WAYFORTH AT BELMONT

DRAFT Traffic Impact Analysis

Belmont, North Carolina

Prepared for:

City of Belmont

February 2019

Kimley»Horn

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Wayforth at Belmont
Belmont, North Carolina

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Prepared by:

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1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) is to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed Wayforth at Belmont 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 traffic impacts of the proposed development.
- To identify improvements to mitigate the proposed development's traffic impacts.

The proposed Wayforth at Belmont multifamily residential development is located on the vacant land that currently sits behind the existing commercial, medical office and single-family homes in the southeast quadrant of the Wilkinson Boulevard (US 29/74) and Park Street (NC 273) intersection in Belmont, North Carolina. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include up to 325 multifamily units. The 37-acre site is currently located outside City limits within the City's Extra Territorial Jurisdiction (ETJ); however, in addition to the proposed rezoning, the site is also proposed to be annexed into the City of Belmont.

The proposed development exceeded the City of Belmont's TIA threshold as established by the *City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis*, resulting in the requirement of this study. The overall site density did not meet North Carolina Department of Transportation's (NCDOT's) TIA threshold; however, it should be noted that coordination also occurred with NCDOT staff in review of the assumptions and methodology documented in this TIA.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2020. Based on the provided site plan, the proposed development will be accessed via the following access points:

- Access 1 – Connection to McLean Street, which provides full-movement access onto Park Street (NC 273) approximately 550 feet south of Wilkinson Boulevard (US 29/74)
- Access 2 - A right-in/right-out (RIRO) driveway connection to Wilkinson Boulevard (US 29/74) approximately 400 feet east of Browntown Road

A TIA Scoping Meeting was held with the City of Belmont, NCDOT and representatives of the applicant in Belmont on December 18, 2018, 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. Note that NCDOT Transportation Improvement Program (TIP) project U-5959, which is funded to improve the intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273), was discussed for inclusion in the analysis of this TIA. However, based on input from NCDOT, the specific improvements and intersection configuration have not yet been determined; therefore, improvements associated with U-5959 were not included in the analysis of this TIA. The approved MOU is included in the **Appendix**.

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

- 2019 Existing Conditions

- 2020 Background Conditions
- 2020 Build-out Conditions
- 2025 Build-out Conditions + 5 years

Based on 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. Wilkinson Boulevard (US 29/74) and Park Street (NC 273)
2. Park Street (NC 273) and Hawley Avenue
3. Wilkinson Boulevard (US 29/74) and Browntown Road
4. Wilkinson Boulevard (US 29/74) and Fuller Street/Wallace Avenue
5. Park Street (NC 273) and McLean Street/Access 1
6. Wilkinson Boulevard (US 29/74) and Access 2 (build-out only)

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.
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain a total lost time of 5 seconds for each movement.

Kimley-Horn was retained to determine the potential transportation impacts of this development (in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and set forth by the *City of Belmont Land Development Code – Section 16.14 Traffic 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 traffic 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:

Wilkinson Boulevard (US 29/74) and Browntown Road

- Westbound right-turn lane along Wilkinson Boulevard (US 29/74) with 150 feet of storage

The operational benefit of this mitigation improvement should be considered with the impacts to existing overhead utilities along with the likelihood of promoting additional traffic along Browntown Road with the City of Belmont and NCDOT to determine if this mitigation will be required.

Park Street (NC 273) and McLean Street/Access 1

- Single westbound egress and single ingress lane along Access 1
- Sight distance on the westbound approach of McLean Street/Access 1 should be reviewed by a professional engineer to ensure appropriate sight distance criteria is met (relative to the existing retaining wall in the southeast quadrant).
- Applicant should coordinate with City of Belmont staff to determine the appropriate cross-section required for McLean Street/Access 1.

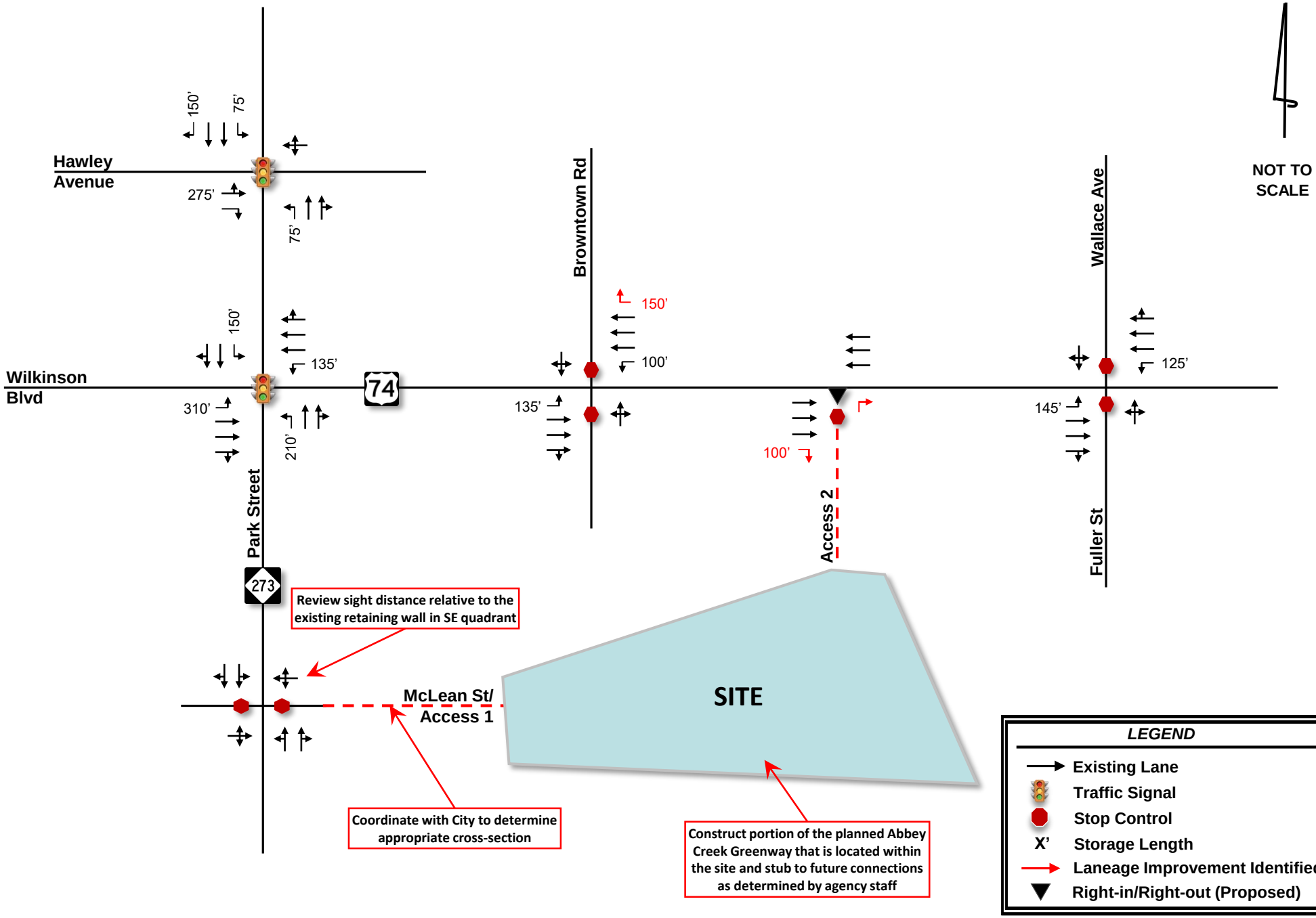
Wilkinson Boulevard (US 29/74) and Access 2 (RIRO)

- Eastbound right-turn lane along Wilkinson Boulevard (US 29/74) with 100 feet of storage
- Single northbound egress and single ingress lane along Access 2

Abbey Creek Greenway

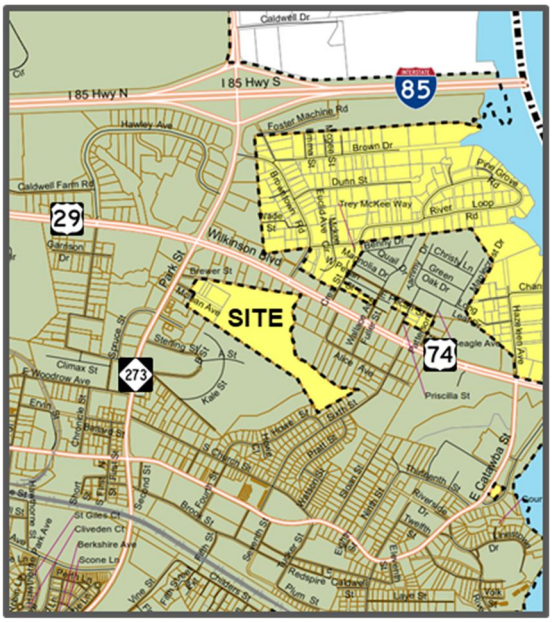
- Portion of the planned Abbey Creek Greenway that is located within the proposed site should be incorporated into the site plan and should stub to future connections as determined by GCLMPO and City of Belmont staff; Applicant should coordinate with these agencies early in the site planning phase to determine the appropriate alignment and cross-section of this greenway.

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.



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	Identified Mitigation Improvements	Figure 1.1

2.0 Introduction



The proposed Wayforth at Belmont multifamily residential development is located on the vacant land that currently sits behind the existing commercial, medical office and single-family homes in the southeast quadrant of the Wilkinson Boulevard (US 29/74) and Park Street (NC 273) intersection in Belmont, North Carolina. Based on the site plan provided by the applicant, the proposed development is currently envisioned to include up to 325 multifamily units. The 37-acre site is currently located outside City limits within the City's ETJ; however, in addition to the proposed rezoning, the site is also proposed to be annexed into the City of Belmont.

The proposed development exceeded the City of Belmont's TIA threshold as established by the *City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis*, resulting in the requirement of this study. The overall site density did not meet NCDOT's TIA threshold; however, it should be noted that coordination also occurred with NCDOT staff in review of the assumptions and methodology documented in this TIA.

For the purposes of this TIA, the development is assumed to be completed (built-out) in 2020. Based on the provided site plan, the proposed development will be accessed via the following access points:

- Access 1 – Connection to McLean Street, which provides full-movement access onto Park Street (NC 273) approximately 550 feet south of Wilkinson Boulevard (US 29/74)
- Access 2 - A RIRO driveway connection to Wilkinson Boulevard (US 29/74) approximately 400 feet east of Browntown Road

A TIA Scoping Meeting was held with the City of Belmont, NCDOT and representatives of the applicant in Belmont on December 18, 2018, 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. Note that NCDOT TIP project U-5959, which is funded to improve the intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273), was discussed for inclusion in the analysis of this TIA. However, based on input from NCDOT, the specific improvements and intersection configuration have not yet been determined; therefore, improvements associated with U-5959 were not included in the analysis of this TIA. 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 Traffic 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 traffic 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. Wilkinson Boulevard (US 29/74) and Park Street (NC 273)
2. Park Street (NC 273) and Hawley Avenue
3. Wilkinson Boulevard (US 29/74) and Browntown Road
4. Wilkinson Boulevard (US 29/74) and Fuller Street/Wallace Avenue
5. Park Street (NC 273) and McLean Street

The study area was based on the *City of Belmont Land Development Code – Section 16.14 Traffic 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." Based on the 1-mile radius, up to thirteen potential study intersections were discussed. 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, 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 Wilkinson Boulevard (US 29/74) and Park Street (NC 273). The information below describes existing conditions for portions of these roadways within the vicinity of the site.

