

Spot Safety Project Evaluation

Work Order #41000004449

Spot Safety Project # 04-02-225

Spot Safety Project Evaluation of the Traffic Signal Revision at the Intersection of NC 125 (10th St) and Marshall St in Roanoke Rapid Halifax 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

2/8/2010

Date

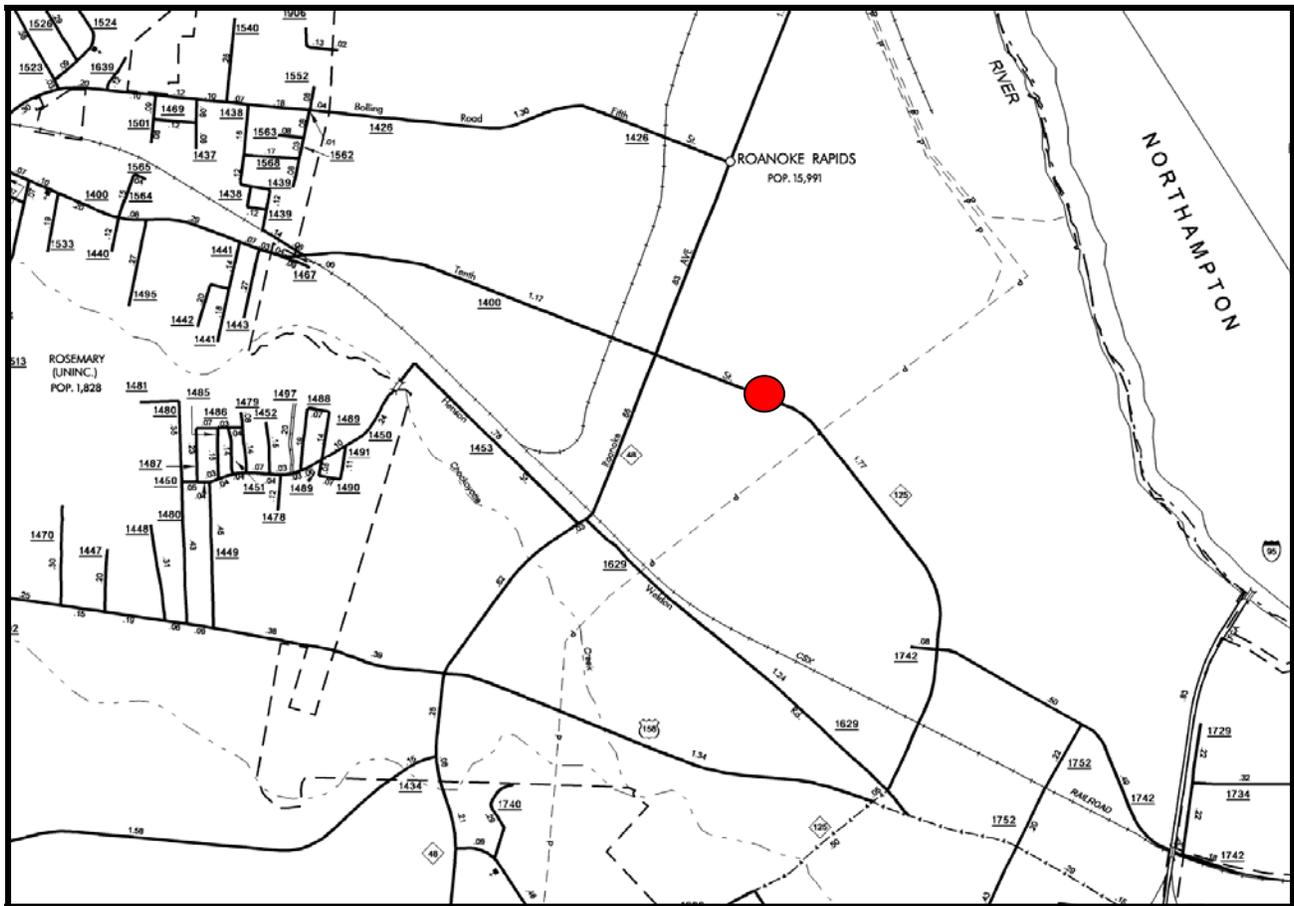
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-02-225 – The Intersection of NC 125 (10th St) and Marshall St in Roanoke Rapids, Halifax County.

The signal number for this location is 04-0154.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to upgrade the existing traffic signal from a pre-timed signal to a semi-actuated signal with loops on the minor approach (Marshall St).

