

# **Spot Safety Project Evaluation**

Project Log # 200704282

Spot Safety Project # 07-00-208

## **Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of NC 6 (Lee St.) and Moody St. Guilford 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**

\_\_\_\_\_  
Brad Robinson, EI

10/7/2008  
Date

Traffic Safety Project Engineer

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

## **Subject Location**

Evaluation of Spot Safety Project Number 07-00-208 – The Intersection of NC 6 (Lee St.) at Moody St. in Guilford County.

## **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 with a protected phase for left turns on NC 6 (Lee St.). The subject intersection is a 4 leg intersection that was originally controlled by stop signs on Moody St. NC 6 is a divided roadway with a left turn, a thru, and a thru-right lane on both approaches. There is painted channelization for the left turn lanes on which yield signs were posted in the before period. Moody St. has single lane approaches on in both directions. The speed limit on NC 6 is 45 mph and the speed limit on Moody St is 35 mph.

The original statement of problem was that vehicles could not safely enter the intersection due to insufficient gaps in traffic. Upon investigation, it was determined that the intersection satisfied traffic signal warrants 2, 6, and 11.

The initial crash analysis was conducted from February 1, 1997 to January 31, 2000 with a total of 33 crashes, 29 of which were considered correctable. The final completion date for the improvements at the subject intersection was on August 29, 2002 with a total cost of \$27,000.00.

## **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 was from August 1, 2002 to September 30, 2002. The before period consisted of reported crashes from November 1, 1996 through July 31, 2002 (5 years, 8 months) and the after period consisted of reported crashes from October 1, 2002 through June 30, 2008 (5 years, 8 months). The ending date for this analysis was determined by the available crash data at the time the analysis was completed.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection.

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.

<b>Treatment Information</b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	71	14	-80.3
Total Severity Index	6.03	3.64	-39.6
Target Crashes	64	7	-89.1
Target Crash Severity Index	6	6.29	4.8
Volume	17,000	15,600	-8.2
<b>Crash Severity Summary</b>			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	11	0	-100.0
Class C Crashes	27	5	-81.5
PDO Crashes	32	9	-71.9

The naive before and after analysis at the treatment location resulted in an 80 percent decrease in Total Crashes, an 89 percent decrease in Target Crashes, and an 8 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

## **Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 80 percent decrease in Total Crashes and an 89 percent decrease in Target Crashes. The Total Severity Index decreased by 40 percent and the Target Crash Severity Index increased by 5 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased from the before to the after period at the treatment location.

The calculated benefit to cost ratio for this project is 31.43 considering total crashes. The benefit to cost ratio considering only target crashes is 29.56. 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.

Referencing the *Collision Diagrams* and the above table, it is apparent that the installation of the signal was effective in reducing Frontal Impact Crashes at the intersection. In the before period there were two large patterns of crashes and one smaller pattern, all of which were significantly reduced in the after period. An Angle Crash pattern involving westbound NC 6 vehicles and northbound Moody St vehicles was reduced from 38 in the before period to only one in the after, a reduction of 97 percent. A second Angle Crash pattern involved eastbound NC 6 vehicles and southbound Moody St vehicles was reduced from 16 in the before period to only two in the after period, a reduction of 88 percent. The third crash pattern was Left Turn-Same Roadway crashes

involving eastbound NC 6 vehicles turning left onto Moody St. This pattern was reduced from five in the before period to one in the after period, a reduction of 80 percent.

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 roadway.

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: NC6 (Lee) at Moddy  
 COUNTY: Guilford  
 FILE NO.: SS 08-29-02

BY: BDR  
 DATE: 10/2/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$27,000	10	0.149	\$4,024
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$27,000</b>	<b>10</b>	<b>0.149</b>	<b>\$4,024</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$6,924  
 TOTAL COST OF PROJECT= \$27,000

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	5.75	1	0.17	38	6.61	32	5.57	\$240,557
AFTER	5.75	0	0.00	5	0.87	9	1.57	\$22,939

Annual Benefits from Crash Cost Savings \$217,617

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$210,694

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 31.43

TOTAL COST OF PROJECT - \$27,000 COMPREHENSIVE B/C RATIO - 31.43

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: NC6 (Lee) at Moddy  
 COUNTY: Guilford  
 FILE NO.: SS 08-29-02 Target Crashes

BY: BDR  
 DATE: 10/2/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$27,000	10	0.149	\$4,024
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$27,000</b>	<b>10</b>	<b>0.149</b>	<b>\$4,024</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
<b>TOTAL ANNUAL COST=</b>	<b>\$6,924</b>
<b>TOTAL COST OF PROJECT=</b>	<b>\$27,000</b>

