

Spot Safety Project Evaluation

Project Log # 200806158

Spot Safety Project # 02-99-243

Spot Safety Project Evaluation of the Center Turn Lane Installation And Increased Superelevation on US 17 near the Intersection of NC 102 Beaufort County

Documents Prepared By:

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Principal Investigator

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9-24-2008
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-99-243 located on US 17 from 0.2 mile South of SR 1131 (Chandler Road) to 0.2 mile North of SR 1134 (Old New Bern Road), milepost 2.26 – 2.79 in Beaufort 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 a center turn lane through the intersections and wedging of the roadway to increase the superelevation in the curve north of SR 1134. US 17 is a two lane facility with soil shoulders and a speed limit of 55 mph.

The original statement of problem was that that motorists were running off the road during wet roadway conditions due to poor superelevation in the curve. Also, queuing was developing while vehicles were waiting to making left turns onto NC 102, SR 1134, and SR 1131 which all intersect within a half mile of each other.

The initial crash analysis was completed from November 1, 1996 to October 31, 1999 with ten (10) reported crashes, nine (9) of which were ran-off road crashes. The final completion for the improvements based on crash reports was during the last quarter of 2002 with a total cost of \$152,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the reported crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from September 1 to November 30, 2002. The before period consisted of reported crashes from February 1, 1997 through August 31, 2002 (5 years and 7 months); and the after period consisted of reported crashes from December 1, 2002 through June 30, 2008 (5 years and 7 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 on US 17 (0' y-line) between milepost 2.26 – 2.79. *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 two different target crashes were analyzed during this study. Target 1 Crashes are Lane Departure / Out of Control Crashes through the curve above SR 1134 as discussed in the project information. Target 2 crashes consist of Rear End collisions on the mainline while waiting to make a left-hand turn. The Lane Departure Crash types considered are as follows: Ran-off Roadway, Left; Ran-off Roadway, Right; and Ran-off Roadway, Straight.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	26	23	- 11.54 %
Total Severity Index	8.82	4.22	- 52.15 %
Target Crashes 1 (Ran-off Roadway)	14	4	- 71.43 %
Target Crash 1 Severity Index	3.64	4.70	29.12 %
Target Crashes 2 (Rear-End Turning)	3	0	- 100.00 %
Target Crash 2 Severity Index	26.27	0.00	- 100.00 %
Volume	6,400	6,700	4.69 %
<u>Injury Crash Summary - Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	2	0	- 100.00 %
Class B injury Crashes	1	5	200.00+ %
Class C Injury Crashes	6	5	- 16.67 %
Total Injury Crashes	9	10	11.11 %

The naive before and after analysis at the treatment location resulted in a 11.5 percent decrease in Total Crashes, a 71 percent decrease in Target 1 Crashes, elimination of Target 2 Crashes, and a 52 percent decrease in the Total Severity Index. The before period ADT year was 1999 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 a 11.5 percent decrease in Total Crashes and a 71 percent decrease in Target 1 Crashes. The summary results above demonstrate that both Total Crashes and both Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, a large portion of crashes in the before period (14 of 26) were the result of vehicles leaving the roadway on wet road conditions in the curve; Target 1 from the table above. After the increase in superelevation, this pattern was significantly reduced to just four (4) crashes. Rear end crashes from stopped motorists waiting to turn left through the strip, Target 2 crashes, were completely eliminated with the addition of the center turn lane.

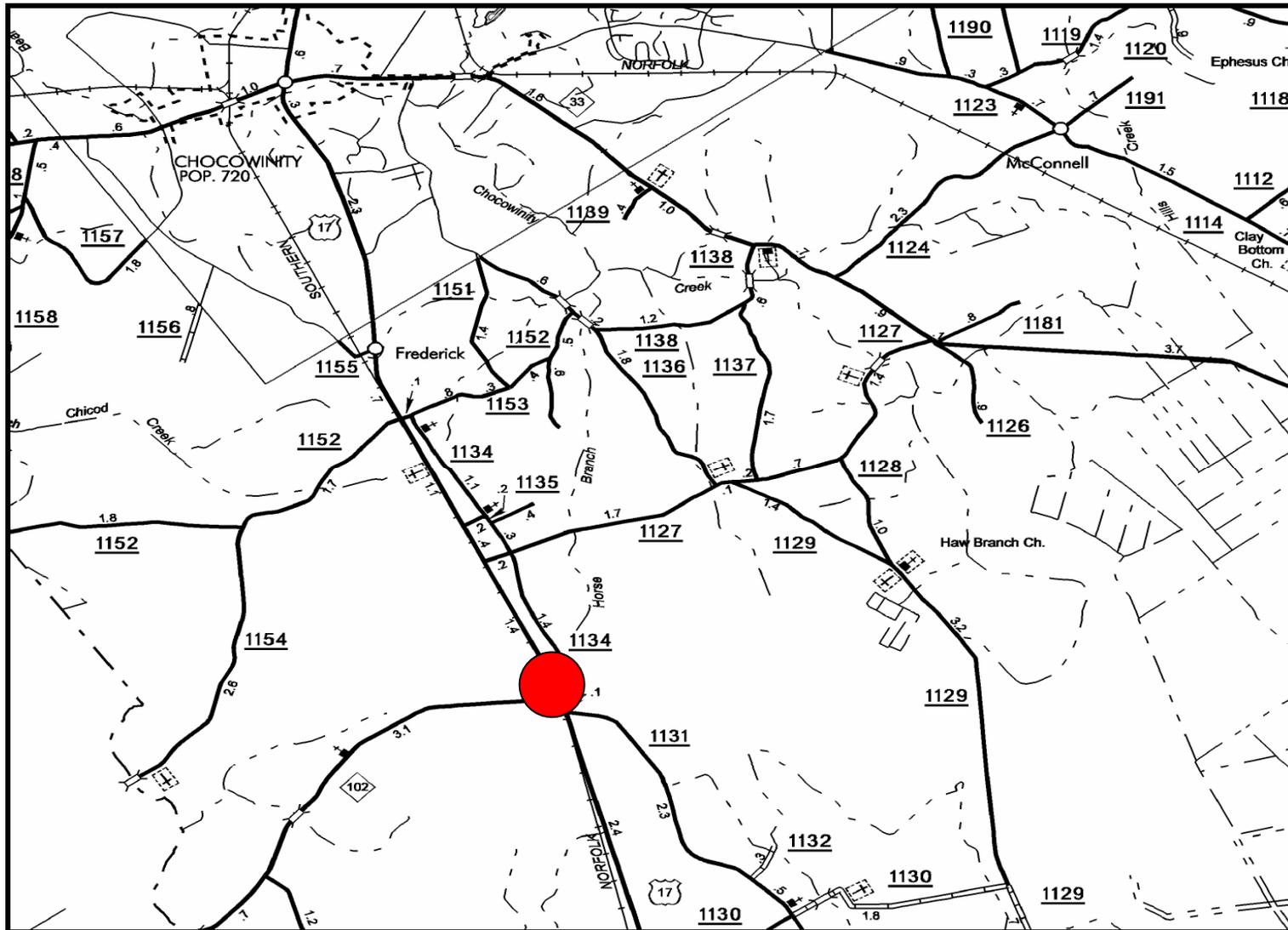
The strip analysis also showed a slight increase in crashes located at the NC 102 intersection, from six (6) in the before period to ten (10) in the after period. Three (3) of these crashes in the after period resulted from vehicles missing the stop sign and running off into the field, which only occurred once in the before period. NC 102 frontal impact crashes also increased from one (1) to five (5).

The calculated benefit to cost ratio for this project is **9.79 considering total crashes**. The benefit to cost ratio considering **combined target crashes is 6.00**. 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 both approaches to the treatment location on US 17. 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
Beaufort County
Evaluation of Spot Safety Project # 02-99-243



Treatment Location: US 17 near NC 102, MP 2.26 – 2.79

**SS# 02-99-243 Aerial Map
Beaufort County**



TREATMENT SITE PHOTOS TAKEN 8/6/2008



Traveling North on US 17 (SR 1131 on right)



Traveling North on US 17



Traveling North on US 17 approaching curve



Traveling South on US 17 approaching curve



Traveling South on US 17 (SR 1134 to the left)



Traveling South on US 17 at NC 102

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 near NC 102
 COUNTY: Beaufort
 FILE NO.: SS 02-99-243

BY: JBS
 DATE: 9/11/2008
 NOTES: Target Crashes - Combined

DETAILED COST: TYPE IMPROVEMENT - Center Turn Lane, Increased Superelevation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$152,000	20	0.102	\$15,482
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$152,000	20	0.102	\$15,482

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,120
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$17,602
 TOTAL COST OF PROJECT= \$152,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

