

Spot Safety Project Evaluation

Order # 41000014230

Spot Safety Project # 06-06-206

Spot Safety Project Evaluation of the 4-Way Stop Intersection Conversion SR 1116 (Old Plank Road) at SR 1288 (Lake Upchurch Road) Cumberland 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

10-3-2011

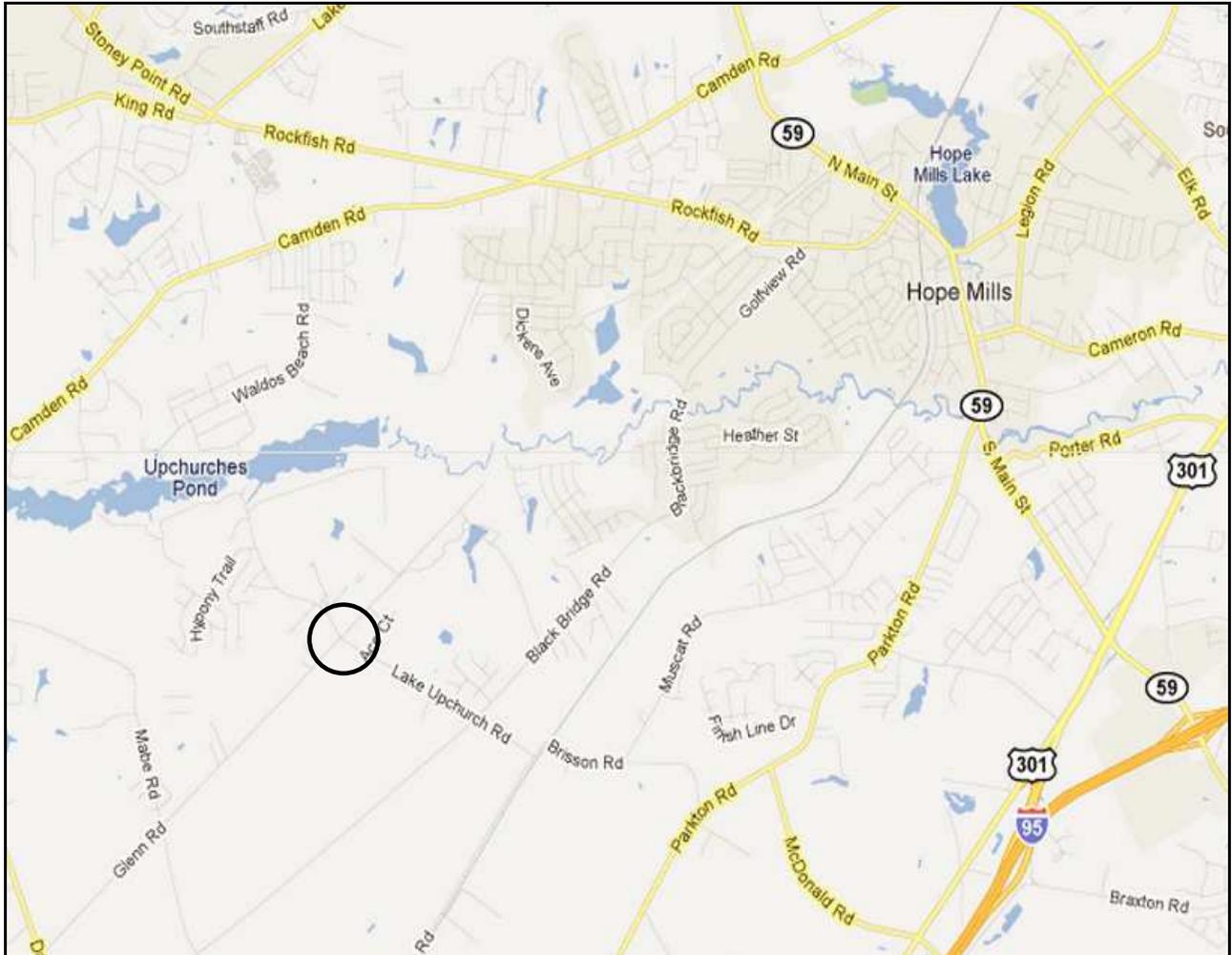
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-06-206 located at the Intersection of SR 1116 (Old Plank Road) and SR 1288 (Lake Upchurch Road) in Cumberland County, near the Town of Hope Mills.