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	5.75	1	0.17	33	5.74	30	5.22	\$222,609
AFTER	5.75	0	0.00	5	0.87	2	0.35	\$17,948

Annual Benefits from Crash Cost Savings \$204,661

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$197,737

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 29.56

TOTAL COST OF PROJECT - \$27,000 COMPREHENSIVE B/C RATIO - 29.56

**Location Map  
Guilford County  
Evaluation of Spot Safety Project # 07-00-208**



**Treatment Location: NC 6 (Lee St) at Moody St**

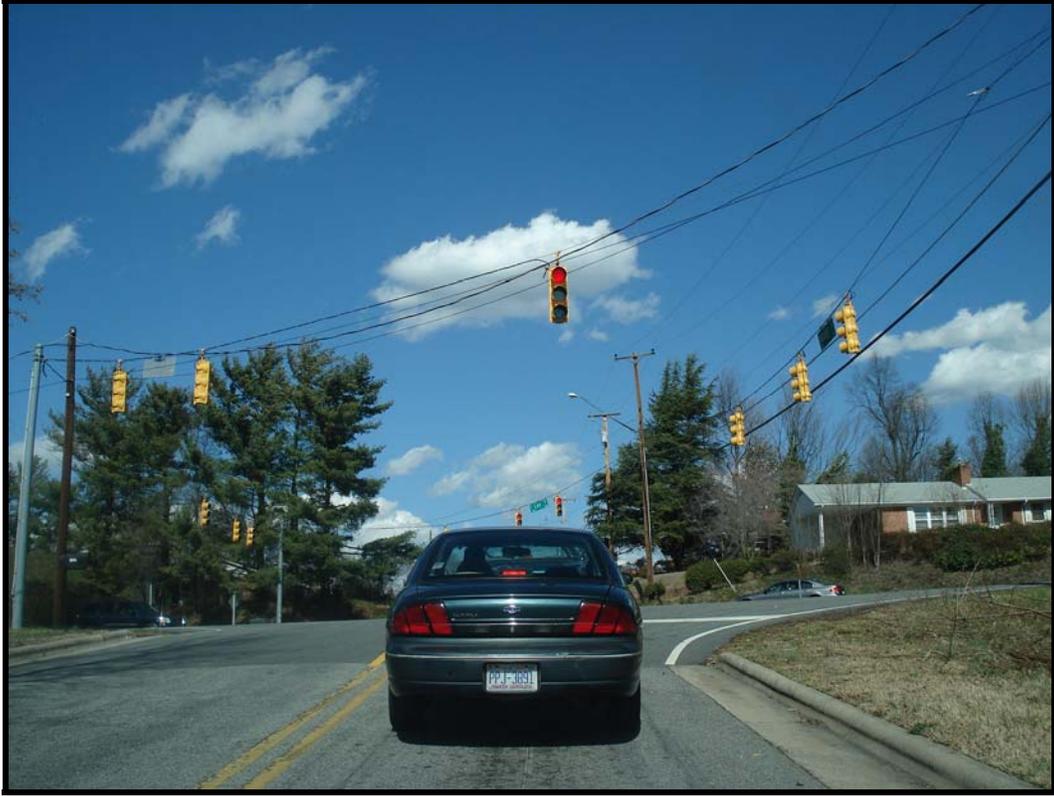
Treatment Site Photos Taken February 18, 2008



Traveling West on NC 6 (Lee St)



