Spot Safety Project Evaluation

Project Log # 200901027

Spot Safety Project # 08-01-206

Spot Safety Project Evaluation of the Traffic Signal Installation
US 311 (S. Main Street) and SR 1570 (Tom Hill Road)
Randolph 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

Traffic Safety Project Engineer

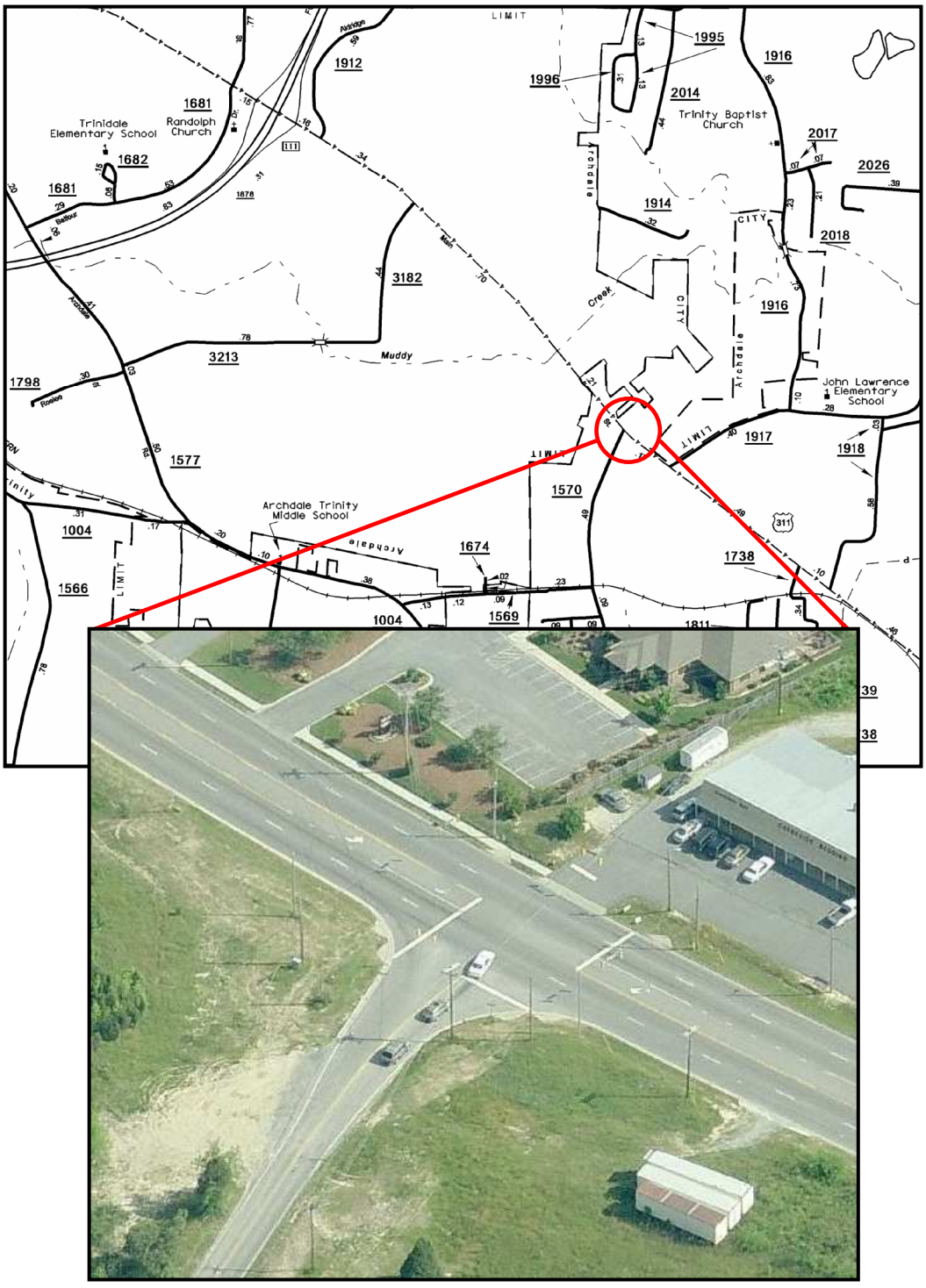
5-20-2009
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-01-206 located at the Intersection of US 311 (South Main Street) and SR 1570 (Tom Hill Road) in Randolph County, near the City of Archdale.

The Sig ID is 08-0517 for this subject intersection.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a new traffic signal. US 311 was upgraded through this location to a five-lane curb and gutter facility in September of 1999 with a continuous center turn lane and a 45 mph speed limit. SR 1570 (Tom Hill Road) is a two-lane rural roadway with a 45 mph posted speed limit. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1570.

