

Spot Safety Project Evaluation

Project Log # 200901025

Spot Safety Project # 08-00-220

Spot Safety Project Evaluation of the Traffic Signal Installation At the Intersection of NC 49 and SR 2481 Randolph 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

4-21-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-00-220 located at the Intersection of NC 49 and SR 2481 (Low Bridge Road / Eastern Randolph Road) in Randolph County.

The **Sig ID is 08-0350** for the new installed traffic signal at the subject location.

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 2-phase, fully actuated traffic signal and the addition of a right turn lane on the westbound approach of SR 2481 (Eastern Randolph Rd). NC 49 and SR 2481 are both two-lane facilities at the subject intersection with turn lanes on the NC 49 approaches and speed limits of 55 mph. The subject location is a crossroads intersection, which was controlled by dual posted stop signs and a "Vehicle Entering When Flashing" beacon on SR 2481 in the before period. Right turn slip lanes were also included for the NC 49 approaches when the signal was installed.

The original statement of problem was that operational concerns have emerged due to excessive congestion. An accident potential exists due to less than desirable sight distance and the intersection also serves as access to Eastern Randolph High School. The original spot safety work order called for raising the intersection and to install a westbound right turn lane but was later updated to a traffic signal by the Division Engineer.

The initial crash analysis was completed from June 1, 1997 to May 31, 2000 with five (5) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on November 26, 2003 with a total cost of \$150,000.

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 October through December 2003. The before period consisted of reported crashes from September 1, 1998 through September 30, 2003 (5 years and 1 month); and the after period consisted of reported crashes from January 1, 2004 through January 31, 2009 (5 years and 1 month). 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 within 150 feet of the subject intersection. *Please see attached location 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	13	13	0.0 %
Total Severity Index	4.42	2.71	- 38.7 %
Target Crashes	8	7	- 12.5 %
Target Crash Severity Index	6.55	3.11	- 52.5 %
Volume	7,100	6,800	- 4.22 %
<u>Injury Crash Summary- Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	1	0.0 %
Class C Injury Crashes	5	2	- 60.0 %
Total Injury Crashes	6	3	- 50.0 %

The naive before and after analysis at the treatment location resulted in a no change in Total Crashes, a 12.5 percent decrease in Target Crashes, and a 39 percent decrease in the Total Severity Index. The before period ADT year was 2001 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 no change in Total Crashes and an 12.5 percent decrease in Target Crashes. The summary results above demonstrate that both Target Crashes and the Severity Indexes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the majority of the target crashes at the intersection in the before period (5 of 8) were the result of angle collisions as an SR 2481 vehicle attempted to cross NC 49. After the signal installation, angle crashes reduced to three (3), all of which were the result of a vehicle running the red light. Left turn, same roadway crashes of SR 2481 motorists increased from one (1) to three (3) through the analysis.

The calculated benefit to cost ratio for this project is **0.32 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.46**. 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. From the photos, notice the limited sight distances from vertical curvature approaching the intersection on the northbound NC 49 and eastbound SR 2481 approaches. 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.

**SS# 08-00-220 Aerial Map
Randolph County**



TREATMENT SITE PHOTOS TAKEN 4/15/2009



Traveling South on NC 49



Traveling North on NC 49



Traveling North on NC 49



Traveling North on NC 49



Traveling East on SR 2481 (Low Bridge Rd)



Traveling East on SR 2481 (Low Bridge Rd)



Traveling West on SR 2481 (Eastern Randolph Rd)



Traveling West on SR 2481 (Eastern Randolph Rd)



