

COLUMBIA STREET ANNEX

TRAFFIC IMPACT STUDY

EXECUTIVE SUMMARY



Prepared for:

The Town of Chapel Hill
Engineering Department

Prepared by:

HNTB North Carolina, PC

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NCBELS License #: C-1554

August 2014

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8-1-14



EXECUTIVE SUMMARY

Project Overview

A commercial/residential mixed-use development, known as the Columbia Street Annex, located along NC Highway 86 (S. Columbia Street) near its intersection with the NC Highway 54 Bypass is being proposed in Chapel Hill. The project proposes to construct 39 residential units and 7,150 square feet of office/retail space on two existing parcels on the west side of S. Columbia Street. **Figure ES-1** shows the general location of the site. The project is anticipated to be fully complete by 2016. This report analyzes the complete build-out scenario for the year 2017 (one year after anticipated completion), the no-build scenario for 2017, as well as 2014 existing year traffic conditions.

The proposed site concept plan shows a single full movement access driveway along S. Columbia Street. No other vehicular access connections are proposed. **Figure ES-2** displays the preliminary concept plan of the Columbia Street Annex and nearby land uses and roadways. The project is expected to provide 68 parking spaces on surface parking lots and an underground garage. This report analyzes and presents the transportation impacts that the Columbia Street Annex will have on the following intersections in the project study area:

- NC 86 (S. Columbia Street) and Purefoy Road/Proposed Site Driveway
- NC 86 (S. Columbia Street) and NC 54/US 15-501 Bypass Westbound Ramps
- US 15-501 and NC 54 Bypass Eastbound Ramps

The impacts of the proposed site at the study area intersections will be evaluated during the AM, noon, and PM peak hours of an average weekday. The following study is based on background traffic for the existing year, 2014, the year following the estimated site build out year of 2016, as well as the estimated site-generated traffic produced by the mixed-use development.

Existing Conditions

Study Area

The site is located in southern Chapel Hill along NC 86 (S. Columbia Street) in the northwest quadrant of its interchange with the NC 54 Bypass. The study area contains two signalized intersections at the interchange ramp terminals. It also includes the existing unsignalized stop-controlled intersection at Purefoy Road adjacent to the site.

NC 86 (S. Columbia Street) 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 interchange access ramps or local neighborhood access streets.

Site Traffic Generation

With the addition of new peak hour 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, with generation rates and methodologies taken from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, Version 9*.



Table ES-1
Weekday Vehicle Trip Generation Summary
Columbia Street Annex

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
Raw Total	333	333	666	9	21	30	23	25	48	38	28	66
Transit/Ped/Bike Reduction	-50	-50	-100	-1	-3	-5	-3	-4	-7	-6	-4	-10
Vehicular Driveway Trips	283	283	566	8	18	25	20	21	41	32	24	56
Pass-By Trips (Retail Only)	-26	-26	-52	-0	-0	-0	-2	-3	-5	-4	-5	-9
New Vehicular Trips Added to Network	257	257	514	8	18	25	18	18	36	28	19	47

* - No ITE Data Available, Assumed Average of AM/PM Peak Hour Data

Background Traffic

Background traffic growth for the 2017 analysis year is expected to come from two sources - ambient regional traffic growth and specific development-related traffic growth. Based on existing information, two Town-approved or recently completed development projects near the project study area are planned to be contribute to background traffic growth by the 2017 analysis year. All remaining estimated traffic growth in the area 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 (NCDOT and Town of Chapel Hill daily traffic information) and consistent with recent traffic impact studies completed near the project study area.

Impact Analysis

Peak Hour Intersection Level of Service (LOS)

Study results indicate existing traffic operations at all study area intersections are acceptable during the AM and Noon peak hours. In the PM peak hour, the signalized ramp terminal intersections at the NC 54 Bypass operate at a LOS F given current traffic levels and signal timing information. Retiming these signals for anticipated 2017 traffic volumes improves the PM peak deficient operations. Even with the addition of peak hour site-generated trips to the projected 2017 background traffic volumes, no additional study area intersections are expected to experience deficient traffic operations in any peak hour. However, capacity analysis results, if recommended improvements at Purefoy Road and the proposed site driveway are implemented, show a decline in worst-case stop controlled delay and LOS, but this is offset by potential safety improvements in this area.

