

Spot Safety Project Evaluation

Order # 4100000801

Spot Safety Project # 14-02-207

**Spot Safety Project Evaluation of the Signal Installation
US 25 and SR 1361 (Saint Johns Rd) / Baldwin Circle
City of Fletcher, Henderson 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

10-21-2009

Date

Traffic Safety Project Engineer

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 intersection traffic signal. US 25 was recently widened to a five-lane facility with a center turn lane and a posted speed limit of 45 mph. SR 1361 (Saint Johns Road) is a two lane roadway with right turn slip lane and a 35 mph posted speed limit. Baldwin Circle is a small residential facility also with a speed limit of 35 mph. The intersection was under stop sign control on the SR 1361 and Baldwin Circle approaches during the before periods.

The original statement of problem was that increased vehicle usage of this intersection has lead to congestion and delay. Also, there has been a developing left turn crash pattern from SR 1361 vehicles attempting to access US 25 (Hendersonville Road) northbound. The main intended purpose of this signal though was to help alleviate the congestion and delay issues.

The initial crash analysis was completed from March 1, 1999 to February 28, 2002 with four (4) reported crashes, three (3) of which were deemed correctable. The completion month for the widening of US 25 to a five lane roadway was May 2001 and was completed under Project R-2214. The final completion date for the signal installation at the subject intersection was on September 22, 2004 with a total cost of \$80,500.

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 January through May 2001 for the widening of US 25 to a 5-lane cross-section and September 2004 for the traffic signal installation. The analysis was split into three time periods:

Before - 2 Lane:	January 1, 1998 to December 31, 2000	(3.00 Years)
Before - 5 Lane:	June 1, 2001 to August 31, 2004	(3.25 Years)
After - Signal:	October 1, 2004 to June 30, 2009	(4.75 Years)

The ending date for this analysis was determined by the available crash data at the time of evaluation. 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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; Angle; and Ran-off Roadway for avoidance.

<u>Treatment Information</u>	Before 2-Lane 3.0 Years	Before 5-Lane 3.25 Years	After Signal 4.75 Years
Total Crashes	7	8	8
Total Crashes per Year	2.3	2.5	1.7
Total Severity Index	2.06	3.78	2.85
Target Crashes	2	7	3
Target Crashes per Year	0.7	2.2	0.6
Target Crash Severity Index	1.00	4.17	3.47
Volume	14,700	19,700	21,800

<u>Injury Crash Summary</u>	Before 2-Lane 3.0 Years	Before 5-Lane 3.25 Years	After Signal 4.75 Years
Fatal injury Crashes	0	0	0
Class A injury Crashes	0	0	0
Class B injury Crashes	0	0	1
Class C Injury Crashes	1	3	1
Total Injury Crashes	1	3	2
Injury Crashes per Year	0.33	0.92	0.42

The before period ADT years were 1999 and 2003; and the after period ADT year was 2007.

Results and Discussion

Referencing the *Collision Diagrams* from the widening of US 25 to a five-lane facility, frontal impact collisions at the intersection more than tripled from 0.7 to 2.2 crashes per year. Of these collisions, five (5) out of the seven (7) frontal impact crashes were vehicles on SR 1361 improperly accessing US 25 when attempting to travel north. With the installation of the signal, the rate once again dropped to 0.6 crashes per year with the frontal impact collisions resulting in one (1) left turn same roadway on US 25 and two (2) US 25 northbound red light run crashes.

The calculated benefit to cost ratio for this project is **0.67 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.06**. The b-c ratio was only calculated from the before 5 lane time period through the after period. 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 the US 25 mainline approaches to the treatment site. 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



Looking South on US 25 (Hendersonville Road) approaching intersection



Looking North on US 25 (Hendersonville Road) approaching intersection



Looking West onto SR 1361 (St. Johns Rd) from intersection



Looking East onto Baldwin Circle from intersection

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes (Before 5-Lane to After)

LOCATION: US 25 at SR 1361		BY: JBS						
COUNTY: Henderson		DATE: 10/20/2009						
FILE NO.: SS 14-02-207		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$80,500	10	0.149	\$11,997			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$80,500	10	0.149	\$11,997			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$15,097			
	TOTAL COST OF PROJECT=				\$80,500			
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	3.25	0	0.00	3	0.92	5	1.54	\$22,615
AFTER	4.75	0	0.00	2	0.42	6	1.26	\$12,505
						Annual Benefits from Crash Cost Savings		\$10,110
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$4,987)		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	0.67		
	TOTAL COST OF PROJECT	-	\$80,500	COMPREHENSIVE B/C RATIO	-			0.67

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes (Before 5 Lane to After)