The subject location is a four-leg intersection controlled by a signal in both the before and after periods. Both NC 125 and Marshall St are three-lane facilities with exclusive left turn lanes for all

approaches to the subject intersection. The speed limits are 35 mph for NC 125 and 25 mph for Marshall St.

The original statement of problem was that there were multiple Rear-End type collisions that had occurred as a result of the high traffic volumes on the main line (NC 125).

The initial crash analysis was conducted from August 1, 1998 to July 31, 2001 with a total of 25 reported crashes, 14 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on February 16, 2004 with a total cost of \$10,000.00.

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 January 1, 2004 to March 31, 2004. The before period consisted of reported crashes from May 1, 1998 through December 31, 2003 (5 years and 8 months) and the after period consisted of reported crashes from April 1, 2004 through November 30, 2009 (5 years and 8 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 Rear-End Crashes on NC 125 approaching the intersection were the Target Crashes for the applied countermeasure. 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	29	26	-10.3
Total Severity Index	3.3	4.42	33.9
Target Crashes	14	8	-42.9
Target Crash Severity Index	3.64	3.77	3.6
Volume	14,000	13,000	-7.1
<u>Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	5	3	-40.0
PDO Crashes	9	5	-44.4

The naive before and after analysis at the treatment location resulted in a 10 percent decrease in Total Crashes, a 43 percent decrease in Target Crashes, and a 7 percent decrease 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 10 percent decrease in Total Crashes and a 43 percent decrease in Target Crashes. The Total Severity Index increased by 34 percent and the Target Severity Index increased by 4 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the subject location from the before to the after period.

The calculated benefit to cost ratio for this project is -4.12 considering total crashes. The benefit to cost ratio considering only target crashes is also 6.72. 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.

Rear-End Crashes were reduced on both approaches of NC 125 from the before to the after period, most noticeably on the eastbound approach. Eastbound Rear-End Crashes decreased by 50 percent from the before to the after period (from 10 to 5). Westbound Rear-End Crashes decreased by 25 percent (from 4 to 3).

Frontal Impact Crashes increased slightly at the intersection. In the before period there was a total of 13 Frontal Impact Crashes and in the after period there were 15, an increase of 13 percent. The largest cause of the after period Frontal Impact Crashes were eastbound vehicles running the signal, which contributed to six of these 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: NC 125 at Marshall
 COUNTY: Halifax
 FILE NO.: SS 04-02-225

BY: bdr
 DATE: 2/5/2010

DETAILED COST: TYPE IMPROVEMENT - Signal Upgrade

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$10,000	10	0.149	\$1,490
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$10,000	10	0.149	\$1,490

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$0
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$0
TOTAL ANNUAL COST=	\$1,490
TOTAL COST OF PROJECT=	\$10,000

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	5.67	0	0.00	9	1.59	20	3.53	\$46,561
AFTER	5.67	0	0.00	12	2.12	14	2.47	\$52,698

Annual Benefits from Crash Cost Savings (\$6,138)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$7,628)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -4.12

TOTAL COST OF PROJECT - \$10,000 COMPREHENSIVE B/C RATIO - -4.12

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 125 at Marshall
 COUNTY: Halifax
 FILE NO.: SS 04-02-225 Target Crashes Only

BY: bdr
 DATE: 2/5/2010

DETAILED COST: TYPE IMPROVEMENT - Signal Upgrade

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$10,000	10	0.149	\$1,490
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$10,000	10	0.149	\$1,490

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$1,490
 TOTAL COST OF PROJECT= \$10,000

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	5.67	0	0.00	5	0.88	9	1.59	\$24,303
AFTER	5.67	0	0.00	3	0.53	5	0.88	\$14,286

Annual Benefits from Crash Cost Savings \$10,018

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$8,527

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.72

TOTAL COST OF PROJECT - \$10,000 COMPREHENSIVE B/C RATIO - 6.72

Treatment Site Photos from Google Street-View



Looking East on NC 125 (10th St)



Looking West on NC 125 (10th St)



