Spot Safety Project Evaluation

Work Order #41000007199

Spot Safety Project # 07-03-206

Spot Safety Project Evaluation of the Installation of Left Turn Lanes and the Intersection Realignment at the Intersection of US 158 and SR 2351 (Witty Rd) Rockingham 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

Brad Robinson, PE

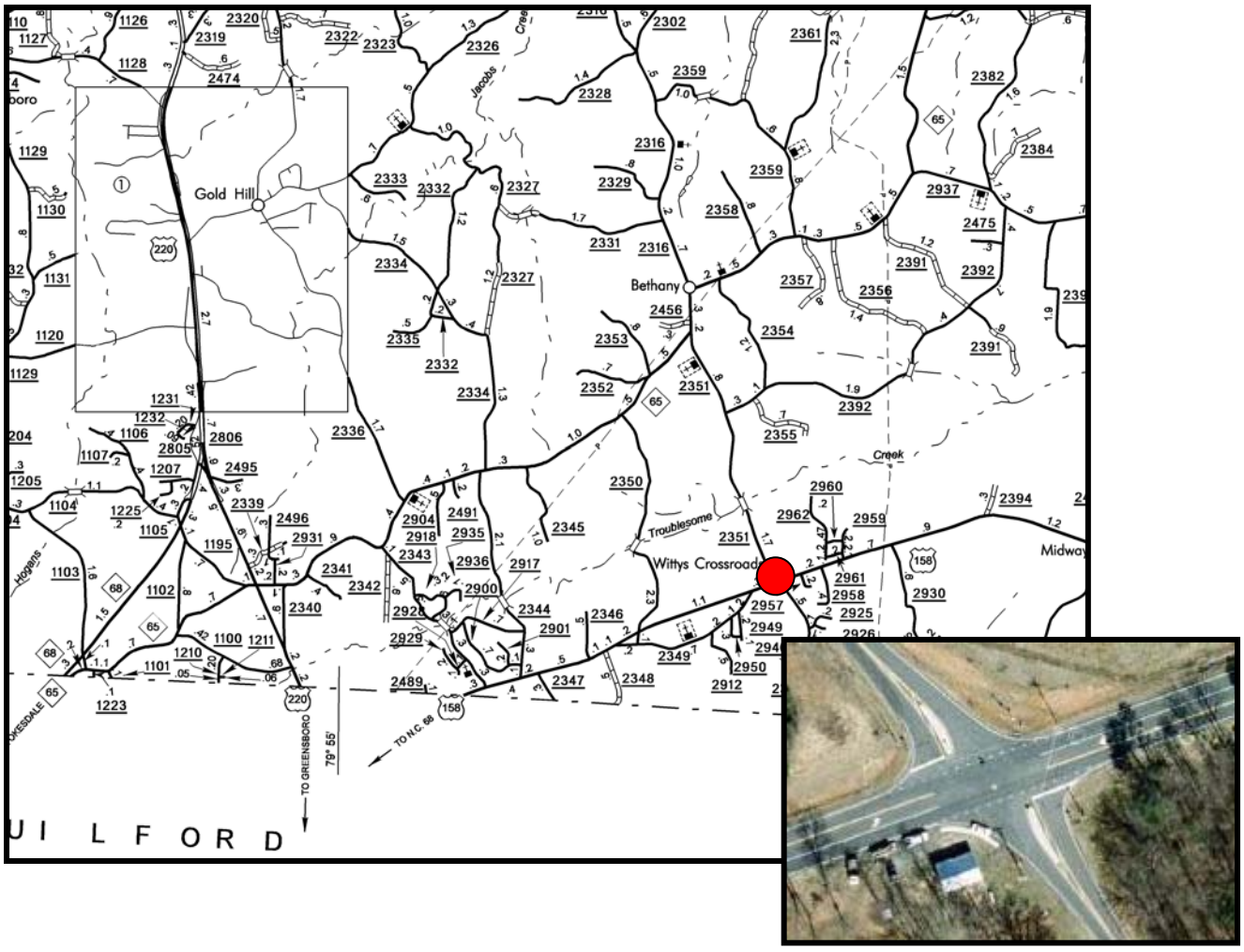
8/2/2010
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-03-206 – The intersection of US 158 and SR 2351 (Witty) in Rockingham County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were to realign SR 2351 so that it intersects US 158 at a 90 degree angle and to construct left turn lanes on US 158. In addition, the existing concrete islands with supplementary stop signs were reconstructed after the realignment.

The subject location is a four-leg intersection which is controlled by stop signs on SR 2351 and an overhead flasher. Prior to the project all approaches were single lane. The speed limit if 50 mph on both roadways.

The original statement of problem was that vehicles were attempting to enter the intersection from a skewed angle.