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. Columbia Street Annex
LOS and Delay (Seconds/Vehicle) Summary**

Intersections	Peak Hour	2014 Existing		2017 No-Build		2017 Build		2017 Mitigated	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
NC 86 (S. Columbia St.) & Purefoy Road	AM	D	27.0	D	29.4	D	30.1	E**	36.5**
	NOON	C	15.3	C	16.1	C	16.4	C**	20.7**
	PM	E	36.1	E	42.5	E	44.4	F**	93.1**
NC 86 (S. Columbia St.) & NC 54 Bypass Westbound Ramps	AM	C	27.0	C	22.8	C	22.8	N/A	N/A
	NOON	C	23.6	C	21.5	C	21.6	N/A	N/A
	PM	E	68.9	D	52.7	D	52.8	N/A	N/A
US 15-501 & NC 54 Bypass Eastbound Ramps	AM	C	34.4	C	24.6	C	24.6	N/A	N/A
	NOON	A	9.9	B	11.6	B	11.6	N/A	N/A
	PM	F	93.0	B	15.2	B	15.2	N/A	N/A
NC 86 (S. Columbia St.) & Site Driveway*	AM	N/A	N/A	N/A	N/A	C*	21.1*	N/A	N/A
	NOON	N/A	N/A	N/A	N/A	B*	14.8*	N/A	N/A
	PM	N/A	N/A	N/A	N/A	D*	28.2*	N/A	N/A

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

** - Results for Realigned Site Driveway to Form Fourth Leg of Intersection

Access Analysis

Vehicular site access is to be accommodated by a single full movement access driveway connecting to S. Columbia Street about 425 feet to the north of its signalized intersection with the NC 54 Bypass westbound ramps. Design details related to driveway throat length are shown on the concept plan and assume an approximate 125 foot driveway throat at this driveway. An internal driveway circulation system to all surface and underground parking areas is also shown on the plans.

Driveway distances along S. Columbia Street from the signalized intersections at the NC 54 Bypass Westbound Ramps and Mason Farm Road (to the north of the study area) are acceptable, based on current standards. The proposed spacing between the proposed driveway and adjacent existing driveways (several that are approximately 250-500 feet north of the proposed driveway) is less than the recommended 750 foot spacing along arterial roadways found in Table 4-A-1 in the Town Design Manual.

Access for pedestrians and bicyclists is adequate in the project study area. Sidewalk is present on both sides of S. Columbia Street adjacent to the site and exists along the major street connections along S. Columbia Street. Crosswalk and pedestrian signals exist across the three major signalized study area intersections near the Columbia Street Annex site. Specific bicycle amenities are present along S. Columbia Street, with striped lanes present in both directions.

Crash Analysis

Data from the NCDOT Traffic Safety Unit was provided for recent three and five-year periods for all existing major study area intersections. The primary crash type at all locations was rear-end



crashes. Overall, the number and severity of crashes are low compared to other locations around Chapel Hill.

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** on the following page are germane to the scope of this study.

Table ES-3. Other Transportation-Related Analyses

Analysis	Comment
Long-Range Planning Level Daily Volume-Capacity Analysis	Due to the fact that the proposed site will add less than 600 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 95 th percentile (max) queue length estimates for the 2017 Build Scenario. The S. Columbia Street/NC 54 Bypass westbound ramps intersection westbound approach has existing and projected queues that exceed its current storage bays that may need additional geometric improvement in the future. Realignment of the proposed site driveway with Purefoy Road, along with some minor geometric changes to the Purefoy Road approach may allow the creation of a short left-turn storage area (1-2 vehicles) that may help operations at this intersection. 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, other than the creation of an exclusive northbound left-turn lane on S. Columbia Street. Based on existing cross-section details with the U-0624 project, corridor speeds on S. Columbia Street and capacity analysis results, no specific acceleration or deceleration lanes are recommended at proposed site access point. No other specific acceleration/deceleration lane issues were analyzed in the project study area.
Pedestrian and Bicycle Analysis	Existing pedestrian and bicycle access and connectivity is adequate along the S. Columbia Street corridor adjacent to the site. Sidewalk exists along the NC 86 and US 15-501 corridors and pedestrian crossings and signals are present on at least one quadrant of signalized intersections. An additional mid-block crosswalk exists 250 feet to the north of the proposed site along S. Columbia Street. Delineated bicycle lanes and wide outside lanes are present in the project study area. The Morgan Creek Trail Greenway has access in the area just to the south of the NC 54 Bypass, providing additional bicycle and pedestrian connectivity to the area.
Public Transportation Analysis	Public transportation service to the study area, and to the proposed site, is excellent with multiple bus stops and multiple local and regional bus routes on S. Columbia Street proximate to the site.



