Spot Safety Project Evaluation

Project Log # 200806155

Spot Safety Project # 02-97-231

Spot Safety Project Evaluation of the "Vehicle Entering When Flashing" Flasher and Channelization Installation at the Intersection of NC 33 and NC 222 / SR 1400 Belvoir Crossroads, Pitt County

Documents Prepared By:

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

Principal Investigator

_____ 9-23-2008
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-97-231 located at the Intersection of NC 33 and NC 222 / SR 1400 (Porter Road) in Pitt County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of an actuated "Vehicle Entering When Flashing" flasher on NC 33 and channelization in the northwest quadrant. NC 33, NC 222, and SR 1400 are all two lane facilities approaching the subject intersection with 45 mph speed limits. The location is a crossroads type intersection with dual posted stop sign control on the NC 222 and SR 1400 approaches.

The original statement of problem was that vehicles traveling on NC 222 / SR 1400 do not have adequate sight distance to see other vehicles approaching the intersection because of parking along the roadside. Additionally, the side streets are hidden to motorists traveling on NC 33 due to commerical development around the intersection.

The initial crash analysis was completed from February 1, 1991 to January 31, 1997 with ten (10) reported crashes, including a fatality collision. The final completion date for the improvement at the subject intersection was during the month of November 2002 based off crash reports with a total cost of $39,000.00.

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 November 2002. The before period consisted of reported crashes from June 1, 1997 through October 31, 2002 (5 years and 5 months); and the after period consisted of reported crashes from December 1, 2002 through April 30, 2008 (5 years and 5 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 within 150 feet of the subject intersection. Within these limits also exists the intersection of NC 33 and SR 1469 (Stokes Road), located approximately 90 feet away and directly across from Belvoir Corner Stop & Grill. *Please see attached location map, collision diagrams, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes at the intersection of NC 33 and NC 222 / SR 1400 were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	11	13	18.18 %
Total Severity Index	12.60	4.98	- 60.48 %
Target Crashes	6	7	16.67 %
Target Crash Severity Index	5.93	4.17	- 29.68 %
Volume	6,300	6,500	3.17 %
Injury Crash Summary			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	2	2	0.00 %
Class C Injury Crashes	5	5	0.00 %
Total Injury Crashes	8	7	- 12.50 %

The naive before and after analysis at the treatment location resulted in an 18 percent increase in Total Crashes, a 17 percent increase in Target Crashes, but a 60.5 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

