

# **Spot Safety Project Evaluation**

Project Log # 200501226

Spot Safety Project # 04-98-249

## **Spot Safety Project Evaluation of the Flashing Traffic Signal Installation at the Intersection of NC 96 and SR 1178 (Keene Rd) in Johnston County**

Documents Prepared By:

Safety Evaluation Group  
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**Principal Investigator**

\_\_\_\_\_  
Samuel D. Coleman

06/22/2005  
Date

Traffic Safety Project Engineer

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 04-98-249 – The intersection of NC 96 and SR 1178 (Keene Rd) in Johnston County.

## **Introduction**

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis of the treatment versus comparison data has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of a flashing traffic signal. NC 96 is a two-lane facility with no left turn lanes at the intersection with SR 1178. SR 1178 is also a two-lane facility with no left turn lanes. NC 96 and SR 1178 both have a speed limit of 45 mph. The intersection is controlled by stop signs on SR 1178 in which the traveling public had difficulty recognizing in the before period. Crashes continued to occur at this location although several revisions (i.e. advance signing, reducing speed limits and clearing sight distances) had been made in an attempt to correct the crash problem. The initial crash analysis for this intersection was completed from June 1, 1992 to May 31, 1998 which yielded 10 total crashes. A total of 8 were angle type crashes and 2 were left turn crashes. These crashes resulted in 1 Class A injury, 10 Class B injuries, and 4 Class C injuries. The final completion date for the construction of the flashing traffic signal was January 4, 1999.

## **Naive Before and After Analysis**

After reviewing the spot safety project 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 December 1998 through February 1999. The before period consisted of reported crashes from June 1, 1993 through November 30, 1998 (5 Years, 5 Months) and the after period consisted of reported crashes from March 1, 1999 through August 31, 2004 (5 Years, 5 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed. The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within 150 feet, at the intersection of NC 96 and SR 1143. The following data table depicts the Naive Before and After Analysis for the above information.

Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. These 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> |
| Total crashes                                  | 9             | 6            | -33.3   |
| Total Severity Index                           | 13.5          | 4.7          | -65.3   |
| Frontal Impact Crashes                         | 9             | 6            | -33.3   |
| Frontal Severity Index                         | 13.5          | 4.7          | -65.3   |
| Volume   | 2500          | 2900         | 16.00   |
| <u>Comparison Information</u>                  |               |              |   |
|  | <b>Before</b> | <b>After</b> | <b>Percent Reduction (-)<br/>Percent Increase (+)</b> |
| Total crashes                                  | 6             | 9            | 50.0  |
| Total Severity Index                           | 4.7           | 12.7         | 170.4   |
| Frontal Impact Crashes                         | 6             | 7            | 16.7  |
| Frontal Severity Index                         | 4.7           | 13.9         | 196.6   |
| Volume   | 2600          | 2950         | 13.5  |
| <u>Odds Ratio: Treatment versus Comparison</u> |               |              |   |
|  | <b>Before</b> | <b>After</b> | <b>Percent Reduction (-)<br/>Percent Increase (+)</b> |
| Treatment Total Crashes                        | 9             | 6            | -55.6   |
| Comparison Total Crashes                       | 6             | 9            |   |
| Treatment F.I. Crashes                         | 9             | 6            | -42.9   |
| Comparison F.I. Crashes                        | 6             | 7            |   |

The naive before and after analysis at the treatment location resulted in a 33.3 percent decrease in Total Crashes, a 33.3 percent decrease in Frontal Impact Crashes, and a 16.0 percent increase in Average Daily Traffic (ADT). The comparison locations resulted in a 50.0 percent increase in Total Crashes, a 16.7 percent increase in Frontal Impact Crashes, and a 13.5 percent increase in ADT. The before period ADT year was 1995 and the after period ADT year was 2001.

The Odds Ratio is used as another means of calculating the treatment effect. The total crashes in the before and after period from the Comparison Intersection are used to calculate the percent reduction in total crashes for the Treatment Intersection. As shown in the table above, using the Odds Ratio calculation, there is a 55.6 percent decrease in Treatment Intersection crashes and a 42.9 percent decrease in Frontal Impact crashes.

