

Spot Safety Project Evaluation

Order # 41000002640

Spot Safety Project # 11-02-206 & 11-02-216

**Spot Safety Project Evaluation of the
Pole Mounted School Zone Flashers (SS-11-02-206) and
Left & Right Turn Lane Installations (SS-11-02-216)
US 221 / NC 194 at West Jefferson Elementary School
Ashe 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

5-11-2010

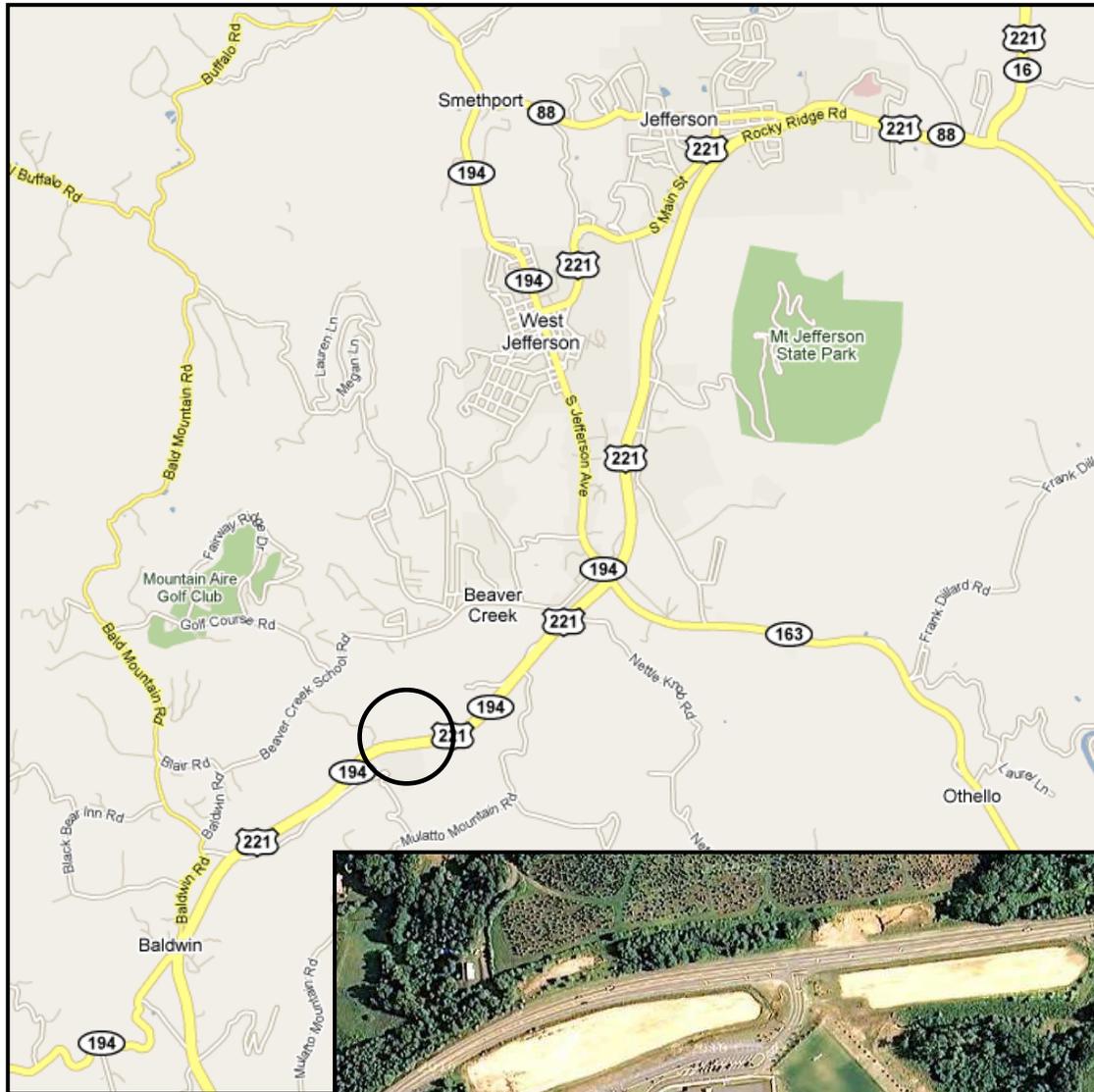
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 11-02-206 and 11-02-216 located at the Intersection of US 221 / NC 194 and the access driveway to West Jefferson Elementary School in Ashe County. The school is located on US 221 at Milepost 9.61 between SR 1143 and SR 1145.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation pole-mounted school zone flashers under SS# 11-02-206; and roadway widening for left and right turn lanes at the school driveway under SS# 11-02-216. US 221 / NC 194 is a two-lane thoroughfare with a 55 mph standard speed limit and 45 mph school zone speed limit. West Jefferson Elementary driveway presents one entrance lane and both a left and right turn exit lane.