The initial crash analysis was conducted from November 1, 1999 to October 31, 2002 with a total of nine reported crashes, seven of which were considered correctable by the chosen countermeasures. The final completion date for the improvements at the subject intersection was on July 15, 2005 with a total cost of $80,000.00.

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 April 1, 2005 to July 31, 2005. The before period consisted of reported crashes from July 1, 2000 through March 31, 2005 (4 years and 9 months) and the after period consisted of reported crashes from August 1, 2005 through April 30, 2010 (4 years and 9 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	13	8	-38.5
Total Severity Index	14.37	4.7	-67.3
Target Crashes	10	7	-30.0
Target Severity Index	18.38	5.23	-71.5
Volume	6,500	6,500	0.0
Target Crash Severity Summary			
Fatal Crashes	1	0	-100.0
Class A Crashes	1	0	-100.0
Class B Crashes	2	1	-50.0
Class C Crashes	1	3	200.0
PDO Crashes	5	3	-40.0

The naive before and after analysis at the treatment location resulted in a 39 percent decrease in Total Crashes, a 30 percent decrease in Target Crashes, and no change in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2007.

Results and Discussion

In the before period the most prominent crash pattern was angle crashes between eastbound US 158 vehicles and southbound SR 2351 vehicles. In the before period there were seven crashes of this type, one resulting in a fatality. There were four crashes of this type in the after period, a reduction of 43 percent.

The calculated benefit to cost ratio for this project is 21.48 considering total crashes. The benefit to cost ratio considering only target crashes is 21.33. 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: US 158 and SR 2351 BY: bdr
COUNTY: Rockingham DATE: 7/27/2010
FILE NO.: SS 07-03-206

DETAILED COST: TYPE IMPROVEMENT - Intersection Realignment and left turn lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$80,000	10	0.149	$11,922
Right-of-Way	$0	0	0.000	$0
TOTALS	$80,000	10	0.149	$11,922

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $12,322
TOTAL COST OF PROJECT= $80,000

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	4.75	2	0.42	3	0.63	8	1.68	$285,137
AFTER	4.75	0	0.00	4	0.84	4	0.84	$20,463

Annual Benefits from Crash Cost Savings $264,674

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $252,351

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 21.48

TOTAL COST OF PROJECT - $80,000 COMPREHENSIVE B/C RATIO - 21.48

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 158 and SR 2351 BY: bdr
COUNTY: Rockingham DATE: 7/27/2010
FILE NO.: SS 07-03-206 Target Crashes Only

DETAILED COST: TYPE IMPROVEMENT - Intersection Realignment and left turn lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$80,000	10	0.149	$11,922
Right-of-Way	$0	0	0.000	$0
TOTALS	$80,000	10	0.149	$11,922

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $12,322
TOTAL COST OF PROJECT= $80,000

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	4.75	2	0.42	3	0.63	5	1.05	$282,421
AFTER	4.75	0	0.00	4	0.84	3	0.63	$19,558

Annual Benefits from Crash Cost Savings $262,863

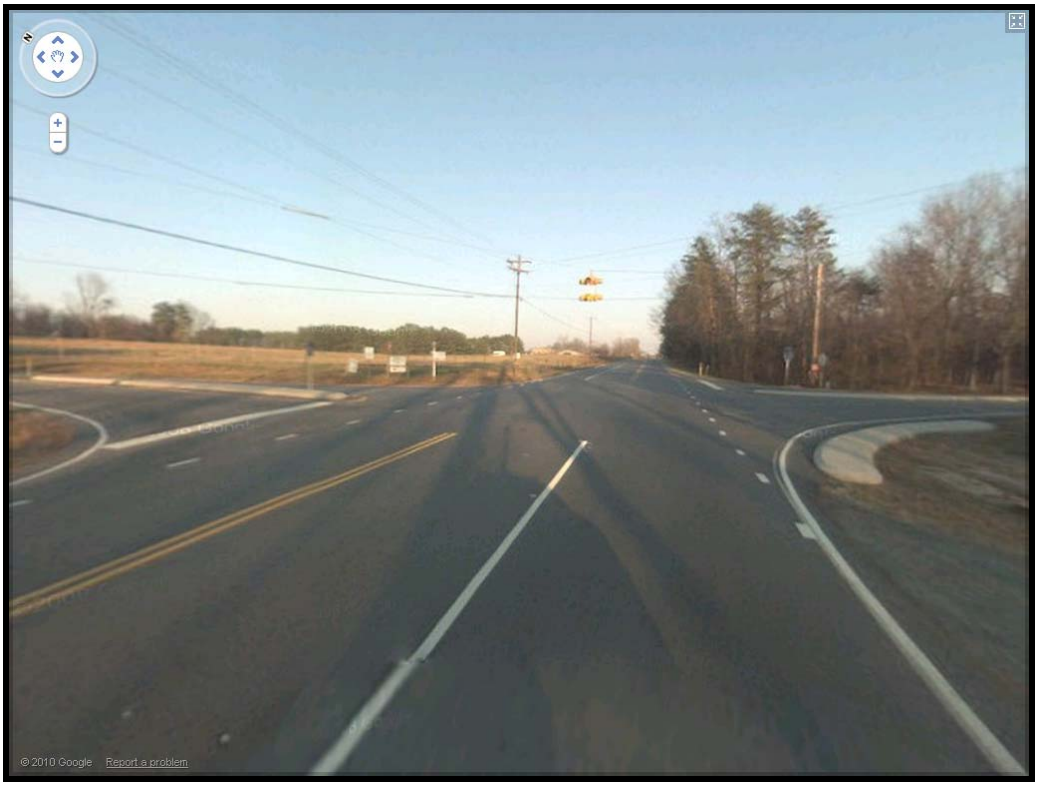
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $250,541

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 21.33

TOTAL COST OF PROJECT - $80,000 COMPREHENSIVE B/C RATIO - 21.33

Treatment Site Photos from Google Street-View

Looking west on US 158



Looking east on US 158

Looking north on SR 2351 (Witty)

Looking south on SR 2351

SS# 07-03-206
Order# 41000007199
Rockingham County
BEFORE Period
7/1/2000-3/31/2005

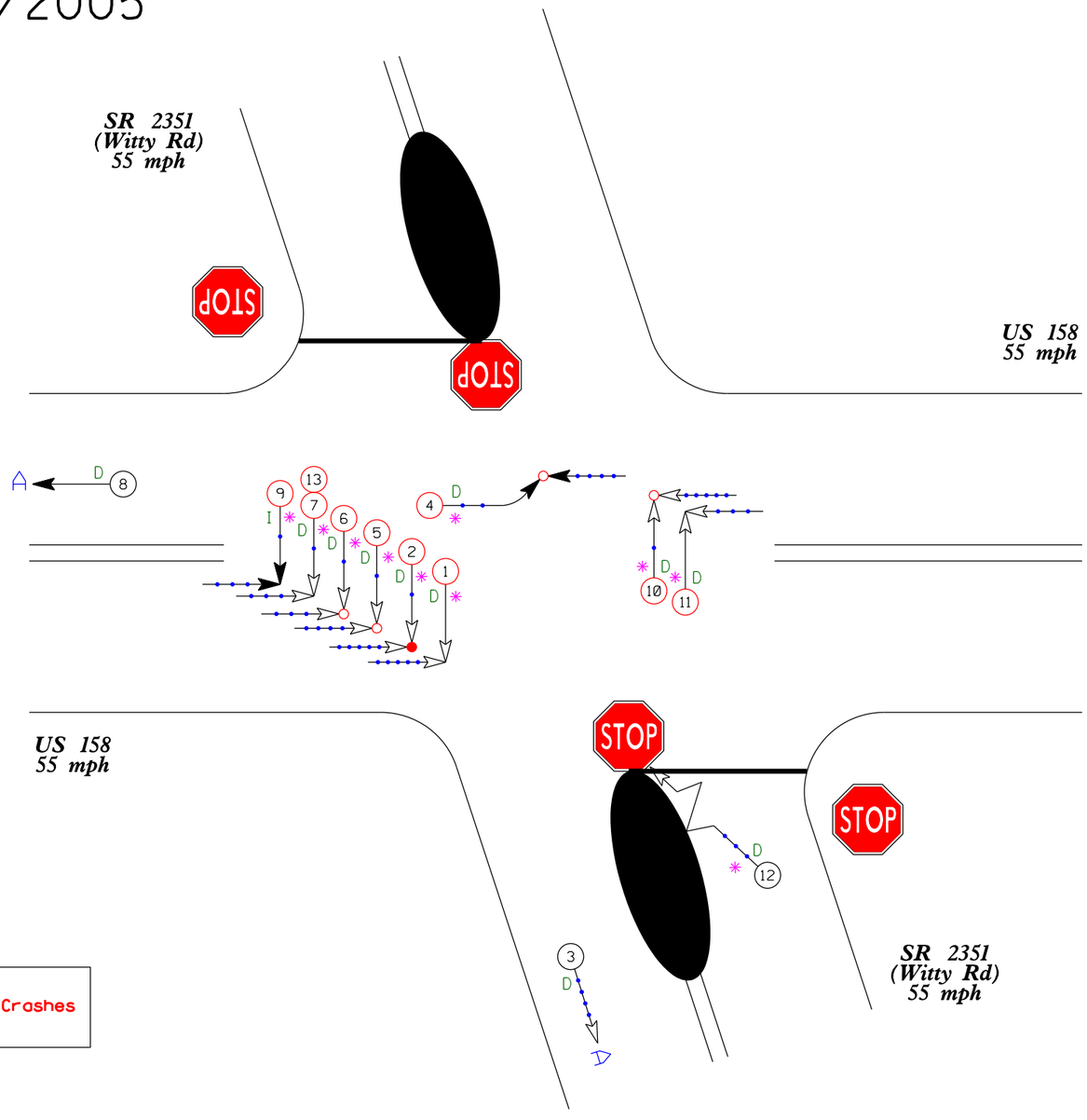
LEGEND

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



Target Crashes

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

TRAFFIC SAFETY UNIT

Date: July 2010 | Prepared By: BDR

SS# 07-03-206
Order# 41000007199
Rockingham County
AFTER Period
8/1/2005-4/30/2010

