

**BARBEE CHAPEL APARTMENTS
RESIDENTIAL DEVELOPMENT
TRANSPORTATION IMPACT ANALYSIS**

EXECUTIVE SUMMARY



Prepared for:

The Town of Chapel Hill
Public Works Department - Engineering

Prepared by:

HNTB North Carolina, PC

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April 2023



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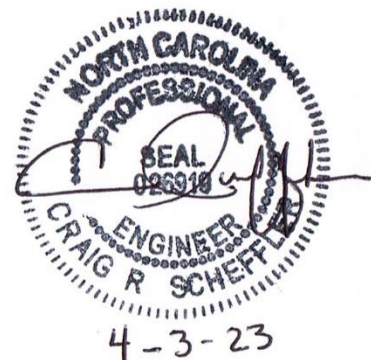
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Project Overview

A new residential community, known as Barbee Chapel Apartments, is being proposed in eastern Chapel Hill along Barbee Chapel Road just south of Stancell Drive / NC Highway 54. **Figure ES-1** shows the general site location. The project proposes to construct approximately 370 multi-family residential units and is anticipated to be fully complete and occupied by 2024. This report analyzes the full build-out scenario for Barbee Chapel Apartments for the year 2025 (one year after anticipated completion), the no-build scenario for 2025, as well as 2022 existing year traffic conditions. It also analyzes a scenario for 2026 where the site is built-out, along with full build-out of the adjacent proposed Hillmont residential development.

The current proposed site concept plan shows a provision for two full movement access driveways serving the site that connect to Barbee Chapel Road. No other external roadway vehicular access connections are proposed. This site concept plan shows a potential internal driveway connection to the adjacent proposed Hillmont development, though no formal analysis of this driveway and potential site traffic impacts was conducted for this study. **Figure ES-2** displays the overall site concept plan and nearby land uses and roadways. The Barbee Chapel Apartments development is expected to provide individual vehicle parking spaces located on surface lots. This report analyzes and presents the transportation impacts that Barbee Chapel Apartments development will have on the following intersections in the project study area:

- NC 54 (Raleigh Road) & Meadowmont Lane / Friday Center Drive
- NC 54 (Raleigh Road) & Barbee Chapel Road / East Barbee Chapel Road
- NC 54 (Raleigh Road) & Little John Road
- Little John Road & Stancell Drive
- Barbee Chapel Road & Stancell Drive
- Barbee Chapel Road & Proposed Site Driveway #1
- Barbee Chapel Road & Proposed Site Driveway #2
- Barbee Chapel Road & Finley Forest Drive / Potential Future Hillmont Development Site Driveway

Existing Conditions

Study Area

The site is located in eastern Chapel Hill in Durham County along Barbee Chapel Road and south of NC 54. The study area contains two signalized intersections along NC 54 at Meadowmont Lane/Friday Center Drive and Barbee Chapel Road. NC 54 is a major east-west arterial providing connectivity between downtown Chapel Hill and south Durham. Barbee Chapel Road is a collector facility providing connectivity for primarily residential development east of Chapel Hill. Remaining study area network roadways are either minor collector or local access streets.

Site Traffic Generation

With the addition of new trips during the weekday AM, noon, and PM peak hours, there are potential site traffic impacts to study area intersections. **Table ES-1** shows the site trip generation details, with rates taken from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, Version 10*.

Background Traffic

Background traffic growth for the 2026 analysis years is expected to come from two sources - ambient regional traffic growth and specific development-related traffic growth. Two development sites near the project study area were considered for specific development related growth. All remaining estimated



traffic volume increases are assumed to occur due to overall region-wide ambient growth (assumed 4.0 percent per year) based on NCDOT/Town historic growth data and taking into consideration the on-going rebound to pre-COVID traffic levels caused by the pandemic.

