

Spot Safety Project Evaluation

Order # 41000010352

Spot Safety Project # 05-03-023

**Spot Safety Project Evaluation of the Installation
of Left Turn Lanes on SR 1301 (Sunset Lake Road)
At the Intersection of SR 1301 (Sunset Lake Road)
and SR 1393 (Bass Lake Road / Hilltop-Needmore Road)
North of Fuquay Varina, In Wake County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Chad J. Neilson

12-30-2010
Date

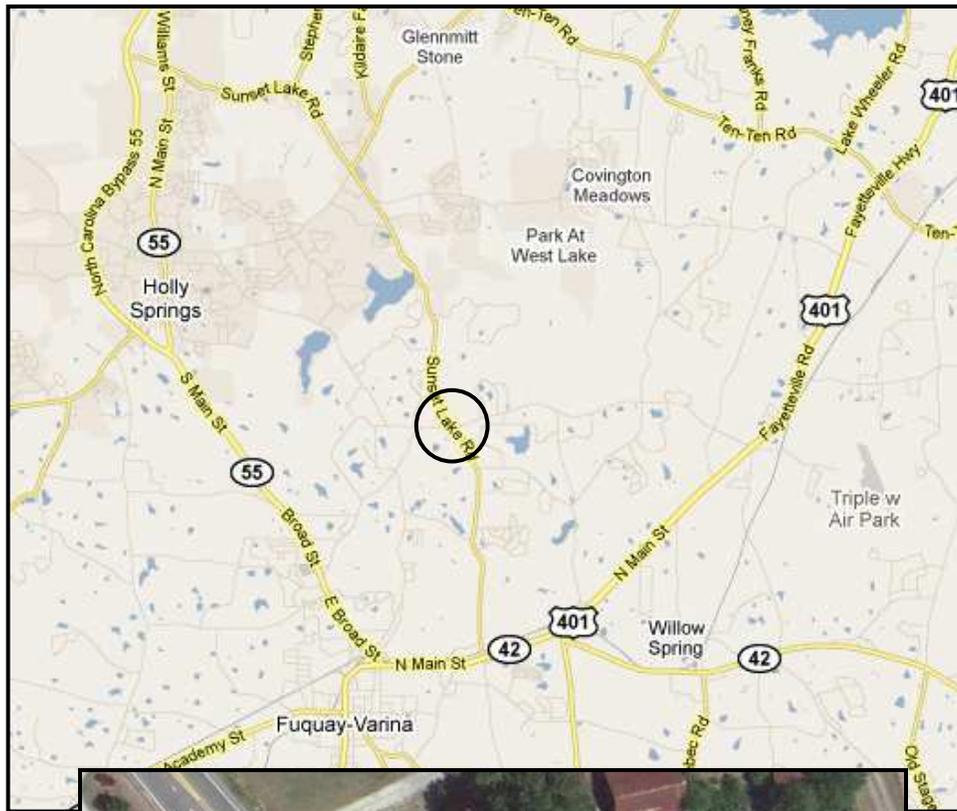
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-03-023 located at the intersection of SR 1301 (Sunset Lake Road) and SR 1393 (Bass Lake Road / Hilltop-Needmore Road) north of Fuquay Varina, Wake County.

The signal ID for the existing signal is 05-0719.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of left turn lanes on SR 1301 (Sunset Lake Road) at the intersection of SR 1301 (Sunset Lake Road) and SR 1393 (Bass Lake Road / Hilltop-Needmore Road). SR 1301 (Sunset Lake Road) is a two-lane facility at the subject intersection with a speed limit of 35 mph for both approaches. SR 1393 (Bass Lake Road / Hilltop-Needmore Road) is a two-lane facility with a speed limit of 45 mph for both approaches. The subject location is a signalized four-leg intersection.

The original statement of problem was long delays with congestion.

The initial crash analysis was completed from February 1, 2000 to January 31, 2003 with twenty (20) reported crashes, of which nine (9) were deemed correctable. The final completion date for the improvement at the subject intersection was on August 3, 2006 with a total cost of \$222,000.00.

