

# Spot Safety Project Evaluation

Order # 41000010525

Spot Safety Project # 02-06-205

## Spot Safety Project Evaluation of the Superelevation Improvements US 70 (E. New Bern Rd) Eastbound near SR 1804 (Neuse Rd) Lenoir County

Documents Prepared By:

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

**Principal Investigator**



---

Jason B. Schronce

1-25-2011

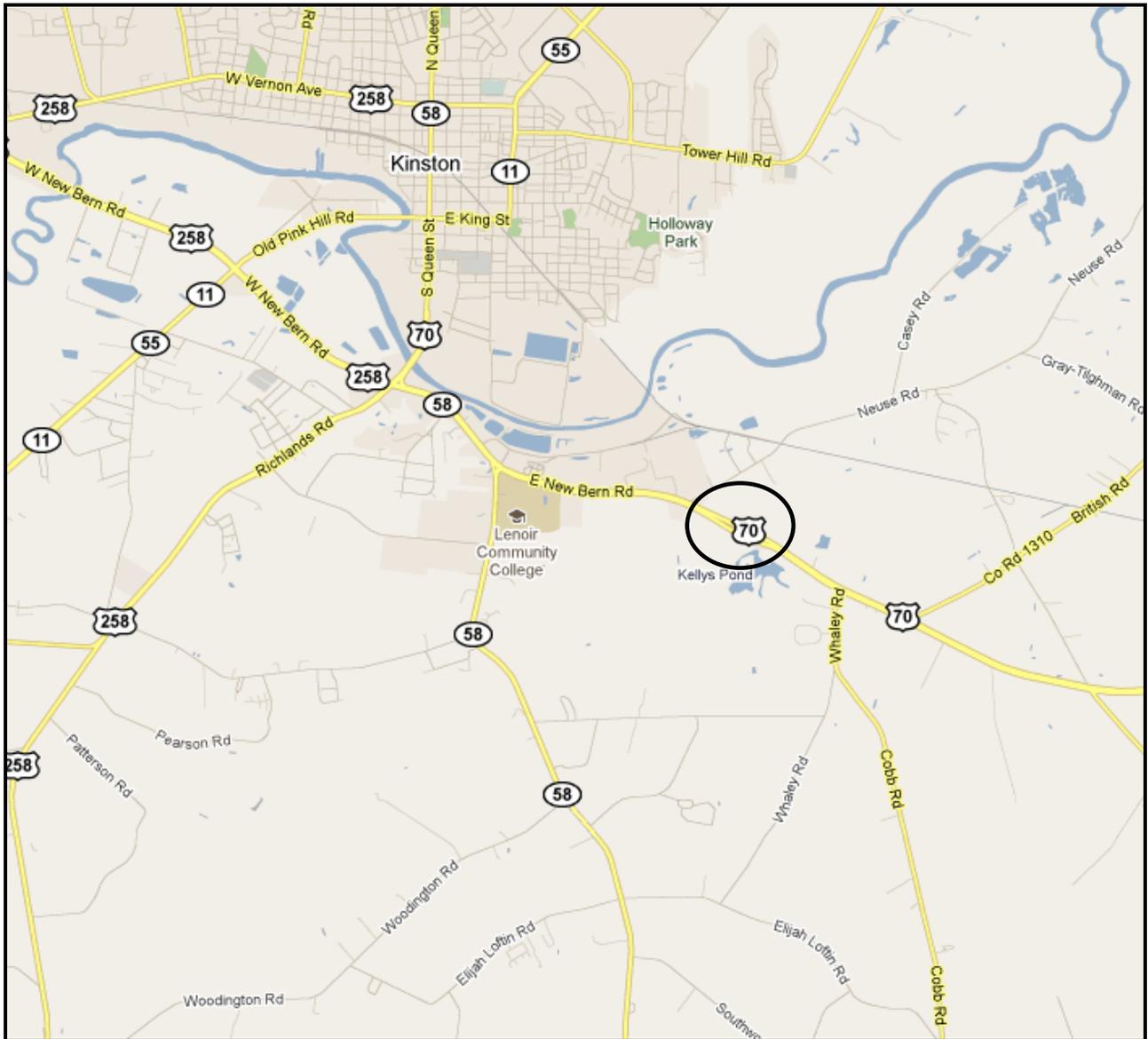
Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 02-06-205 located along US 70 (E. New Bern Road) Eastbound Direction only in Lenoir County, East of the City of Kinston. The study limits extend from milepost range 17.318 to 17.980 which are located from 150 feet east of SR 1804 (Neuse Road) to Bridge #73.





