

Spot Safety Project Evaluation

Order # 41000007120

Spot Safety Project # 05-03-217

**Spot Safety Project Evaluation of the Monolithic Island Installation
On the South Leg at the Intersection of US 401 (Main Street)
And SR 2768 (Judd Parkway)
City 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

9-22-2010

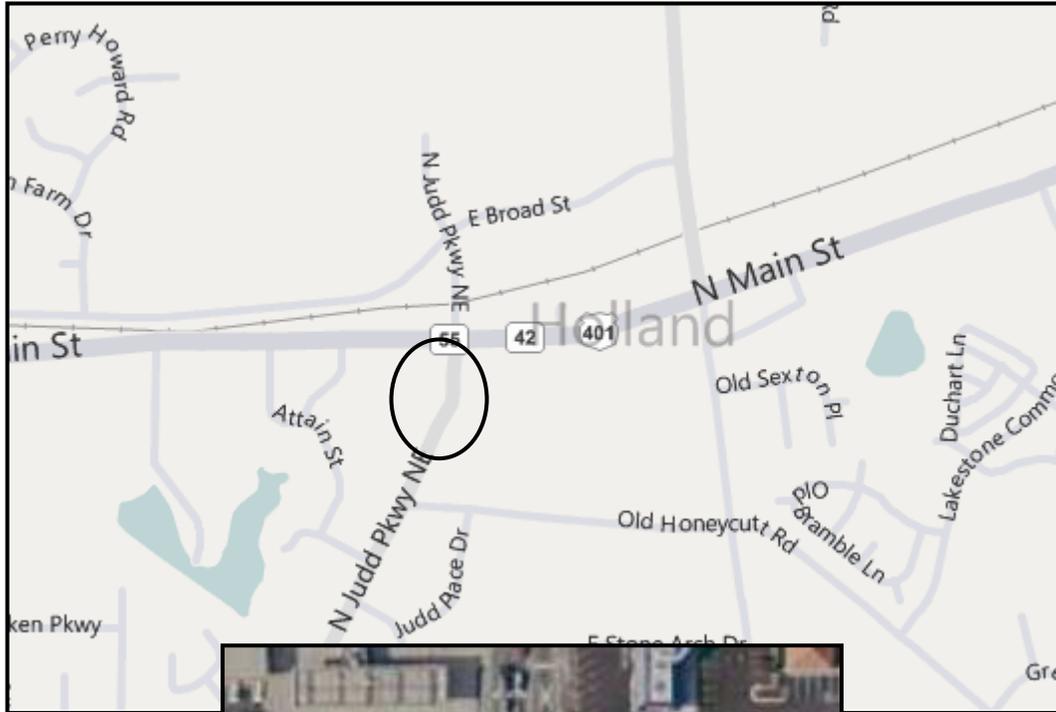
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-03-217 located just south of the Intersection of US 401 (Main Street) and SR 2768 / SR 5056 (Judd Parkway) in the city of Fuquay Varina, in Wake County.



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 monolithic island on the south leg at US 401 (Main Street) and SR 2768 / SR 5056 (Judd Parkway). US 401 (Main Street) is a five-lane facility with a center two-way-left-turn-lane and has a speed limit of 45 mph. SR 2768 / SR 5056 (Judd Parkway) is a three-lane facility with a two-way-center-left-turn lane and designated turn lanes at US 401 (Main Street). It has a speed limit of 35 mph. For the purpose of this study the intersections will be referred to as the following:

- Location 1 - SR 2768 (Judd Parkway) and Rose's Entrance / KFC Entrance
- Location 2 - US 401 / NC 42 / NC 55 (Main Street) and SR 2768 / SR 5056 (Judd Parkway)

The original statement of problem was the concern for crashes due to insufficient gaps along SR 2768 (Judd Parkway) for vehicles attempting to enter the roadway at Location 1. The intended purpose of the new monolithic island is to prevent vehicles from turning left into and out of Rose's Entrance / Exit and KFC Entrance / Exit.

The initial crash analysis was completed from December 1, 1999 to November 30, 2002 with thirteen (13) reported crashes, eight (8) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on March 5, 2005 with a total cost of \$80,000.00.

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 February 2005 and March 2005. The before period consisted of reported crashes from November 1, 1999 through January 31, 2005 (5 years and 3 months); and the after period consisted of reported crashes from April 1, 2005 through June 30, 2010 (5 years and 3 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 crashes that occurred on SR 2768 (Judd Parkway) where the monolithic island was installed, Location 1. The data also consists of all crashes within 150 feet of the US 401 (Main Street) and SR 2768 / SR 5056 (Judd Parkway) intersection, Location 2. *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 at Location 1 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; Head on; and Angle. There are no target crashes at Location 2.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	73	164	124.66 %
Total Crash Severity Index	4.17	2.35	- 43.65 %
Location 1 Crashes	17	16	- 5.88 %
Location 2 Crashes	56	148	164.29 %
Location 1 Target Crashes	17	0	N/A
Location 1 Target Crash Severity Index	3.61	0.00	N/A
Volume (Location 1) (2002, 2007)	14,000	16,000	14.29 %
Volume (Location 2) (2002, 2007)	22,000	25,000	13.64 %

The naive before and after analysis at the treatment location resulted in a one hundred and twenty-four (124) percent increase in Total Crashes, a one hundred (100) percent decrease in Target Crashes, and a forty-three (43) percent decrease in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2007.

