



NCDOT TIP #U-5774
NC 54 Corridor Improvements
Concurrence Point 2

October 2018

I. INTRODUCTION

In accordance with the National Environmental Policy Act of 1969 (NEPA), a Categorical Exclusion (CE) will be prepared for the proposed NC 54 Corridor Improvements project. The content of this document conforms to the Council on Environmental Quality (CEQ) guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the Federal Highway Administration's (FHWA) *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (Technical Advisory T6640.8A, 1987).

This report describes the alternatives screening process used to develop alternative concepts and identify alternatives for detailed study. CEQ regulations require that an environmental document address the "no action" alternative and "rigorously explore and objectively evaluate all reasonable alternatives."

2. PROJECT HISTORY

The *NC 54/I-40 Corridor Study* was completed by DCHC MPO in December 2011 and provides a transportation-land use master plan for the section of NC 54 from US 15/US 501 to I-40 at Exit 273. The study recommends specific improvements to roadway, pedestrian and bicycle, and transit facilities and services. In addition, a feasibility study was completed by the NCDOT in 2012 (FS-1005C), which proposed widening of the section of NC 54 from I-40 at Exit 273 to NC 55.

The proposed action is listed in the DCHC MPO *2040 Metropolitan Transportation Plan*, the DCHC MPO *2016-2025 Metropolitan Transportation Improvement Program*, and is included in the NCDOT 2018-2027 STIP as project number U-5774. The project is partially funded, receiving both state and federal funding, and divided into ten STIP sections shown in Table 1 below.

Table 1: U-5774 STIP Sections

Section	Description	Cost	ROW/ Const. (FY)
U-5774A	US 15 / US 501. Upgrade interchange.	\$14.8M	Unfunded
U-5774B	US 15 / US 501 in Orange County to SR 1110 (Barbee Chapel Road) in Durham County, upgrade roadway corridor and convert at-grade intersection with SR 1110 to interchange.	\$41.9M	2022/2024
U-5774C	SR 1110 (Barbee Chapel Road) to I-40. Upgrade roadway corridor.	\$26.7M	2022/2024
U-5774D	Falconbridge Road. Convert at-grade intersection to interchange.	Included in U-5774F	Unfunded
U-5774E	SR 1110 (Farrington Road). Convert at-grade intersection to grade separation.	Included in U-5774F	Unfunded
U-5774F	I-40 / NC 54 Interchange improvements – coordinate with I-5702A.	\$94.1M	Unfunded
U-5774G	I-40 to NC 751. Upgrade roadway corridor.	\$32.0M	Unfunded



U-5774H	NC 751 to SR 1118 (Fayetteville Road). Upgrade roadway corridor.	\$21.6M	2023/2025
U-5774I	SR 1118 (Fayetteville Road) to SR 1106 (Barbee Road). Upgrade roadway corridor.	\$33.6M	Unfunded
U-5774J	SR 1106 (Barbee Road) to NC 55. Upgrade roadway corridor.	\$30.6M	Unfunded

3. PURPOSE AND NEED

The purpose and need for the proposed action is documented in detail in the Purpose and Need Report (2017) for this project. The **purpose** of the proposed project is to improve traffic operations along NC 54 between US 15/US 501 and NC 55 by reducing congestion, while improving mobility and accessibility for all users of the NC 54 corridor.

The **needs** to improve the NC 54 corridor, from US 15/US 501 in Chapel Hill to NC 55 in Durham, are as follows:

- **Decreased Mobility in the NC 54 Corridor**
- **Increasing Congestion due to Roadway Capacity Deficiencies**
- **Critical Crash Rate Exceeding State Average**

