

Spot Safety Project Evaluation

Order # 41000010278

Spot Safety Project # 05-03-205

**Spot Safety Project Evaluation of the Installation of a
Traffic Signal with Left-turn Lanes along SR 1393 (Hilltop-Needmore Road)
At the Intersection of SR 1393 (Hilltop-Needmore Road) and SR 1404 (Johnson Pond 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

12-22-2010

Date

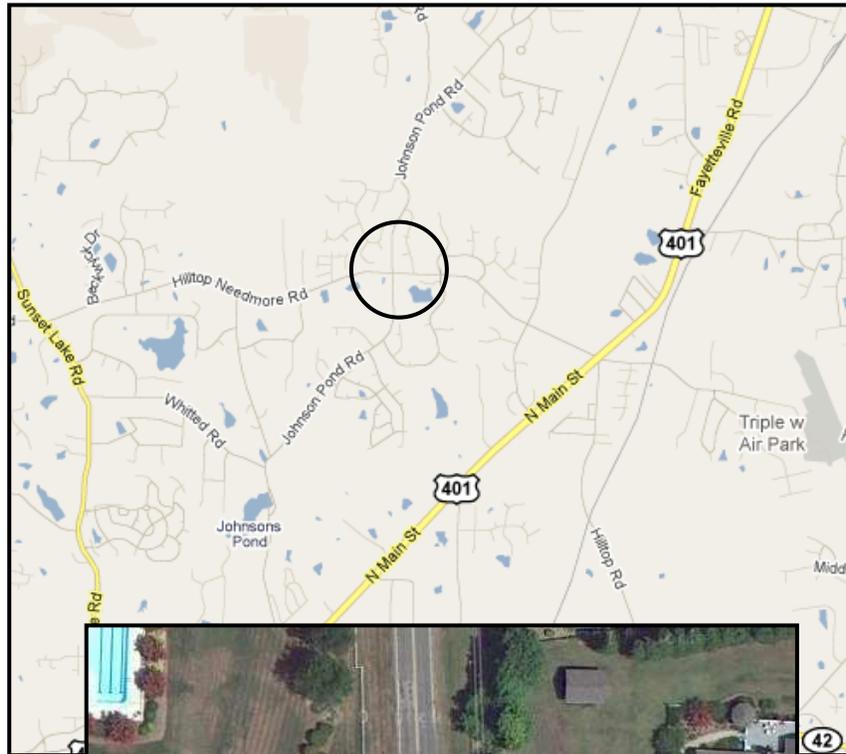
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-03-205 located at the intersection of SR 1393 (Hilltop-Needmore Road) and SR 1404 (Johnson Pond Road) north of Fuquay Varina, Wake County.

The signal ID for the newly installed signal is 05-1702.



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 traffic signal with left turn lanes along SR 1393 (Hilltop-Needmore Road) at the intersection of SR 1393 (Hilltop-Needmore Road) and SR 1404 (Johnson Pond Road). SR 1393 (Hilltop-Needmore Road) is a two-lane facility at the subject intersection with speed limit of 45 mph for both approaches. SR 1404 (Johnson Pond Road) is a two-lane facility with a speed limit of 45 mph for both approaches. The subject location is a stop sign controlled, with overhead flashers, four-leg intersection with the SR 1404 (Johnson Pond Road) approaches encountering the stop sign condition.

The original statement of concern was vehicles on SR 1404 (Johnson Pond Road) cannot cross or enter the intersection safely due to insufficient gaps in traffic.

The initial crash analysis was completed from May 1, 2000 to April 30, 2003 with seventeen (17) reported crashes, of which sixteen (16) were deemed correctable. The final completion date for the improvement at the subject intersection was on August 3, 2006 with a total cost of \$232,520.00.

