

Spot Safety Project Evaluation

Project Log # 200812183

Spot Safety Project # 10-01-215

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of Mulberry Church Road and SR 1815 (Queen City Drive)
City of Charlotte, Mecklenburg County**

Documents Prepared By:

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

Principal Investigator



Jason B. Schronce

3/9/2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-01-215 located at the Intersection of Mulberry Church Road and SR 1815 (Queen City Drive) in Mecklenburg County. Multiple mapping software programs also indicate that the south leg of this location converts to US-521 (Billy Graham Parkway) at this intersection.

The Signal ID is 10-1852 and was initially designed by the City of Charlotte.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an actuated traffic signal that interconnected to the existing signal system at the I-85 ramp terminals. The north leg of Mulberry Church Road is a wide cross-section two-lane roadway that widens to a four-lane concrete median divided facility at the subject intersection. SR 1815 (Queen City Drive) is a two-lane, two-way facility that serves as the I-85 Service Road and contains many PVAs including gas stations, restaurants, and hotels. The subject intersection is a crossroads type with speed limits of 45 mph and 35 mph, respectively.

The original statement of problem was that a significant number of angle collisions were occurring due to congestion issues. The intersection met signal warrants 1A, 1C, 2, 3B and 7.

The initial crash analysis was completed from May 1, 1997 to May 1, 2000 with fifty-four (54) reported crashes, thirty-two (32) of which were deemed correctable. The final completion date for the improvement at the subject intersection was during March 2003 by crash data with a total cost of \$45,500.00.

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 was the month of March 2003. The before period consisted of reported crashes from August 1, 1997 through February 28, 2003 (5 years and 7 months); and the after period consisted of reported crashes from April 1, 2003 through October 31, 2008 (5 years and 7 months). The ending date for this analysis was determined by the 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.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	109	78	- 28.4 %
Total Severity Index	4.75	4.15	- 12.6 %
Target Crashes	72	36	- 50.0 %
Target Crash Severity Index	4.08	3.88	- 4.9 %
Volume	39,100	38,500	- 1.5 %
<u>Injury Crash Summary - Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	8	4	- 50.0 %
Class C Injury Crashes	37	19	- 48.6 %
Total Injury Crashes	46	24	- 47.8 %

The naive before and after analysis at the treatment location resulted in a 28 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, and a 13 percent decrease in the Total Severity Index. The before period ADT year was 2000 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 28 percent decrease in Total Crashes and a 50 percent decrease in Target Crashes. 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.

Referencing the *Collision Diagrams*, a significant portion of crashes at the intersection in the before period (46 of 109) resulted in angle collisions as SR 1815 vehicles attempted to cross the four-lane congested intersection. After the signal installation, this pattern was positively reduced to ten collisions, eight of which were the result of Mulberry Church Road motorists running the red light. Please reference the table below to discern the remaining target crash type distribution:

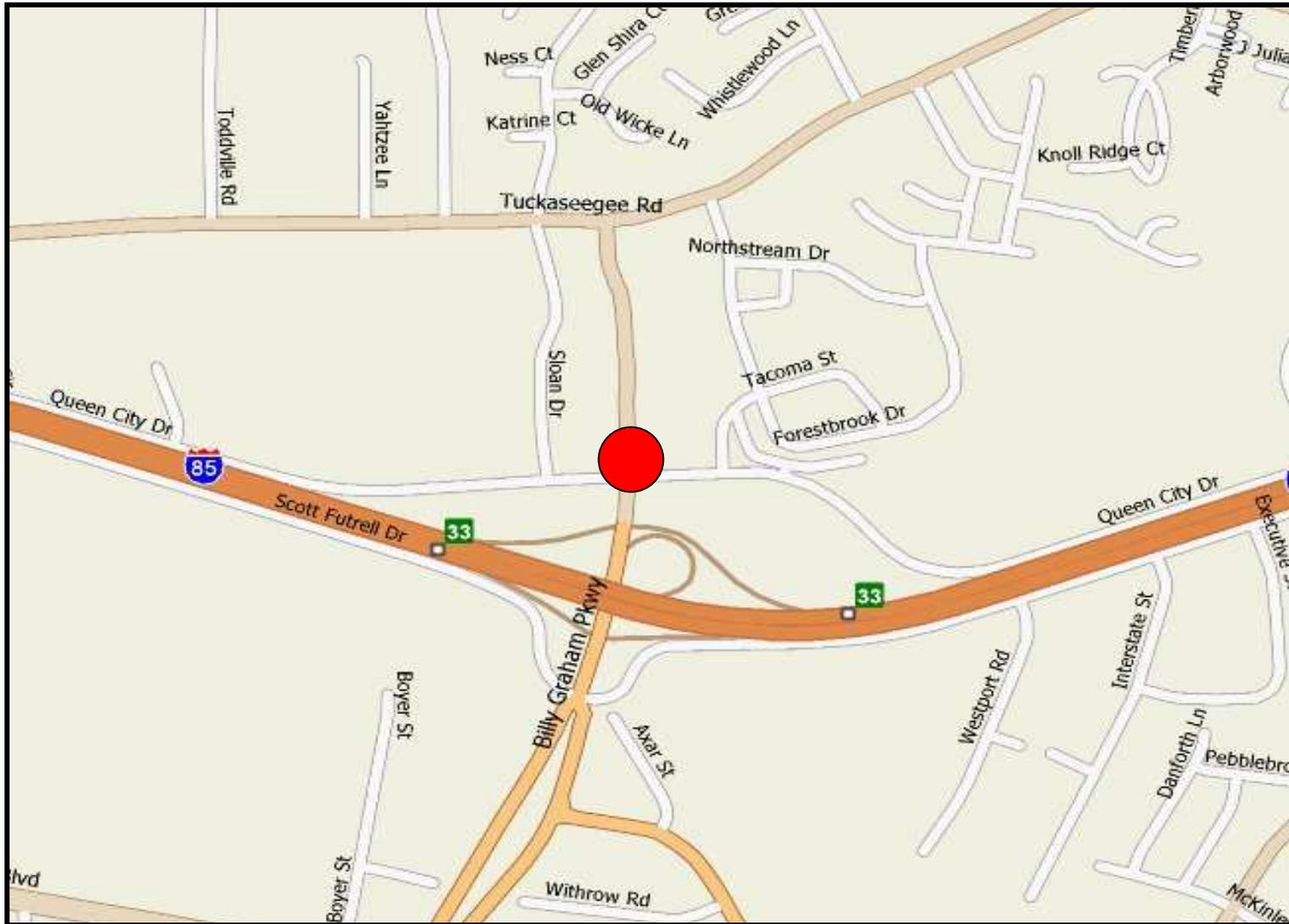
<u>Target Crash Type Distribution</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Angle Collisions	46	10	- 78.3 %
Left Turn – Different Roadway	15	3	- 80.0 %
Left Turn – Same Roadway	10	18	80.0 %
Right Turn Crashes	1	5	200+ %

The left turn; same roadway crash pattern from the after period diagram indicates 12 of the 18 crashes of this type occurred from northbound vehicles turning west onto Queen City Drive. There was also an increase in Rear-End Crashes (from 5 to 10) on the westbound SR 1815 approach to the intersection.

The calculated benefit to cost ratio for this project is **7.83 considering total crashes**. The benefit to cost ratio **considering only target crashes is 6.65**. 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 for all 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.

Location Map
Mecklenburg County, City of Charlotte
Evaluation of Spot Safety Project # 10-01-215



Treatment Location: Mulberry Church Road at SR 1815 (Queen City Dr / I-85 Service Rd)

SS# 10-01-215
Aerial Map – City of Charlotte



TREATMENT SITE PHOTOS TAKEN 1/15/2009



Traveling North on Mulberry Church Rd (also known as Billy Graham Pkwy)



Traveling North on Mulberry Church Rd



Traveling East on SR 1815 (Queen City Dr / I-85 Service Rd)



Traveling East on SR 1815 (Queen City Drive)



Traveling West on SR 1815 (Queen City Drive)



