

Spot Safety Project Evaluation

Order # 41000004034

Spot Safety Project # 08-03-200

**Spot Safety Project Evaluation of the Traffic Signal Installation
US 311 at SR 1571 (Glenola Road) / SR 1928 (Cedar Square Road)
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

2-16-2010

Date

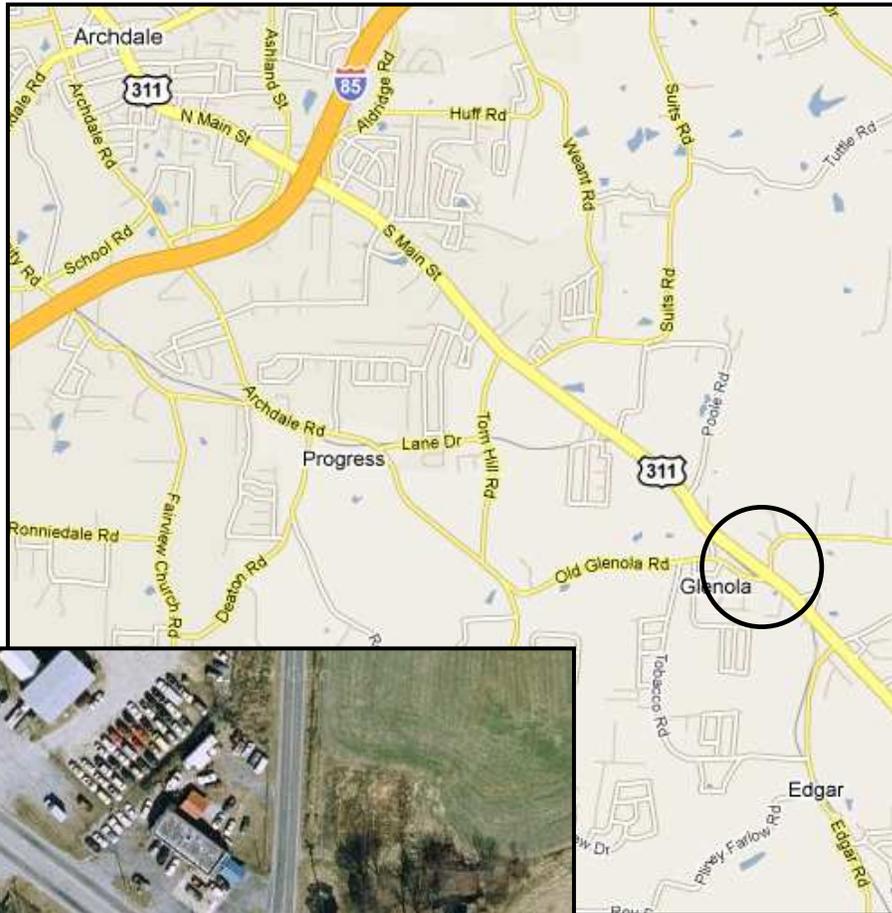
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-03-200 located at the Intersection of US 311 and SR 1571 (Glenola Road) / SR 1928 (Cedar Square Road) in Randolph County.

The Sig ID is 08-0523 for this newly installed traffic signal.



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 intersection traffic signal. US 311 is comprised of a three-lane section from the north that ends at this intersection with dedicated left turn lanes in both directions. SR 1571 (Glenola Rd) and SR 1928 are both two-lane facilities and this location has a posted speed limit of 45 mph on all approaches. The subject location is a four-leg intersection, which was controlled by stop signs on the SR 1571 and SR 1928 (Cedar Square Rd) approaches. There is also an active at-grade rail crossing in proximity of the intersection on SR 1571 which required signal preemption.

The original statement of problem was the existing crash pattern of side street vehicles attempting to cross US 311 resulting in angle collisions. The intended purpose of the new traffic signal is to alleviate the accident patterns by designating the traveling right-of-way.

The initial crash analysis was completed from January 1, 2000 to December 31, 2002 with nine (9) reported crashes, eight (8) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on April 22, 2004 with a total cost of \$61,800.

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 were the months of March through May 2004. The before period consisted of reported crashes from September 1, 1998 through February 29, 2004 (5 years and 6 months); and the after period consisted of reported crashes from June 1, 2004 through November 30, 2009 (5 years and 6 months). 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, 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	15	13	- 13.3 %
Total Severity Index	4.95	10.82	118.6 %
Target Crashes	11	7	- 36.4 %
Target Crash Severity Index	5.71	7.34	28.5 %
Volume	14,000	17,000	21.4 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	1	0	- 100.0 %
Class C Injury Crashes	7	7	0.0 %
Total Injury Crashes	8	8	0.0 %

The naive before and after analysis at the treatment location resulted in a 13 percent decrease in Total Crashes, a 36 percent decrease in Target Crashes, but a 119 percent increase in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007.

