

Spot Safety Project Evaluation

Project Log # 200703096

Spot Safety Project # 10-99-217

**Spot Safety Project Evaluation of the Traffic Signal and
Left Turn Lane Installation at the Intersection of
NC 73 and SR 2408 (Goldhill Rd)
Cabarrus 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

3-3-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-99-217 located at the Intersection of NC 73 (Mt. Pleasant Highway) and SR 2408 (Goldhill Road) in Cabarrus 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 an actuated traffic signal. In the study period, NC 73 and SR 2408 were both two-lane facilities at the subject intersection with no turn lanes and speed limits of 55 mph and 45 mph, respectively. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 2408 (Goldhill Rd). Along with this Spot Safety Project, an eastbound NC 73 left turn lane was added during the same year with Small Urban Funds.

The original statement of problem was the existence and potential of frontal impact crashes at this location. The intersection met signal warrants 1, 2, 8, 9, and 11.

The initial crash analysis was completed from August 1, 1996 to August 1, 1999 with thirteen (13) reported crashes, one (1) of which was deemed correctable. The final completion date for the traffic signal installation at the subject intersection was on during the first quarter of 2001 with a total cost of \$35,000.00.

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 of both countermeasures was from May 1, 2000 to May 31, 2001. The before period consisted of reported crashes from December 1, 1992 through April 30, 2000 (7 years and 5 months); and the after period consisted of reported crashes from June 1, 2001 through October 31, 2008 (7 years and 5 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 Target Crash 1 for the new signal installation. 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. Eastbound NC 73 Rear-end Crashes were Target Crash 2 and were analyzed for the installation of the Left Turn Lane.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	30	23	-23.3 %
Total Severity Index	6.24	10.49	68.1 %
Target Crashes 1 – Intersection Frontal	4	8	100.0 %
Target Crash 1 Severity Index	25.50	15.10	-40.8 %
Target Crashes 2 – Left Turn Rear-End	13	0	- 100.0 %
Target Crash 2 Severity Index	4.42	0.00	- 100.0 %
Target Crashes Combined	17	8	- 52.9 %
Volume	15,100	17,000	12.6 %
<u>Injury Crash Summary – Total</u>			
Fatal injury Crashes	0	1	100.0 %
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	3	2	- 33.3 %
Class C Injury Crashes	8	7	- 12.5 %
Total Injury Crashes	12	11	- 8.3 %

The naive before and after analysis at the treatment location resulted in a 23 percent decrease in Total Crashes, an 53 percent decrease in Combined Target Crashes, but a 68 percent increase in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 23 percent decrease in Total Crashes and an 53 percent decrease in Combined Target Crashes. The summary results above demonstrate that both Total Crashes and Combined Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, three patterns of crashes exist at the intersection in the before period. The eastbound NC 73 rear-end pattern of 13 collisions (Target Crash 2) was completely eliminated by the installation of the left turn lane. The southbound SR 2408 rear-end crash pattern was also positively impacted by the installation of the signal. This pattern reduced from seven (7) collisions in the before period to just one (1) in the after period.

