Spot Safety Project Evaluation

Order # 41000006191

Spot Safety Project # 05-04-216

Spot Safety Project Evaluation of the Signal Installation
At The Intersection of NC 751 and SR 1107 (Stagecoach Road)
Durham County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator

Chad J. Neilson

Traffic Safety Project Engineer

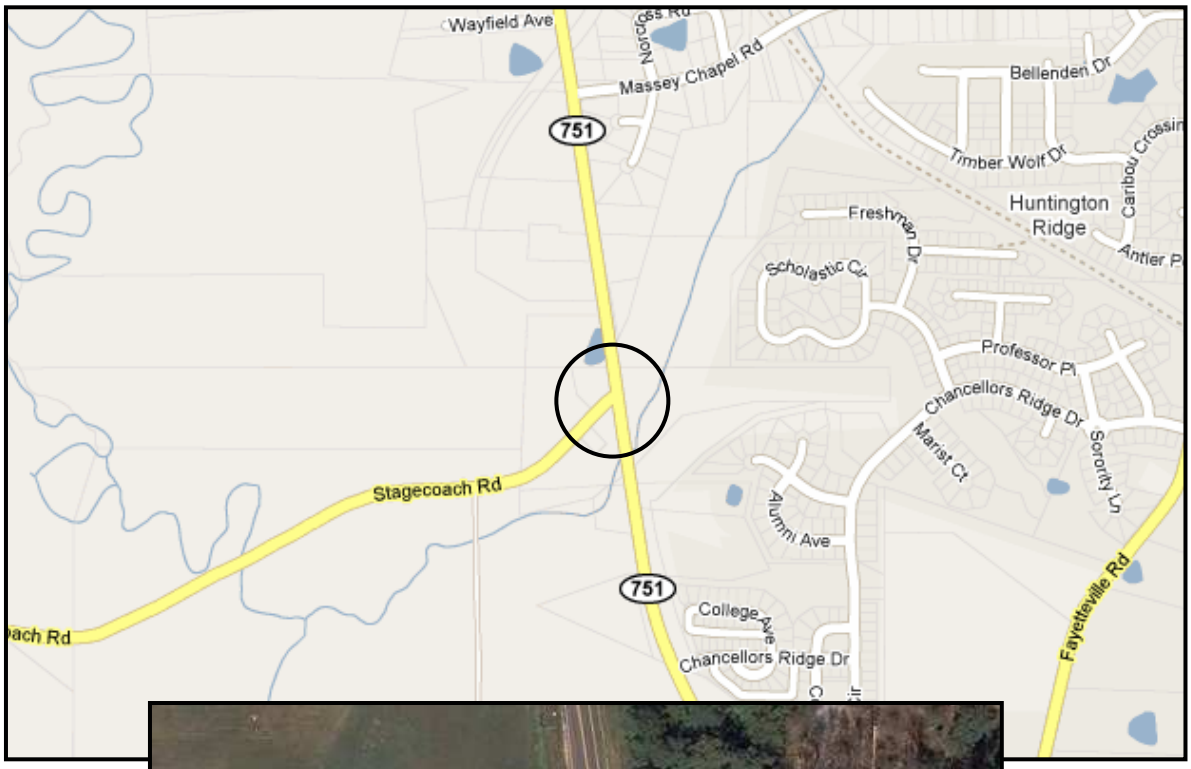
5-26-2010
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-04-216 located at the Intersection of NC 751 and SR 1107 (Stagecoach Road) in Durham County, east of Chapel Hill.

The Signal ID is 05-2263 for this newly installed traffic signal.



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 traffic signal. NC 751 and SR 1107 (Stagecoach Road) are both two-lane facilities at the subject location with speed limits of 45 mph on NC 751 and 55 mph on SR 1107 (Stagecoach Road). The subject location is a three-leg intersection, which was controlled by a stop sign for the SR 1107 (Stagecoach Road) approach.

The original statement of problem was the concern of crashes due to insufficient gaps in traffic on NC 751 for entering vehicles from SR 1107 (Stagecoach Road). The intended purpose of the new signal is to create gaps in traffic along NC 751 and alleviate crashes.

The initial crash analysis was completed from June 1, 2001 to May 31, 2004 with fifteen (15) reported crashes, nine (9) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 18, 2005 with a total cost of $43,500.00.

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 were the months of October 2005 through November 2005. The before period consisted of reported crashes from June 1, 2001 through September 30, 2005 (4 years and 4 months); and the after period consisted of reported crashes from December 1, 2005 through March 31, 2010 (4 years and 4 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. 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.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	19	16	- 15.79 %
Total Severity Index	2.95	3.31	12.20 %
Target Crashes	11	1	- 90.91 %
Target Crash Severity Index	3.69	1	- 72.90 %
Volume	12,200	15,600	27.87 %

Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal Injury Crashes	0	0	0.00 %
Class A Injury Crashes	0	0	0.00 %
Class B Injury Crashes	2	4	100.00 %
Class C Injury Crashes	3	1	- 66.67 %
Total Injury Crashes	5	5	0.00 %

The naive before and after analysis at the treatment location resulted in a sixteen (16) percent decrease in Total Crashes, a ninety-one (91) percent decrease in Target Crashes, and a twelve (12) percent increase in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period angle crash pattern at the intersection consisted of ten (10) crashes, and was the only defined crash pattern during this time. After the signal installation, this pattern was completely eliminated. There remained only one target crash during the after period, a left-turn same roadway, property damage only crash.

The calculated benefit to cost ratio for this project is **0.31 considering total crashes**. The benefit to cost ratio **considering only target crashes is 2.55**. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided from Google Street View for all three approaches to the treatment intersection. 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.

TREATMENT SITE PHOTOS

Looking North on NC 751

Looking South on NC 751

Looking East on SR 1107 (Stagecoach Road)

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL CRASHES

LOCATION: NC 751 at SR 1107 (Stagecoach Rd) BY: C Neilson
COUNTY: Durham DATE: 5/20/2010
FILE NO.: SS 05-04-216

DETAILED COST: TYPE IMPROVEMENT - Signal Installation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$43,500	10	0.149	$6,483
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$43,500	10	0.149	$6,483

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,583
TOTAL COST OF PROJECT= $43,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.33	0	0.00	5	1.15	14	3.23	$36,998
AFTER	4.33	0	0.00	5	1.15	11	2.54	$34,018

Annual Benefits from Crash Cost Savings $2,979

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($6,604)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.31

TOTAL COST OF PROJECT - $43,500 COMPREHENSIVE B/C RATIO - 0.31

BENEFIT-COST ANALYSIS WORKSHEET - TARGET CRASHES

LOCATION: NC 751 at SR 1107 (Stagecoach Rd) BY: C Neilson
COUNTY: Durham DATE: 5/20/2010
FILE NO.: SS 05-04-216

DETAILED COST: TYPE IMPROVEMENT - Signal Installation

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BEFORE	4.33	0	0.00	4	0.92	7	1.62	$25,427
AFTER	4.33	0	0.00	0	0.00	1	0.23	$993