Table ES-1. Weekday Vehicle Trip Generation Summary

Description	Density	Daily			AM Peak			Noon Peak*			PM Peak		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Mid-Rise Multi-family (ITE LUC 221)	370 Units	844	844	1,688	26	73	99	39	46	85	78	51	129

* - No Noon Peak ITE Data Available – Used Average of AM and PM Peak Data X 0.75

Impact Analysis

Peak Hour Intersection Level of Service

Existing traffic operations at all study area intersections are acceptable during all three peak hours analyzed, except for the stop-controlled movement at the NC 54 / Little John Road intersection. The projected ambient and background development traffic growth will increase impacts by 2025, worsening delays in the vicinity of this intersection and queuing along Barbee Chapel Road at its intersection with NC 54. The addition of peak hour site-generated trips to the projected 2025 background traffic volumes, further worsens these deficient traffic operations, particularly for the northbound approach at NC 54 / Barbee Chapel Road. Additional mitigation improvements were tested at these locations in the 2025 and 2026 analysis scenarios to increase capacity and queue storage. A traffic operations summary for each intersection, related to vehicular delays (intersection total average if signalized, critical movement if stop-controlled) and the corresponding traffic simulation Level-of-Service (LOS_s) is shown in **Table ES-2**.

Vehicular Access Analysis

Vehicular site access to the project is to be accommodated at a two proposed full movement driveway access connections to Barbee Chapel Road about 600 and 925 feet south of Barbee Chapel Road’s intersection with NC 54. The proposed driveway has a single inbound and two outbound lanes, as shown on the concept plan. All driveway connections to Barbee Chapel Road would have acceptable design distances for driveway separations from intersections, and driveway separation from other access driveways based on standards found in the 2017 *Town of Chapel Hill Public Works Design Manual* and the 2003 *NCDOT Policy on Street and Driveway Access to North Carolina Highways*. Additional driveway throat length (50 foot minimum) is necessary for the southern driveway if it is built as currently shown on the site concept plan.

Signal Warrant Analysis

Based on projected 2025 and 2026 traffic volumes and proposed access plans, no unsignalized study area intersection would warrant the installation of a traffic signal, based on the Peak Hour warrant methodology found in the 2009 *Manual on Uniform Traffic Control Devices (MUTCD)*.

Crash Analysis

Data from the NCDOT Traffic Safety Unit was collected as part of the recent Hillmont Residential TIA for the five-year period 2/1/2017 to 1/31/2022 for the segment of Barbee Chapel Road in the vicinity of the proposed Barbee Chapel Apartments site. There were 18 crashes reported along the Barbee Chapel Road study area corridor between Finley Forest Drive and NC 54 over the five year period. The primary crash types were left-turn and angle crashes and crashes clustered near the NC 54/Barbee Chapel Road intersection. Overall, the number of crashes along Barbee Chapel Road in the project study area is higher than state-wide averages for similar facilities, but the overall severity is lower.



