

# **Spot Safety Project Evaluation**

Project Log # 200602153

Spot Safety Project # 05-00-208

## **Preliminary Evaluation of the Construction of a Roundabout at the Intersection of NC 751 and SR 1307 - Old Erwin Road in Durham County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

\_\_\_\_\_  
Carrie L. Simpson, EI

\_\_\_\_\_  
Date

Traffic Safety Project Engineer

# ***Project Evaluation Documentation***

## **Subject Location**

The Intersection of NC 751 and SR 1307-Old Erwin Road in Durham County

## **Project Information**

The project improvement countermeasure chosen for the subject location was the construction of a roundabout. Prior to the project improvement, the location was controlled with a stop condition on SR 1307-Old Erwin Road. The speed limit on NC 751 is 55 mph and the speed limit on SR 1307-Old Erwin Road is 45mph.

The initial crash analysis for this location was completed from January 1, 1997 through December 31, 1999 with a total of 13 reported crashes. According to the initial crash analysis, there was one Angle crash, five Left Turn-Different Roadway crashes, one Left Turn-Same Roadway crash, four Rear-End crashes, one Ran Off Road-Right crash, and one Animal crash. The “correctable” crashes (which were considered Left Turn and Angle crash types) resulted in four class-A injuries, one class-B injury, and five class-C injuries. The *Project Justification Sheet* in the Project File Folder sites that vehicles on SR 1307-Old Erwin Road were unable to safely enter the intersection due to insufficient gaps in traffic. The project improvement was completed on September 30, 2003 at a cost of approximately \$265,000.

## **Naïve Before and After Analysis**

After reviewing the spot safety file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from September 1, 2003 through October 31, 2003. The before period consisted of reported crashes from September 1, 2000 through August 31, 2003 (3 Years) and the after period consisted of reported crashes from November 1, 2003 through July 31, 2006 (2 Years, 9 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed. The treatment data consisted of all crashes within 150 feet of the treatment intersection. Please see the attached *Location Map* for further detail.

The following data table depicts the Naive Before and After Analysis for the treatment intersection. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

| <u>Treatment Information</u> | <b>Before</b>  |                 | <b>After</b>      |                 | <b>Percent Reduction (-)/<br/>Percent Increase (+)</b> |
|------------------------------|----------------|-----------------|-------------------|-----------------|--|
|                              | <b>3 Years</b> | <b>Per Year</b> | <b>2.75 Years</b> | <b>Per Year</b> |  |
| Total Crashes                | 15             | 5               | 1                 | 0.36            | -92.7%   |
| Total Severity Index         | 3.47           | ---             | 1                 | ---             | -71.2%   |
|                              |                |                 |                   |                 |  |
| Target Crashes               | 6              | 2               | 0                 | 0               | -100.0%  |
| Target Severity Index        | 3.47           | ---             | 0                 | 0               | -100.0%  |
|                              |                |                 |                   |                 |  |
| Volume                       | 16,100         | ---             | 15,900            | ---             | -1.2%  |

| <u>Target Crash Information</u> | <b>Before</b>  |                 | <b>After</b>      |                 | <b>Percent Reduction (-)/<br/>Percent Increase (+)</b> |
|---------------------------------|----------------|-----------------|-------------------|-----------------|--|
|                                 | <b>3 Years</b> | <b>Per Year</b> | <b>2.75 Years</b> | <b>Per Year</b> |  |
| Fatal Injury Crashes            | 0              | 0               | 0                 | 0               | N/A  |
| Non-Fatal Injury Crashes        | 2              | 0.67            | 0                 | 0               | -100.0%  |
| Total Injury Crashes            | 2              | 0.67            | 0                 | 0               | -100.0%  |
| Night Crashes                   | 2              | 0.67            | 0                 | 0               | -100.0%  |
| Wet Crashes                     | 0              | 0               | 0                 | 0               | N/A  |

The naïve before and after analysis considering 2.75 years of after data at the treatment location resulted in a 93 percent decrease in Total Crashes Per Year, a 100 percent decrease in Target Crashes Per Year, and a 1 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2005.

## **Results and Discussion**

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 93 percent decrease in Total Crashes Per Year and a 100 percent decrease in Target Crashes Per Year. The number of Total Crashes decreased from five crashes per year in the before period to less than one crash per year in the after period. The summary results above demonstrate that when using the naïve before and after analysis method the treatment locations appear to have had a substantial reduction in the frequency and severity of crashes from the before to the after period.