Mitigation Measures/Recommendations

Planned Improvements

There are no Town of Chapel Hill or North Carolina Department of Transportation improvement projects for study area roadway facilities within the analysis year time frame of 2014-2017.

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 2014 and 2017. To make a comparative assessment of potential improvements to signal timing (by optimizing signal cycle lengths, splits and offsets for projected 2017 traffic volumes) it was assumed that signal timing reoptimization would occur for the S. Columbia Street corridor by the year 2017 with or without the development of the Columbia Street Annex project.

Applicant Committed Improvements

Based on the preliminary site concept plans and supporting development information provided, there are the following specific external transportation-related improvements proposed adjacent to the Columbia Street Annex:

- Provision of a northbound left-turn lane and pavement marking modifications to the existing NC 86 (S. Columbia Street) southbound additional inside through travel lane that develops south of Purefoy Road.
- Provision of a crosswalk in this vicinity.
- Provision of continuous sidewalk along site frontage.

Necessary Improvements

Based on traffic capacity analyses for the 2017 design year, 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 (see **Figures ES-3 and 4**).

- 1) Retime the NC 54 Bypass interchange ramp terminal intersections to optimize overall capacity given the existing intersection geometrics and progression along NC 86 (S. Columbia Street) and US 15-501. Reoptimizing these two intersections with the rest of the US 15-501 corridor south of the interchange may improve operations at the signalized ramp terminals for 2017 build-out+1 year conditions, particularly in the PM peak hour.

The proposed signal timing improvements are recommended in order to mitigate existing system operational deficiencies and are recommended whether or not the Columbia Annex project is constructed.

- 2) To provide additional storage capacity for the NC 54 Bypass westbound off-ramp for 2017 build-out+1 year anticipated conditions, the existing inside left-turn lane storage bay at this approach to NC 86 (S. Columbia Street) should be lengthened from 275 feet to 650 feet. This will allow improved traffic flow during this signal phase and will improve the overall safety and efficiency of traffic flow at this intersection.

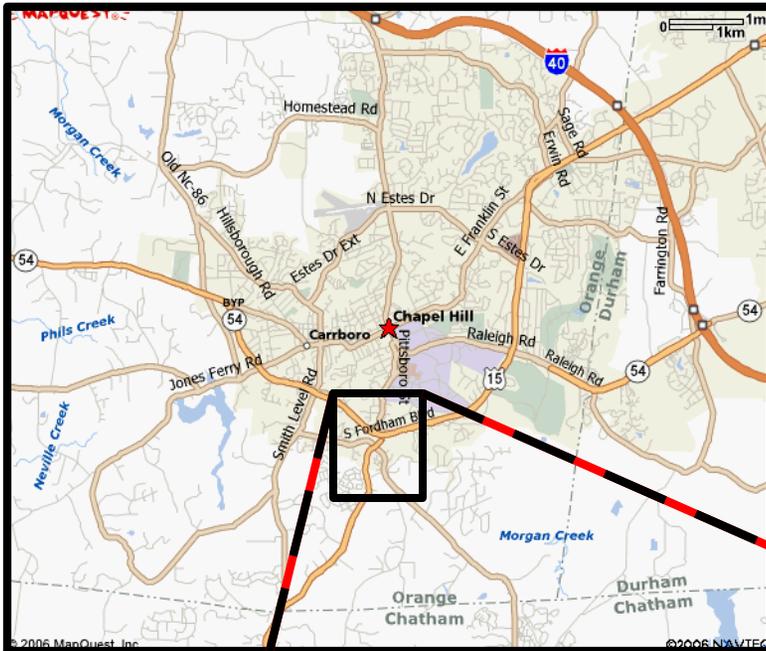


This improvement is recommended based on anticipated queue storage needs in 2017 with or without Columbia Street Annex site traffic impacts.

- 3) Due to the fact that the proposed site access driveway does not align with the existing Purefoy Road on the opposite side of NC 86 (S. Columbia Street), it is recommended that the Applicant consider investigating the feasibility for realigning the proposed site access to immediately opposite Purefoy Road. This improvement would not necessarily reduce the number of vehicular conflict points in this vicinity, but it would prevent left-turning movements from conflicting with each other from the driveway and Purefoy Road, and it would improve sight lines from the minor street approaches and provide a more orderly means of judging and accepting the limited available gaps in the high volume S. Columbia Street traffic pattern. In addition to this improvement, additional minor geometric modifications to this newly realigned intersection (see **Figure 14**) may enhance traffic operations and safety, as well as provide for the maximum amount of southbound through traffic storage at the adjacent NC 54 Bypass westbound off-ramp intersection, and provide for a short westbound left-turn pocket on Purefoy Road.

