



Transportation Feasibility & Impact Analyses FY 2013

I-85 Future Interchange Location Analysis

Technical Memorandum #2: Feasibility

June 28, 2013



Contents

| | |
|--|----------|
| Introduction | 2 |
| Study Purpose | 2 |
| Tech memo purpose | 2 |
| Interchange Justification Requirements | 2 |
| Area of Influence..... | 3 |
| Safety and Operational Performance | 3 |
| Alternatives..... | 3 |
| Performance Objectives, Measures, and Technical Analysis Requirements | 4 |
| Interchange Justification Policy Requirements . | 4 |
| Interchange Location Alternatives..... | 5 |
| Selection Criteria..... | 5 |
| Interchange Configuration Options | 5 |
| Interchange Location Alternatives..... | 6 |

Introduction

Study Purpose

This study focuses on the identification of 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 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 feasibility of an interchange between Exit 191 and Exit 202 on I-85 in Granville County.

This tech memo is #2 of 3, with the others being:

- Tech Memo #1: Existing Conditions
- Tech Memo #3: Impacts

Interchange Justification Requirements

When proposing a new interchange on the Interstate System, justification for this new connection must be provided for review and approval by the Federal Highway Administration (FHWA). The Policy states that it “*is applicable to new or revised access points to the existing Interstate System regardless of the source of funding of the original construction or source of funding for the proposed access points. This includes routes incorporated into the Interstate System under the provisions of 23 U.S.C.*”

103(c)(4)(A) or other legislation.”¹ The *Interstate System Access Information Guide* (August 2010) developed by the FHWA provides the “guidance on how and what should be addressed in requests for new or modified access to the Interstate System.”² The following provides the guidance set forth in order to complete the Interchange Justification Report, sometimes referred to as an Interstate System Access Change Request.

Area of Influence

The area of influence is based on safety and operations concerns. The area of influence must include adjacent interchanges on either side of the proposed access change. Since this analysis considers an interchange between I-85 Exits 191 and 202, these interchanges must be included in the analysis. The analysis should also include intersections near the interchange that may impact (or be impacted) by a proposed change.

The FHWA states that the “*area of influence should be extended beyond these limits based on the impact of the proposed change in access. If the safety or operational performance of segments beyond the adjacent interchanges may be affected, or a coordinated signal system is involved with the local roadway network, then the area of influence should be expanded to support making an informed decision based on the consequences of the project.*”³

Safety and Operational Performance

The current and anticipated safety and operational performance associated with the proposed change in access in the design year is strongly related to the following:

- Traffic volume (average daily and peak periods)
- Mix of traffic volumes (percent trucks, transit, and special use (HOV/HOT))

¹ FHWA Interstate System Access Information Guide, August 2010, p4

² FHWA Interstate System Access Information Guide, August 2010, p1

³ FHWA Interstate System Access Information Guide, August 2010, p15

- Location (rural, urban, suburban)
- Terrain (mountainous, rolling, level)
- Interchange and access (ramp) spacing along the mainline and their effect on weaving distances, the number of lane changes required, and the speed differential of mixing vehicles
- Roadway segments (mid-block or typical section; intersection, including type of intersection traffic control) along the local roadway network
- Surrounding land use (number of driveways, commercial versus residential; associated pedestrian activity) and the anticipated changes in land use and resulting travel patterns
- Limits of the project if part of a system of improvements
- Influence of operations at adjacent interchanges along the Interstate facility or intersections along the intersecting roadways within the transportation network
- Alternatives / modes that are being considered to address the problem
- Hours of congestion (as defined by the problem statement) present today and in the future
- Crash data

Alternatives

For any Interstate System Access Change Request, the FHWA requests that the following alternatives be analyzed. The need for any change in access should be supported by a qualitative and quantitative comparison of these minimum alternatives.

No Build or No Action Alternative

This alternative describes the conditions that will exist if the proposed new or modified access is not completed. The alternative should be analyzed in the existing condition and the design period to establish a baseline for the analysis of the potential benefits and impacts of the proposed new or modified access.

Transportation System Management Alternative

This alternative should clearly show that there are no other alternatives which could meet the need addressed by the proposed new or modified alternative. This alternative will demonstrate that the need being addressed by the request cannot be satisfied adequately by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets; improving traffic control; modifying ramp terminals and intersection; or adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands.

Alternative Transportation Modes

In the operational analysis of this alternative, the consideration of any modal shift of traffic to public transit or special use lanes should be consistent with the planning data presented in other plans or studies and derived from the regional travel demand forecasting model provided by the State DOT or MPO.

