

Spot Safety Project Evaluation

Order # 41000006395

Spot Safety Project # 10-02-210

**Spot Safety Project Evaluation of the
Traffic Signal Installation with Four Left Turn Lanes
SR 1007 (Rocky River Road) at SR 1162 (Goldmine Road)
City of Monroe, 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

8-2-2010

Date

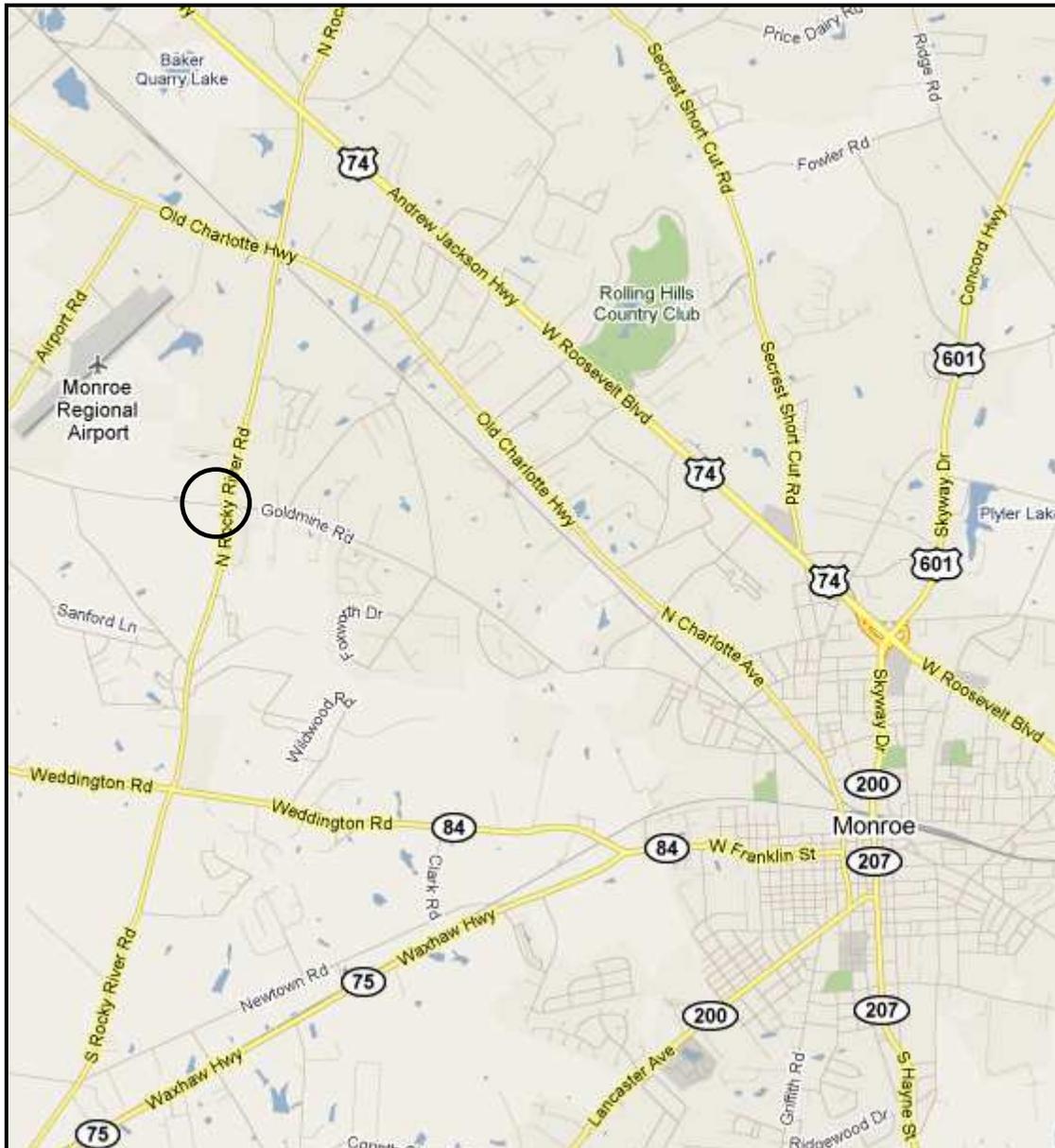
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-02-210 located at the Intersection of SR 1007 (Rocky River Road) and SR 1162 (Goldmine Road) in Union County, City of Monroe.