Wilkinson Boulevard (US 29/74) is a six-lane, divided highway with a posted speed limit of 50 mph within the study area. This US highway is classified as a principal arterial by NCDOT's functional classification system and as a boulevard by Gaston-Cleveland-Lincoln Metropolitan Planning Organization (GCLMPO). Based on 2017 NCDOT annual average daily traffic (AADT) maps, Wilkinson Boulevard (US 29/74) carries an AADT volume of 21,000 vehicles per day (vpd) west of Park Street (NC 273) and 20,000 vpd east of Park Street (NC 273).

Part Street (NC 273) is a four-lane, undivided roadway south of Wilkinson Boulevard (US 29/74) and a five-lane, undivided roadway with a two-way left-turn median north of Wilkinson Boulevard (US 29/74). Park Street (NC 273) has a posted speed limit of 35 mph in the vicinity of the site. Park

Street (NC 273) is classified by NCDOT's functional classification system as a minor arterial and as a boulevard by GCLMPO. Based on 2017 NCDOT AADT maps, Park Street (NC 273) carries an AADT volume of 21,000 vpd just south of Wilkinson Boulevard (US 29/74) and 30,000 vpd just north of Wilkinson Boulevard (US 29/74).

3.2 EXISTING INTERSECTION VOLUME DEVELOPMENT

AM (6:30-8:30) and PM (4:30-7:00) intersection turning-movement, heavy-vehicle, pedestrian and bicycle counts were performed by National Data & Surveying Services on Thursday, January 24, 2019, at the following intersections:

1. Wilkinson Boulevard (US 29/74) and Park Street (NC 273)
2. Park Street (NC 273) and Hawley Avenue
3. Wilkinson Boulevard (US 29/74) and Browntown Road
4. Wilkinson Boulevard (US 29/74) and Fuller Street/Wallace Avenue
5. Park Street (NC 273) and McLean Street

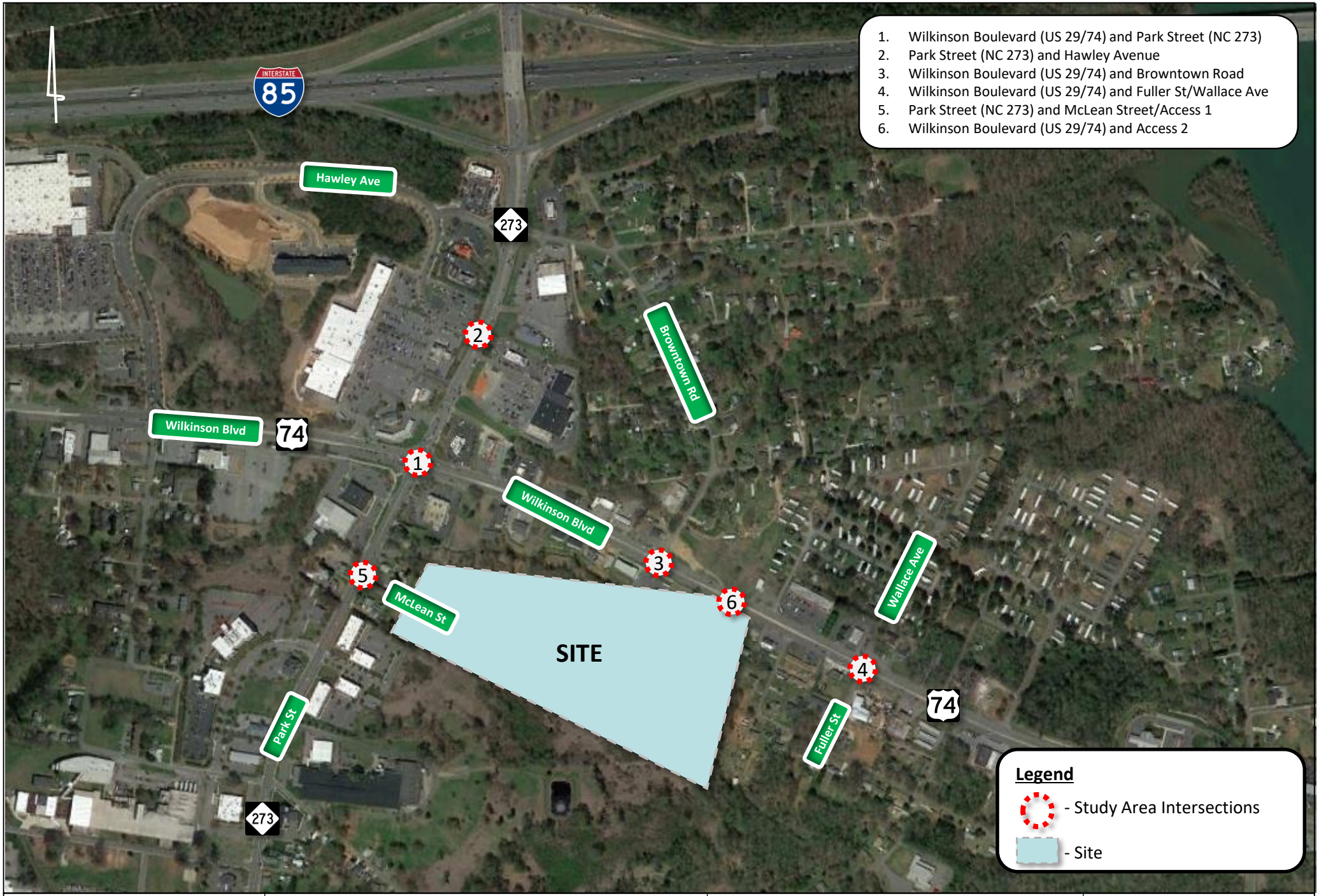
The PM peak hour was consistently found to be 4:45-5:45PM at all five study intersections; however, the specific AM peak hour differed amongst some of the study intersections. The specific peak hour of each individual intersection was used as the baseline data to represent the highest collected traffic volumes within the specified count timeframes. The peak hours for each of the intersections are shown in **Table 3.1.**

Table 3.1 – AM & PM Intersection Peak Hours

Intersection	AM Peak Hour	PM Peak Hour
1. Wilkinson Blvd (US 29/74) and Park St (NC 273)	7:15 AM - 8:15 AM	4:45 PM - 5:45 PM
2. Park St (NC 273) and Hawley Ave	7:00 AM - 8:00 AM	4:45 PM - 5:45 PM
3. Wilkinson Blvd (US 29/74) and Browntown Rd	7:30 AM - 8:30 AM	4:45 PM - 5:45 PM
4. Wilkinson Blvd (US 29/74) and Fuller St/Wallace Ave	7:30 AM - 8:30 AM	4:45 PM - 5:45 PM
5. Park St (NC 273) and McLean St	7:15 AM - 8:15 AM	4:45 PM - 5:45 PM

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

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



Kimley»Horn	**Wayforth at Belmont Traffic Impact Analysis**	**Study Area/Site Location**	**Figure 3.1**

Site Data:

Tax Parcels:	3595415718, 3595417905, 3595425063, 3595425025, 3595424049, 3595514461, 3595519301, 3595519578, 3595518618, 3595610719, & 3595518866
Total Acreage:	+/- 37.11 Acres (Per GIS)
Location:	
Existing:	Gaston County, NC City of Belmont, NC
Proposed:	City of Belmont, NC
Zoning:	
Existing:	H-C, G-R, & BC-D
Proposed:	TBD
Total Potential Apartment Units:	+/- 270 Units
Setbacks:	
Front (Maximum):	0-25'
Side:	0'
Corner:	4'
Rear:	15'
Total Potential Density:	+/- 7.28 DU/AC
Open Space:	
Required:	+/- 6.81 AC *
Proposed:	+/- 6.81 AC

*Note:Required open space based on "Open Space Dedication Matrix" in Chapter 7 of the City of Belmont Land Development Code. Estimated number of bedrooms (540) x 550 = 297,000 SF or 6.81 AC. Open space requirement subject to change should the bedroom count change.

Watershed: Protected Area - WSIV

General Notes
1. Base information provided by Gaston County GIS Data and should be verified for accuracy.
2. All site plan, zoning, and wetland information utilized in the preparation of this plan is considered to be preliminary in nature and subject to change and final verification.
3. Draft - Do not rely on this document.

Floodplain Information
Floodplain information obtained from FEMA FIRM Panels 3710359500M effective date of study 9/2/2015.

Stream/Wetland Information
Stream/Wetland information is based on preliminary information provided to ESP by Gaston County GIS data. For purposes of preparation of this Preliminary Sketch Plan Submittal, any potential wetland areas and stream features depicted on the plan are considered to be preliminary in nature and approximate in location. The Preliminary Sketch Plan Submittal will need to be revised once all agencies approved on-site wetland/stream and appropriate jurisdictional boundaries are surveyed and verified with acceptable levels of accuracy- unit loss may occur.

Access Points/Driveways/Streets
1. Proposed project site entrance locations are considered preliminary in nature and need to be verified for adequate sight distance.
2. All roadway and street systems are considered to be preliminary and will need to be verified for sufficiency to satisfy or exceed minimum requirements established in the City of Belmont Land Development Code and applicable standards identified by NCDOT. Street connections are conceptual and may be subject to change based on agency input and review.

Open Space/Tree Save
Open Space and Tree Save areas are conceptual and preliminary. The exact location of these areas may change as the client finalizes decisions regarding final layout, product allocation, and as other spatially dependent project components such as stormwater areas, wetland areas, utility features, and buffers, (as applicable) for this project are better defined.

Potential Stormwater Quality Areas
Location of proposed stormwater areas are conceptual and preliminary and still need to be determined. The exact size and location of these areas will change as the client finalizes decisions regarding final layout, product allocation, and as other proposed changes to the project are better defined. Layout and unit count subject to change based on final design of stormwater areas.

Public Information
ESP Associates is not responsible for plan deficiencies created by incorrect, incomplete, missing or outdated information derived from public sources such as GIS, Planning and Zoning departments.

ESP Associates, Inc.
P.O. Box 7030
Charlotte, NC 28241
803.802.2440
www.espassociates.com