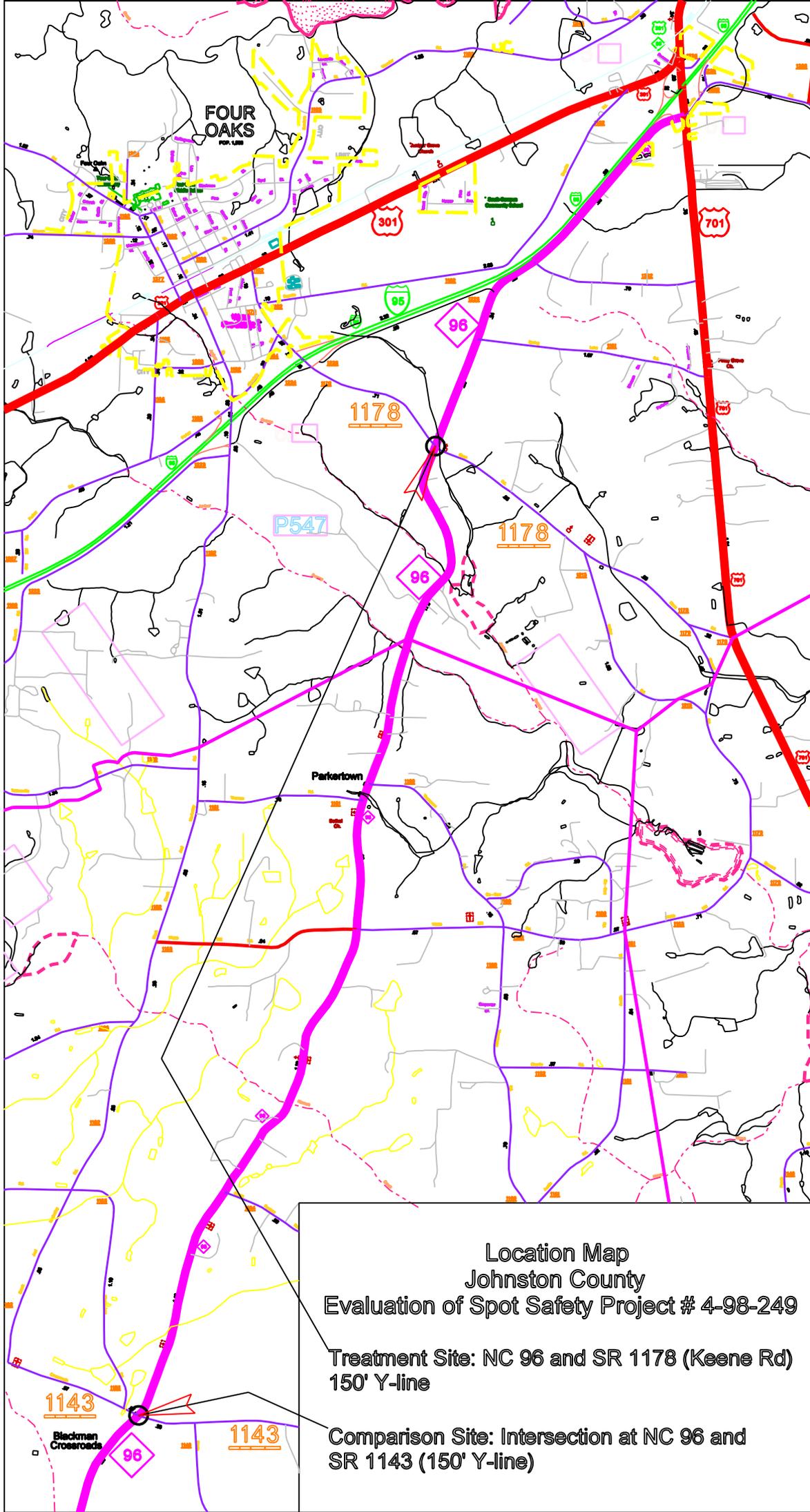
## **Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 33.3 percent decrease in Total Crashes and a 33.3 percent decrease in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 55.6 percent decrease in Total Crashes at the Treatment Intersection and a 42.9 percent decrease in Frontal Impact crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and a decrease in the number of Frontal Impact Crashes from the before to the after period.

The flashing traffic signal was installed as a countermeasure to provide a safer intersection for the traveling public. As stated previously, there were issues with reports of drivers not complying with the stop control condition on SR 1178. Analysis of the crash diagrams and crash reports demonstrated no significant evidence of consistent stop sign violations. There were a total of 12 angle crashes in both the before and after dataset. Within these crashes there were no measurements recorded of tire impressions (skid marks) which may indicate vehicles did recognize the stop condition in time to come to a controlled stop. Also, 3 of the 12 crashes reported vehicles on SR 1178 traveling above 30 mph, which may indicate stop sign violations.

