Spot Safety Project Evaluation

Order # 41000002945
Project Log # 200906077

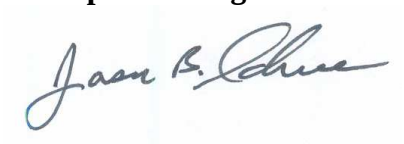
Spot Safety Project # 03-99-217

Spot Safety Project Evaluation of the Center Turn Lane Installation
NC 172 from NC 24 (Freedom Hwy) to SR 1500 (Starling Rd)
Onslow County

Documents Prepared By:

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

Principal Investigator



_____ 1-26-2010
Jason B. Schronce Date

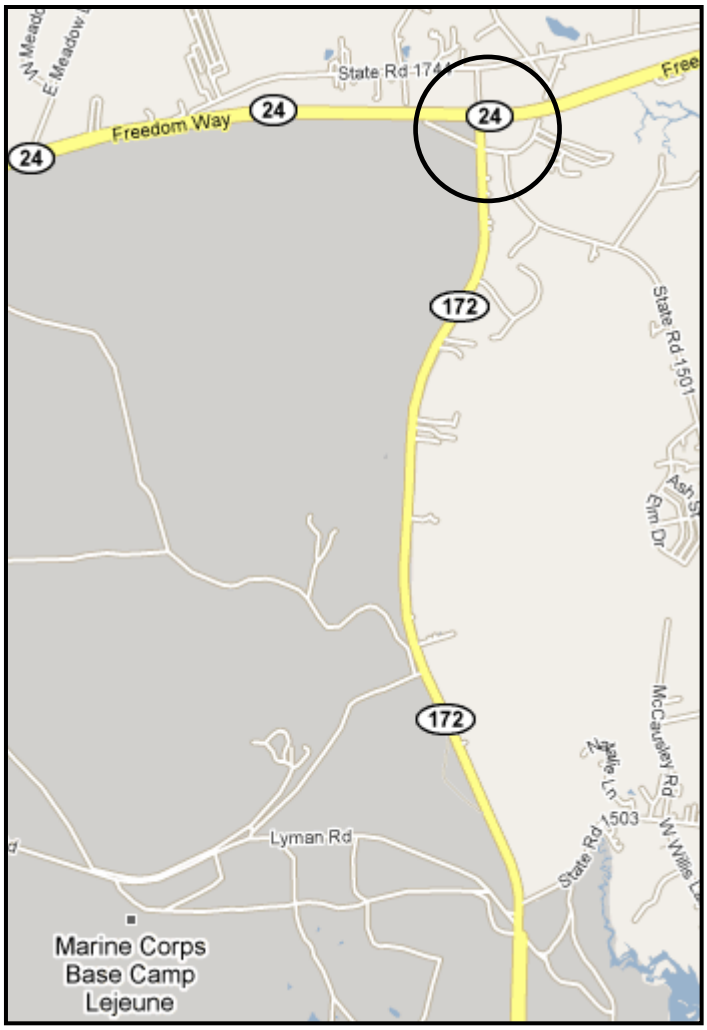
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-99-217 located along the segment of NC 172 from the intersection of NC 24 (Freedom Highway) to 0.23 mile south including the intersection of SR 1500 (Starling Road). The analysis was conducted from NC 172 Milepost Range 26.00 to 26.362.

This roadway segment is located southeast of the City of Jacksonville bordering Camp Lejeune Marine Corps Base.



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 NC 172 center turn lane. NC 172 is a two-lane commuter route providing direct access to Camp Lejeune Marine Corps Base from NC 24 (Freedom Highway). The center turn lane segment consists of access points for two gas stations, a used car lot, and the intersection of NC 172 with SR 1500 (Starling Road). The speed limit is 55 mph on NC 172.

The original statement of problem was that congestion and delay along this segment has contributed to the lack of storage for left turn motorists, which has induced a pattern of rear-end collisions. The intended purpose of this countermeasure was to provide storage for left turning vehicles therefore reducing the rear-end collisions and delay issues.

The initial crash analysis was completed from July 1, 1996 to June 30, 1999 with thirty-three (33) reported crashes, twenty (20) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 20, 2003 with a total cost of $111,000.