NORTH

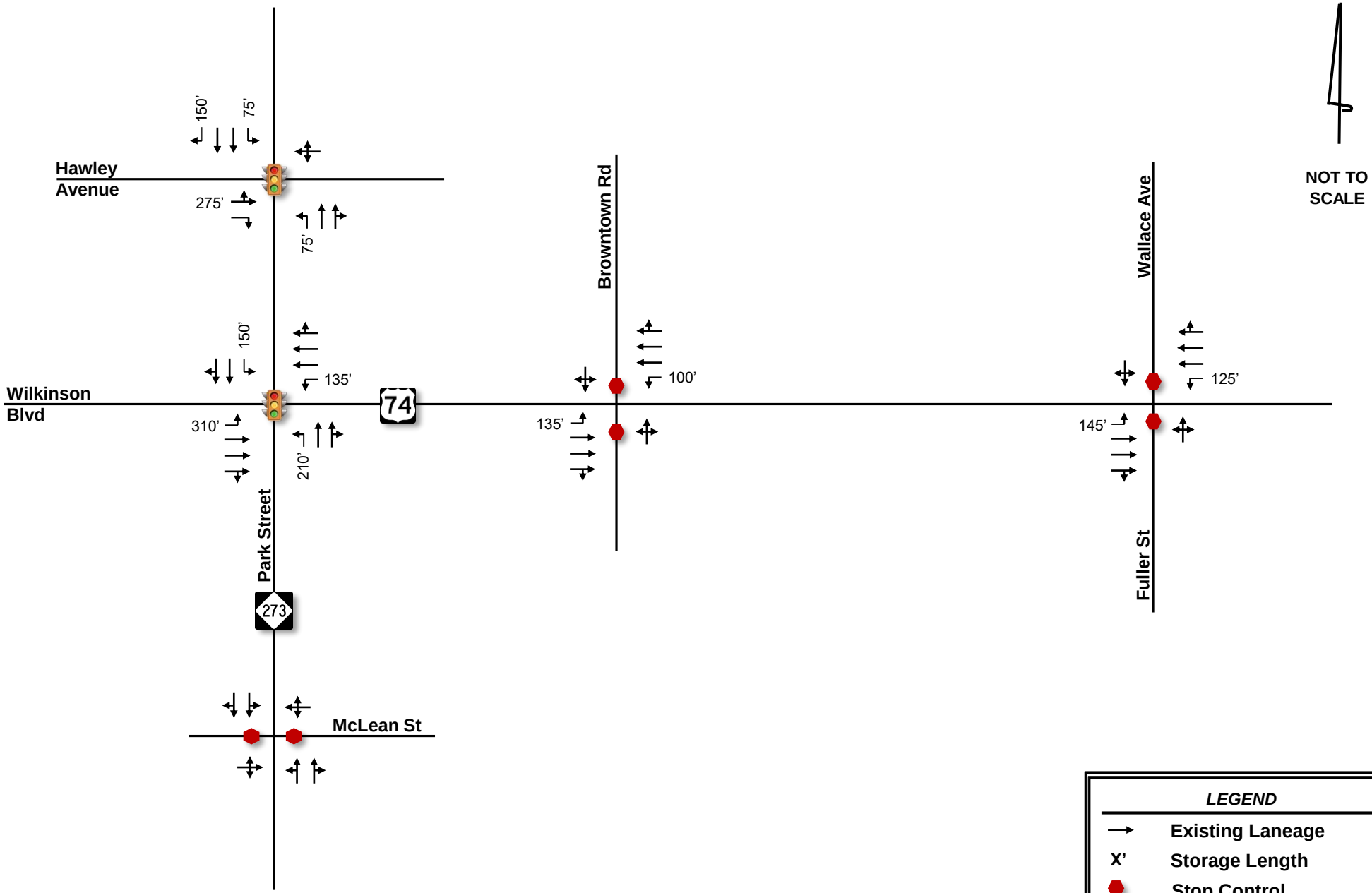
Wilkinson Blvd. Site
Preliminary Sketch Plan

ESP Job #GW28 December 4, 2018

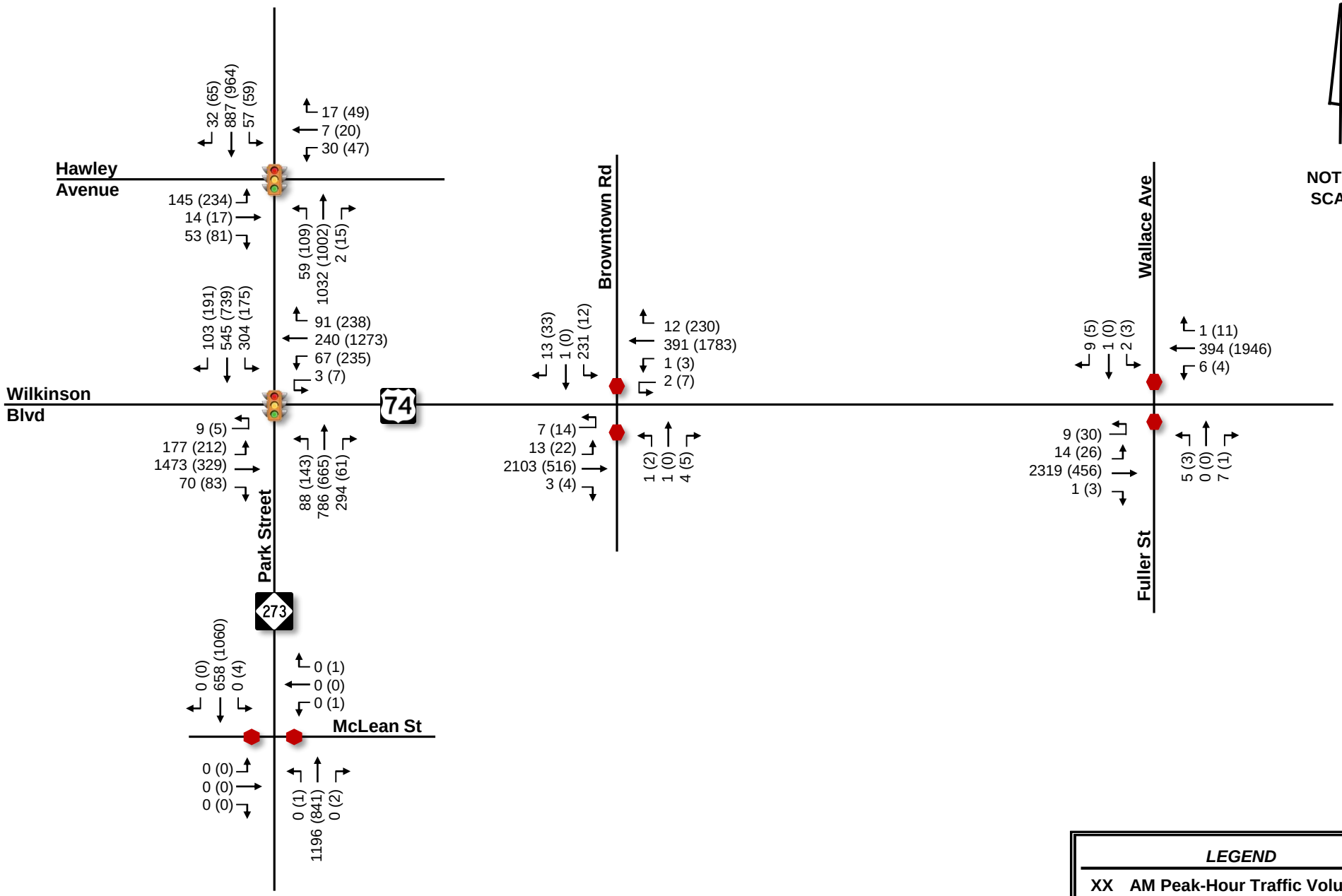
GRAPHIC SCALE
200 0 100 200 400
1 INCH = 200 FT.

by FIORENZA COMMUNITIES
301 Fieldbrook Place
Charlotte, NC 28209

Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	Proposed Site Plan	Figure 3.2



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	Existing Roadway Laneage	Figure 3.3



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	2019 Existing Traffic Volumes	Figure 3.4

4.0 Background Traffic Volume Development

Projected background (non-project) traffic is defined as the expected growth or change in traffic volumes on the surrounding roadway network between the year the existing counts were collected (2019) and the expected build-out year (2020) 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 two percent (2%) was applied to the 2019 existing peak-hour traffic volumes to calculate base 2020 and 2025 background traffic volumes. This growth rate was determined based on review of historical NCDOT AADT maps, specifically along Wilkinson Boulevard (US 29/74) and Park Street (NC 273) between 2008 and 2016, in coordination with NCDOT and City of Belmont staff.

Note that this non-specific growth rate was not applied to McLean Street, the Wendy's driveway, NAPA driveway or the residential driveway opposite McLean Street, as each of these serve specific traffic generators.

4.2 APPROVED DEVELOPMENTS

Based on input from the City of Belmont and NCDOT staff, no approved developments that are expected to significantly impact traffic volumes within the study area were included in the background traffic volumes for this TIA. **Figure 4.1** shows the projected 2020 background AM and PM peak-hour traffic volumes.

4.3 PLANNED TRANSPORTATION PROJECTS

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

1. US 74/NC 273 Intersection Improvements (U-5959) - Funded
2. US 74 Adaptive Signal System (U-6038) - Funded
3. Abbey Creek Greenway (through Proposed Site)
4. Proposed Multi-Use Path or Greenway along south side of Wilkinson Blvd (US 29/74)
5. Proposed On-Street Bike Lanes/Cycle Track along Park Street (NC 273)

NCDOT TIP project U-5959 is currently being designed to improve the intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273). Based on the current NCDOT State Transportation Improvement Program (STIP) as of February 2019, U-5959 is scheduled for construction in FY 2021 through State Highway Trust funds. Given the proximity of this intersection to the proposed access points for the Wayforth at Belmont development, there were discussions at the TIA Scoping Meeting as to how this future project may impact the analysis in this TIA and

potentially the operational control of the access points for the proposed development. Following the TIA Scoping Meeting, NCDOT indicated that the preferred intersection configuration and specific improvements have not yet been determined; therefore, improvements associated with U-5959 were not included in the analysis of this TIA.

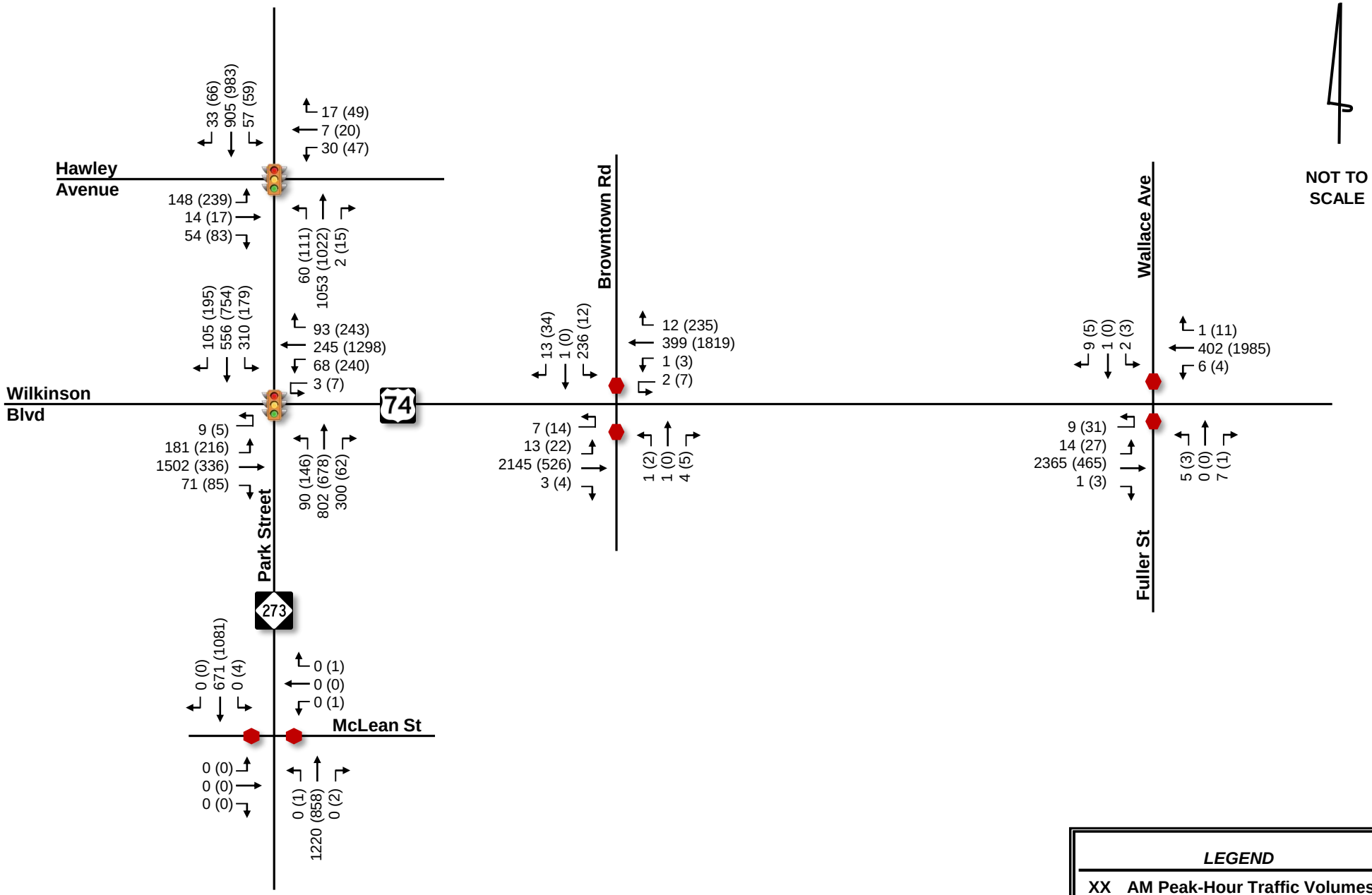
NCDOT TIP project U-6038 is currently funded to improve mobility along Wilkinson Boulevard (US 29/74) by implementing a coordinated signal system between Catawba Street (NC 7) and Wesleyan Drive that will dynamically adjust signal timing based on traffic demand. Based on the current NCDOT STIP as of February 2019, U-6038 is scheduled for construction in FY 2019 through State Highway Trust funds. This project was first identified through the Build A Better Boulevard initiative.