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 13 percent decrease in Total Crashes and a 36 percent decrease in Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period crash data presented a pattern of ten (10) collisions (including the ran-off road crash in avoidance) from vehicles who unsuccessfully attempted to cross or access US 311 from the side street approaches. All of these vehicles came to a complete stop at the intersection but pulled out into on-coming traffic resulting in frontal impact collisions. After the signal installation, these angle collisions were reduced to four (4) crashes from vehicles that ran the red indication signal. Left turn-same roadway collisions at this intersection did increase slightly from one (1) to three (3) during the analysis as well.

From the chart above, there was over a 100 percent increase in the Total Severity Index for this location. There was an A-injury pedestrian collision (crash 13) during the after period resulting as a secondary collision from a previous angle collision (crash 12). The pedestrian struck was assisting the occupants of the earlier collision when she was struck by an on-coming vehicle. This created a negative benefit-cost ratio for this evaluation as stated below.

The calculated benefit to cost ratio for this project is **(-7.00) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.44**. 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 from Google Street View for all four 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.

TREATMENT SITE PHOTOS



Looking South on US 311 approaching intersection



Looking North on US 311



Looking East on SR 1571 (Glenola Road)
Intersection with Advanced Signal Head



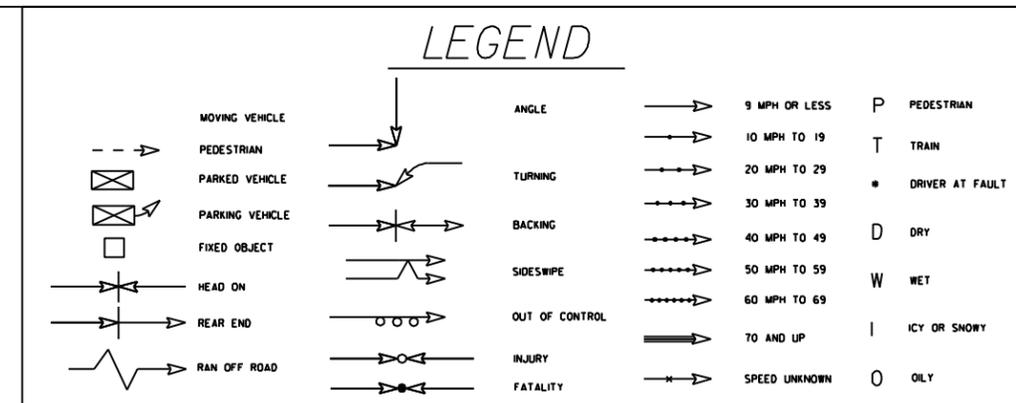
Traveling West / Southwest on SR 1928 (Cedar Square Rd)
Intersection with Advanced Signal Head

