



US 1/US 1A/FALLS OF NEUSE ROAD INTERSECTION ANALYSIS

PROJECT IMPACT ANALYSIS





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1.0 INTRODUCTION

1.1 Study Purpose

The purpose of this “hot spot” analysis is to build upon the Capital Area Metropolitan Planning Organization’s (CAMPO) US 1 North Corridor Phase I Study, and consider interim and future improvements for the intersection of Capital Boulevard (US 1)/ US 1A/Falls of Neuse Road located in Wake Forest. The adopted Metropolitan Transportation Improvement Program (MTIP) calls for the US 1 Corridor to be upgraded to a freeway facility by 2030 and as part of this conversion, the intersection at US 1/US 1A/Falls of Neuse will be converted from an at-grade intersection to a grade separation interchange. In collaboration with CAMPO and the US 1 Planning Council, the study team identified three potential future interchanges at the Falls of Neuse/South Main Street (US1A) intersection. The study team also identified and analyzed interim safety and operational improvements to improve the efficiency and extend the life of the existing intersection.

This is the third of three technical memorandum will document the impacts of three types of interchange configurations for the US/US 1A/Falls of Neuse Road intersection and recommend a locally preferred alternative.

2.0 COMPARISON OF CONCEPTUAL ALTERNATIVES

In collaboration with the US 1 Planning Council and CAMPO, the study team identified three interchange concepts, the Single Point Urban Interchange (SPUI), the Diverging Diamond Interchange (DDI) and the Compressed Diamond Interchange (CDI). It was assumed that Starr Road, which serves as a frontage road in the southeast quadrant of the intersection, would be relocated as shown in the 2005 US 1 Phase I Report. While developing the conceptual design for each alternative based on a planning level 2040 level of service traffic analysis, the study team assessed each alternative based on the following criteria:

- Cost
- Environmental, Cultural, Right of Way, and Development Access Impacts
- Traffic Operations
- Bicycle, Pedestrian, and Transit Considerations
- Additional Advantages and Disadvantages

3.0 IMPACT ASSESSMENT

3.1 Mobility and Access

Construction of an interchange at the US 1/ US 1A/Falls of Neuse location would reduce travel times for regional traffic on US 1, as well as for east-west vehicular traffic along US 1A / Falls of Neuse. The SPUI and the DDI offers a higher 2040 LOS from a traffic operations perspective, in comparison to the CDI, which experiences heavy left turn volumes on US 1 and insufficient vehicular storage on the bridge deck. Access impacts to businesses in the four quadrants of the intersection were relatively similar between the three interchange alternatives, with the SPUI having the most impacts to business driveways over the DDI and CDI.

3.2 Multimodal Considerations

All three alternatives benefit from comparable improved LOS and reduced delay on US 1/ Capital Boulevard, which would benefit transit along the US 1 corridor. The Capital Area Transit (CAT) Wake Forest Loop route, as well as the TTA Express Route would benefit from any of the three interchange alternatives considered.

US 1 will be a freeway facility in 2030 and non conducive to bicycle or pedestrian travel, therefore these modes were not the focus of this study. For pedestrians and bicyclists crossing US 1, the DDI offers the most protection. Both the SPUI and the CD are less conducive, with the SPUI having a large area of uncontrolled pavement which could lead to safety concerns.

3.3 Environmental Impacts

Land use in the vicinity of the interchange is predominately commercial, and based on a GIS database search, there are no wetlands within the vicinity of the interchange. The US1/ US 1A/Falls of Neuse intersection falls in both the Richland Creek and Smith Creek Watersheds, and runoff from the construction of and of the interchange itself may cause impacts to several tributaries within the vicinity. Smith Creek is listed on the NCDENR 2014 303(d) list of impaired waters. Additional water quality analysis may be required during the NEPA/ permitting phase, regardless of the interchange configuration selected.

3.4 Socioeconomic Impacts

As this area has grown nearly 300% between 2000 and 2010, and is anticipated to continue to grow, improving mobility to allow residents, goods and materials to flow more freely benefits the community. Constructing a grade separated facility at US 1/ US 1A / Falls of Neuse will Improve safety at this intersection which was identified as one of five high priority crash locations according to the Wake Forest Transportation Plan (2010). Transportation infrastructure investments, such as this interchange would ensure continued economic development along the US 1 corridor, including the anticipated 30,000 square foot expansion by Rex Healthcare.