The Abbey Creek Greenway has been identified as a proposed greenway with an alignment shown to traverse the proposed site based on Belmont's *Comprehensive Land Use Plan* (adopted in 2018), Bicycle Master Plan and Pedestrian Master Plan, as well as GCLMPO's Comprehensive Transportation Plan (CTP). An image from the Future Transportation Map within Belmont's *Comprehensive Land Use Plan* (CLUP) is shown to the right. The green-dotted line shown to cross through the proposed site represents the proposed Abbey Creek Greenway. According to the CLUP, this greenway is designated as part of the Carolina Thread Trail System and runs along Abbey Creek within the City's sewer easement in East Belmont. Given this alignment shown in the adopted planning documents, the portion of the greenway that is located within the proposed site should be incorporated into the proposed site plan and should stub to future connections as determined by GCLMPO and City of Belmont staff. It is important that the applicant coordinates with these agencies early in the site planning phase to determine the appropriate alignment and cross-section of this greenway.

Below is additional information found in the adopted transportation planning documents relative to each of the five identified projects:

- **US 74/NC 273 Intersection Improvements (U-5959)**
  - Improve intersection of Wilkinson Blvd (US 29/74) and Park St (NC 273)
  - Construction Winter 2021
  - **Per NCDOT, intersection improvements have not yet been identified; therefore, future U-5959 improvements at this intersection will not be included in the scope of this TIA.**
- **US 74 Adaptive Signal System (U-6038)**
  - Coordinated signal system between Catawba St (NC 7) and Wesleyan Dr
  - Construction Summer 2019

- **Abbey Creek Greenway (through Proposed Site)**
  - Proposed greenway between Park St and Loftin Riverfront Park along Catawba St
  - Designated as part of Carolina Thread Trail System
  - Funding projected for 2019/2020 Fiscal Year (per Belmont's 2018 CLUP)
  - **Alignment shown through proposed site; Applicant to coordinate w/ GCLMPO and City to determine appropriate alignment and cross-section.**
  - Included in the following transportation planning documents:
    - Belmont's *Comprehensive Land Use Plan* (2018)
    - Belmont Bicycle Master Plan (2012)
    - Belmont Pedestrian Master Plan (2009)
    - GCLMPO CTP
- **Proposed Multi-Use Path or Greenway along south side of Wilkinson Blvd (US 29/74)**
  - Recommended multi-use path or greenway along south side of Wilkinson Blvd (US 29/74) between Catawba River and South Fork River
  - Included in the following transportation planning documents:
    - Belmont's *Comprehensive Land Use Plan* (2018)
    - Belmont Bicycle Master Plan (2012)
    - Belmont Pedestrian Master Plan (2009)
    - GCLMPO CTP
- **Proposed On-Street Bike Lanes/Cycle Track along Park Street (NC 273)**
  - Recommended bike lanes along Park St (NC 273) between I-85 and Central Avenue
  - Included in the following transportation planning documents:
    - Belmont's *Comprehensive Land Use Plan* (2018) – On-street bike lanes
    - Belmont Bicycle Master Plan (2012) – Cycle track
    - GCLMPO CTP (Bicycle Plan)



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	2020 Background Traffic Volumes	Figure 4.1

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 site plan provided by the applicant, the proposed development will be accessed via the following access points:

- Access 1 – Connection to McLean Street, which provides full-movement access onto Park Street (NC 273) approximately 550 feet south of Wilkinson Boulevard (US 29/74)
- Access 2 - A RIRO driveway connection to Wilkinson Boulevard (US 29/74) approximately 400 feet east of Browntown Road

5.2 TRAFFIC GENERATION

The traffic generation potential of the proposed development was determined using the trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, Tenth Edition, 2017) for all land uses.

Based on the most recent site plan provided by the applicant, the proposed development is envisioned to include up to 325 multifamily units.

Table 5.1 summarizes the projected trip generation for the proposed development. During a typical weekday, the proposed development has the potential to generate 109 and 137 net new external trips during the AM and PM peak hours, respectively.

Table 5.1 - Trip Generation

Land Use	Intensity	Daily	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
Multifamily Housing Mid-Rise - (Apartments)	325 DU	1,770	109	28	81	137	84	53
Net New External Trips		**1,770**	**109**	**28**	**81**	**137**	**84**	**53**

5.3 SITE TRAFFIC DISTRIBUTION 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 use and population densities in the area. The following site traffic distribution was reviewed and approved as part of the MOU by the City of Belmont, NCDOT and the applicant:

- 45% to/from the north along Park Street (NC 273)
- 30% to/from the east along Wilkinson Boulevard (US 29/74)
- 10% to/from the south along Park Street (NC 273)
- 15% to/from the west along Wilkinson Boulevard (US 29/74)

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

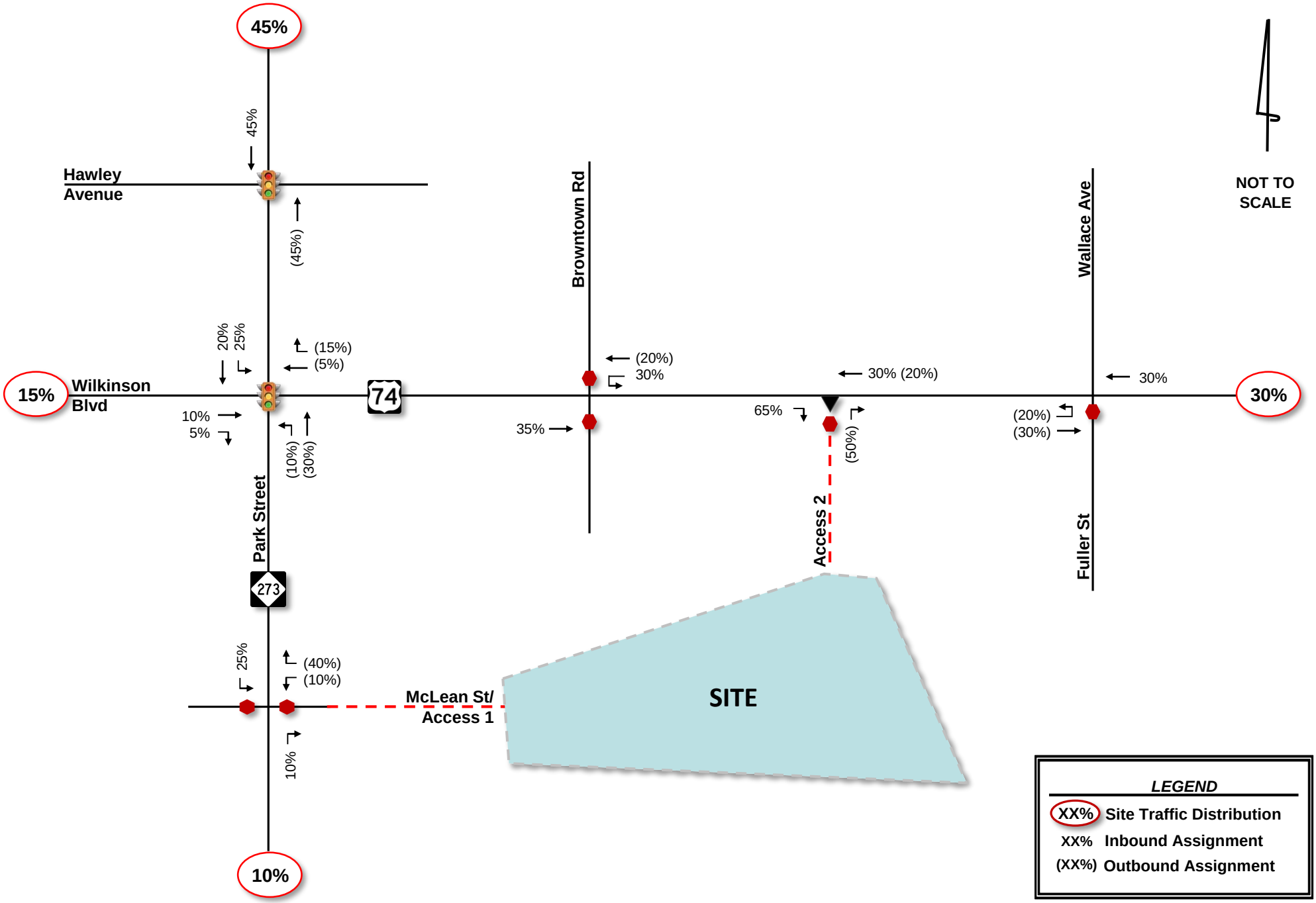
5.4 2020 BUILD-OUT TRAFFIC VOLUMES

The 2020 build-out traffic volumes include the assignment of the projected site traffic generation added to the 2020 background traffic volumes. **Figures 5.2** and **5.3** show the projected 2020 build-out traffic volumes for the AM and PM peak hours, respectively.