LOCATION: US 25 at SR 1361		BY: JBS						
COUNTY: Henderson		DATE: 10/20/2009						
FILE NO.: SS 14-02-207		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT -	New Traffic Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$80,500	10	0.149	\$11,997			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$80,500	10	0.149	\$11,997			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$15,097			
	TOTAL COST OF PROJECT=				\$80,500			
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	3.25	0	0.00	3	0.92	4	1.23	\$21,415
AFTER	4.75	0	0.00	1	0.21	2	0.42	\$5,432
						Annual Benefits from Crash Cost Savings		\$15,984
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$887		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	1.06		
	TOTAL COST OF PROJECT	-	\$80,500	COMPREHENSIVE B/C RATIO	-			1.06



US 25
Hendersonville Rd
45 MPH



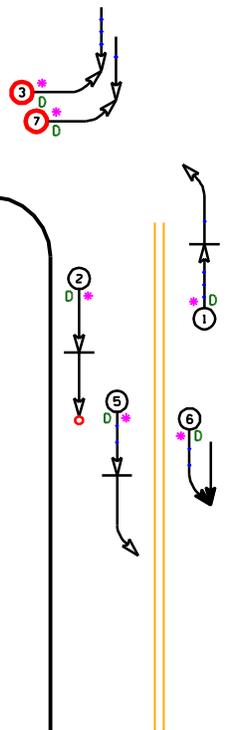
Baldwin Circle

SR 1361
Saint Johns Rd
35 MPH



Fabric Shop

Automotive Shop



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		HAZARD		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		9 MPH OR LESS		70 MPH TO 79		ONLY

SS# 14-02-207
Henderson County
City of Fletcher
BEFORE Period
US-25: 2 Lane
1/1/98 - 12/31/00
3.0 Years

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: M	AREA:
STUDY PERIOD: 1/1/98 - 12/31/2000		
DISTANCE: Y-LINE + 150 FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 10-15-2009		
LOG NUMBER: SS# 14-02-207 BEFORE 2Ln		

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



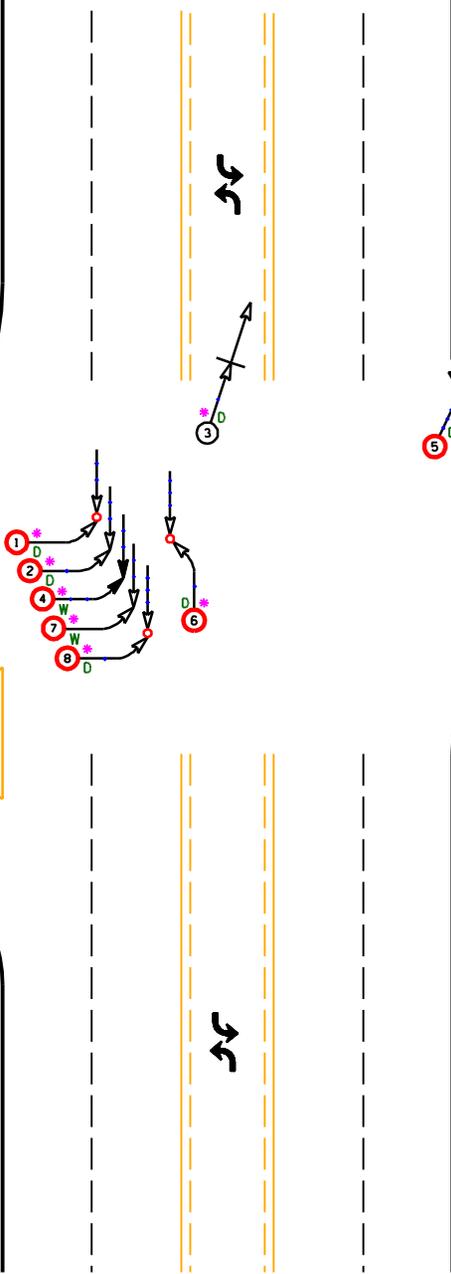
US 25
Hendersonville Rd
45 MPH

SR 1361
Saint Johns Rd
35 MPH

Baldwin Circle

Automotive Shop

Fabic Shop



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		HURRY		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		TO AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY

SS# 14-02-207
Henderson County
City of Fletcher
BEFORE Period
US-25: 5 Lane
6/1/01 - 8/31/04
3.25 Years

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION 14	AREA:
	STUDY PERIOD: 6/1/2001 - 8/3/2004	
	DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 10-15-2009		
LOG NUMBER: SS# 14-02-207 BEFORE SLR		

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



US 25
Hendersonville Rd
45 MPH

SR 1361
Saint Johns Rd
35 MPH

Baldwin Circle

Fabic Shop

Automotive Shop

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PARKED 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		HURRY		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		TO AND UP		70 MPH TO 79		ONLY

SS# 14-02-207
Henderson County
City of Fletcher
AFTER Period
US-25: 5 Lane
10/1/04 - 6/30/09
4.75 Years



New Signalized
Intersection
Sig ID 14-1039

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: M	AREA:
	STUDY PERIOD: 10/1/2004 - 6/30/2009	
	DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 10-15-2009		
LOG NUMBER: SS# 14-02-207 AFTER Sig		

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DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION