middle School

- Additional northbound through lane along S Point Road (NC 273) that provides a minimum of 500 feet of storage and extends to R L Stowe Road
- Additional southbound through lane along S Point Road (NC 273) that extends a minimum of 500 feet south of this intersection, serving as a drop lane extending from R L Stowe Road

4. S Point Road (NC 273) and South Point HS/Red Raider Run

- Additional northbound through lane along S Point Road (NC 273)
- Additional southbound through lane along S Point Road (NC 273)

5. S Point Road (NC 273) and R L Stowe Road/Nixon Road

- Additional westbound left-turn lane along R L Stowe Road (creating dual left-turn lanes) and provide a minimum of 275 feet of storage for the westbound shared through/right-turn lane along with proper signing/striping (*see below)
- Restripe the existing southbound right-turn lane along S Point Road (NC 273) to provide a shared through/right lane and extends through the Belmont Middle School signalized intersection
  - The appropriate storage for southbound through/right lane should be coordinated with City and NCDOT staff to determine if the existing turn lane should also be extended (from 150 feet to 200 feet) in addition to being restriped.
- Extension of the existing northbound right-turn lane along S Point Road (NC 273) to the Belmont Middle School signalized intersection to serve as the additional northbound through lane along S Point Road (NC 273) and drop as the right-turn lane at R L Stowe Road

*Given the westbound approach volumes where the left-turn movement is significantly higher than the through/right combination, along with the existing concrete median in place for the left-over at Belmont Town Center that restricts extension of the inside left-turn lane, consideration

should be given to allowing the additional left-turn lane to become the drop lane from R L Stowe Road. This would require the westbound through/right lane drivers to shift over a lane as they approach S Point Road (NC 273), which would not be normal driver expectation for a through movement. Therefore, if allowed by the City and NCDOT, proper signing and striping is recommended to alleviate the potential driver expectation concern

6. S Point Road and Access 1

- Single eastbound egress lane and single ingress lane along Access 1
- Provide a 100-foot internal protected stem (IPS) along Access 1
- Southbound right-turn lane along S Point Road with 100 feet of storage

7. S Point Road and Access 2

- Single eastbound egress lane and single ingress lane along Access 2
- Provide a 100-foot IPS along Access 2

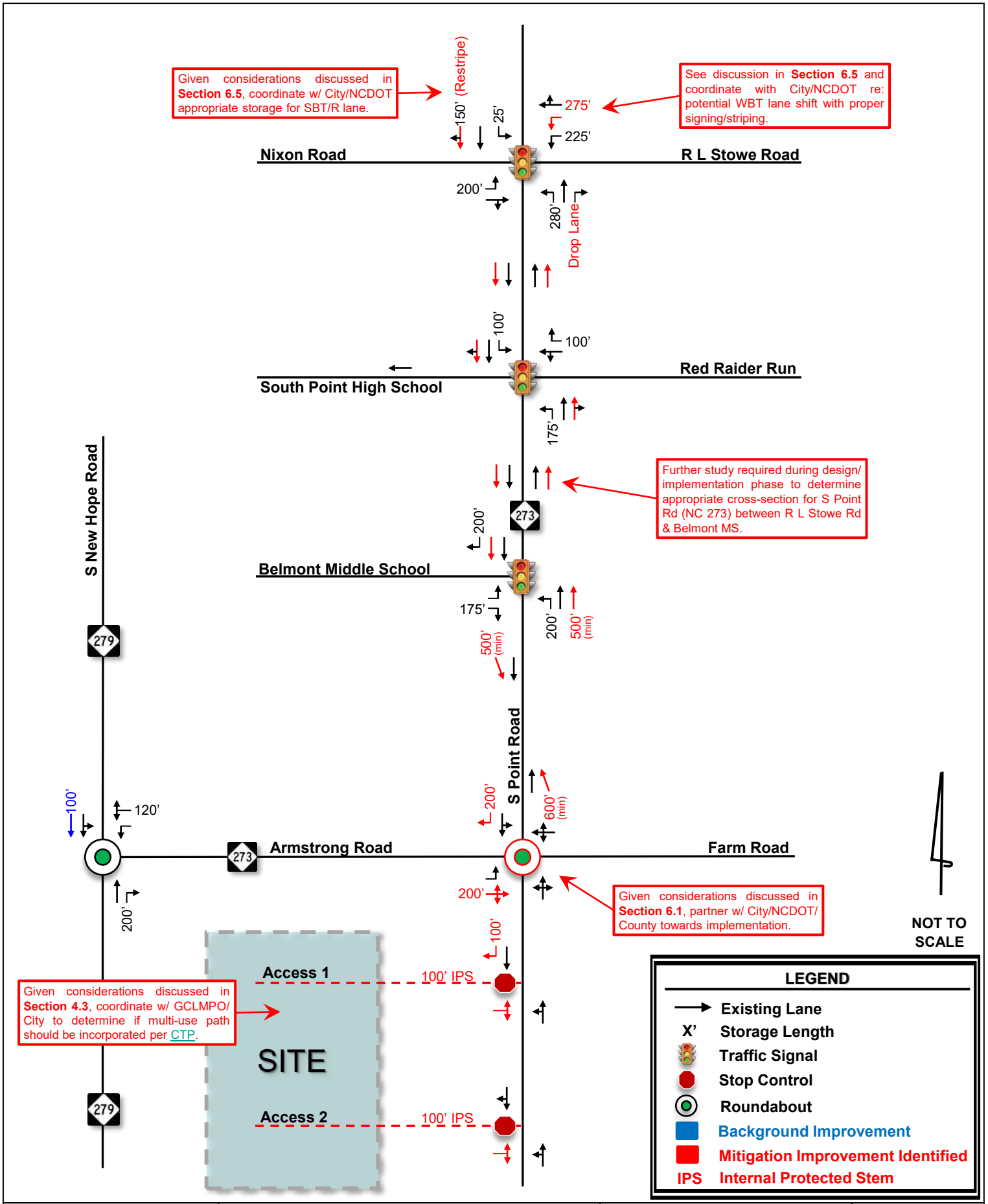
Multi-Use Path

- The applicant should coordinate with GCLMPO and the City of Belmont to determine if the multi-use path recommended in GCLMPO's CTP through the northeastern portion of the proposed site should be incorporated, along with the specific alignment and cross-section if required.

Overall Corridor

Given the northbound and southbound through-lane capacity improvements identified to mitigate the impacts of the site along S Point Road (NC 273) between Belmont Middle School and R L Stowe Road, a four (4)-lane section is identified for mitigation. Further study will be required during the design and implementation phase to determine the preferred cross-section for this ~½-mile corridor.

The mitigation improvements identified within the study area are shown in **Figure 9.1**. The improvements shown on this figure are subject to approval by NCDOT and the City of Belmont. All additions and attachments to the State and City roadway system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.



BELMONT NORTH CAROLINA

Kimley»Horn

Lakeview Farms Transportation Impact Analysis

Identified Mitigation Improvements

Figure 9.1

APPENDIX