

Spot Safety Project Evaluation

Work Order #41000005649

Spot Safety Project # 05-98-200

**Spot Safety Project Evaluation of the Traffic Signal Installation and the Construction of
Turn Lanes at the Intersection of SR 1010 and SR 1303 (Smith)
Wake 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

4/20/2010

Date

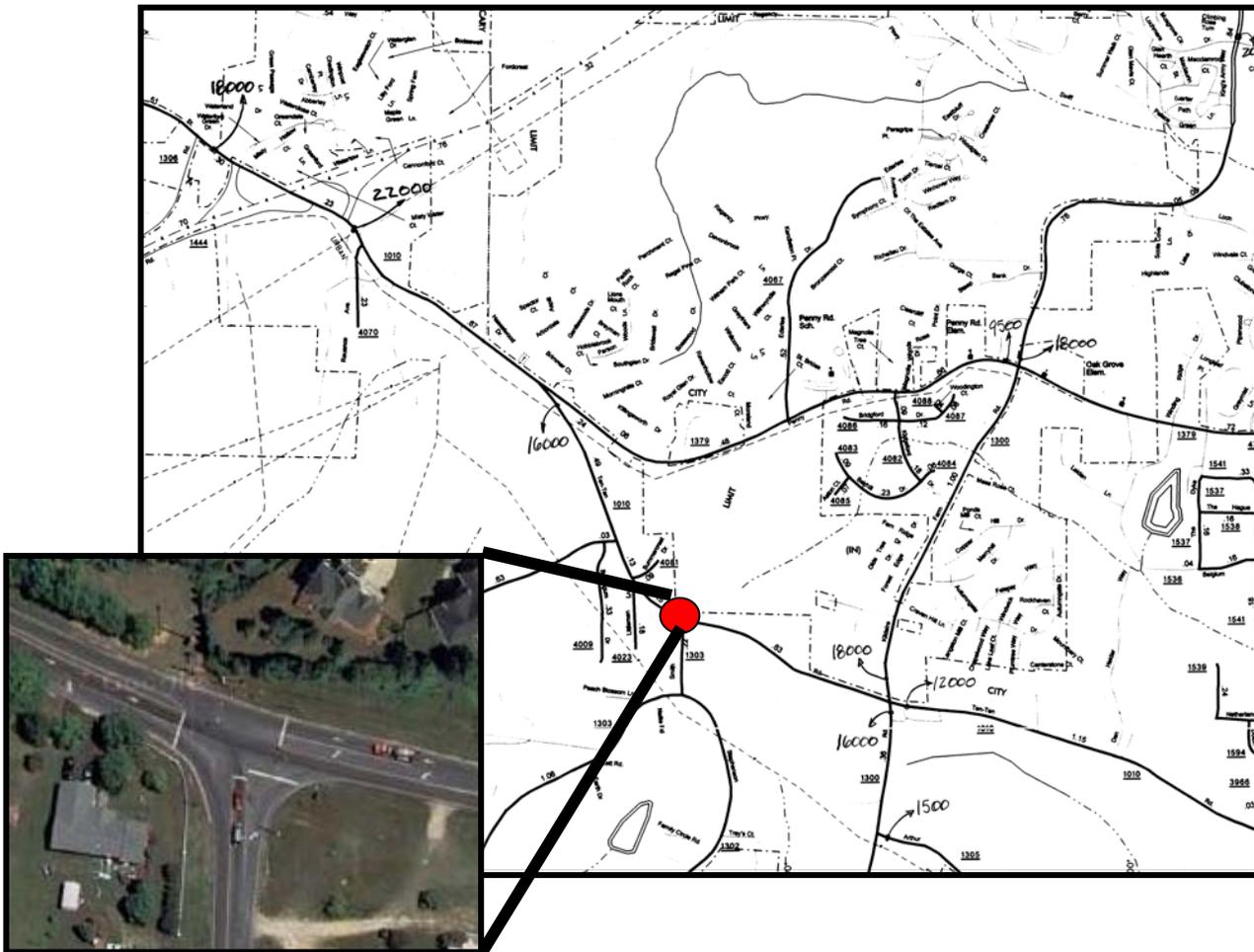
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-98-200 – The intersection of SR 1010 (Ten-Ten) and SR 1303 (Smith) in Wake County.