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 September through October 2003. The before period consisted of reported crashes from October 1, 1997 through August 31, 2003 (5 years and 11 months); and the after period consisted of reported crashes from November 1, 2003 through September 30, 2009 (5 years and 11 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 along NC 172 from Milepost 26.00 to Milepost 26.362 (150 feet south of the NC 24 intersection) and a 0 feet y-line. *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 crash types who typically experience improvement with this countermeasure were chosen as target crashes. The crash types considered are as follows: Left turn, same roadway; Rear-end, Slow or Stop; Rear-end, Turn; Sideswipe, Same Direction; and Sideswipe, Opposite Direction. The target crashes are broken down further in the following tables.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	37	66	78.4 %
Total Severity Index	9.10	2.79	- 69.3 %
Target Crashes	20	32	60.0 %
Target Crash Severity Index	9.23	2.85	- 69.1 %
Volume	3,800	5,000	31.6 %

Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	5	5	0.0 %
Class C Injury Crashes	15	11	- 26.7 %
Total Injury Crashes	22	16	- 27.3 %

Target Crash Breakdown	Before	After	Percent Reduction (-) Percent Increase (+)
Target 1 – Mainline Rear-ends	10	9	- 10.0 %
Target 2 – Mainline Sideswipes	1	3	200.0 %
Target 3 – Left Turn; Same Road	9	20	122.2 %
T3a - Passing illegally at SR 1500	3	0	- 100.0 %
T3b - Left Turn Same Rd (SR 1500)	6	1	- 83.3 %
T3c - Left Turn Same Rd (Gas Station)	0	19	300+ %

The naive before and after analysis at the treatment location resulted in a 78 percent increase in Total Crashes, a 60 percent increase in Target Crashes, but a 69 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 78 percent increase in Total Crashes and a 60 percent increase in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams* and the tables above, crashes along this segment increased significantly during the after period. From the 'Target Crash Breakdown' table above, it appears that center turn lane successfully reduced Target 3a illegal passing collisions and Target 3b left turn crashes at the SR 1500 intersection. Target 1 Rear-end collisions along the strip also saw a slight ten percent reduction.

However, Target 3c left turn-same roadway collisions from vehicles accessing the public vehicular areas (PVAs) near the NC 24 intersection increased from zero (0) in the before period to nineteen (19) during the after period. This crash pattern increase accounts for the increase in both total and target crashes during the analysis. From viewing the police crash reports of the eighteen (18) northbound collisions, it appears that vehicles queued in the left turn lane at the signal are allowing curiosity gaps which are contributing to the increase in crashes.

The calculated benefit to cost ratio for this project is **12.39 considering total crashes**. The benefit to cost ratio **considering only target crashes is 6.70**. 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 by Google Street View along the segment of NC 172 with the center turn lane. 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 countermeasure.

TREATMENT SITE PHOTOS

Looking North on NC 172 at Start of Center Turn Lane

Looking North on NC 172 at SR 1500

Looking North on NC 172 along PVA entrances (used car lot to left)

Looking North on NC 172 approaching NC 24 (Freedom Hwy)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 172 from NC 24 to SR 1500 | BY: JBS
COUNTY: Onslow County | DATE: 1/26/2010
FILE NO.: SS 03-99-217 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Install a Center Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$111,000	20	0.102	$11,306
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$111,000	20	0.102	$11,306

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $1,448
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $12,754
TOTAL COST OF PROJECT= $111,000

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	5.92	2	0.34	20	3.38	15	2.53	$239,611
AFTER	5.92	0	0.00	16	2.70	50	8.45	$81,588

Annual Benefits from Crash Cost Savings $158,024

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $145,270

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 12.39

TOTAL COST OF PROJECT - $111,000 COMPREHENSIVE B/C RATIO - 12.39

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 172 from NC 24 to SR 1500 | BY: JBS
COUNTY: Onslow County | DATE: 1/26/2010
FILE NO.: SS 03-99-217 | NOTES: Target Crashes - Rearend / Left Turn

DETAILED COST: TYPE IMPROVEMENT - Install Center Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$111,000	20	0.102	$11,306
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$111,000	20	0.102	$11,306

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $1,448
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $12,754
TOTAL COST OF PROJECT= $111,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

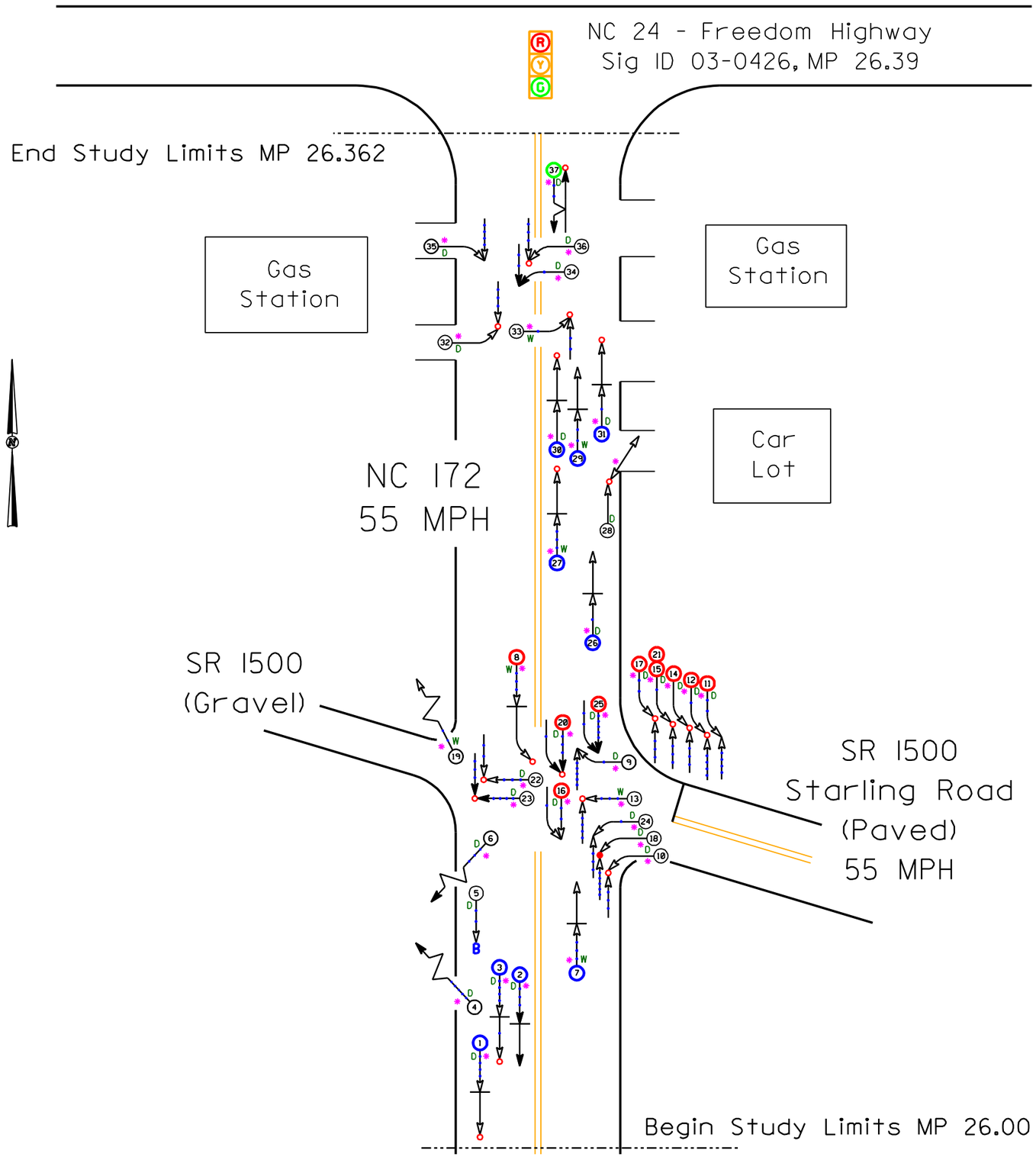
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.92	1	0.17	12	2.03	7	1.18	$125,557
AFTER	5.92	0	0.00	8	1.35	24	4.05	$40,135

Annual Benefits from Crash Cost Savings $85,422

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $72,669

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.70

TOTAL COST OF PROJECT - $111,000 COMPREHENSIVE B/C RATIO - 6.70



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# 03-99-217
Onslow County
Camp Lejeune MCB
BEFORE Period
10/1/97 - 8/31/03

Target Crashes

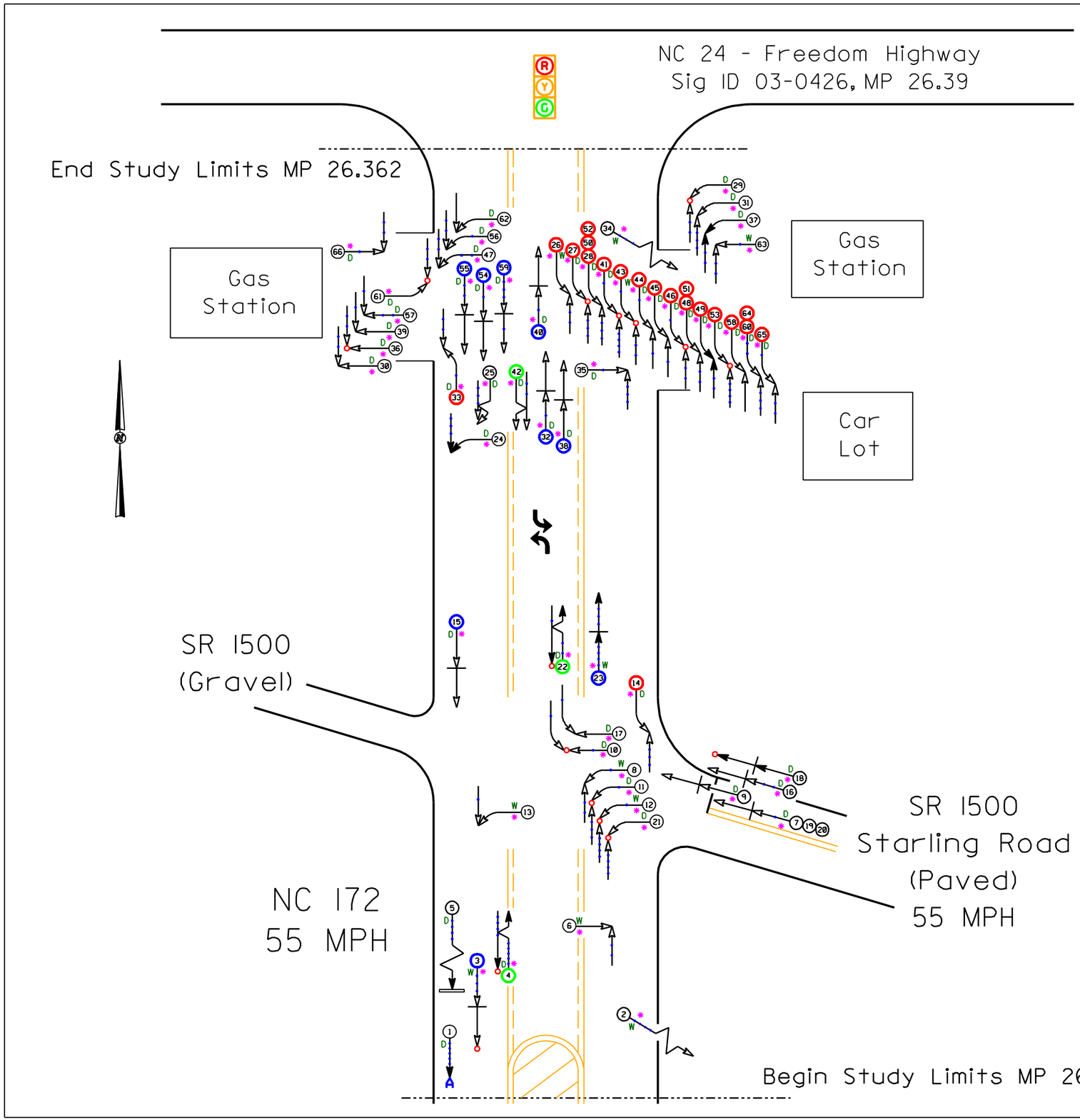
1 - Mainline Rear-Ends
2 - Sideswipes
3 - Left Turn, Same Rd

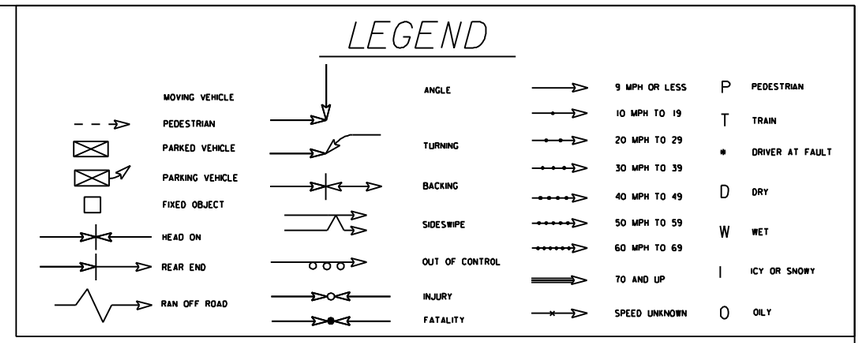
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM

DIVISION: 3	AREA:
STUDY PERIOD: 10/1/1997 - 8/31/2003	
DISTANCE: Y-LINE = 0FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-4-2010	
LOG NUMBER: SS# 03-99-217 BEFORE	

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





SS# 03-99-217
Onslow County
Camp Lejeune MCB
AFTER Period
11/1/03 - 9/30/09

Target Crashes

- 1 - Mainline Rear-Ends
- 2 - Sideswipes
- 3 - Left Turn, Same Rd

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 3	AREA:
STUDY PERIOD: 11/1/2003 - 9/30/2009	
DISTANCE: Y-LINE : OFT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-21-2010	
LOG NUMBER: SS# 03-99-217 AFTER	

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