

Spot Safety Project Evaluation

Project Log # 200811076

Spot Safety Project # 05-01-204

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of SR 3977 / SR 3112 (Cary Parkway) and
Rainbrook Drive / James Jackson Avenue
Wake County, City of Cary**

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

2-4-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-01-204 located at the Intersection of SR 3977 / SR 3112 (Cary Parkway) and James Jackson Avenue / Rainbrook Drive (Preston Country Club) in Wake County within the City of Cary.

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 multi-phase, actuated traffic signal (Sig ID 05-2184). SR 3977 / 3112 (Cary Parkway) has 3-lane approaches with a left turn lane, a thru lane, a thru-right lane, and a posted speed limit of 45 mph. James Jackson Avenue and Rainbrook Drive both present single lane approaches and speed limits of 35 mph. The subject intersection is a crossroads type which was controlled by stop conditions on James Jackson Avenue and Rainbrook Drive in the before period.

The original statement of problem consisted of excessive delay accessing Cary Parkway. The intersection met signal warrants 1A, 1B, 2 and 3B.

The initial crash analysis was completed from January 1, 1998 to December 31, 2000 with five (5) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on December 31, 2003 with a total cost of \$40,000.00 contributed by the NCDOT.

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 December 2003. The before period consisted of reported crashes from March 1, 1999 through November 30, 2003 (4 years and 9 months); and the after period consisted of reported crashes from January 1, 2004 through September 30, 2008 (4 years and 9 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 all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Intersection 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	24	45	87.5 %
Total Severity Index	5.63	7.70	36.8 %
Target Crashes	17	23	35.3 %
Target Crash Severity Index	5.79	12.50	115.9 %
Volume	29,300	30,400	3.75 %
<u>Injury Crash Summary – Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	3	300.0 %
Class B injury Crashes	8	1	- 87.5 %
Class C Injury Crashes	7	9	28.6 %
Total Injury Crashes	15	13	- 13.3 %

The naive before and after analysis at the treatment location resulted in a 88 percent increase in Total Crashes, a 35 percent increase in Target Crashes, and a 37 percent increase in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2006.

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 88 percent increase in Total Crashes and a 35 percent increase in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the number of angle collisions remained constant from the before to the after period with the post signal collisions resulting from Cary Parkway vehicles running the red light. All of these red light run crashes have occurred during daytime hours and under dry conditions.

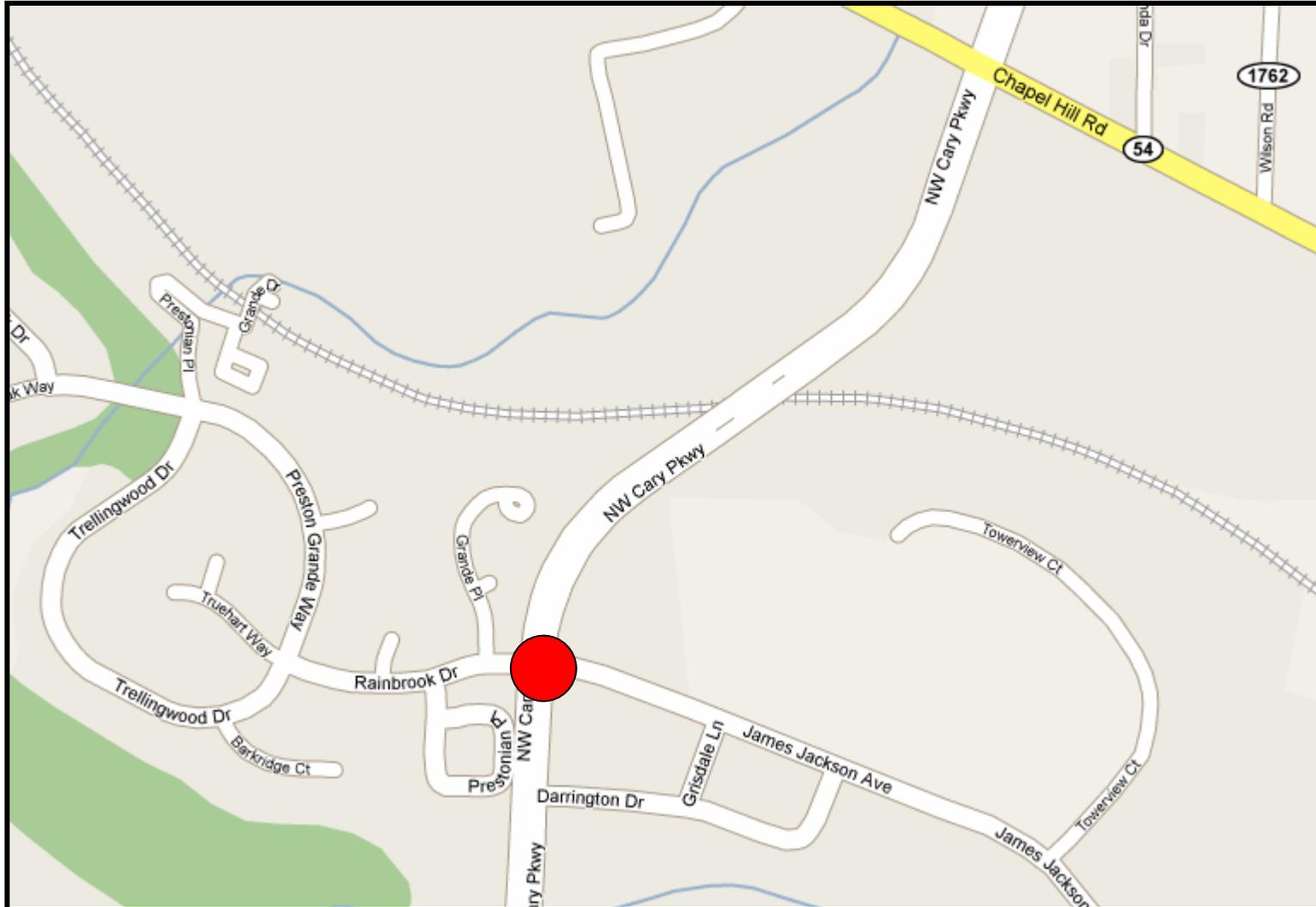
Two other crash patterns have developed in the after period including left turn-same roadway collisions involving southbound Cary Parkway vehicles turning left onto James Jackson Avenue and rear-end collisions also on Cary Parkway. There exists a southbound horizontal curve approaching the intersection with a Signal Ahead Warning sign placed back approximately 300 feet.