**Aerial Map from Bing Maps – Showing Prior Intersection Alignment
SR 1288 intersecting SR 1116 in the middle of a sharp horizontal curve.**

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the intersection realignment and conversion to four-way stop control. SR 1116 (Old Plank Road) and SR 1288 (Lake Upchurch Road) are both two-lane facilities at the subject intersection with speed limits of 55 mph on all three paved roadway approaches. The fourth leg, a residential dead-end dirt road, was also labeled as Old Plank Road. The subject location was converted from a three-leg intersection where SR 1288 intersected in the middle of a sharp horizontal curve to a traditional rural four-leg intersection.

The original statement of problem was the run-off road crash pattern from vehicles on SR 1116 due to the sharp horizontal curve and the location of intersecting Lake Upchurch Road. There was one fatal collision in March 2006 when a truck lost control in the curve causing an “angle” type collision.

The initial crash analysis was completed from April 1, 2001 to March 31, 2006 with six (6) reported crashes. The final completion date for the improvement at the subject intersection was on September 27, 2007 with a total cost of \$30,000.

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 were the months of August through October 2007. The before period consisted of reported crashes from December 1, 2003 through July 31, 2007 (3 years and 8 months); and the after period consisted of reported crashes from November 1, 2007 through June 30, 2011 (3 years and 8 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. *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. The Lane Departure Crash types considered are as follows: Ran-Off Roadway (Left, Right, Straight); Rollover; Head on; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	9	1	- 88.9 %
Total Severity Index	12.71	1.00	- 92.1 %
Target Crashes – Lane Departure	9	1	- 88.9 %
Target Crash Severity Index	12.71	1.00	- 92.1 %
Volume (2005, 2009)	2,800	3,100	10.7 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	0	- 100.0 %
Class B injury Crashes	2	0	- 100.0 %
Class C Injury Crashes	2	0	- 100.0 %
Total Injury Crashes	5	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in an 89 percent decrease in both Total and Target Crashes with a 92 percent decrease Crash Severity Indexes. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a pattern of vehicles travelling too fast for the roadway geometrics and losing control in the SR 1116 horizontal curve at the intersection. There were two (2) ran-off roadway crashes travelling westbound, one (1) westbound

head-on collision as the vehicle attempted to access SR 1288, one (1) vehicle that ran through the stop sign eastbound, and five (5) lane departure crashes northbound including the fatality crash.

After the intersection was realigned to four 90-degree points and placed under four-way stop control, the crash patterns at this location were nearly eliminated. There was one vehicle in the after period that ran through the dual posted SR 1288 stop signs and crashed off the roadway. The new countermeasure successfully removed the before period crash patterns and safety concerns.

The calculated benefit to cost ratio for this project is **44.06 considering both total and target crashes**. 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 all four 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.

Treatment Site Photos



Travelling East on SR 1288 (Lake Upchurch Road)



Travelling North on SR 1116 (Old Plank Road) – New Stop Control



Travelling North on SR 1116 (Old Plank Road) – New Stop Control



Travelling South on Old Plank Road – Dirt Road



Travelling West on SR 1116 (Lake Upchurch Road) – New Control

BENEFIT-COST ANALYSIS WORKSHEET - Total & Target Crashes

LOCATION: SR 1116 @ SR 1288
 COUNTY: Cumberland
 FILE NO.: SS 06-06-206

BY: JBS
 DATE: 9/15/2011
 All Crashes were Target (Lane Departure) Crashes

DETAILED COST: TYPE IMPROVEMENT - **Realign Intersection & 4-Way Stop Control**

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$30,000	10	0.149	\$4,471
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$30,000	10	0.149	\$4,471

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$4,471
 TOTAL COST OF PROJECT= \$30,000

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	3.67	1	0.27	4	1.09	4	1.09	\$198,147
AFTER	3.67	0	0.00	0	0.00	1	0.27	\$1,172

