

Spot Safety Project Evaluation

Work Order #41000009775

Spot Safety Project # 02-02-205

**Spot Safety Project Evaluation of the Widening of the Eastern Leg of SR 1703 (14th St) at its
Intersection with SR 1707 (Charles Blvd) in order to
Construct a Second Westbound Through Lane
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



Brad Robinson, PE

2/7/2011

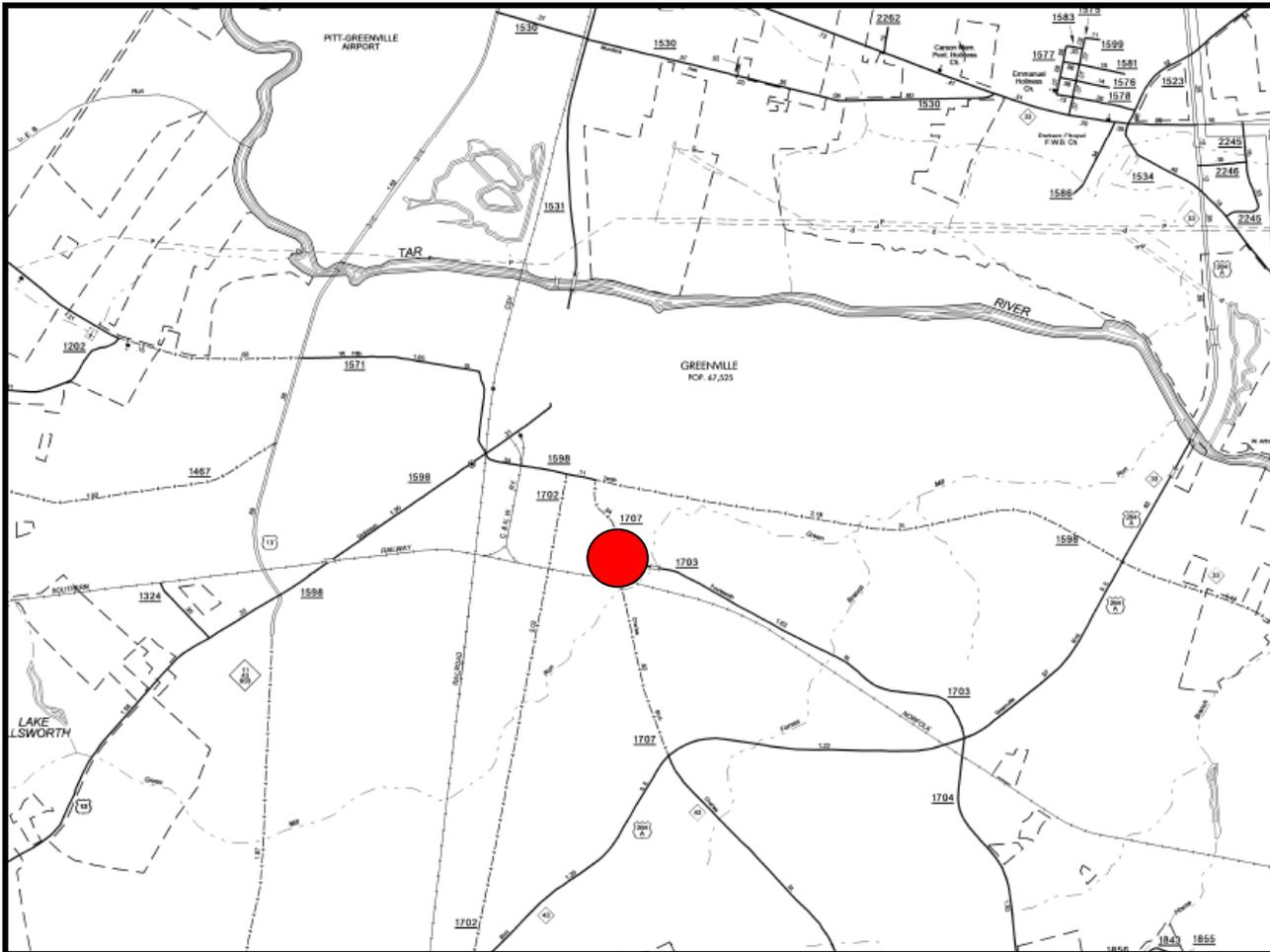
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-02-205 – SR 1703 (14th St) and SR 1707 (Charles Blvd) in Pitt County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to widen the eastern leg of SR 1703 (14th St) in order to construct a second westbound through lane. The new lane extends approximately 0.1 miles from the intersection.