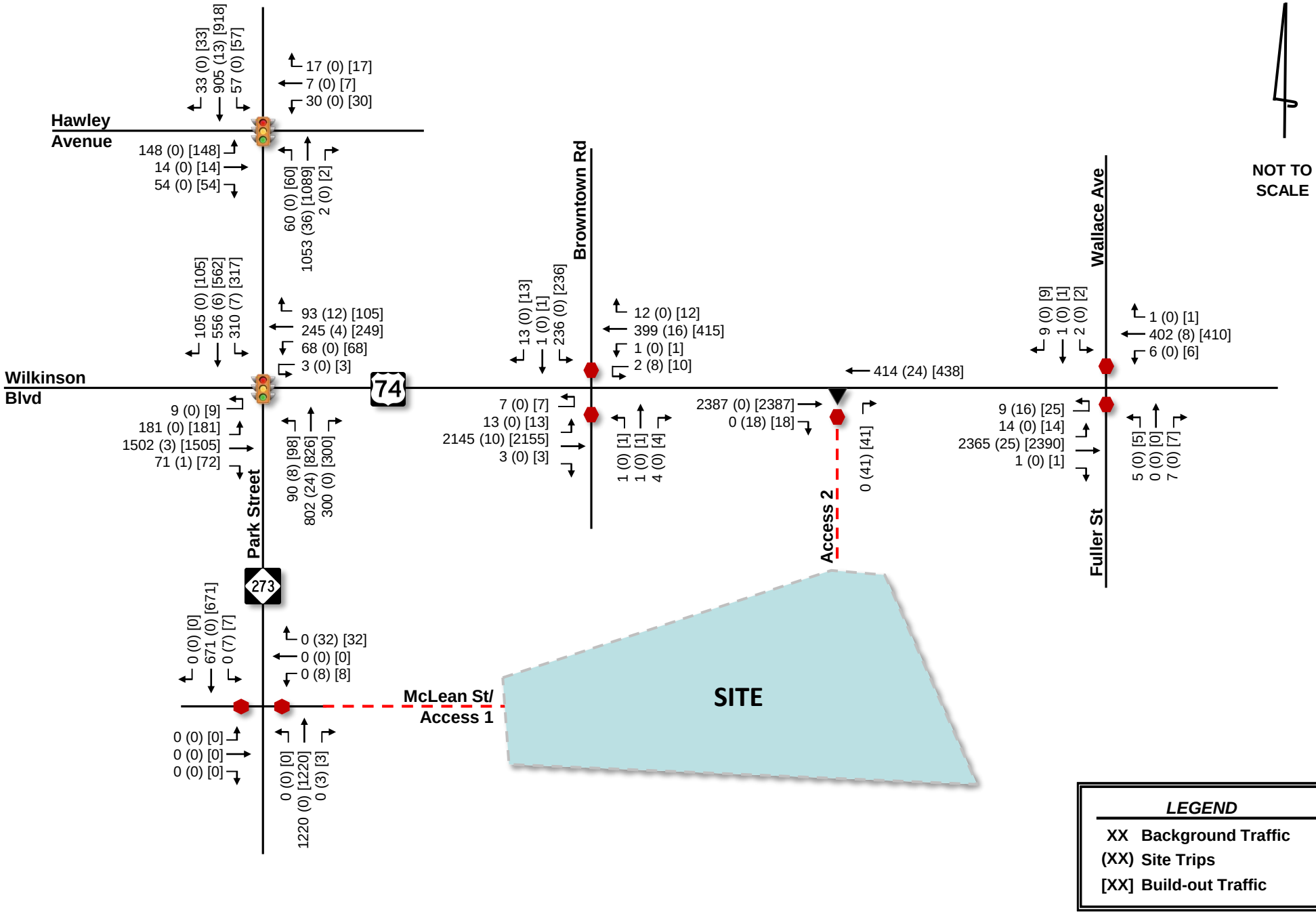
5.5 2025 BUILD-OUT TRAFFIC VOLUMES

As required by the *City of Belmont Land Development Code – Section 16.14 Traffic Impact Analysis,* an analysis scenario of five years after the build-out year was performed. The 2025 build-out traffic volumes include the assignment of the proposed site traffic generation added to the 2025 base background traffic volumes. **Figure 5.4** shows the projected 2025 AM and PM peak-hour build-out traffic volumes.

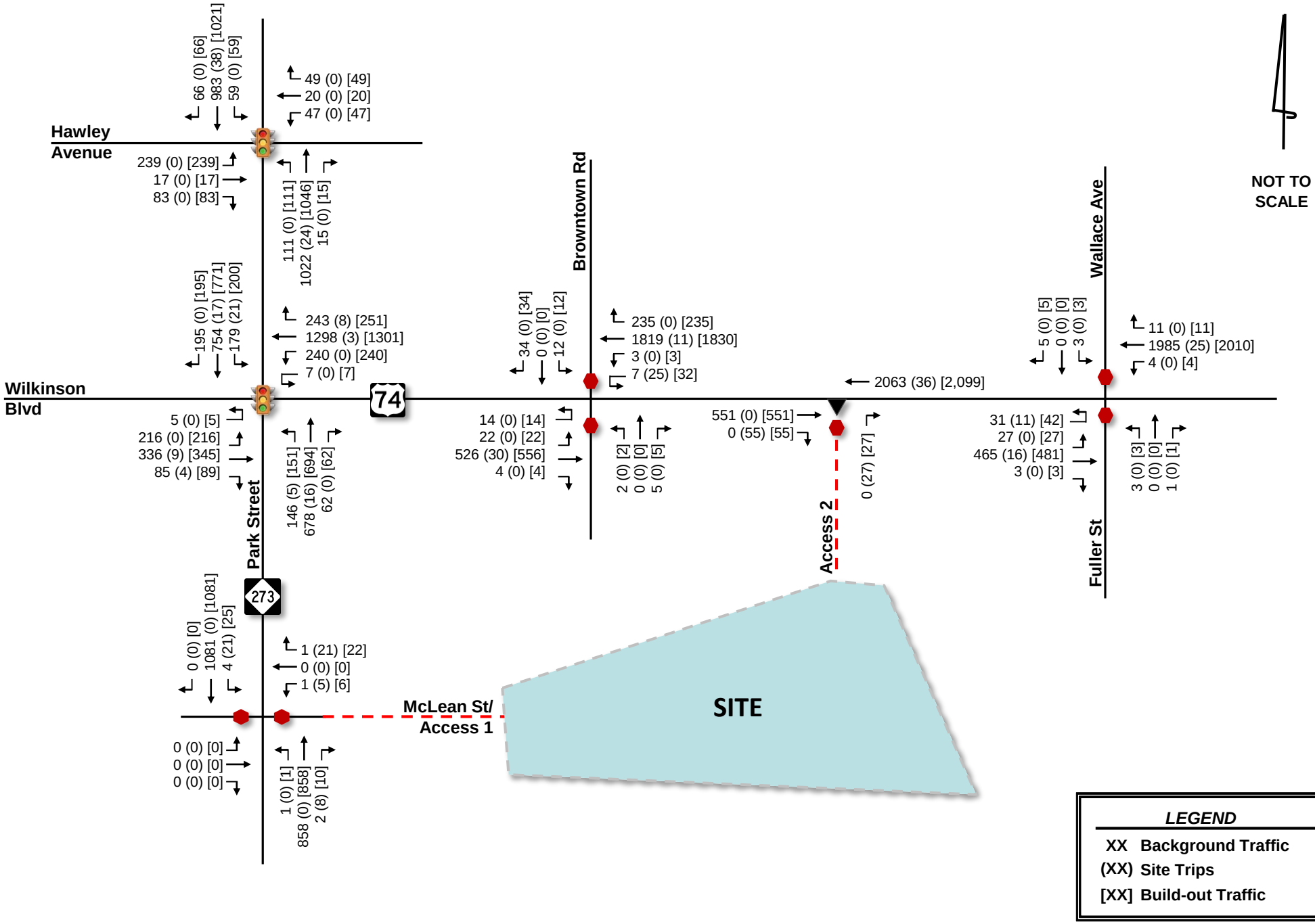
Intersection volume development worksheets for all intersections and driveways within the study network are provided in the **Appendix**.



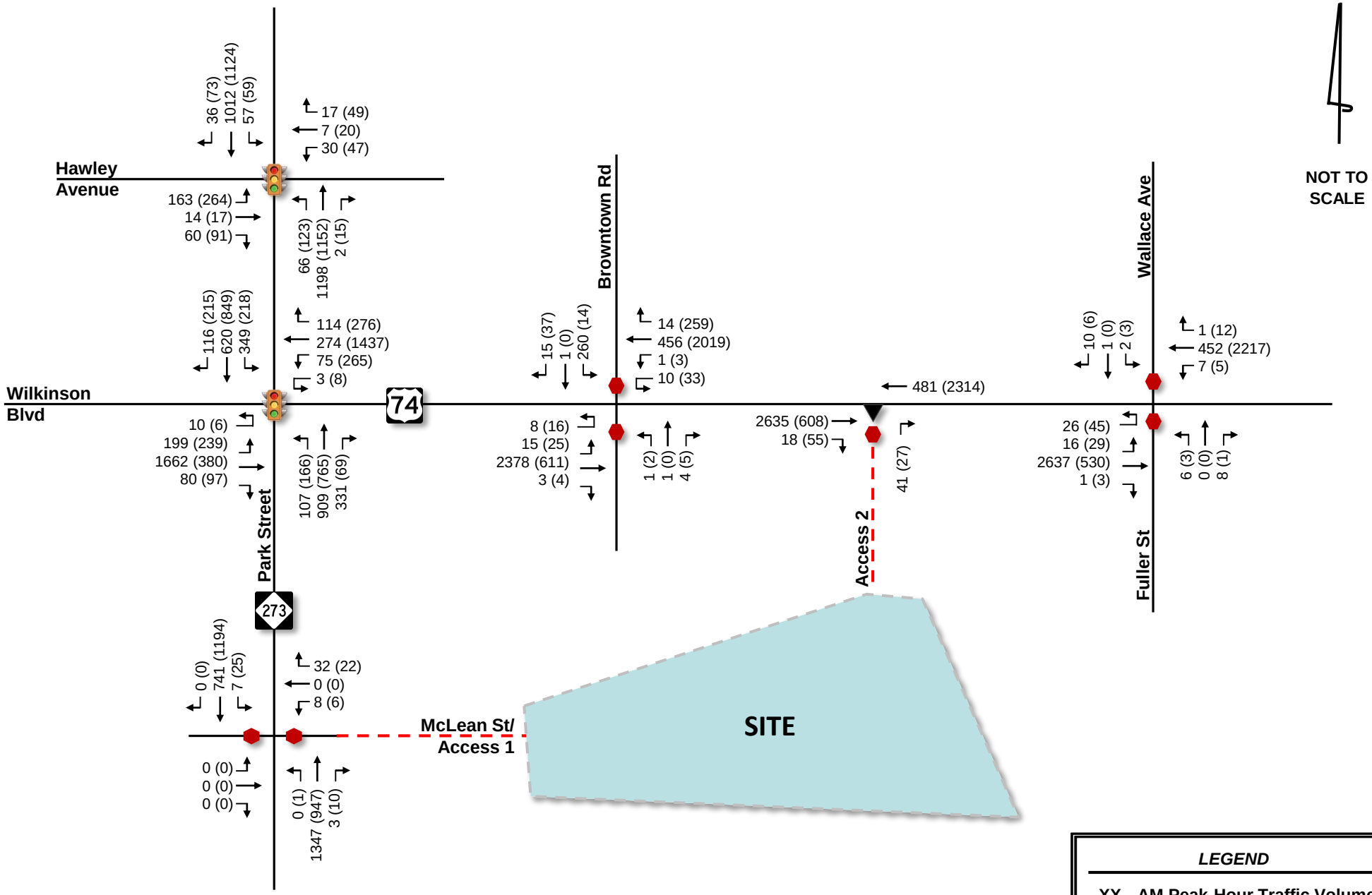
Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	Site Traffic Distribution and Assignment	Figure 5.1



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	2020 Build-Out AM Peak-Hour Traffic Volumes	Figure 5.2



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	2020 Build-Out PM Peak-Hour Traffic Volumes	Figure 5.3



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	2025 Build-Out Traffic Volumes	Figure 5.4

6.0 Capacity Analysis

Based on the requirements set forth by the *City of Belmont Land Development Code – Section 16.14 Traffic 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:

- 2019 Existing Conditions
- 2020 Background Conditions
- 2020 Build-out Conditions
- 2025 Build-out Conditions + 5 years

Capacity analyses were performed for the AM and PM peak hours using the Synchro Version 9 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.

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

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

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

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

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

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

NCDOT staff provided the signal geometric plans for the following signalized intersections:

- Wilkinson Boulevard (US 29/74) and Park Street (NC 273)
- Park Street (NC 273) and Hawley Avenue

The provided signal plans were used in the development of the existing conditions Synchro network. The cycle lengths and splits were optimized given the timing inputs in the existing conditions network and in accordance with NCDOT Congestion Management guidelines, and were maintained throughout the background, build-out and build-out +5 scenarios unless otherwise noted. 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.
- Lost time adjust was added to the yellow and all-red times provided in the existing signal plans to maintain at total lost time of 5 seconds for each movement.

Note that zero-volume movements were not changed to four vehicles per hour in the analysis. Given that these volumes were located on movements where little to no volume would be regularly expected during the peak hours (e.g., northbound/southbound through movements at the unsignalized median breaks along Wilkinson Boulevard), these movements were kept at zero to match the counts collected in the field.