Countermeasure is “Black” Pavement around Median Crossover  
Eastbound US 70 Couplet Only

### **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of superelevation improvements and asphalt overlay with modified open graded friction course. US 70 eastbound is a two-lane, one-way couplet with intermittent driveway access points and a horizontal curve signed with chevrons. The speed limit on this section of roadway is 55 mph. This segment also has a left turn lane leading into the median crossover and a local preferred restaurant.

The original statement of problem established that this section of roadway lacked superelevation that allowed water to remain on the roadway, which has led to a substantial run-off road wet crash pattern. This location was identified by the 2005 Highway Safety Improvement Program under Project Study 53S00001.

The initial crash analysis was completed from November 1, 2000 to October 31, 2005 with twenty (20) reported wet run-off road crashes and five (5) dry run-off road collisions. The final completion date for the improvement at the subject intersection was on October 23, 2007 with a total cost of \$152,000.

## 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 month of October 2007. The before period consisted of reported crashes from September 1, 2004 through September 30, 2007 (3 years and 1 month); and the after period consisted of reported crashes from November 1, 2007 through November 30, 2010 (3 years and 1 month). 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 US 70 eastbound from 150' east of SR 1804 (MP 17.318) to Bridge #73 (MP 17.98) with a zero (0) foot 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 Lane Departure Crashes were the target crashes for the applied countermeasure. All the Lane Departure Crashes that occurred at this location through the analysis were in the form of Ran-off Road (right or left).

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	30	4	- 86.7 %
Total Severity Index	5.25	1.00	- 81.0 %
Target Crashes – Lane Departure	25	2	- 92.0 %
Target Crash Severity Index	6.10	1.00	- 83.6 %
Lane Departure – Wet / Ice Roadway	23	0	- 100.0 %
Lane Departure – Dry Roadway	2	2	0.0 %
Volume (2006, 2009)	6,500	7,000	7.7 %

<b><u>Injury Crash Summary</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	0	0	N/A
Class C Injury Crashes	7	0	- 100.0 %
Total Injury Crashes	8	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in an 87 percent decrease in Total Crashes, a 98 percent decrease in Target Crashes, and an 81 percent decrease in the Total Severity Index. The before period ADT year was 2006 and the after period ADT year was 2009.

## Results and Discussion

Referencing the *Collision Diagrams*, the before period was experiencing a significant crash pattern of lane departure vehicles during wet roadway conditions on the area between the median crossover and restaurant driveway. Of the twenty-five (25) before period ran-off road crashes, twenty-three (23) occurred under wet (raining, standing water, or ice) roadway conditions.

After the improvement of installing superelevation and a friction course overlay, the wet roadway crash pattern was completely eliminated. There were two (2) after period ran-off road collisions. Both of these occurred under dry conditions and one explicitly stated that they were avoiding an animal strike. This countermeasure's effectiveness is deemed extremely successful and noted with a high benefit-cost ratio.

The calculated benefit to cost ratio for this project is **17.77 considering total crashes**. The benefit to cost ratio **considering only target crashes is 17.50**. 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 from Google Street View for multiple points along the treatment segment. 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 improvement.