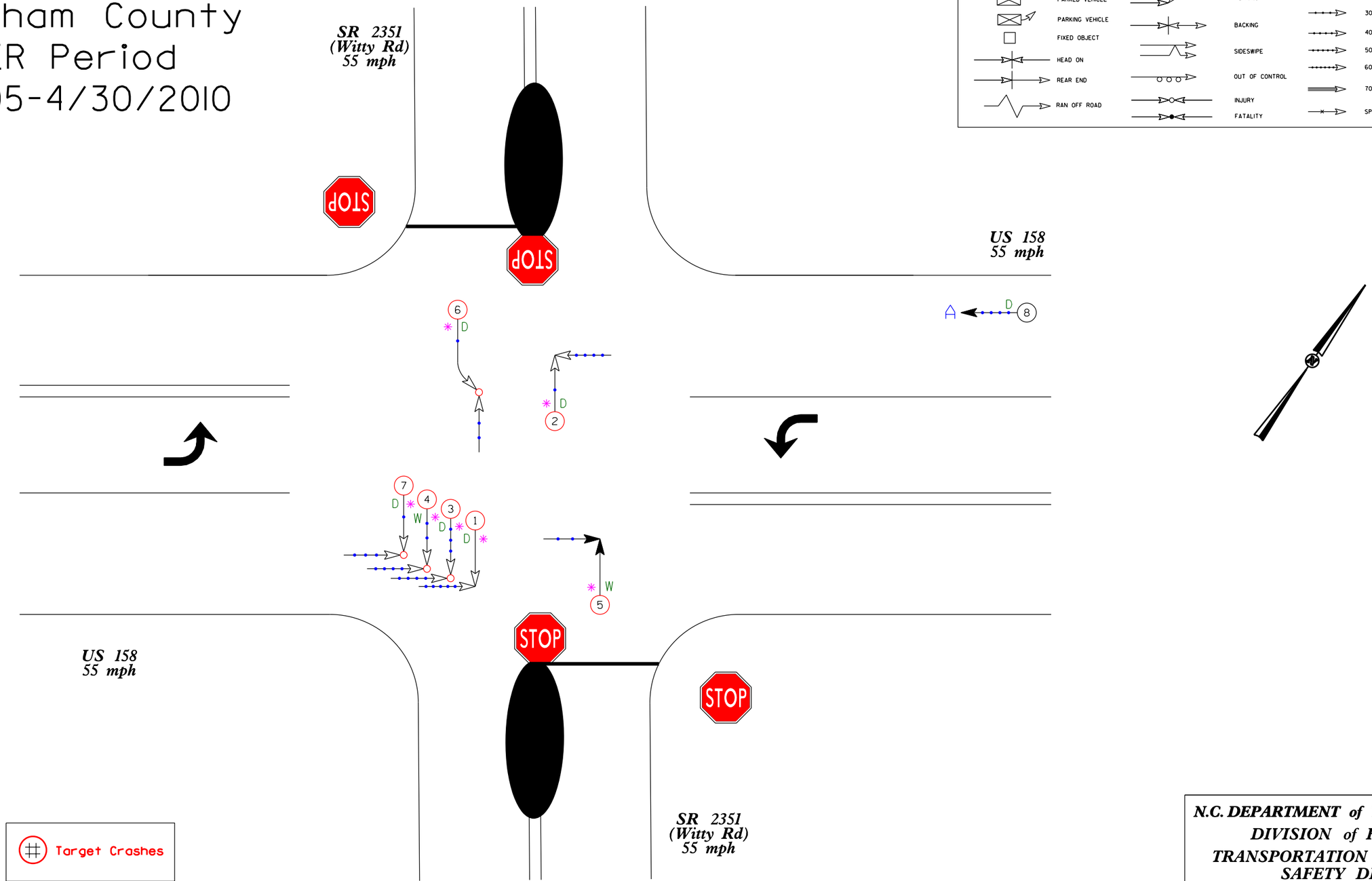
LEGEND

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



Target Crashes

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

TRAFFIC SAFETY UNIT

Date: July 2010 | *Prepared By: BDR*