Prior to the project, the eastern leg of SR 1703 had one through lane and one left turn lane on the intersection approach. There were already two existing receiving lanes for the westbound direction on the western side of the intersection. The western leg of SR 1703 has one through lane, one left

turn lane, and one right turn lane on the intersection approach. The speed limit is 35 mph for all approaches.

The original statement of problem was that with only one through lane on westbound SR 1703 traffic would often back up to the bridge approximately 750 feet from the intersection. The additional through lane was meant to alleviate congestion and to mitigate Rear-End Crashes.

The initial crash analysis was conducted from November 1, 1998 to October 31, 2001 with a total of 17 reported crashes. The final completion date for the improvements at the subject intersection was on September 1, 2006 with a total cost of \$150,000.00.

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 from August 1, 2006 to October 30, 2006. The before period consisted of reported crashes from September 1, 2002 through July 31, 2006 (3 years and 11 months) and the after period consisted of reported crashes from November 1, 2006 through September 30, 2010 (3 years and 11 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the intersection for all legs except for the eastern leg of SR 1703, where the limits extend to 0.1 miles from the intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Rear-End Crashes on the westbound approach of SR 1703 were the Target Crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	30	40	33.3
Total Severity Index	2.97	3.59	20.9
Target Crashes	2	1	-50.0
Target Severity Index	4.7	1	-78.7
Volume	31,500	34,000	7.9
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	0	-100.0
Class C Crashes	0	0	N/A
PDO Crashes	1	1	0.0

Results and Discussion

The naive before and after analysis at the treatment location resulted in a 33 percent increase in Total Crashes, a 50 percent decrease in Target Crashes, and an 8 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2004 and the after period ADT year was 2008.

The calculated benefit to cost ratio for this project is -2.23 considering total crashes. The benefit to cost ratio considering only target crashes is 0.33. 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.

Target Crashes experienced a 50 decrease at the subject intersection. This is somewhat misleading, since there were only two Target Crashes in the before period. As stated in the *Project Background* section, the second through lane was meant to alleviate congestion. A naïve before and after crash analysis does not measure the possible operational benefits that the additional lane might have added to the roadway.

It appears that a few non-target Frontal Impact crash patterns developed in the intersection from the before to the after period. In the before period there were a total of seven (7) Frontal Impact Crashes at the intersection, including five Left Turn-Same Roadway Crashes, one Left Turn-Different Roadway Crash, and one Angle Crash. In the after period there were a total of twenty (20) Frontal Impact Crashes at the intersection, including 10 Left Turn-Different Roadway Crashes, eight Angle Crashes, and two Right Turn-Different Roadway Crashes.

Please see the attached *Treatment Site Photos*. Photos were obtained from Google Street-view. 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 roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1703 at SR 1707
 COUNTY: Pitt
 FILE NO.: SS 02-02-205

BY: bdr
 DATE: 1/31/2011

DETAILED COST: TYPE IMPROVEMENT - Widening w/ second westbound through lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$150,000	20	0.102	\$15,278
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$150,000	20	0.102	\$15,278

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$15,678
 TOTAL COST OF PROJECT= \$150,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	3.92	0	0.00	8	2.04	22	5.61	\$64,949
AFTER	3.92	0	0.00	14	3.57	26	6.63	\$99,949

Annual Benefits from Crash Cost Savings (\$35,000)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$50,678)
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -2.23

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - -2.23

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1703 at SR 1707
 COUNTY: Pitt
 FILE NO.: SS 02-02-205 Target Crashes only

BY: bdr
 DATE: 1/31/2011

DETAILED COST: TYPE IMPROVEMENT - Widening w/ second westbound through lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$150,000	20	0.102	\$15,278
	\$0	0	0.000	\$0
TOTALS	\$150,000	20	0.102	\$15,278

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$15,678
 TOTAL COST OF PROJECT= \$150,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	3.92	0	0.00	1	0.26	1	0.26	\$6,199
AFTER	3.92	0	0.00	0	0.00	1	0.26	\$1,097

Annual Benefits from Crash Cost Savings \$5,102

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$10,576)
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.33

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 0.33

Treatment Site Photos from Google Street-View



Looking east on SR 1703 (14th St)



Looking west on SR 1703 (14th St)



Looking north on SR 1707 (Charles Blvd)



Looking south on SR 1707 (Charles Blvd)

SS# 02-02-205
 Order# 41000009775
 Pitt County
 BEFORE Period
 9/1/02 - 7/31/06

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		9 MPH OR LESS
	PARKED VEHICLE		10 MPH TO 19
	PARKING VEHICLE		TURNING
	FIXED OBJECT		20 MPH TO 29
	HEAD ON		30 MPH TO 39
	REAR END		40 MPH TO 49
	RAN OFF ROAD		50 MPH TO 59
	INJURY		60 MPH TO 69
	FATALITY		70 AND UP
	SPEED UNKNOWN		PEDESTRIAN
			TRAIN
			* DRIVER AT FAULT
			D DRY
			W WET
			I ICY OR SNOWY
			O OILY

SR 1707
 (Charles Blvd)
 35 mph

ADT (YEAR)
 14,000 (2004)

SR 1703
 (14th St)
 35 mph

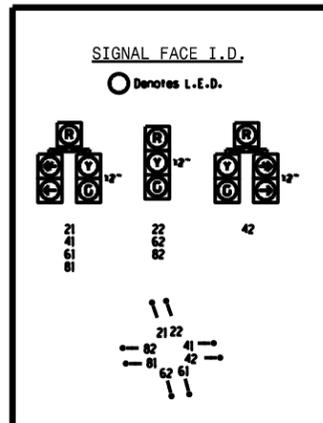
ADT (YEAR)
 13,000 (2004)

ADT (YEAR)
 16,000 (2004)

SR 1703
 (14th St)
 35 mph

SR 1707
 (Charles Blvd)
 35 mph

ADT (YEAR)
 20,000 (2004)



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

TRAFFIC SAFETY UNIT

Date: January 2011 Prepared By: bdr

SS# 02-02-205
 Order# 41000009775
 Pitt County
 AFTER Period
 11/1/06-9/30/10

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		9 MPH OR LESS
	PARKED VEHICLE		10 MPH TO 19
	PARKING VEHICLE		TURNING
	FIXED OBJECT		20 MPH TO 29
	HEAD ON		30 MPH TO 39
	REAR END		40 MPH TO 49
	RAN OFF ROAD		50 MPH TO 59
	BACKING		60 MPH TO 69
	SIDESWIPE		70 AND UP
	OUT OF CONTROL		SPEED UNKNOWN
	INJURY		P PEDESTRIAN
	FATALITY		T TRAIN
			* DRIVER AT FAULT
			D DRY
			W WET
			I ICY OR SNOWY
			O OILY

SR 1707
 (Charles Blvd)
 35 mph
 ADT (YEAR)
 16,000 (2008)

SR 1703
 (14th St)
 35 mph

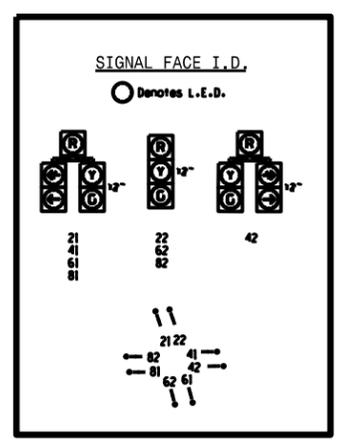
ADT (YEAR)
 14,000 (2008)

ADT (YEAR)
 16,000 (2008)

SR 1703
 (14th St)
 35 mph

ADT (YEAR)
 22,000 (2008)

SR 1707
 (Charles Blvd)
 35 mph



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

TRAFFIC SAFETY UNIT

Date: January 2011

Prepared By: bdr