The original statement of problem was the presence of frontal impact type collisions as vehicles attempt to enter US 311 from the side street. However, the initial crash analysis and validation for this project was conducted when US 311 was a two-lane roadway facility. The intended purpose of the new traffic signal was to alleviate crashes and bring awareness to the intersection.

The initial crash analysis was completed from December 31, 1997 to December 31, 2000 with seven (7) reported crashes, four (4) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on April 3, 2003 with a total cost of $60,000.00.

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 the month of April 2003. The before period consisted of reported crashes from January 1, 2000 through March 31, 2003 (3 years and 3 months); and the after period consisted of reported crashes from May 1, 2003 through July 31, 2006 (3 years and 3 months). The ending date for this analysis was limited by the date of widening of US 311 to a five-lane cross section in September of 1999.

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, different roadways; Head on; Angle; and other types when attempting to avoid an angle collision.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	5	9	80.0 %
Total Severity Index	5.44	3.47	- 36.2 %
Target Crashes	5	5	0.0 %
Target Crash Severity Index	5.44	2.48	- 54.4 %
Volume	19,100	20,900	9.4 %

Injury Crash Summary	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	2	0	- 100.0 %
Class C Injury Crashes	1	3	100+ %
Total Injury Crashes	3	3	0.0 %

The naive before and after analysis at the treatment location resulted in an 80 percent increase in Total Crashes, zero change in Target Crashes, but a 36 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 80 percent increase in Total Crashes and no change in the number of Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have remained steady and/or increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period consisted of a defined pattern of left turning motorists from SR 1570 improperly judging gap acceptance. After the signal installation, the number of target crashes has remained consistent at five with three of these being red-light run collisions, one US 311 permissive green left turn crash, and one right turn hit-and-run. Rear-end collisions on US 311 have also developed traveling northbound with a small pattern of three crashes in the after period.

The calculated benefit to cost ratio for this project is **(-0.40) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.72**. 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 for all three 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 TAKEN 4/15/2009

Traveling North on US 311 (S. Main Street)

Traveling North on US 311

Traveling Northeast on SR 1570 (Tom Hill Road)

Traveling Northeast on SR 1570

Traveling South on US 311 (S. Main Street)

Traveling South on US 311

Facing West from Creekside Bedding PVA

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 311 at SR 1570 | BY: JBS
COUNTY: Randolph | DATE: 5/19/2009
FILE NO.: SS 08-01-206 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$60,000	10	0.149	$8,942
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$60,000	10	0.149	$8,942

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $12,042
TOTAL COST OF PROJECT= $60,000

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	3.25	0	0.00	3	0.92	2	0.62	$19,015
AFTER	3.25	0	0.00	3	0.92	6	1.85	$23,815

Annual Benefits from Crash Cost Savings ($4,800)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($16,842)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.40

TOTAL COST OF PROJECT - $60,000 COMPREHENSIVE B/C RATIO - -0.40

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 311 at SR 1570 | BY: JBS
COUNTY: Randolph | DATE: 5/19/2009
FILE NO.: SS 08-01-206 | NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$60,000	10	0.149	$8,942
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$60,000	10	0.149	$8,942

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $12,042
TOTAL COST OF PROJECT= $60,000

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	3.25	0	0.00	3	0.92	2	0.62	$19,015
AFTER	3.25	0	0.00	1	0.31	4	1.23	$10,338

Annual Benefits from Crash Cost Savings $8,677

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($3,365)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.72

TOTAL COST OF PROJECT - $60,000 COMPREHENSIVE B/C RATIO - 0.72

SS# 08-01-206
Randolph County
BEFORE Period
1/1/00 - 3/31/03

LEGEND

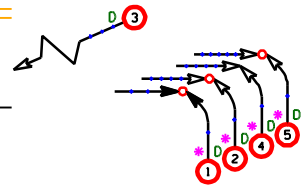
MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

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

US 311
S. Main Street
45 MPH



STOP

SR 1570
Tom Hill Rd
45 MPH

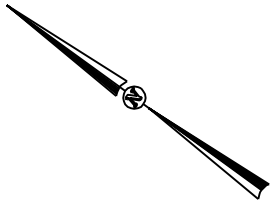
Note Crash 3 - Motorcycle laid-over to avoid an Angle Collision

(#) Frontal Impact Target Crashes

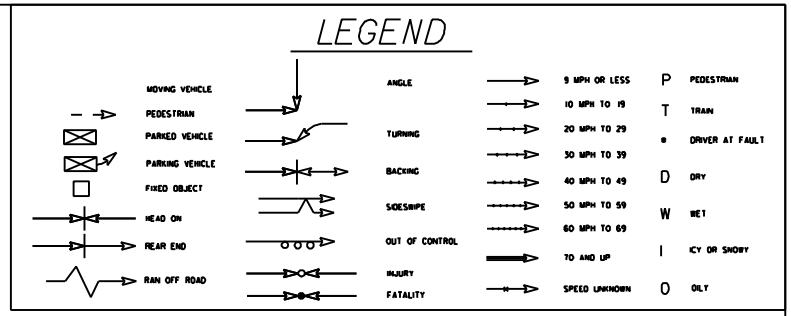
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