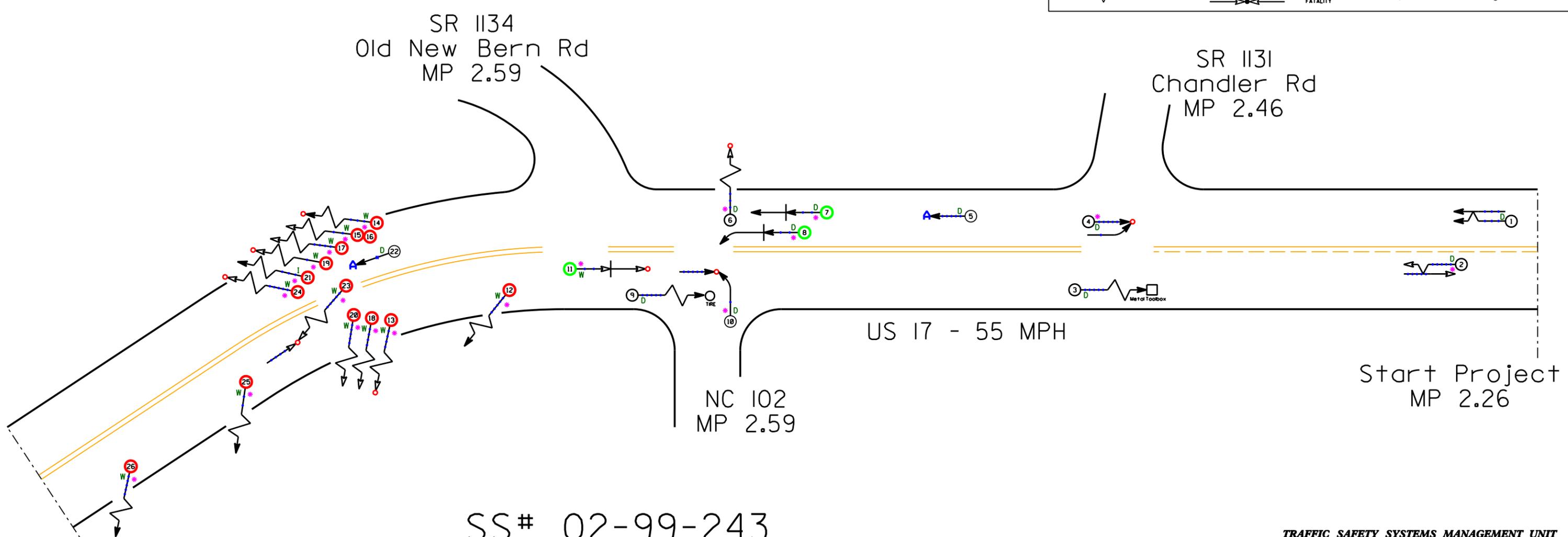
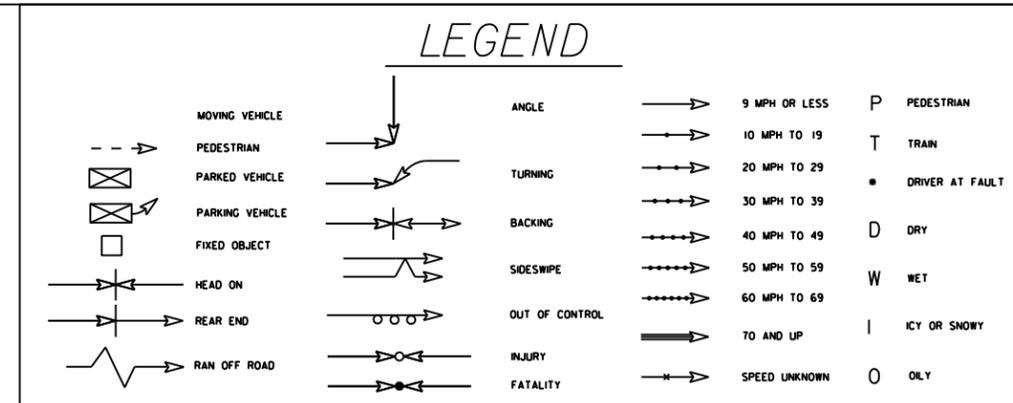
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.58	1	0.18	5	0.90	11	1.97	\$113,423
AFTER	5.58	0	0.00	2	0.36	2	0.36	\$7,849

Annual Benefits from Crash Cost Savings \$105,573

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$87,972

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.00

TOTAL COST OF PROJECT - \$152,000 COMPREHENSIVE B/C RATIO - 6.00



SS# 02-99-243
Beaufort County
BEFORE Period
2/1/97 - 8/31/02
US 17 near NC 102

- Target Crashes
Ran-off Road
- Target Crashes
Center Turn Lane

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 2	AREA: 4
STUDY PERIOD: 2/1/1997 - 8/31/2002	
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: 9-11-2008	
LOG NUMBER: SS* 02-99-243 BEFORE	

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



⊕ Target Crashes
⊕ Ran-off Road
⊕ Target Crashes
⊕ Center Turn Lane

MOVING VEHICLE		ANGLE		PEDESTRIAN	
→	MOVING VEHICLE	↘	ANGLE	→	9 MPH OR LESS P PEDESTRIAN
- - -	PEDESTRIAN	↙	TURNING	→	10 MPH TO 19 T TRAIN
⊠	PARKED VEHICLE	↔	BACKING	→	20 MPH TO 29
⊠	PARKING VEHICLE	↔	SIDESWIPE	→	30 MPH TO 39
□	FIXED OBJECT	↔	OUT OF CONTROL	→	40 MPH TO 49
⊕	HEAD ON	↔	INJURY	→	50 MPH TO 59 D DRY
⊕	REAR END	↔	FATALITY	→	60 MPH TO 69 W WET
⊕	RAN OFF ROAD	↔	SPEED UNKNOWN	→	70 AND UP I ICY OR SNOWY
		↔		→	0 OILY

SR 1134
Old New Bern Rd
MP 2.59

US 17
55 MPH

SR 1131
Chandler Rd
MP 2.46

Start Project
MP 2.26

NC 102
MP 2.59

SS# 02-99-243
 Beaufort County
 AFTER Period
 12/1/02 - 6/30/08
 US 17 near NC 102

End Project
MP 2.79

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 2	AREA: 4
STUDY PERIOD: 12/1/2002 - 6/30/2008	
DISTANCE: Y-LINE : OFT	
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* 02-99-243 AFTER	

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