Spot Safety Project Evaluation

Project Log # 200702020

Spot Safety Project # 02-01-209

Spot Safety Project Evaluation of the Four Foot Paved Shoulders Installation near the Intersection of US 258 and NC 41 Jones County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator

_____ 9-9-2008
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-01-209 located at and near the intersection of NC 258 and NC 41 in Jones County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation four foot paved shoulders along US 258 from 500 feet south to 1000 feet north of the intersection with NC 41. In the study period, US 258 was a two lane roadway with soft soil shoulders, no turn lanes at the NC 41 intersection, and a speed limit of 55 mph.

The original statement of problem was that tractor-trailers routinely gouge the shoulder adjacent to the pavement which forces maintenance to fill in holes. The addition of the four foot paved shoulders will allow motorists additional pavement for correcting ran-off road maneuvers and allow for safer entrance into the intersection.

The vicinity surrounding this location has gone through many changes from 1993 through 2006 and a complete crash analysis showing the site progression is shown in the results section of this report.

The initial crash analysis was completed from June 1, 1997 to May 31, 2000 with fourteen (14) reported crashes, six (6) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on July 15, 2002 with a total cost of $25,000.00.

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 month of July in 2002. The before period consisted of reported crashes from November 1, 1999 through June 30, 2002 (2 years and 8 months); and the after period consisted of reported crashes from August 1, 2002 through March 31, 2005 (2 years and 8 months). This analysis was limited by other countermeasures installed in the vicinity during 2005 including left turn lanes on US 258.

The treatment data consisted of all crashes on US 258 (0’ y-line) within the study area of 0.1 mile south (MP 1.25) to 0.3 mile north (MP 1.65) of the intersection with NC 41. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran-off Roadway Crashes were the target crashes for the applied countermeasure. The Target Crash types considered are as follows: Ran-off Roadway, Left; Ran-off Roadway, Straight; Ran-off Roadway, Right; and Loss of Control collisions in the intersection under wet roadway conditions.

Table 1: Treatment Information – 4' Paved Shoulders			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	21	10	- 52.38 %
Total Severity Index	7.43	3.96	- 46.70 %
Target Crashes	8	2	- 75.00 %
Target Crash Severity Index	13.25	4.70	- 64.53 %
Volume	4,025	3,875	- 3.73 %
Injury Crash Summary – Total			
Fatal injury Crashes	1	0	- 100.00 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	1	0.00 %
Class C Injury Crashes	7	3	- 57.14 %
Total Injury Crashes	9	4	- 55.55 %

The naive before and after analysis at the treatment location resulted in a 52 percent decrease in Total Crashes, a 75 percent decrease in Target Crashes, and a 47 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2003.

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 53 percent decrease in Total Crashes and a 75 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 noticeable portion of crashes at the intersection in the before period (8 of 21) were the result of a vehicle losing control and running off the roadway; with seven (7) of these crashes occurring on wet pavement. After the paved shoulders were installed, this pattern was significantly reduced to just two (2), also with a significant decrease in crash severity.

From the before period to the after period, the diagrams also show a positive improvement in the number of angle crashes occurring at this location (from 9 to 4). At the same time as the four foot paved shoulder installation, brush was cleared out in the northwest quadrant of the intersection which appears to have assisted in creating a positive sight distance improvement. This has helped drivers make better decisions in gap acceptance for crossing US 258 on NC 41.

The calculated benefit to cost ratio for this project is **90.61 considering total crashes**. The benefit to cost ratio considering only **target crashes is 83.34**. 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.

As mentioned in the project background section of this report, many other improvements have been made at this location since 1993 through 2006. The chart below shows a progression analysis of the intersection safety labeled by crashes per year.

