Spot Safety Project Evaluation

Project Log # 200901028

Spot Safety Project # 08-01-210

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of SR 1547 (Finch Farm Rd) and SR 1556 (Welborn Rd)
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

Traffic Safety Project Engineer

4-21-2009
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-01-210 located at the Intersection of SR 1547 (Finch Farm Road) and SR 1556 (Welborn Road) in Randolph County, near the Town of Trinity.

The Sig ID is 08-0747 for this new traffic signal installation.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 3-phase, fully actuated traffic signal. SR 1547 and SR 1556 are both two-lane facilities at the subject intersection with no turn lanes and speed limits of 45 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1556 (Welborn Rd). Access to the "Quick Shop Gas Stop" PVA comprises the fourth leg of this traffic signal which is offset by approximately 30 feet to the north of the intersection.

The original statement of problem was the occurrence of frontal impact collisions as vehicles attempted to access SR 1547 (Finch Farm Rd). The intersection met signal warrants 2 and 3B. The intended purpose of this signal installation was to eliminate an accident pattern.

The initial crash analysis was completed from December 31, 1997 to December 31, 2000 with nine (9) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on April 11, 2003 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 months of March and April 2003. The before period consisted of reported crashes from June 1, 1997 through February 28, 2003 (5 years and 9 months); and the after period consisted of reported crashes from May 1, 2003 through January 31, 2009 (5 years and 9 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.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	18	13	- 27.8 %
Total Severity Index	5.11	3.28	- 35.8 %
Target Crashes	11	4	- 63.6 %
Target Crash Severity Index	6.38	2.85	- 55.3 %
Volume	9,300	8,940	-3.9 %
Injury Crash Summary – Total			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	3	2	- 33.3 %
Class C Injury Crashes	7	2	- 71.4 %
Total Injury Crashes	10	4	- 60.0 %

The naive before and after analysis at the treatment location resulted in a 28 percent decrease in Total Crashes, a 64 percent decrease in Target Crashes, and a 36 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2006.

Results and Discussion

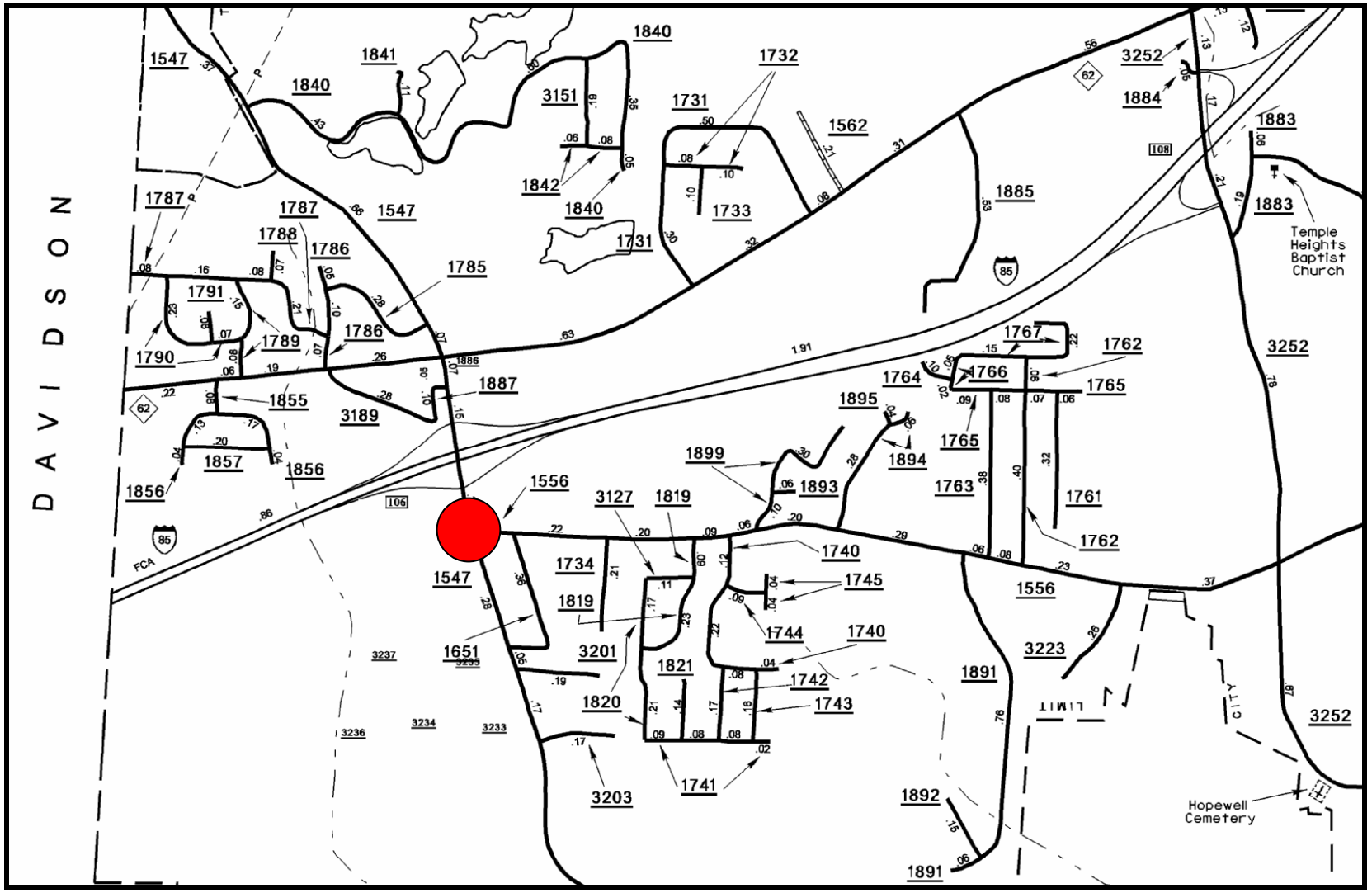
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 28 percent decrease in Total Crashes and a 64 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, a large portion of crashes at the intersection in the before period (11 of 18) were the result of vehicles either attempting to access SR 1547 or cross Finch Farm Road between the Gas Station and SR 1556. After the signal installation, frontal impact crashes were reduced to four (4), which included one red light run and two improper permissive green left turn maneuvers. Rear-end collisions also reduced from six (6) in the before period to four (4) in the after period.