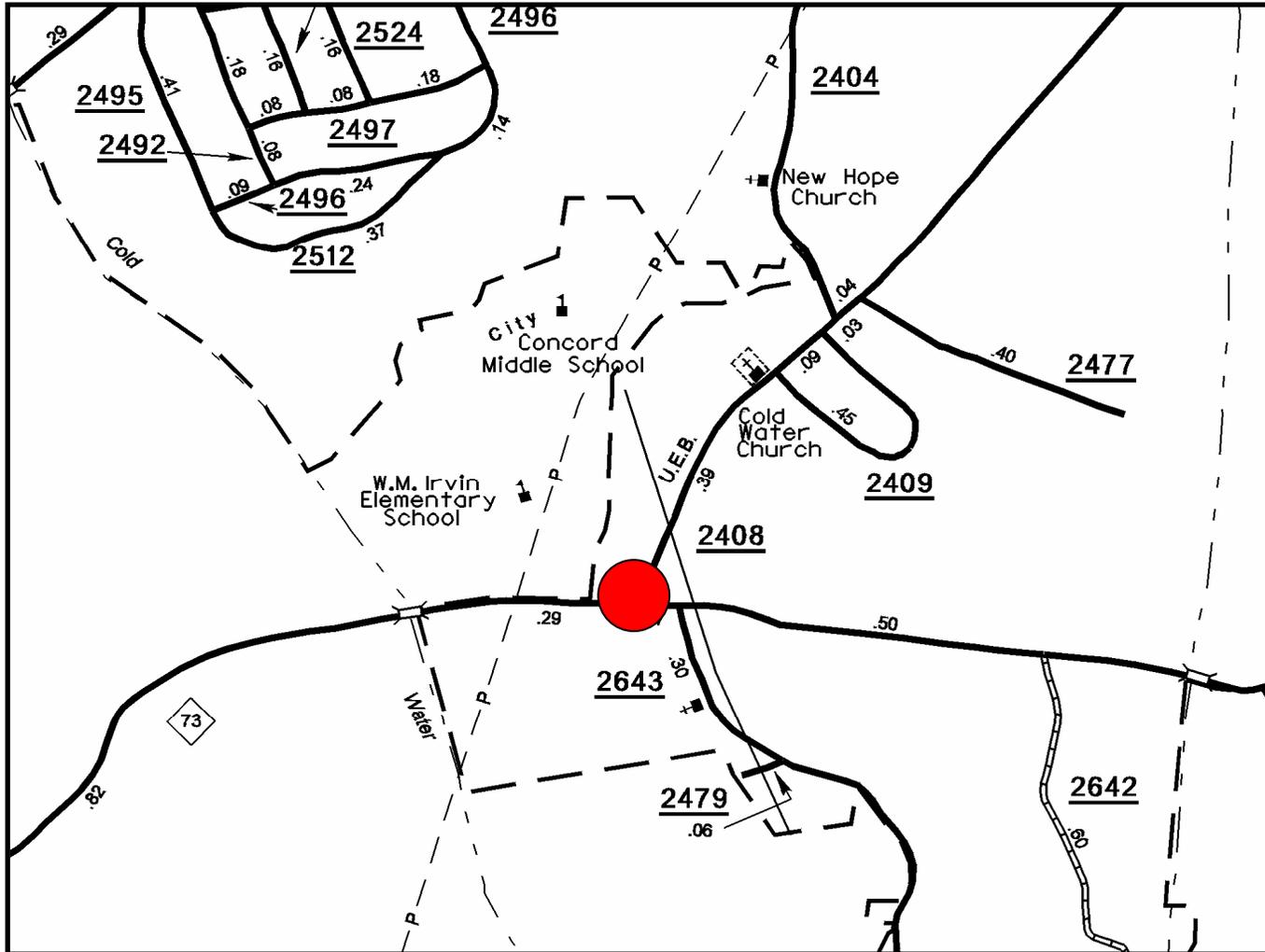
However, after the signal installation, the frontal impact pattern (Target Crash 1) doubled through the analysis. Left turn same roadway crashes increased from two (2) to seven (7) with eastbound NC 73 motorists improperly accessing the permissive signal phase. The after period also had one (1) vehicle on westbound NC 73 run the red light resulting in a frontal impact crash.

An after period fatal collision did occur at this location during our analysis. The rear-end crash occurred eastbound on NC 73 at the signal and involved three vehicles. The Fatal Crash Investigation revealed a full impact speed of 55 mph to two completely stopped vehicles. The fatality occurred in the middle vehicle even though the child was restrained in a protective device. It was concluded that no roadway fault was apparent and no improvements were warranted.

The calculated benefit to cost ratio for this project is **(-7.14) considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.48**. 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
Cabarrus County
Evaluation of Spot Safety Project # 10-99-217**



Treatment Location: NC-73 at SR 2408 (Goldhill Road)

**SS# 10-99-217 Aerial Map
Cabarrus County**



TREATMENT SITE PHOTO TAKEN 8/28/2007



Traveling East on NC-73



Traveling West on NC-73

(Observe Signal Ahead Warning Sign and curve leading into the intersection)



Traveling West on NC-73



Traveling South on SR 2408 (Goldhill Rd)



Traveling South on SR 2408 (Goldhill Rd)