## TREATMENT SITE PHOTOS



Traveling East on US 70 entering study area



Traveling East on US 70 showing median crossover



Traveling East on US 70 showing segment curvature



Traveling East on US 70 showing restaurant PVA

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

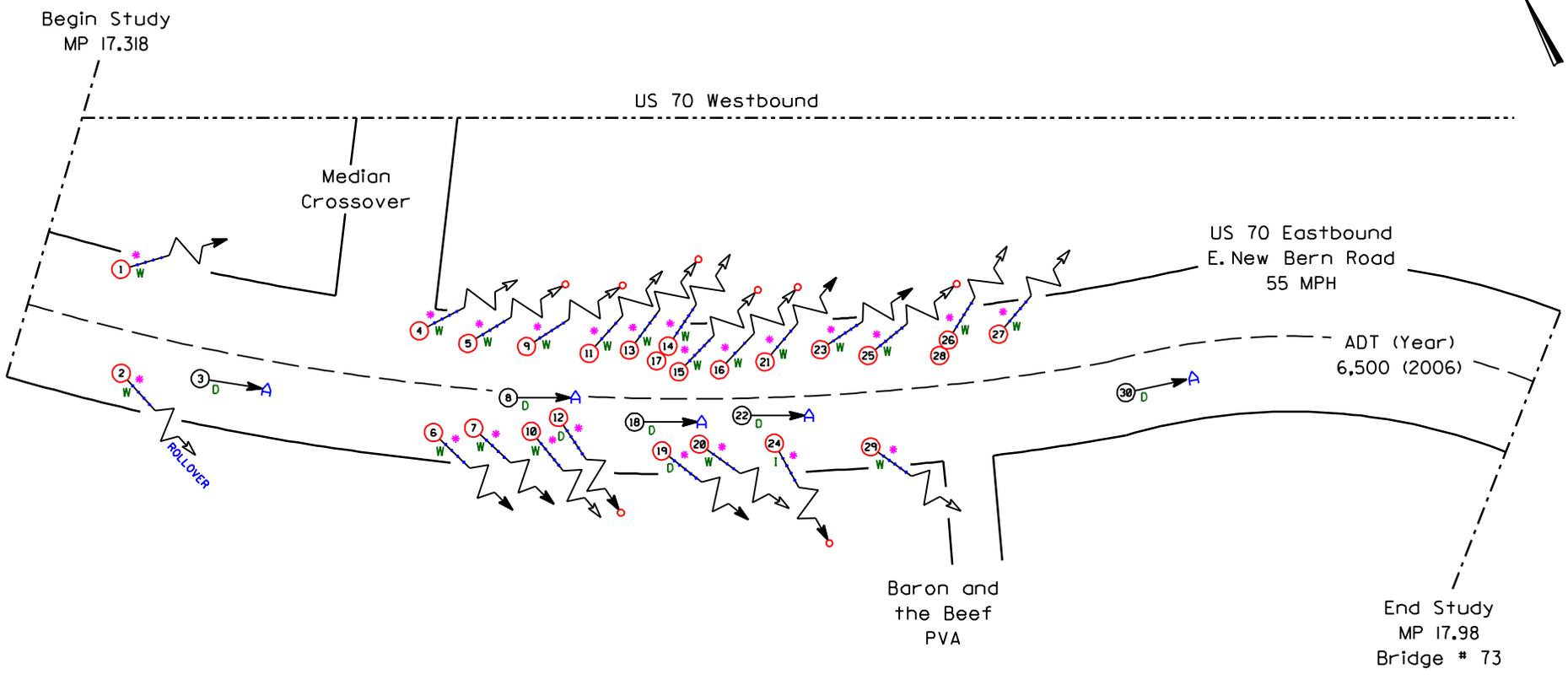
LOCATION: US 70 near SR 1804		BY: JBS						
COUNTY: Lenoir		DATE: 1/14/2011						
FILE NO.: SS# 02-06-205								
DETAILED COST:	TYPE IMPROVEMENT - <b>Superelevation &amp; Friction Course</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$152,000	20	0.102	\$15,482			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$152,000	20	0.102	\$15,482			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$15,482			
	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	3.08	1	0.32	7	2.27	22	7.14	\$280,714
AFTER	3.08	0	0.00	0	0.00	4	1.30	\$5,584
						Annual Benefits from Crash Cost Savings		\$275,130
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$259,648	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	17.77	
TOTAL COST OF PROJECT		-	\$152,000	COMPREHENSIVE B/C RATIO		-	17.77	

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 70 near SR 1804		BY: JBS						
COUNTY: Lenoir		DATE: 1/14/2011						
FILE NO.: SS# 02-06-205								
DETAILED COST:	TYPE IMPROVEMENT - <b>Superelevation &amp; Friction Course</b>							
	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 =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$15,482			
	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	3.08	1	0.32	7	2.27	17	5.52	\$273,734
AFTER	3.08	0	0.00	0	0.00	2	0.65	\$2,792
						Annual Benefits from Crash Cost Savings		\$270,942
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$255,460	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	17.50	
TOTAL COST OF PROJECT		-	\$152,000	COMPREHENSIVE B/C RATIO		-	17.50	

SS# 02-06-205  
 Order# 41000010525  
 Lenior County  
 BEFORE Period  
 9/1/04 - 9/30/07  
 US 70 Eastbound Only

LEGEND							
	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		30 MPH TO 35		TRAIN
	PAKED VEHICLE		BACKING		30 MPH TO 35		OTHER AT FAULT
	PAKED VEHICLE		SHOULDER		40 MPH TO 45		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 55		WET
	HEAD ON		REAR END		60 MPH TO 65		TO AND UP
	REAR END		RUN OFF ROAD		TO AND UP		CITY OR STREET
	RUN OFF ROAD		REAR END		SPEED UNKNOWN		ONLY
	RUN OFF ROAD		REAR END		SPEED UNKNOWN		ONLY