Table ES-2. Peak Hour Intersection Capacity Analysis Summary

Intersections	Peak Hour	1 - 2022 Existing		2 - 2025 No-Build		3 - 2025 Build		4 - 2025 Mitigated		5 - 2026 Mitigated With Hillmont	
		LOS _s	Delay	LOS _s	Delay	LOS _s	Delay	LOS _s	Delay	LOS _s	Delay
NC 54 (Raleigh Road) & Meadowmont Lane / Friday Center Drive	AM	B	16.7	B	18.4	B	18.1	B	16.8	B	18.7
	NOON	B	16.0	B	17.0	B	17.7	B	17.2	B	18.3
	PM	C	24.5	C	31.4	C	33.5	C	21.0	C	22.6
NC 54 (Raleigh Road) & Barbee Chapel Road / East Barbee Chapel Road	AM	C	23.3	C	30.4	C	33.2	C	27.8	D	35.2
	NOON	B	15.9	B	17.2	B	19.8	B	19.5	C	22.4
	PM	C	22.2	C	27.0	C	29.7	C	24.1	C	26.4
NC 54 (Raleigh Road) & Little John Road [#]	AM	E	39.7	F	61.1	E	45.4	E	47.9	F	54.8**
	NOON	D	25.7	D	32.9	E	41.9	E	40.4	E	40.4**
	PM	F	116	F	236	F	304	F	289	F	117**
Barbee Chapel Road & Stancell Drive [#]	AM	B	10.6	B	11.1	B	11.4	B	11.4	B	12.6
	NOON	A	9.4	A	9.6	A	9.8	A	9.8	B	10.2
	PM	A	9.7	A	9.9	B	10.1	B	10.1	B	10.6
Little John Road & Stancell Drive [#]	AM	C	17.9	D	30.3	A	9.8	B	13.8	B	12.2
	NOON	A	9.9	B	12.6	C	20.2	B	12.2	A	8.7
	PM	D	29.5	F	450	F	562	F	510	F	166
Barbee Chapel Road & Finley Forest Dr / Proposed Hillmont Site Driveway [#]	AM	B	10.3	B	14.6	F	204	B	12.8	B	13.3
	NOON	A	7.2	A	8.9	A	9.8	A	8.8	A	9.4
	PM	C	15.3	C	18.3	C	20.2	C	18.3	D	25.8
Barbee Chapel Road & Proposed Northern Site Driveway #1 [#]	AM	N/A	N/A	N/A	N/A	F	329	A	5.9	A	7.3
	NOON	N/A	N/A	N/A	N/A	A	5.4	A	4.7	A	5.0
	PM	N/A	N/A	N/A	N/A	A	7.9	A	5.0	A	5.1
Barbee Chapel Road & Proposed Southern Site Driveway #2 [#]	AM	N/A	N/A	N/A	N/A	F	152	A	7.9	A	9.3
	NOON	N/A	N/A	N/A	N/A	A	4.8	A	5.4	A	5.9
	PM	N/A	N/A	N/A	N/A	A	6.3	A	9.4	B	10.9

N/A – Not Applicable or No Improvements Necessary

BOLD/ITALICS – Critical Movement or Overall Intersection Requires Mitigation Per Town TIA Guidelines

- Worst-Case LOS/Delay for Unsignalized/Stop-Controlled Critical Movement

** - Delay Calculated as Weighted Average of Left and Right-Turn Movements for Northbound Approach

Other Transportation-Related Analyses

Other transportation-related analyses relevant to the 2001 Town of Chapel Hill Guidelines for the preparation of Traffic Impact Studies were completed as appropriate. The following topics listed in **Table ES-3** are germane to the scope of this study.



Table ES-3. Other Transportation-Related Analyses

Analysis	Comment
Long Range Planning Level Daily V/C Analysis	The projected 1,700 daily trips generated by the site were analyzed in comparison to daily demand estimates for the 2045 horizon year of the Triangle Regional Travel Demand Model. Results indicate that, regardless of site development and long-term projects to improve capacity along the NC 54 corridor, future facility demands may result in congested conditions at peak times during the day. Daily site traffic impacts are most pronounced along the Barbee Chapel Road corridor between the site driveways and NC 54.
Turn Lane Storage Requirements	Storage bay lengths at study area intersections were analyzed using TransModeler maximum queue length estimates for the 2025 and 2026 Build Scenarios. At the intersection of Barbee Chapel Road and NC 54, the northbound approach queues may exceed existing storage due to site traffic impacts. Lengthening the northbound queue storage to the vicinity of Pearl Lane and adjustments to signal timing may be necessary to mitigate this issue. Additional lengthening of the westbound left-turn bay at the NC 54 and Little John Road is necessary to accommodate additional site traffic related to the Hillmont development. Separation of the Little John Road northbound approach to left and right-turn lanes improves operational efficiency in this vicinity. No other intersection maximum queue results indicate potential queue spillback.
Appropriateness of Acceleration/Deceleration Lanes	Generally, existing roadway facilities have appropriate auxiliary turn lanes to facilitate traffic flow. Additional southbound and northbound turn lanes at the Barbee Chapel Road intersection with Finley Forest Drive / Future Hillmont Site Driveway would provide a safety and operational benefit by removing these traffic movements from the high volume through traffic streams along Barbee Chapel Road.
Pedestrian and Bicycle Analysis	Existing pedestrian access and connectivity is lacking along the Barbee Chapel Road corridor but is provided near the site via the paved off-road path along Stancell Drive. No bicycle facilities exist along Barbee Chapel Road within the project study area. The paved off-road path along Stancell Drive provides connectivity to other paved paths along the NC 54 corridor and pedestrian sidewalk/bicycle lanes in the Meadowmont and Friday Center areas.
Public Transportation Analysis	Public transportation service to the study area, and to the proposed site is adequate, with bus stops and multiple local and regional bus routes servicing the Friday Center and Meadowmont development. No bus service extends directly to serve the site, however.

Mitigation Measures/Recommendations

Planned Improvements

There are no North Carolina Department of Transportation or Town of Chapel Hill improvement projects for study area roadway facilities within the analysis year time frame of 2022-2026.

Background Committed Improvements

Several previous traffic impact studies for development projects in and near the study area recommended signal timing reoptimization for signalized intersections along the NC 54 (Raleigh Road) corridor by their respective build-out years. It is assumed that periodic signal timing reoptimization may occur for the NC 54 corridor by the year 2025, whether or not specifically needed by any of the proposed background traffic generating developments included in this study. No other geometric improvements or changes to study area transportation network facilities constructed by private development projects are expected by the 2025 Build-Out Year+1.



Applicant Committed Improvements

Based on the preliminary site plans and supporting development information provided, there are several specific transportation-related improvements proposed for the Barbee Chapel Apartments project. Internal and external improvements (shown schematically in **Figure ES-3**) include:

- Provision of two full movement access driveways connecting to Barbee Chapel Road.
- Provision of sidewalk along east side of Barbee Chapel Road

Necessary Improvements

Based on traffic capacity analyses for the 2025 design year for the Barbee Chapel Apartments development and analyses of existing study area turning bay storage lengths and site access, the following improvements are recommended as being necessary for adequate transportation network operations and safety (see **Figure ES-3**).

- Lengthen the northbound left-turn lane at the NC 54 / Barbee Chapel Road intersection to approximately 450 feet and appropriate taper, using the existing pavement section in the vicinity of Pearl Lane. Monitor and reoptimize coordinated signal timings at the signalized intersection.
- With the extension of the northbound left-turn lane and necessary taper, it is recommended that the northern proposed Site Driveway #1 be limited to right-turn in/right-turn out (RIRO) access.
- Along the site frontage, a consistent three-lane cross section on Barbee Chapel Road is recommended, allowing a development of a southbound left-turn lane with 100 feet of storage and appropriate taper at the southern proposed Site Driveway #2. This driveway should feature full ingress/egress access.
- A high visibility pedestrian crosswalk and median refuge is recommended across the south leg of the Barbee Chapel Road / southern Site Driveway #2 intersection.
- A sidewalk extension is recommended along the west side of Barbee Chapel Road to connect to existing sidewalk at Finley Forest and the recommended pedestrian crosswalk/median refuge.
- As mandated by NCDOT, construct a northbound right-turn lane with 50 feet of full storage at the northern Site Driveway #1.
- As mandated by NCDOT, construct a northbound right-turn lane with 100 feet of full storage at the southern Site Driveway #2.

These improvements are recommended due to site transportation needs due to the Barbee Chapel Apartments development.

Additional Necessary Improvements recommended in the Hillmont Residential TIA include the following. These are related to specific impacts from the Hillmont development traffic and would not be necessary if the Hillmont site is not constructed.

