

Spot Safety Project Evaluation

Project Log # 200906072

Spot Safety Project # 03-02-212

**Spot Safety Project Evaluation of the Traffic Signal Installation
US 17 / NC 210 at SR 1563 (Sloop Point Loop Road)
Pender 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

8-13-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-02-212 located at the Intersection of US 17 / NC 210 and SR 1563 (Sloop Point Loop Road) in Pender County, near the Town of Woodside.

The Sig ID is 03-0585 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 17 / NC 210 is a four lane divided facility with a 55 mph speed limit. US 17 southbound also provides a dedicated left turn lane and the northbound approach provides both a left and a right turn lane at this three leg intersection. SR 1563 is a rural two lane roadway with a 55 mph speed limit. The subject location was controlled by dual posted stop signs on SR 1563 (Sloop Point Loop Road) in the before period.

The original statement of problem was the observed pattern of frontal impact collisions as SR 1563 vehicles attempted to access the high speed and volume roadway of US 17. The intended purpose of the new traffic signal was to alleviate the existing crash pattern.

The initial crash analysis was completed from February 1, 1999 to January 31, 2002 with eighteen (18) reported crashes, nine (9) of which were deemed correctable “angle collisions” including one fatality crash. The final completion date for the improvement at the subject intersection was on January 20, 2003 with a total cost of \$120,000.

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 the month of January 2003. The before period consisted of reported crashes from January 1, 2000 through December 31, 2002 (3 years); and the after period consisted of reported crashes from February 1, 2003 through January 31, 2006 (3 years). The ending date for this analysis was limited by the widening of US 17 to a four-lane divided highway in the fourth quarter of 1999.

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; Angle; and Ran-off Roadway as an evasive reaction to avoid an angle collision.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	15	15	0.0 %
Total Severity Index	13.08	5.44	- 58.4 %
Target Crashes – Frontal Impact	11	8	- 27.3 %
Target Crash Severity Index	16.80	6.55	- 61.0 %
Volume	25,700	34,400	33.9 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	2	0	- 100.0 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	2	1	- 50.0 %
Class C Injury Crashes	2	8	300.0 %
Total Injury Crashes	6	9	50.0 %

The naive before and after analysis at the treatment location resulted in zero percent change in Total Crashes, a 27 percent decrease in Target Crashes, and a 58 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 but a 27 percent decrease in Target Crashes. The summary results above demonstrate that both Target Crashes and the Severity of Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period SR 1563 left turning vehicle crash pattern at the intersection consisted of eight (8) collisions and one (1) avoidance collision, including the fatality crash, and was the only defined crash pattern during this time. After the signal installation, this pattern was reduced to just one (1) which resulted from a side street motorist running the red light. The overall frontal impact target crashes migrated in the after period with the formation of six (6) left turn same roadway collisions from southbound US 17 vehicles turning on the green permissive phasing.

The calculated benefit to cost ratio for this project is **14.64 considering total crashes**. The benefit to cost ratio **considering only target crashes is 15.28**. 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.

In addition to the naive before-after evaluation; the crash analysis was carried out to the current available crash data. This additional time frame consisted of collisions from February 1, 2006 through April 30, 2009 (3 Years and 4 Months). This analysis was conducted with the same 150 foot y-line and Frontal Impact Target Crashes as stated above.

<u>Extra After Period Analysis</u>	3.25 Yrs	<u>Injury Crash Summary</u>	
Total crashes	16	Fatal injury Crashes	0
Total Severity Index	15.10	Class A injury Crashes	2
		Class B injury Crashes	4
Target Crashes – Frontal Impact	7	Class C Injury Crashes	6
Target Crash Severity Index	17.11	Total Injury Crashes	12

As seen from the Extra Period Analysis Table and Collision Diagram, the frequency of crashes remains consistent with the original analysis. However, the severity doubles with the addition of two (2) severe injury (A-injury) collisions. One of these severe injury crashes was a target left-turn same roadway collision. This time period also experienced six (6) permissive signal left turn crashes on US 17; as in the designated after period.