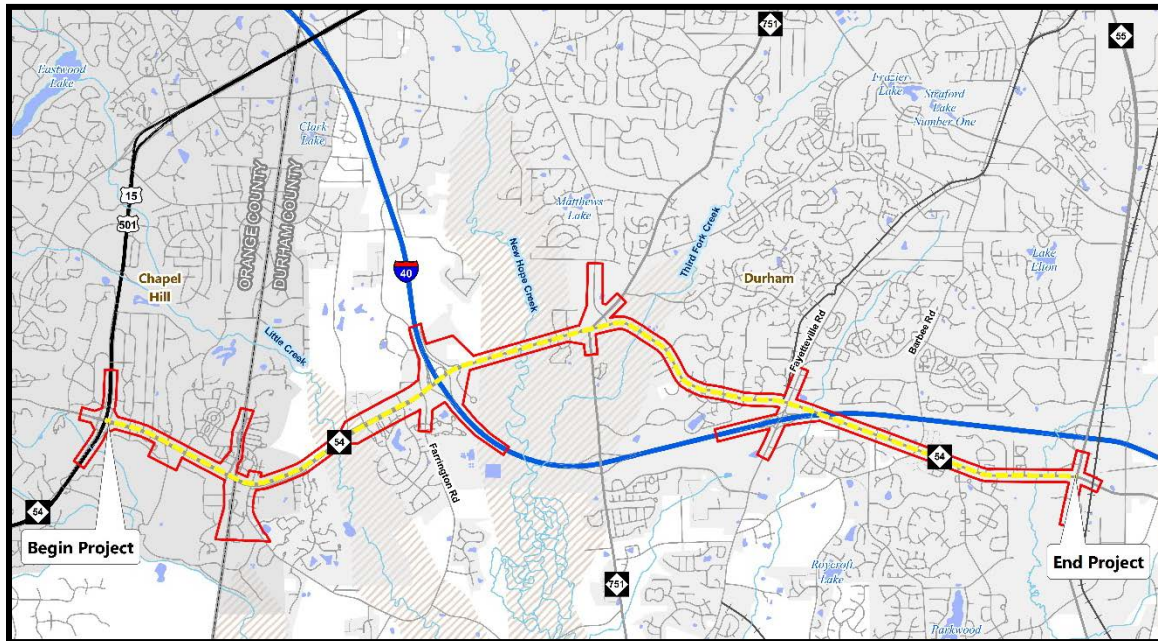
Other desirable outcomes include:

- Vehicular Safety
- Multimodal Accessibility and Safety

4. ALTERNATIVES DEVELOPMENT AND SCREENING

The North Carolina Department of Transportation (NCDOT) proposes to improve the NC 54 corridor from US 15/US 501 in Chapel Hill to NC 55 in Durham. The project is approximately 9.2 miles long (see Figure 1). Improvement strategies may include, though not be limited to, widening of portions of the existing roadway facility, multimodal accommodations, traffic control, access management, intersection improvements, grade separations, interchange upgrades, and signal timing modifications. The project study area is located mostly in Durham County, with the western part of the project study area in Orange County.

Figure I: U-5774 Project Study Area



A. ALTERNATIVE STRATEGIES AND INITIAL SCREENING

FHWA recommends that the basic alternative strategies listed below should be considered “when determining reasonable alternatives” (FHWA Technical Advisory T 6640.8A, 1987):

- No-Build or No-Action Alternative
- Transportation Demand Management Alternative
- Transportation System Management Alternative
- Mass Transit Alternative
- Build Alternatives, including New Location and Upgrade Existing Roadways

Each alternative strategy was qualitatively evaluated for its effectiveness in addressing the elements of the project’s defined purpose and need, and those strategies that would not meet all elements of the purpose and need were removed from further consideration. The results of this initial screening are summarized in Table 2 and discussed in detail in the Alternatives Development and Screening Report (October 2018).

The results of the Initial Screening indicated that only the **Build Alternative – Upgrade Existing NC 54 Alternative** would fulfill the identified needs and meet the purpose of the project; therefore, only the No-Build Alternative and this alternative were carried forward for further evaluation.

