

Spot Safety Project Evaluation

Order # 41000009944

Spot Safety Project # 10-03-213

**Spot Safety Project Evaluation of the Installation of
Left Turn Lanes (Moving Ahead) and Traffic Signal (Spot Safety)
SR 1367 (Unionville-Indian Trail Rd) at SR 1501 (Secrest Shortcut Rd)
Union 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

11-30-2010

Date

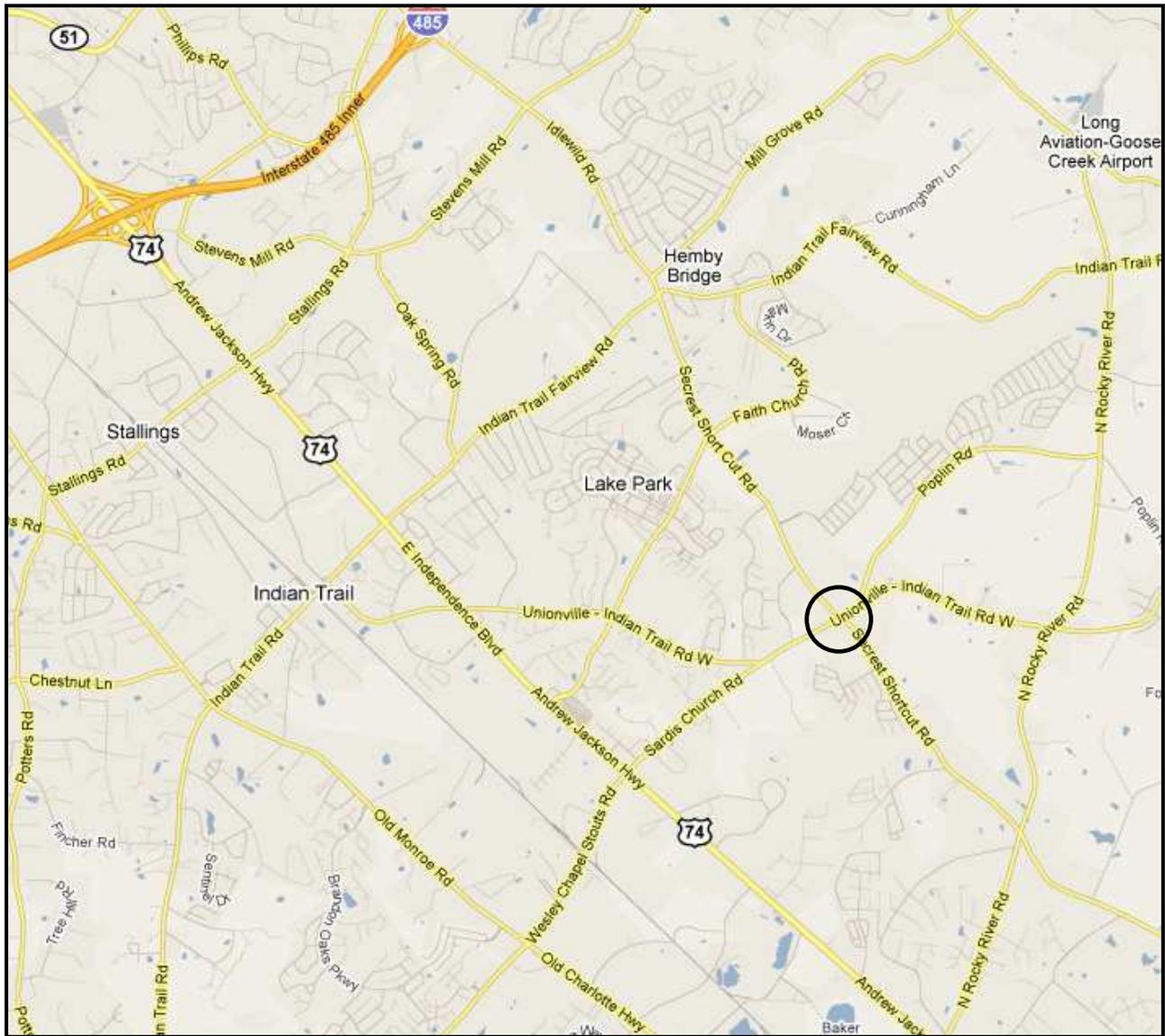
Traffic Safety Project Engineer

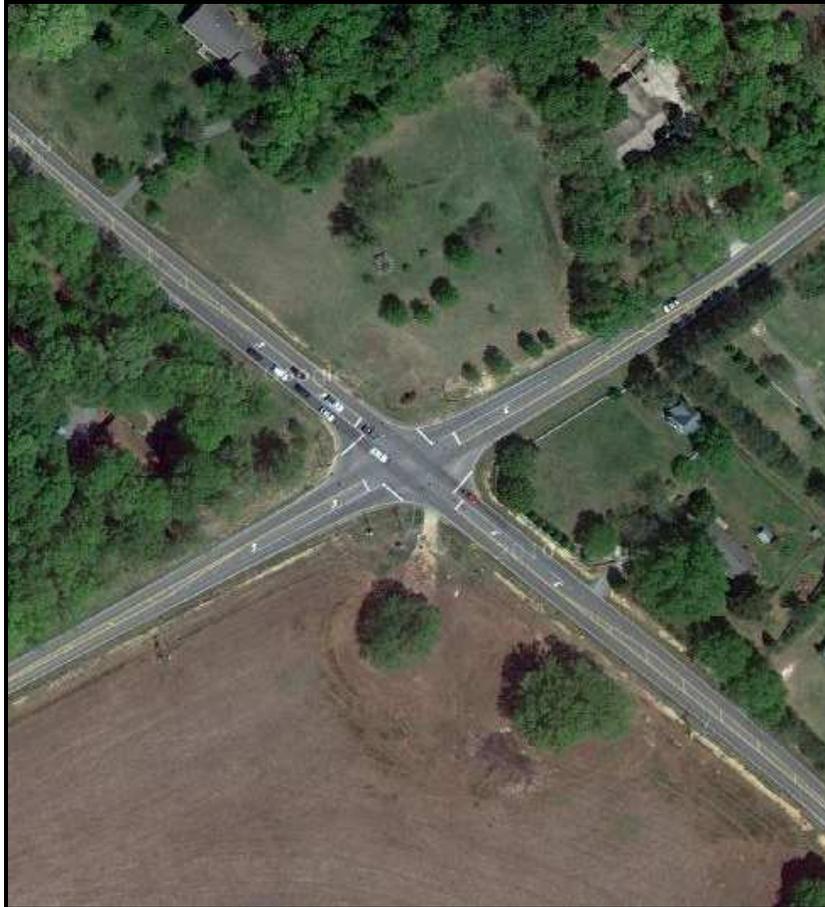
Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-03-213 located at the Intersection of SR 1367 (Unionville-Indian Trail Road) and SR 1501 (Secret Shortcut Road) in Union County, northeast of the Town of Indian Trail.

The Sig ID is 10-1899 for this newly installed traffic signal.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. SR 1367 and SR 1501 (Secret Short Road) are both two-lane facilities at the subject intersection with speed limits of 45 mph on all approaches. The subject location is a four-leg crossroads intersection, which was controlled by dual posted stop signs on the SR 1367 (Unionville-Indian Trail Rd) approaches in the before period. At the same time as the signal installation, left turn lanes were added through roadway widening on all approaches by Moving Ahead Project MA-10121R.

The original statement of problem was the existence of angle and frontal crash patterns due mainly to congestion but enhanced by a slightly skewed intersection with some sight distance restrictions. The intended purposes of these combined improvements were to alleviate collisions and increase intersection capacity.

