

Spot Safety Project Evaluation

Project Log # 200704286

Spot Safety Project # 07-01-203

Spot Safety Project Evaluation of the Installation of a Traffic Signal at the Intersection of SR 1005 (Alamance Church Rd) and Rotherwood Rd Guilford County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator

Brad Robinson

Brad Robinson, EI

12/12/2008
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-203 – The Intersection of SR 1005 (Alamance Church Rd) and Rotherwood Rd in Guilford County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal (Signal ID # 07-2014). The subject location is a four-leg intersection which was controlled by stop signs on Rotherwood Rd and at the shopping center entrance in the before period. Rotherwood Rd has a single lane approach and the shopping center entrance has a thru-left and a right turn lane. Eastbound SR 1005 (Alamance Church Rd) has a thru-right, thru, and a left turn lane. In the before period westbound SR 1005 had a thru-right and a thru lane. According to aerial photos a left turn lane was added on westbound SR 1005 around the same time as this project was completed. The speed limit is 35 mph for all approaches.

The original statement of problem was that traffic volumes had increased to the point where motorists could not safely maneuver through the intersection.

The initial crash analysis was conducted from January 1, 1998 to December 31, 2001 with a total of 17 crashes, 14 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on July 2, 2002 with a total cost of \$22,741.

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 from June 1, 2002 to July 31, 2002. The before period consisted of reported crashes from June 1, 1996 through May 31, 2002 (6 years) and the after period consisted of reported crashes from August 1, 2002 through July 31, 2008 (6 years). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types are considered as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	34	15	-55.9
Total Severity Index	3.61	3.47	-3.9
Target Crashes	27	5	-81.5
Target Crash Severity Index	3.74	3.96	5.9
Volume	3,900	4,200	7.7
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	0	-100.0
Class C Crashes	11	5	-54.5
PDO Crashes	22	10	-54.5

The naive before and after analysis at the treatment location resulted in a 56 percent decrease in Total Crashes, an 82 percent decrease in Target Crashes, and an 8 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2005.

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 56 percent decrease in Total Crashes and an 82 percent decrease in Target Crashes. The Total Severity Index decreased by 4 percent and the Target Crash Severity Index increased by 6 percent. 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.

The calculated benefit to cost ratio for this project is 5.05 considering total crashes. The benefit to cost ratio considering only target crashes is 5.80. 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.

Referencing the *Collision Diagrams* and the above tables it appears that the installation of the traffic signal helped to reduce or eliminate all of the Target Crash patterns at the intersection.

As mentioned in the *Project Background* section, a westbound left turn lane was added at the intersection around the same time as the traffic signal. There were two Left Turn-Same Roadway Crashes in the before period involving westbound vehicles turning left. There were no crashes of this type in the after period. The addition of the left turn might have contributed to the elimination of this small crash pattern.

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 roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1005 at Rotherwood
 COUNTY: Guilford
 FILE NO.: SS 07-01-203

BY: BDR
 DATE: 12/3/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$22,741	10	0.149	\$3,389
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$22,741	10	0.149	\$3,389

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$6,289
 TOTAL COST OF PROJECT= \$22,741

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	6.00	0	0.00	12	2.00	22	3.67	\$55,400
AFTER	6.00	0	0.00	5	0.83	10	1.67	\$23,667

Annual Benefits from Crash Cost Savings \$31,733

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$25,444

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.05

TOTAL COST OF PROJECT - \$22,741 COMPREHENSIVE B/C RATIO - 5.05

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1005 at Rotherwood
 COUNTY: Guilford
 FILE NO.: SS 07-01-203 Target Crashes

BY: BDR
 DATE: 12/3/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$22,741	10	0.149	\$3,389
	\$0	0	0.000	\$0
TOTALS	\$22,741	10	0.149	\$3,389

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$6,289
 TOTAL COST OF PROJECT= \$22,741

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	6.00	0	0.00	10	1.67	17	2.83	\$45,233
AFTER	6.00	0	0.00	2	0.33	3	0.50	\$8,767

Annual Benefits from Crash Cost Savings \$36,467

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$30,178

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.80

TOTAL COST OF PROJECT - \$22,741 COMPREHENSIVE B/C RATIO - 5.80

Treatment Site Photos Taken February 18, 2008



Driving Eastbound on SR 1005 (Alamance Church Rd)



Driving Eastbound on SR 1005 (Alamance Church Rd)



Driving Westbound on SR 1005 (Alamance Church Rd)



Driving Westbound on SR 1005 (Alamance Church Rd)