Per NCDOT capacity analysis guidelines, existing peak-hour factors were used in the 2019 existing conditions analysis, and a peak-hour factor of 0.9 was used for all future-year scenarios. Heavy-vehicle percentages collected with the counts were used and maintained for all scenarios, subject to a two-percent minimum.

Mitigation for traffic impacts caused by the proposed development were noted and identified based on City of Belmont and NCDOT mitigation requirements. When determining the proposed development's traffic impact to the study area intersections, the 2020 build-out conditions were compared to the 2020 background conditions. Based on the *City of Belmont Land Development Code*, "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 9 software are included in the **Appendix**. Additionally, queuing and blocking reports generated by the SimTraffic microsimulation model are included in the **Appendix**.

6.1 WILKINSON BLVD (US 29/74) AND PARK ST (NC 273)

Table 6.1 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273).

Table 6.1 - Wilkinson Boulevard (US 29/74) and Park Street (NC 273)

Condition	Measure	EB		WB		NB		SB		Intersection
		EBL	EBTR	WBL	WBTR	NBL	NBTR	SBL	SBTR	LOS (Delay)
AM Peak Hour										
2019 Existing	LOS (Delay)	F (91.9)		E (68.2)		F (114.4)		E (69.9)		F (91.1)
	Synchro 95th Q	281'	#760'	m#157'	m154'	156'	#759'	#578'	280'	
2020 Background	LOS (Delay)	F (105.5)		E (64.0)		F (96.6)		E (69.0)		F (91.0)
	Synchro 95th Q	285'	#812'	m#173'	m157'	160'	#840'	#599'	268'	
2020 Build-out	LOS (Delay)	F (106.4)		E (64.3)		F (103.7)		E (72.3)		F (93.9)
	Synchro 95th Q	285'	#815'	m#168'	m164'	172'	#867'	#619'	270'	
2025 Build-out +5	LOS (Delay)	F (147.6)		E (67.7)		F (142.3)		F (87.3)		F (125.0)
	Synchro 95th Q	315'	#950'	m#187'	m179'	185'	#1003'	#700'	327'	
PM Peak Hour										
2019 Existing	LOS (Delay)	E (68.6)		E (69.1)		E (73.3)		F (81.3)		E (72.9)
	Synchro 95th Q	#374'	158'	285'	#619'	#255'	#451'	#296'	#606'	
2020 Background	LOS (Delay)	E (67.6)		E (78.5)		E (67.9)		F (85.6)		E (76.6)
	Synchro 95th Q	#382'	159'	292'	#653'	#269'	#452'	#309'	#639'	
2020 Build-out	LOS (Delay)	E (67.1)		F (80.8)		E (70.6)		F (94.7)		F (80.4)
	Synchro 95th Q	#382'	164'	292'	#662'	#281'	#467'	#357'	#656'	
2025 Build-out +5	LOS (Delay)	E (79.4)		F (117.1)		F (88.9)		F (132.4)		F (109.9)
	Synchro 95th Q	#434'	180'	324'	#771'	#314'	#547'	#392'	#756'	

- 95th percentile volume exceeds capacity, queue may be longer

m - Volume for 95th percentile queue is metered by upstream signal

Note that the results shown in **Table 6.1** reflect the following modifications applied to the capacity analyses that differ from the background data collected to meet NCDOT *Congestion Management Capacity Analysis Guidelines:*

- RTOR operations were not allowed.

As discussed in **Section 4.3**, NCDOT TIP project U-5959 is currently being designed to improve this intersection, with construction currently scheduled for FY 2021. Given the proximity of this intersection to the proposed development access points, there were discussions at the TIA Scoping Meeting as to how this future project may impact the analysis in this TIA and potentially the operational control of the access points for the proposed development. Following the TIA Scoping Meeting, NCDOT indicated that the preferred intersection configuration and specific improvements have not yet been determined; therefore, improvements associated with U-5959 were not included in the analysis of this TIA.

Table 6.1 shows the overall intersection currently operates at LOS F during the AM peak hour and LOS E during the PM peak hour and is expected to continue to operate at LOS F and LOS E under 2020 background conditions during the AM and PM peak hours, respectively. Note that the decrease in delay on some of the approaches between 2019 existing and 2020 background conditions is due to the change in peak-hour factors (PHFs). Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, the PHFs obtained from the collected traffic count data were used for 2019 existing conditions only (some PHFs collected were higher and some lower than 0.9); however, a PHF of 0.9 was used for all future conditions.

When the proposed site traffic is added to the 2020 background volumes, the overall intersection is expected to increase in delay during both peak hours and drop from LOS E to LOS F during the PM peak hour. Therefore, identification of potential mitigation improvements is required.

As shown in **Figures 5.2 and 5.3**, the proposed Wayforth at Belmont site is expected to add the most turning volumes to the westbound right-turn movement (12 vehicles) during the AM peak hour and the reciprocal movement, the southbound left turn (21 vehicles), during the PM peak hour. Improvements at these two locations were considered. A southbound left-turn is already provided at this intersection, and the left-turn lane extends into a two-way left-turn lane which provides additional storage if and when needed. However, since the westbound approach does not currently include a right-turn lane, construction of an exclusive westbound right-turn lane was considered for mitigation and further evaluated.

With this turn lane in place, the overall intersection is expected to improve to LOS E (66.3 seconds) during the PM peak hour; however, the turn lane is expected to only add negligible benefit during the AM peak hour where it is shown to stay at LOS F (93.3 seconds). **Figure 5.3** shows a relatively high westbound right-turn volume (251 vehicles) during the PM peak hour, with only three percent of those vehicles (8 vehicles) being contributed by the proposed site. Furthermore, **Figures 5.2 and 5.3** show that the proposed site is expected to add less than two percent of the total entering traffic to this intersection during both peak hours. Additionally, installation of a right-turn lane on the westbound approach would likely have significant impacts to the surrounding businesses and roadside utilities. As shown in the image to the right, existing overhead utility poles would likely be required to be relocated, and the circulation, access and parking for the existing Taco Bell would be significantly impacted. Given the considerations discussed above, combined with the future improvements planned to be constructed at this intersection in FY 2021 as part of U-5959, construction of a westbound right-turn lane is not recommended as mitigation for the proposed Wayforth at Belmont development.

Note that the mitigation improvement identified in **Section 6.3** of an exclusive right-turn lane along Wilkinson Boulevard (US 29/74) at Browntown Road could offset some of the impact at this intersection by improving the westbound right-turn movement onto Browntown Road, which is used by some drivers as an option to avoid the right turn at the Park Street (NC 273) signal.

6.2 PARK STREET (NC 273) AND HAWLEY AVE

Table 6.2 summarizes the LOS, control delay and 95th percentile queue lengths at the signalized intersection of Park Street (NC 273) and Hawley Avenue. The westbound approach serves as the driveway for the existing Wendy's fast-food restaurant.

Table 6.2 - Park Street (NC 273) and Hawley Avenue

Condition	Measure	EB		WB	NB		SB			Intersection
		EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBT	SBR	LOS (Delay)
AM Peak Hour										
2019 Existing	LOS (Delay)	E (77.6)		E (61.3)	A (0.9)		A (7.1)			B (13.1)
	Synchro 95th Q	109'	79'	54'	m2'	m11'	39'	232'	20'	
2020 Background	LOS (Delay)	E (77.8)		E (57.1)	A (1.1)		A (6.8)			B (11.7)
	Synchro 95th Q	244'	90'	93'	m2'	m18'	43'	236'	22'	
2020 Build-out	LOS (Delay)	E (77.8)		E (57.1)	A (1.2)		A (6.9)			B (11.6)
	Synchro 95th Q	244'	90'	93'	m3'	m22'	43'	240'	22'	
2025 Build-out +5	LOS (Delay)	E (76.5)		D (54.6)	A (1.6)		A (8.0)			B (12.0)
	Synchro 95th Q	262'	96'	90'	m3'	m25'	50'	291'	25'	
PM Peak Hour										
2019 Existing	LOS (Delay)	E (64.0)		D (43.8)	A (2.3)		B (12.4)			B (16.7)
	Synchro 95th Q	221'	89'	102'	m17'	m78'	57'	294'	47'	
2020 Background	LOS (Delay)	E (62.7)		D (41.1)	A (2.7)		B (12.6)			B (15.9)
	Synchro 95th Q	306'	93'	133'	m19'	m97'	61'	325'	47'	
2020 Build-out	LOS (Delay)	E (62.7)		D (41.1)	A (2.9)		B (12.8)			B (15.9)
	Synchro 95th Q	306'	93'	133'	m20'	m99'	62'	342'	47'	
2025 Build-out +5	LOS (Delay)	E (62.8)		D (39.0)	A (4.0)		B (14.8)			B (17.0)
	Synchro 95th Q	#350'	101'	134'	m21'	m98'	71'	393'	52'	

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

Note that the results shown in **Table 6.2** reflect the following modifications applied to the capacity analyses that differ from the background data collected to meet NCDOT *Congestion Management Capacity Analysis Guidelines:*

- RTOR operations were not allowed.

Table 6.2 shows the signalized intersection currently operates at LOS B during both peak hours and is expected to continue to operate at LOS B during both peak hours under 2020 background conditions. Note that the decrease in delay for the overall intersection as well as some of the approaches between 2019 existing and 2020 background conditions is due to the change in PHFs. Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, the PHFs obtained from the collected traffic count data were used for 2019 existing conditions only (some PHFs collected were higher and some lower than 0.9); however, a PHF of 0.9 was used for all future conditions.

When the proposed site traffic is added to the 2020 background volumes, the intersection is expected to continue to operate at LOS B during both peak hours. Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for capacity purposes.

6.3 WILKINSON BLVD (US 29/74) AND BROWNTOWN RD

Table 6.3 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized intersection of Wilkinson Boulevard (US 29/74) and Browntown Road. The northbound approach serves as the driveway for the existing NAPA Auto-Parts store. This intersection is expected to serve U-turn traffic for drivers from the east wanting to access the proposed site.

Table 6.3 - Wilkinson Boulevard (US 29/74) and Browntown Road

Condition	Measure	EB		WB			NB	SB	Intersection
		EBL	EBTR	WBL	WBTR	WBR	NBLTR	SBLTR	LOS (Delay)
AM Peak Hour									
2019 Existing	LOS (Delay)	A (0.1)		A (0.2)			F (263.1)	F (Err)	
	Synchro 95th Q	1'	0'	1'	0'	-	38'	Err	
2020 Background	LOS (Delay)	A (0.0)		A (0.1)			F (118.4)	F (702.0)	
	Synchro 95th Q	1'	0'	0'	0'	-	13'	607'	
2020 Build-out	LOS (Delay)	A (0.0)		A (0.0)			F (123.2)	F (746.9)	
	Synchro 95th Q	1'	0'	0'	0'	-	13'	619'	
2020 Build-out IMP*	LOS (Delay)	A (0.0)		A (0.0)			F (100.9)	F (657.6)	
	Synchro 95th Q	0'	0'	0'	0'	0'	13'	595'	
2025 Build-out +5*	LOS (Delay)	A (0.0)		A (0.0)			F (169.9)	F (1113.9)	
	Synchro 95th Q	0'	0'	0'	0'	0'	18'	760'	
PM Peak Hour									
2019 Existing	LOS (Delay)	A (0.8)		A (0.0)			C (20.2)	F (238.4)	
	Synchro 95th Q	8'	0'	0'	0'	-	4'	120'	
2020 Background	LOS (Delay)	A (0.9)		A (0.0)			C (19.0)	F (229.9)	
	Synchro 95th Q	9'	0'	0'	0'	-	2'	105'	
2020 Build-out	LOS (Delay)	A (0.9)		A (0.0)			C (19.8)	F (247.1)	
	Synchro 95th Q	9'	0'	0'	0'	-	2'	108'	
2020 Build-out IMP*	LOS (Delay)	A (0.0)		A (0.0)			C (21.1)	F (91.5)	
	Synchro 95th Q	0'	0'	0'	0'	0'	3'	65'	
2025 Build-out +5*	LOS (Delay)	A (0.0)		A (0.0)			D (25.4)	F (199.5)	
	Synchro 95th Q	0'	0'	0'	0'	0'	3'	108'	

*HCM 2010 TWSC results are reported here, as HCM Unsignalized was unable to report results due to the number of approach lanes when the WBR was added.