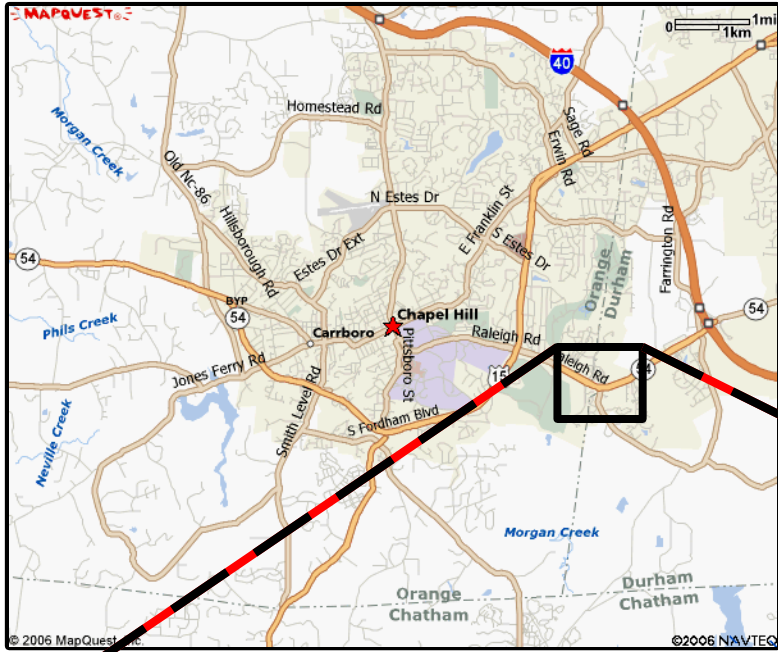
- Construct a right-turn lane at the northbound Barbee Chapel Road approach at the NC 54 intersection, with 125 feet of storage utilizing existing pavement and widening along frontage of the existing gas station up to its existing access driveway along Barbee Chapel Road.
- Upgrade NC 54 / Barbee Chapel Road signal for northbound right-turn overlap signal phase and retime signal. For the 2026 future year analysis, if both the Barbee Chapel Apartments and Hillmont sites are constructed, monitor and re-time the signal upon completion of the Hillmont site.







Town of Chapel Hill: Transportation Impact Analysis

Barbee Chapel Apartments – Proposed Residential Development

- Construct a 150 foot southbound left-turn lane and appropriate taper at the Barbee Chapel Road and Finley Forest Drive / Hillmont Site Driveway intersection. The intersection design and adjustment in alignment for through travel lanes along Barbee Chapel Road should allow for the creation of a northbound left-turn lane with 100 feet of minimum storage and appropriate taper.
- Stripe separate left-turn and through/right-turn lanes at the Finley Forest Drive approach.
- Provide a pedestrian crosswalk across the south leg of the Barbee Chapel Road / Finley Forest Drive approach.
- Restripe the current northbound approach at the NC 54 / Little John Road intersection for separate left-turn and right-turn lanes, with small amount of roadway widening, as needed.
- Extend the existing westbound left-turn bay at the NC 54 / Little John Road intersection to 250 feet of vehicle storage and appropriate taper.
- Extend the existing paved off-road multi-use path on the south side of Stancell Drive across the proposed Barbee Chapel Apartments site frontage.
- Per Town Mobility Plan recommendations, remaining sidewalk north of Finley Forest Drive to NC 54 along Barbee Chapel Road should be constructed.

