

Spot Safety Project Evaluation

Work Order #41000007660

Spot Safety Project # 02-02-243

**Spot Safety Project Evaluation of the Sight Distance Improvements and Installation of a Four-Way Stop at the Intersection of SR 1126 (Forlines Rd) and SR 1127 (Frog Level Rd)
Pitt 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

8/13/2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-02-243 – The intersection of SR 1126 (Forlines Rd) and SR 1127 (Frog Level Rd) in Pitt County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to purchase right-of-way in the southeast and southwest quadrants of the intersection and to clear existing trees in order to improve sight distance. As an addition to the project, median islands were constructed on both approaches of SR 1127 in order to install dual stop signs. Two months after the project was constructed the dual stop signs were removed and instead the intersection was made into a four-way stop.

The subject location is a four-leg intersection which was controlled by stop signs on SR 1127 prior to the project. All approaches are single lane and have speed limits of 55 mph.

The original statement of problem was that motorists entering the intersection from the southern approach of SR 1127 had limited sight distance due to the trees on either side.

The initial crash analysis was conducted from March 1, 1999 to February 28, 2002 with a total of 18 reported crashes, ten of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on October 11, 2005 with a total cost of \$70,000.00. The intersection was converted to an all way on December 20, 2005.

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 September 1, 2005 to January 31, 2006. The before period consisted of reported crashes from April 1, 2001 through August 31, 2005 (4 years and 5 months) and the after period consisted of reported crashes from February 1, 2006 through June 30, 2010 (4 years and 5 months). 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 that occurred in the intersection were the Target Crashes for the applied countermeasure. These crash types are considered 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.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	21	8	-61.9
Total Severity Index	5.23	3.77	-27.9
Target Crashes	19	4	-78.9
Target Severity Index	5.67	4.7	-17.1
Volume	5,700	9,000	57.9
Target Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	2	1	-50.0
Class C Crashes	10	1	-90
PDO Crashes	7	2	-71.4

The naive before and after analysis at the treatment location resulted in a 62 percent decrease in Total Crashes, a 79 percent decrease in Target Crashes, and a 58 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

The conversion of the intersection to a four-way stop appears to have been effective in reducing Target Crashes at the intersection. All of the existing Target Crash patterns in the before period were either reduced or eliminated in the after period. The most prominent crash pattern in the before period, Angle Crashes between northbound SR 1127 vehicles and westbound SR 1126 vehicles, was reduced by 88 percent, from 8 in the before to 1 in the after.

According to the crash report narratives the after period included two crashes resulting from westbound SR 1126 vehicles running the stop sign, two crashes resulting from eastbound SR 1126 vehicles running the stop sign, and three crashes resulting from southbound SR 1127 vehicles running the stop sign. Six of the eight after period crashes occurred at night.

The calculated benefit to cost ratio for this project is 4.29 considering total crashes. The benefit to cost ratio considering only target crashes is 4.81. 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 were obtained from Google Street-view. 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 1126 at SR 1127
 COUNTY: Pitt
 FILE NO.: SS 02-02-243

BY: bdr
 DATE: 8/6/2010

DETAILED COST: TYPE IMPROVEMENT - 4-way stop

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$70,000	10	0.149	\$10,432
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$70,000	10	0.149	\$10,432

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$10,432
 TOTAL COST OF PROJECT= \$70,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.41	0	0.00	12	2.72	9	2.04	\$63,197
AFTER	4.41	0	0.00	3	0.68	5	1.13	\$18,481

Annual Benefits from Crash Cost Savings \$44,717

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$34,284

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.29

TOTAL COST OF PROJECT - \$70,000 COMPREHENSIVE B/C RATIO - 4.29

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1126 at SR 1127
 COUNTY: Pitt
 FILE NO.: SS 02-02-243 Target Crashes Only

BY: bdr
 DATE: 8/6/2010

DETAILED COST: TYPE IMPROVEMENT - 4-way stop

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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	\$70,000	10	0.149	\$10,432
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 TOTAL ANNUAL COST= \$10,432
 TOTAL COST OF PROJECT= \$70,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.41	0	0.00	12	2.72	7	1.59	\$61,247
AFTER	4.41	0	0.00	2	0.45	2	0.45	\$11,020

Annual Benefits from Crash Cost Savings \$50,227

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$39,795

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.81

TOTAL COST OF PROJECT - \$70,000 COMPREHENSIVE B/C RATIO - 4.81

Treatment Site Photos from Google-Street View



Looking west on SR 1126 (Forlines Rd)