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

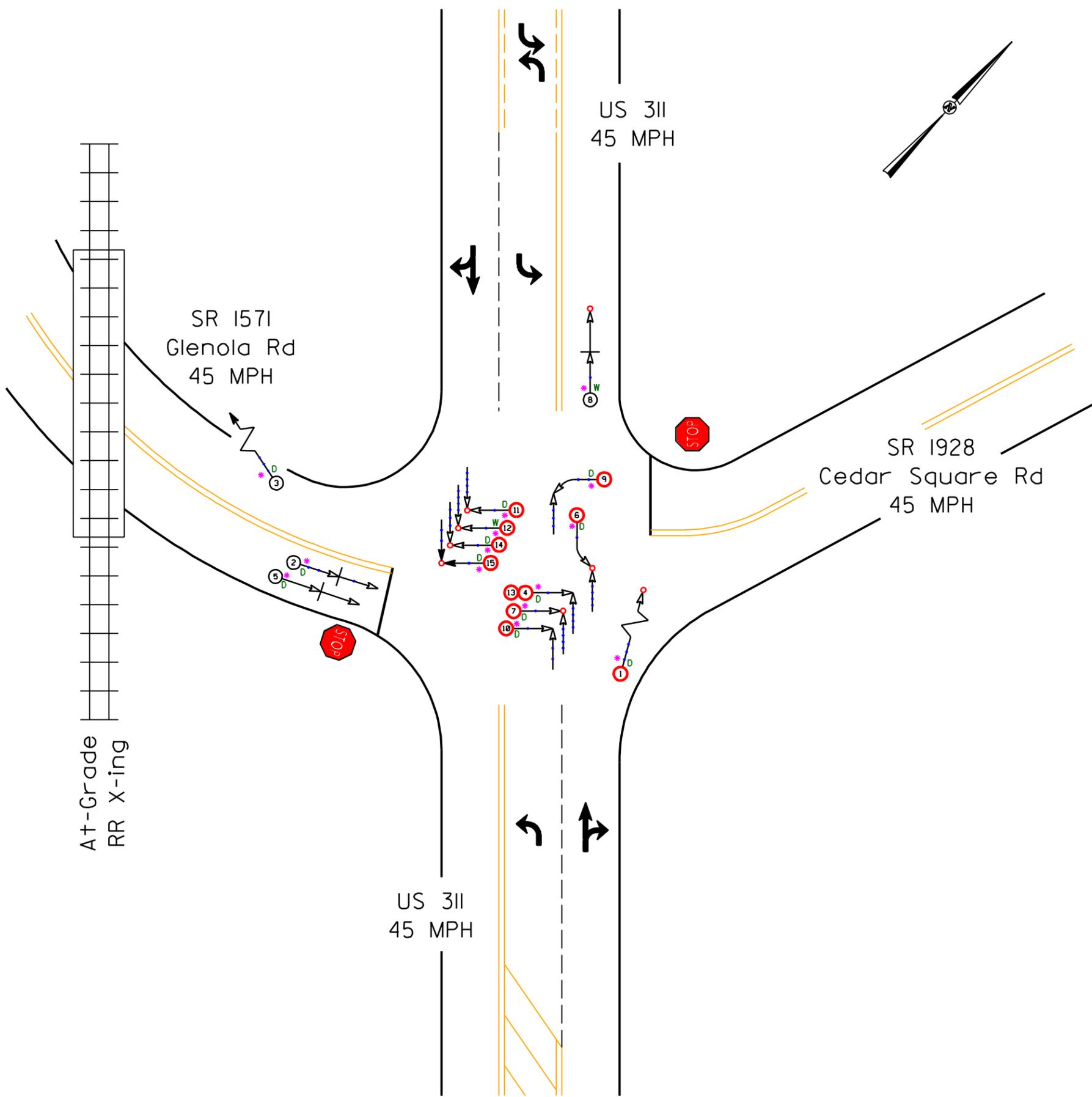
LOCATION: US 311 at SR 1571 / 1928		BY: JBS						
COUNTY: Randolph		DATE: 2/11/2010						
FILE NO.: SS 08-03-200		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - New Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$61,800	10	0.149	\$9,210			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$61,800	10	0.149	\$9,210			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$12,310			
	TOTAL COST OF PROJECT=				\$61,800			
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	5.50	0	0.00	8	1.45	7	1.27	\$31,145
AFTER	5.50	1	0.18	7	1.27	5	0.91	\$117,364
						Annual Benefits from Crash Cost Savings		(\$86,218)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$98,528)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-7.00		
TOTAL COST OF PROJECT		-	\$61,800	COMPREHENSIVE B/C RATIO		-	-7.00	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 311 at SR 1571 / 1928		BY: JBS						
COUNTY: Randolph		DATE: 2/11/2010						
FILE NO.: SS 08-03-200		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - New Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$61,800	10	0.149	\$9,210			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$61,800	10	0.149	\$9,210			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$12,310			
	TOTAL COST OF PROJECT=				\$61,800			
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	5.50	0	0.00	7	1.27	4	0.73	\$25,745
AFTER	5.50	0	0.00	6	1.09	1	0.18	\$20,345
						Annual Benefits from Crash Cost Savings		\$5,400
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$6,910)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.44		
TOTAL COST OF PROJECT		-	\$61,800	COMPREHENSIVE B/C RATIO		-	0.44	



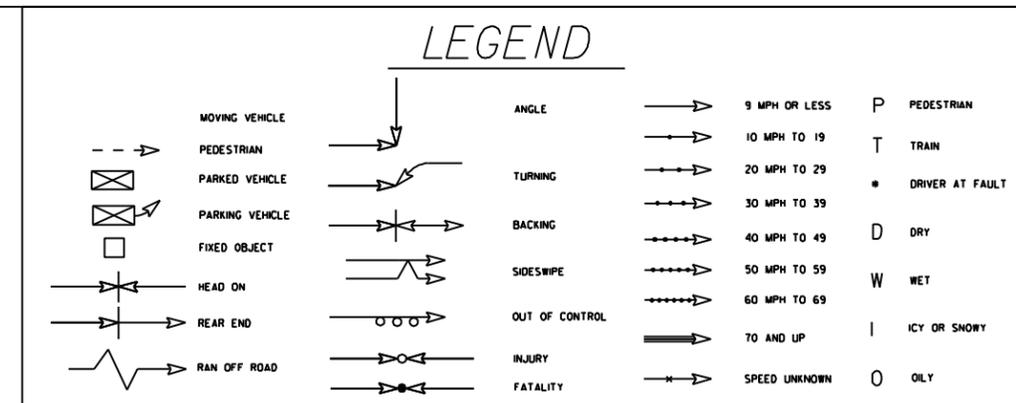
SS# 08-03-200
 Randolph County
 South of Archdale
 BEFORE Period
 9/1/98 - 2/29/04