Six Target Crashes occurred in the entire three-year before period. The Target Crashes in the before period included one Angle Crash and five Left-Turn Crashes, resulting in one class B injury crash and one class C injury crash. The Target Severity Index in the before period was 3.47.

Research shows that roundabouts may improve the safety of intersections by eliminating or altering conflict types, by reducing speed differentials at intersections, and by forcing drivers to decrease speeds as they proceed into and through the intersection. Roundabouts reduce vehicular crossing conflicts, thus diminishing the opportunity for Frontal Impact crashes to occur. The reduction of conflicts through the physical and geometric features of a roundabout have been shown to be more effective than the separation of conflicts by time as in a signalized intersection.

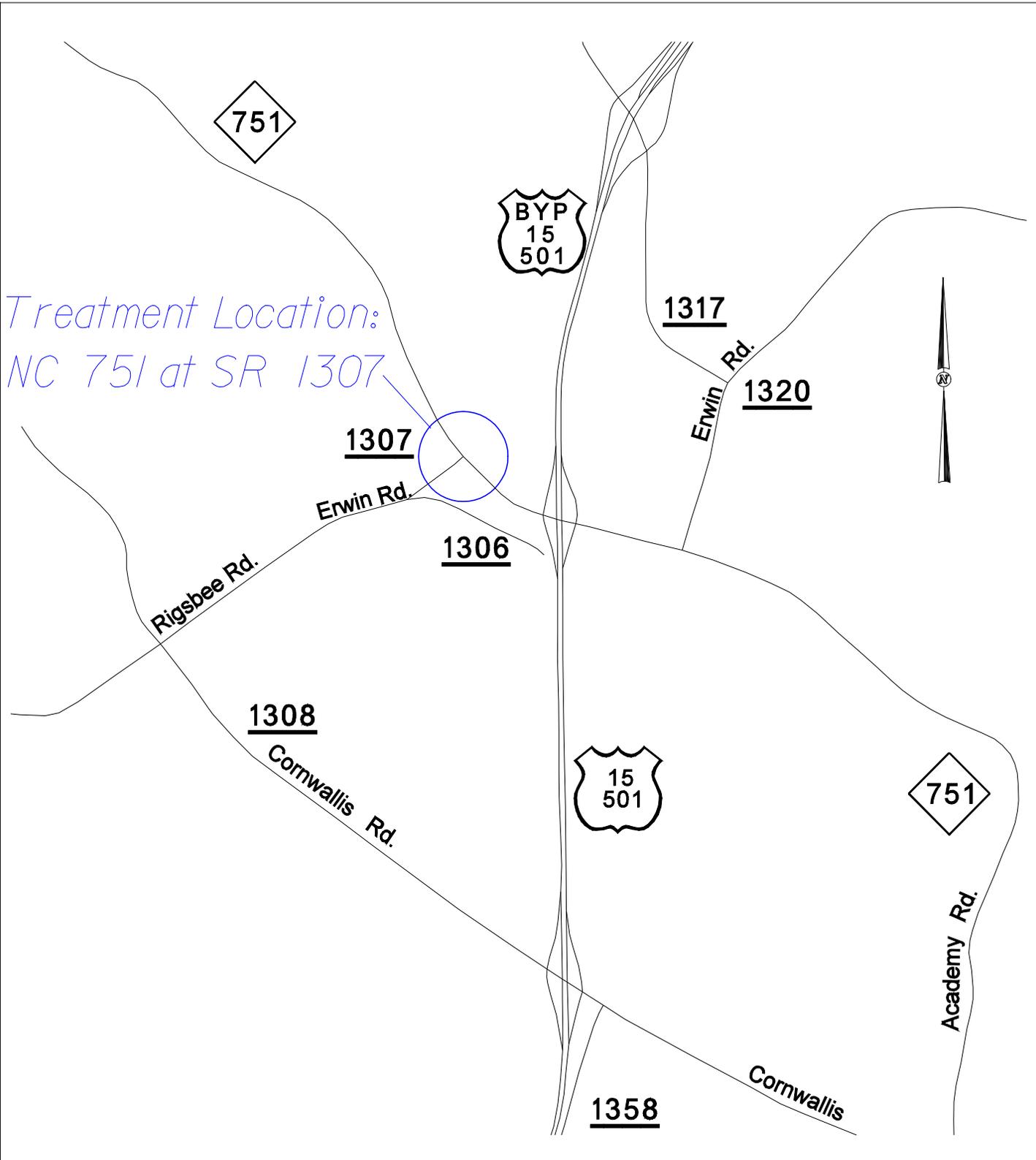
Please see the attached Treatment Site Photos. Photos are provided for all approaches of the Treatment Intersection. Notice the Roundabout Warning Signs with 15-mph advisory plaques and the Yield Ahead Warning Signs placed on each approach.