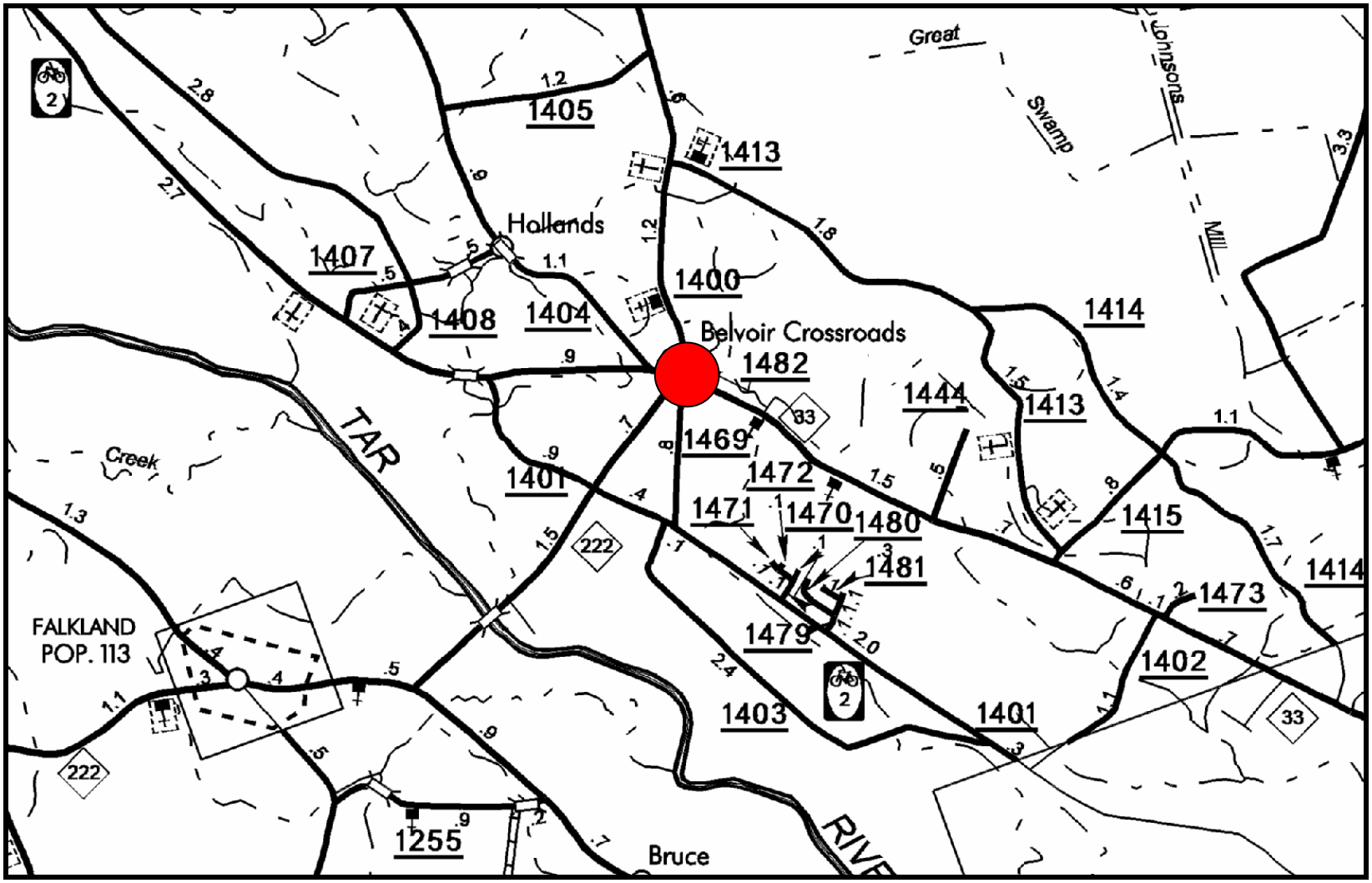
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 18 percent increase in Total Crashes and a 17 percent increase in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased slightly at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, angle crashes at NC 33 and NC 222 decreased slightly from five (5) in the before period to four (4) in the after. However, in the after period, all four crashes occurred from the NC 22 approach and only one (1) was attributed to a vehicle running the stop sign. The crash pattern at NC 33 and SR 1469 intersection also doubled from two (2) to four (4) crashes in after period, which the majority of these crashes occurred at night.

The calculated benefit to cost ratio for this project is **13.73 considering total crashes**. The benefit to cost ratio considering only **target crashes is 0.29**. 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 for all approaches to the treatment intersection. 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
Pitt County
Evaluation of Spot Safety Project # 02-97-231



Treatment Location: NC 33 at NC 222 / SR 1400 (Porter Road)