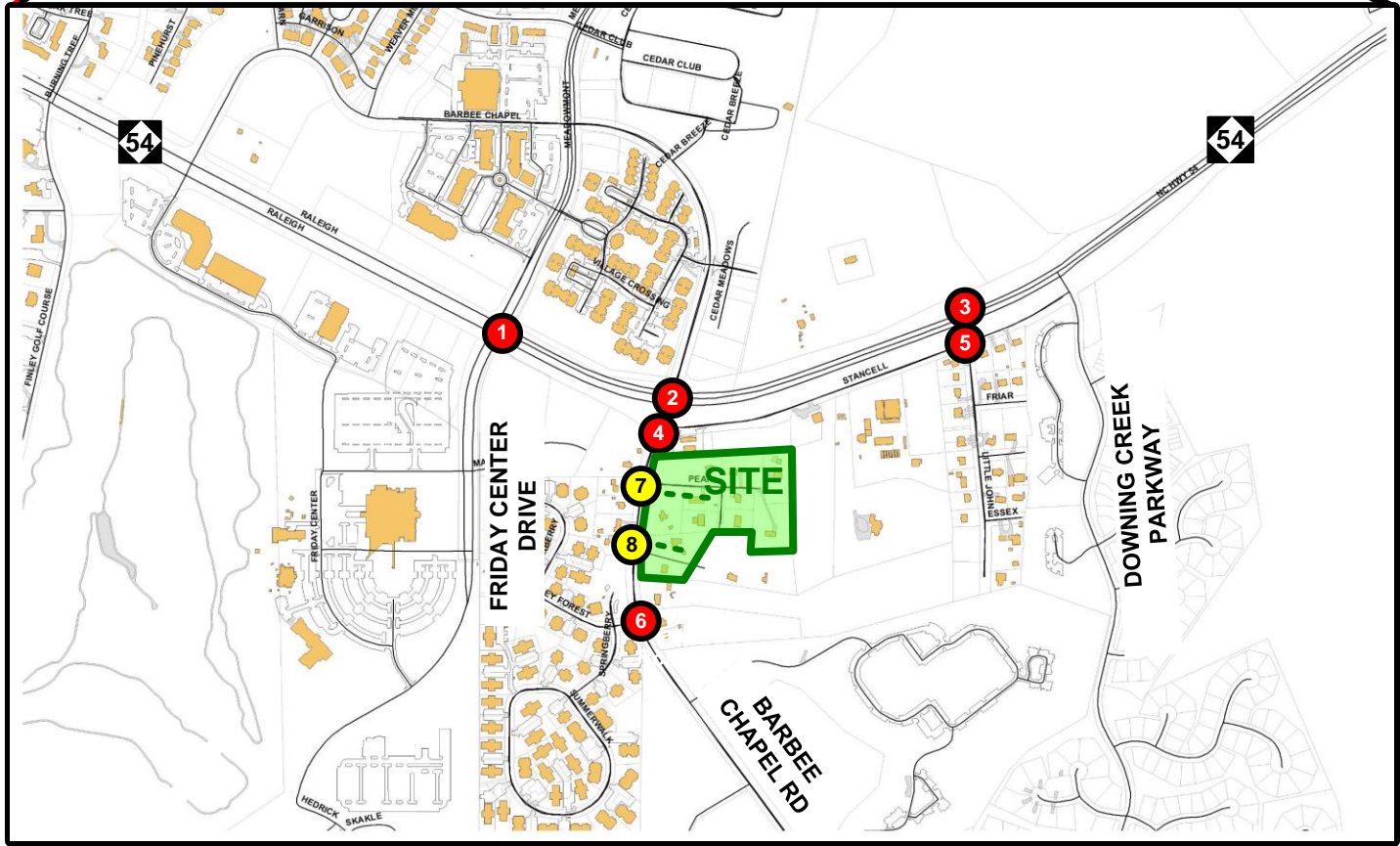


LEGEND

-  = Existing Building Footprint
-  = Existing Study Area Intersection
-  = Proposed Site Driveway
-  = Proposed Barbee Chapel Apts Site