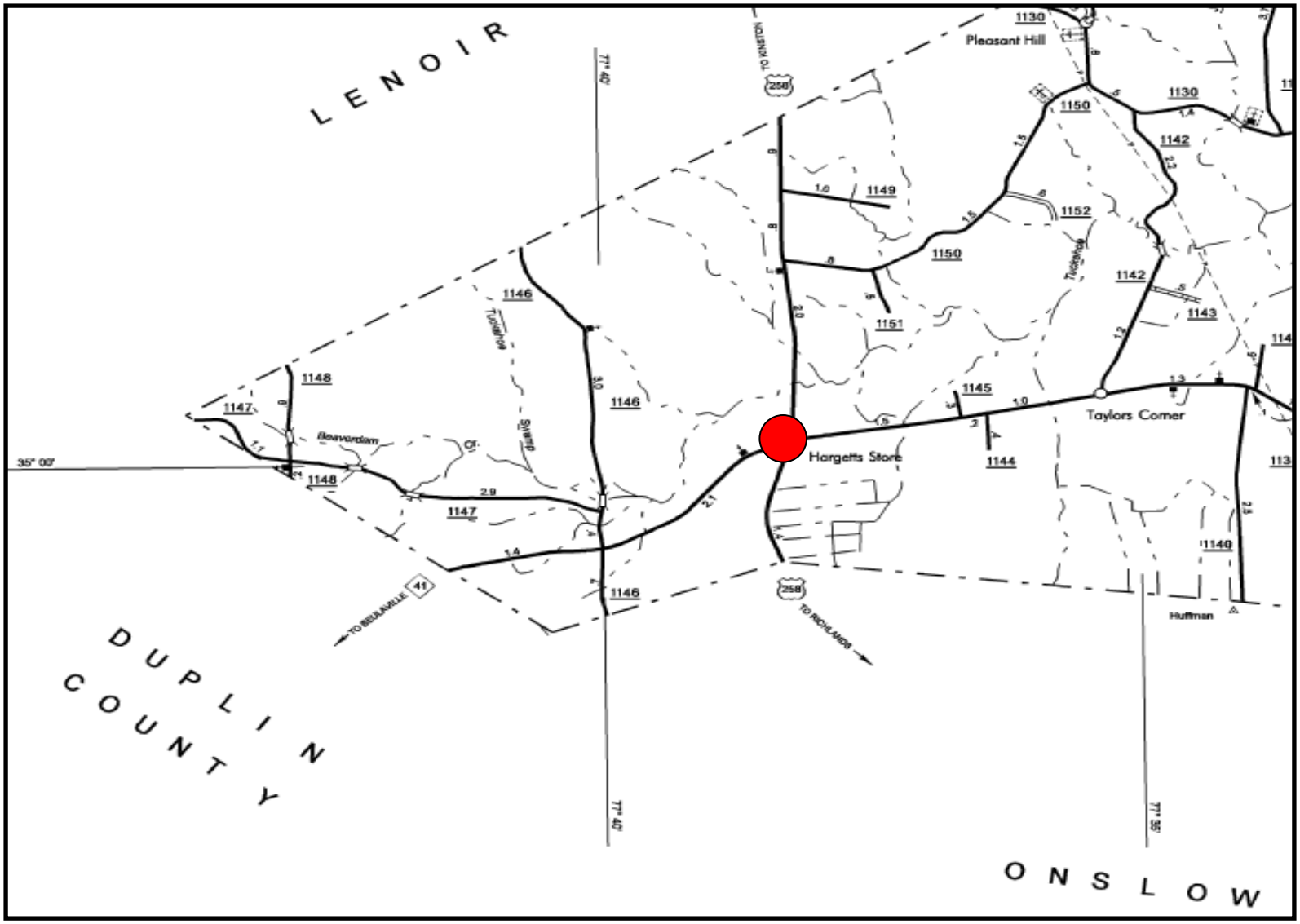
Table 2: Site Information Full Progression of US 258	**Crashes**	**Time Frame**	**Crashes Per Year**	**Severity Index**
Before Countermeasures 1/1/1990 – 3/31/1993	25	3.25	7.69	14.90
Flasher Installation at NC 41 SS# 02-92-025 6/1/1993 – 11/30/1996	26	3.50	7.43	14.94
Resurface 1 / Superelevation SS# 02-94-234 2/1/1997 – 6/30/2002	33	5.41	6.10	6.88
Four Foot Paved Shoulders SS# 02-01-209 8/1/2002 – 3/31/2005	10	2.67	3.75	3.96
Left Turn Lanes on US 258 (Division Installed) 6/1/2005 – 8/31/2006	14	1.25	11.20	3.64
Resurface 2 / Friction Course SS# 02-06-210 10/1/2006 – 5/31/2008	4	1.67	2.40	1.00

From the table above, notice how the intersection was experiencing steady improvement until the left turn lanes were added on US 258. At this point, crashes per year skyrocketed to 11.20 until the roadway was resurfaced for superelevation and a friction course was overlaid in September of 2006.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. The configuration of US 258 shown is consistent with all the countermeasures installed as explained by the intersection progression analysis in Table 2.