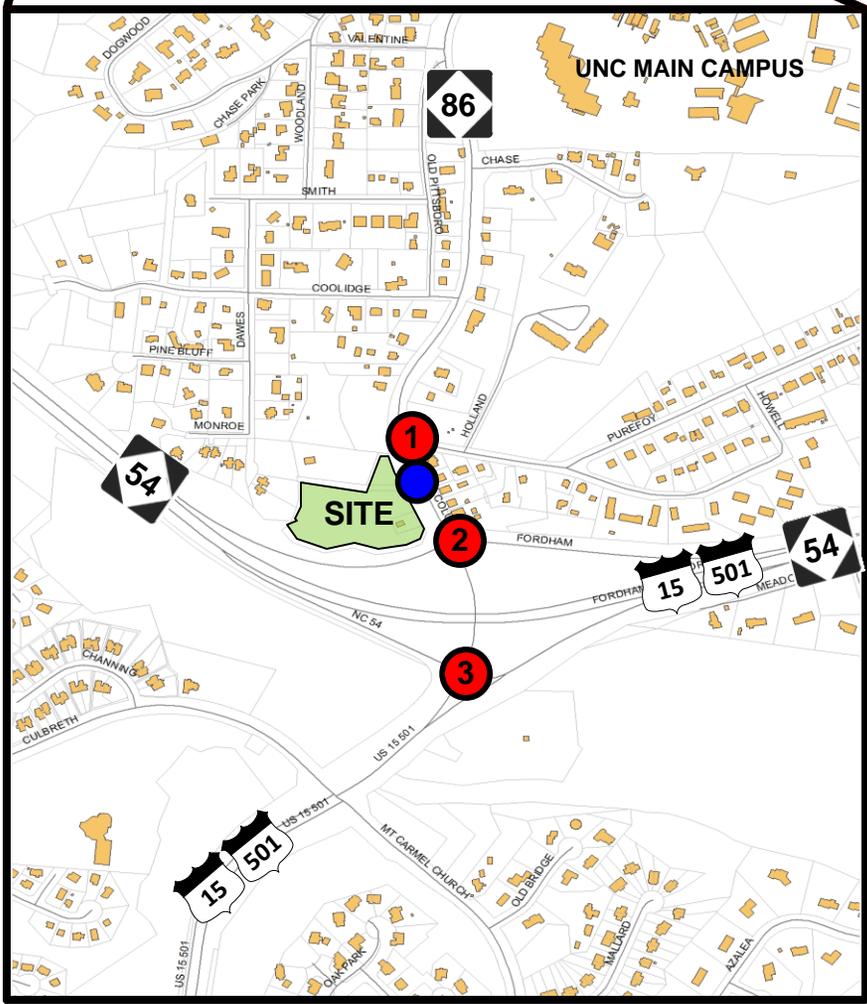
Capacity analysis results indicate that, though aligning the site driveway and Purefoy Road produces longer projected vehicular delays than if the driveway and Purefoy Road were operating as separate three-legged intersections with NC 86 (S. Columbia Street), in reality, there would be little safe opportunity for left-turning traffic from the site driveway and Purefoy Road to use the two-way left-turn lane refuge area (that is in actuality becomes a southbound through lane for NC 86). Aligning the driveway and Purefoy Road provides better clarity for delineation of acceptable gaps and turning movements. Maximum queue length results for the most critical approach (westbound left-turns) indicate there would be little difference (3-4 vehicles maximum queue) between the existing proposed offset configuration and the realigned configuration.

This improvement is recommended specifically for the Columbia Street Annex project.