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 July 2006 through September 2006. The before period consisted of reported crashes from June 1, 2002 through June 30 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 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; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	22	6	- 72.72 %
Total Crash Severity Index	8.48	14.87	75.35 %
Target Crashes	19	2	- 89.47 %
Target Crash Severity Index	9.27	38.90	319.63 %
Volume (2004, 2008)	10,000	11,300	13.00 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.00 %
Class B injury Crashes	4	0	- 100.00 %
Class C Injury Crashes	8	1	- 87.50 %
Total Injury Crashes	13	2	- 84.62 %

The naive before and after analysis at the treatment location resulted in a seventy-two (72) percent decrease in Total Crashes, eighty-nine (89) percent decrease of Target Crashes, and a seventy-five (75) percent increase 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 nineteen (19) target crashes. There was a southbound angle crash pattern that accounted for six (6) target crashes. There was a northbound angle crash pattern that accounted for eight (8) target crashes. After the installation of the traffic signal and left-turn lanes, there were two (2) target crashes. The southbound angle crash pattern was eliminated in the after period. The northbound angle crash pattern was reduced to two (2) target crashes.

The calculated benefit to cost ratio for this project is **1.62 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.65**. 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 1404 (Johnson Pond Rd)



Looking West on SR 1393 (Hilltop-Needmore Rd)



Looking South on SR 1404 (Johnson Pond Rd)



Looking East on NC 42

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: SR 1393 (Hilltop-Needmore Road) at SR 1404 (Johnson Pond Road)		BY: C Neilson						
COUNTY: Wake		DATE: 12/21/2010						
FILE NO.: SS 05-03-205								
DETAILED COST:	TYPE IMPROVEMENT -	Signal Installation						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$217,520	10	0.149	\$32,417			
		\$0	0	0.000	\$0			
	Right-of-Way	\$15,000	50	0.082	\$1,226			
	TOTALS	\$232,520	10	0.145	\$33,643			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$36,543			
	TOTAL COST OF PROJECT=				\$232,520			
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	12	2.94	9	2.21	\$222,721
AFTER	4.08	1	0.25	1	0.25	4	0.98	\$163,529
							Annual Benefits from Crash Cost Savings	\$59,191
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$22,648		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	1.62		
	TOTAL COST OF PROJECT	-	\$232,520	COMPREHENSIVE B/C RATIO	-			1.62

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: SR 1393 (Hilltop-Needmore Road) at SR 1404 (Johnson Pond Road)		BY: C Neilson						
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FILE NO.: SS 05-03-205								
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	Right-of-Way	\$15,000	50	0.082	\$1,226			
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	TOTAL ANNUAL COST=				\$36,543			
	TOTAL COST OF PROJECT=				\$232,520			
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	7	1.72	\$215,711
AFTER	4.08	1	0.25	0	0.00	1	0.25	\$155,466
							Annual Benefits from Crash Cost Savings	\$60,245
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$23,702		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	1.65		
	TOTAL COST OF PROJECT	-	\$232,520	COMPREHENSIVE B/C RATIO	-			1.65

SS# 05-03-205
 Order# 41000010278
 Wake County
 BEFORE Period
 6/1/02 - 6/30/06

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	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		TO AND LIP		50 MPH TO 59		ICY OR SNOWY
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		9 MPH OR LESS		ONLY

SR 1404
 (JOHNSON POND ROAD)

AAADT (YEAR)
 4200 (2004)

45 MPH

NOTE : Crash #66 "at fault" vehicle swirved to avoid angle crash with NB vehicle

SR 1393 (HILLTOP-NEEDMORE ROAD)

45 MPH

AAADT (YEAR)
 6400 (2004)

AAADT (YEAR)
 6400 (2004)

45 MPH

SR 1393 (HILLTOP-NEEDMORE ROAD)

45 MPH

SR 1404
 (JOHNSON POND ROAD)

AAADT (YEAR)
 3100 (2004)



Frontal Impact
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-21-2010

Prepared By: C Neilson

SS# 05-03-205
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 Wake County
 AFTER Period
 10/1/06 - 10/31/10

SR 1404
 (JOHNSON POND ROAD)

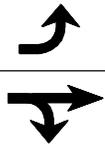
AADT (YEAR)
 4900 (2008)

45 MPH

SR 1393 (HILLTOP-NEEDMORE ROAD)

45 MPH

← AADT (YEAR)
 7200 (2008)



45 MPH



COUNTERMEASURE :
 NEW SIGNAL ID : 05-1702

45 MPH

SR 1404
 (JOHNSON POND ROAD)

SR 1404
 (JOHNSON POND ROAD)

SR 1393 (HILLTOP-NEEDMORE ROAD)



Frontal Impact
 Target Crashes

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
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