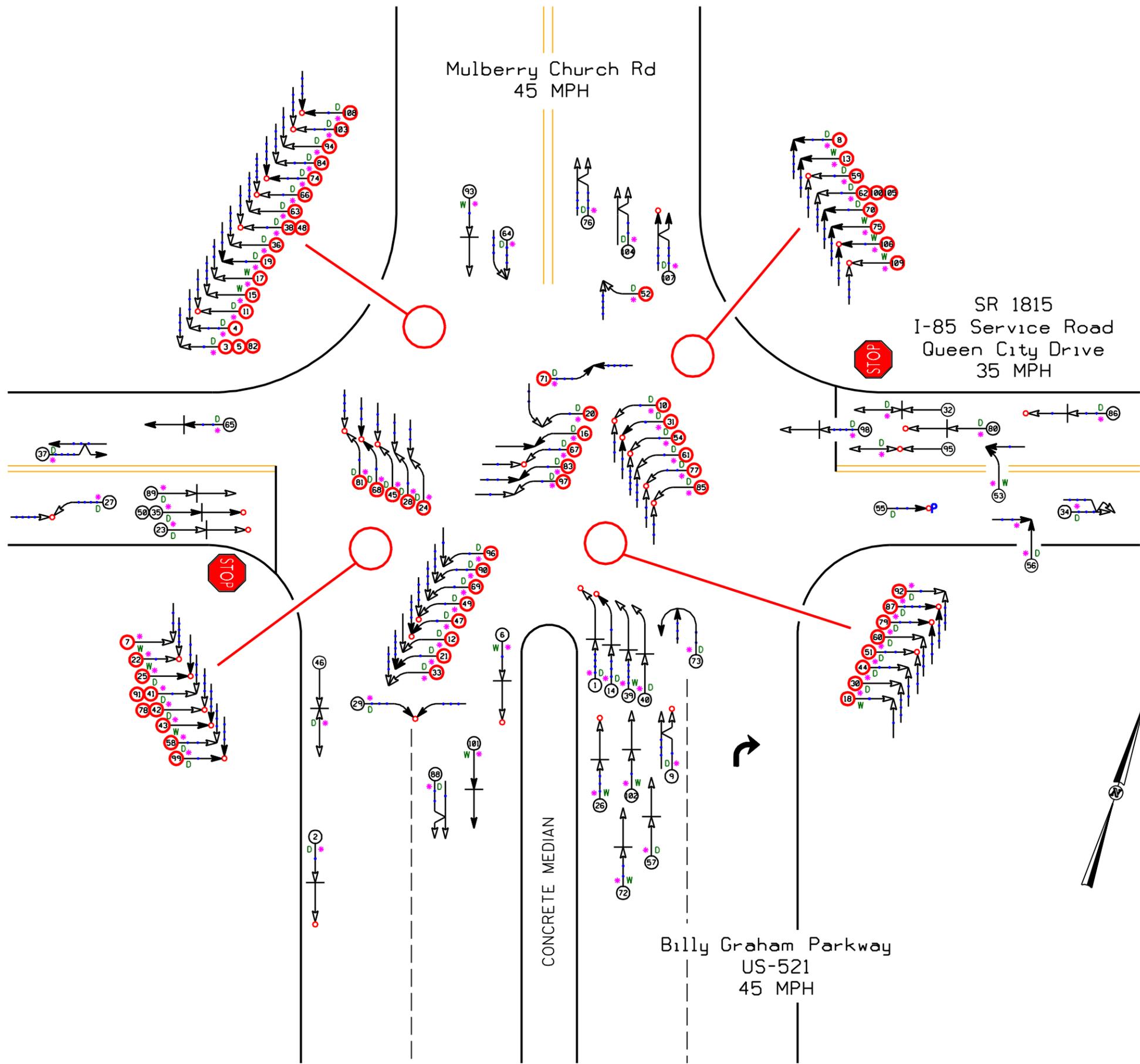
Traveling West on SR 1815



Traveling South on Mulberry Church Road



Traveling South on Mulberry Church Road



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		
↘	RAN OFF ROAD	↔		→	70 AND UP		
		↔		→	SPEED UNKNOWN	O	OILY

SS# 10-01-215
 Mecklenburg County
 City of Charlotte
 BEFORE Period
 8/1/97 - 2/28/03

⊕ Frontal Impact
 ⊕ Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
STUDY PERIOD: 8/1/1997 - 2/28/2003		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 2-11-2009		
LOG NUMBER: SS* 10-01-215 BEFORE		

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

Mulberry Church Rd
45 MPH

SR 1815
I-85 Service Road
Queen City Drive
35 MPH

Billy Graham Parkway
US-521
45 MPH

CONCRETE MEDIAN

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		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SS# 10-01-215
Mecklenburg County
City of Charlotte
AFTER Period
4/1/03 - 10/31/08



New Signalized
Intersection

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 10	AREA:
STUDY PERIOD: 4/1/2003 - 10/31/2008	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-18-2009	
LOG NUMBER: SS* 10-01-215 AFTER	

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