The initial crash analysis was completed from May 1, 2000 to April 30, 2003 with twenty-two (22) reported crashes, sixteen (16) of which were deemed correctable including one A-injury crash. The final completion date for the improvement at the subject intersection was on January 17, 2006 with a total cost of \$215,000. The project funding was split between \$55,000 through Spot Safety Funds and \$160,000 through the Moving Ahead Project Funds.

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 December 2005 through January 2006. The before period consisted of reported crashes from April 1, 2001 through November 30, 2005 (4 years and 8 months); and the after period consisted of reported crashes from February 1, 2006 through September 30, 2010 (4 years and 8 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, 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; Angle; and Ran-off Roadway (avoidance).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	47	29	- 38.3 %
Total Severity Index	6.39	4.06	- 36.5 %
Target Crashes	37	19	- 48.6 %
Target Crash Severity Index	7.45	5.28	- 29.1 %
Volume (2003, 2008)	13,300	18,200	36.8 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	8	6	- 25.0 %
Class C Injury Crashes	16	6	- 62.5 %
Total Injury Crashes	25	12	- 52.0 %

The naive before and after analysis at the treatment location resulted in a 38 percent decrease in Total Crashes, an 49 percent decrease in Target Crashes, and a 36.5 percent decrease in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a significant crash pattern of thirty-two (32) angle collisions from SR 1367 vehicles choosing insufficient gaps when attempting to cross the intersection. There were also three (3) ran-off roadway collisions where the SR 1501 motorists were avoiding an angle collision and two (2) other left turn crashes. The strongest angle crash pattern (17 collisions) occurred from SR 1367 motorists traveling southbound through the intersection and this direction also accounted for the three ran-off roadway collisions.