3.5 Costs

As expected the SPUI was the most expensive mostly due to the additional spur ramps (compared to the Compressed Diamond) and the large dual bridges along US 1 required to span the intersection below. The DDI was also required additional cost considerations for the additional spur ramps required. The bridge span was shorter than the SPUI which resulted in a cheaper alternative. The least expensive alternative was the CDI. With the traditional layout the bridge span lengths are significantly cheaper than the SPUI and DDI and no spur ramps are required.

3.6 Additional Considerations

Interchange skew, and over/under configuration considerations for the SPUI, DDI, and CDI alternatives were relatively similar. Constructability constraints for US 1, Falls of Neuse and US 1A were also comparable between the three alternatives.

Table 1: US 1/US 1A/Falls of Neuse Road Comparison of Conceptual Alternatives						
Option	Cost	Impacts	Traffic Operations: LOS AM/PM	Bicycle/Pedestrian/Transit Considerations	Other Advantages	Disadvantages
Single Point Urban Interchange (SPUI)	\$35.0M FY 2014	<i>Environment al:</i> More <i>Cultural:</i> Most <i># Driveways:</i> 12 <i>Right of Way:</i> 8.5 Acres 10 Parcels	C / C	<i>Bicycle and Pedestrian:</i> Loss of some sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 Smooth progression along US 1A Fewer conflict points than a traditional intersection Driver familiarity with interchange configuration Single signalized intersection Reduction of driveways in vicinity of intersection reduces number of crashes 	<ul style="list-style-type: none"> Less conducive to accommodating bicyclists and pedestrians crossing Capital Boulevard Large area of uncontrolled pavement which could leave to safety concerns
Diverging Diamond Interchange (DDI)	\$32.5M FY 2014	<i>Environment al:</i> More <i>Cultural:</i> More <i># Driveways:</i> 9 <i>Right of Way:</i> 8 acres 13 parcels	SB Ramp: C/C NB Ramp: D/D	<i>Bicycle and Pedestrian:</i> Loss of sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 Fewer conflict points Less phases than traditional interchange (2-phase) More conducive to accommodating bicyclists and pedestrians crossing US 1 	<ul style="list-style-type: none"> Unconventional interchange configuration
Compressed Diamond Interchange (CDI)	\$27.8 M FY 2014	<i>Environment al:</i> Least <i>Cultural:</i> Least <i># Driveways:</i> 9 <i>Right of Way:</i> 8 acres 14 parcels	SB Ramp: F/F NB Ramp: F/F	<i>Bicycle and Pedestrian:</i> Loss of sidewalk in NE quadrant of intersection near dealership <i>Transit:</i> Improved LOS and Delay on US 1 / Capital Boulevard	<ul style="list-style-type: none"> Free flowing US 1 	<ul style="list-style-type: none"> Intersection still experiences queuing Substantial left turn volumes onto US 1 and not enough storage on the bridge deck

NOTES: For the purpose of comparison, costs and ROW impacts do not include frontage and backage roads.

4.0 LOCALLY PREFERRED ALTERNATIVE

Once the feasibility study and evaluation of impacts were completed for each alternative the Study Team presented its findings with the US 1 Council of Planning. Each alternative was evaluated based on the criteria previously mentioned. Based on the evaluation and collaborative discussions, it was determined that the Diverging Diamond Interchange was the most desirable alternative. The Council did note that the Phase I Report showed US 1 shifting to the west, and asked the Study Team to shift the alignment of US 1 back to the west to better match the Phase I Report recommendation.

The study Team did shift the US 1 alignment however only the preferred alternative was shifted to the west. Based on the initial study and evaluation of the alternatives the adjustment would result in proportional costs and impacts across all alternatives. The shift would have no impacts on the traffic operations. The interchange was re-laid out and a planning level cost estimate was completed along with a reevaluation of impacts to Right of Way, environmental, and access to businesses.

The locally preferred alternative assumes that the realignment of Starr Road would be the same recommendation as the Phase I Report.

Costs were for the locally preferred alternative were completed using NCDOT's 2014 Cost per Mile Spreadsheet and reasonable bid costs for bridge and approach slabs. Costs reflect 2014 dollars and are projected to 2030 based on an assumed 2.5% growth which is compounded annually. Costs do not include Right of Way (ROW) or any utility conflicts or relocations.

The ROW impacts were quantified by acres of required ROW to be purchased, number of parcels affected, and total takes. Table 2 reflects those impacts.

Table 1: Locally Preferred Alternative Cost Estimate

Functional Diverging Diamond Interchange Cost Estimate					
Description	Quantity		Unit Price	Amount (2014)	Amount (2030) ¹
US 1					
Widen Existing 4-Lane w/ Median to 8-Lane Interstate (US 1 from Height Lane to just north of US 1A/Falls of Neuse Intersection)	1.21	miles	\$12,000,000	\$14,520,000	\$21,555,022
Widen Existing 6-Lane w/ Median to 8-Lane Interstate (US 1 from just north of US 1A/Falls of Neuse Intersection to NC 98 Bypass)	1.29	miles	\$7,600,000	\$9,804,000	\$14,554,093
Interchange					
Dual Bridges along US 1 over DDI	23,500	SF	\$200	\$4,700,000	\$6,977,176
Approach Slabs (4 @ 72' x 25')	7200	SF	\$45	\$324,000	\$480,980
Ramp Connections from US 1 to DDI	4	EA	\$1,850,000	\$7,400,000	\$10,985,342
Spur ramps	4	EA	\$375,000	\$1,500,000	\$2,226,758
US 1A/Falls of Neuse Road					
New Location 4-Lane Curb & Gutter w/ Raised Median + Bike Lanes and Sidewalk (Falls of Neuse through Interchange Ramps) ²	0.45	miles	\$5,233,000	\$2,354,850	\$3,495,788
Widening US 1A + Bike Lanes and Sidewalk (From Ramp Termini to Walmart Entrance)	0.27	miles	\$5,033,000	\$1,358,910	\$2,017,310
Frontage and Backage Roads³					
New Location 3-Lane w/ Curb & Gutter and Sidewalk on Both Sides (Backage Road from Starr Road to US 1A)	0.77	miles	\$3,820,000	\$2,941,400	\$4,366,525
New Location 3-Lane w/ Curb & Gutter and Sidewalk on One Side (Frontage Road from US 1A to Caveness Farms)	0.7	miles	\$3,710,000	\$2,597,000	\$3,855,261
	Subtotal			\$47,500,160	\$70,514,255
	Misc & Mobilization (30%)			\$14,250,048.00	\$21,154,276.35
	CONTRACT COST			\$61,750,208	\$91,668,531
	Engineering & Contingencies (15%)			\$9,262,531	\$13,750,280
	CONSTRUCTION COST			\$71,012,739	\$105,418,810
	Design Cost (10% of Construction Cost)			\$7,101,274	\$10,541,881
	TOTAL			\$78,114,013	\$115,960,692

Table 2: Locally Preferred Alternative ROW Impacts

Functional Diverging Diamond Interchange ROW Impacts				
Description	ROW Required		Parcels Impacted	Total Takes
Interchange				
Ramps	4.96	acres	10	1
US 1A				
US 1A Widening east of Interchange Ramps	0.52	acres	7	0
Frontage and Backage Roads¹				
Southeast Backage Road (Starr Road to US 1A)	5.77	acres	9	1
Northeast Frontage Road (US 1A to Caveness Farms)	2.72	acres	13	2
	Subtotal	13.97 acres	39	4
	Additional 20%	2.79 acres	8	1
	TOTAL	16.76 acres	47	5

¹ Assumes same general alignment as 2006 Phase I Report

**US 1/US1 A/Falls of Neuse Road
Intersection Analysis**
**Figure 1:
Locally Preferred
Alternative**

PRELIMINARY PLANS
SUBJECT TO CHANGE WITHOUT NOTICE
JULY 2014

