CHAPEL HILL COOPERATIVE PRESCHOOL

TRAFFIC IMPACT STUDY

EXECUTIVE SUMMARY

Prepared for:

The Town of Chapel Hill
Public Works Department - Engineering

Prepared by:

HNTB North Carolina, PC

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Suite 200
Raleigh, NC 27609

NCBELS License #: C-1554

December 2017

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Project Overview

A new institutional development, known as the Chapel Hill Cooperative Preschool, located along Mount Carmel Church Road near its intersection with US Highway 15-501 is being proposed in Chapel Hill. The project proposes to construct a 9,000 square feet preschool with an ultimate student population of 100 and 22 staff (originally studied as 80 students and 20 staff) on several existing parcels on the north side of Mt. Carmel Church Road. **Figure ES-1** shows the general location of the site. The project is anticipated to be fully complete by 2018. This report analyzes the complete build-out scenario for the year 2019 (one year after anticipated completion), the no-build scenario for 2019, a 2022 future scenario to include the full effects of the nearby Obey Creek development, as well as 2017 existing year traffic conditions.

The proposed site concept plan shows a single restricted movement access driveway (right-turn in/right-turn out only) along Mt. Carmel Church Road. No other vehicular access connections are proposed. **Figure ES-2** displays the preliminary site plan for the Chapel Hill Cooperative Preschool and nearby land uses and roadways. The project is expected to provide 37 parking spaces and eight parent drop-off parking stalls on surface parking lots.

This report analyzes and presents the transportation impacts that the Chapel Hill Cooperative Preschool will have on the following intersections in the project study area:

- US 15-501 and Mt. Carmel Church Road / Culbreth Road
- US 15-501 and Arlen Park Drive / Bennett Road
- Mt. Carmel Church Road and Bennett Road
- Mt. Carmel Church Road and proposed Site Driveway (Right-turn In/Right-turn Out Only)

The impacts of the proposed site at the study area intersections have been evaluated during the AM, noon, and PM peak hours of an average weekday.

Existing Conditions

Study Area

The site is located in southern Chapel Hill along Mt. Carmel Church Road in the northeast quadrant of its signalized intersection with US 15-501. The study area also contains the signalized intersection of US 15-501 and Arlen Park Drive / Bennett Road along with the existing unsignalized stop-controlled intersection at Mt. Carmel Church Road / Bennett Road just upstream of the site. US 15-501 is a major arterial facility providing connectivity between downtown Chapel Hill and the UNC Main Campus with the NC 54 Bypass and US 15-501 corridors. Remaining study area network roadways are either minor arterial or collector roadways or local neighborhood access streets.

Site Traffic Generation

With the addition of new peak hour preschool-related trips during the weekday AM, noon, and PM peak hours, there are potential site traffic impacts to the study area intersections. **Table ES-1** shows the site trip generation details. A detailed comparison of site trip generation data was made through comparisons from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, Version 9*, the North Carolina Department of Transportation Municipal, School Transportation Assistance (NCDOT MSTA) school trip generation calculation spreadsheet, and actual field recorded data from the existing Chapel Hill Cooperative Preschool sites taken over a three day period in October 2016. Since the actual field collected data will likely most closely resemble future trip generation conditions at the new

preschool site, an expansion factor was applied to it to estimate 2019 future ultimate build-out trip generation estimates for the site.

Table ES-1
Weekday Vehicle Trip Generation Summary - Chapel Hill Cooperative Preschool

Trip Generation Statistic	Daily			AM Peak Hour			Noon Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Existing Trip Generation Data (Approximately 80 Students / 20 Staff)	173	173	346	33	29	62	6	6	12	32	36	68
Ultimate Expansion (100 Students / 22 Staff)	**216**	**216**	**433**	**41**	**36**	**78**	**8**	**8**	**16**	**40**	**45**	**85**

Background Traffic
Background traffic growth for the 2019 and 2022 analysis years is expected to come from two sources - ambient regional traffic growth and specific development-related traffic growth. Based on existing information, no Town-approved or recently completed development projects near the project study area are expected to add to background traffic growth by the 2019 analysis year. All remaining estimated traffic growth in the area during this period is assumed to occur due to overall region-wide ambient growth. To account for this, an ambient area-wide traffic growth percentage of 1.2 percent per year was applied to existing traffic volumes based on information from the historic daily traffic growth patterns in the project study and consistent with recent traffic impact studies completed near the project study area. For the 2022 analysis, it was assumed that the Obey Creek development would be built-out and its projected traffic volumes would be included in this future year analysis, along with continuing ambient area-wide growth.