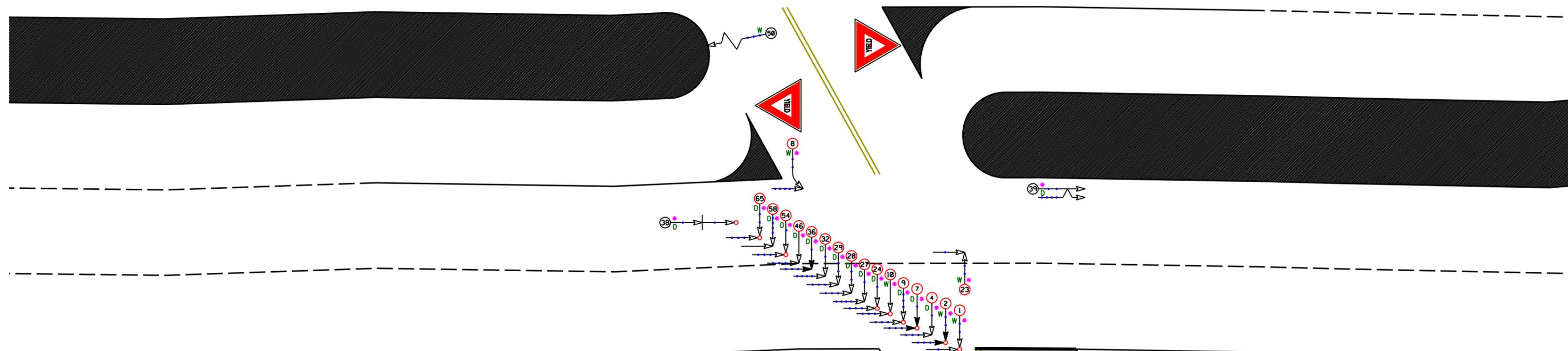
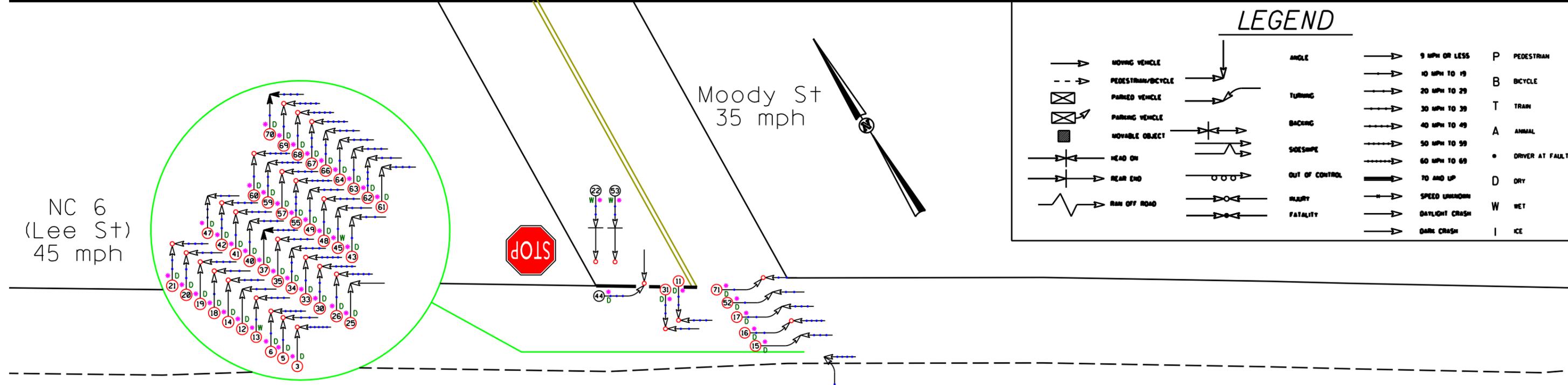
Traveling East on NC 6 (Lee St)



Traveling North on Moody St



Traveling South on Moody St



**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**  
 HIGHWAY SAFETY IMPROVEMENT PROGRAM

**SAFETY INFORMATION**  
 MANAGEMENT AND SUPPORT

**COLLISION DIAGRAM**

DIVISION: 40 AREA: ..

STUDY PERIOD: 11/1/1996 TO 7/31/2002

DISTANCE: ..... Y-LINE: 150 FT

ANALYSIS PREPARED BY: B. Bobiosoo

DIAGRAM PREPARED BY: B. Bobiosoo

DIAGRAM REVIEWED BY: .....

SCALE: NOT TO SCALE

DATE: October, 2008

LOG NUMBER: 200704282

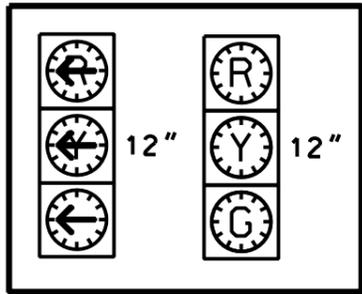
**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY AND SAFETY DIVISON**

Guilford County  
 Treatment Site - Total Crashes  
 Before Period  
 November 1, 1996 - July 31, 2002