The signal number for this location is 05-1970.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were to install a traffic signal at the intersection and to construct a left turn lane on westbound SR 1010, a right turn lane on eastbound SR 1010, and a right turn lane on northbound SR 1303.

The subject location is a three-leg intersection which was controlled by a stop sign on SR 1303 prior to the project. The speed limit is 45 mph on all approaches and all were single lane in the before period.

The original statement of problem was that vehicles on SR 1303 could not safely enter the intersection due to insufficient gaps in traffic.

The initial crash analysis was conducted from March 1, 1999 to February 28, 2002 with a total of 10 reported crashes, nine of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on September 23, 2004 with a total cost of \$200,000.00.

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 from August 1, 2004 to October 31, 2004. The before period consisted of reported crashes from April 1, 1999 through July 31, 2004 (5 years and 4 months) and the after period consisted of reported crashes from November 1, 2004 through February 28, 2010 (5 years and 4 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.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	23	7	-69.6
Total Severity Index	4.54	5.23	15.2
Target Crashes			
Target Crashes	17	0	-100.0
Target Severity Index	4.92	0	-100.0
Volume			
Volume	16,000	19,000	18.8
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	5	0	-100.0
Class C Crashes	4	0	-100.0
PDO Crashes	8	0	-100.0

The naive before and after analysis at the treatment location resulted in a 70 percent decrease in Total Crashes, a 100 percent decrease in Target Crashes, and a 19 percent increase in Average Daily Traffic (ADT). 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 70 percent decrease in Total Crashes and a 100 percent decrease in Target Crashes. The Total Severity Index decreased by 15 percent and the Target Severity Index decreased by 100 percent. The summary results above demonstrate that both Total and Target Crashes appear to have decreased from the before to the after period.

The calculated benefit to cost ratio for this project is 1.00 considering total crashes. The benefit to cost ratio considering only target crashes is 1.20. 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.

It appears that the countermeasures were effective in reducing Frontal Impact Crashes at the intersection. The largest crash pattern in the before period were Left Turn-Different Roadway Crashes involving vehicles turning left out of SR 1303. There were a total of 15 of this type, 13 involving eastbound SR 1010 vehicles and two involving westbound SR 1010 vehicles. In the after period there were no Frontal Impact Crashes.

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 1010 at SR 1303
 COUNTY: Wake
 FILE NO.: SS 05-98-200

BY: bdr
 DATE: 4/12/2010

DETAILED COST: TYPE IMPROVEMENT - Signal and turn lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$200,000	10	0.149	\$29,806
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$200,000	10	0.149	\$29,806

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,600
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$33,306
 TOTAL COST OF PROJECT= \$200,000

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	5.34	0	0.00	11	2.06	12	2.25	\$50,637
AFTER	5.34	0	0.00	4	0.75	3	0.56	\$17,341

Annual Benefits from Crash Cost Savings \$33,296

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$10)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.00

TOTAL COST OF PROJECT - \$200,000 COMPREHENSIVE B/C RATIO - 1.00

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1010 at SR 1303
 COUNTY: Wake
 FILE NO.: SS 05-98-200 Target Crashes Only

BY: bdr
 DATE: 4/12/2010

DETAILED COST: TYPE IMPROVEMENT - Signal and turn lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$200,000	10	0.149	\$29,806
	\$0	0	0.000	\$0
TOTALS	\$200,000	10	0.149	\$29,806

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,600
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$33,306
 TOTAL COST OF PROJECT= \$200,000

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	5.34	0	0.00	9	1.69	8	1.50	\$40,000
AFTER	5.34	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$40,000

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$6,694

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.20

TOTAL COST OF PROJECT - \$200,000 COMPREHENSIVE B/C RATIO - 1.20

Treatment Site Photos from Google Street-View



Looking West on SR 1010 (Ten-Ten)



Looking East on SR 1010 (Ten-Ten)

