

Spot Safety Project Evaluation

Order # 41000005546

Spot Safety Project # 07-00-219

**Spot Safety Project Evaluation of the
Additional Overhead Sign Installation
I-40 Eastbound near I-85 Business Exit Ramp
Guilford County, City of Greensboro**

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

6-15-2010

Date

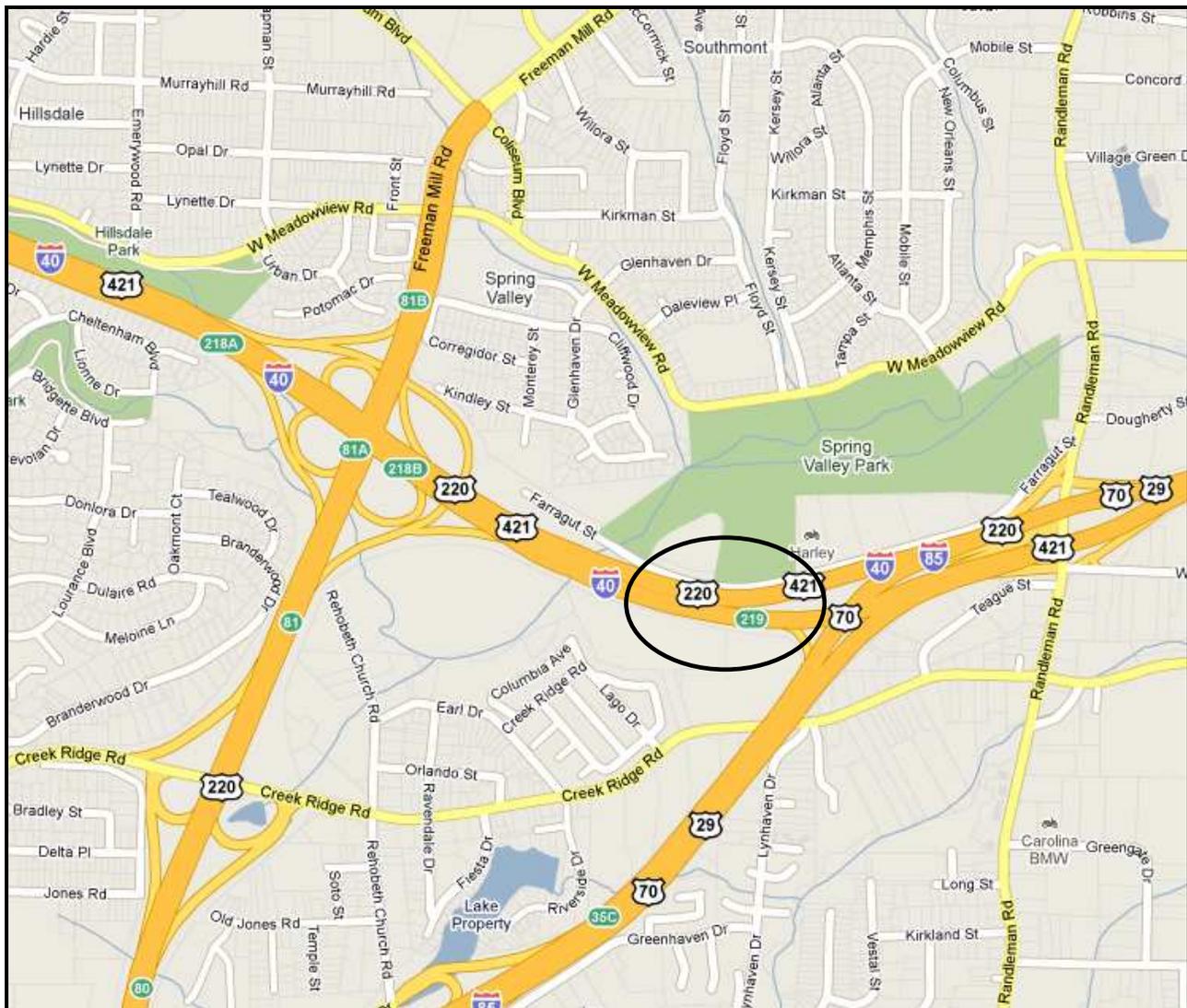
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-00-219 located along Interstate 40 (also formally known as Interstate 40 Business) near the exit for Interstate 85 Business (Exit 219) in Guilford County, City of Greensboro. The study location is for eastbound traveling vehicles only.