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 were the months of March 2006 through September 2006. The before period consisted of reported crashes from February 1, 2002 through February 28, 2006 (4 years and 1 month); and the after period consisted of reported crashes from October 1, 2006 through October 31, 2010 (4 years and 1 month). 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 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 left turn, same roadway crashes and rear end crashes along SR 1301 (Sunset Lake road) were the target crashes for the applied countermeasure.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	25	22	- 12.00 %
Total Crash Severity Index	7.29	2.01	- 72.43 %
Target Crashes	10	11	10.00 %
Target Crash Severity Index	11.54	2.35	- 79.64 %
Volume (2004, 2008)	18,600	18,800	1.08 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	3	0	- 100.00 %
Class C Injury Crashes	8	3	- 62.50 %
Total Injury Crashes	12	3	- 75.00 %

The naive before and after analysis at the treatment location resulted in a twelve (12) percent decrease in Total Crashes, ten (10) percent increase of Target Crashes, and a seventy-two (72) percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented ten (10) target crashes. There was a northbound rear-end crash pattern at the intersection that accounted for three (3) target crashes. There was a left-turn, same roadway crash pattern that accounted for six (6) target crashes. After the installation of the northbound and southbound left-turn lanes, there were eleven (11) target crashes. The northbound rear-end crash pattern increased in the after period to four (4) target crashes. The southbound rear-end crash pattern accounted for three (3) crashes in the after period. The left turn, same roadway crash pattern was reduced to four (4) target crashes.

The calculated benefit to cost ratio for this project is **9.49 considering total crashes**. The benefit to cost ratio **considering only target crashes is 8.11**. 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.

Photos were provided for this location by Google Street View for all four approaches of this 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



Looking North on SR 1301 (Sunset Lake Rd)



Looking West on SR 1393 (Hilltop-Needmore Rd)



Looking South on SR 1301 (Sunset Lake Rd)



Looking East on SR 1393 (Bass Lake Rd)

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: SR 1301 (Sunset Lake Road) at SR 1393 (Bass Lake Road / Hilltop-Needr		BY: C Neilson							
COUNTY: Wake		DATE: 12/23/2010							
FILE NO.: SS 05-03-023									
DETAILED COST:	TYPE IMPROVEMENT - Left Turn Lane Install								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$168,000	20	0.102	\$17,111				
		\$0	0	0.000	\$0				
	Right-of-Way	\$32,000	50	0.082	\$2,616				
	TOTALS	\$200,000	22	0.099	\$19,727				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$19,727				
	TOTAL COST OF PROJECT=				\$200,000				
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	4.08	1	0.25	11	2.70	13	3.19	\$222,034	
AFTER	4.08	0	0.00	3	0.74	19	4.66	\$34,730	
								Annual Benefits from Crash Cost Savings	\$187,304
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$167,577			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	9.49			
TOTAL COST OF PROJECT		-	\$200,000	COMPREHENSIVE B/C RATIO		-	9.49		

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: SR 1301 (Sunset Lake Road) at SR 1393 (Bass Lake Road / Hilltop-Needr		BY: C Neilson							
COUNTY: Wake		DATE: 12/23/2010							
FILE NO.: SS 05-03-023									
DETAILED COST:	TYPE IMPROVEMENT - Left Turn Lane Install								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$168,000	20	0.102	\$17,111				
		\$0	0	0.000	\$0				
	Right-of-Way	\$32,000	50	0.082	\$2,616				
	TOTALS	\$200,000	22	0.099	\$19,727				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$19,727				
	TOTAL COST OF PROJECT=				\$200,000				
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	4.08	1	0.25	4	0.98	5	1.23	\$179,289	
AFTER	4.08	0	0.00	2	0.49	9	2.21	\$19,289	
								Annual Benefits from Crash Cost Savings	\$160,000
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$140,273			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	8.11			
TOTAL COST OF PROJECT		-	\$200,000	COMPREHENSIVE B/C RATIO		-	8.11		

AA DT (YEAR)
6600 (2004)

AA DT (YEAR)
12000 (2004)

GAS STATION

35 MPH

45 MPH

SR 1393 (BASS LAKE ROAD)

PVA

GRASS

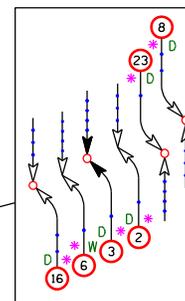
SR 1301 (SUNSET LAKE ROAD)

LEGEND

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



SIGNAL ID : 05-0719



SR 1393 (HILLTOP-NEEDMORE ROAD)

AA DT (YEAR)
6600 (2004)

45 MPH

35 MPH

AA DT (YEAR)
12000 (2004)

SR 1301 (SUNSET LAKE ROAD)