# Target Crashes

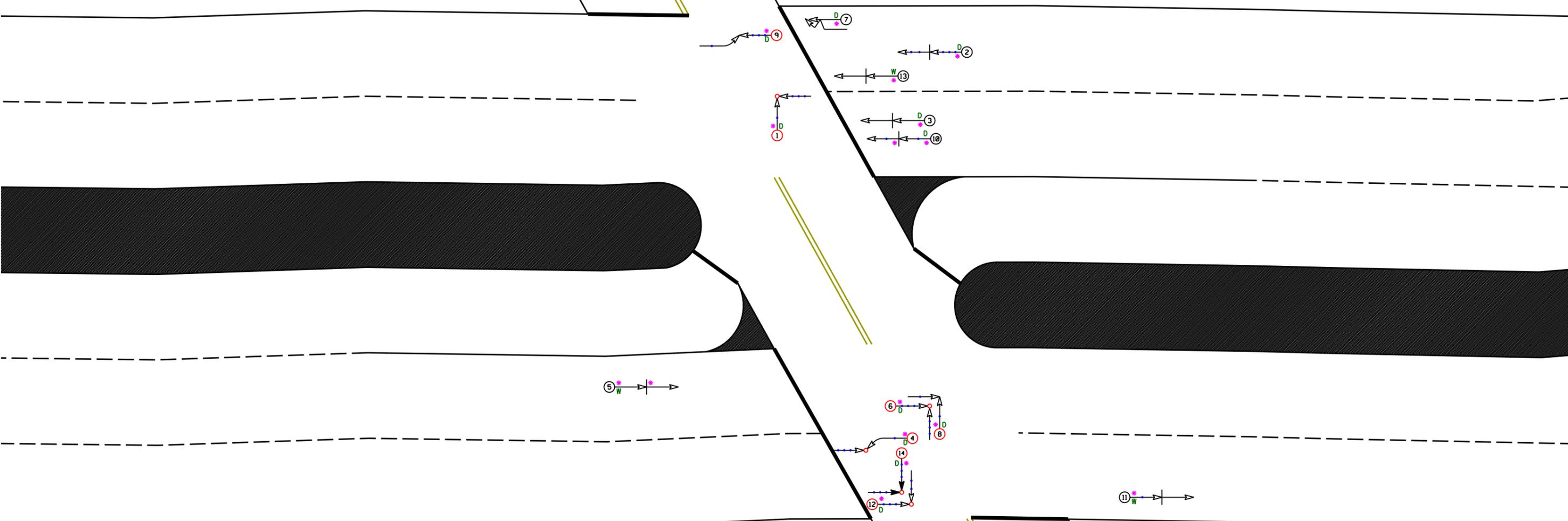
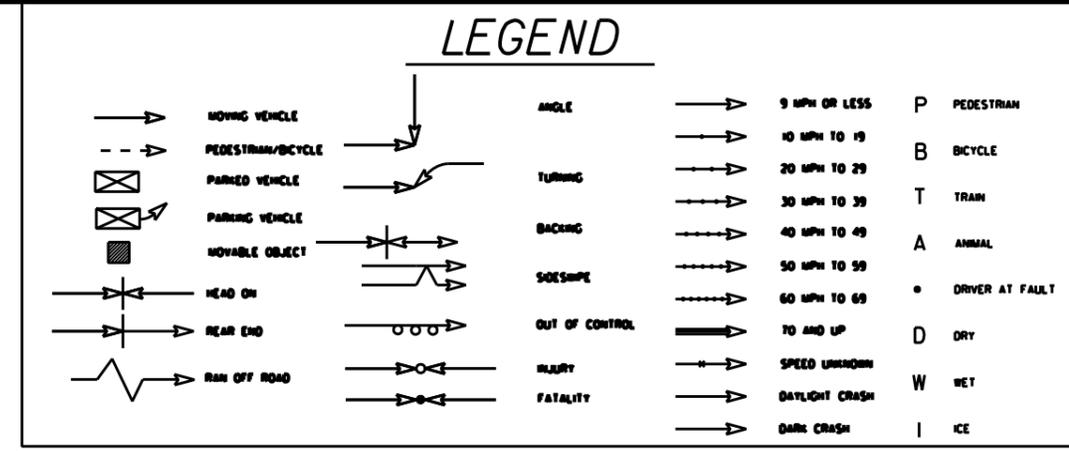
Moody St  
 35 mph

NC 6  
 (Lee St)  
 45 mph



NC 6  
(Lee St) Signalized  
45 mph Intersection

Moody St  
35 mph



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	
HIGHWAY SAFETY IMPROVEMENT PROGRAM	
SAFETY INFORMATION MANAGEMENT AND SUPPORT	
SAFETY EVALUATION	
TRAFFIC SAFETY	
AFTER SIGNAL INSTALLATION	
N.C. DEPARTMENT of TRANSPORTATION	
DIVISION of HIGHWAYS	
TRANSPORTATION MOBILITY AND	
SAFETY DIVISION	

COLLISION DIAGRAM	
DIVISION: 40	AREA: ..
STUDY PERIOD: 10/1/2002 TO 6/30/2008	
DISTANCE: ..... Y-LINE: 150 FT	
ANALYSIS PREPARED BY: B. Bobios00	
DIAGRAM PREPARED BY: B. Bobios00	
DIAGRAM REVIEWED BY: .....	
SCALE: NOT TO SCALE	
DATE: October, 2008	
LOG NUMBER: 200704202	

Guilford County  
Treatment Site - TotalCrashes  
After Period  
October 1, 2002 - June 30, 2008

# Target Crashes

Moody St  
35 mph

NC 6  
(Lee St)  
45 mph