Driving Southwest on Rotherwood Rd



Driving Southbound on Rotherwood Rd



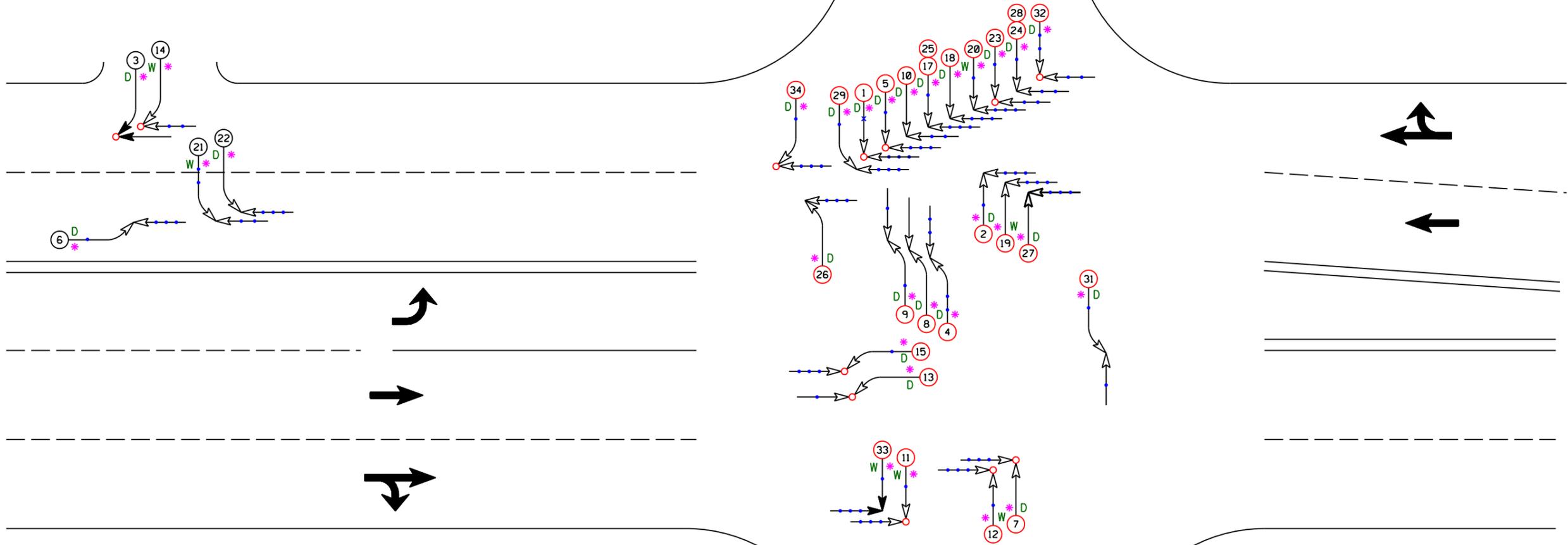
Driving Northbound in PVA

Guilford County
 SR 1005 (Alamance Church Rd) at
 Rotherwood Rd
 BEFORE Period
 6/1/1996-5/31/2002



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		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		INJURY		ONLY



Target Crash



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

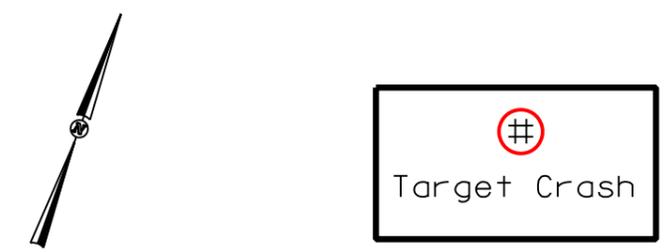
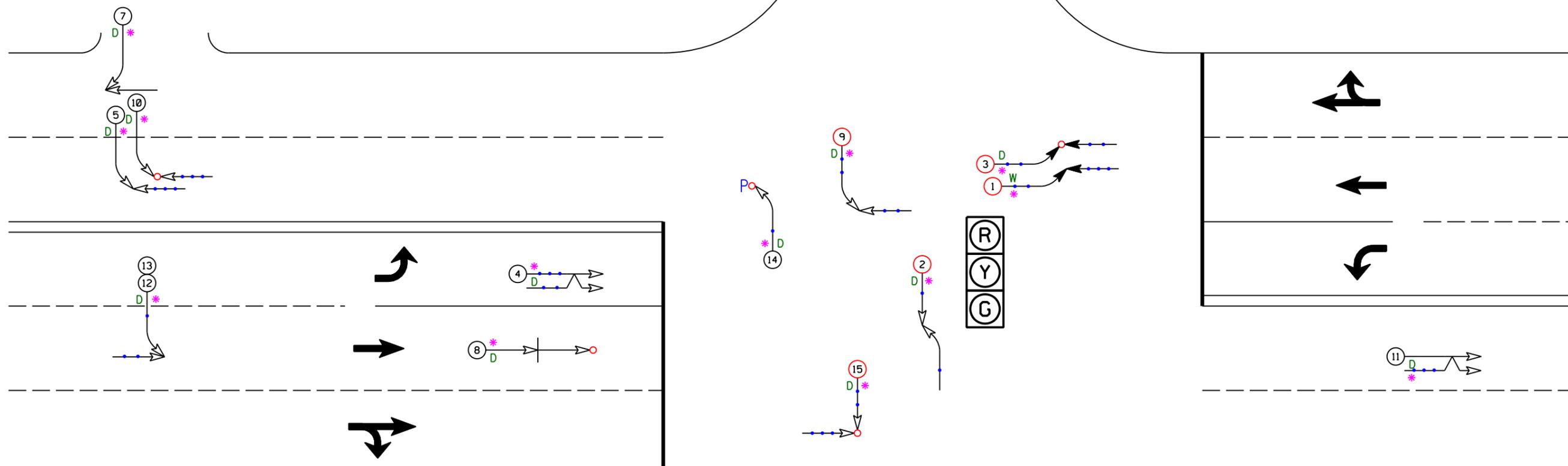
	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 6/1/96-5/31/02	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: December 2008		
LOG NUMBER: 200704286		

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

Guilford County
 SR 1005 (Alamance Church Rd) at
 Rotherwood Rd
 AFTER Period
 8/1/2002-7/31/2008

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		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		ONLY



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
STUDY PERIOD: 8/1/02-7/31/08		
DISTANCE: Y-LINE = 150FT		
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: December 2008		
LOG NUMBER: 200704286		

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
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