Build Alternative (Alternative[s] that Provide for New or Modified Access)

Only after the TSM and Alternative Transportation Modes have been analyzed to demonstrate that they cannot meet the needs being addressed in the request should new or modified access be considered. The analysis of these alternatives should provide an analysis that considers the safety, operational, design, and environmental consequences of the proposed action as compared to the No Build Alternative.

Build Alternative which Incorporate TSM and Alternative Modes (Alternative[s] that Provide for New or Modified Access)

This is a hybrid alternative which reflects a combination of the previously discussed alternatives. Combining these alternatives may provide a greater value than the two other alternatives independent of each other.

Performance Objectives, Measures, and Technical Analysis Requirements

The purpose, need, goal, and objective of the interchange should be discussed during the

coordination process. This purpose and need identify or define the performance criteria or deficiency that the project is looking to address or overcome, and provides an objective and measurable baseline in which the proposed and recommended alternative is to address. A set of quantitative performance measures should be established to support this analysis.

The documentation requirements include the following sections at a minimum:

- Summary
- Introduction—Background Purpose and Location
- Methodology
- Existing Conditions
- Need
- Alternatives
- Future Year Traffic
- Alternatives Analysis
- Funding Plan
- Recommendations
- Appendices

Interchange Justification Policy Requirements

The FHWA requires that eight policy requirements be addressed as part of the Justification document. A detailed list of the policy requirements are provided in the appendix. In summary, the policy requirements are:

- Demand and capacity of the current interchange system and its adequacy to handle current and future traffic in its current configuration and/or with improvements
- Transportation System Management (TSM), geometric design, and alternative improvement to the Interstate to accommodate current and future traffic
- No adverse impact on the safety and operations of the interstate facility
- Will connect to a public road and will provide for traffic movements in all directions
- Coordination and consistency with local and regional plans

- Consider a comprehensive corridor approach if plans include multiple access improvements
- Coordination and consistency between planned future land use and development, and transportation improvements
- Inclusion of environmental considerations

The FHWA focuses on mobility, safety, and congestion as a major component of interchange justification. The Administration places a premium on looking at utilizing existing infrastructure through operational improvements over the development of a new interchange to relieve congestion. However, other impacts such as economic development are acknowledged within the interstate guidance. The Guide states, *“The impact of access changes on the operations of the Interstate System are important; also of equal importance is the impact the changes will have on the system as a whole, the environment, potential economic development, the local street system, and safety, both on and off of the Interstate System.”*⁴

Interchange Location Alternatives

The analysis of alternatives as part of this effort focuses on congestion, but as described above, other considerations such as economic development, impacts to street systems, safety, and the environment are included, though each should be explored in future in-depth studies.

Selection Criteria

This analysis was to consider a maximum of three alternative locations for a new interchange between I-85 Exit 191 and 202. Criteria used for the selection of the alternatives include:

- Location between I-85 Exits 191 and 202
- Connection to an existing roadway
- Provision of emergency access to I-85
- Impact to nearby wetlands, buildings and/or facilities
- Greater support for economic development

Interchange Configuration Options

There are many different types of interchange configurations. The American Association of State Highway and Transportation Officials (AASHTO) publishes “The Green Book” which includes the standards of geometric designs for the nation’s highways and streets. The figure below shows the basic interchange configuration types. The current Exits 191 and 202 are diamond interchanges.

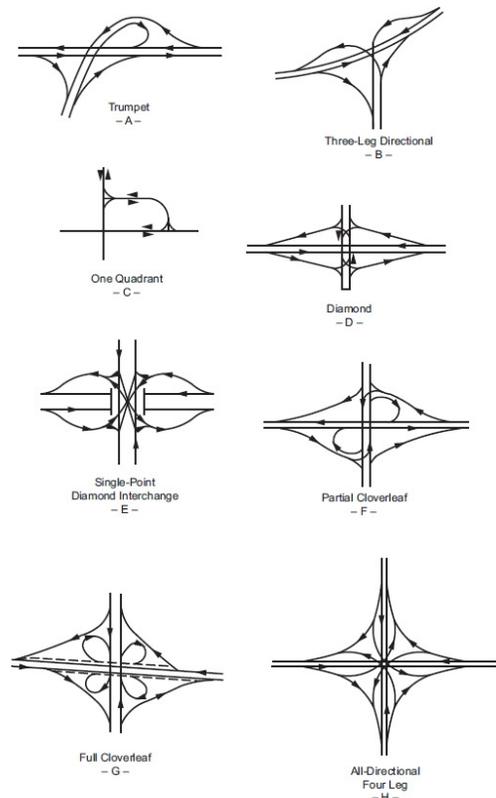


FIGURE 1 AASHTO INTERCHANGE CONFIGURATION TYPES
Source: AASHTO Green Book

The Brogden interchange as coded in the Triangle Regional Model is a modified diamond in order to avoid potentially sensitive environmental areas on the Northeast quadrant of the interchange. An image of the interchange is shown below.

⁴ FHWA Interstate System Access Information Guide, August 2010, p1

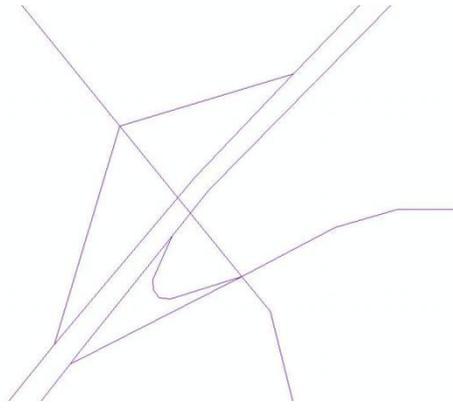


FIGURE 2 BROGDEN INTERCHANGE FROM TRM

Brogden Rd. and I-85 Interchange Configuration as Coded in the Triangle Regional Model for 2030

Based on the anticipated traffic volumes, environmental considerations, and the rural character of the study area diamond interchanges provide the most straightforward configuration. Diamond interchanges can be signalized (as Exit 191) or unsignalized (as Exit 202). It provides for movements in all directions and requires less use of land than free flowing clover leaf-style interchanges. It does, however, appear logical to include a modified diamond in the case of Brogden Road in order to tie in to nearby Hester Road. In addition all the alternatives include the widening of NC 56 from two lanes to four at Exit 191 for the year 2040 as included in the 2040 MTP and Triangle Regional Model. Maintaining this interchange in its current configuration as a two lane road in 2040 could have significant impacts on the LOS at this Exit.

Interchange Location Alternatives

Based on the criteria described above, five interchange locations were preliminarily evaluated. Three interchange locations were selected which include those at the following locations:

- Brogden Road (SR 1127)
- Sanders Road (SR 1132)
- Smith Road (SR 1135)
- Bryan Hills Road
- Thollie Green Road

Bryan Hills Road was not considered a viable alternative because of its close proximity to the Northbound and Southbound rest areas on I-85 within the study area. Ramp configurations, changes to rest area access, and a possible

relocation of Bryan Hills Road to provide enough spacing for merging cars and rest area access were all considerations. Thollie Green Road is not considered a viable alternative because it is a residential street that approaches I-85 at a skewed angle, and dead ends at the interstate. There are no other existing roadways that cross I-85 within the study area. As such, only Brogden Road, Sanders Road, and Smith Road were fully evaluated as options in this study.

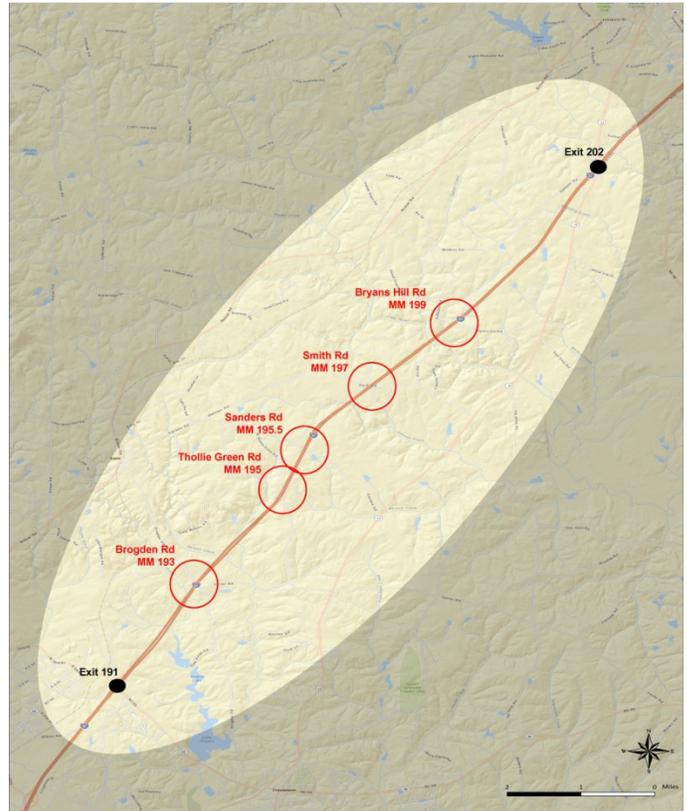


FIGURE 3 LOCATIONS OF INTERCHANGE ALTERNATIVES