Please see the attached *Treatment Site Photos*. Photos are provided from Google Street View for all three 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 West / Northwest on SR 1563 (Sloop Point Loop Rd)



Looking South / Southeast onto US 17 / NC 210 Northbound Lanes



Looking South / Southeast on US 17 approaching intersection

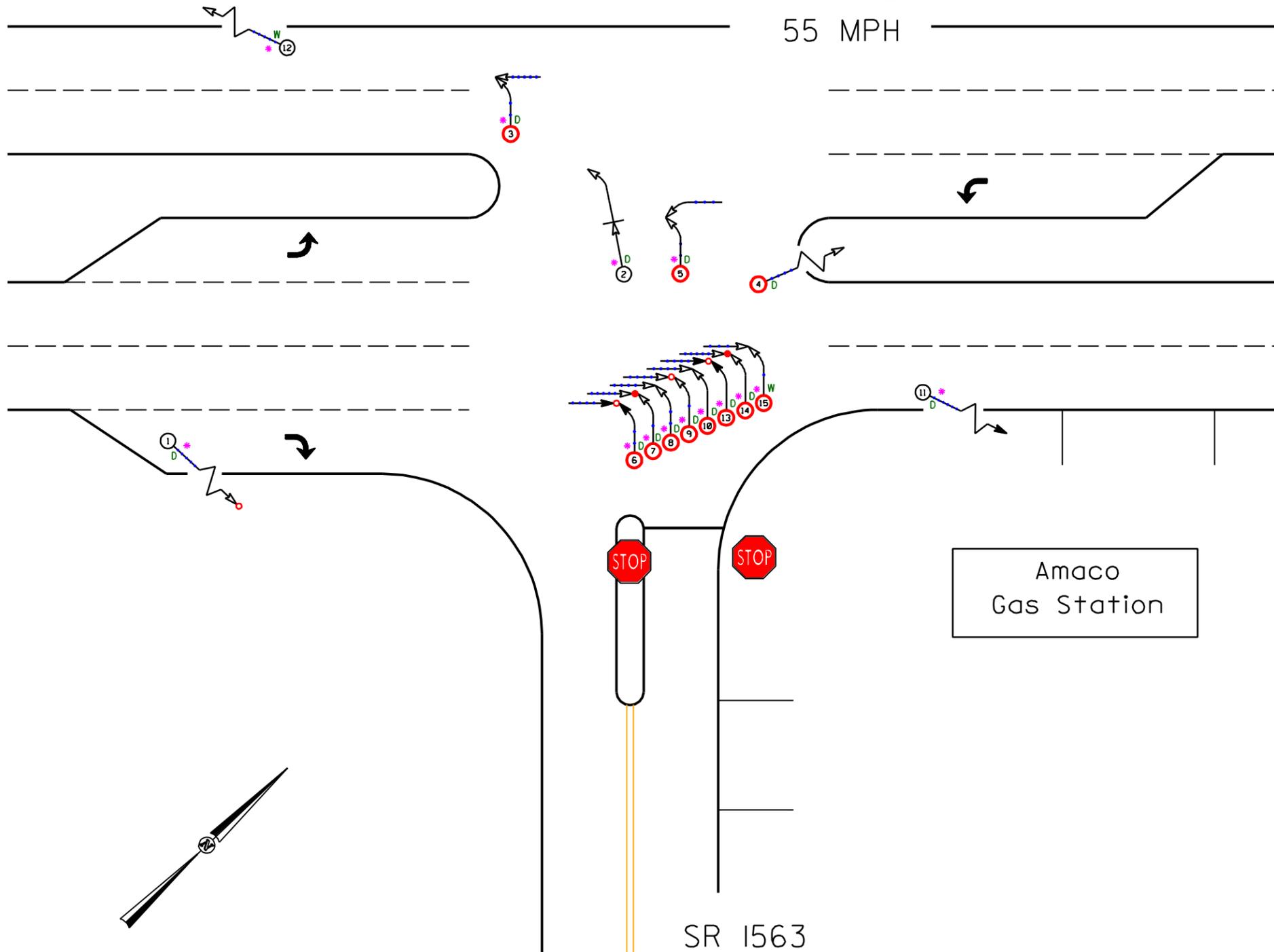
BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 17 at SR 1563		BY: JBS						
COUNTY: Pender		DATE: 8/4/2009						
FILE NO.: SS 03-02-212		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - New Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$120,000	10	0.149	\$17,884			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$120,000	10	0.149	\$17,884			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$20,984			
	TOTAL COST OF PROJECT=				\$120,000			
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	3.00	2	0.67	4	1.33	9	3.00	\$369,033
AFTER	3.00	0	0.00	9	3.00	6	2.00	\$61,800
						Annual Benefits from Crash Cost Savings		\$307,233
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$286,250		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	14.64		
TOTAL COST OF PROJECT		-	\$120,000	COMPREHENSIVE B/C RATIO		-	14.64	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 17 at SR 1563		BY: JBS						
COUNTY: Pender		DATE: 8/4/2009						
FILE NO.: SS 03-02-212		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - New Intersection Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$120,000	10	0.149	\$17,884			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$120,000	10	0.149	\$17,884			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$20,984			
	TOTAL COST OF PROJECT=				\$120,000			
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	3.00	2	0.67	3	1.00	6	2.00	\$359,133
AFTER	3.00	0	0.00	6	2.00	2	0.67	\$38,600
						Annual Benefits from Crash Cost Savings		\$320,533
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$299,550		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	15.28		
TOTAL COST OF PROJECT		-	\$120,000	COMPREHENSIVE B/C RATIO		-	15.28	