The original statement of problem listed the potential for congestion and crashes during student drop-off and pick-up times. The new school increased the volume at this location and these projects were established in anticipation of the school opening.

The initial crash analysis was completed from February 1, 1999 to February 1, 2002 with no correctable crashes since the school was not operational until August 2003. The final completion date for these improvements was on June 30, 2004 with a combined total cost of \$56,000. The costs were split between \$6,000 for the flashers and \$50,000 for the widening and turn lanes.

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 year from July 2003 through June 2004. During this year, the school officially opened and the improvements were installed. The before period consisted of reported crashes from November 1, 1997 through June 30, 2003 (5 years and 8 months); and the after period consisted of reported crashes from July 1, 2004 through February 28, 2010 (5 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 1000 feet of the school intersection, US 221 Milepost Range 9.42 to 9.80. *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 School Zone Related Crashes were the target crashes for the applied countermeasure. The Target Crash Types include Rear-End, Slow or Stop; Left Turn, Same Roadway; Left Turn, Different Roadway; and Right Turn, Different Roadway; when accessing the school driveway.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	4	8	100.0 %
Total Severity Index	1.00	1.93	93.0 %
Target Crashes – SZ Related	1	4	300.0 %
Target Crash Severity Index	1.00	2.85	185.0 %
Volume (2000, 2007)	6,700	8,600	28.4 %

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

The naive before and after analysis at the treatment location resulted in a 100 percent increase in Total Crashes, a 300 percent increase in Target Crashes, and a 93 percent increase in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2007.

Results and Discussion

Referencing the *Collision Diagrams*, this location experienced reasonable increases in crashes considering the addition of the elementary school along this segment. Total crashes doubled from four (4) to eight (8) but still the after period only equates to 1.41 crashes per year. With the additional traffic from the school, this site is still functioning well. The increase in total crashes, target crashes, and the negative b-c ratio do not take into consideration volume increases and site development.

The one target crash in the before period consisted of a rear-end collision as a construction vehicle attempted to access the school area. With school being in operation, there were four (4) collisions from motorists entering/exiting the facility; one of the US 221 left turn same roadway crash resulted in a B-class injury.

The calculated benefit to cost ratio for this project is **(-0.56) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.49)**. 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 both major approaches to the treatment location showing both countermeasures. 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 North / Northeast on US 221 entering the School Zone



Traveling Northeast on US 221 at Pole Mounted Flasher



Traveling East on US 221 at West Jefferson Elementary



Traveling West on US 221 entering School Zone with Flasher



Traveling West on US 221 at West Jefferson Elementary



Looking South into the West Jefferson Elementary School approach

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 221 at West Jefferson Elem		BY: JBS							
COUNTY: Ashe		DATE: 4/28/2010							
FILE NO.: SS 11-02-206 & 11-02-216		NOTES: Total Crashes							
DETAILED COST:	TYPE IMPROVEMENT - SZ Flashers & Turn Lanes								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$56,000	10	0.149	\$8,346				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$56,000	10	0.149	\$8,346				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,000				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$9,346				
	TOTAL COST OF PROJECT=				\$56,000				
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	5.67	0	0.00	0	0.00	4	0.71	\$2,751	
AFTER	5.67	0	0.00	1	0.18	7	1.23	\$7,989	
								Annual Benefits from Crash Cost Savings	(\$5,238)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$14,584)			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.56			
TOTAL COST OF PROJECT		-	\$56,000	COMPREHENSIVE B/C RATIO		-	-0.56		