Table 2: Initial Screening of Alternative Strategies

Alternative Strategy	Evaluation Criteria				Decision
	Regional and Local Mobility	Congestion	Vehicular Safety	Multimodal Accessibility and Safety	
No-Build					<input checked="" type="checkbox"/> *
Transportation Demand Management					<input type="checkbox"/>
Transportation System Management					<input type="checkbox"/>
Mass Transit					<input type="checkbox"/>
Build – New Location					<input type="checkbox"/>
Build - Upgrade Existing Roadways					<input checked="" type="checkbox"/>

* Retained for further study as a baseline for comparing other alternatives

B. ALTERNATIVE CONCEPTS

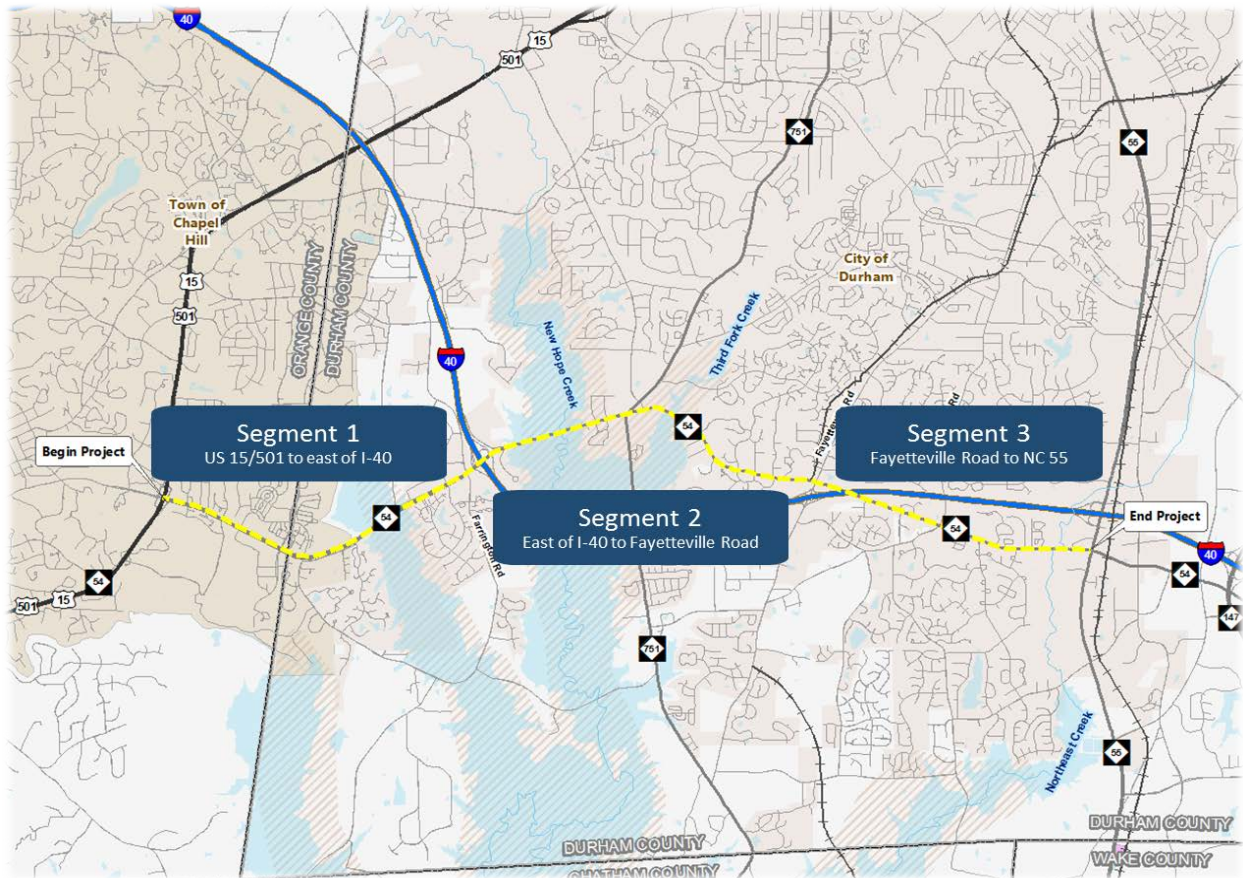
Alternative Concepts for the Upgrade Existing NC 54 Alternative were developed based on a range of factors, including projected traffic demand, human and natural environmental constraints, and local plans. For purposes of developing Alternative Concepts, the project study area was divided into three segments (see **Error! Reference source not found.**) based on existing roadway conditions and land use:

- Segment 1: US 15/501 to east of I-40
- Segment 2: East of I-40 to Fayetteville Road (SR 1118)
- Segment 3: Fayetteville Road to NC 55