Annual Benefits from Crash Cost Savings $24,434

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $14,851

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.55

TOTAL COST OF PROJECT - $43,500 COMPREHENSIVE B/C RATIO - 2.55

SS# 05-04-216
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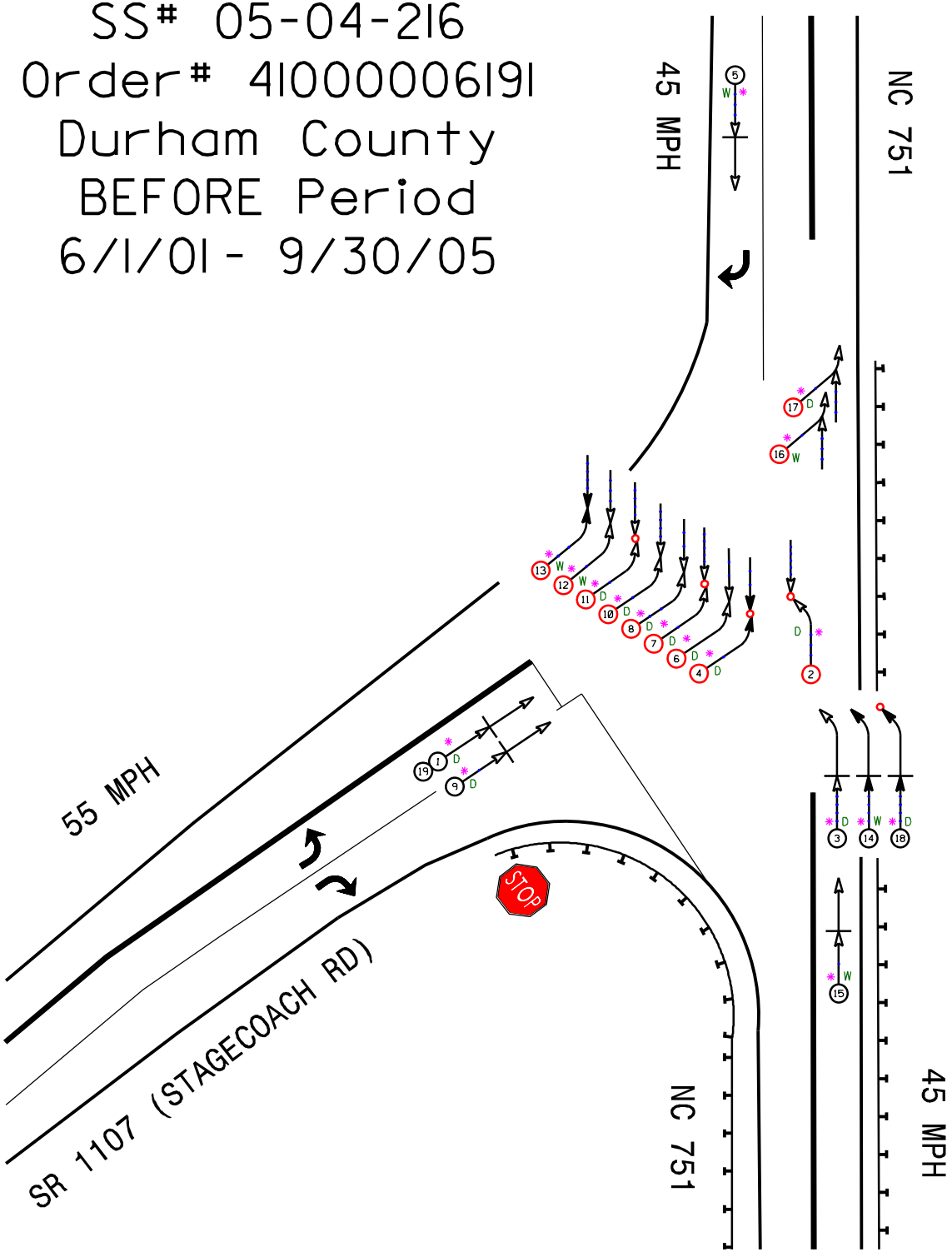
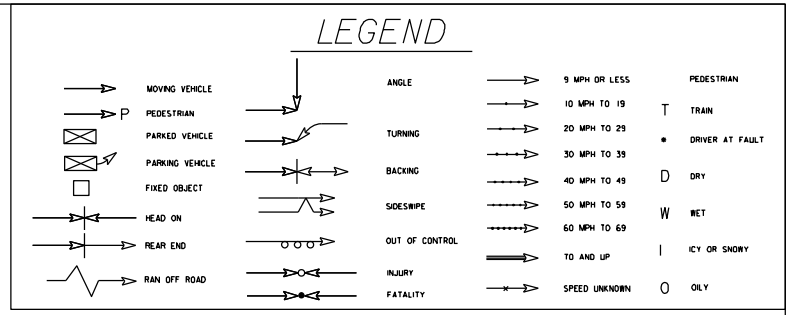
Durham County
BEFORE Period
6/1/01 - 9/30/05





Frontal Impact Target Crashes

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 5-17-2010

Prepared By: C Neilson

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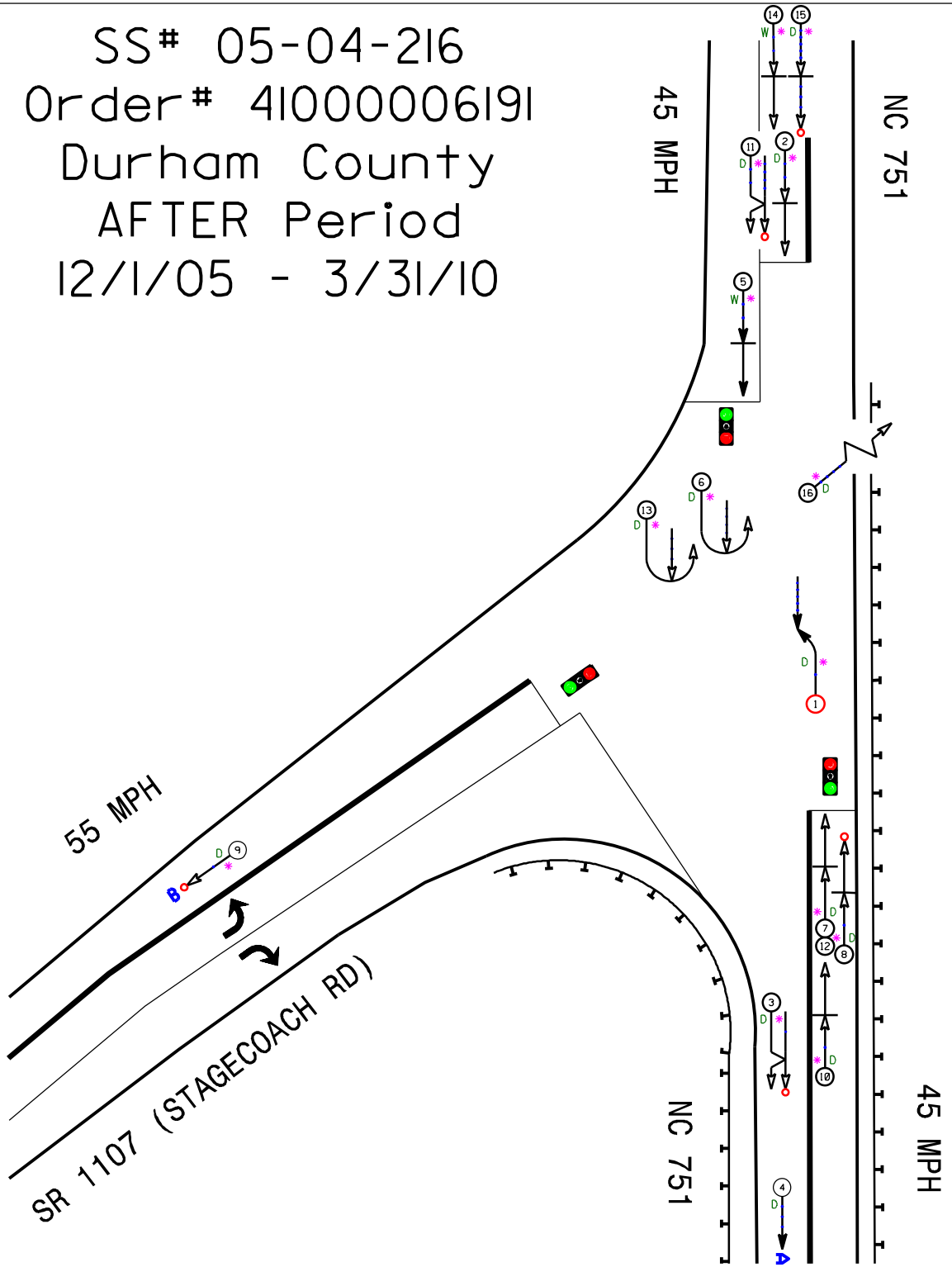
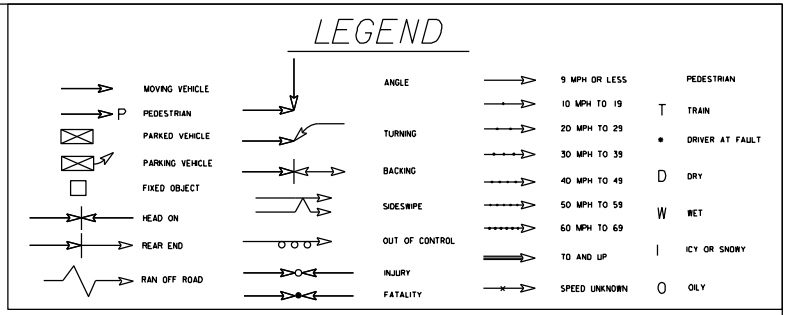
Durham County
AFTER Period
12/1/05 - 3/31/10





Frontal Impact Target Crashes

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