Upon further investigation, the 4 after period angle crashes consisted of one blatantly disregarding the stop condition and fleeing the scene and 3 others in violation of the stop condition at low speeds. The attached pictures show a small hill on the Northbound approach where drivers crossing NC 96 may have a hard time seeing vehicles approaching the intersection. Sight distance does not seem to be an issue when looking at the pictures, but may be a factor in recognizing vehicles from the Northbound approach. Of the 12 angle crashes (8 before and 4 after), 9 angle crashes (6 before and 3 after) involved a vehicle traveling the Northbound approach on NC 96 toward the intersection.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 33.3 to a 55.6 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 33.3 to a 42.9 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.



Location Map  
 Johnston County  
 Evaluation of Spot Safety Project # 4-98-249

Treatment Site: NC 96 and SR 1178 (Keene Rd)  
 150' Y-line

Comparison Site: Intersection at NC 96 and  
 SR 1143 (150' Y-line)

On eastbound approach looking south



On eastbound approach looking north



Looking south



Looking east



Drive North



Drive west



Drive west



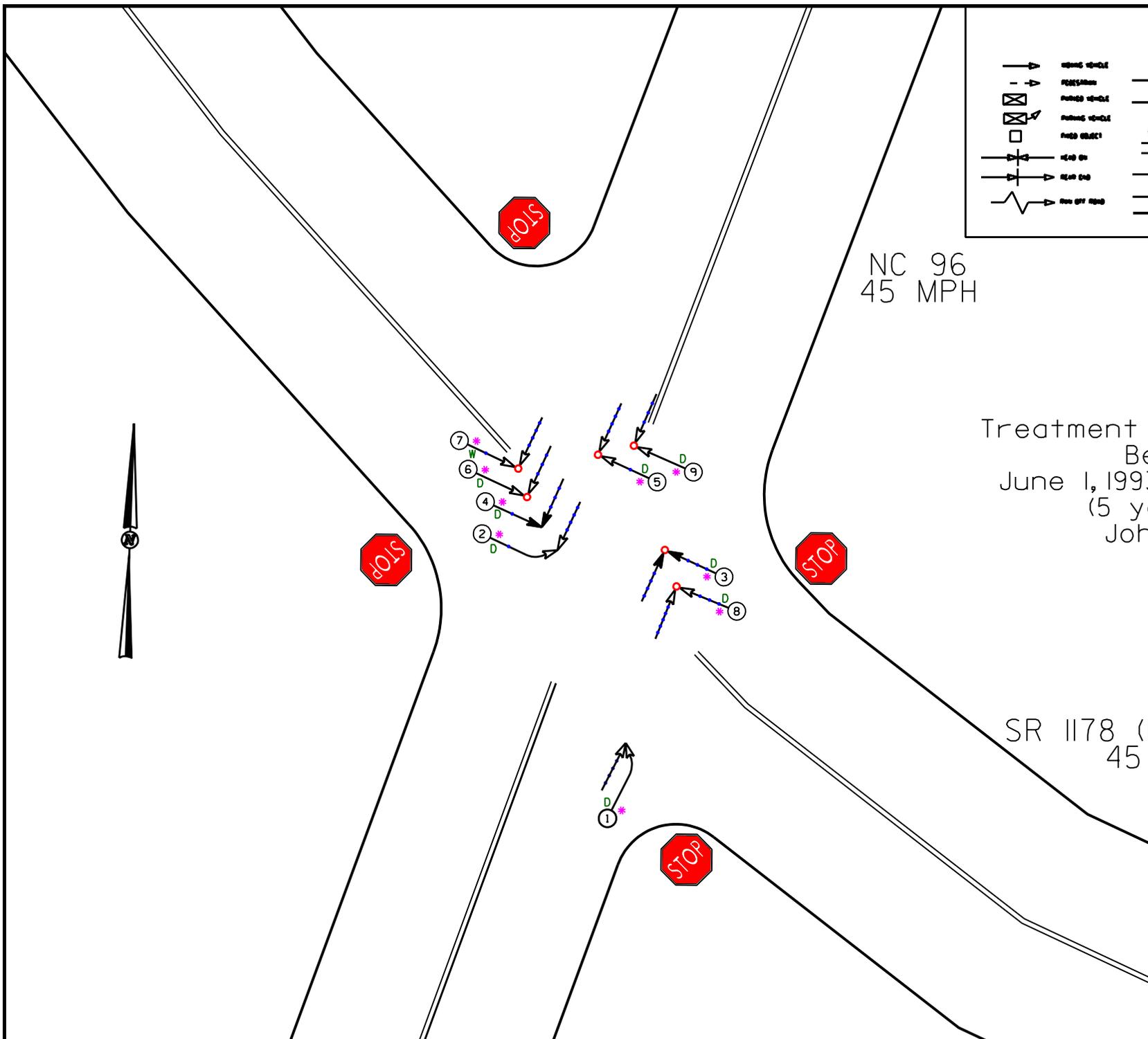
# LEGEND

|  |                |  |         |  |                |  |                   |
|--|----------------|--|---------|--|----------------|--|-------------------|
|  | MOVING VEHICLE |  | MOBILE  |  | 9 MPH OR LESS  |  | P PEDESTRIAN      |
|  | PEDESTRIAN     |  | TURNING |  | 10 MPH TO 19   |  | B BICYCLE         |