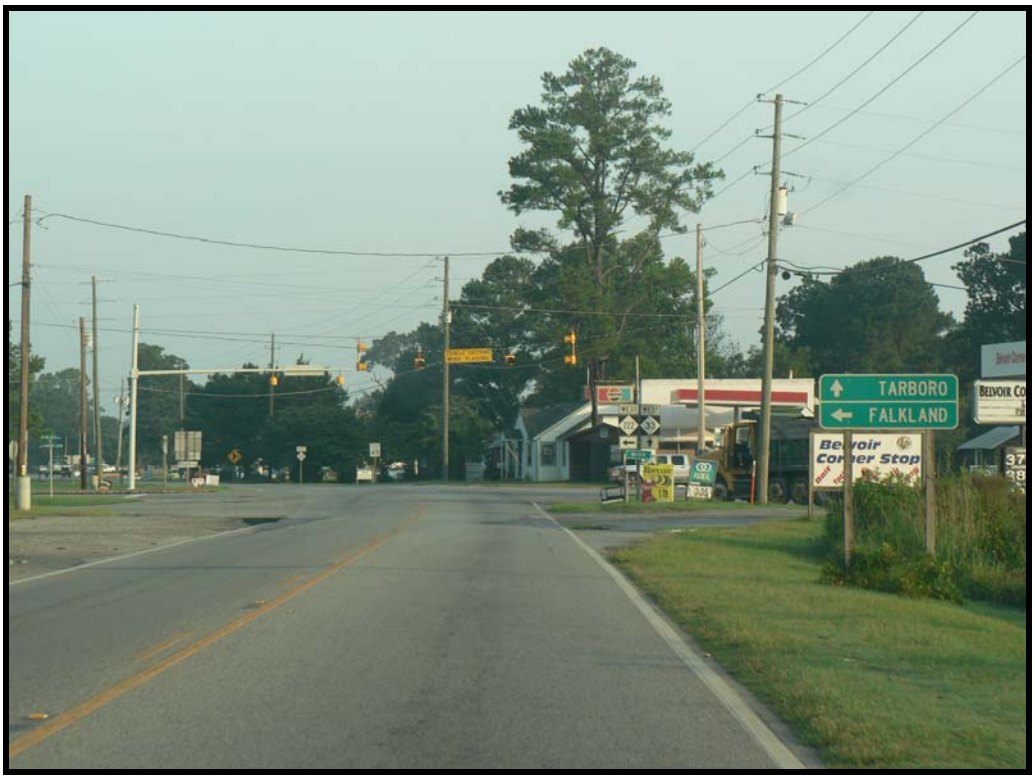
TREATMENT SITE PHOTOS TAKEN 8/6/2008

Traveling East on NC 33

Traveling East on NC 33

Traveling South on SR 1400 (Porter Road)

Traveling North on NC 222



Traveling West on NC 33


View of SR 1469 (Stokes Road) from Belvoir Corner Store

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 33 at NC 222 | BY: JBS
COUNTY: Pitt | DATE: 9/11/2008
FILE NO.: SS 02-97-231 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - "Vehicle Entering When Flashing" Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$39,000	10	0.149	$5,812
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$39,000	10	0.149	$5,812

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,562
TOTAL COST OF PROJECT= $39,000

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	5.42	1	0.18	7	1.29	3	0.55	$117,657
AFTER	5.42	0	0.00	7	1.29	6	1.11	$27,565

Annual Benefits from Crash Cost Savings $90,092

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $83,530

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 13.73

TOTAL COST OF PROJECT - $39,000 COMPREHENSIVE B/C RATIO - 13.73

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 33 at NC 222 | BY: JBS
COUNTY: Pitt | DATE: 9/11/2008
FILE NO.: SS 02-97-231 | NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - "Vehicle Entering When Flashing" Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$39,000	10	0.149	$5,812
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$39,000	10	0.149	$5,812

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,562
TOTAL COST OF PROJECT= $39,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