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

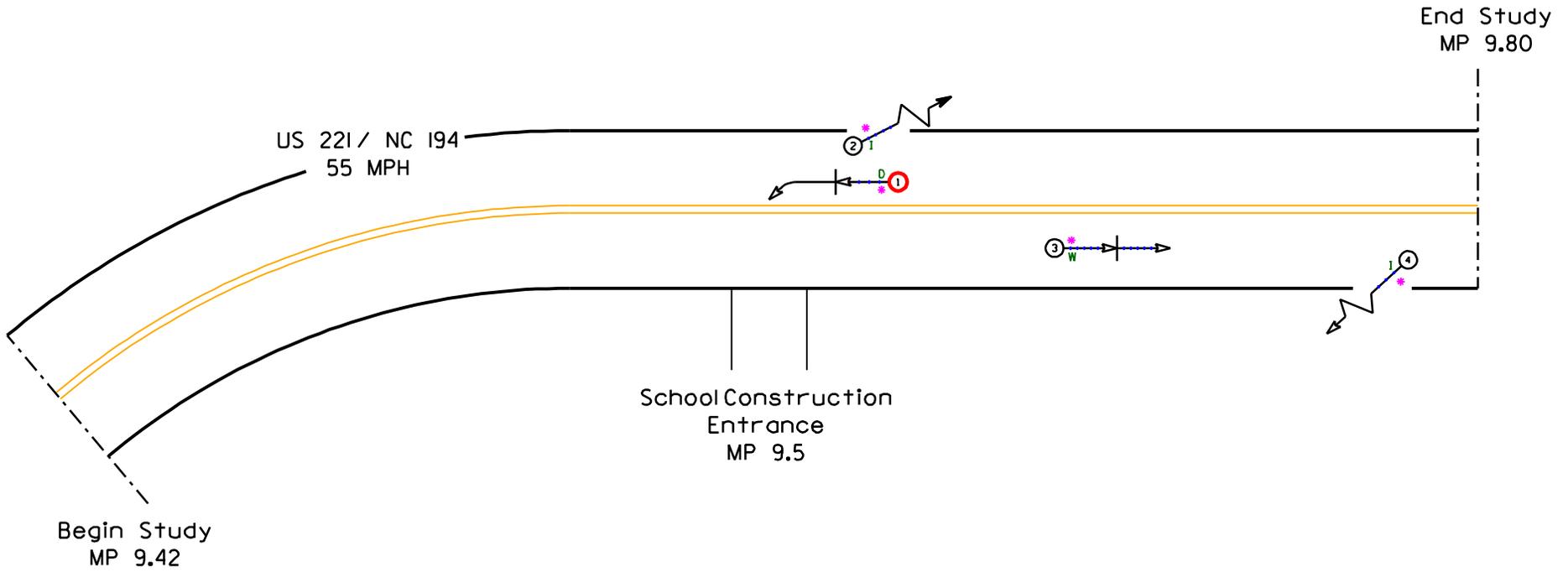
LOCATION: US 221 at West Jefferson Elem		BY: JBS							
COUNTY: Ashe		DATE: 4/27/2010							
FILE NO.: SS 11-02-206 & 11-02-216		NOTES: Target Crashes - SZ Related							
DETAILED COST:	TYPE IMPROVEMENT - SZ Flashers, Turn Lanes								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$56,000	10	0.149	\$8,346				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$56,000	10	0.149	\$8,346				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,000				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$9,346				
	TOTAL COST OF PROJECT=				\$56,000				
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	5.67	0	0.00	0	0.00	1	0.18	\$688	
AFTER	5.67	0	0.00	1	0.18	3	0.53	\$5,238	
								Annual Benefits from Crash Cost Savings	(\$4,550)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$13,896)			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.49			
TOTAL COST OF PROJECT		-	\$56,000	COMPREHENSIVE B/C RATIO		-	-0.49		