|  | PAKED VEHICLE  |  | DRIVWAY |  | 20 MPH TO 29   |  | T TRUCK           |
|  | ROAD OBJECT    |  | DRIVWAY |  | 30 MPH TO 39   |  | A ANIMAL          |
|  | STOP SIGN      |  | DRIVWAY |  | 40 MPH TO 49   |  | • CHANGE AT FAULT |
|  | STOP SIGN      |  | DRIVWAY |  | 50 MPH TO 59   |  | D DRIVE           |
|  | STOP SIGN      |  | DRIVWAY |  | 60 MPH TO 69   |  | W WET             |
|  | STOP SIGN      |  | DRIVWAY |  | 70 MPH OR MORE |  | CREST OF SHEET    |
|  | STOP SIGN      |  | DRIVWAY |  | SPEED WARNING  |  |                   |
|  | STOP SIGN      |  | DRIVWAY |  | DETOUR         |  |                   |
|  | STOP SIGN      |  | DRIVWAY |  | DETOUR         |  |                   |

NC 96  
45 MPH

Treatment Site - Total Crashes  
Before Period  
June 1, 1993 - November 30, 1998  
(5 years 5 months)  
Johnston County

SR 1178 (Keene Rd)  
45 MPH



|   |                |                                  |  |
|---|----------------|----------------------------------|--|
|   |                | COLLISION DIAGRAM                |  |
| DIVISION: .....   | AREA: .....    | STUDY PERIOD: 6/1/93 TO 11/30/98 |  |
| DISTANCE: .....   | T-LINE: 150 FT | ANALYSIS PREPARED BY: S. COLLINS |  |
| DIAGRAM PREPARED BY: S. COLLINS   |                | DIAGRAM REVIEWED BY: .....       |  |
| BECORE ELASHER INSTALLATION   |                | SCALE: NOT TO SCALE              |  |
|   |                | DATE: 08/15/05                   |  |
|   |                | DC NUMBER: .....                 |  |
| N.C. DEPARTMENT of TRANSPORTATION<br>DIVISION of HIGHWAYS<br>TRAFFIC ENGINEERING AND SAFETY<br>SYSTEMS BRANCH |                |                                  |  |