SS# 05-03-023
Order# 41000010352
Wake County
BEFORE Period
2/1/02 - 2/28/06



Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-23-2010

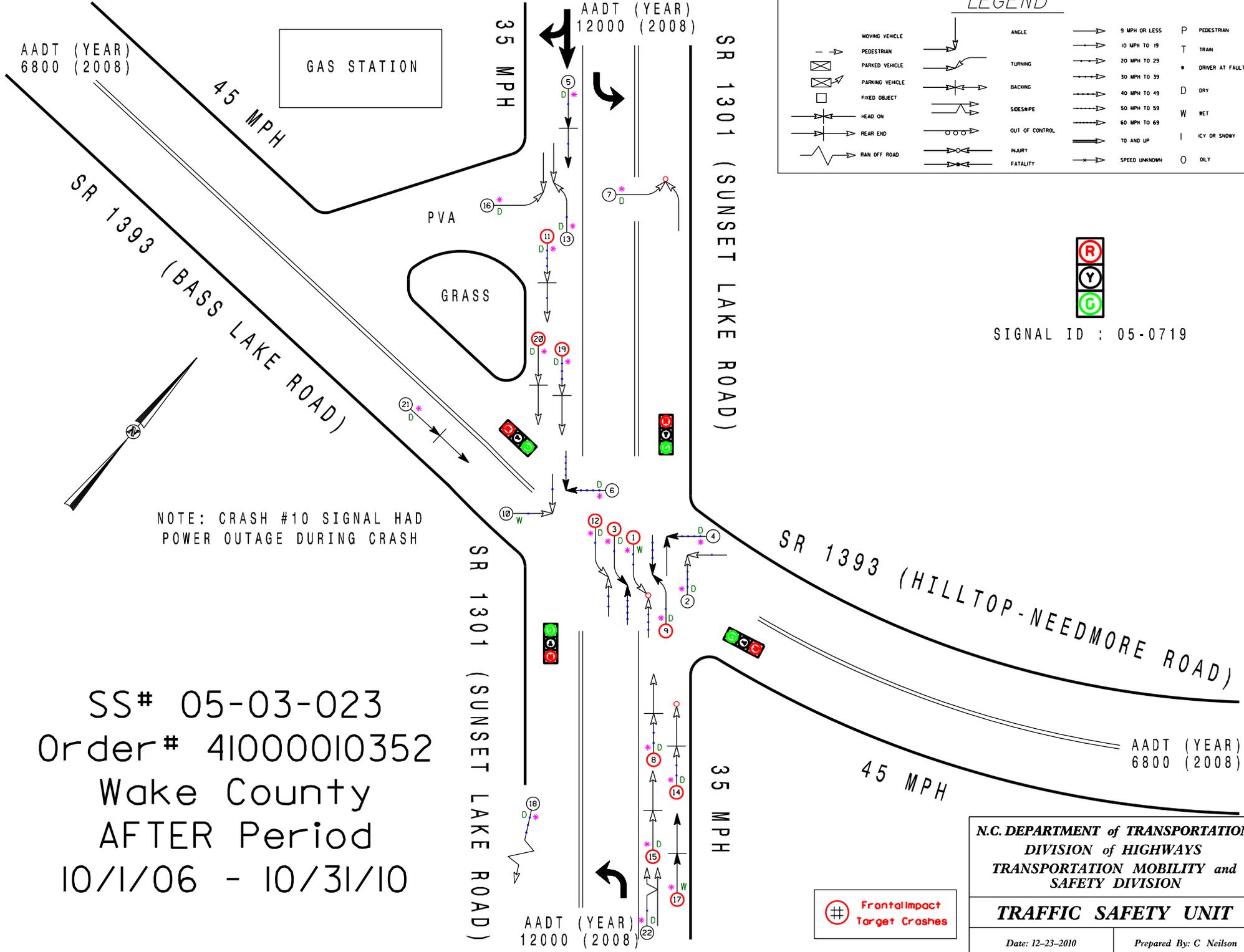
Prepared By: C Neilson

AADT (YEAR)
6800 (2008)

AADT (YEAR)
12000 (2008)

AADT (YEAR)
12000 (2008)

AADT (YEAR)
6800 (2008)



GAS STATION

PVA

GRASS

SR 1393 (BASS LAKE ROAD)

SR 1301 (SUNSET LAKE ROAD)

SR 1393 (HILLTOP-NEEDMORE ROAD)

SR 1301 (SUNSET LAKE ROAD)

LEGEND

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



SIGNAL ID : 05-0719

NOTE: CRASH #10 SIGNAL HAD POWER OUTAGE DURING CRASH

SS# 05-03-023
Order# 41000010352
Wake County
AFTER Period
10/1/06 - 10/31/10

⊕ Frontal Impact
Target Crashes

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DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
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TRAFFIC SAFETY UNIT

Date: 12-23-2010

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