For the evaluation of Alternative Concepts, conceptual designs were developed and used to compare the alternatives. Conceptual designs include:

- Roadway centerlines
- Number of lanes, including some turn lanes
- Edge of pavement
- Potential right of way
- Spot checks for vertical clearance

Figure 2. Alternative concepts segments



Segment 1: Generally, six-lane and eight-lane widening was considered in combination with various interchange or intersection concepts at US 15/501, Friday Center Drive/Meadowmont Lane/Barbee Chapel Road, and I-40. Options for each element, as described in the sections below, are generally interchangeable and could be implemented in various combinations. Detailed descriptions of each alternative concept can be found in the **Alternatives Development and Screening Report**.

Segment 2: Based on projected future traffic volumes for year 2040, widening to four lanes between I-40 and NC 55 is recommended. Multiple typical sections were evaluated with varying median widths, shoulder treatments, and bike/ped accommodations. Two options were developed: one for sections through USACE property and one for sections through non-USACE property.

Segment 3: One option for widening to four lanes was considered for this segment.

Table 3. Alternative Concepts

Segment Element	Existing Conditions	Alternative Concepts
Segment 1: US 15/501 to East of I-40		
US 15/501 Interchange	Cloverleaf interchange with two-way ramps with monolithic islands separating travel lanes	Option 1: Half partial cloverleaf/half synchronized street interchange Option 2: Contraflow interchange
Hamilton Road to W. Barbee Chapel Road	6-lanes with a raised median, curb and gutter, signalized intersections, and numerous driveways; signalized intersections at Hamilton Road, Finley Golf Course/Burning Tree Drive, and Exchange/W. Barbee Chapel Road.	Option 1: Six-lane synchronized street Option 2: Eight-lane roadway with signalized intersections
W. Barbee Chapel Road to E. Barbee Chapel Road	The intersections of Friday Center Drive/Meadowmont Lane and Barbee Chapel Road/East Barbee Chapel Road with NC 54 are both signalized and are only about 1,000 feet apart.	Option 1: Full CFI (Four Quadrant) Option 2: Full CFI (Two Quadrant) Option 3: Offset CFI Option 4: Barbee Chapel Partial Interchange
E. Barbee Chapel Road to George King Road	4-lanes with depressed median; median break at Littlejohn Road; right-in, right-out only access at Downing Creek Parkway; NC 54 is within a 150-foot easement through USACE property between Downing Creek Parkway and George King Road.	Option 1: Six-lane synchronized street Option 2: Eight-lane synchronized street
George King Road to I-40	4-lanes with a depressed grass median between George King Road and Falconbridge Road then widens to 6 lanes with a painted median through the Farrington Road intersection	Option 1: Six-lane depressed roadway with frontage roads Option 2: Eight-lane synchronized street
I-40 Interchange	NC 54 is five lanes through the I-40 interchange (three westbound and two eastbound) with a center turn lane; diamond type interchange with a loop in the northeast quadrant	Option 1: Partial cloverleaf interchange
Segment 2: East of I-40 to Fayetteville Road		
USACE Property	2 lanes within 60' USACE easement from Quadrangle Drive/Leigh Farm Road to Copper Ridge Drive/Biscayne Road	Option 1: Four-lane divided with 30-foot depressed median Option 2: Four-lane divided with raised median

Non-USACE Property

4 lanes through intersections at NC 751 and Garrett Road; 2 lanes from east of Hope Valley Commons/Woodcroft Shopping Center; widens to 3 lanes from Highgate Drive to Southpoint Crossing Drive; 4 lanes through Fayetteville Road intersection

Option 1: Four-lane divided with 23-foot raised median and partial control of access

Segment 3: Fayetteville Road to NC 55

Segment 3

2 lanes with a center turn lane in some areas; transitions to 4 lanes just west of NC 55

Option 1: Four-lane divided with 23-foot raised median and partial control of access

C. ALTERNATIVE CONCEPTS AND SECOND SCREENING

The Second Screening compared conceptual designs for Alternative Concepts using the following five evaluation criteria:

Traffic Operations



A Traffic Capacity Analysis (2018) was prepared to evaluate traffic operations for the build alternative concepts. Alternative Concepts need to have an overall LOS of D or better; individual movements at an intersection may be LOS E or F during one or both peaks but must have a volume to capacity ratio of 0.85 or lower.

Bike/Pedestrian Mobility



As noted in the project purpose and need, multimodal accessibility and safety are part of the identified purpose for this project. Therefore, the Second Screening considered bike/pedestrian mobility along and across the NC 54 for each of the Alternative Concepts, including presence of sidewalks and/or multiuse paths; number and type of crossings; and other safety considerations.

Compatibility with Durham-Orange Light Rail Transit Project



The GoTriangle-planned Durham-Orange Light Rail Transit (D-O LRT) project (STIP Project TE-5205) is proposed in close proximity to and within the project study area. Within the study area, the alignment runs parallel along the south side of NC 54 from the Exchange until crossing NC 54 with a grade-separation just east of the NC 54 intersection with Downing Creek Parkway. Stations are planned within the project study area at Hamilton Road, Friday Center, Woodmont, and Leigh Village. Park and ride lots at Leigh Village and Friday Center would provide transfer points for travelers to go between personal vehicles and the LRT or bus service. The D-O LRT is scheduled to begin operations in 2028.

Location and design of the proposed D-O LRT was coordinated with local officials, staff, and interested public during development of a Final Environmental Impact Statement/Record of Decision for the project in 2016. Final design is underway, and is being coordinated with the NC 54 Corridor Improvements project; therefore, alternative concepts for the NC 54 Corridor Improvements project were evaluated with respect to their compatibility with existing plans for the LRT, including crossings of the LRT tracks, accessibility (vehicular and non-motorized) to proposed stations, and proximity to the

overall alignment. *(Note: this criterion only applies to portions of Segment 1 from Hamilton Road to George King Road.)*

Consistency with Local Plans



Consistency with local plans was considered in development of Alternative Concepts and initial screening of Alternative Strategies. Plans include the NCDOT STIP, DCHC MPO 2040 MTP, local land use plans, local bike/ped plans, and other small area plans.

Stakeholder Coordination



Several meetings with key stakeholders were held to review Alternative Concepts:








- Town of Chapel Hill and UNC staff – February 12, 2018
- City of Durham and DCHC MPO staff – February 13, 2018
- GoTriangle staff – February 13, 2018
- Town of Chapel Hill, City of Durham, UNC, and DCHC MPO staff – April 23, 2018
- USACE and NCWRC representatives – April 24, 2018
- Merger Team – May 9, 2018
- Local officials meeting (Chapel Hill) – July 10, 2018
- Public Meeting (Chapel Hill) – July 10, 2018
- Local officials meeting (Durham) – July 11, 2018
- Public Meeting (Chapel Hill) – July 11, 2018





Summaries of stakeholder and public comments are included in the Alternatives Development and Screening Report.





Table 4 includes a summary of the second screening.



Second Screening Results









Table 4. Second Screening of Alternative Concepts.

Segment 1 Alternative Concepts		Evaluation Criteria					Decision
							
US 15/501 Interchange	<p>Option 1: Half partial cloverleaf/half synchronized street interchange</p>	<p>7 of the 8 intersections analyzed as part of the interchange operate at LOS D or better. The intersection at the ramp terminal from US 15/501 northbound to NC 54 eastbound operates at LOS E in the PM peak.</p>	<p>Signals at all ramp terminals.</p>	<p>N/A</p>	<p>Consistent with MTP and local plans.</p>	<p>Supported by local stakeholders.</p>	
	<p>Option 2: Contraflow interchange</p>	<p>6 of the 8 intersections operate at LOS C or better. The intersections at US 15/501 northbound/US 15/501 on ramp from NC 54 westbound and at the ramp terminal from US 15/501 northbound to NC 54 eastbound operate at LOS E in the PM peak.</p>	<p>Free-flow right turns at ramp terminals.</p>	<p>N/A</p>	<p>Consistent with MTP and local plans.</p>	<p>Free-flow right turns not supported by stakeholders.</p>	