After the signal installation, total frontal impact crashes decreased by nearly 50 percent. However, there were nine (9) angle crashes resulting from vehicles on all approaches running the red light. In addition, left turn-same roadway crashes increased from one (1) in the before period to eight (8) in the after period. Rear-end collisions at this location decreased slightly, from eight (8) to seven (7), through the evaluation period.

The calculated benefit to cost ratio for this project is **5.20 considering total crashes**. The benefit to cost ratio **considering only target crashes is 5.10**. 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 all four 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



Traveling East / Southeast on SR 1501 (Secret Shortcut Rd)



Looking West / Northwest on SR 1501 (Secret Shortcut Rd)



Looking South / Southwest on SR 1367 (Unionville-Indian Trail Road)



Looking North / Northeast on SR 1367 (Unionville-Indian Trail Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1367 at SR 1501		BY: JBS						
COUNTY: Union		DATE: 11/30/2010						
FILE NO.: SS# 10-03-213								
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal and 4 Left Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$215,000	10	0.149	\$32,041				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$215,000	10	0.149	\$32,041				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,800				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$36,741				
TOTAL COST OF PROJECT=				\$215,000				
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	4.67	1	0.21	24	5.14	22	4.71	\$257,944
AFTER	4.67	0	0.00	12	2.57	17	3.64	\$67,045
Annual Benefits from Crash Cost Savings								\$190,899
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$154,158	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	5.20	
TOTAL COST OF PROJECT		-	\$215,000	COMPREHENSIVE B/C RATIO		-	5.20	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1367 at SR 1501		BY: JBS						
COUNTY: Union		DATE: 11/30/2010						
FILE NO.: SS# 10-03-213 - Frontal Impact Crashes								
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal and 4 Left Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$215,000	10	0.149	\$32,041				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$215,000	10	0.149	\$32,041				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,800				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$36,741				
TOTAL COST OF PROJECT=				\$215,000				
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	4.67	1	0.21	22	4.71	14	3.00	\$242,013
AFTER	4.67	0	0.00	11	2.36	8	1.71	\$54,475
Annual Benefits from Crash Cost Savings								\$187,537
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$150,796	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	5.10	
TOTAL COST OF PROJECT		-	\$215,000	COMPREHENSIVE B/C RATIO		-	5.10	



SR 1367
Unionville-Indian Trail Rd
45 MPH

ADT (Year)
3,500 (2004)

SR 1501
Secret Shortcut Rd
45 MPH

A ← D 14

ADT (Year)
8,600 (2004)

28 W

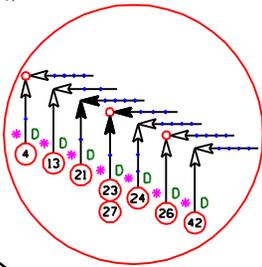
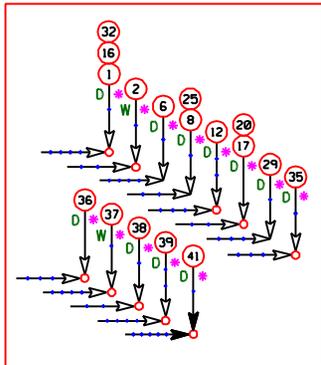
ADT (Year)
7,300 (2003)

ADT (Year)
6,000 (2004)

LEGEND

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

SS# 10-03-213
Order# 41000009944
Union County
BEFORE Period
4/1/01 - 11/30/05



Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-29-2010 Prepared By: J. Schronce



SR 1367
Unionville-Indian Trail Rd
45 MPH

ADT (Year)
5,100 (2008)

SR 1501
Secret Shortcut Rd
45 MPH

ADT (Year)
12,000 (2008)

ADT (Year)
9,500 (2008)

ADT (Year)
8,200 (2008)

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		DRY
	HEAD ON		50 MPH TO 59		60 MPH TO 69		WET
	REAR END		INJURY		70 AND UP		ICY OR SNOWY
	RAN OFF ROAD		FATALITY		SPEED UNKNOWN		OLT

SS# 10-03-213
Order# 41000009944
Union County
AFTER Period
2/1/06 - 9/30/10



New Signalized
Intersection
Sig ID 10-1899



Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-29-2010

Prepared By: J. Schronce