The calculated benefit to cost ratio for this project is **(-34.84) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-33.16)**. 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 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.

Location Map
Wake County, Town of Morrisville
Evaluation of Spot Safety Project # 05-01-204



Treatment Location: SR 3112 / 3977 (Cary Parkway) at James Jackson Ave. / Rainbrook Drive

**SS# 05-01-204 Aerial Map
Wake County**



TREATMENT SITE PHOTOS TAKEN 1-27-2009



Traveling North on Cary Parkway



Traveling North on Cary Parkway



Traveling East on Rainbrook Drive (Preston Country Club)



Traveling South on SR 2643 (Union Cross Rd)



Traveling West on James Jackson Avenue



Traveling South on Cary Parkway



Traveling South on Cary Parkway



Traveling South on Cary Parkway

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Cary Pkwy @ James Jackson
 COUNTY: Wake
 FILE NO.: SS 05-01-204

BY: JBS
 DATE: 1/29/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - **New Traffic Signal**

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$40,000	10	0.149	\$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,200
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$9,061
 TOTAL COST OF PROJECT= \$40,000

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	4.75	0	0.00	15	3.16	9	1.89	\$64,232
AFTER	4.75	3	0.63	10	2.11	32	6.74	\$379,958

Annual Benefits from Crash Cost Savings (\$315,726)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$324,787)
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -34.84

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - -34.84

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Cary Parkway @ James Jackson
 COUNTY: Wake
 FILE NO.: SS 05-01-204

BY: JBS
 DATE: 1/29/2009
 NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$40,000	10	0.149	\$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,200
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$9,061
 TOTAL COST OF PROJECT= \$40,000

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	4.75	0	0.00	11	2.32	6	1.26	\$46,611
AFTER	4.75	3	0.63	5	1.05	15	3.16	\$347,053

Annual Benefits from Crash Cost Savings (\$300,442)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$309,503)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -33.16

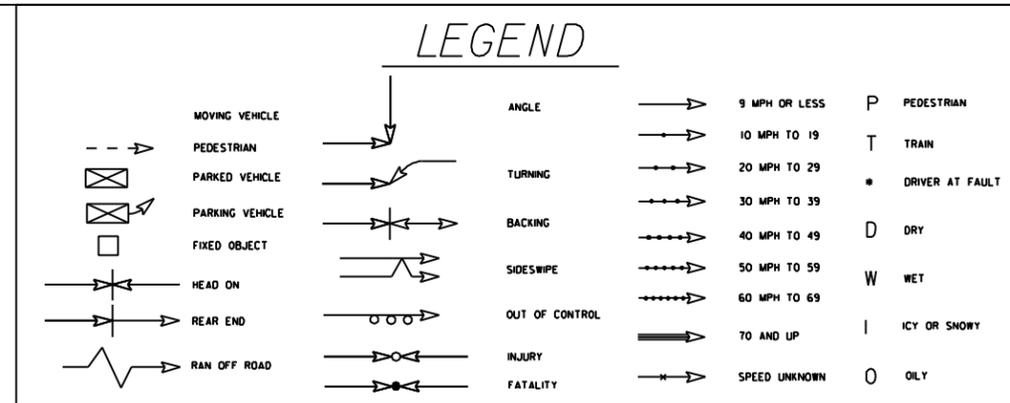
TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - -33.16

SR 3112 / SR 3977
Cary Parkway
45 MPH

Rainbrook Drive
45 MPH

James Jackson Rd
45 MPH

Notes:
Crash 2 - Exact Location Unkown
Crashes 9 & 17 - Ran-off Roadway
to avoid angle collision



SS# 05-01-204
Wake County
City of Cary
BEFORE Period
3/1/99 - 11/30/03

 Intersection
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

 	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 3/1/1999 - 11/30/2003	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 1-6-2009		
LOG NUMBER: SS* 05-01-204 BEFORE		

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

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		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

Rainbrook Drive
45 MPH

James Jackson Rd
45 MPH

SR 3112 / SR 3977
Cary Parkway
45 MPH

SS# 05-01-204
Wake County
City of Cary
AFTER Period
1/1/04 - 9/30/08



New Signalized
Intersection

Intersection
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 1/1/2004 - 9/30/2008	
	DISTANCE: Y-LINE : 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 1-8-2009		
LOG NUMBER: SS* 05-01-204 AFTER		

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