

# Spot Safety Project Evaluation

Project Log # 200812056

Spot Safety Project # 13-99-216

## Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of SR 1002 (Old Leicester) and SR 1369/1641 (Mt Carmel Rd/Old Hwy 20) Buncombe County

Documents Prepared By:

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

Principal Investigator



Brad Robinson, PE

7/15/09

Date

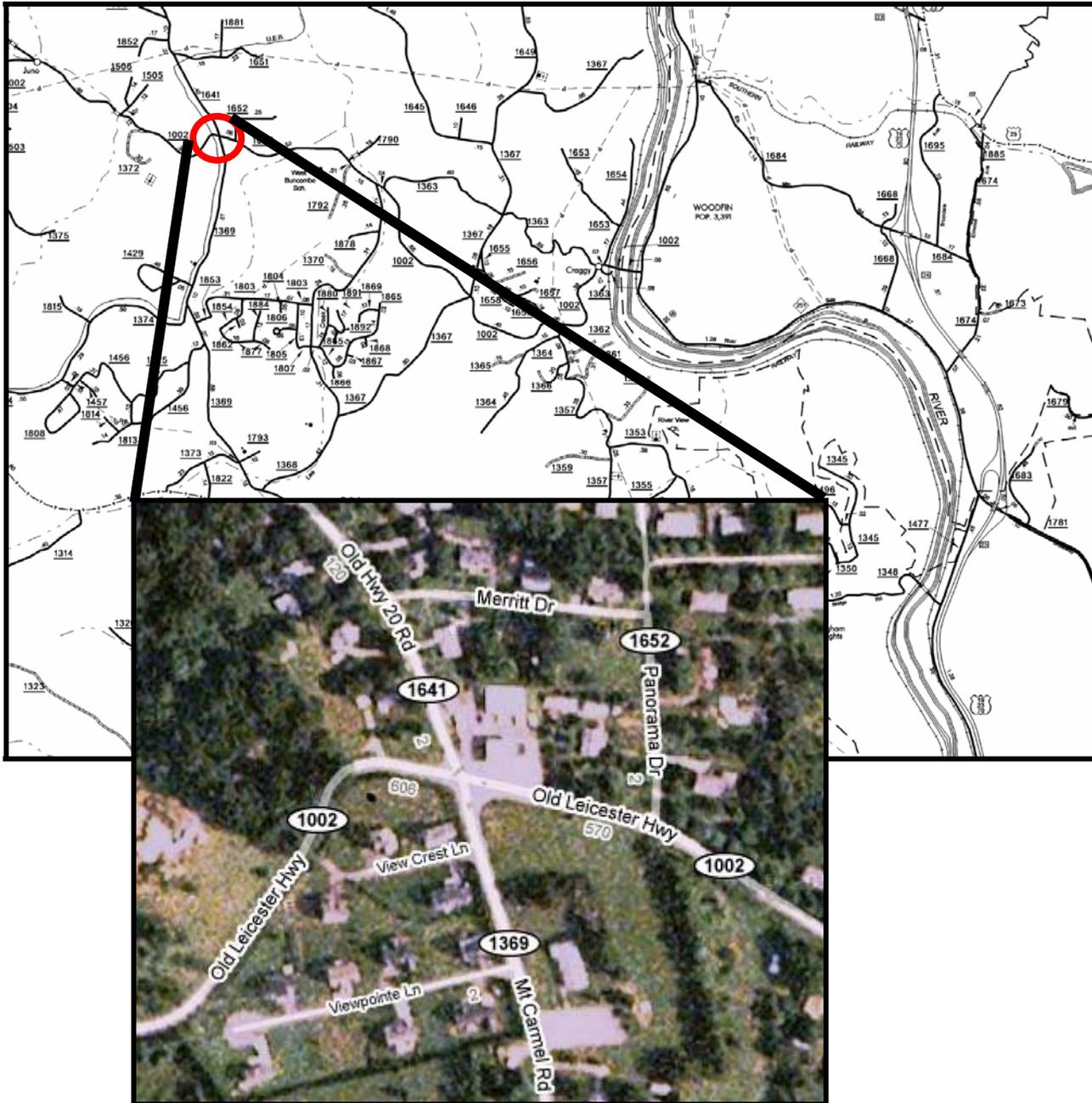
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 13-99-216 – The Intersection of SR 1002 (Old Leicester Rd) and SR 1369/1641 (Mt Carmel Rd /Old Hwy 20) in Buncombe County.