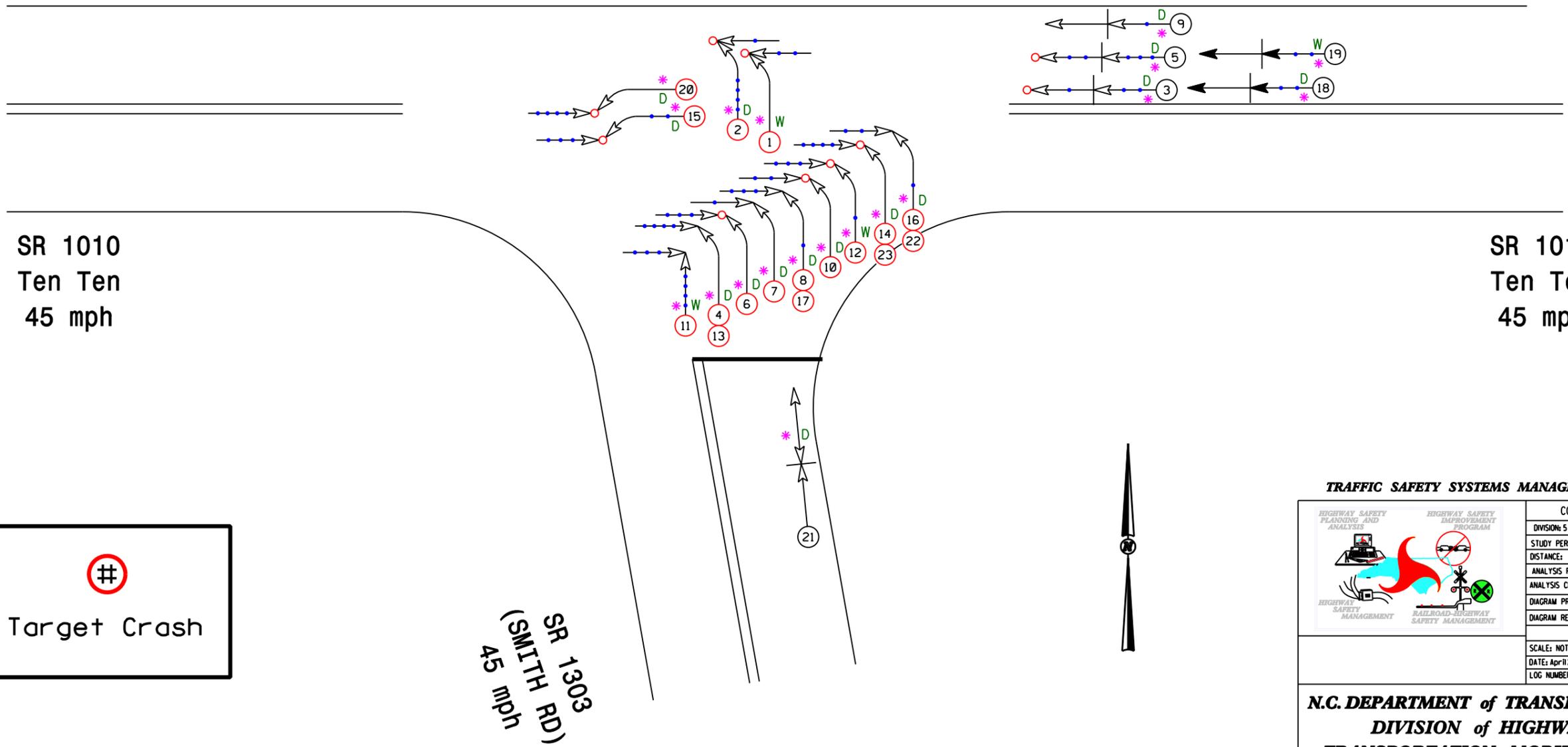


Looking North on SR 1303 (Smith)

Wake County
 SR 1010 at SR 1303 (Smith Rd)
 BEFORE Period
 4/1/1999-7/31/2004

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		ONLY



SR 1010
 Ten Ten
 45 mph

SR 1010
 Ten Ten
 45 mph

Target Crash

SR 1303
 (SMITH RD)
 45 mph

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 4/1/99-7/3/04	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: Apr 11 2004		
LOG NUMBER: 4000005649		