Table 6.3 shows the stop-controlled southbound approach of Browntown Road currently operates with long delays during both peak hours, specifically the AM peak hour where **Table 6.3** shows it is operating over the theoretical capacity and cannot be calculated. The stop-controlled southbound approach is expected to continue to operate with long delays under 2020 background conditions. Note that the decrease in delay between 2019 existing and 2020 background conditions is due to the change in PHFs. Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, the PHFs obtained from the collected traffic count data were used for 2019 existing conditions only (some PHFs collected were higher and some lower than 0.9); however, a PHF of 0.9 was used for all future conditions.

When the proposed site traffic is added to the 2020 background volumes, the side-street approaches are expected to experience further delay and continue to operate with long delays under 2020 build-out conditions. The increase in delay is due to the further reduction in the gaps available to be able to turn onto the mainline. Given the increased delay caused by the project, identification of mitigation improvements is required. The following improvement was identified to mitigate the added delay caused by the addition of site traffic:

- Westbound right-turn lane along Wilkinson Boulevard (US 29/74) with 150' of storage

Figures 5.2 and **5.3** show a relatively heavy utilization of Browntown Road as an option to bypass the signalized intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273), where there are 236 southbound left-turn vehicles during the AM peak hour (to travel east along US 74) and 235 westbound right-turn vehicles during the PM peak hour (from the east along US 74 towards I-85). With this improvement in place, the added delay caused by the proposed site is expected to be fully mitigated.

The recommended storage of 150 feet is based on review of the auxiliary turn-lane warrants included in **Section 7.0**.

Note that existing overhead utilities are located along the north side of Wilkinson Boulevard (US 29/74), as shown in the image to the right (view is looking towards the east). Installation of a westbound-right turn lane will likely require relocation of these utility poles. Additionally, providing a westbound right-turn lane at this location would likely encourage more drivers to utilize Browntown Road as an alternative access to Park Street (NC 273), likely promoting additional traffic on this two-lane road. These considerations should be weighed with the benefit expected of this mitigation improvement with the City of Belmont and NCDOT to determine if this improvement will be required.

Also note that the excessive existing delay shown in **Table 6.3** for the southbound approach during the AM peak hour was not representative of the actual delay experienced during a site visit performed on January 30, 2019. Instead, short queues (less than two vehicles) and short delays were observed. The discrepancy between the modeled delay and observed delay for this approach is thought to be a result of the platooning of vehicles caused by the multiple traffic signals along the Wilkinson Boulevard (US 29/74) signalized corridor that were not included in the study area for this TIA. Therefore, further observation of the SimTraffic model showed that southbound left-turn vehicles were having issues turning onto the mainline because the high amount of traffic volume was relatively spaced both eastbound and westbound, and regular gaps were not provided to flush out the southbound traffic.

6.4 WILKINSON BLVD (US 29/74) AND FULLER ST/WALLACE AVE

Table 6.4 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized intersection of Wilkinson Boulevard (US 29/74) and Fuller Street/Wallace Avenue. This intersection is expected to serve U-turn traffic for drivers exiting the site and wanting to travel north and west (as well as provides an alternative option to travel south if exiting the site from McLean Street/Access 1 becomes difficult).

Table 6.4 - Wilkinson Boulevard (US 29/74) and Fuller Street/Wallace Avenue

Condition	Measure	EB		WB		NB	SB	Intersection
		EBL	EBTR	WBL	WBTR	NBLTR	SBLTR	LOS (Delay)
AM Peak Hour								
2019 Existing	LOS (Delay)	A (0.1)		A (0.9)		F (Err)	F (886.0)	
	Synchro 95th Q	2'	0'	8'	0'	Err	103'	
2020 Background	LOS (Delay)	A (0.1)		A (0.7)		F (994.1)	F (307.4)	
	Synchro 95th Q	1'	0'	6'	0'	65'	43'	
2020 Build-out	LOS (Delay)	A (0.1)		A (0.7)		F (1163.0)	F (342.1)	
	Synchro 95th Q	1'	0'	6'	0'	67'	45'	
2025 Build-out +5	LOS (Delay)	A (0.1)		A (1.0)		F (Err)	F (843.5)	
	Synchro 95th Q	1'	0'	9'	0'	Err	62'	
PM Peak Hour								
2019 Existing	LOS (Delay)	A (1.3)		A (0.0)		D (29.8)	F (168.0)	
	Synchro 95th Q	10'	0'	1'	0'	6'	37'	
2020 Background	LOS (Delay)	A (1.3)		A (0.0)		D (34.1)	F (121.7)	
	Synchro 95th Q	11'	0'	0'	0'	2'	19'	
2020 Build-out	LOS (Delay)	A (1.3)		A (0.0)		E (35.5)	F (130.5)	
	Synchro 95th Q	12'	0'	0'	0'	3'	20'	
2025 Build-out +5	LOS (Delay)	A (1.5)		A (0.0)		E (45.7)	F (219.6)	
	Synchro 95th Q	16'	0'	0'	0'	3'	30'	

Table 6.4 shows the stop-controlled northbound approach of Fuller Street currently operates over the theoretical capacity and cannot be calculated during the AM peak hour operates with moderate delays during the PM peak hour. The stop-controlled southbound of Wallace Avenue currently operates with long delays during both peak hours. Both side-street approaches are expected to continue to operate with long delays during the AM peak hour under 2020 background conditions. Note that the decrease in delay between 2019 existing and 2020 background conditions is due to the change in PHFs. Based on NCDOT *Congestion Management Capacity Analysis Guidelines*, the PHFs obtained from the collected traffic count data were used for 2019 existing conditions only (some PHFs collected were higher and some lower than 0.9); however, a PHF of 0.9 was used for all future conditions.

When the proposed site traffic is added to the 2020 background volumes, the side-street approaches are expected to experience further delay and continue to operate with long delays during the AM peak hour, along with a drop from LOS D to LOS E on the northbound approach of Fuller Street during the PM peak hour. The increase in delay is due to the further reduction in the gaps available to be able to turn onto the mainline; however, the drop in LOS on the northbound approach reflects only a slight increase in average delay by less than 1.5 seconds per vehicle.

Figures 5.2 and **5.3** show that the average delays on the side-street approaches shown in **Table 6.4** reflect the average delays for a small amount of volume. The northbound approach of Fuller Street accommodates a volume of 12 vehicles during the AM peak hour and 4 vehicles during the PM peak hour, whereas the southbound approach of Wallace Avenue accommodates a volume of

12 vehicles during the AM peak hour and 8 vehicles during the PM peak hour. As stated previously in **Section 6.0**, it is not uncommon 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. Since the proposed development is not expected to have a significant adverse impact on operations at this intersection, no mitigation improvements are recommended for capacity purposes.

6.5 PARK ST (NC 273) AND MCLEAN ST/ACCESS 1

Table 6.5 summarizes the LOS, control delay and 95th percentile queue lengths at the unsignalized intersection of Park Street (NC 273) and McLean Street/Access 1. Access 1 is proposed to tie into and extend existing McLean Street where it will serve as the westbound approach to this intersection. The eastbound approach serves as the driveway for an existing single-family residential home.

Table 6.5 - Park Street (NC 273) and McLean Street/Access 1

Condition	Measure	EB	WB	NB		SB		Intersection
		EBLTR	WBLTR	NBLT	NBTR	SBLT	SBTR	LOS (Delay)
AM Peak Hour								
2019 Existing	LOS (Delay)	A (0.0)	A (0.0)	A (0.0)		A (0.0)		
	Synchro 95th Q	0'	0'	0'	0'	0'	0'	
2020 Background	LOS (Delay)	A (0.0)	A (0.0)	A (0.0)		A (0.0)		
	Synchro 95th Q	0'	0'	0'	0'	0'	0'	
2020 Build-out	LOS (Delay)	A (0.0)	D (28.3)	A (0.0)		A (0.3)		
	Synchro 95th Q	0'	21'	0'	0'	1'	0'	
2025 Build-out +5	LOS (Delay)	A (0.0)	E (37.2)	A (0.0)		A (0.3)		
	Synchro 95th Q	0'	28'	0'	0'	1'	0'	
PM Peak Hour								
2019 Existing	LOS (Delay)	A (0.0)	C (22.7)	A (0.1)		A (0.2)		
	Synchro 95th Q	0'	3'	0'	0'	1'	0'	
2020 Background	LOS (Delay)	A (0.0)	C (22.2)	A (0.0)		A (0.1)		
	Synchro 95th Q	0'	1'	0'	0'	0'	0'	
2020 Build-out	LOS (Delay)	A (0.0)	C (18.9)	A (0.0)		A (0.5)		
	Synchro 95th Q	0'	9'	0'	0'	3'	0'	
2025 Build-out +5	LOS (Delay)	A (0.0)	C (23.3)	A (0.0)		A (0.6)		
	Synchro 95th Q	0'	12'	0'	0'	3'	0'	

There is currently very little volume turning to/from McLean Street prior to the proposed extension to serve as Access 1. As shown in **Table 6.5,** the stop-controlled westbound approach of Access 1 is expected to operate at LOS D or better with short queues during both peak hours.

As shown in the image on the next page, there is currently a retaining wall located in the southeast quadrant of this intersection that appears to be impeding sight distance for westbound drivers. Sight distance on the westbound approach of McLean Street/Access 1 should be reviewed by a professional engineer to ensure appropriate sight distance criteria is met. Additionally, coordination with the City of Belmont is recommended to determine the appropriate cross-section required for McLean Street/Access 1.

Review of auxiliary turn-lane warrants and further discussion of a potential southbound left-turn lane at this intersection is included in **Section 7.0**. It should also be noted that as discussed in **Section 4.3**, improvements associated with NCDOT TIP project U-5959 could potentially impact this intersection, including the operational control given the proximity of this access to the signalized intersection being improved (approximately 550 feet). However, at the time of this TIA, NCDOT has indicated that the preferred intersection configuration and specific improvements have not yet been determined.

6.6 WILKINSON BLVD (US 29/74) AND ACCESS 2

Table 6.6 summarizes the LOS, control delay and 95th percentile queue lengths at the proposed unsignalized intersection of Wilkinson Boulevard (US 29/74) and Access 2, located approximately 400 feet east of Browntown Road. This access is proposed as a right-in/right-out (RIRO) driveway given the existing concrete median along Wilkinson Boulevard (US 29/74).

Table 6.6 - Wilkinson Boulevard (US 29/74) and Access 2

Condition	Measure	EB	WB	NB	Intersection
		EBTR	WBT	NBR	LOS (Delay)
AM Peak Hour					
2020 Build-out	LOS (Delay)	A (0.0)	A (0.0)	C (20.1)	
	Synchro 95th Q	0'	0'	14'	
2025 Build-out +5	LOS (Delay)	A (0.0)	A (0.0)	C (22.9)	
	Synchro 95th Q	0'	0'	17'	
PM Peak Hour					
2020 Build-out	LOS (Delay)	A (0.0)	A (0.0)	A (9.9)	
	Synchro 95th Q	0'	0'	3'	
2025 Build-out +5	LOS (Delay)	A (0.0)	A (0.0)	B (10.0)	
	Synchro 95th Q	0'	0'	3'	

As shown in **Table 6.6,** the stop-controlled northbound approach of Access 2, is expected to operate as a RIRO driveway with short delays and queues during both peak hours. Therefore, no additional improvements beyond construction of the driveway are recommended at this intersection for capacity purposes.