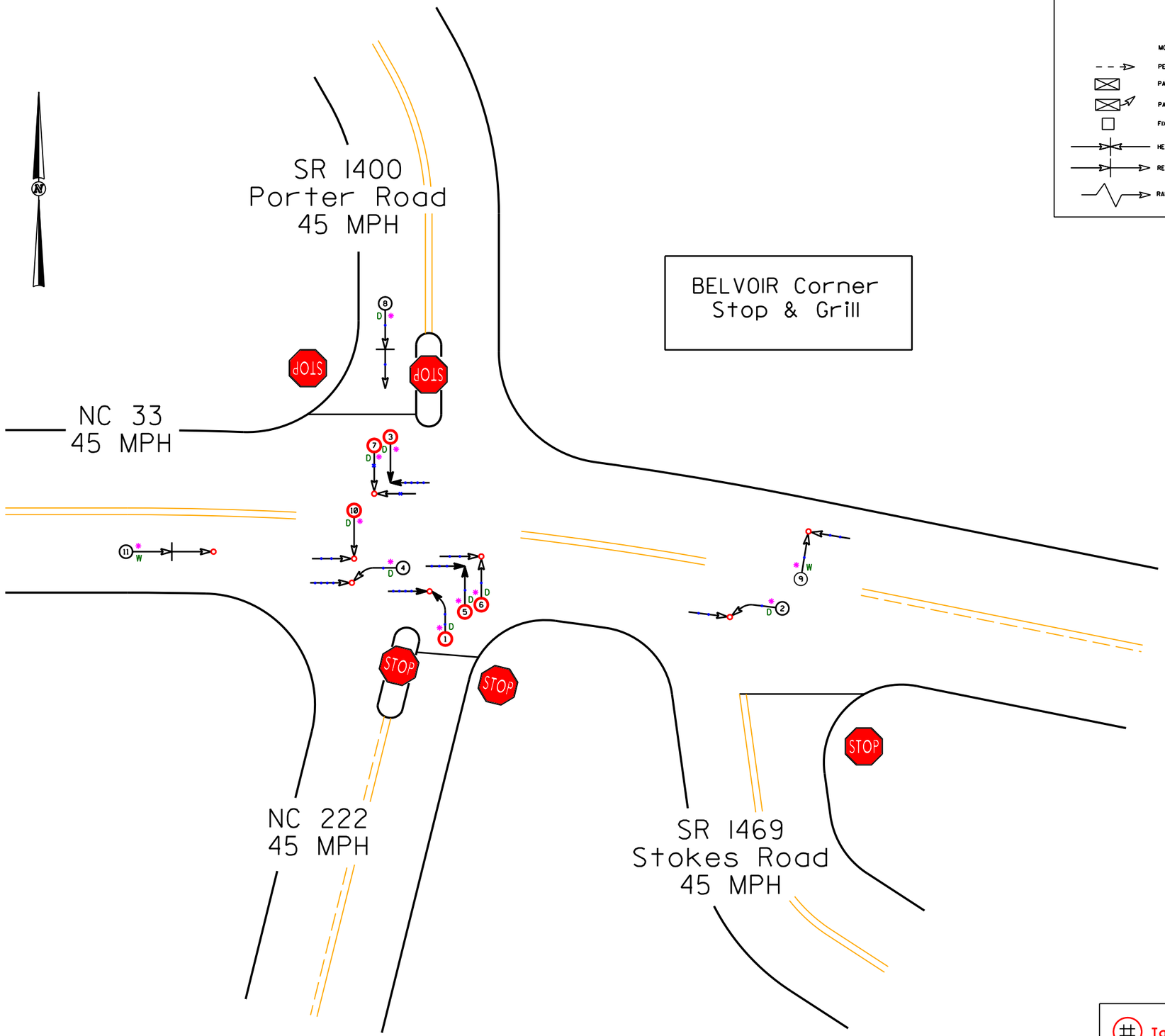
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.42	0	0.00	4	0.74	2	0.37	$14,723
AFTER	5.42	0	0.00	3	0.55	4	0.74	$12,841

Annual Benefits from Crash Cost Savings $1,882

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($4,680)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.29

TOTAL COST OF PROJECT - $39,000 COMPREHENSIVE B/C RATIO - 0.29



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# 02-97-231
Pitt County
Bells X-Roads
BEFORE Period
6/1/97 - 10/31/02
NC 33 at NC 222