Hamilton Road to West Barbee Chapel Road	<p>Option 1: 6-lane synchronized street</p>	All signalized and unsignalized intersections operate at LOS C or better.	“Z” crossing at Hamilton Road, Environ Way, and Finley Golf Course Road/Burning Tree Drive	No LRT crossings (existing crossing at Exchange eliminated by the closing of Exchange at NC 54).	Consistent with STIP, MTP, and locals plans.	Preferred by local stakeholders.	
	<p>Option 2: 8-lane roadway with signalized intersections</p>	All signalized and unsignalized intersections operate at LOS C or better.	Crossing at signalized intersections at Hamilton Road or Finley Golf Course/Burning Tree Drive. Crossing at Environ Way would not be permitted, as NC 54 westbound traffic would not be signalized at this location.	No LRT crossings (existing crossing at Exchange eliminated by the closing of Exchange at NC 54).	Not consistent with STIP, MTP, or local plans.	Not preferred by local stakeholders due to inconsistency with local plans.	
West Barbee Chapel Road to Barbee Chapel Road	<p>Option 1: Full CFI (4-quadrant with 6-lane NC 54)</p>	Operates at LOS D.	Crossing at existing pedestrian tunnel west of Friday Center Drive/ Meadowmont Lane. Multi-stage crossing at the CFI intersection at Friday Center Drive/ Meadowmont Lane.	Two crossings of LRT at Friday Center Drive and the left-turn crossover east of Friday Center Drive; crossing at Barbee Chapel Road eliminated.	Not consistent with STIP or MTP.	Concerns from local stakeholders about perceived complexity and challenges to bike/ped mobility.	
	<p>Option 2: Full CFI (2-quadrant with 8-lane NC 54)</p>	Operates at LOS D.	Crossing at existing pedestrian tunnel west of Friday Center Drive/ Meadowmont Lane. Multi-stage crossing at the CFI intersection at Friday Center Drive/ Meadowmont Lane.	Two crossings of LRT at Friday Center Drive and a new crossing east of Friday Center Drive; crossing at Barbee Chapel Road eliminated.	Not consistent with STIP or MTP.	Concerns from local stakeholders about perceived complexity and challenges to bike/ped mobility.	

	<p>Option 3: Offset CFI</p>	<p>Operates at LOS D with 6-lane typical section or LOS B with 8-lane typical section.</p>	<p>Crossing at existing pedestrian tunnel west of Friday Center Drive/ Meadowmont Lane.</p>	<p>Two crossings of LRT at Barbee Chapel Road and at the left-turn crossover east of Barbee Chapel Road; crossing at Friday Center Drive eliminated.</p>	<p>Not consistent with STIP or MTP.</p>	<p>Concerns from local stakeholders about perceived complexity; concerns with</p>	
	<p>Option 4: Barbee Chapel Partial Interchange</p>	<p>Signalized and unsignalized both operate at level F</p>	<p>Crossing at existing pedestrian tunnel west of Friday Center Drive/ Meadowmont Lane. "Z" crossing at Hamilton Road</p>	<p>One crossing of LRT crossing at Friday Center Drive.</p>	<p>Consistent with STIP and MTP.</p>	<p>Not supported by stakeholders due to impacts.</p>	
Barbee Chapel Road to George King Road	<p>Option 1: 6-lane synchronized street</p>	<p>All signalized and unsignalized intersections operate at LOS D or better.</p>	<p>Multiuse path on south side of NC 54 only; no crossings in this area.</p>	<p>One crossing of LRT remains at Little John Road; crossing at Downing Creek Parkway eliminated; no conflicts with LRT aerial crossing of NC 54 from south to north.</p>	<p>Consistent with MTP and local plans.</p>	<p>Preferred by local stakeholders.</p>	
	<p>Option 2: 8-lane synchronized street</p>	<p>All signalized and unsignalized intersections operate at LOS B or better.</p>	<p>Multiuse path on south side of NC 54 only; no crossings in this area.</p>	<p>One crossing of LRT remains at Little John Road; crossing at Downing Creek Parkway eliminated; substantial re-design of the LRT alignment and proposed bridge over NC 54 required.</p>	<p>Not consistent with MTP or local plans.</p>	<p>Not preferred by local stakeholders.</p>	

George King Road to I-40	<p>Option 1: 6-lane depressed roadway with frontage roads</p>	<p>All signalized and unsignalized intersections operate at LOS C or better.</p>	<p>Bike/ped connectivity across NC 54 via at-grade bridges over depressed section; crossing on Farrington Road grade separation.</p>	<p>N/A</p>	<p>Generally consistent with MTP and STIP.</p>	<p>Preferred by local stakeholders.</p>	
	<p>Option 2: 8-lane synchronized street</p>	<p>All signalized and unsignalized intersections operate at LOS C or better.</p>	<p>“Z” crossing at Falconbridge Road; crossing on Farrington Road grade separation.</p>	<p>N/A</p>	<p>Not consistent with MTP and STIP.</p>	<p>Not preferred by local stakeholders.</p>	

Segments 2 and 3 Alternative Concepts		Evaluation Criteria				Decision
						
Segment 2: USACE Property	Option 1: 4-lane divided with depressed median	All signalized and unsignalized intersections operate at LOS D or better.	Multiuse path on south side of NC 54.	Consistent with MTP.	Generally supported by local stakeholders; some concerns with limited bike/ped accommodations.	
	Option 2: 4-lane divided with raised median	All signalized and unsignalized intersections operate at LOS D or better.	Multiuse path on south side of NC 54.	Consistent with MTP.	Generally supported by local stakeholders; some concerns with limited bike/ped accommodations.	
Segment 2: Non-USACE Property	Option 1: 4-lane divided with 23-foot raised median	All signalized and unsignalized intersections operate at LOS D or better.	Multiuse path on south side of NC 54 and sidewalk on north side of NC 54; crossings at signalized intersections at Quadrangle Drive/Leigh Farm Road, Highgate Drive, Highgate Drive/Rollingwood Drive, Southpoint Crossing Drive, and Fayetteville Road.	Consistent with MTP.	Generally supported by local stakeholders.	
Segment 3	Option 1: 4-lane divided with 23-foot raised median	All signalized and unsignalized intersections operate at LOS D or better.	Multiuse path on south side of NC 54 and sidewalk on north side of NC 54; crossings at signalized intersections at Boulder Road, Amhurst Road/Pine Glen Trail, Barbee Road, Revere Road, Waterford Valley Drive, Kristen Marie Lane, Residence Inn Boulevard, and NC 55.	Consistent with MTP.	Generally supported by local stakeholders; some concerns with proposed intersection treatments.	

5. DETAILED STUDY ALTERNATIVES

Two primary alternatives for detailed study are recommended. Differences between the alternatives are at the US 15/501 interchange, the intersections of Friday Center Drive/Meadowmont Drive and Barbee Chapel Road, from George King Road to I-40, and at the NC 751/Garrett Road intersection.

Segment Element	Alternative 1	Alternative 2
Segment 1: US 15/501 to East of I-40		
US 15/501 Interchange	Option 1: Half partial cloverleaf/half synchronized street interchange	Option 2: Contraflow interchange
Hamilton Road to W. Barbee Chapel Road	Option 1: Six-lane synchronized street	Option 1: Six-lane synchronized street
W. Barbee Chapel Road to E. Barbee Chapel Road	Option 1: Full CFI (Two Quadrant)	Option 1: Full CFI (Four Quadrant)
E. Barbee Chapel Road to George King Road	Option 1: Six-lane synchronized street	Option 1: Six-lane synchronized street
George King Road to I-40	Option 1: Six-lane depressed roadway with frontage roads	Option 2: Eight-lane synchronized street
I-40 Interchange	Option 1: Partial cloverleaf interchange	Option 1: Partial cloverleaf interchange
Segment 2: East of I-40 to Fayetteville Road		
USACE Property	Option 2:: Four-lane divided with raised median	Option 2:: Four-lane divided with raised median
Non-USACE Property	Option 1: Four-lane divided with 23-foot raised median and partial control of access	Option 1: Four-lane divided with 23-foot raised median and partial control of access
Segment 3: Fayetteville Road to NC 55		
Segment 3	Option 1: Four-lane divided with 23-foot raised median and partial control of access	Option 1: Four-lane divided with 23-foot raised median and partial control of access