Please note that this is a preliminary evaluation based on only 2.75 years of after data. This evaluation will be updated when there is at least three years of after data available so a more concrete conclusion can be drawn. Also, as the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

## **Reference**

1. Roundabouts: An Informational Guide  
FHWA-RD-00-67, June 2000

Location Map  
Spot Safety Project 05-00-208  
Durham County



*Treatment Site Photos (Taken on February 23, 2006)*



Looking west at the Roundabout Warning Sign with 15-mph Advisory Plaque.



Looking west at the Yield Ahead Warning Sign in advance of the intersection.

*Treatment Site Photos (Taken on February 23, 2006)*



Looking west at the Treatment Intersection.



Looking east at the Roundabout Warning Sign with 15-mph Advisory Plaque.

*Treatment Site Photos (Taken on February 23, 2006)*



Looking east at the Yield Ahead Warning Sign in advance of the intersection.



Looking east at the Treatment Intersection.

*Treatment Site Photos (Taken on February 23, 2006)*



Looking north at the Roundabout Warning Sign with 15-mph Advisory Plaque.



Looking north at the Yield Ahead Warning Sign in advance of the intersection.

*Treatment Site Photos (Taken on February 23, 2006)*



Looking north at the Treatment Intersection.



NC 751 AT SR 1307 (OLD ERWIN RD)

DURHAM CO.

SEPTEMBER 1, 2000 - AUGUST 31, 2003

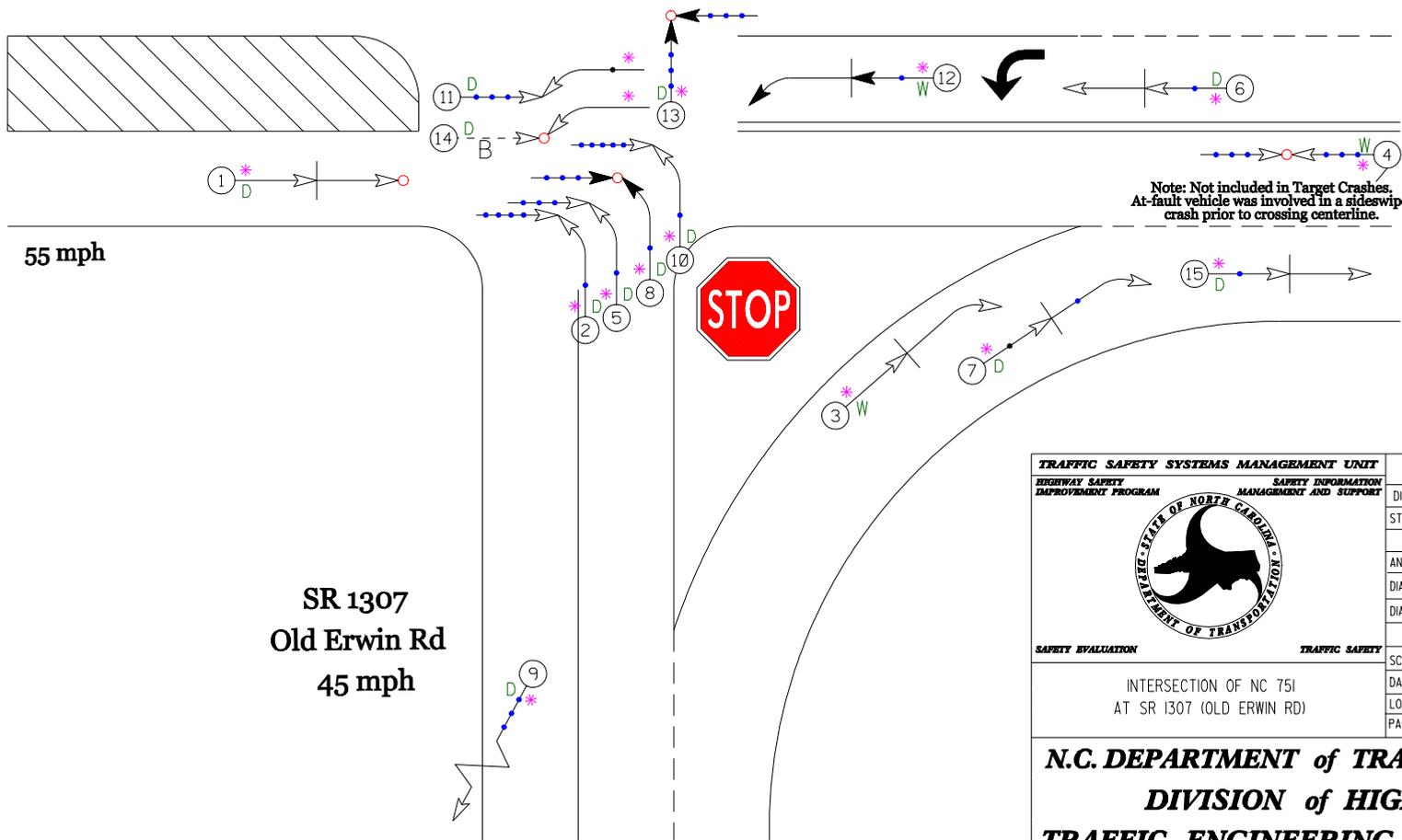
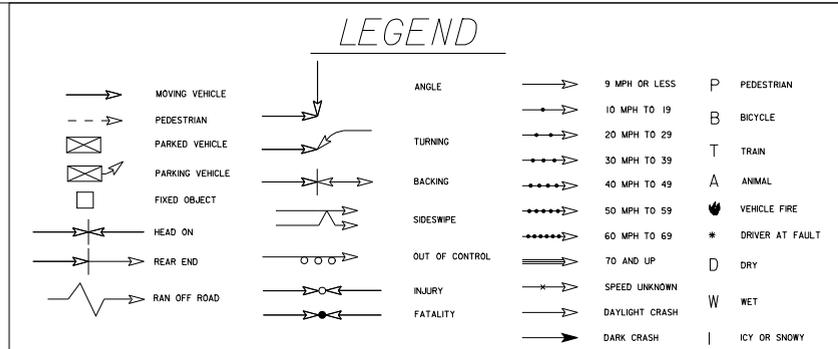
(3 YRS)