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 intersections beyond those necessary for capacity were determined based on a review of the figure titled 'Warrant for Left and Right-Turn Lanes' found on page 80 in the *NCDOT Policy On Street And Driveway Access to North Carolina Highways*. The results of the warrants for left and right-turn lanes under 2020 background and build-out conditions are summarized by intersection below and included in the **Appendix**.

2020 Background Conditions

Wilkinson Boulevard (US 29/74) and Browntown Road

- Westbound right-turn lane along Wilkinson Boulevard (US 29/74) with a minimum storage length of 150 feet

2020 Build-out Conditions

Wilkinson Boulevard (US 29/74) and Browntown Road

- Westbound right-turn lane along Wilkinson Boulevard (US 29/74) with a minimum storage length of 150 feet

Park Street (NC 273) and McLean Street/Access 1

- Southbound left-turn lane along Park Street (NC 273) with a minimum storage length of 50 feet

Construction of a southbound left-turn lane would require the through lanes along Park Street (NC 273) to be shifted to provide room for the left-turn lane. This would likely require significant impacts to the existing overhead utilities along both sides of Park Street (NC 273) along with impacts to multiple residential and business properties. Furthermore, these potential impacts may only serve a temporary condition given the impending NCDOT TIP project U-5959, which is currently scheduled for construction in FY 2021. According to NCDOT, the preferred intersection configuration and associated improvements for the adjacent signalized intersection (approximately 550 feet north of McLean Street/Access 1) have not yet been determined. However, given the close proximity, U-5959 improvements could be expected to potentially impact this access location.

Additionally, the proposed site traffic shown in **Figure 5.3** making this southbound left-turn into Access 1 is travelling from the north or west to access the site. If accessing the site via Access 1 becomes challenging, drivers are provided the option to instead turn onto (or stay straight along) Wilkinson Boulevard (US 29/74) to alternatively access the site via Access 2. Given that this site is a proposed residential use, residents will learn the safest and quickest route to access the site. Considering the impacts required to install this turn lane along with the alternative access option provided with the relatively minor volume the turn lane would serve, a southbound left-turn lane is **not recommended** to be constructed at this intersection as part of the proposed Wayforth at Belmont development.

Wilkinson Boulevard (US 29/74) and Access 2

- Eastbound right-turn lane along Wilkinson Boulevard (US 29/74) with a minimum storage length of 50 feet

Based on NCDOT *Congestion Management Capacity Analysis Guidelines,* full storage for a right-turn lane should accommodate a minimum of 100 feet; therefore, an eastbound right-turn lane along Wilkinson Boulevard (US 29/74) with a minimum storage length of **100 feet** is recommended.

8.0 Crash Data Analysis

Crash data was obtained at the study intersections for crashes that occurred between October 1, 2013, and September 30, 2018. Over this five-year period, 225 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.

Table 8.1 – Crash Severity Summary

Crash Type	Number of Crashes
Fatal Crashes	1
Class A	1
Class B	5
Class C	40
Property Damage Only	178
Total	***225***

Table 8.1 above displays the total number of crashes by severity type from most to least severe. As shown, there was one fatal crash reported, which occurred at the Wilkinson Boulevard (US 29/74) and Park Street (NC 273) intersection. 79% of the crashes over the past five 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.

Table 8.2 – Crash Frequency Summary

Location	Crashes/100 MEV
Wilkinson Blvd at Park St	123.07
Park St at Hawley Ave	121.04
Wilkinson Blvd at Browntown Rd	67.11
Wilkinson Blvd at Fuller St/Wallace Ave	48.09
Park St at McLean St	61.83
Average	***93.63***

Table 8.2 shows the crash rates at the study area intersections resulted in a weighted average crash rate of 93.63 crashes per 100 million entering vehicles (MEV), with the highest rates occurring at the signalized intersections of Wilkinson Boulevard at Park Street and Park Street at Hawley Avenue. There have been 100 and 61 total crashes reported over this five-year period at these two intersections, respectively.

As discussed in **Section 4.3**, NCDOT TIP project U-5959 is currently being designed to improve the intersection of Wilkinson Boulevard (US 29/74) and Park Street (NC 273), with construction currently scheduled for FY 2021. Based on input from NCDOT, the preferred intersection configuration and specific improvements have not yet been determined. Both capacity and safety will be required to be evaluated to determine the appropriate configuration for this intersection.

Additionally, the segment of Park Street (NC 273) between Wilkinson Boulevard (US 29/74) and I-85, which includes the signalized study intersection at Hawley Avenue, is expected to be included as part of the evaluation for both TIP project U-5959, as well as I-5719, which is being designed to widen I-85 in Gaston County along with improvements to existing interchanges. I-5719 is currently scheduled to begin construction in FY 2020. The funded improvements along the Park Street (NC 273) corridor associated with these two projects are expected to improve both safety and congestion in this area.

Table 8.3 – Crash Type Summary

Crash Type	Wilkinson Blvd at Park St	Park St at Hawley Ave	Wilkinson Blvd at Browntown Rd	Wilkinson Blvd at Fuller St/ Wallace Ave	Park St at McLean St
Angle	16	19	12	5	6
Backing up	1	3			
Fixed Object			1		1
Left-Turn, Different Roadways	1	1	1		1
Left-Turn, Same Roadway	1	9	1	2	
Other Non-Collision	1				
Overturn/Rollover		1			
Parked Motor Vehicle			1		
Pedestrian				1	
Ran off Road - Right	4	1			
Ran off Road - Straight	1				
Rear End, Slow or Stop	58	18	3	7	12
Rear End, Turn	1			1	
Right-Turn, Same Roadway	3	3			
Sideswipe Opposite Direction	2	1			
Sideswipe Same Direction	11	5	6	2	1
Total	*100*	*61*	*25*	*18*	*21*

The most common crash type within the study area was a rear-end collision caused by a slowing or stopping vehicle, making up 44% of total crashes. This crash type is often associated with mainline traffic along a corridor with the lack of turn lanes onto side-streets and can also be associated with congestion. These types of crashes are typically on the lower end of the severity spectrum, which correlates with the data presented in **Table 8.1**.

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:

Wilkinson Boulevard (US 29/74) and Browntown Road

- Westbound right-turn lane along Wilkinson Boulevard (US 29/74) with 150 feet of storage

The operational benefit of this mitigation improvement should be considered with the impacts to existing overhead utilities along with the likelihood of promoting additional traffic along Browntown Road with the City of Belmont and NCDOT to determine if this mitigation will be required.

Park Street (NC 273) and McLean Street/Access 1

- Single westbound egress and single ingress lane along Access 1
- Sight distance on the westbound approach of McLean Street/Access 1 should be reviewed by a professional engineer to ensure appropriate sight distance criteria is met (relative to the existing retaining wall in the southeast quadrant).
- Applicant should coordinate with City of Belmont staff to determine the appropriate cross-section required for McLean Street/Access 1.

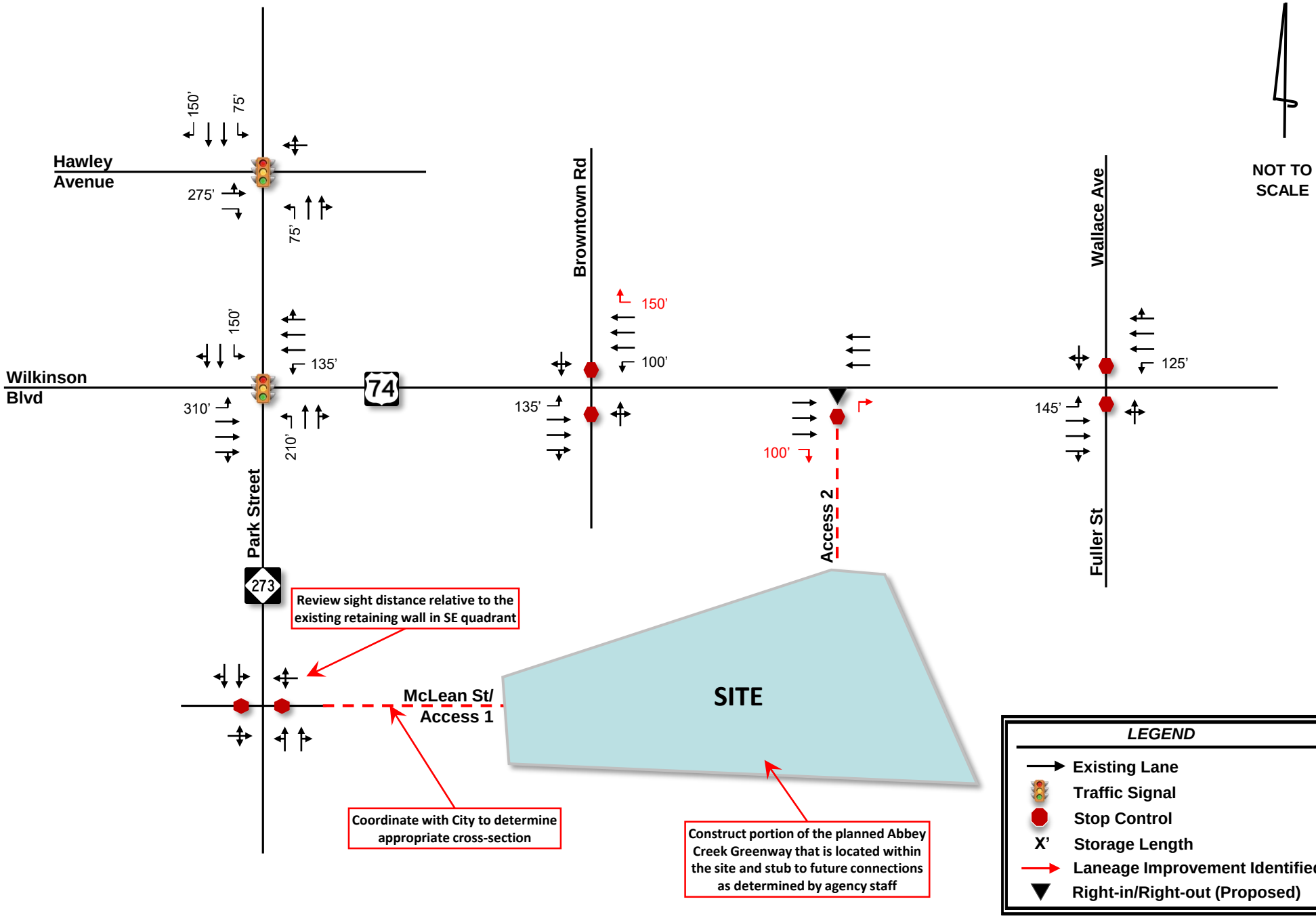
Wilkinson Boulevard (US 29/74) and Access 2 (RIRO)

- Eastbound right-turn lane along Wilkinson Boulevard (US 29/74) with 100 feet of storage
- Single northbound egress and single ingress lane along Access 2

Abbey Creek Greenway

- Portion of the planned Abbey Creek Greenway that is located within the proposed site should be incorporated into the site plan and should stub to future connections as determined by GCLMPO and City of Belmont staff; Applicant should coordinate with these agencies early in the site planning phase to determine the appropriate alignment and cross-section of this greenway.

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.



Kimley»Horn	Wayforth at Belmont Traffic Impact Analysis	Identified Mitigation Improvements	Figure 9.1