SR 248I
Low Bridge Rd
55 MPH

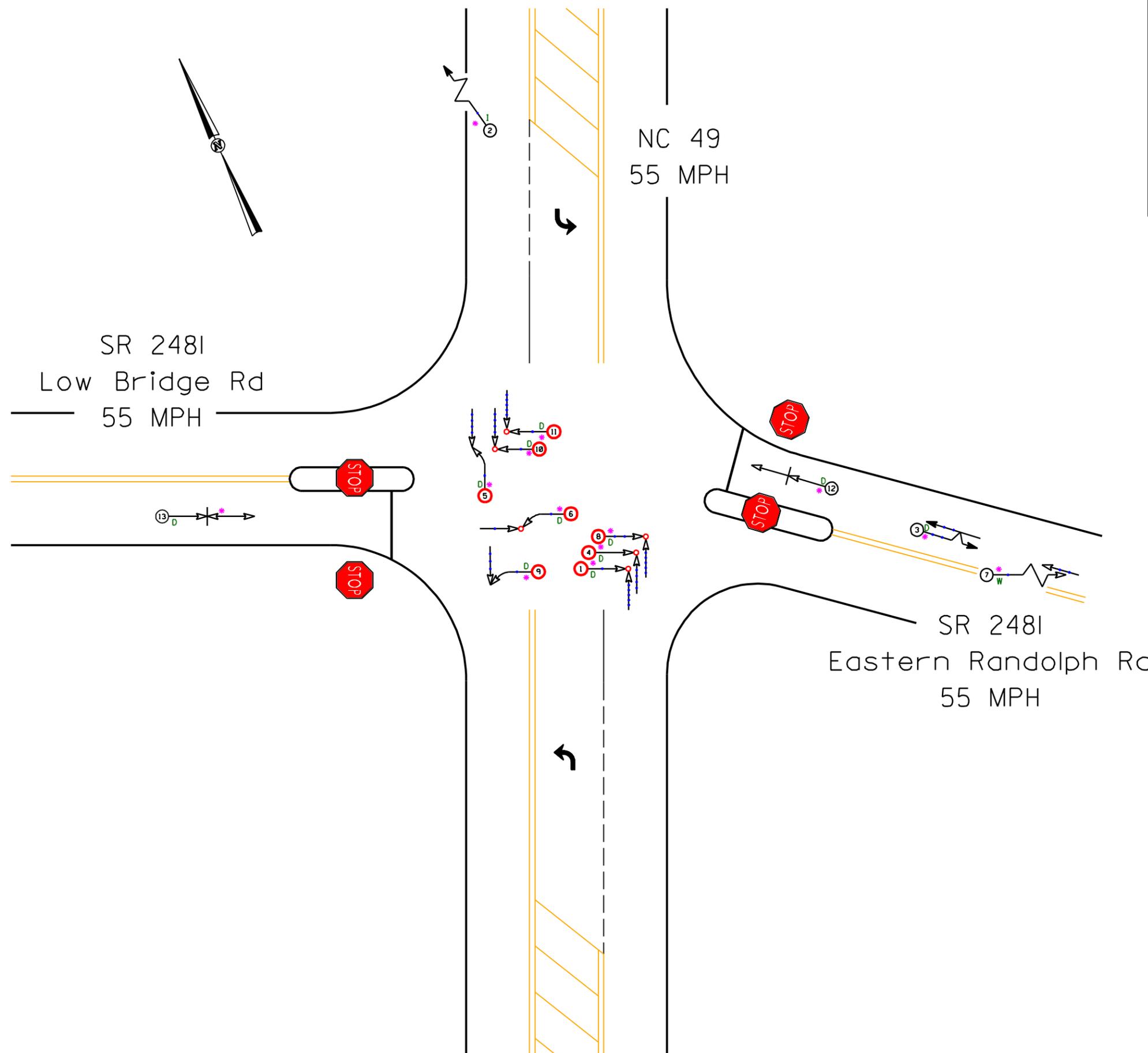
NC 49
55 MPH

SR 248I
Eastern Randolph Rd
55 MPH

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		SPEED UNKNOWN
	9 MPH OR LESS		PEDESTRIAN
	10 MPH TO 19		TRAIN
	20 MPH TO 29		DRIVER AT FAULT
	30 MPH TO 39		DRY
	40 MPH TO 49		WET
	50 MPH TO 59		ICY OR SNOWY
	60 MPH TO 69		OILY
	70 AND UP		

SS# 08-00-220
Randolph County
BEFORE Period
9/1/98 - 9/30/03

VEHICLE ENTERING WHEN FLASHING



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION:	AREA:
STUDY PERIOD: 9/1/1998 TO 9/30/2003	
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: 4-20-2009	
LOG NUMBER: SS# 08-00-220 BEFORE	