The calculated benefit to cost ratio for this project is **2.23 considering total crashes**. The benefit to cost ratio **considering only target crashes is 2.70**. 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
Randolph County
Evaluation of Spot Safety Project # 08-01-210



Treatment Location: SR 1547 (Finch Farm Rd) at SR 1556 (Welborn Rd)

SS# 08-01-210 Aerial Map
Randolph County

TREATMENT SITE PHOTOS TAKEN 4/15/2009

Traveling South on SR 1547 (Finch Farm Rd)
Picture taken from NB I-85 Ramps

Traveling South on SR 1547 (Finch Farm Rd)

Traveling North on SR 1547 (Finch Farm Rd)

Traveling North on SR 1547 (Finch Farm Rd)

Traveling West on SR 1556 (Welborn Rd) – Signal Ahead Warning Sign

Traveling West on SR 1556 (Welborn Rd)

Traveling East from the “Quick Shop, Gas Stop” PVA
Notice the Offset Approaches to the Intersection

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Finch Farm at Welborn
COUNTY: Randolph
FILE NO.: SS 08-01-210

BY: JBS
DATE: 4/20/2009
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal Installation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$35,000	10	0.149	$5,216
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$35,000	10	0.149	$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,116
TOTAL COST OF PROJECT= $35,000

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	5.75	0	0.00	10	1.74	8	1.39	$36,730
AFTER	5.75	0	0.00	4	0.70	9	1.57	$18,626

Annual Benefits from Crash Cost Savings $18,104

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $9,988

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.23

TOTAL COST OF PROJECT - $35,000 COMPREHENSIVE B/C RATIO - 2.23

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Finch Farm at Welborn
COUNTY: Randolph
FILE NO.: SS 08-01-210

BY: JBS
DATE: 4/20/2009
NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal Installation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$35,000	10	0.149	$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,116
TOTAL COST OF PROJECT= $35,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