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
Jones County
Evaluation of Spot Safety Project # 02-01-209



Treatment Location: On US-258, 0.1 mile South to 0.3 mile North of the intersection with NC-41.
US-258 MP: 1.25 – 1.65

TREATMENT SITE PHOTOS TAKEN 4/11/2007

Traveling East on NC 41

Traveling West on NC 41

Traveling North on US 258

Traveling North on US 258

Traveling North on US 258

Traveling South on US 258

Traveling South on US 258

Traveling North on US 258 – Slippery When Wet Sign with Flagging

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 258 at NC 41 | BY: JBS
COUNTY: Jones | DATE: 9/7/2008
FILE NO.: SS 02-01-209 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - 4' Paved Shoulders

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$25,000	20	0.102	$2,546
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$25,000	20	0.102	$2,546

ESTIMATED INCREASE IN ANNUAL MAINT. COST = ($85)
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $2,461
TOTAL COST OF PROJECT= $25,000

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	2.67	1	0.37	8	3.00	12	4.49	$258,727
AFTER	2.67	0	0.00	4	1.50	6	2.25	$35,730

Annual Benefits from Crash Cost Savings $222,996

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $220,535

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 90.61

TOTAL COST OF PROJECT - $25,000 COMPREHENSIVE B/C RATIO - 90.61

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 258 at NC 41 | BY: JBS
COUNTY: Jones | DATE: 9/7/2008
FILE NO.: SS 02-01-209 | NOTES: Target Crashes - Ran-off Roadway

DETAILED COST: TYPE IMPROVEMENT - 4' Paved Shoulders

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$25,000	20	0.102	$2,546
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$25,000	20	0.102	$2,546

ESTIMATED INCREASE IN ANNUAL MAINT. COST = ($85)
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $2,461
TOTAL COST OF PROJECT= $25,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

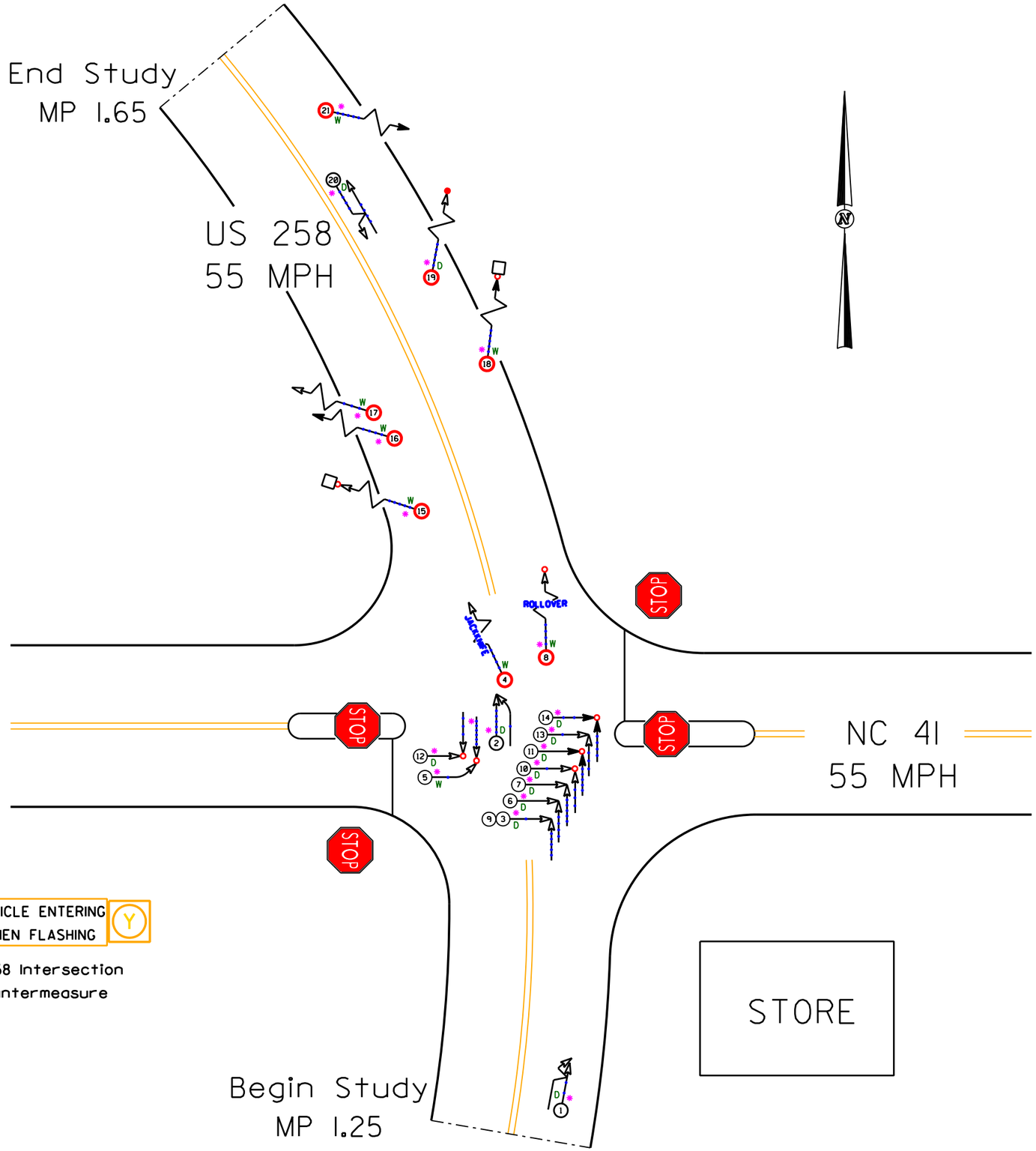
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	2.67	1	0.37	3	1.12	4	1.50	$213,333
AFTER	2.67	0	0.00	1	0.37	1	0.37	$8,202