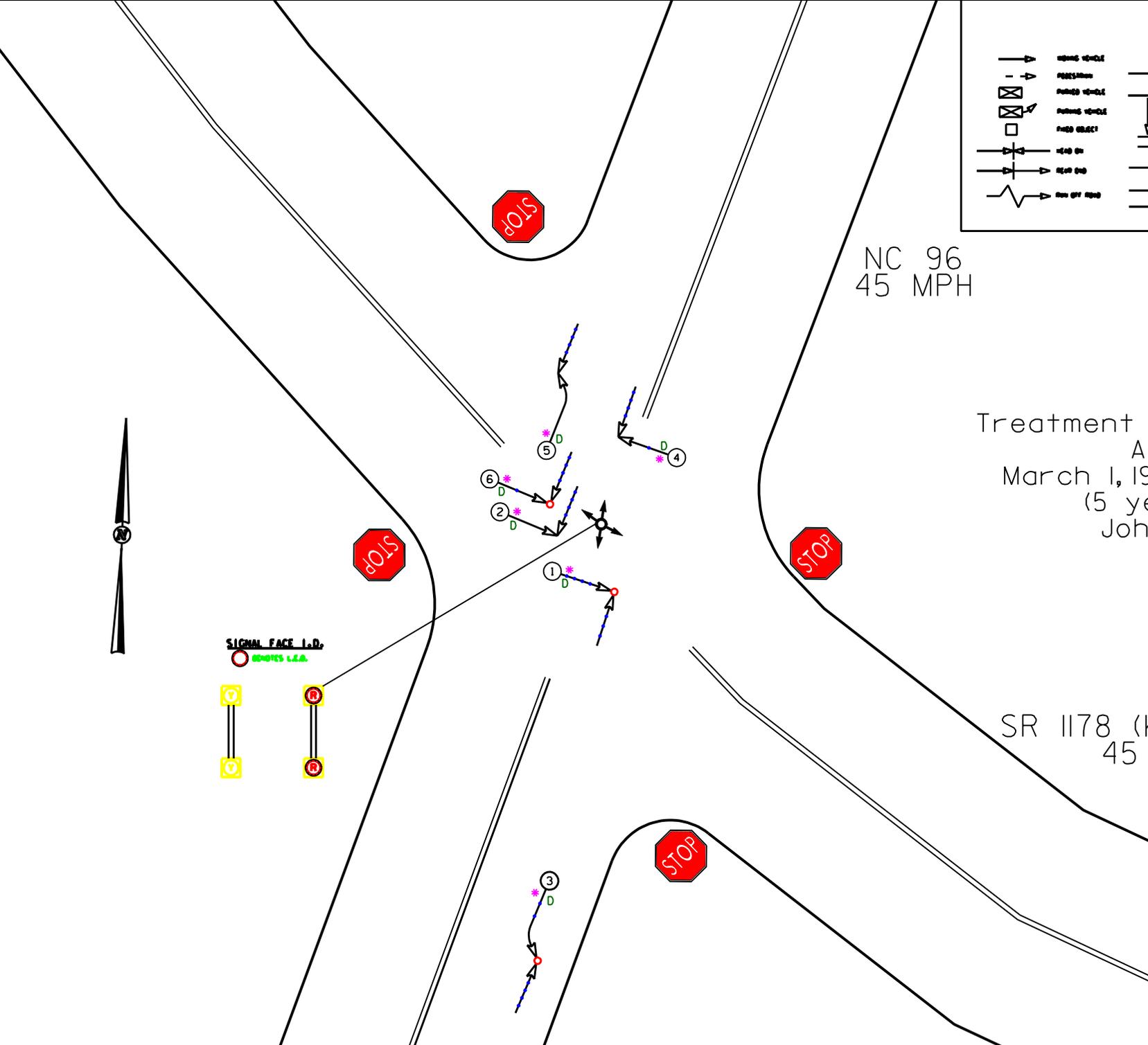
### LEGEND

|  |                 |  |                |  |               |  |                |
|--|-----------------|--|----------------|--|---------------|--|----------------|
|  | MOVING VEHICLE  |  | PEDESTRIAN     |  | 9 mph or less |  | PEDESTRIAN     |
|  | PUSHED VEHICLE  |  | BICYCLE        |  | 10 mph to 19  |  | BICYCLE        |
|  | PUSHING VEHICLE |  | TRAM           |  | 20 mph to 29  |  | TRAM           |
|  | PUSHED VEHICLE  |  | ANIMAL         |  | 30 mph to 39  |  | ANIMAL         |
|  | PUSHING VEHICLE |  | OTHER AT FAULT |  | 40 mph to 49  |  | OTHER AT FAULT |
|  | PUSHED VEHICLE  |  | D              |  | 50 mph to 59  |  | D              |
|  | PUSHING VEHICLE |  | W              |  | 60 mph to 69  |  | W              |
|  | HEAD ON         |  | N              |  | 70 mph to 79  |  | N              |
|  | REAR END        |  | S              |  | 80 mph to 89  |  | S              |
|  | RUN OFF ROAD    |  | I              |  | 90 mph to 99  |  | I              |
|  |                 |  | OUT OF CONTROL |  | 10 mph up     |  |                |
|  |                 |  | RIGHT          |  | SPEED UNKNOWN |  |                |
|  |                 |  | FAULTY         |  | UNKNOWN CRASH |  |                |
|  |                 |  | SIDE CRASH     |  | SIDE CRASH    |  |                |

NC 96  
45 MPH

Treatment Site - Total Crashes  
After Period  
March 1, 1999 - August 31, 2004  
(5 years 5 months)  
Johnston County

SR 1178 (Keene Rd)  
45 MPH



|   |  |                                     |                |
|---|--|-------------------------------------|----------------|
| <b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b> |  | <b>COLLISION DIAGRAM</b>            |                |
|   |  | DIVISION: .....                     | AREA: .....    |
|   |  | STUDY PERIOD: 3/1/1999 TO 8/31/2004 |                |
|   |  | DISTANCE: .....                     | T-LINE: 150 FT |
|   |  | ANALYSIS PREPARED BY: S. Colquhoun  |                |
|   |  | DIAGRAM PREPARED BY: S. Colquhoun   |                |
|   |  | DIAGRAM REVIEWED BY: .....          |                |
|   |  | SCALE: .....                        | NOT TO SCALE   |
|   |  | DATE: .....                         | Dec 17 2005    |
|   |  | LOG NUMBER: .....                   |                |

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