

Spot Safety Project Evaluation

Project Log # 200703100

Spot Safety Project # 10-00-203

**Spot Safety Project Evaluation of the Left Turn Lanes and
Traffic Signal Installation at the Intersection of
NC 160 (Steele Creek Rd) and SR 1143 (Brown-Grier Rd)
City of Charlotte, Mecklenburg County**

Documents Prepared By:

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Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

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Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-00-203 – The Intersection of NC 160 (Steele Creek Road) and SR 1143 (Brown-Grier Road) within the City of Charlotte in Mecklenburg 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 an actuated traffic signal. In the study period, NC 160 and SR 1143 were both two-lane facilities at the subject intersection with left turn lanes provided on NC 160 and speed limits of 50 mph and 45 mph, respectively. The subject location is a four-leg intersection, which was controlled by stop signs on SR 1143 (Brown-Grier Rd). The fourth leg of the intersection is the entrance to a residential community with no other outlet access. The left turn lanes also were not installed under this spot safety project but were constructed close enough to the completion date that the analysis covers both countermeasures.

The original statement of problem was the developing angle crash pattern from traffic entering a high volume, high speed road from the side street. The intersection met signal warrants 9 and 11.

The initial crash analysis was completed from December 1, 1996 to December 31, 1999 with fifteen (15) reported crashes, seven (7) of which were deemed correctable. The final completion date for the signal installation was on May 30, 2002 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 the complete 2000 calendar year. The before period consisted of reported crashes from November 1, 1996 through December 31, 1999 (3 years and 2 months); and the after period consisted of reported crashes from January 1, 2001 through December 31, 2007 (7 years). The beginning date for this analysis was determined by the residential development that formed the current 4-leg intersection and the ending date 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 (Signal) and Mainline Rear-Ends (Left Turn Lanes) were the two separate target crashes for the current evaluation. 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 3.17 yrs	After 7.0 yrs	Percent Reduction (-) Percent Increase (+)
Total crashes	21	42	
Total Crashes per year	6.62	6.00	- 9.37 %
Total Severity Index	10.33	4.72	- 54.31 %
Frontal Impact Target Crashes (Red)	14	26	
Frontal Impact Crashes per year	4.42	3.71	- 16.06 %
Frontal Crash Severity Index	13.94	3.28	- 76.47 %
Left Turn Target Crashes (Green)	4	0.0	
Left Turn Target Crashes per year	1.26	0.0	- 100.00 %
Left Turn Target Severity Index	2.85	0.0	- 100.00 %
Volume	12,700	17,800	40.16 %
<u>Injury Crash Summary per year –Total</u>			
Fatal injury Crashes per year	0.32	0.14	- 56.25 %
Class A injury Crashes per year	0.32	0.0	- 100.00 %
Class B injury Crashes per year	0.32	0.29	- 9.38 %
Class C Injury Crashes per year	1.58	1.29	- 18.35 %
Total Injury Crashes per year	2.54	1.72	- 32.28 %

The naive before and after analysis at the treatment location resulted in a 9 percent decrease in Total Crashes per year, a 16 percent decrease in Frontal Impact Crashes per year, and a 54 percent decrease in the Total Severity Index. The before period ADT year was 1998 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 a 9 percent decrease in Total Crashes per year, a 16 percent decrease in Frontal Impact Crashes per year, and complete elimination of the Left Turn Lane 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.