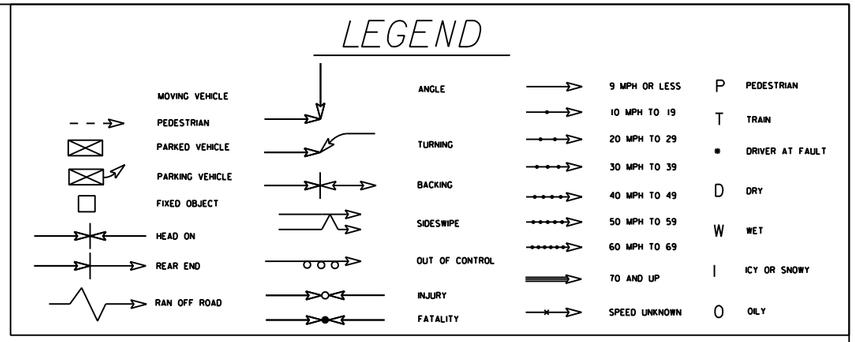
Annual Benefits from Crash Cost Savings $205,131

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $202,670

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 83.34

TOTAL COST OF PROJECT - $25,000 COMPREHENSIVE B/C RATIO - 83.34





SS# 02-01-209
Jones County
Before Period
11/1/99 - 6/30/02
US 258 at NC 41

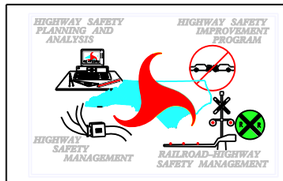
Note: Study Limits on US 258:
0.3 mile North of NC-41
to 0.1 mile South of NC-41

