

Spot Safety Project Evaluation

Order # 41000010625

Spot Safety Project # 05-04-002

**Spot Safety Project Evaluation of the Installation of a Traffic Signal
At the Intersection of SR 3109 (Brier Creek Parkway) and Brier Leaf Lane / PVA
And the Installation of a Directional Crossover Median
At the Intersection of SR 3109 (Brier Creek Parkway) and Little Brier Creek Lane / PVA
In the City of Raleigh, Wake 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

1-21-2011

Date

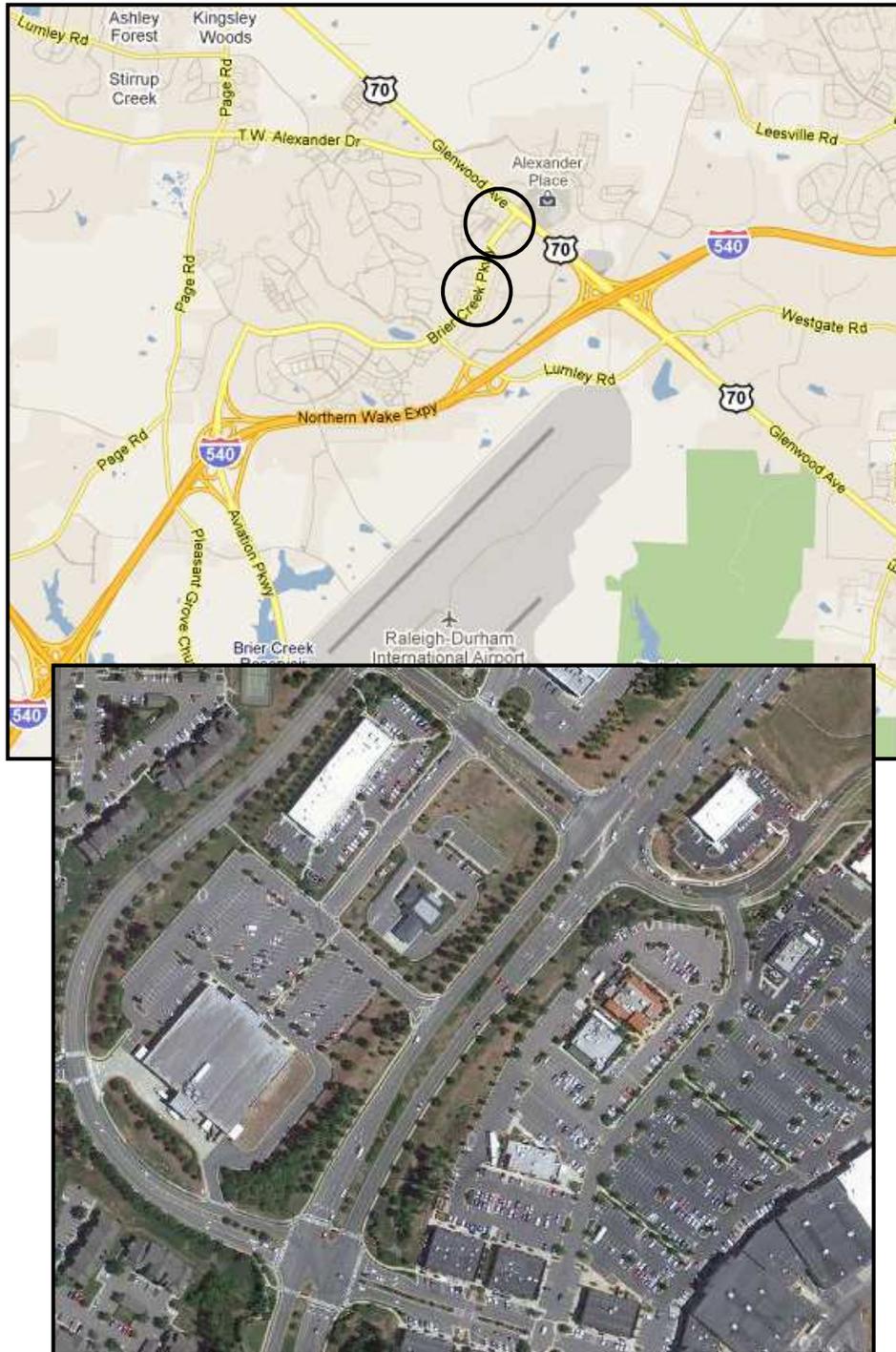
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-04-002 located at the intersection of SR 3109 (Brier Creek Parkway) and Brier Leaf Lane / PVA and the intersection of SR 3109 (Brier Creek Parkway) / Little Brier Creek Lane / PVA, in the city of Raleigh, Wake County.

The signal ID for the new signal is 05-2248.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of a traffic signal at the intersection of SR 3109 (Brier Creek Parkway) and Brier Leaf Lane / PVA and the installation of a directional crossover at the intersection of SR 3109 (Brier Creek Parkway) and Little Brier Creek Lane / PVA. SR 3109 (Brier Creek Lane) is a four-lane, median divided facility at the subject intersections with a speed limit of 45 mph for both approaches. Brier Leaf Lane is a two-lane facility with a speed limit of 35 mph for the eastbound approach and 25 mph for the westbound approach. Little Brier Creek is a two lane facility with no posted speed limit. Both intersections are full access stop sign controlled with the side streets encountering the stop sign condition. For the purpose of this study, the intersections will be referred to as the following:

- Location 1 – SR 3109 (Brier Creek Parkway) and Brier Leaf Lane / PVA
- Location 2 – SR 3109 (Brier Creek Parkway) and Little Brier Creek Lane / PVA

The original statement of problem was crash concerns along SR 3109 (Brier Creek Parkway) with traffic volumes increasing as the community grows.

There was no initial crash analysis for this study. This project area was established in 2003, therefore there was not available crash data to analyze. The final completion date for the improvement at the subject intersection was on February 23, 2006 with a total cost of \$166,700.00.

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 August 2005 through March 2006. The before period consisted of reported crashes from January 1, 2003 through July 31, 2005 (2 years and 7 months); and the after period consisted of reported crashes from April 1, 2006 through November 30, 2010 (4 years and 8 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 along SR 3109 (Brier Creek Parkway) from 150' south of Location 1 to 150' north of Location 2. *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 at Location 1. 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. At Location 2, Left turn, different roadway and Angle crashes are considered as target crashes.

Treatment Information		Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes		56	163	-
Total Crashes per Year		21.71	34.98	61.12 %
Total Crash Severity Index		4.60	2.63	- 42.83 %
Volume (2004, 2008)		6,500	7,300	12.31 %
Location 1	Total Crashes	14	57	-
	Total Crashes per Year	5.43	12.23	125.23 %
	Target Crashes	2	38	-
	Target Crashes per Year	0.78	8.15	944.87 %
	Target Crash Severity Index	1.00	4.12	312.00 %
Location 2	Total Crashes	42	99	-
	Total Crashes per Year	16.28	21.24	30.47 %
	Target Crashes	26	0	-
	Target Crashes per Year	10.08	0.00	- 100.00 %
	Target Crash Severity Index	7.62	0.00	- 100.00 %

The naive before and after analysis at the treatment location resulted in a sixty-one (61) percent increase in Total Crashes per Year and a forty-two (42) percent decrease in the Total Severity Index. At Location 1, Total Crashes per Year were increased by one-hundred and twenty-five (125) percent. At Location 2, Total Crashes per Year were increased by thirty (30) percent. The before period ADT year was 2004 and the after period ADT year was 2008. Both ADT's are estimates based from traffic counts conducted for this project.

Location 1 Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	-
Class A injury Crashes	0	0	-
Class B injury Crashes	0	3	-
Class C Injury Crashes	2	15	-
Total Injury Crashes	2	18	-
Total Injury Crashes per Year	0.78	3.86	398.07 %

The Total Injury Crashes per Year at Location 1 was increased by three-hundred and ninety-eight (398) percent.

Location 2 Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	-
Class A injury Crashes	1	0	-
Class B injury Crashes	6	1	-
Class C Injury Crashes	9	17	-
Total Injury Crashes	16	18	-
Total Injury Crashes per Year	6.20	3.86	- 37.74 %

The Total Injury Crashes per Year at Location 2 was decreased by thirty-seven (37) percent.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented two (2) target crashes at Location 1. After the signal installation, there were thirty-eight (38) target crashes. There was a newly developed northbound left-turn, same roadway crash pattern that accounted for sixteen (16) target crashes. There was also a southbound left-turn, same roadway crash pattern that accounted for seventeen (17) target crashes.

The before period presented twenty-six (26) target crashes at Location 2. There was an eastbound angle crash pattern that accounted for six (6) target crashes. There was a westbound angle crash pattern that accounted for sixteen (16) target crashes. After the installation of the directional crossover median, there were zero (0) target crashes.

There are newly developed crash patterns at Location 2. The westbound rear-end crash pattern increased to fifty-three (53) crashes from fourteen (14) crashes. The eastbound rear-end crashes pattern increased to fifteen (15) crashes from zero (0). It should be noted, in the after period these two approaches were restricted to right only turn lanes due to the installation of the directional crossover median.

The calculated benefit to cost ratio for this project is **6.04 considering total crashes**. The benefit to cost ratio **considering only target crashes is 10.07**. 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.

Photos were provided for this location by Google Street View for all four approaches of both study intersections. 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.

TREATMENT SITE PHOTOS
Location 1



Looking North on SR 3109 (Brier Creek Pkwy)



Looking West on Brier Leaf Lane / PVA



Looking South on SR 3109 (Brier Creek Pkwy)



Looking East on Brier Leaf Lane

Location 2



Looking North on SR 319 (Brier Creek Pkwy)



Looking West on ARCO Drive



Looking South on SR 3109 (Brier Creek Pkwy)



Looking East on Little Brier Creek Lane

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL (Combined Loc. 1 and 2)

LOCATION: SR 3109 (Brier Creek Parkway) from Brier Leaf Lane to Little Brier Cr		BY: C Neilson						
COUNTY: Wake		DATE: 1/19/2011						
FILE NO.: SS 05-04-002								
DETAILED COST:	TYPE IMPROVEMENT - Signal and Median Directinoal Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$166,700	10	0.149	\$24,843			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$166,700	10	0.149	\$24,843			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$27,743			
	TOTAL COST OF PROJECT=				\$166,700			
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	2.58	1	0.39	17	6.59	38	14.73	\$439,302
AFTER	4.66	0	0.00	36	7.73	127	27.25	\$271,695
							Annual Benefits from Crash Cost Savings	\$167,607
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$139,864			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	6.04			
TOTAL COST OF PROJECT		-	\$166,700	COMPREHENSIVE B/C RATIO		-	6.04	

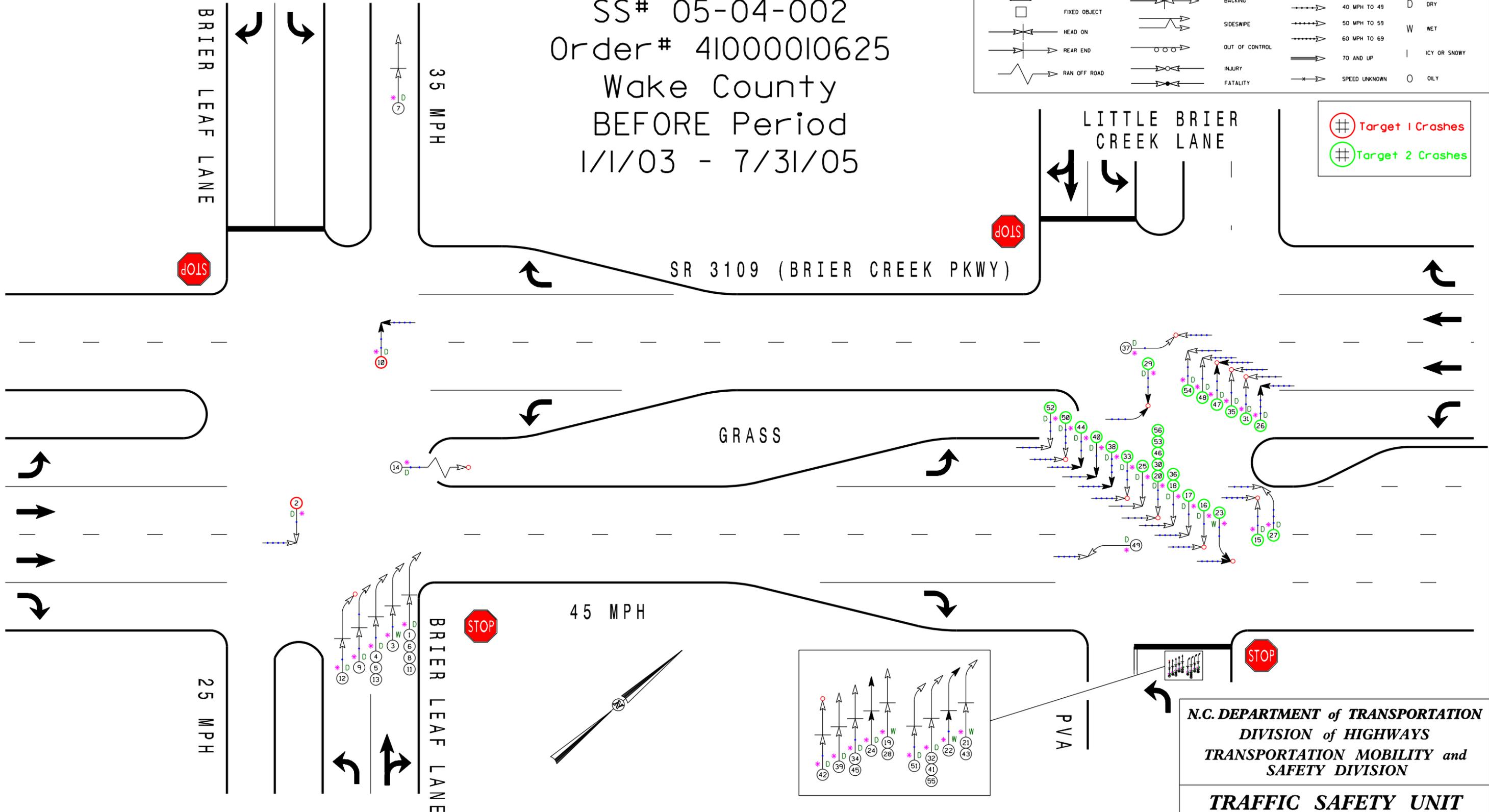
BENEFIT-COST ANALYSIS WORKSHEET - TARGET (Combined Loc. 1 and 2)