Annual Benefits from Crash Cost Savings \$196,975

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$192,505

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 44.06

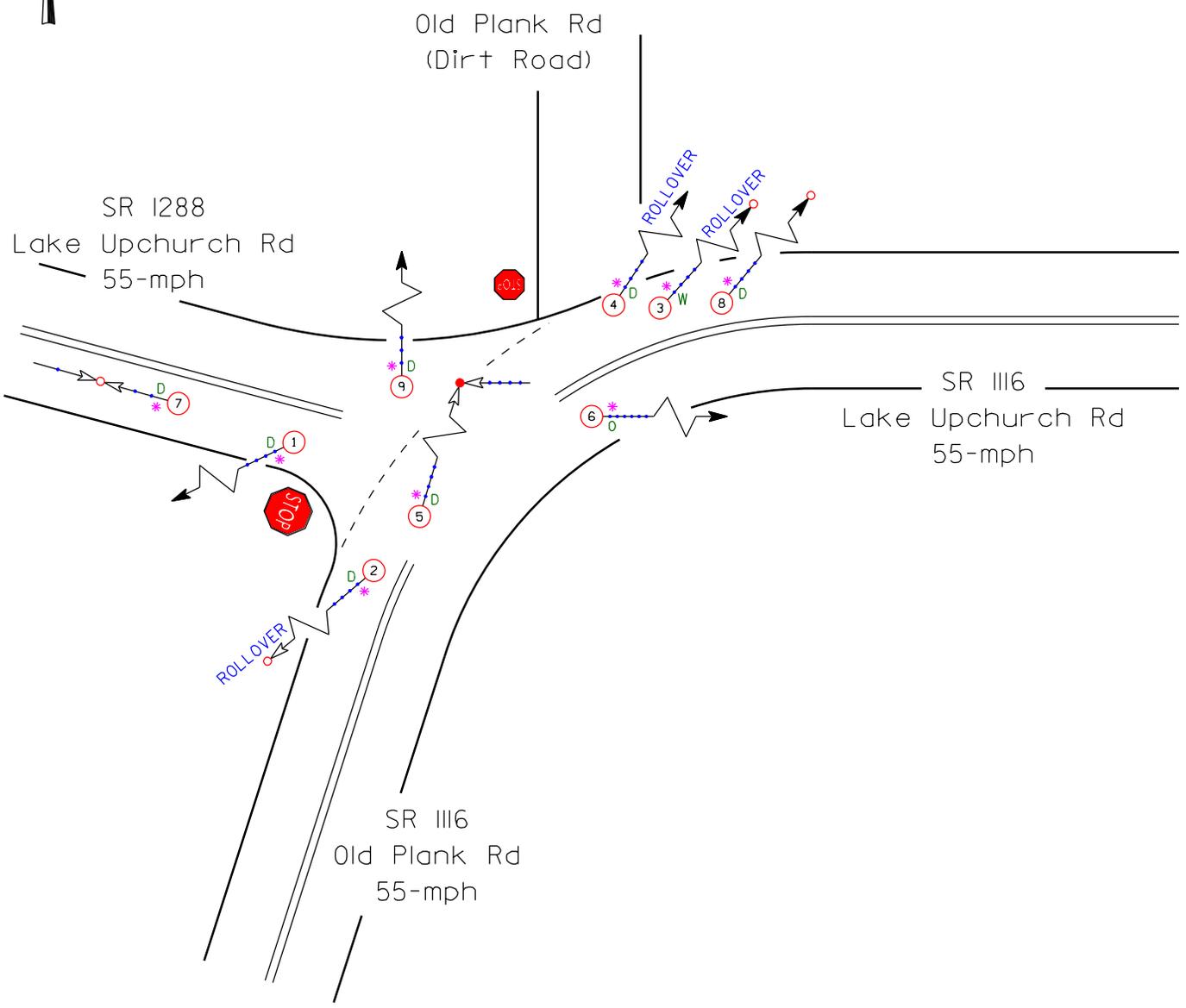
TOTAL COST OF PROJECT - \$30,000 COMPREHENSIVE B/C RATIO - 44.06



LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKING VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		BACKING		30 MPH TO 39		DRY
	FIXED OBJECT		BACKING		40 MPH TO 49		WET
	HEAD ON		BACKING		50 MPH TO 59		ICY OR SNOWY
	REAR END		BACKING		60 MPH TO 69		ONLY
	RAN OFF ROAD		BACKING		OUT OF CONTROL		TO AND UP
	RAN OFF ROAD		BACKING		HAZY		SPEED UNKNOWN
	RAN OFF ROAD		BACKING		FATALITY		

SS# 06-06-206
 Order# 41000014230
 Cumberland County
 BEFORE Period
 12/1/03 - 7/31/07



Lane Departure
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 8-30-2011
Prepared By: J. Schronce



Old Plank Rd
(Dirt Road)