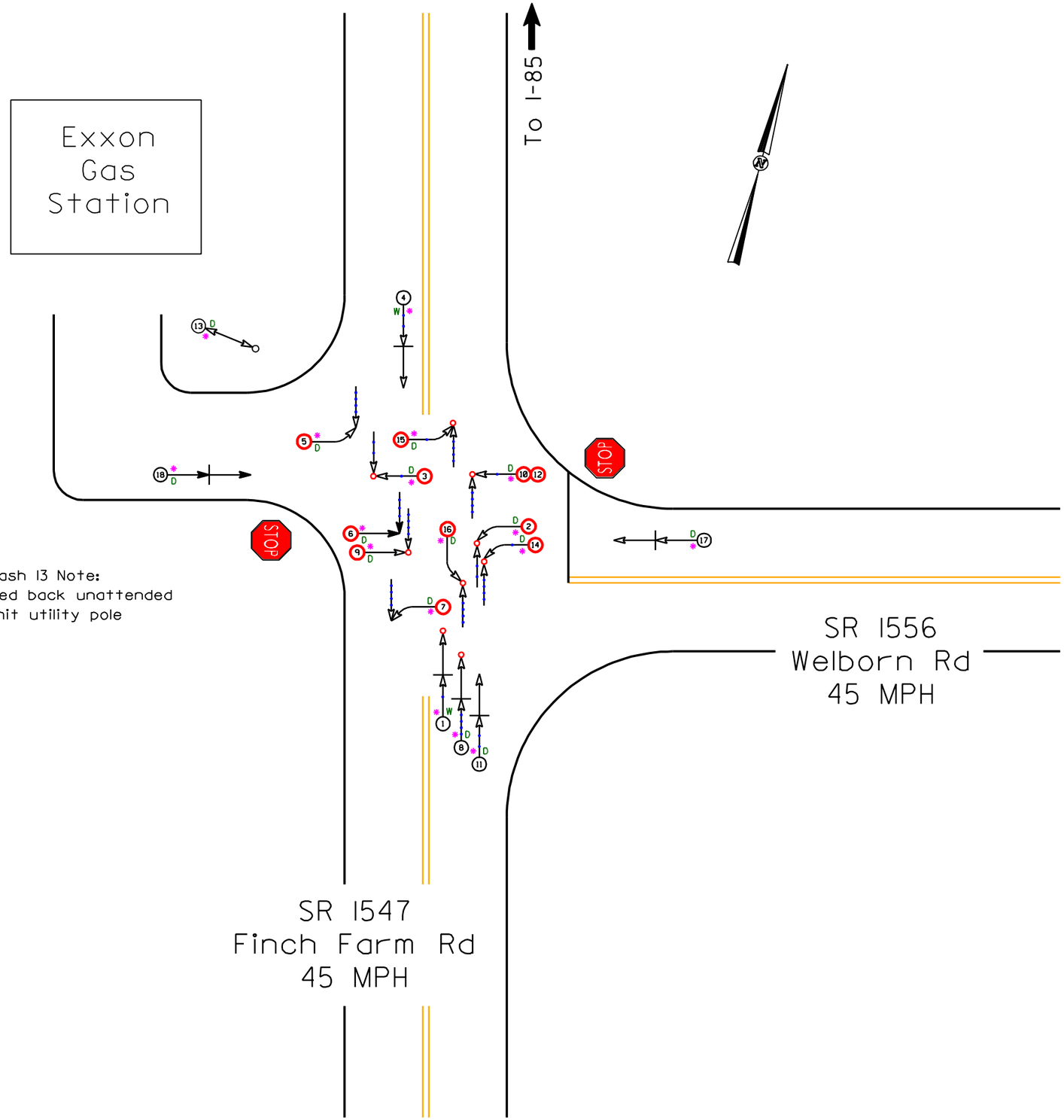
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.75	0	0.00	8	1.39	3	0.52	$27,078
AFTER	5.75	0	0.00	1	0.17	3	0.52	$5,165