LOCATION: SR 3109 (Brier Creek Parkway) from Brier Leaf Lane to Little Brier Cr		BY: C Neilson						
COUNTY: Wake		DATE: 1/19/2011						
FILE NO.: SS 05-04-002								
DETAILED COST:	TYPE IMPROVEMENT - Signal and Median Directinoal Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$166,700	10	0.149	\$24,843			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$166,700	10	0.149	\$24,843			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$27,743			
	TOTAL COST OF PROJECT=				\$166,700			
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	2.58	1	0.39	13	5.04	14	5.43	\$368,295
AFTER	4.66	0	0.00	16	3.43	22	4.72	\$88,970
							Annual Benefits from Crash Cost Savings	\$279,325
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$251,581			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	10.07			
TOTAL COST OF PROJECT		-	\$166,700	COMPREHENSIVE B/C RATIO		-	10.07	

SS# 05-04-002
 Order# 41000010625
 Wake County
 BEFORE Period
 1/1/03 - 7/31/05

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		OILY



Target 1 Crashes
 Target 2 Crashes

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

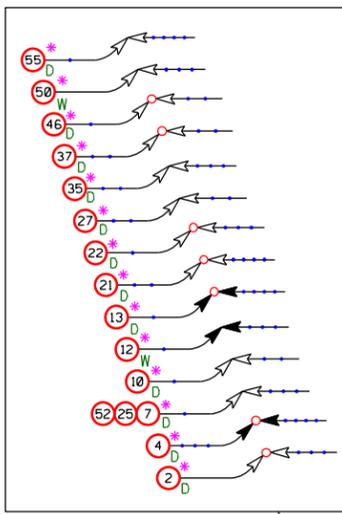
TRAFFIC SAFETY UNIT

Date: 1-18-2011
 Prepared By: C Neilson

SS# 05-04-002
 Order# 41000010625
 Wake County
 AFTER Period
 4/1/06 - 11/30/10

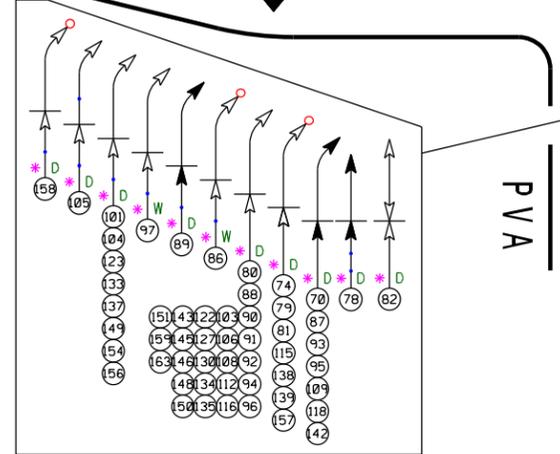
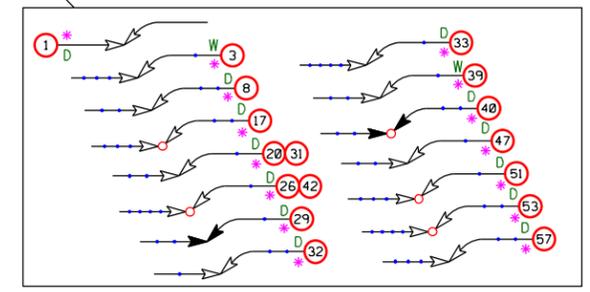
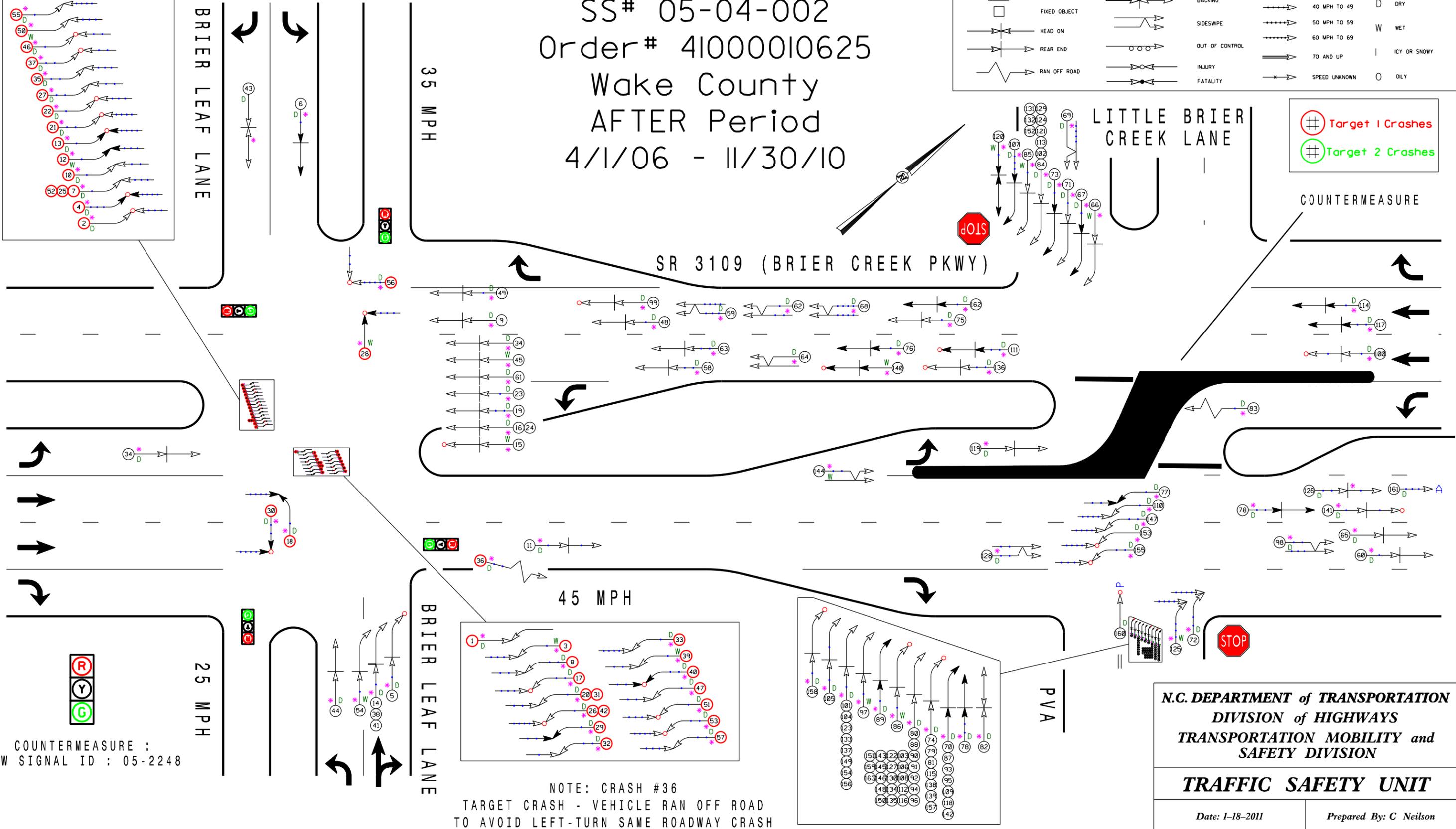
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		9 MPH OR LESS		70 AND UP		OILY



Target 1 Crashes
Target 2 Crashes

COUNTERMEASURE



NOTE: CRASH #36
 TARGET CRASH - VEHICLE RAN OFF ROAD
 TO AVOID LEFT-TURN SAME ROADWAY CRASH

COUNTERMEASURE :
 NEW SIGNAL ID : 05-2248

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

TRAFFIC SAFETY UNIT

Date: 1-18-2011

Prepared By: C Neilson