Looking North on Marshall

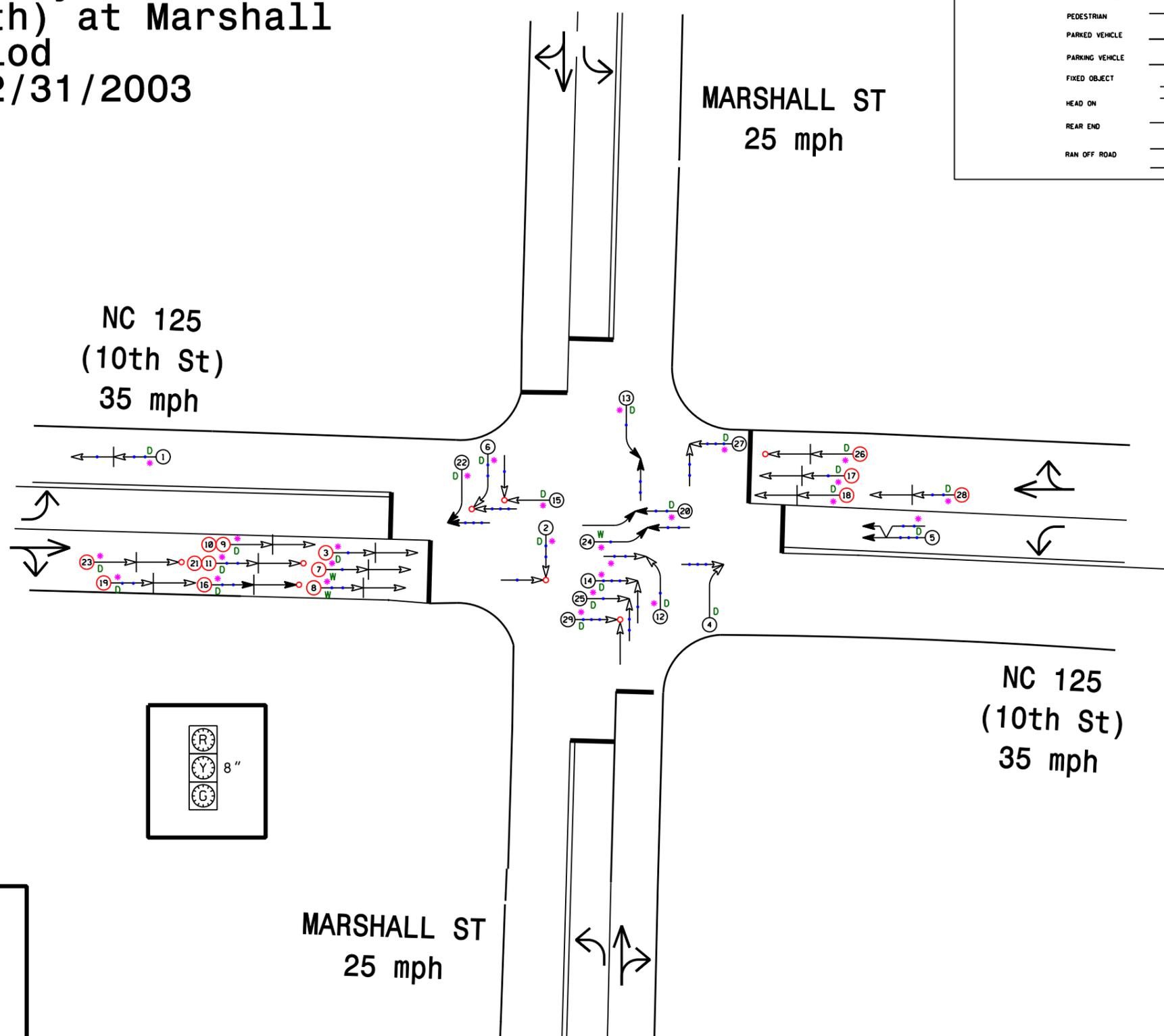


Looking South on Marshall St

Halifax County
 NC 125 (10th) at Marshall
 BEFORE Period
 5/1/1998-12/31/2003

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		70 AND UP	
		SPEED UNKNOWN	

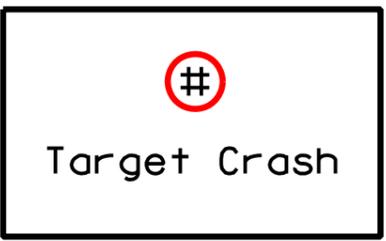
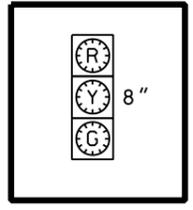