NOT TO SCALE



Source: Town of Chapel Hill GIS Files



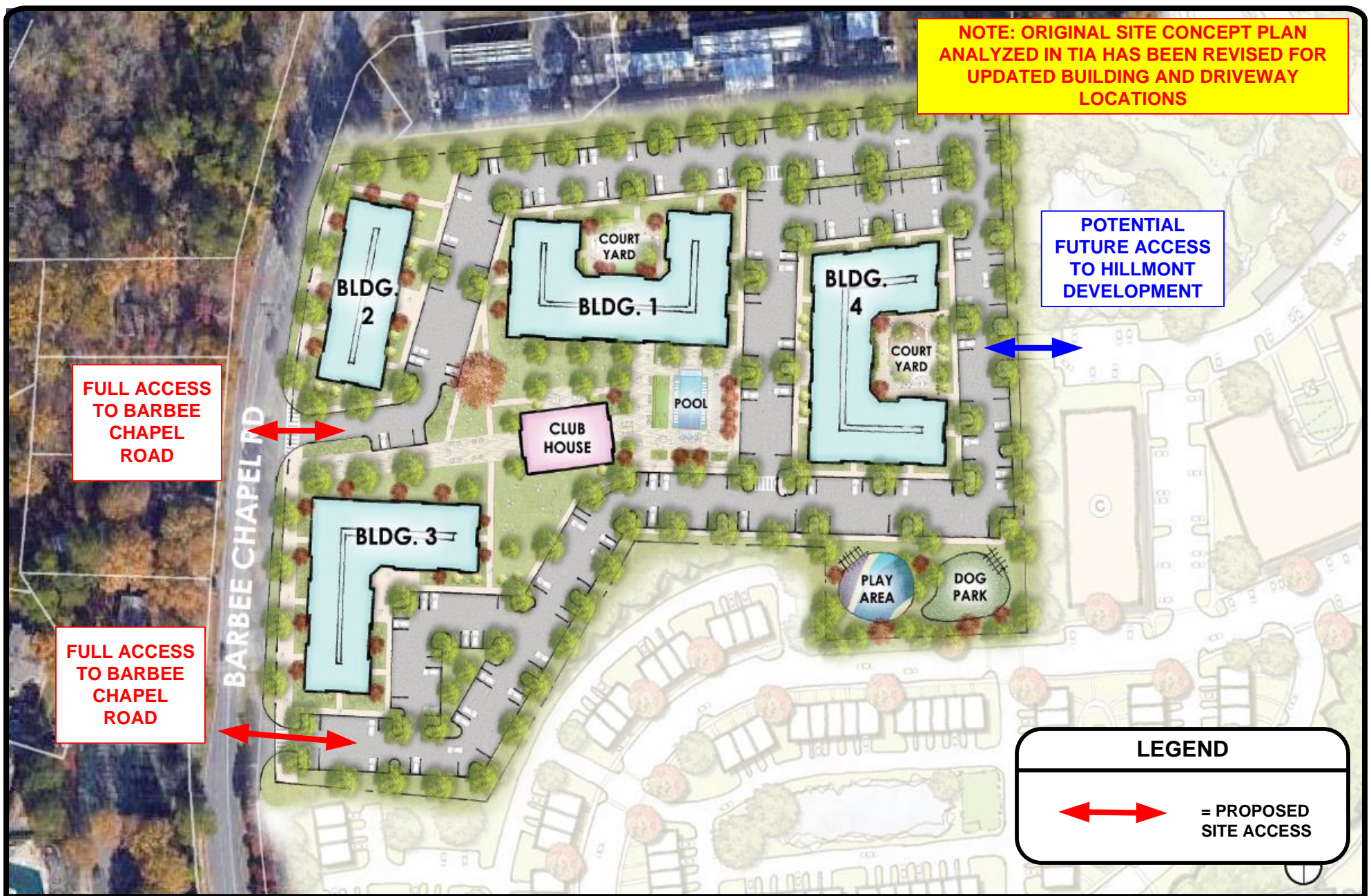

**Barbee Chapel Road Apartments
Transportation Impact Analysis**

PROJECT STUDY AREA


DATE: April 2023

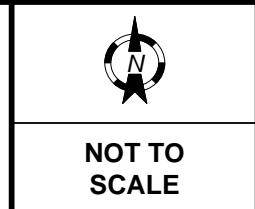
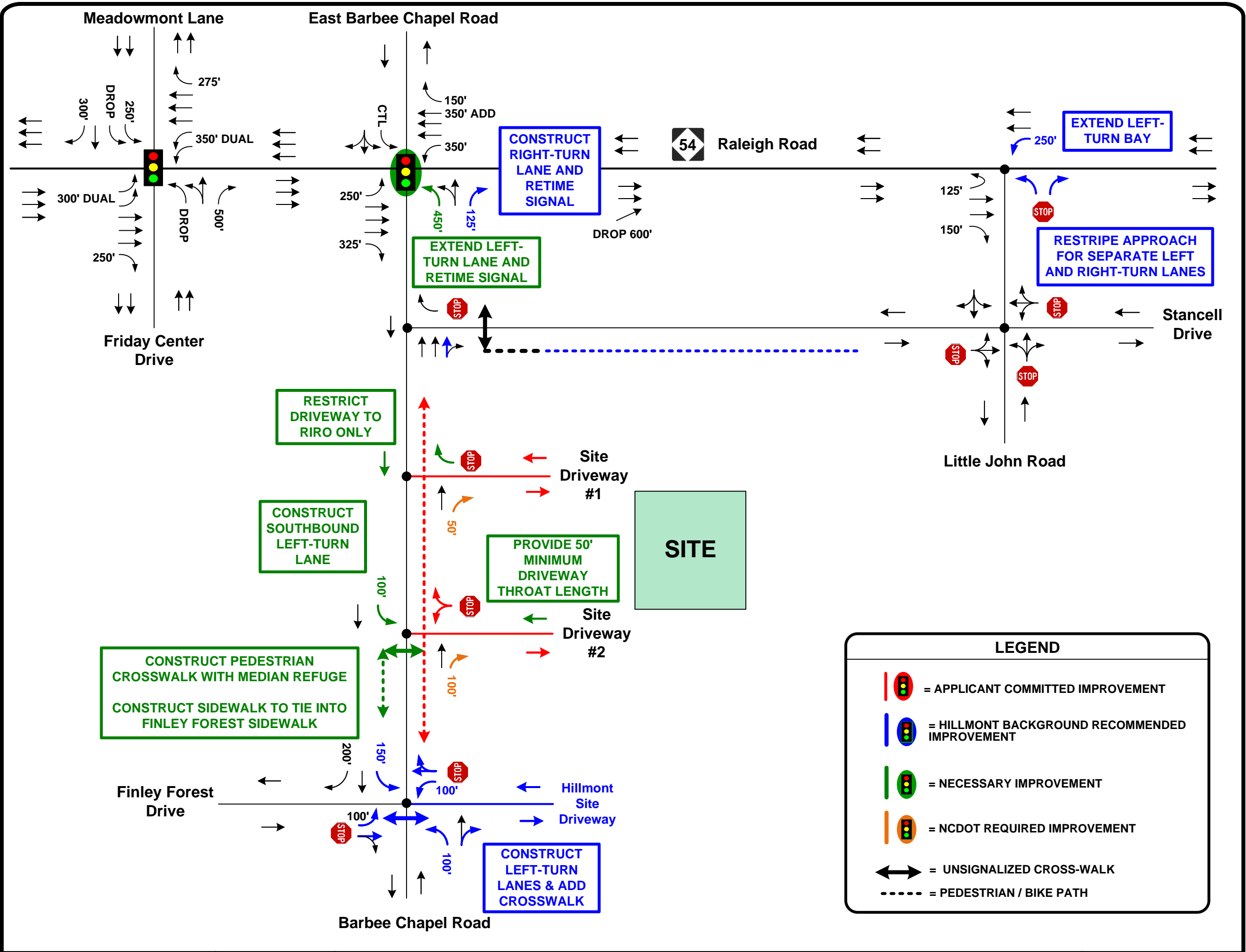
FIGURE ES-1

NOTE: ORIGINAL SITE CONCEPT PLAN ANALYZED IN TIA HAS BEEN REVISED FOR UPDATED BUILDING AND DRIVEWAY LOCATIONS



LEGEND

 = PROPOSED SITE ACCESS



Barbee Chapel Road Apartments
 Transportation Impact Analysis

COMMITTED AND RECOMMENDED IMPROVEMENTS

DATE: April 2023

FIGURE ES-3