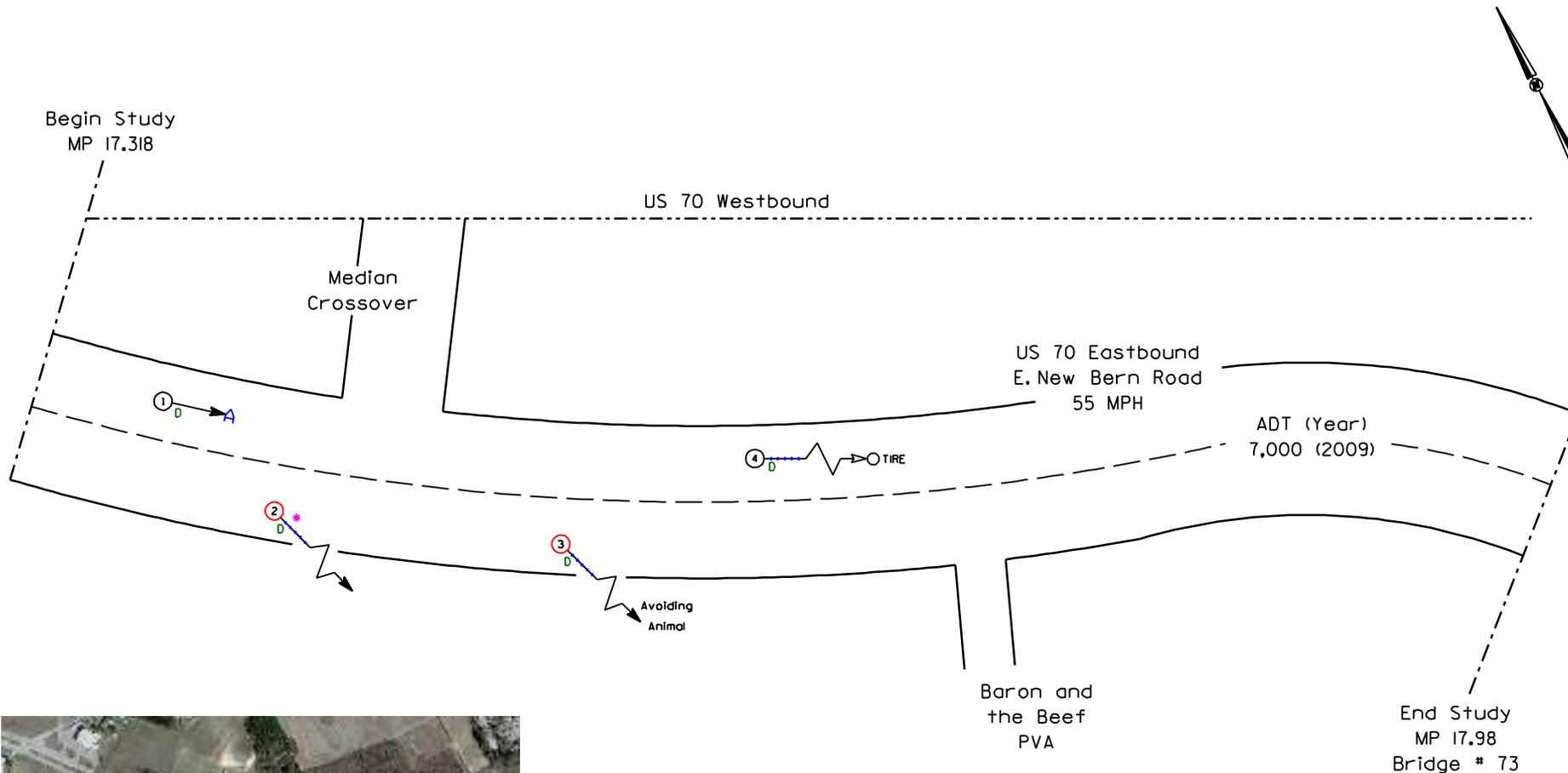


**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**  
**TRAFFIC SAFETY UNIT**  
 Date: 1-13-2011 Prepared By: J. Schronce

Lane Departure Target Crashes

SS# 02-06-205  
 Order# 41000010525  
 Lenior County  
 AFTER Period  
 11/1/07 - 11/30/10  
 US 70 Eastbound Only

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		40 MPH TO 75		TRAIN
	PAKED VEHICLE		BACKING		30 MPH TO 35		OTHER AT FAULT
	PAKED VEHICLE		SHOULDER		40 MPH TO 45		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 55		WET
	HEAD ON		RUN OFF ROAD		60 MPH TO 65		ICY OR SNOWY
	HEAD ON		RUN OFF ROAD		TO AND UP		ICY OR SNOWY
	HEAD ON		RUN OFF ROAD		SPEED EXCEEDED		ONLY
	HEAD ON		RUN OFF ROAD		SPEED EXCEEDED		ONLY
	HEAD ON		RUN OFF ROAD		SPEED EXCEEDED		ONLY



Countermeasure:  
 Improve superelevation &  
 Overlay with open grade  
 friction course

Lane Departure  
 Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 1-13-2011      Prepared By: J. Schronce