<u>Location 1 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	3	0	N/A
Class C Injury Crashes	3	1	- 66.67 %
Total Injury Crashes	6	1	- 83.33 %

The total number of injury crashes at Location 1 was reduced by thirty-three (33) percent.

Results and Discussion

Referencing the *Collision Diagrams*, the before period had a westbound left-turn crash pattern at Location 1, which accounted for twelve (12) target crashes. After the monolithic island installation, the westbound left-turn crash pattern was completely eliminated.

A new crash pattern occurred in the after period at the north end of the newly installed monolithic island. There is a new sideswipe crash pattern from vehicles attempting to maneuver between northbound queued vehicles and the end of the concrete island. This newly formed crash pattern accounts for thirteen (13) crashes in the after period and zero (0) in the before period.

The reason for providing information for Location 2, even though no improvements were made, is due to the proximity to the newly installed monolithic island. The before period has a pattern of rear-end crashes for both directions on US 401 (Main Street) at Location 2. The eastbound rear-end crash pattern increased to twenty (20) crashes in the after period from ten (10) crashes. The westbound rear-end crash pattern increased to eighteen (18) crashes in the after period from seven

(7) crashes. There is an eastbound left-turn pattern that accounted for eight (8) crashes in the after period from two (2) crashes.

The calculated benefit to cost ratio for this project is **4.77 considering total crashes**. The benefit to cost ratio **considering only target crashes is 8.56**. 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 northbound and southbound views at Location 1 and all four approaches at Location 2. 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
Location 1



Looking North on SR 2768 (Judd Parkway)



Looking South on SR 2768 (Judd Parkway)

Treatment Site Photos
Location 2



Looking South on SR 5056 (Judd Parkway)



Looking West on US 401 (Main Street)



Looking North on SR 2768 (Judd Parkway)



Looking East on US 401 (Main Street)

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: US 401 (Main St) & SR 2768 (Judd Parkway)		BY: C Neilson						
COUNTY: Wake		DATE: 9/14/2010						
FILE NO.: SS 05-03-217								
DETAILED COST:	TYPE IMPROVEMENT -	Monolithic Island						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$25,000	15	0.117	\$2,921			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$25,000	15	0.117	\$2,921			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$3,721			
	TOTAL COST OF PROJECT=				\$25,000			
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	5.25	1	0.19	21	4.00	51	9.71	\$241,771
AFTER	5.25	0	0.00	30	5.71	134	25.52	\$224,038
							Annual Benefits from Crash Cost Savings	\$17,733
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$14,013
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	4.77
	TOTAL COST OF PROJECT -	\$25,000		COMPREHENSIVE B/C RATIO -				4.77

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: US 401 (Main St) & SR 2768 (Judd Parkway)		BY: C Neilson						
COUNTY: Wake		DATE: 9/14/2010						
FILE NO.: SS 05-03-217								
DETAILED COST:	TYPE IMPROVEMENT -	Monolithic Island						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$25,000	15	0.117	\$2,921			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$25,000	15	0.117	\$2,921			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$3,721			
	TOTAL COST OF PROJECT=				\$25,000			
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	5.25	0	0.00	6	1.14	11	2.10	\$31,867
AFTER	5.25	0	0.00	0	0.00	0	0.00	\$0
							Annual Benefits from Crash Cost Savings	\$31,867
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$28,146
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	8.56
	TOTAL COST OF PROJECT -	\$25,000		COMPREHENSIVE B/C RATIO -				8.56

GAS STATION

BURGER KING

US 401 / NC 42 / NC 55 (MAIN ST)

SR 5056 (JUDD PARKWAY)

45 MPH

45 MPH

45 MPH

US 401 / NC 42 / NC 55 (MAIN ST)

KFC

BANK

NOTE CRASH # 60 INVOLVED POLICE VEHICLE

35 MPH

SR 2768 (JUDD PARKWAY)

ROSE'S PVA

PVA

SR 2768 (JUDD PARKWAY)

35 MPH

ROSE'S PVA (2ND ENTRANCE)

SS# 05-03-217
Order# 41000007120
Wake County
BEFORE Period
11/1/99 - 1/31/05

Frontal Impact
Target Crashes

LEGEND

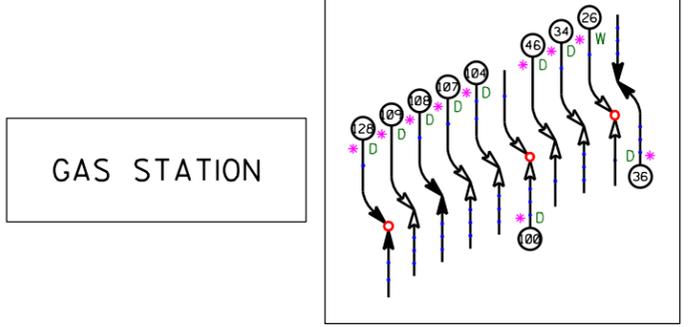
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PARKED VEHICLE		BACKING
	PARKING VEHICLE		SIDESWIPE
	FIXED OBJECT		OUT OF CONTROL
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		
	9 MPH OR LESS		PEDESTRIAN
	10 MPH TO 19		TRAIN
	20 MPH TO 29		DRIVER AT FAULT
	30 MPH TO 39		DRY
	40 MPH TO 49		WET
	50 MPH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