LEGEND

-  = Existing Building Footprint
-  = Existing Study Area Intersection
-  = Proposed Site Driveway/Existing Intersection
-  = Proposed Site Parcel



**Columbia Street Annex
Traffic Impact Study**

PROJECT STUDY AREA MAP

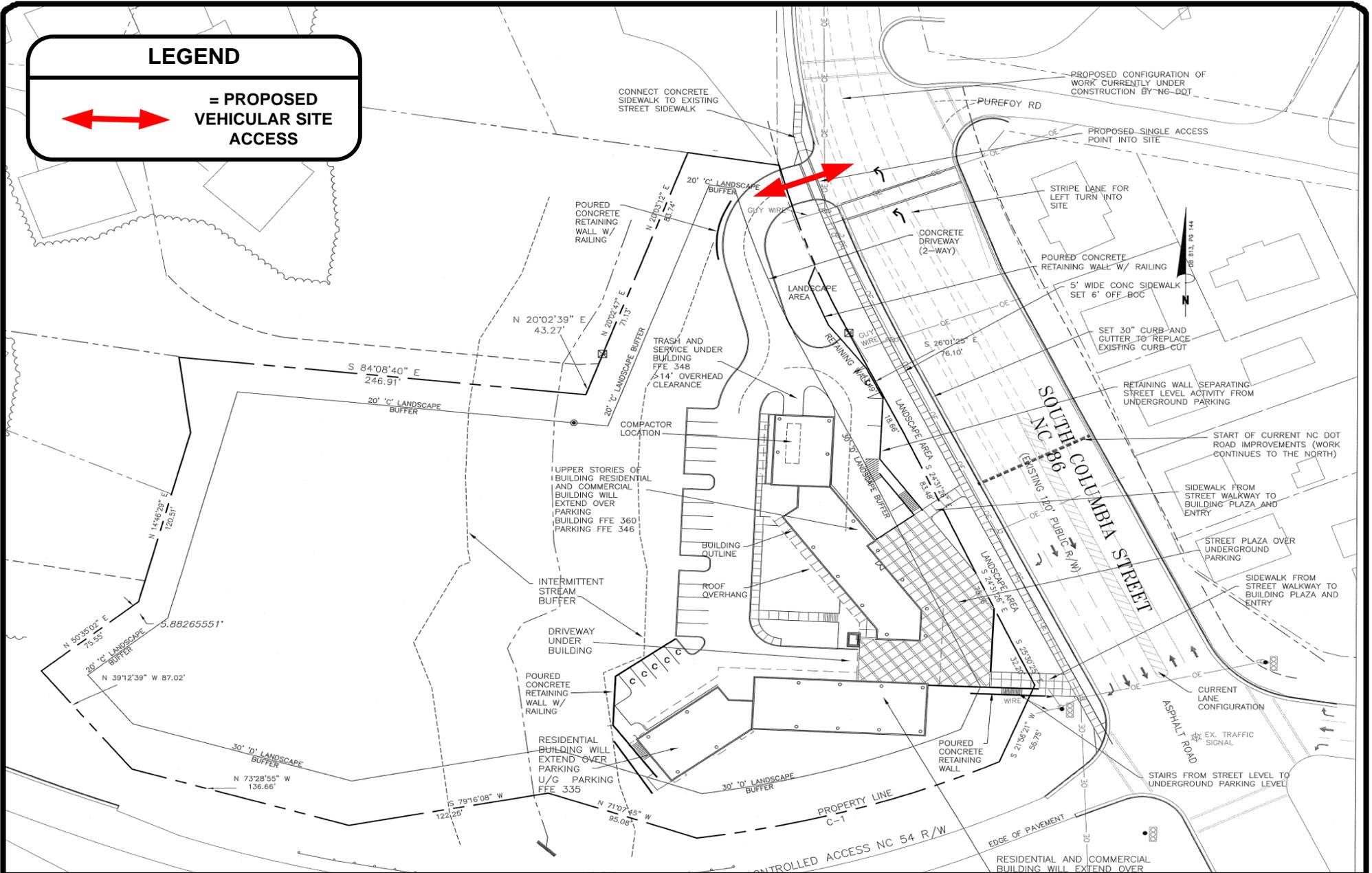
DATE: August 2014

FIGURE ES-1

LEGEND



**= PROPOSED
VEHICULAR SITE
ACCESS**



HNTB



**NOT
TO
SCALE**

**Columbia Street Annex
Traffic Impact Study**

SITE CONCEPT PLAN

DATE: August 2014

FIGURE ES-2



NOT TO SCALE

S. Columbia Street

LEGEND

-  = NECESSARY GEOMETRIC IMPROVEMENT
-  = NECESSARY SIGNAL TIMING IMPROVEMENT

Realign Driveway with Purefoy Road