The study location is between the exits for Freeman Mill Road and Randleman Road; with US 220 and US 421 as corresponding routes with Interstate 40. The study milepost ranges are 13.81 (bridge over creek) east to 14.51 (bridge crossing Interstate 85 Business).





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an additional overhead cantilever guide sign. Interstate 40 at this location is a grass median divided facility with four lanes in the eastbound direction. Of those four lanes, the inside fast lane drops at the exit and the outside slow lane becomes an exit only lane for Interstate 85 Business. I-40 becomes a two lane eastbound facility over the bridge crossing I-85 Business. The speed limit along this strip is 55 mph. The bridge over I-85 Business (MP 14.51) was replaced by TIP Project B-4534 and construction began in September of 2008. The new additional overhead sign is located approximately 200' east of the creek bridge and covers just the outside exit only lane.

The original statement of problem stated that inadequate advanced signing of the exit for I-85 Business southbound has lead to a pattern of rear-end and sideswipe type collisions. The intended purpose of this project was to alleviate crashes by giving motorists more time to make better driving decisions.

The initial crash analysis was completed from August 1, 1997 to July 31, 2000 with forty-one (41) reported crashes, seven (7) of which were deemed correctable. These correctable collisions included three (3) rear-end and four (4) sideswipe crashes. The final completion date for the improvement at the subject intersection was on January 30, 2004 with a total cost of \$50,000.

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 December 2003 through January 2004. The before period consisted of reported crashes from May 1, 1999 through November 30, 2003 (4 years and 7 months); and the after period consisted of reported crashes from February 1, 2004 through August 31, 2008 (4 years and 7 months). The ending date for this analysis was limited by the replacement of the bridge over I-85 Business under Project B-4534.

The treatment data consisted of all I-40 Eastbound crashes between milepost 13.81 and 14.51 on I-40 / US 220 / US 421 which include Exit 219 (I-85 Business South). *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 a particular crash pattern was not selected as target crash; however the tables below highlight multiple crash patterns along this segment.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	39	36	- 7.7 %
Total Severity Index	5.41	4.49	- 17.0 %
Exit 219 Ramp Run-off Roadway	17	12	- 29.4 %
Exit Only Lane (Rear-end / Sideswipe)	0	3	200+ %
Total Segment (Rear-end / Sideswipe)	17	19	11.8 %
Volume (2001, 2007)	43,500	49,000	12.6 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	5	3	- 40.0 %
Class C Injury Crashes	8	14	75.0 %
Total Injury Crashes	14	17	21.4 %

The naive before and after analysis at the treatment location resulted in an 8 percent decrease in Total Crashes and a 17 percent increase in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007. The ADT was calculated by taking the Interstate ADT for this segment and dividing by two for eastbound vehicles only.

Results and Discussion

Referencing the *Collision Diagrams*, this segment appears to have similar crash frequency and crash types throughout both evaluation periods. The chart above shows an eight (8) percent decrease in total crashes with a twenty-nine (29) percent decrease in ramp run-off road crashes. The majority of the rear-end and sideswipe type collisions appear to be occurring as the inside fast lane drops near the exit ramp. The actual crashes are occurring in the second lane from the median as motorists react to merging vehicles and fast traveling decisions. Total rear-end and sideswipe crashes did increase slightly with an eleven (11) percent increase through the evaluation.