Impact Analysis

Peak Hour Intersection Level of Service (LOS)
Study results indicate existing traffic operations at all study area intersections are acceptable during all three peak hours in 2017. With additional background traffic growth and the addition of site traffic in the 2019 analysis year, the Mt. Carmel Church Road / Bennett Road intersection will experience deficient operational conditions if the NCDOT U-5854 roundabout project is not constructed. With the roundabout constructed, operations at this intersection improve considerably for all scenarios studied. No additional study area intersection is expected to experience deficient traffic operations in any peak hour in the 2019 Without Site or 2019 With Site scenarios. Signal timing improvements to the US 15-501 study area intersections will allow their overall operations to remain at 2019 Without Site levels, even with site traffic included. 2022 analysis results indicate the Obey Creek project will add delays to all study area intersections. Additional recommended improvements from the Obey Creek traffic impact study or additional system-wide improvements to the US 15-501 and NC 54 Bypass (Fordham Boulevard) corridors, currently under study by the NCDOT and Town of Chapel Hill, are necessary to address congestion and operational deficiencies outside the preschool study area. These improvements are needed as a result of existing traffic congestion and background traffic growth primarily related to the Obey Creek proposed development.

A summary of the traffic operations for each intersection, related to vehicular delays (intersection average as a whole if signalized, critical movement if stop-controlled) and the corresponding Level-of-Service (LOS) is shown in **Table ES-2** on the following page.

Table ES-2. Intersection Capacity Analysis Summary

Intersections	Peak Hour	2017 Existing		2019 No-Build		2019 Build		2019 Mitigated		2022 Build	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
US 15-501 & Mt. Carmel Church Road - Culbreth Road	AM	D	41.8	D	43.6	D	46.9	D	43.7	D	54.1
	NOON	B	17.6	B	17.1	B	17.2	B	15.9	B	18.7
	PM	C	31.8	C	33.2	D	37.4	C	29.7	D	45.7
US 15-501 & Arlen Park Drive - Bennett Road	AM	B	16.7	B	17.0	B	17.0	B	14.5	B	18.2
	NOON	A	8.4	A	8.5	A	8.6	A	7.2	A	7.6
	PM	A	8.5	B	10.1	B	10.2	A	9.1	B	11.7
Mt. Carmel Church Road & Bennett Road **(STOP)**	AM	D*	32.2*	E*	36.0*	***F****	***250****	N/A	N/A	N/A	N/A
	NOON	B*	14.6*	B*	14.9*	B*	14.9*	N/A	N/A	N/A	N/A
	PM	C*	21.3*	C*	22.2*	***F****	***71.7****	N/A	N/A	N/A	N/A
Mt. Carmel Church Road & Bennett Road **(ROUNDABOUT)****	AM	A	9.4	A	9.7	B	10.7	N/A	N/A	B	12.2
	NOON	A	5.2	A	5.3	A	5.3	N/A	N/A	A	5.5
	PM	A	8.5	A	8.7	A	9.4	N/A	N/A	B	10.4
Mt. Carmel Church Road & Site Driveway*	AM	N/A	N/A	N/A	N/A	C*	21.1*	N/A	N/A	C*	16.1*
	NOON	N/A	N/A	N/A	N/A	B*	14.8*	N/A	N/A	B*	10.4*
	PM	N/A	N/A	N/A	N/A	B*	28.2*	N/A	N/A	B*	11.9*

N/A – Not Applicable or No Improvements Necessary
BOLD/ITALICS – Critical Movement or Overall Intersection Requires Mitigation Per Town TIS Guidelines
* - Worst-Case LOS/Delay for Unsignalized/Stop-Controlled Critical Movement
** - Roundabout Expected to be Complete in 2018 – Stop-Controlled Analysis in 2019 For Comparative Purposes Only

Access Analysis

Vehicular site access is to be accommodated by a single restricted (RIRO) access driveway connecting to Mt. Carmel Church Road about 575 feet to the east of its signalized intersection with US 15-501. Design details related to driveway throat length are shown on the site plan and assume an approximate 50 foot driveway throat at this driveway, which is consistent with a required 50 foot throat depth in Figure 3.9 of the 2017 *Chapel Hill Public Works Engineering Design Manual*. Driveway distances along Mt. Carmel Church Road from the signalized intersection at US 15-501 and the adjacent Old Bridge Road intersection are approximately 575 feet and 275 feet, respectively, and are acceptable, based on recommendations of 100 foot minimum corner clearance between driveways and intersections, as set forth in the 2003 *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and the 100 foot minimum separation along collector streets specified in the Town Design Manual. The proposed spacing between the proposed driveway and adjacent existing driveways is more than the recommended 50 foot spacing between adjacent driveways along collector roadways found in Table 3.2 in the Town Design Manual.

Access for pedestrians and bicyclists exists in the project study area, though not specifically along Mt. Carmel Church Road to the proposed site. Sidewalk is present on the west side of US 15-501 and exists along the major street connection along Culbreth Road. Crosswalk and pedestrian signals exist in at least one quadrant of the signalized study area intersections near the Chapel Hill Cooperative Preschool site. Specific bicycle amenities are present along US 15-501 with striped lanes present in both directions. The Morgan Creek Greenway system and additional paved path linkages are present west of the US 15-501 corridor, along the creek and under the James Taylor Bridge.

Crash Analysis
Data from the NCDOT Traffic Safety Unit TEAAS crash database was extracted for the most recent five-year periods for the Mt. Carmel Church Road corridor and its intersections with Bennett Road and US 15-501. The primary crash types at all locations were rear-end and angle crashes. Overall, the number and severity of crashes along the corridor are higher than statewide averages for a similar facility. The NCDOT proposed roundabout project at Bennett Road and the recently completed restriping of the Mt. Carmel Church Road approach at US 15-501 should mitigate some of the issues causing the higher than normal crash rates.

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 Volume-Capacity	Due to the fact that the proposed site will add less than 500 daily trips to the study area network, no long-range daily v/c analysis was conducted for this study.
Turn Lane Storage Requirements	Storage bay lengths at study area intersections were analyzed using Synchro and HCS 95th percentile (max) queue length estimates for the 2019 and 2022 Build Scenarios. The US 15-501 and Mt. Carmel Church Road / Culbreth Road intersection westbound approach has projected queues that near the capacity of its current redesigned storage bays that may need additional mitigation by retiming the signalized intersection to prevent excessive queue spillback that would block the proposed site driveway. No other recommendations for improvements to storage bays are expected, based on the analysis results.
Appropriateness of Acceleration/ Deceleration Lanes	The site concept plan shows no specifics related to acceleration/deceleration lanes. Based on previous recommendations from NCDOT regarding this project, and considering the need to provide efficient operations in the vicinity of the site driveway intersection, a 100 foot deceleration taper for right-turns into the site is recommended. No other specific acceleration/deceleration lane issues were analyzed.
Pedestrian and Bicycle Analysis	Existing pedestrian and bicycle access and connectivity exists along the US 15-501 corridor adjacent to the site, but no amenities for pedestrians or bicycles exist along Mt. Carmel Church Road adjacent to the site. Sidewalk exists along the US 15-501 corridor and pedestrian crossings and signals are present on at least one quadrant of signalized intersections. Delineated bicycle lanes are present along the corridor in the project study area. The Morgan Creek Trail Greenway has access to existing roadway facilities and adjacent neighborhoods and may provide the best non-motorized connection for the proposed site.
Public Transportation Analysis	Bus service to the study area and proposed site, is available with bus stops located along US 15-501 and Culbreth Road and local CHT bus routes serving the area. However, no direct access connections from the stops to the site currently exist and no stops exist along US 15-501 in the northbound direction near Mt. Carmel Church Road.

Mitigation Measures/Recommendations

Planned Improvements

NCDOT STIP U-5864 proposes to construct a single-lane roundabout at the intersection of Mt. Carmel Church Road and Bennett Road, with construction occurring in 2018. To account for this improvement project, all 2019 and 2022 analysis conditions for this study include a scenario that assesses the operational performance of the proposed roundabout given its design parameters and anticipated traffic volumes.

There are no other Town of Chapel Hill or North Carolina Department of Transportation improvement projects for study area roadway facilities within the analysis year time frame of 2017-2022. NCDOT continues to study the US 15-501 corridor in and around Chapel Hill through feasibility studies and NCDOT Strategic Prioritization studies, but no committed projects are expected in the 2017-2022 timeframe. NCDOT has an identified STIP project (U-5304A) that may provide improvements to the NC 54 Bypass interchange, and US 15-501 in the vicinity of the interchange, included as part of its design, but no committed design exists at this time. U-5304A is currently slated for construction beginning in 2026.

Background Committed Improvements

There are no specific geometric or operational improvements to study area roadway intersections or facilities related to background private development projects that are expected to be completed between 2017 and 2019. Additional changes and improvements to intersections along the US 15-501 corridor that were recommended/committed to as part of the Obey Creek Mixed-Use development are all located at intersections that are beyond the specific study area for the Chapel Hill Cooperative Preschool. One recommended improvement from the Obey Creek study, the pavement marking restriping on Mt. Carmel Church Road and signal design and timing upgrades at its intersection with US 15-501 have recently been completed.

Applicant Committed Improvements

Based on the site concept plan and supporting development information provided, there are the following specific transportation-related improvements proposed adjacent to the Chapel Hill Cooperative Preschool:

- Construction of a concrete median along Mt. Carmel Church Road at the proposed site driveway to block ingress and egress of left-turning vehicles along with appropriate signage to prevent wrong-way maneuvers.

- Commitment to providing an easement along Mt. Carmel Church Road site frontage to connect to the Morgan Creek Greenway system.

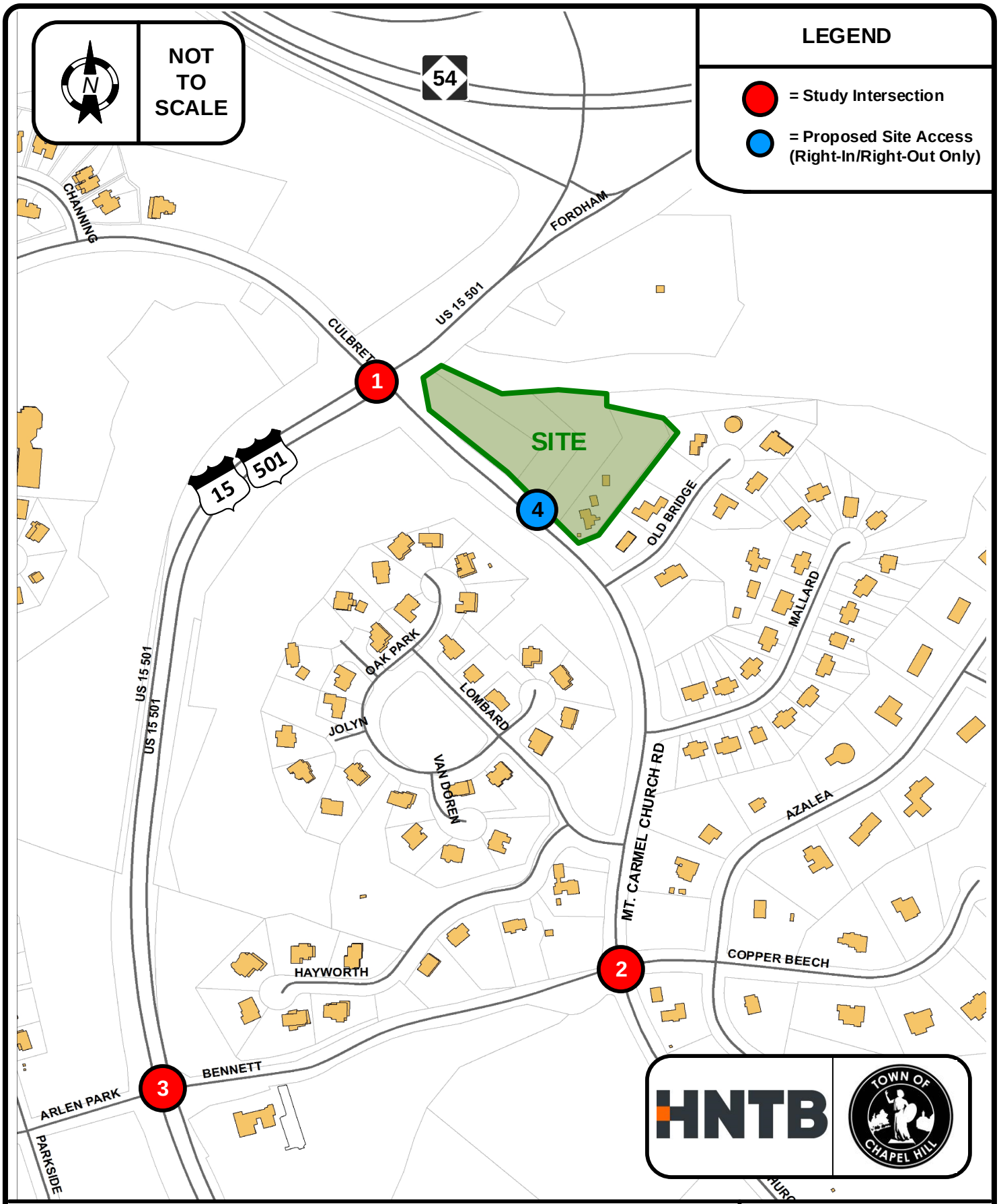
Necessary Improvements

Based on traffic capacity analyses for the 2019 build-out+1 year and 2022 future analysis year, and analyses of the proposed site plan and internal driveways/circulation, the following improvements are recommended as being necessary for adequate transportation network operations (see **Figure ES-3**).

1) Retime the traffic signals along the US 15-501 corridor from the NC 54 Bypass interchange through Arlen Park Drive / Bennett Road to offset the impacts of site-related traffic and ensure that queuing along Mt. Carmel Church Road can be contained as efficiently as possible within the existing 375 foot dual right-turn lane configuration.

2) To provide safe and efficient operations in the direct vicinity of the proposed site driveway along Mt. Carmel Church Road, a dedicated 100 foot right-turn taper (matching previous NCDOT recommendations) should be constructed along Mt. Carmel Church Road.

These recommendations assume the construction of the NCDOT STIP U-5864 roundabout at Mt. Carmel Church Road / Bennett Road occurs before the preschool is built-out. If the U-5864 project is delayed, it is recommended that the Applicant coordinate with school staff and parents to inform them that traffic needs to use the alternative route inbound of US 15-501 to Bennett Road to Mt. Carmel Church Road. Operational results for this scenario indicate that this alternative may lead to lengthy delays for site trips at the eastbound Bennett Road stop-controlled approach. Construction of the roundabout will eliminate these operational issues and should provide a quicker means of accessing the site.