Looking east on SR 1126 (Forlines Rd)



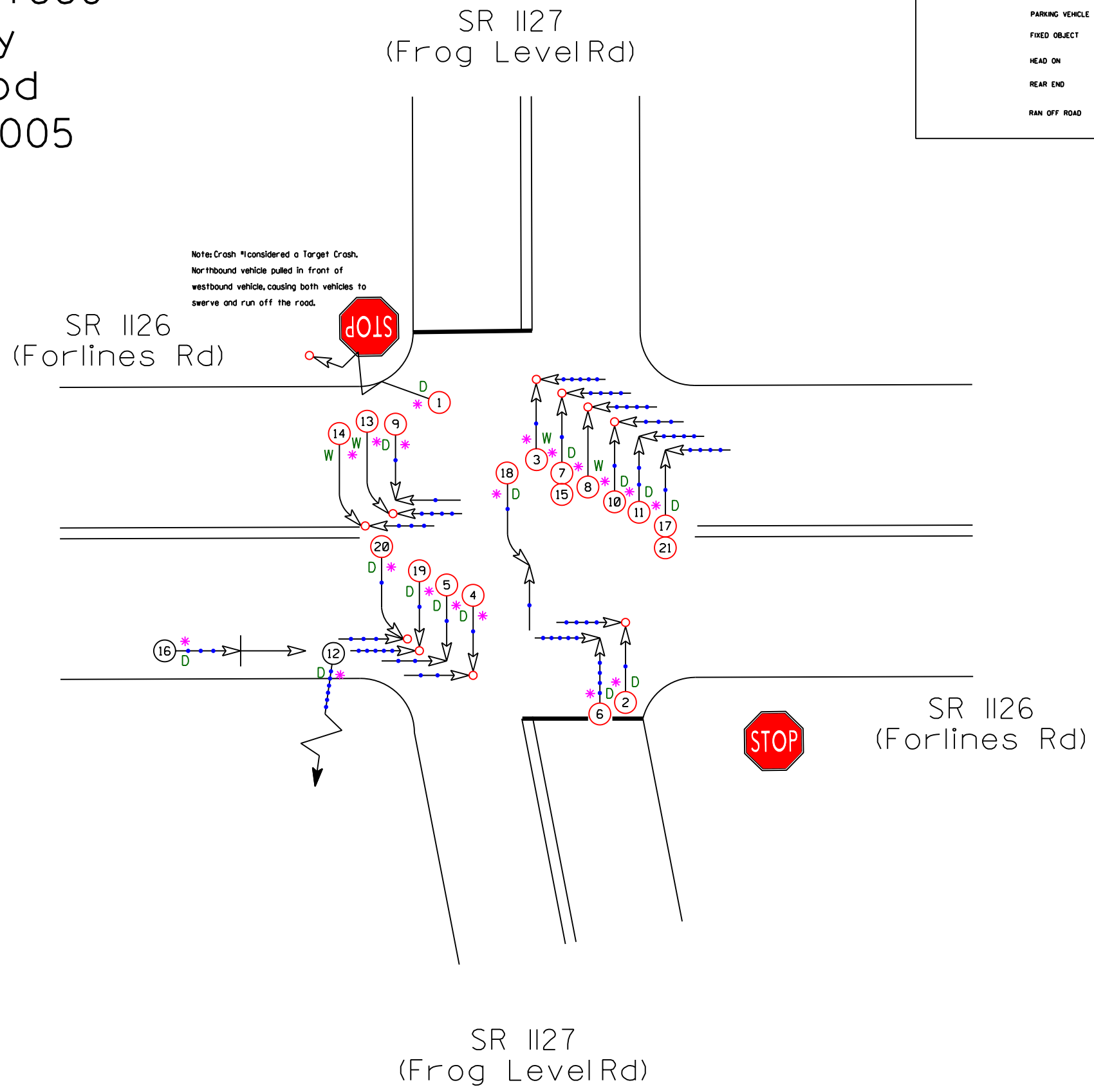
Looking south on SR 1127 (Frog Level Rd)



Looking north on SR 1127 (Frog Level Rd)

SS# 02-02-243
 Order# 41000007660
 Pitt County
 BEFORE Period
 1/1/2001-8/31/2005