SS# II-02-206 & II-02-216
 Ashe County
 BEFORE Period
 11/1/1997 - 6/30/2003



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SHOULDER		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		HURT		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		70 AND UP		SPEED UNKNOWN
	RAN OFF ROAD				0		



School Zone
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION II	AREA:
	STUDY PERIOD: 11/1997 - 6/30/2003	
	DISTANCE: Y-LINE + OFT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 4-27-200		
LOG NUMBER: SS# II-02-206 & II-02-216 B		

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

SS# II-02-206 & II-02-216

Ashe County

AFTER Period

7/1/2004 - 2/28/2010

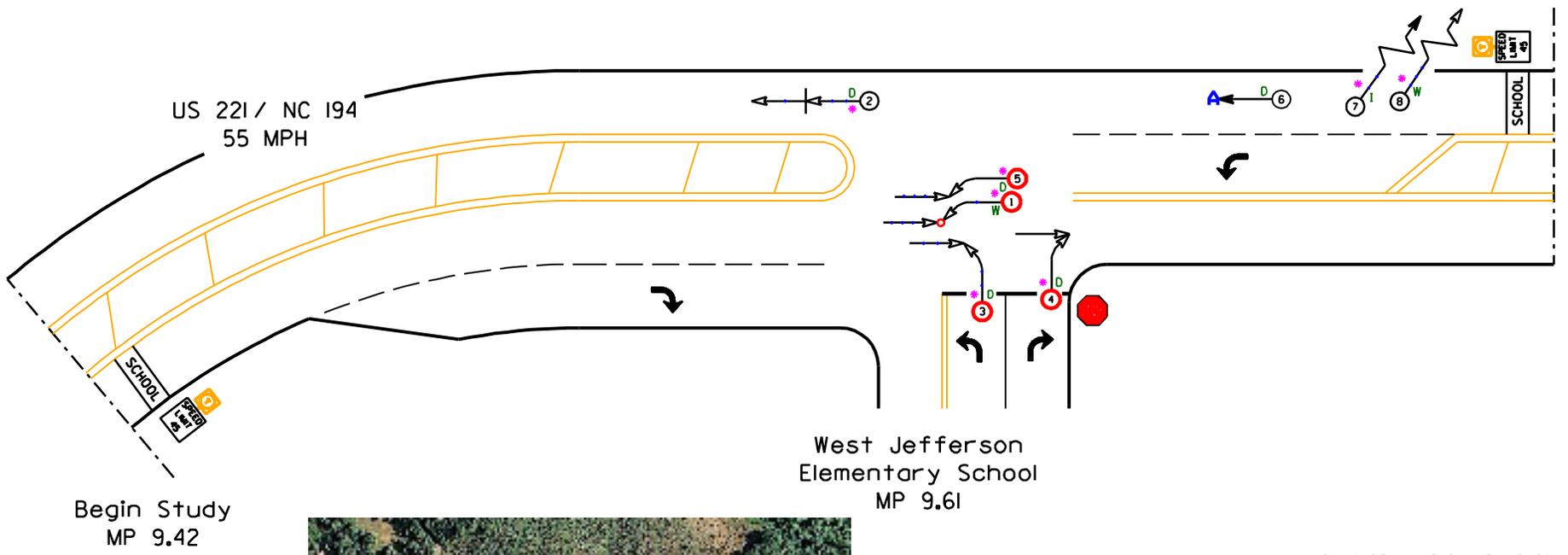


LEGEND

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

2 Spot Safety Projects:
 SS# II-02-206: Install School Zone Flashers
 SS# II-02-216: Widen US 221 for Turn Lanes

End Study
MP 9.80



School Zone
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION#	AREA:
	STUDY PERIOD: 7/1/2004 - 2/28/2010	
	DISTANCE: Y-LINE + OFT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-27-2010		
LOG NUMBER: SS# II-02-206 & II-02-216 A		

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
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