The signal number for this location is 13-1115.



## 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 two-phase traffic signal.

The subject location is a four-leg intersection which was controlled by stop signs on SR 1369/1641 in the before period. SR 1002 and SR 1369/1641 are both two-lane roadways with single approach lanes. The speed limits are 55 mph for SR 1002 and 35 mph for SR 1369/1641.

The original statement of problem was that the side street was experiencing delay.

The initial crash analysis was conducted from July 1, 1995 to June 30, 1999 with a total of two reported crashes, both of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 22, 2003 with a total cost of \$35,000.00.

## 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 December 1, 2002 to February 28, 2003. The before period consisted of reported crashes from November 1, 1996 through November 30, 2002 (6 years and 1 month) and the after period consisted of reported crashes from March 1, 2003 through March 31, 2009 (6 years and 1 month). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

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 crash types occurring in the intersection were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<b>Treatment Information</b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	17	8	-52.9
Total Severity Index	4.05	3.77	-6.9
Target Crashes	11	4	-63.6
Target Crash Severity Index	3.69	2.85	-22.8
Volume	6,700	7,000	4.5

<b><u>Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	1	0.0
Class C Crashes	6	2	-66.7
PDO Crashes	10	5	-50.0

The naive before and after analysis at the treatment location resulted in a 53 percent decrease in Total Crashes, a 64 percent decrease in Target Crashes, and a 5 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2006.

## **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 53 percent decrease in Total Crashes and a 64 percent decrease in Target Crashes. The Total Severity Index decreased by 7 percent and the Target Crash Severity Index decreased by 23 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 2.05 considering total crashes. The benefit to cost ratio considering only target crashes is also 1.56. 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 above tables and the *Collision Diagrams*, it appears that the signal installation was effective in reducing Frontal Impact Crashes at the subject intersection. In the before period there were 11 Frontal Impact Crashes. A pattern of seven Target Crashes occurred between northbound SR 1369 vehicles and westbound SR 1002 vehicles. In the after period there were only four Frontal Impact Crashes and the above-mentioned pattern was eliminated.

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.

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 1002 at SR 1369/1641  
 COUNTY: Buncombe  
 FILE NO.: SS 13-99-216

BY: BDR  
 DATE: 7/13/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$35,000	10	0.149	\$5,216
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$35,000</b>	<b>10</b>	<b>0.149</b>	<b>\$5,216</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$8,116  
 TOTAL COST OF PROJECT= \$35,000

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	6.08	0	0.00	7	1.15	10	1.64	\$29,934
AFTER	6.08	0	0.00	3	0.49	5	0.82	\$13,322

Annual Benefits from Crash Cost Savings \$16,612

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$8,496

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.05

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 2.05

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 1002 at SR 1369/1641  
 COUNTY: Buncombe  
 FILE NO.: SS 13-99-216 Target Crashes Only

BY: BDR  
 DATE: 7/13/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$35,000	10	0.149	\$5,216
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$35,000</b>	<b>10</b>	<b>0.149</b>	<b>\$5,216</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$8,116  
 TOTAL COST OF PROJECT= \$35,000

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	6.08	0	0.00	4	0.66	7	1.15	\$17,993
AFTER	6.08	0	0.00	1	0.16	3	0.49	\$5,362

Annual Benefits from Crash Cost Savings \$12,632

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$4,516

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.56

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 1.56



Looking South on SR 1641



Looking North on SR 1369 (Mt Carmel Rd)



Looking West on SR 1002 (Old Leicester)



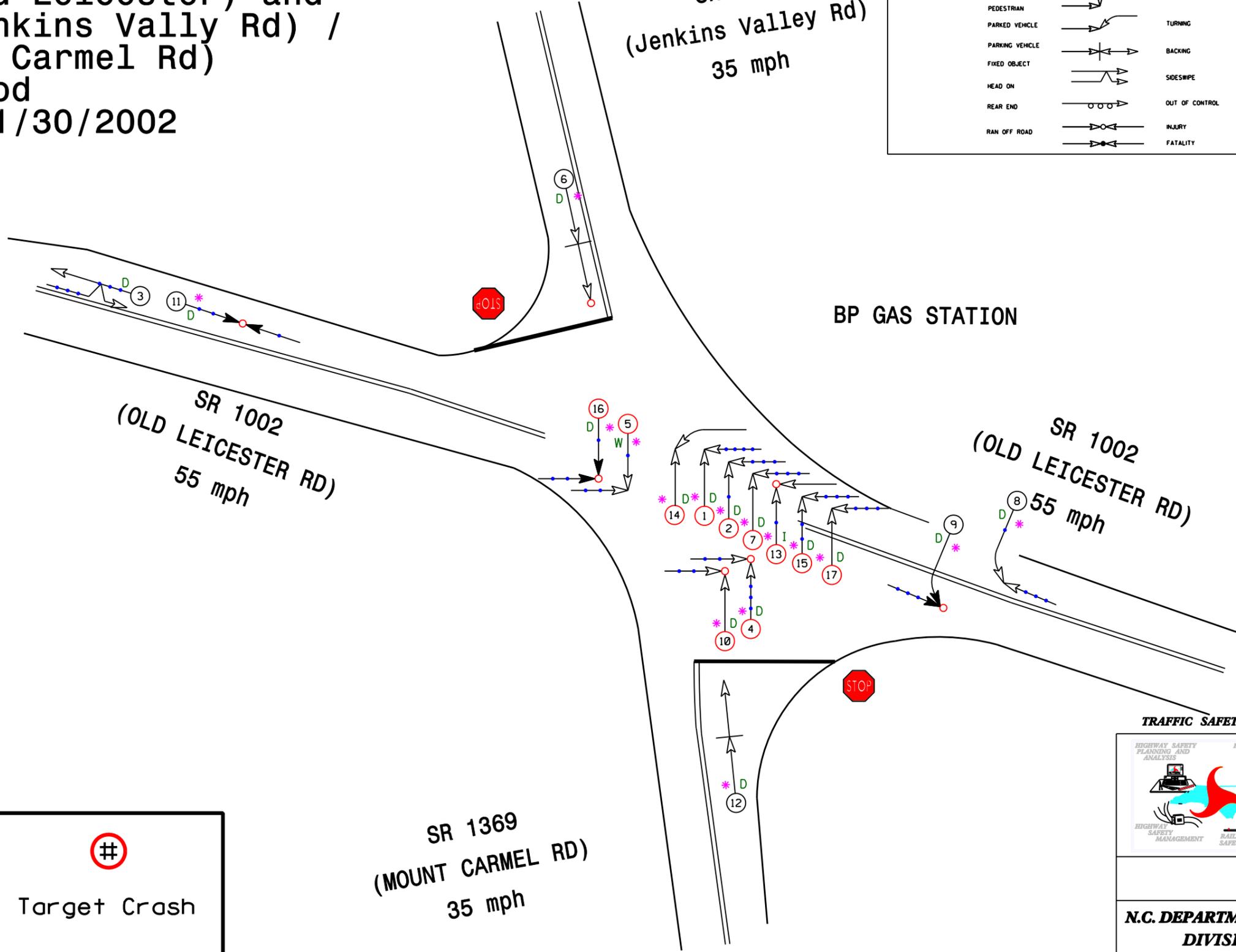
Looking West on SR 1002 (Old Leicester) at Intersection

Buncombe County  
 SR 1002 (Old Leicester) and  
 SR 1641 (Jenkins Vally Rd) /  
 SR 1369 (Mt Carmel Rd)  
 BEFORE Period  
 11/1/1996-11/30/2002

SR 1641  
 (Jenkins Valley Rd)  
 35 mph

**LEGEND**

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



#  
 Target Crash

SR 1369  
 (MOUNT CARMEL RD)  
 35 mph

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**



**COLLISION DIAGRAM**

DIVISION: 13	AREA:
STUDY PERIOD: 11/1/96-11/30/02	
DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: June 2009	
LOG NUMBER: 20082056	

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

Buncombe County  
 SR 1002 (Old Leicester) and  
 SR 1641 (Jenkins Vally Rd) /  
 SR 1369 (Mt Carmel Rd)  
 AFTER Period  
 3/1/03-3/31/09

SR 1641  
 (Jenkins Valley Rd)  
 35 mph

BP GAS STATION

SR 1002  
 (OLD LEICESTER RD)  
 55 mph

SR 1002  
 (OLD LEICESTER RD)  
 55 mph

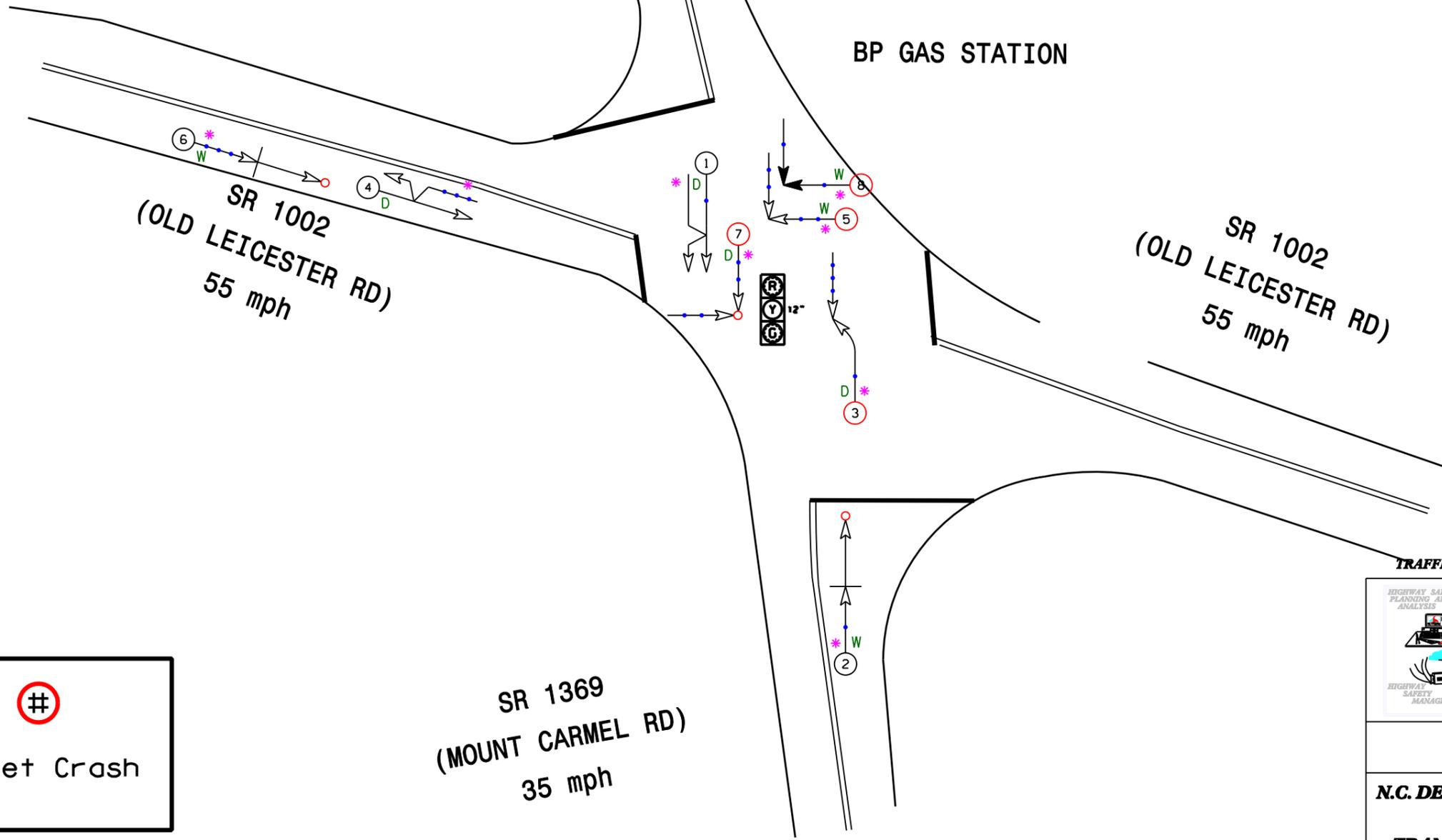
SR 1369  
 (MOUNT CARMEL RD)  
 35 mph

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PARKED VEHICLE	TURNING	10 MPH TO 19	T TRAIN
PARKING VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
FIXED OBJECT	SIDESWIPE	30 MPH TO 39	D DRY
	OUT OF CONTROL	40 MPH TO 49	W WET
RAN OFF ROAD	INJURY	50 MPH TO 59	I ICY OR SNOWY
	FATALITY	60 MPH TO 69	O OLY
		70 AND UP	
		SPEED UNKNOWN	



#  
 Target Crash



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: I3	AREA:
	STUDY PERIOD: 3/1/03-3/31/09	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
	ANALYSIS CHECKED BY:	
	DIAGRAM PREPARED BY: BDR	
	DIAGRAM REVIEWED BY:	
	SCALE: NOT TO SCALE	
	DATE: June 2009	
	LOG NUMBER: 20082056	

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