BEFORE PERIOD - TOTAL CRASHES

Service Road  
for  
Duke Forest

NC 751

NC 751



|  |   |                                   |                  |
|--|---|-----------------------------------|------------------|
| <b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b>    |   | COLLISION DIAGRAM                 |                  |
| HIGHWAY SAFETY IMPROVEMENT PROGRAM               | SAFETY INFORMATION MANAGEMENT AND SUPPORT | DIVISION: 5                       | REGION: CAPITAL  |
|  |   | STUDY PERIOD: 09/01/00 - 08/31/03 |                  |
|  |   | ANALYSIS PREPARED BY: CLS         |                  |
|  |   | DIAGRAM PREPARED BY: CLS          |                  |
| SAFETY EVALUATION                                |   | DIAGRAM REVIEWED BY:              |                  |
| TRAFFIC SAFETY                                   |   | SCALE: NOT TO SCALE               | DATE: 10/16/2006 |
| INTERSECTION OF NC 751 AT SR 1307 (OLD ERWIN RD) |   | LOG NUMBER: 2006021536            | PAGE: 1 OF 1     |

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**



NC 751 AT SR 1307 (OLD ERWIN RD)

DURHAM CO.

NOVEMBER 1, 2003 - JULY 31, 2006

(2 YRS, 9 MO)