Y VEHICLE ENTERING WHEN FLASHING Y

US 258 Intersection
Countermeasure

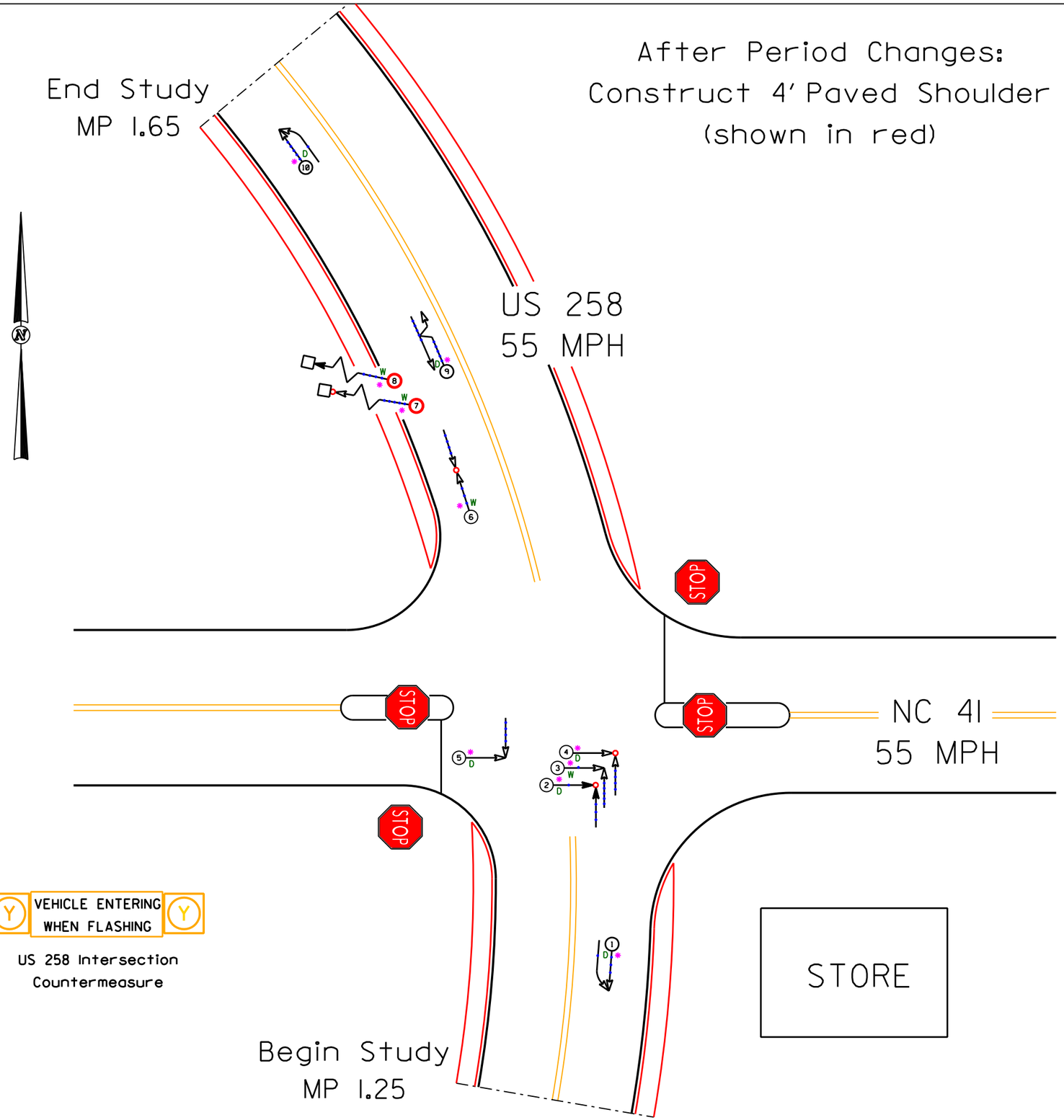
(#) Target Crashes
Ran-off Road
Loss of Control

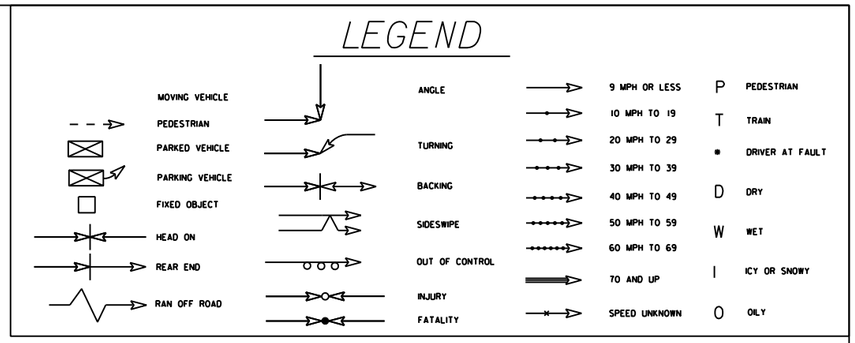
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 2	AREA:
STUDY PERIOD: 11/1/1999 - 6/30/2002	
DISTANCE: Y-LINE = 0 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 8-5-2008	
LOG NUMBER: SS# 02-01-209	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH





SS# 02-01-209
Jones County
AFTER Period
8/1/02 - 3/31/05
US 258 at NC 41

Note: Study Limits on US 258:
0.3 mile North of NC-41
to 0.1 mile South of NC-41

Target Crashes
Ran-off Road
Loss of Control

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 2	AREA:
STUDY PERIOD: 8/1/2002 - 3/31/2005	
DISTANCE: Y-LINE = 0 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 8-5-2008	
LOG NUMBER: SS# 02-01-209	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH