Transportation Feasibility & Impact Analyses FY 2013

I-85 Future Interchange Location Analysis

Technical Memorandum #1: Existing Conditions and Trends

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Introduction

Study Purpose

This study focuses on the identification of three potential I-85 interchange locations and the resulting performance of the overall transportation network performance, with due consideration given to EMS response, economic development, and land use. The purpose of this analysis is to recommend a location for a new interchange that would meet the federal interchange access justification criteria, one that would improve mobility and emergency management on I-85 while maintaining the existing character of the study area (Figure 1) and providing economic development opportunities. NC 56 at exit 191 and US 15 at exit 202 are central spines for Butner, Creedmoor, and Oxford downtowns, and the absence of additional exits between these towns has no doubt influenced the development character of these communities. Balancing mobility, development, and incident management can be accomplished through coordination and consideration of various alternatives.

Tech memo purpose

The purpose of this technical memorandum is to document the existing and future baseline travel conditions within the areas of Exit 191 and Exit 202 and along I-85 between these interchanges as reflected in the Triangle Regional Model, and existing regional and local plans.

This tech memo is #1 of 3, with the others being:

- Tech Memo #2: Feasibility
- Tech Memo #3: Impacts

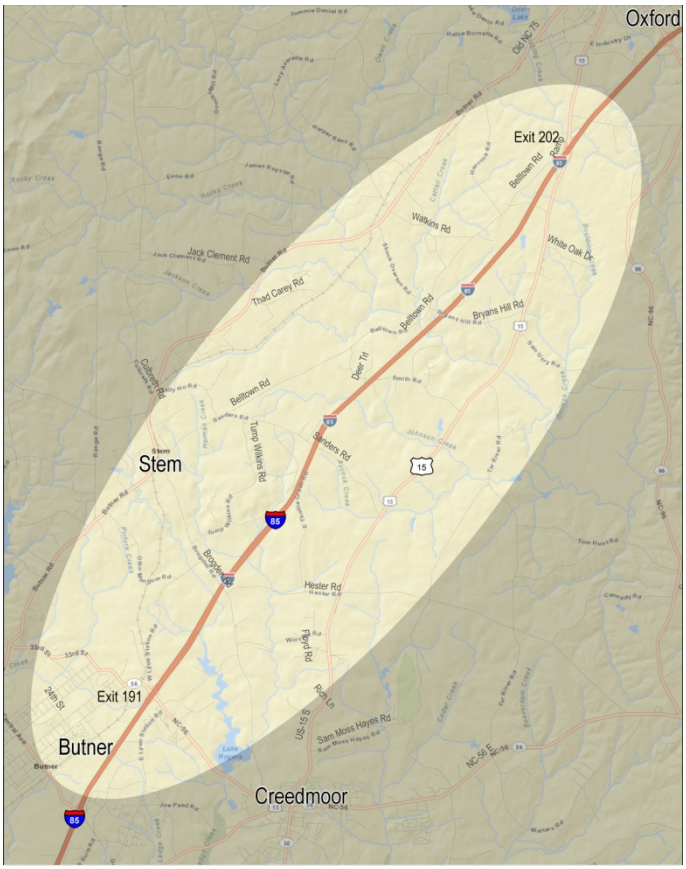

FIGURE 1 STUDY AREA MAP

Baseline Demographic Conditions

Baseline conditions and trends includes a review of previous studies and plans and their relevance, existing population, employment, and land use, interchange traffic conditions, emergency management operations, and economic development for the current and baseline future year of 2040.

Review of Existing Plans

The following relevant regional studies were reviewed.

- 2040 Metropolitan Transportation Plan
- CAMPO Transportation Improvement Program
- Granville County CTP
- NCDOT 2040 Plan
- CAMPO Congestion Management Process (CMP)
- CAMPO Intelligent Transportation Systems Strategic Deployment Plan Update
- Butner 2020 Comprehensive Land Use Plan
- Oxford Comprehensive Plan
- Creedmoor City Plan 2030
- NC50 Corridor Study

Existing Population, Employment, and Land Use

The study area is rural in nature with most of the population and employment within the towns of Creedmoor, Butner, and Oxford. However the area is growing. According to the US Census, Granville County had a total population of 59,916 in April of 2010 and 60,436 in June of 2012. This is up 24 percent from the 48,824 residents in 2000. This growth has been based in south Granville primarily, as exemplified by the four towns' growth: Butner, Creedmoor, and Stem have seen 31 percent, 85 percent and 102% population growth, respectively, while Oxford has seen just over 1 percent growth.

Town	2000 Population	2010 Population	% change
Butner[1]	5,792	7,591	31.1%
Creedmoor	2,232	4,124	84.7%
Oxford	8,338	8,461	1.5%
Stem	229	463	102.2%

Economic development growth has not been as robust. In 2010 there were a total of 835 non-farm businesses in the county, employing nearly 13,200 people. This is up only 6 percent from 785 establishments in 2000.

[1] Butner was classified as a CDP in the 2000 Census, but as a town in the 2010 Census

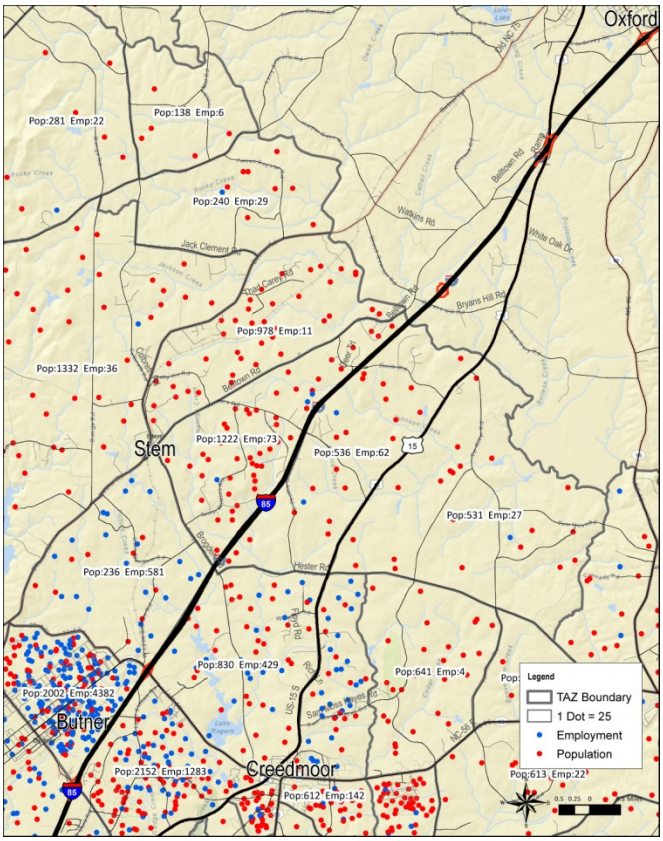

FIGURE 2 2012 POPULATION AND EMPLOYMENT

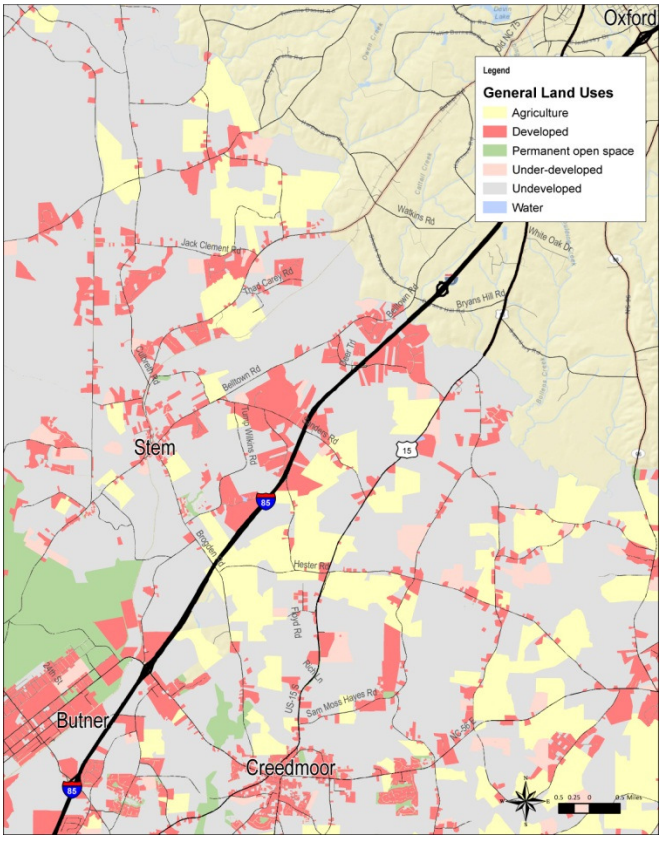

FIGURE 3 LAND USE MAP

Existing Roadway Conditions

With limited transit service in the area, auto traffic accounts for most travel mode choices. Below is a review of existing regional roadway conditions, as well as intersection-level conditions for I-85 Exits 191 and 202. The purpose of documenting these conditions is to measure to what extent tested improvements impact the transportation system.

Study Area Travel Conditions

Travel conditions were estimated for the study area using the Triangle Regional Model's outputs for 2010. Existing conditions are within acceptable levels when looking at regional mobility. No roadways within the study area currently experience high levels of congestion.

Traffic Conditions

Traffic conditions are different from regional conditions in that they account for geometry, signal timing, turning movements, and traffic volumes at a smaller level of detail. The existing traffic conditions for I-85 Exits 202 and 191 are described below.

Baseline analyses were performed for existing (2012 due to availability of NCDOT AADT data) conditions and an assumed build year of 2040. Intersection traffic operations were modeled and analyzed in accordance with the Transportation Research Board's Highway Capacity Manual[2] (HCM).

Level-of–Service (LOS) is defined as a "qualitative measure describing operation conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience

A model of the study area was developed in Synchro 8.0. NCDOT 2012 AADT volumes and field data was entered into the model including turning movements, speed limits, lane geometry, and signal phasing. AADT volumes were factored

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[2] National Research Council. Transportation Research Board. Highway Capacity Manual, Special Report 209. 4th Edition, Washington, DC. 2000.

up in the model utilizing the growth projections for the respective roadways from the Triangle Regional Model for the 2040 baseline condition. The signal phasing was obtained from the signal upgrade plan dated May 2013 from the NCDOT. Existing operational conditions were further imputed into the model including the allowance of Right-Turns on Red (RTOR).

The results of the capacity analysis for the 2012 existing conditions indicate that the intersections in the study area operate within acceptable levels-of-service of C or better for both the morning and afternoon peak-hours, with a few movements operating at a service level of D for both AM and PM peak-hours. These intersections are very close to LOS C and small operational changes may provide less delay in the short-term.

Crash History

Historical crash data was collected for the study area for the five years between 2007 and 2011. These data provide information on the locations of crashes in order to inform this analysis on areas for potential roadway safety improvements, as well as for EMS response when considering a potential new interchange.

There were a total of 230 crashes on I-85 between Exits 191 and 202 during the 5-year time period. Two thirds of these occurred between Sanders Road and Exit 191. There were 21 crashes at Exit 191 and 54 crashes at Exit 202.

Future Baseline Roadway Conditions

Future Baseline Roadway Conditions include the existing infrastructure and planned projects within the fiscally constrained regional Transportation Improvement Program (TIP) or Long Range Transportation Plan (LRTP). The horizon year for this analysis is 2040 and traffic volumes were estimated using the Triangle Regional Model. Modeled highway volumes were then used to factor interchange volumes from existing AADTs to estimate future interchange LOS.

Planned Projects

There are two significant projects planned in the study area. The first is a widening of NC 56, from two lanes to four lanes, between the interchange and W. Lyon Station Road. This project is planned for implementation by the year 2040. The second is a new interchange at I-85 and Brogden Road by the year 2030. Since this analysis is aimed at assessing a new interchange and its impacts within the study area, and a future baseline condition was necessary for the assessment, the Brogden Interchange was removed to be tested as an alternative. The NC56 widening project was left in the baseline condition as well as each alternative. The analysis of the alternatives, especially at the detailed Exit 191 intersection level, would be much different if this project were removed.

Travel Demand Model Results

All links within the modeled study area show acceptable Volume to Capacity ratios and travel speeds. Volumes are expected to increase steadily over the time period with minor changes in the study area. For example, volumes at NC 56 and I-85 (Exit 191) are expected to increase as a result of planned capacity improvements. These volumes are diversions from Brogden Road, which is expected to see a decrease in volumes from 2030 to 2040 as a result of the project. V/C ratios also improve as a result of these capacity improvements.

Intersection Level Traffic Estimates

Baseline intersection LOS is not expected to significantly worsen over time, with a few exceptions. The Northbound I-85 to Eastbound NC 56 (Exit 191) is expected to experience a minor increase in delay, from an LOS C to and LOS D. This is also true with Southbound W. Lyon Station Road and Westbound NC 56. A significant change, however, is expected at Exit 202 and the vehicle movement from Northbound I-85 to Westbound US 15. This LOS may warrant signalization of the interchange in the future.

Emergency Management

The Stem, Providence, and Butner Fire Departments divide responsibility of this corridor. Emergency management responders receive approximately 100-120 incident reports per year along I-85 between exits 191 and 202. There are three emergency vehicle turnaround points on this stretch, at locations just north and south of the Granville

County Rest Area at milepost 199, and an additional turnaround approximately 0.5 miles north of exit 191.

Currently, responders are often forced to park on the opposite side of the interstate, increasing responder safety concerns. Incident management personnel estimate that the minimum response time from Providence Station to the midpoint between exits 191 and 202 is 15 minutes. Based on an analysis of a sample response data set from Granville County Emergency Management, average response times are a little over 8 min, with a median response time of 7 minutes and 30 seconds.

The National Fire Protection Association (NFPA) has developed standards for all aspects of response. Standard NFPA 1720 is the *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Volunteer Fire Departments.* The table below shows the population/distance threshold, minimum staff, and response time standards from NFPA. Currently, the average and median response times are within these standards.

TABLE 1 NFPA 1720 STANDARDS

Population Protected	Minimum Staff	Response Time (min)
>1,000 people/sq. mi.	15	9
500-1,000 people/sq. mi.	10	10
<500 people/sq. mi.	6	14
Travel distance ≥ 8 mi.	4	14

In the event of a road closure along the interstate, police and fire departments are equipped to coordinate detour routes, though no formal alternative route exists. NCDOT is available to assist on rerouting when low-weight bridges require additional detours for trucks.
There is no Intelligent Transportation Systems (ITS) equipment currently in use by the county within the project study area, though NCDOT does have cameras. Granville County has expressed interest in obtaining access to these cameras, though that has yet to occur and is not included in the CAMPO ITS Deployment Plan.

Economic Development

One of the purposes of a new interchange is the economic development potential it may bring for the study area and region. As discussed earlier in this report, economic development growth has not been robust. The vast majority of the area north of exit 191 is either being used for agricultural purposes, or is unused or underused.

Exit 191 is currently characterized as retail strip type development, accommodating restaurants, fuel stations, etc. Heavy industrial, light industrial, and general commercial uses are scattered on the towns' peripheries. To the immediate south of the corridor, there is interest by the Town of Butner to develop land between Exits 189 and 191 adjacent to I-85 SB between the interstate and Railroad tracks. Currently the land has no access road, and the town is currently planning to add one. The land is zoned for light and heavy industrial use, and would remain as such if an access road were built.

Much of the land in the study area is composed of large parcels which, were there mutual interest by landowner and developer, would be one criteria of suitability for industrial and commercial development. While many of the parcels immediately adjacent to the interstate are smaller, there are many large parcels along Brogden Road, particularly south towards Creedmoor, as well as a few large parcels along Sanders Road. Note again, however, that this does not imply that these parcels are available for purchase or redevelopment, merely that industrial and commercial developers are more likely to be interested in larger parcels and the prevalence of such land suggests the possibility of future redevelopment interest associated with a new interchange.