Frontal Impact Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	
COLLISION DIAGRAM	
DIVISION: B	AREA:
STUDY PERIOD: 9/1/1998 - 2/29/2004	
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: 2-4-2010	
LOG NUMBER: SS* 08-03-200 BEFORE	

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

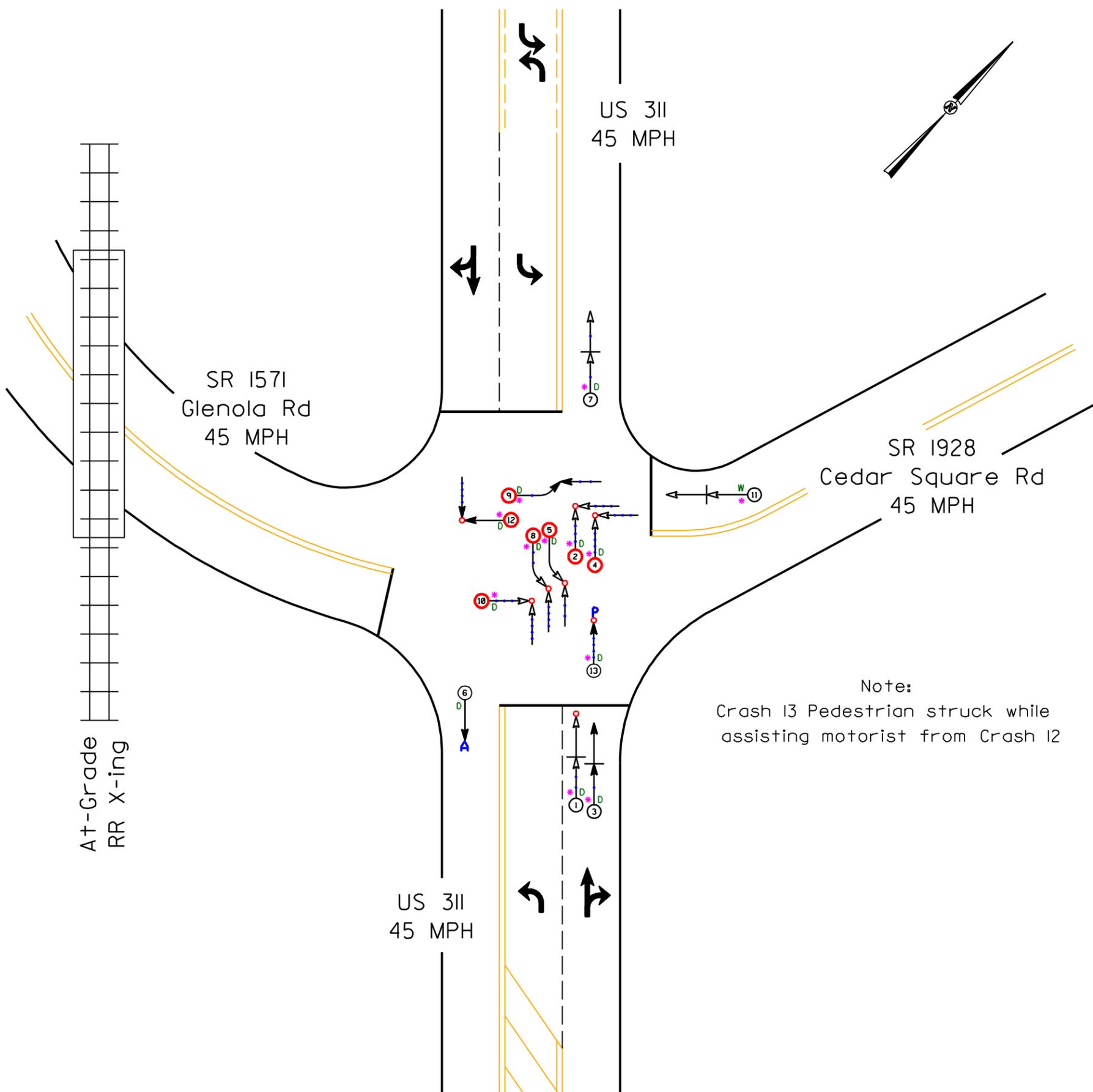


SS# 08-03-200
 Randolph County
 South of Archdale
 AFTER Period
 6/1/04 - 11/30/09



New Signalized
 Intersection
 with RR Preemption
 Sig ID 08-0523

Note:
 Crash 13 Pedestrian struck while
 assisting motorist from Crash 12



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: B	AREA:
STUDY PERIOD: 6/1/2004 - 11/30/2009		
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: 2-4-2010		
LOG NUMBER: SS* 08-03-200 AFTER		

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