SR 1288
Lake Upchurch Rd
55-mph



SR 1116
Lake Upchurch Rd
55-mph

SR 1116
Old Plank Rd
55-mph



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		BACKING		30 MPH TO 39		WET
	HEAD ON		BACKING		40 MPH TO 49		ICY OR SNOWY
	REAR END		BACKING		50 MPH TO 59		ONLY
	RAN OFF ROAD		BACKING		60 MPH TO 69		TO AND UP
			BACKING		70 MPH TO 79		SPEED UNKNOWN
			BACKING		80 MPH TO 89		
			BACKING		90 MPH TO 99		
			BACKING		100 MPH TO 109		
			BACKING		110 MPH TO 119		
			BACKING		120 MPH TO 129		
			BACKING		130 MPH TO 139		
			BACKING		140 MPH TO 149		
			BACKING		150 MPH TO 159		
			BACKING		160 MPH TO 169		
			BACKING		170 MPH TO 179		
			BACKING		180 MPH TO 189		
			BACKING		190 MPH TO 199		
			BACKING		200 MPH TO 209		
			BACKING		210 MPH TO 219		
			BACKING		220 MPH TO 229		
			BACKING		230 MPH TO 239		
			BACKING		240 MPH TO 249		
			BACKING		250 MPH TO 259		
			BACKING		260 MPH TO 269		
			BACKING		270 MPH TO 279		
			BACKING		280 MPH TO 289		
			BACKING		290 MPH TO 299		
			BACKING		300 MPH TO 309		
			BACKING		310 MPH TO 319		
			BACKING		320 MPH TO 329		
			BACKING		330 MPH TO 339		
			BACKING		340 MPH TO 349		
			BACKING		350 MPH TO 359		
			BACKING		360 MPH TO 369		
			BACKING		370 MPH TO 379		
			BACKING		380 MPH TO 389		
			BACKING		390 MPH TO 399		
			BACKING		400 MPH TO 409		
			BACKING		410 MPH TO 419		
			BACKING		420 MPH TO 429		
			BACKING		430 MPH TO 439		
			BACKING		440 MPH TO 449		
			BACKING		450 MPH TO 459		
			BACKING		460 MPH TO 469		
			BACKING		470 MPH TO 479		
			BACKING		480 MPH TO 489		
			BACKING		490 MPH TO 499		
			BACKING		500 MPH TO 509		
			BACKING		510 MPH TO 519		
			BACKING		520 MPH TO 529		
			BACKING		530 MPH TO 539		
			BACKING		540 MPH TO 549		
			BACKING		550 MPH TO 559		
			BACKING		560 MPH TO 569		
			BACKING		570 MPH TO 579		
			BACKING		580 MPH TO 589		
			BACKING		590 MPH TO 599		
			BACKING		600 MPH TO 609		
			BACKING		610 MPH TO 619		
			BACKING		620 MPH TO 629		
			BACKING		630 MPH TO 639		
			BACKING		640 MPH TO 649		
			BACKING		650 MPH TO 659		
			BACKING		660 MPH TO 669		
			BACKING		670 MPH TO 679		
			BACKING		680 MPH TO 689		
			BACKING		690 MPH TO 699		
			BACKING		700 MPH TO 709		
			BACKING		710 MPH TO 719		
			BACKING		720 MPH TO 729		
			BACKING		730 MPH TO 739		
			BACKING		740 MPH TO 749		
			BACKING		750 MPH TO 759		
			BACKING		760 MPH TO 769		
			BACKING		770 MPH TO 779		
			BACKING		780 MPH TO 789		
			BACKING		790 MPH TO 799		
			BACKING		800 MPH TO 809		
			BACKING		810 MPH TO 819		
			BACKING		820 MPH TO 829		
			BACKING		830 MPH TO 839		
			BACKING		840 MPH TO 849		
			BACKING		850 MPH TO 859		
			BACKING		860 MPH TO 869		
			BACKING		870 MPH TO 879		
			BACKING		880 MPH TO 889		
			BACKING		890 MPH TO 899		
			BACKING		900 MPH TO 909		
			BACKING		910 MPH TO 919		
			BACKING		920 MPH TO 929		
			BACKING		930 MPH TO 939		
			BACKING		940 MPH TO 949		
			BACKING		950 MPH TO 959		
			BACKING		960 MPH TO 969		
			BACKING		970 MPH TO 979		
			BACKING		980 MPH TO 989		
			BACKING		990 MPH TO 999		
			BACKING		1000 MPH TO 1009		

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Cumberland County
AFTER Period
11/1/07 - 6/30/11

Countermeasure:
Intersection realigned to eliminate
sharp curve and converted
to 4-way Stop Control.



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DIVISION of HIGHWAYS
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Date: 8-30-2011

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