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

TRAFFIC SAFETY UNIT

Date: 9-14-2010

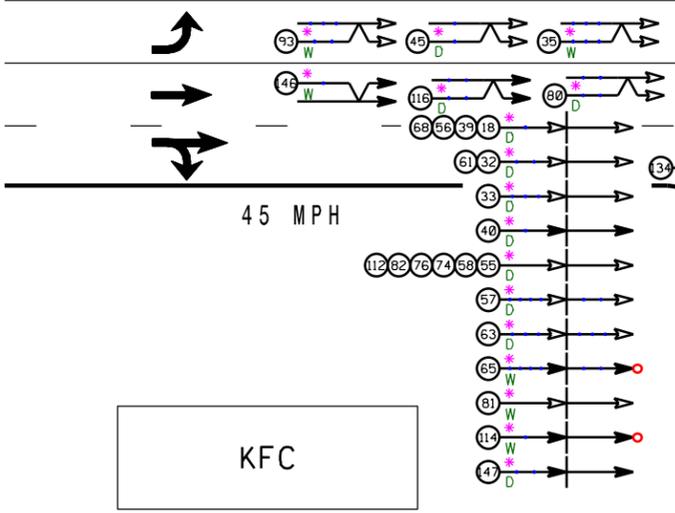
Prepared By: C Neilson



GAS STATION

BURGER KING

US 401 / NC 42 / NC 55 (MAIN ST)

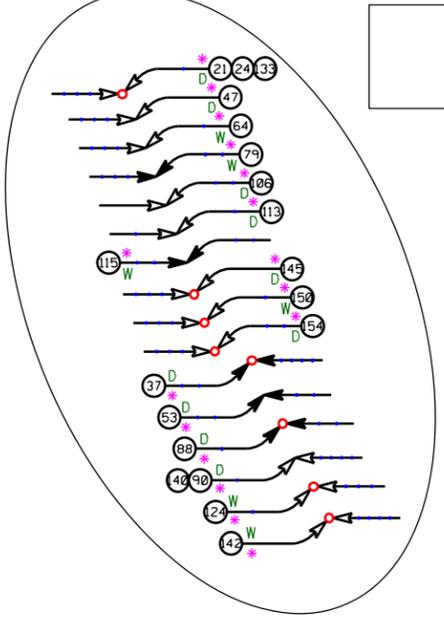


KFC

NOTE CRASH # 83 INVOLVED A DISABLED VEHICLE

35 MPH

SR 2768 (JUDD PARKWAY)



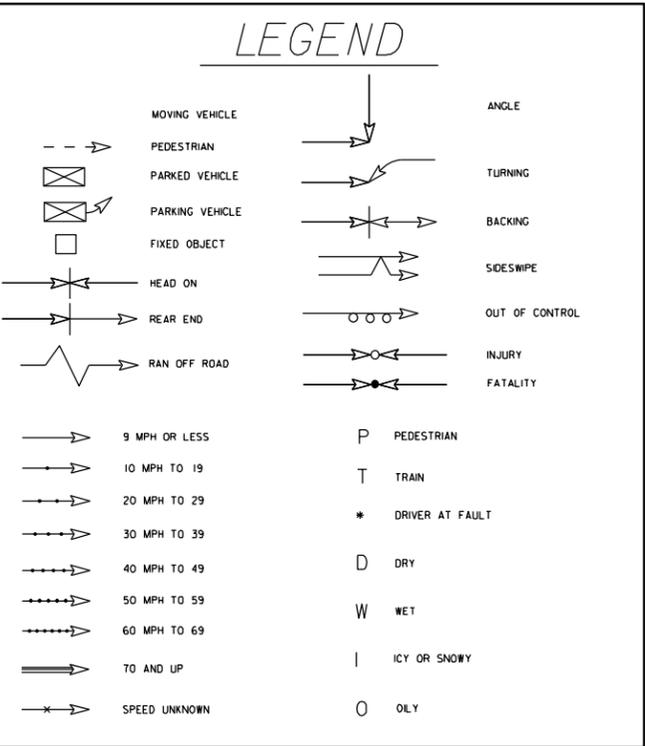
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ROSE'S PVA

PVA

Frontal Impact Target Crashes

SS# 05-03-217
 Order# 41000007120
 Wake County
 AFTER Period
 4/1/05 - 6/30/10



SR 2768 (JUDD PARKWAY)

35 MPH

ROSE'S PVA (2ND ENTRANCE)

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