AFTER PERIOD - TOTAL CRASHES

Service Road  
for  
Duke Forest

NC 751

NC 751

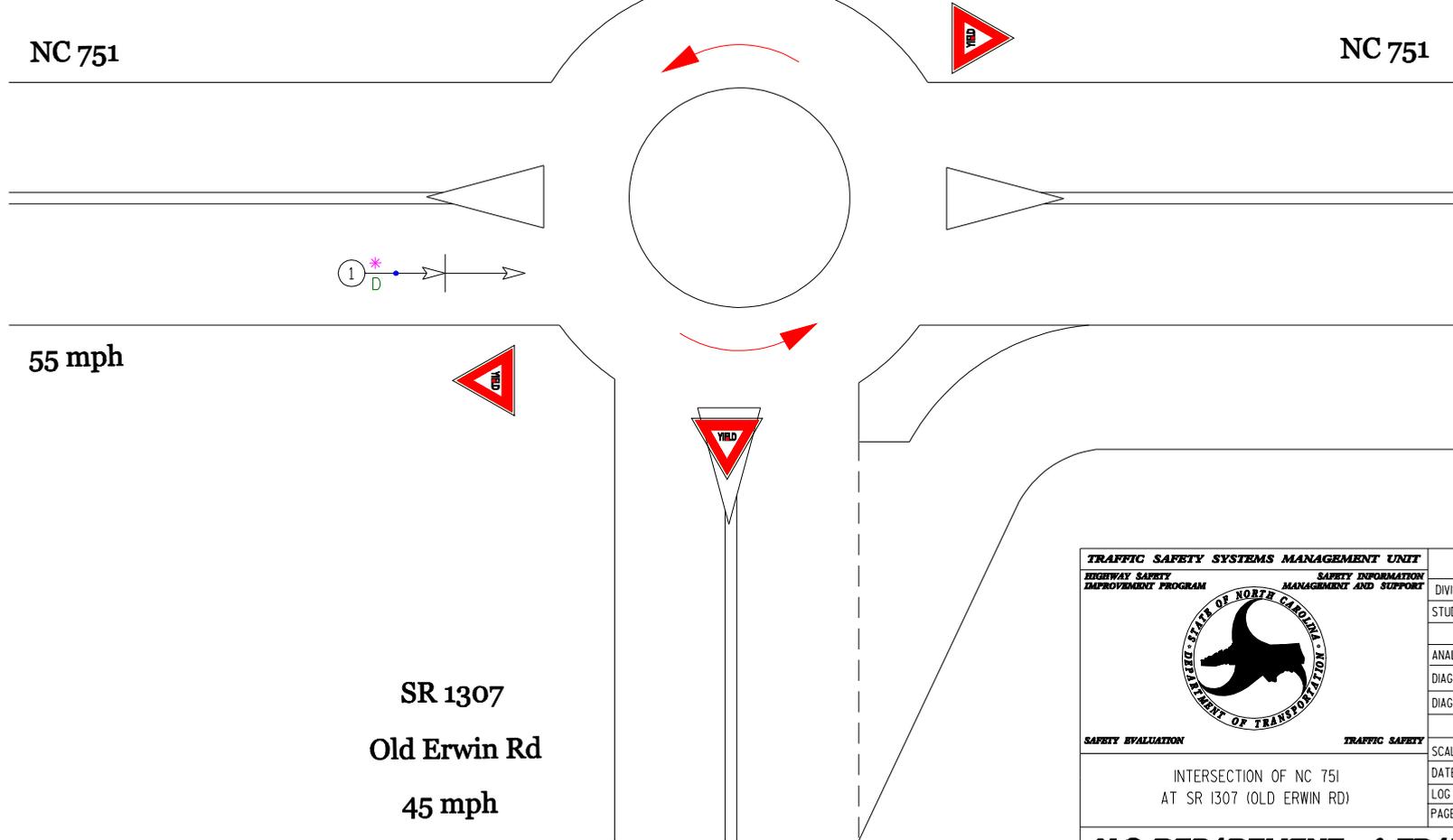
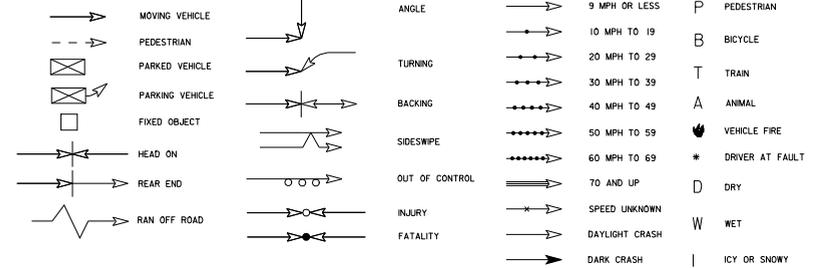
55 mph

SR 1307

Old Erwin Rd

45 mph

LEGEND



|   |  |                                   |                 |
|---|--|-----------------------------------|-----------------|
| <b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b>   |  | COLLISION DIAGRAM                 |                 |
| <small>HIGHWAY SAFETY IMPROVEMENT PROGRAM</small>                                     | <small>SAFETY INFORMATION MANAGEMENT AND SUPPORT</small> | DIVISION: 5                       | REGION: CAPITAL |
|  |  | STUDY PERIOD: 11/01/03 - 07/31/06 |                 |
|   |  | ANALYSIS PREPARED BY: CLS         |                 |
| SAFETY EVALUATION   |  | DIAGRAM PREPARED BY: CLS          |                 |
| TRAFFIC SAFETY  |  | DIAGRAM REVIEWED BY:              |                 |
| INTERSECTION OF NC 751 AT SR 1307 (OLD ERWIN RD)                                      |  | SCALE:                            | NOT TO SCALE    |
|   |  | DATE:                             | 10/16/2006      |
|   |  | LOG NUMBER:                       | 2006021536      |
|   |  | PAGE:                             | 1 OF 1          |

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**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**