US-17 / NC 210
55 MPH



SR 1563
Sloop Point Loop Rd
55 MPH

Amaco
Gas Station

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				70 AND UP		OILY

SS# 03-02-212
Pender County
Town of Woodside
BEFORE Period
1/1/00 - 12/31/02

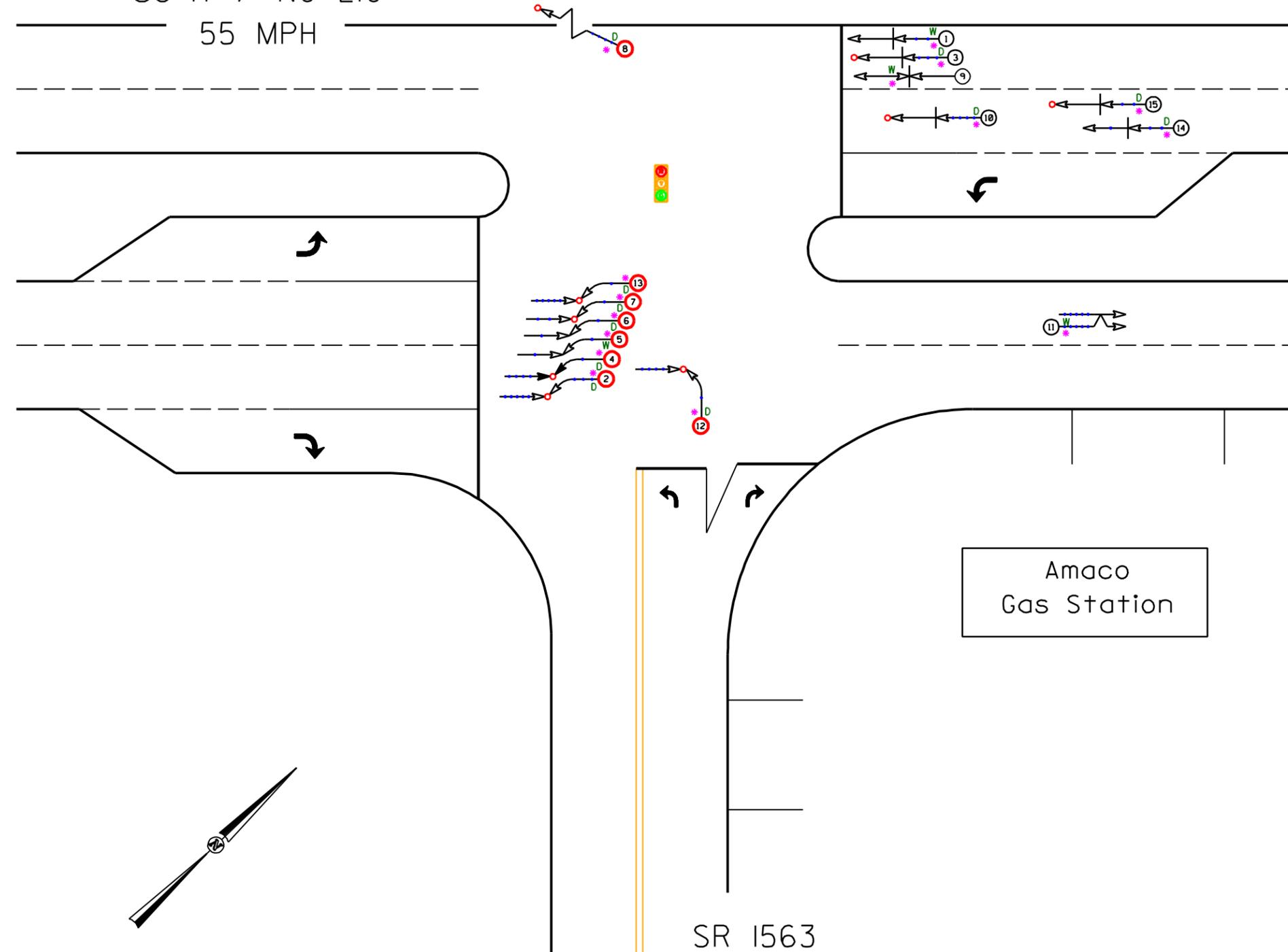
Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 1/1/2000 - 12/31/2002	
	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: 8-3-2009		
LOG NUMBER: SS# 03-02-212 BEFORE		