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

Wake County
 SR 1010 at SR 1303 (Smith Rd)
 AFTER Period
 11/1/04-2/28/10

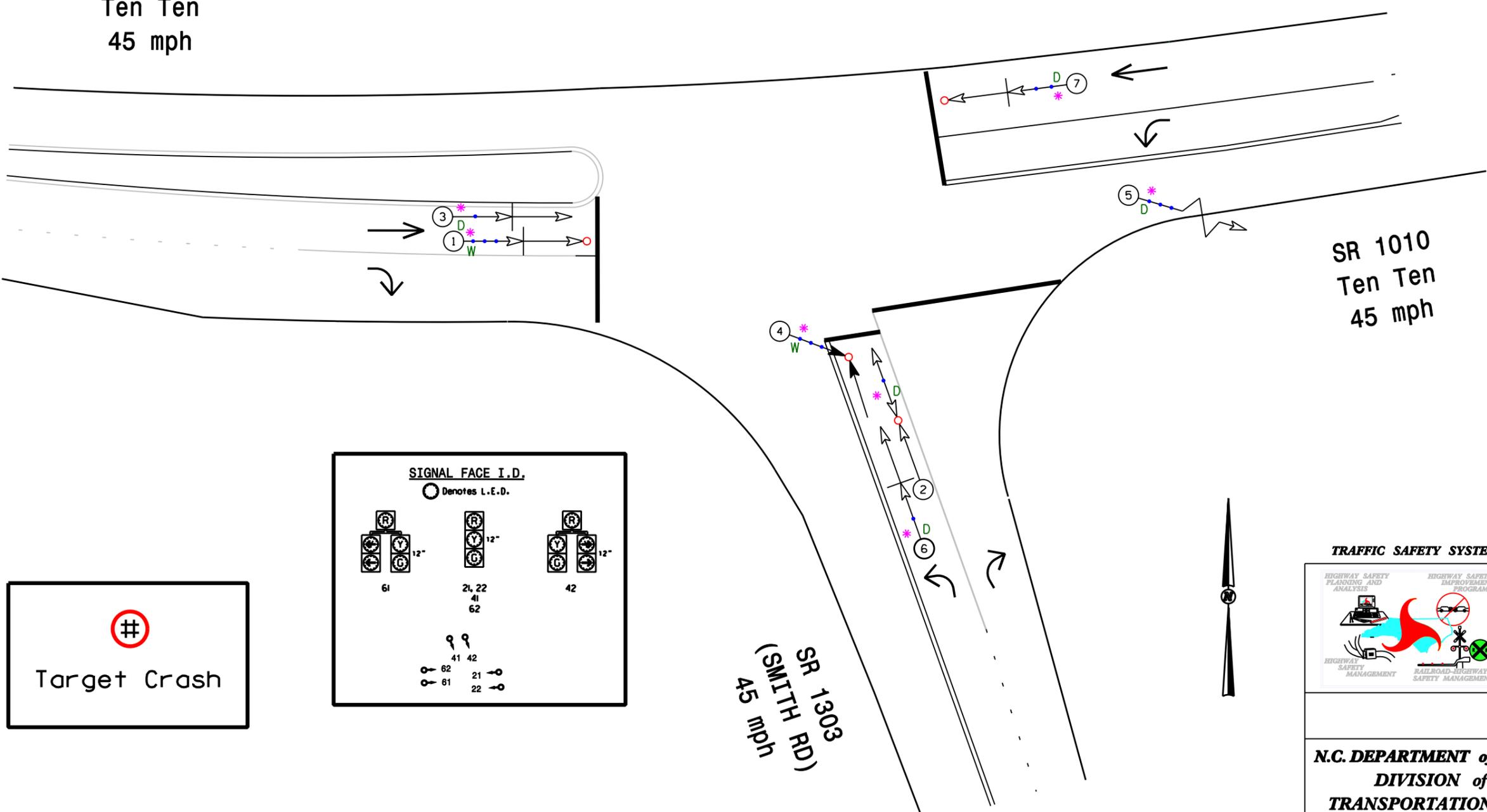
SR 1010
 Ten Ten
 45 mph

SR 1010
 Ten Ten
 45 mph

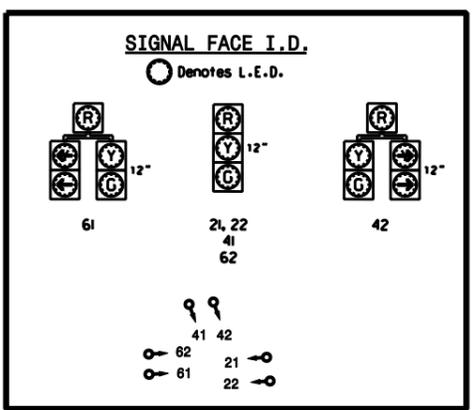
SR 1303
 (SMITH RD)
 45 mph

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		



Target Crash



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 11/04-2/28/10	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BOR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BOR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: Apr 11 2010		
LOG NUMBER: 4000005649		

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