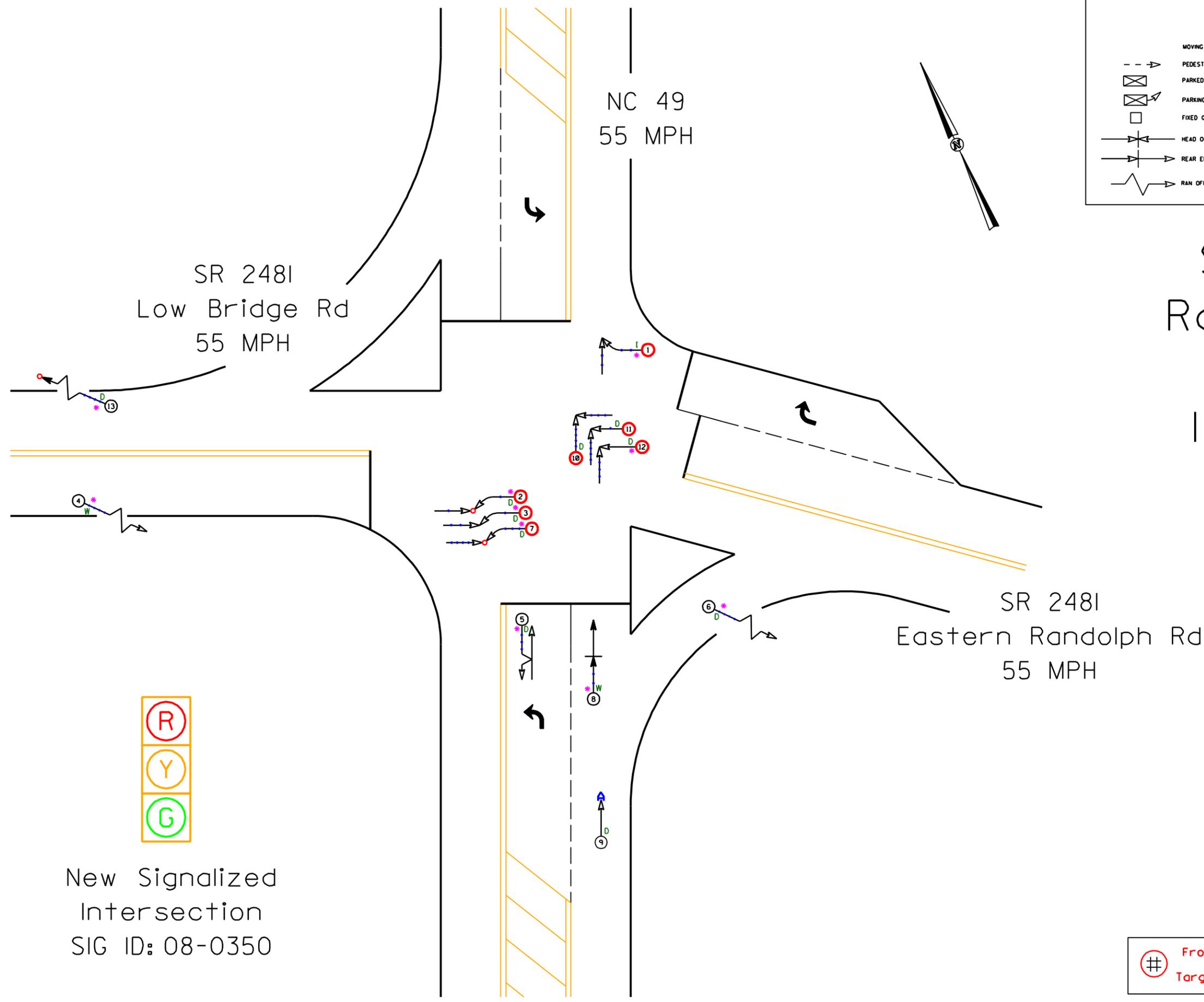
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

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



SS# 08-00-220
 Randolph County
 AFTER Period
 1/1/04 - 1/31/09



R
 Y
 G

New Signalized
 Intersection
 SIG ID: 08-0350

⊕ Frontal Impact
 ⊕ Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION:	AREA:
	STUDY PERIOD: 1/1/2004 - 1/31/2009	
	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: 4-20-2009		
LOG NUMBER: SS* 08-00-220 AFTER		

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