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

US-17 / NC 210
55 MPH



SR 1563
Sloop Point Loop Rd
55 MPH

Amaco
Gas Station

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	O	OILY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		

SS# 03-02-212
Pender County
Town of Woodside
AFTER Period
2/1/03 - 1/31/06



New Signal
Installation
Sig ID 03-0585

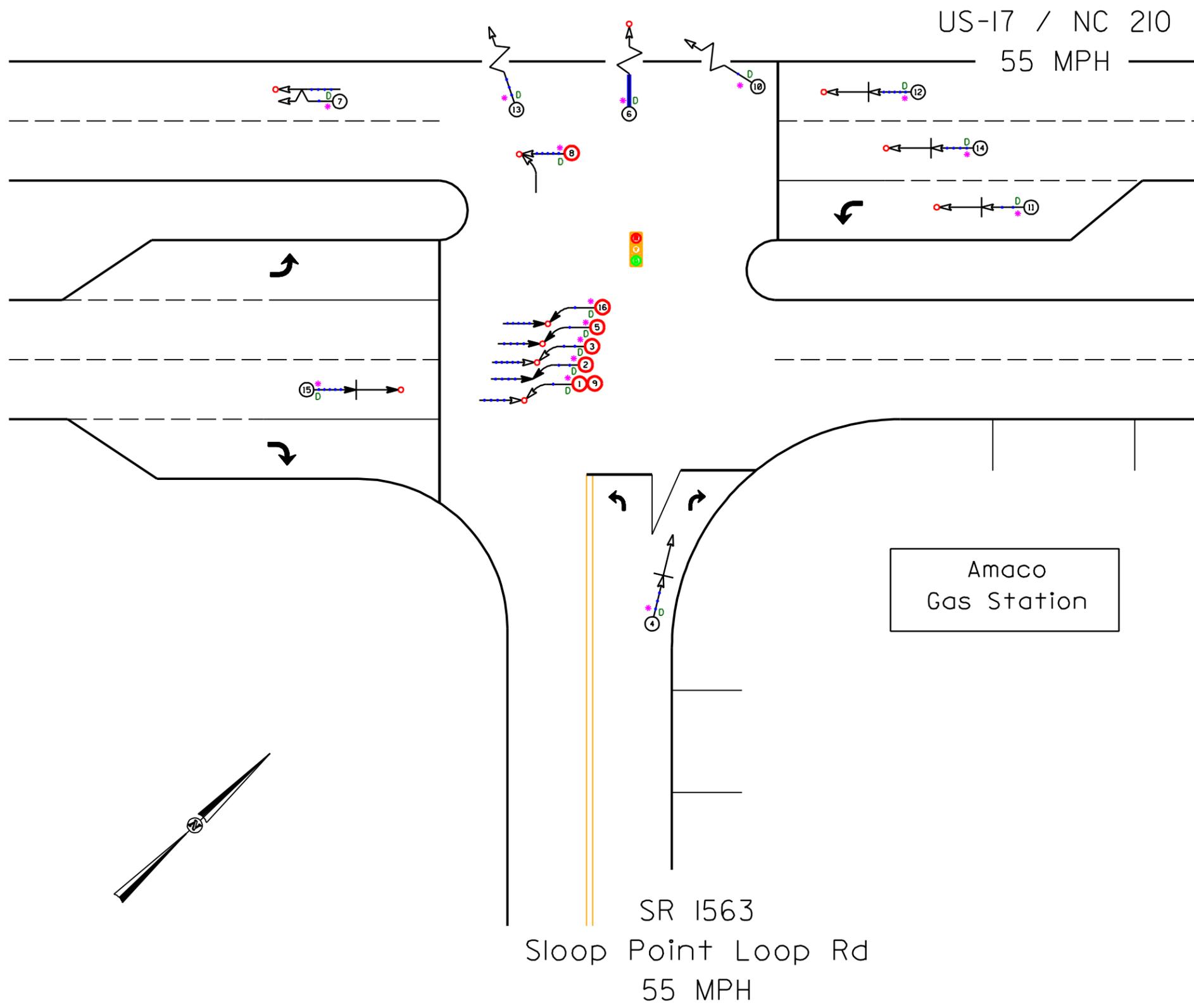


Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 2/1/2003 - 1/31/2006	
	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: 8-3-2009		
LOG NUMBER: SS* 03-02-212 AFTER		

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		OILY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		

SS# 03-02-212
 Pender County
 Town of Woodside
 Extra Crash Period
 2/1/06 - 4/30/09

Existing
 Traffic Signal
 Sig ID 03-0585

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 2/1/2006 - 4/30/2009	
	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: 8-3-2009		
LOG NUMBER: SS* 03-02-212 AFTER		

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