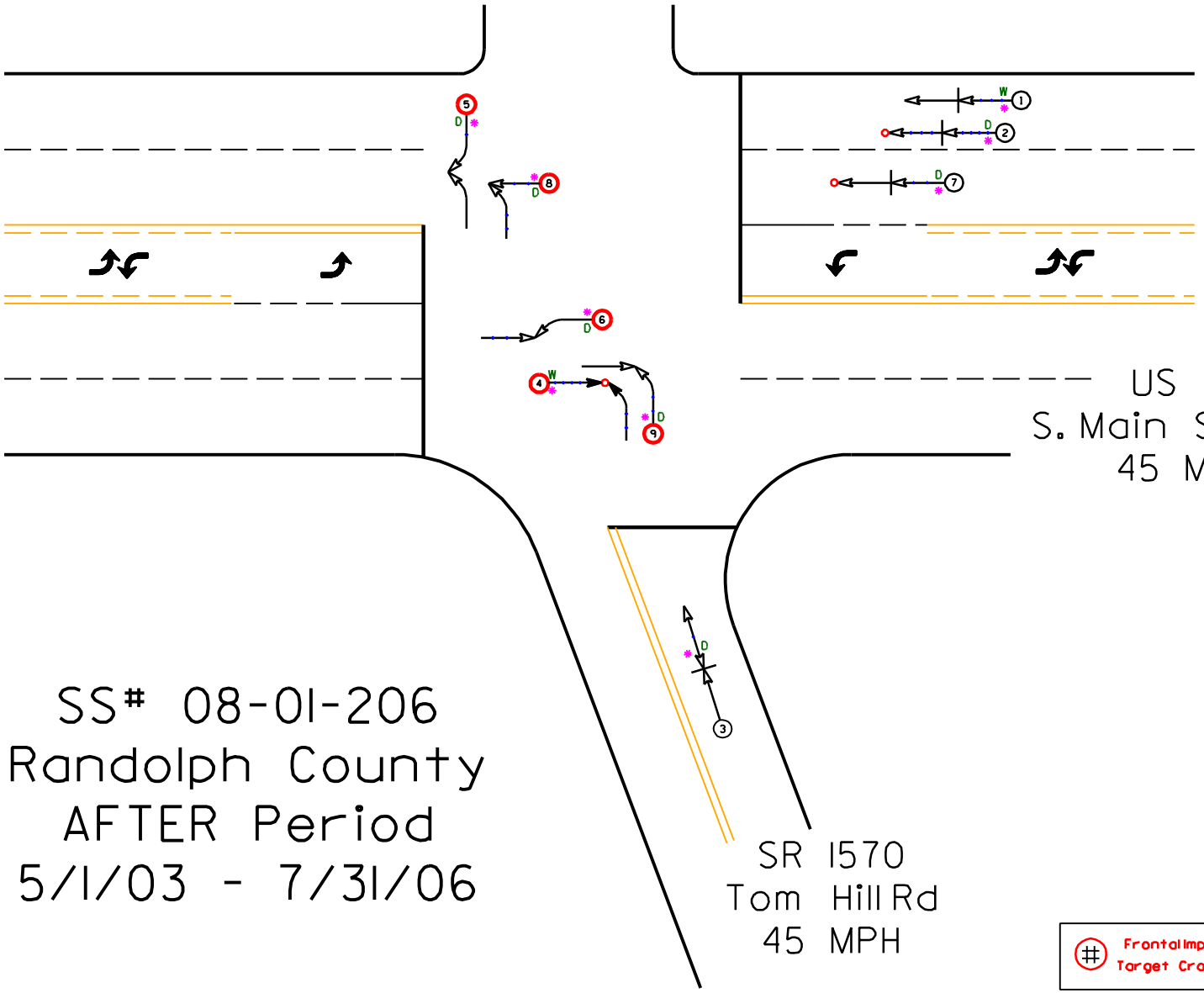
COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 1/1/2000 - 3/31/2003	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 5-19-2009	
LOG NUMBER: SS# 08-01-206 BEFORE	

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



Creekside
Bedding
PVA





New Signalized
Intersection
Sig ID 08-0517

SS# 08-01-206
Randolph County
AFTER Period
5/1/03 - 7/31/06

Frontal Impact Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 5/1/2003 - 7/31/2006	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 5-19-2009	
LOG NUMBER: SS# 08-01-206 AFTER	

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