The calculated benefit to cost ratio for this project is **11.57 considering total 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 at multiple points along the treatment segment. The photos are shown during the time this location was under construction by TIP Project B-4534. 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



Traveling East on I-40 at Bridge over Creek (MP 13.81)
Countermeasure: Additional Overhead Cantilever Sign



Traveling East on I-40 along segment
Picture showing the merge and lane drop from the left



Traveling East on I-40 along segment at Exit 219



Traveling East on I-40 approaching end of study limits
Bridge over I-85 Business (Bridge shown being replaced)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: I-40 near I-85 Business South
 COUNTY: Guilford
 FILE NO.: SS 07-00-219

BY: JBS
 DATE: 6/1/2010

DETAILED COST: TYPE IMPROVEMENT - Additional Overhead Sign

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$50,000	6	0.216	\$10,816
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$50,000	6	0.216	\$10,816

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$50
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$10,866
 TOTAL COST OF PROJECT= \$50,000

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	4.58	1	0.22	13	2.84	25	5.46	\$217,795
AFTER	4.58	0	0.00	17	3.71	19	4.15	\$92,074

Annual Benefits from Crash Cost Savings \$125,721

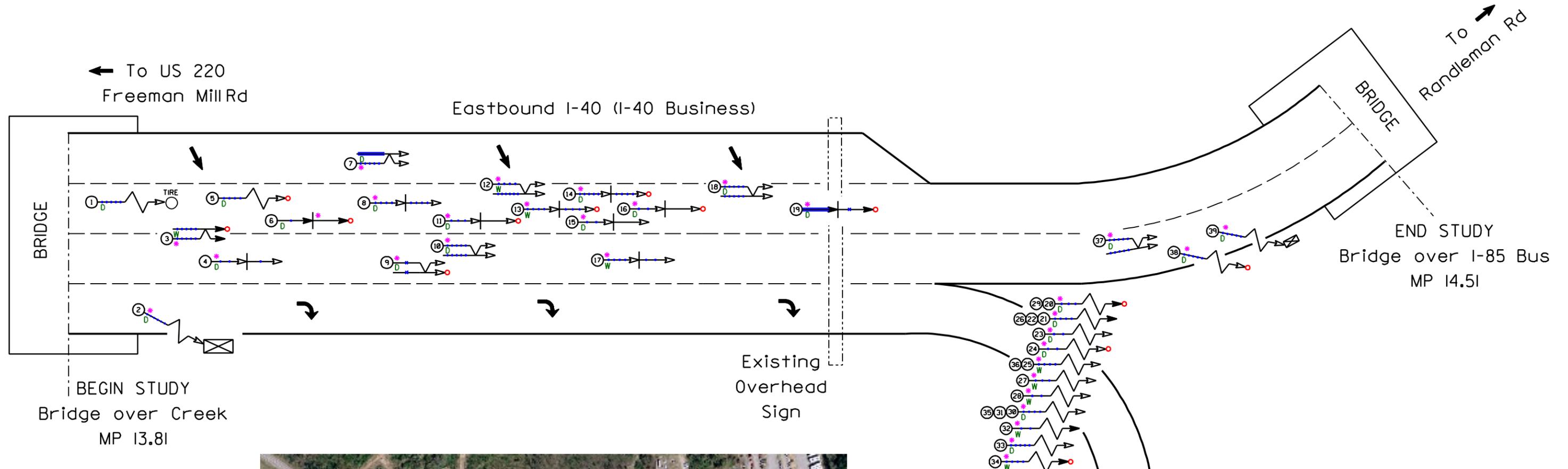
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$114,855

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.57

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - 11.57

SS# 07-00-219
 Guilford County
 City of Greensboro
 BEFORE Period
 5/1/99 - 11/30/03

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PARKED VEHICLE		BACKING
	PARKING VEHICLE		SIDESWIPE
	FIXED OBJECT		OUT OF CONTROL
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		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



Note Crash 5:
 Motorcycle lost control
 while avoiding a vehicle
 merging lanes



Order Number: 41000005546
Created by: J. Schronce
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N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRANSPORTATION MOBILITY and SAFETY DIVISION