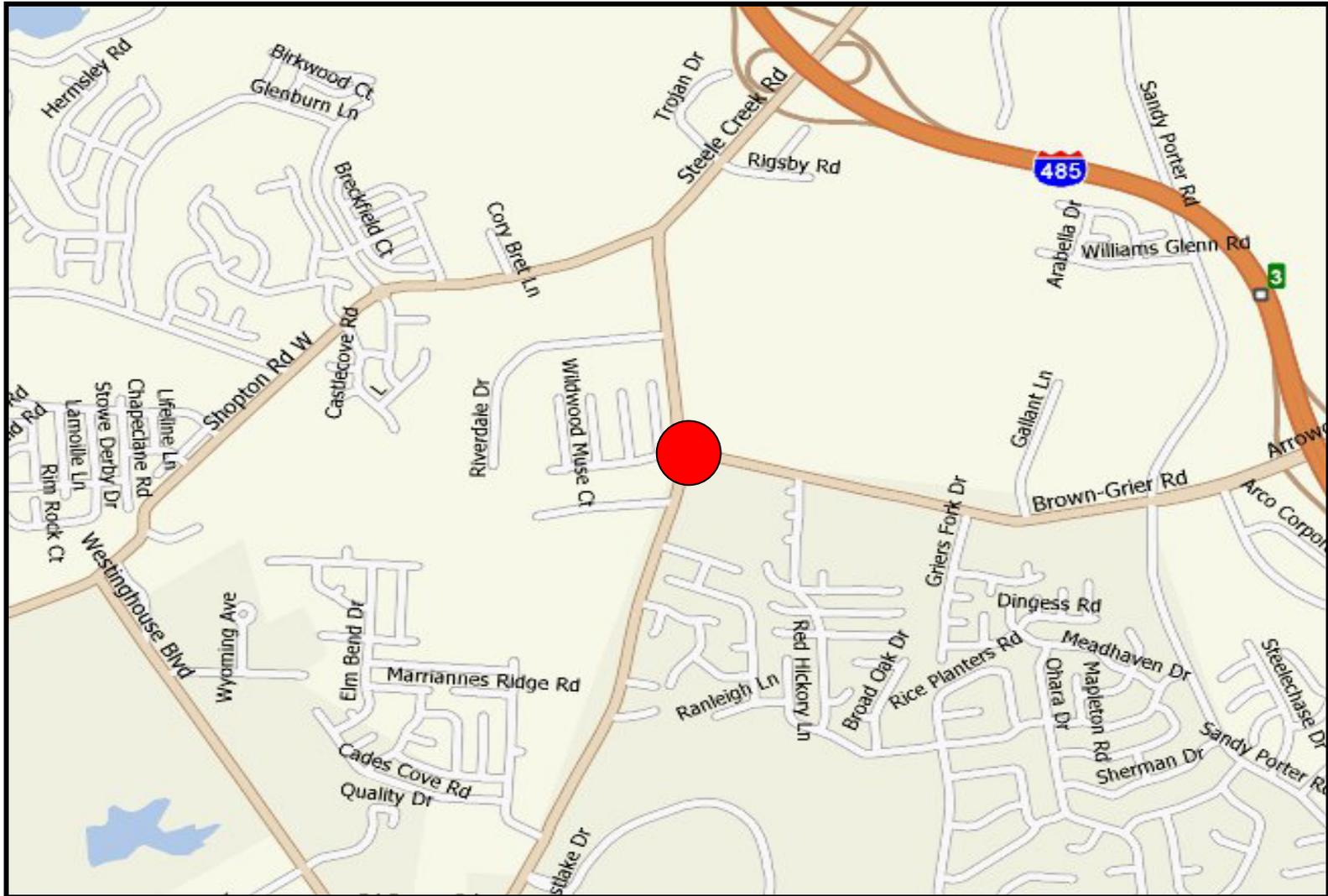
Referencing the *Collision Diagram*, the majority of crashes at the intersection in the before period were either a result of a vehicle turning left onto NC 160 from SR 1143 or unsuccessfully trying to cross NC 160. These patterns of angle and left turn, different roadway crashes resulted in one fatality. After the countermeasures were installed, the angle crash pattern was reduced to just one crash which resulted from a NC 160 vehicle running the red light. However, a significant pattern of left turn, same roadway type crashes has formed in the after period.

Overall, the safety of the intersection has increased through the evaluation with a 54 percent reduction in the total severity index and a 32 percent reduction in total injury crashes per year.

The calculated benefit to cost ratio for this project is 29.95 considering total crashes. 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 # 10-00-203



Treatment Location: NC 160 (Steele Creek Rd) at SR 1143 (Brown-Grier Rd)

**SS# 10-00-203 Aerial Map
City of Charlotte**



TREATMENT SITE PHOTOS TAKEN 8/28/2007



Traveling North on NC 160 (Steele Creek Rd)



Traveling North on NC 160



Traveling South on NC 160 (Steele Creek Rd)



Traveling East on SR 1143 (Residential Community)



Traveling West on SR 1143 (Brown-Grier Rd)



Traveling West on SR 1143 (Brown-Grier Rd)

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

SS# 10-00-203
 Mecklenburg County
 City of Charlotte
 BEFORE Period
 11/1/96 - 12/31/99
 3.17 Years
 NC 160 at SR 1143

Brown-Grier Rd
 Wildwood Community
 (No Outlet)

SR 1143
 Brown-Grier Rd
 45 MPH

NC 160
 Steele Creek Rd
 50 MPH

Avoidance & Rollover

- Mainline Rear-End (Left Turn Lanes)
- Intersection Frontal (New Signal)

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 10	AREA: 1
STUDY PERIOD: 11/1/1996 - 12/31/1999	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 4-29-2008	
LOG NUMBER: SS* 10-00-203	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH

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		ONLY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

Note Crash 23:
Fatal occurred
secondary to original
sideswipe collision

SS# 10-00-203
Mecklenburg County
City of Charlotte
AFTER Period
1/1/01 - 12/31/07
7.0 Years
NC 160 at SR 1143

Brown-Grier Rd
Wildwood Community
(No Outlet)

SR 1143
Brown-Grier Rd
45 MPH

NC 160
Steele Creek Rd
50 MPH

New Signalized
Intersection

Mainline Rear-End
(Left Turn Lanes)
 Intersection Frontal
(New Signal)

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
	STUDY PERIOD: 1/1/2001 - 12/31/2007	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-29-2008		
LOG NUMBER: SS* 10-00-203		

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