Annual Benefits from Crash Cost Savings $21,913

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $13,797

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.70

TOTAL COST OF PROJECT - $35,000 **COMPREHENSIVE B/C RATIO - 2.70**



Crash 13 Note:
Vehicle rolled back unattended and hit utility pole

LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

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

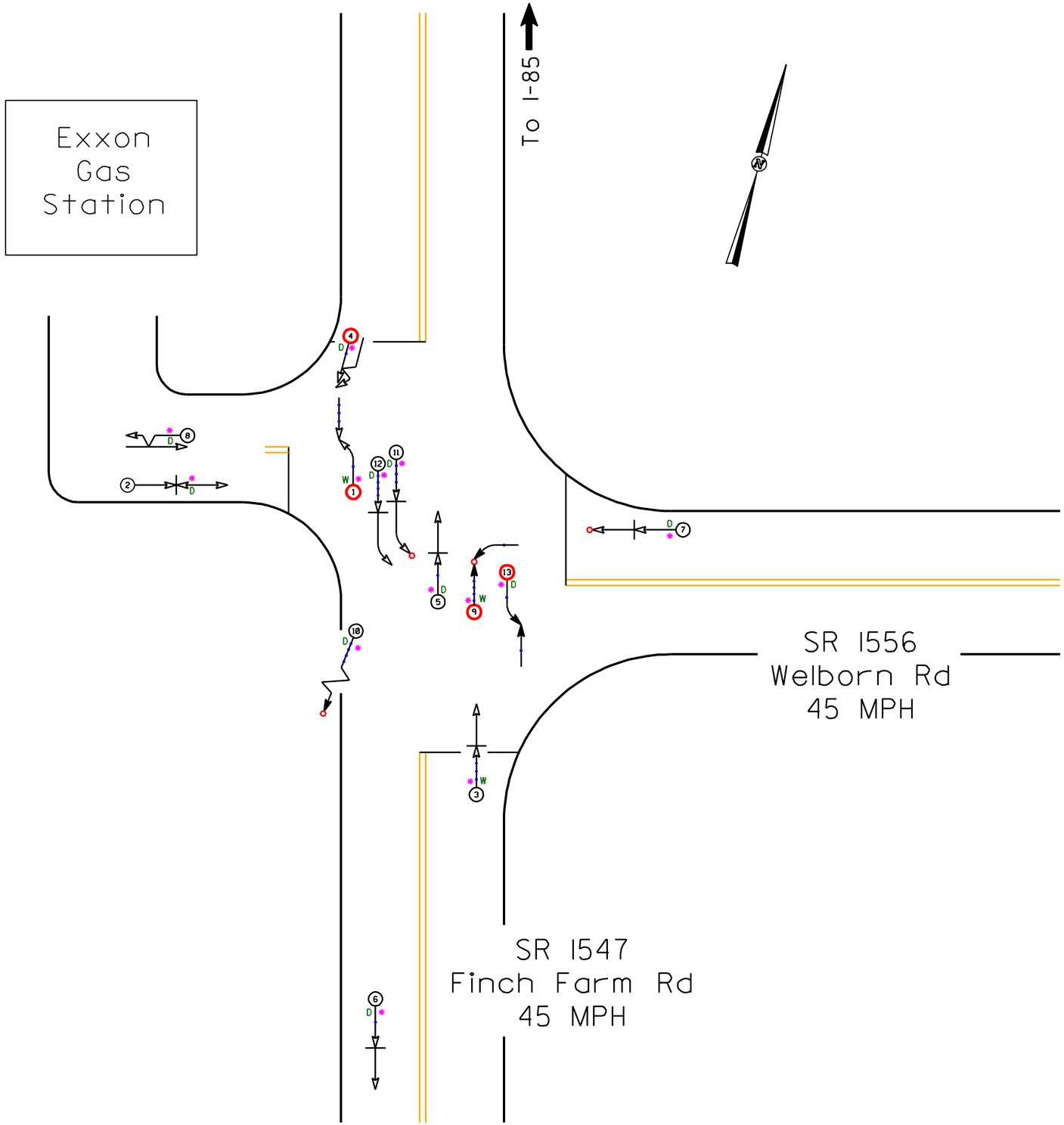
SS# 08-01-210
Randolph County
BEFORE Period
6/1/97 - 2/28/03

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 6/1/1997 - 2/28/2003	
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: 4-7-2009	
LOC NUMBER: SS# 08-01-210 BEFORE	

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



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
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* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 08-01-210
Randolph County
AFTER Period
5/1/03 - 1/31/09

R
Y
G
New Signal
Installation
Sig ID 08-0747

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 5/1/2003 - 1/31/2009	
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: 4-7-2009	
LOG NUMBER: SS# 08-01-210 AFTER	

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