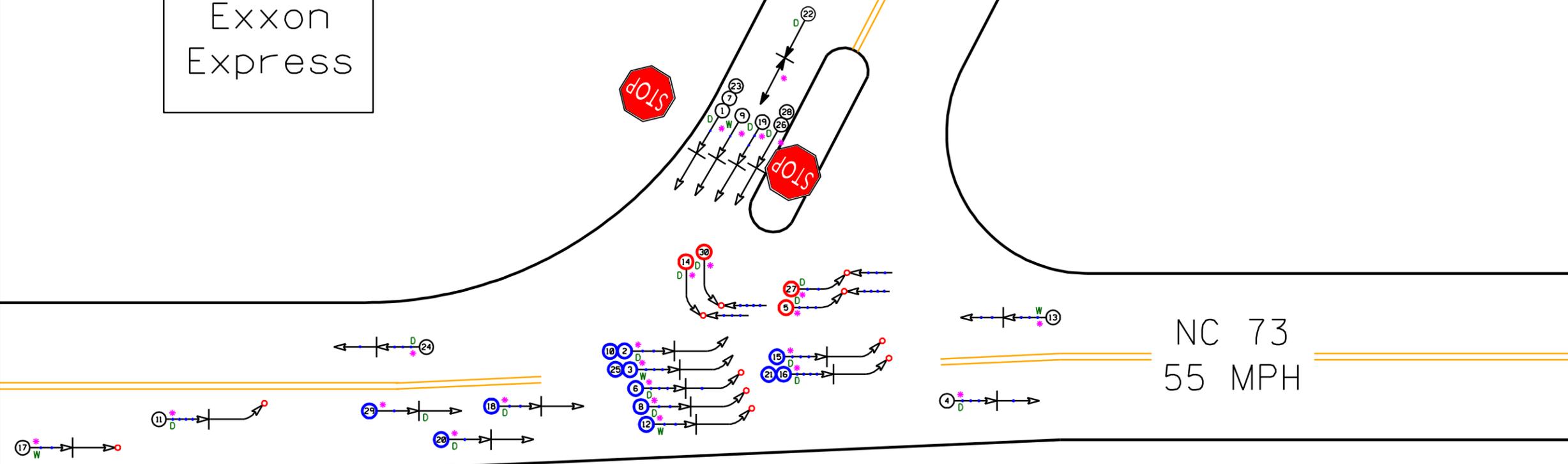
Exxon Express

SR 2408
Goldhill Road
55 MPH

NC 73
55 MPH

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		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		OILY



SS# 10-99-217
Cabarrus County
Before Period
12/1/92 - 4/30/00
NC-73 at SR 2408

New Signal
 Target Crashes

Left Turn Lane
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
	STUDY PERIOD: 12/1/1992 - 4/30/2000	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM EXAMINED BY: ST		
SCALE: NOT TO SCALE		
DATE: 2-24-2009		
LOG NUMBER: SS* 10-99-217 BEFORE		

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

SS# 10-99-217
 Cabarrus County
 After Period
 6/1/01 - 10/31/08
 NC-73 at SR 2408

Exxon Express

Building

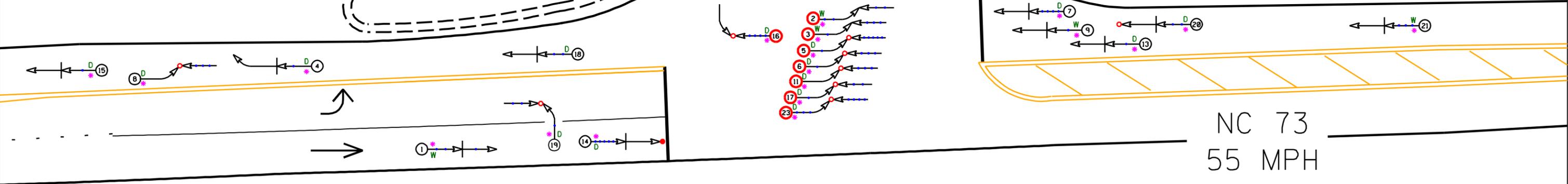
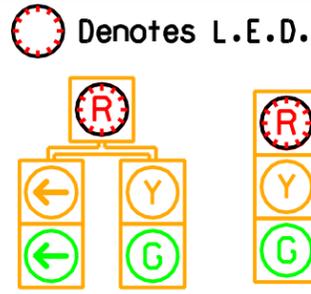
SR 2408
 Goldhill Road
 45 MPH

NC 73
 55 MPH

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		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		

SIGNAL FACE I.D.



New Signal
 Target Crashes

Left Turn Lane
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
	STUDY PERIOD: 6/1/2008 TO 10/31/2008	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 2-24-2009		
LOG NUMBER: SS* 10-99-217 AFTER		

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