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 ONLY	

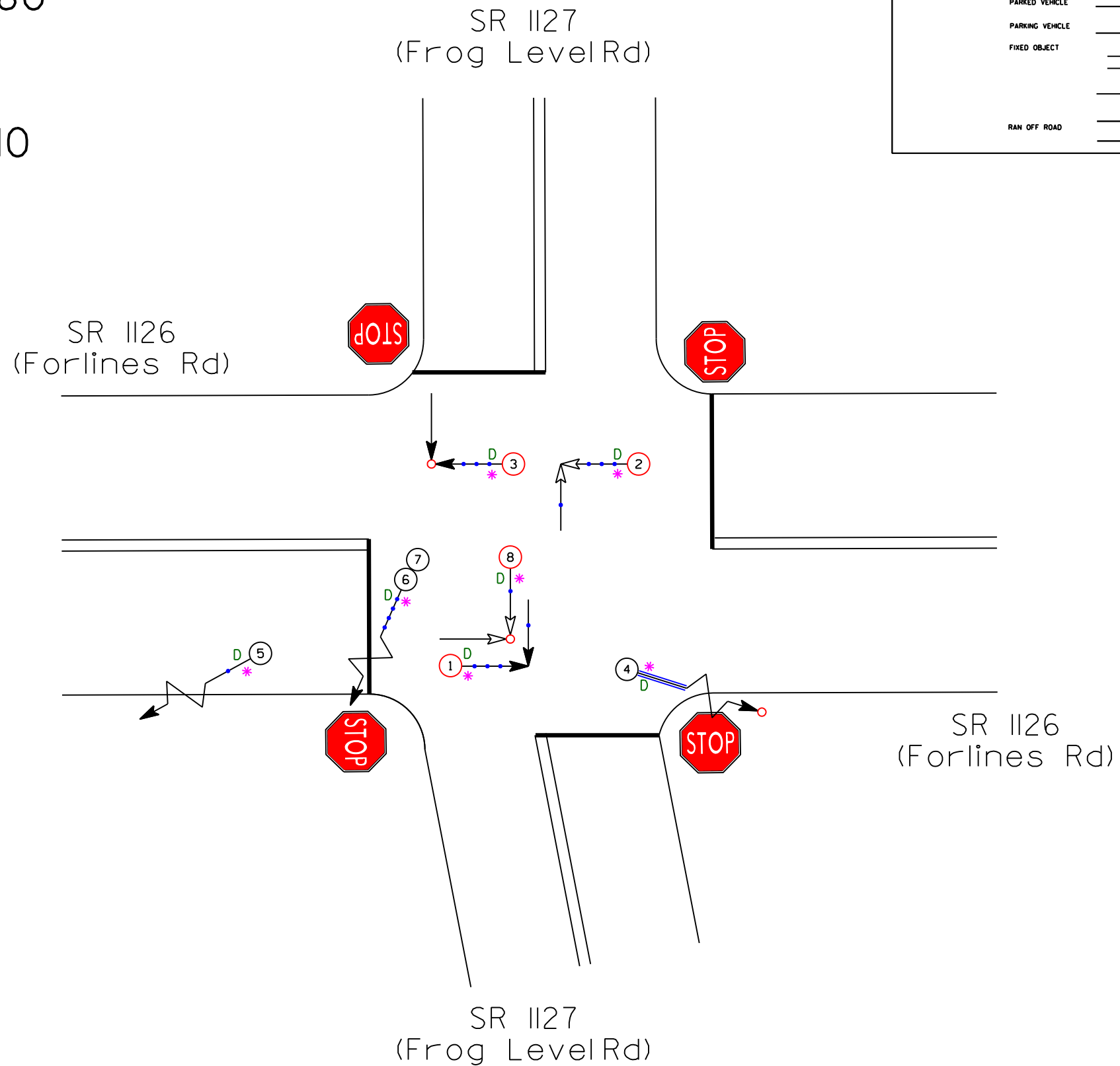


Target Crashes

N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and SAFETY DIVISION
TRAFFIC SAFETY UNIT
 Date: August 2010 Prepared By: bdr

SS# 02-02-243
 Order# 41000007660
 Pitt County
 AFTER Period
 11/1/2005-6/30/2010

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
RAN OFF ROAD	OUT OF CONTROL	→	40 MPH TO 49	W	WET
	INJURY	→	50 MPH TO 59	I	ICY OR SNOWY
	FATALITY	→	60 MPH TO 69	O	ONLY
		→	70 AND UP		
		→	SPEED UNKNOWN		



Target Crashes

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

TRAFFIC SAFETY UNIT

Date: August 2010 Prepared By: bdr