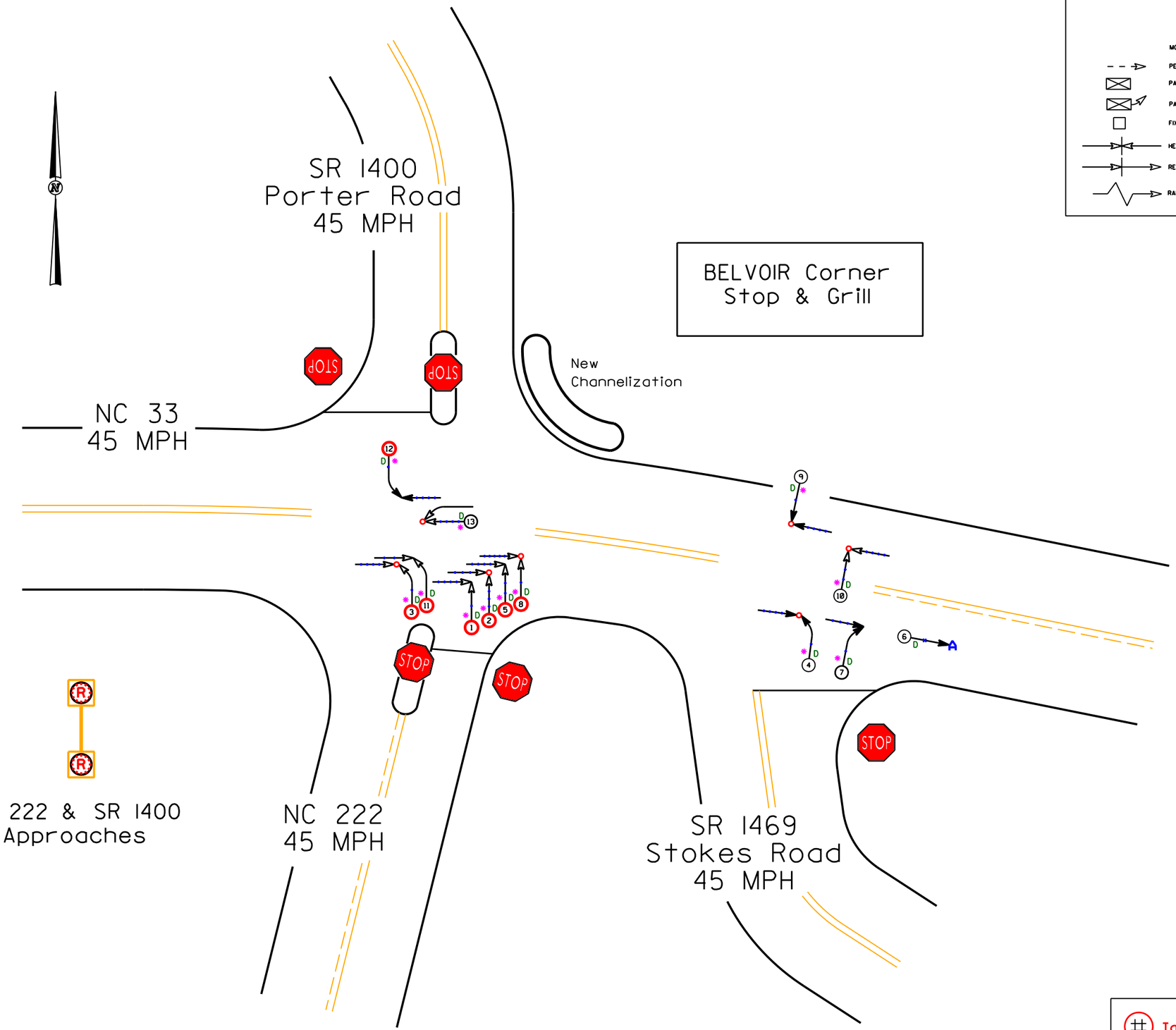
Target Crashes

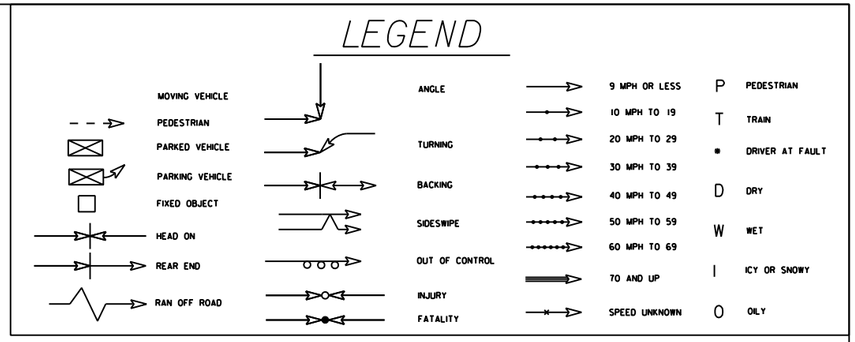
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS
HIGHWAY SAFETY IMPROVEMENT PROGRAM
HIGHWAY SAFETY MANAGEMENT
RAILROAD-HIGHWAY SAFETY MANAGEMENT

COLLISION DIAGRAM	
DIVISION: 2	AREA:
STUDY PERIOD: 6/1/1997 - 10/31/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 9-11-2008	
LOG NUMBER: SS# 02-97-231BEFORE	

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





SS# 02-97-231
Pitt County
Bells X-Roads
AFTER Period
12/1/02 - 4/30/08
NC 33 at NC 222

VEHICLES ENTERING WHEN FLASHING

NC 33
Approaches

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 2	AREA:
STUDY PERIOD: 12/1/2002 - 4/30/2008	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 9-11-2008	
LOG NUMBER: SS# 02-97-231 AFTER	

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