Site Driveway

SITE

Purefoy Road

Extend Existing Left-Turn Bay

NC 54/US 15-501 WB Off-Ramp

NC 54 WB On-Ramp

Retime Signal



NC 54 EB Off-Ramp

NC 54/US 15-501 EB On-Ramp

Retime Signal



HNTB



Columbia Street Annex Traffic Impact Study

DATE: August 2014

COMMITTED AND RECOMMENDED IMPROVEMENTS

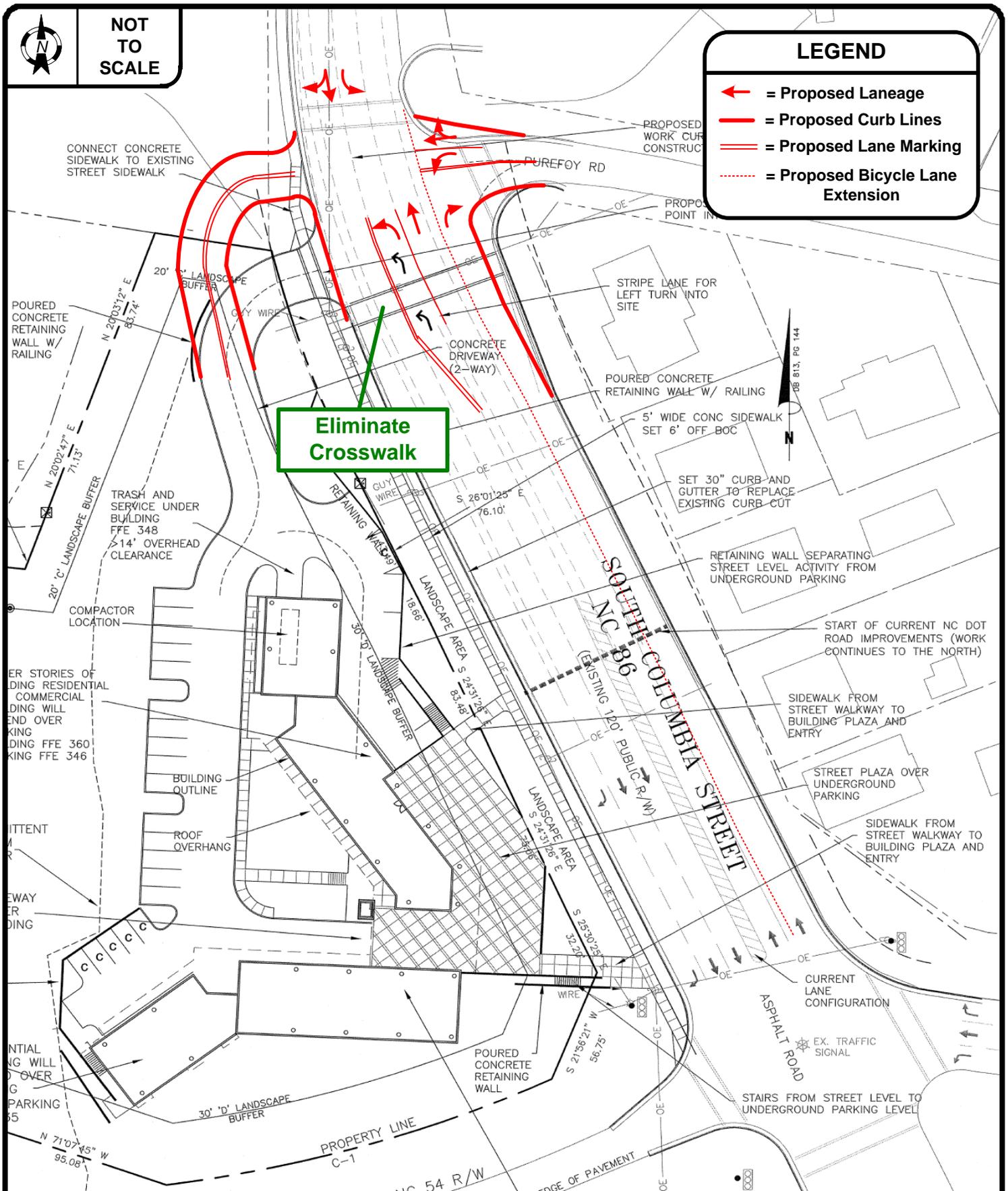
FIGURE ES-3



NOT TO SCALE

LEGEND

-  = Proposed Laneage
-  = Proposed Curb Lines
-  = Proposed Lane Marking
-  = Proposed Bicycle Lane Extension



Columbia Street Annex Traffic Impact Study

RECOMMENDED IMPROVEMENTS DETAIL

DATE: August 2014

FIGURE ES-4