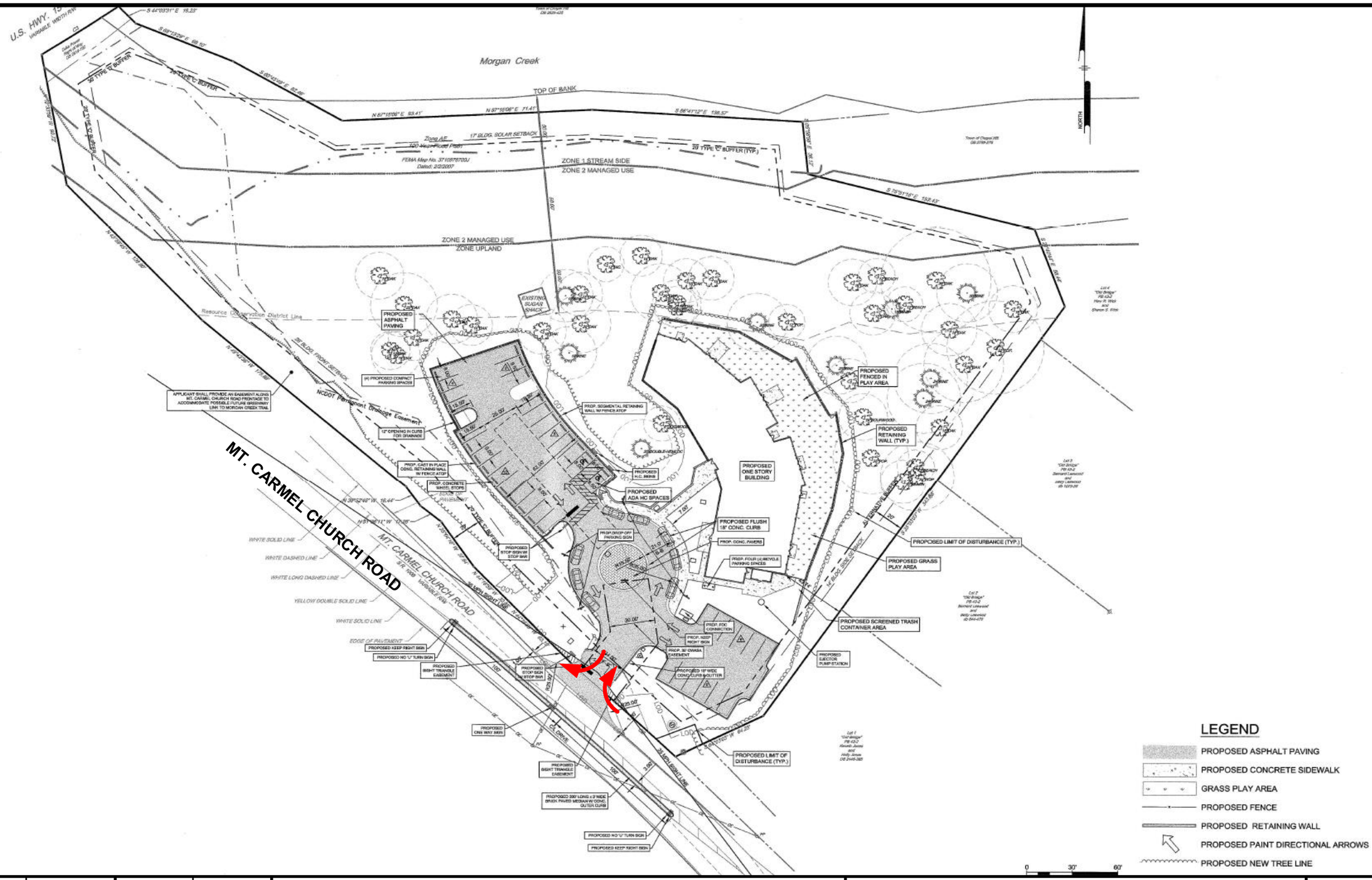


Chapel Hill Cooperative Preschool
Traffic Impact Study

PROJECT STUDY AREA

DATE: December 2017

FIGURE ES-1



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NOT TO SCALE

LEGEND

↔ = PROPOSED SITE ACCESS

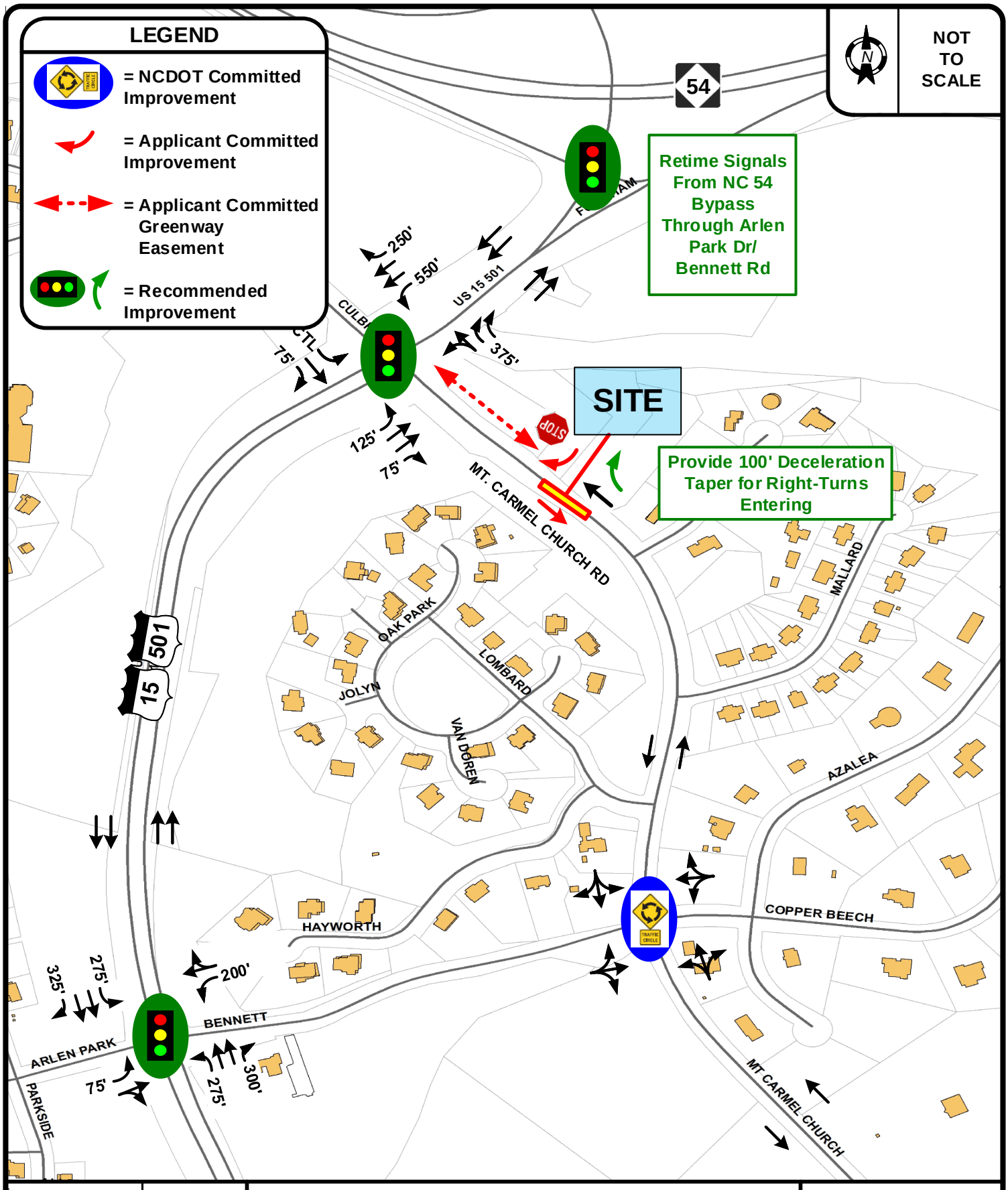
Chapel Hill Cooperative Preschool

Traffic Impact Study

DATE: December 2017

SITE CONCEPT PLAN

FIGURE ES-2



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TOWN OF CHAPEL HILL

Chapel Hill Cooperative Preschool
Traffic Impact Study

COMMITTED AND RECOMMENDED IMPROVEMENTS

DATE: December 2017

FIGURE ES-3