NC 125
 (10th St)
 35 mph

MARSHALL ST
 25 mph

NC 125
 (10th St)
 35 mph

MARSHALL ST
 25 mph



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

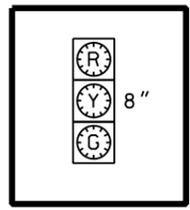
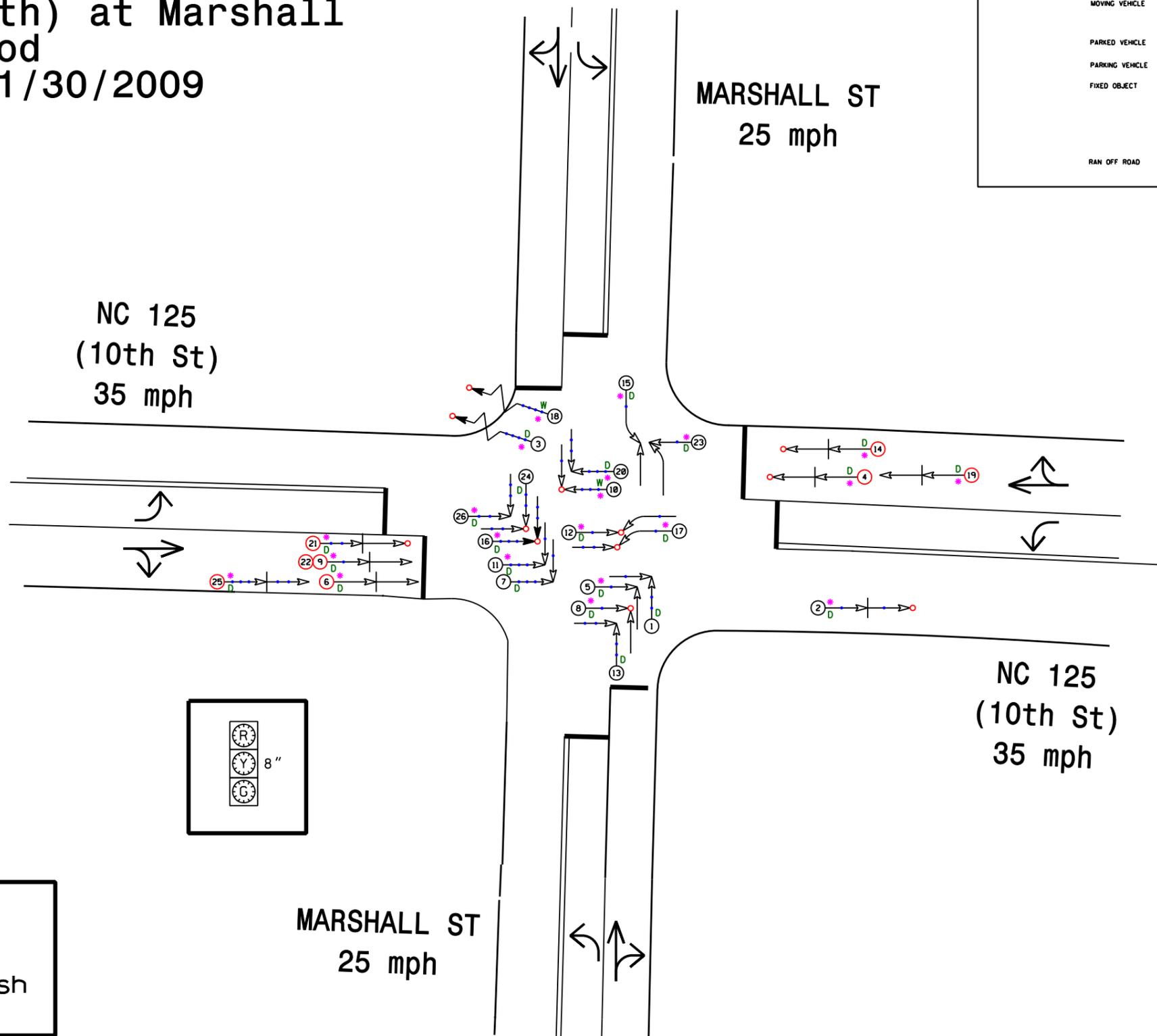
	COLLISION DIAGRAM	
	DIVISION: 4	AREA:
	STUDY PERIOD: 5/1/98-12/31/03	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: February 200		
LOG NUMBER: 4000004449		

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

Halifax County
 NC 125 (10th) at Marshall
 AFTER Period
 4/1/2001-11/30/2009

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 OILY
		70 AND UP	
		SPEED UNKNOWN	



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 4	AREA:
	STUDY PERIOD: 4/1/04-11/30/09	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: February 2010		
LOG NUMBER: 4000004449		

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