The Sig ID is 10-0933 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 with new left turn lanes on all four approaches. SR 1007 and SR 1162 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 a stop condition on SR 1162 (Goldmine Rd) with an intersection flasher.

The original statement of problem was the existence of a prominent angle crash pattern at this intersection. The intended purpose of the new left turn lanes and traffic signal was to alleviate the existing location crash pattern.

The initial crash analysis was completed from April 1, 1999 to April 1, 2002 with fifteen (15) reported crashes, thirteen (13) of which were deemed correctable angle collisions. The final completion date for the improvement at the subject intersection was on November 7, 2005 with a total cost of \$145,000.

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 August through November 2005. The before period consisted of reported crashes from April 1, 2001 through July 31, 2005 (4 years and 4 months); and the after period consisted of reported crashes from December 1, 2005 through March 31, 2010 (4 years and 4 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; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	47	10	- 78.7 %
Total Severity Index	6.39	3.96	- 38.0 %
Target Crashes	39	9	- 76.9 %
Target Crash Severity Index	7.12	4.29	- 39.7 %
Volume (2003, 2008)	11,000	14,100	28.2 %

<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	9	0	- 100.0 %
Class C Injury Crashes	15	4	- 73.3 %
Total Injury Crashes	25	4	- 84.0 %

The naive before and after analysis at the treatment location resulted in a 79 percent decrease in Total Crashes, a 77 percent decrease in Target Crashes, and a 38 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 strong pattern of thirty-six (36) angle or left turn-different roadway collisions from vehicles on SR 1162 unsuccessfully accessing SR 1007 (Rocky River Road). The frontal impact crash pattern also consisted of one (1) head-on crash and two (2) left turn-same roadway crashes on Goldmine Road. After the traffic signal and left turn lane installations, intersection crashes were significantly reduced by 79 percent. The after period did experience five (5) vehicles run the red-light and four (4) left turn-same roadway collisions. This location also saw a reduction of rear-end collisions approaching the intersection from four (4) to zero (0) through the evaluation.

The calculated benefit to cost ratio for this project is **9.72 considering total crashes**. The benefit to cost ratio **considering only target crashes is 9.18**. 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



Looking South on SR 1007 (Rocky River Road)



Looking North on SR 1007 (Rocky River Road)



Traveling East on SR 1162 (Goldmine Road)



Looking West on SR 1162 (Goldmine Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: Rocky River at Goldmine		BY: JBS						
COUNTY: Union		DATE: 7/30/2010						
FILE NO.: SS 10-02-210								
DETAILED COST: TYPE IMPROVEMENT - Signal with 4 Left Turn Lanes								
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$145,000	10	0.149	\$21,609				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$145,000	10	0.149	\$21,609				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,600				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$26,109				
TOTAL COST OF PROJECT=				\$145,000				
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	4.33	1	0.23	24	5.54	22	5.08	\$278,199
AFTER	4.33	0	0.00	4	0.92	6	1.39	\$24,434
Annual Benefits from Crash Cost Savings								\$253,764
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$227,655	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	9.72	
TOTAL COST OF PROJECT		-	\$145,000	COMPREHENSIVE B/C RATIO		-	9.72	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: Rocky River at Goldmine		BY: JBS						
COUNTY: Union		DATE: 7/30/2010						
FILE NO.: SS 10-02-210								
DETAILED COST: TYPE IMPROVEMENT - Signal with 4 Left Turn Lanes								
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$145,000	10	0.149	\$21,609				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$145,000	10	0.149	\$21,609				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,600				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$26,109				
TOTAL COST OF PROJECT=				\$145,000				
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	4.33	1	0.23	22	5.08	16	3.70	\$263,002
AFTER	4.33	0	0.00	4	0.92	5	1.15	\$23,441
Annual Benefits from Crash Cost Savings								\$239,561
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$213,452	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	9.18	
TOTAL COST OF PROJECT		-	\$145,000	COMPREHENSIVE B/C RATIO		-	9.18	



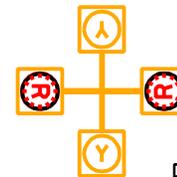
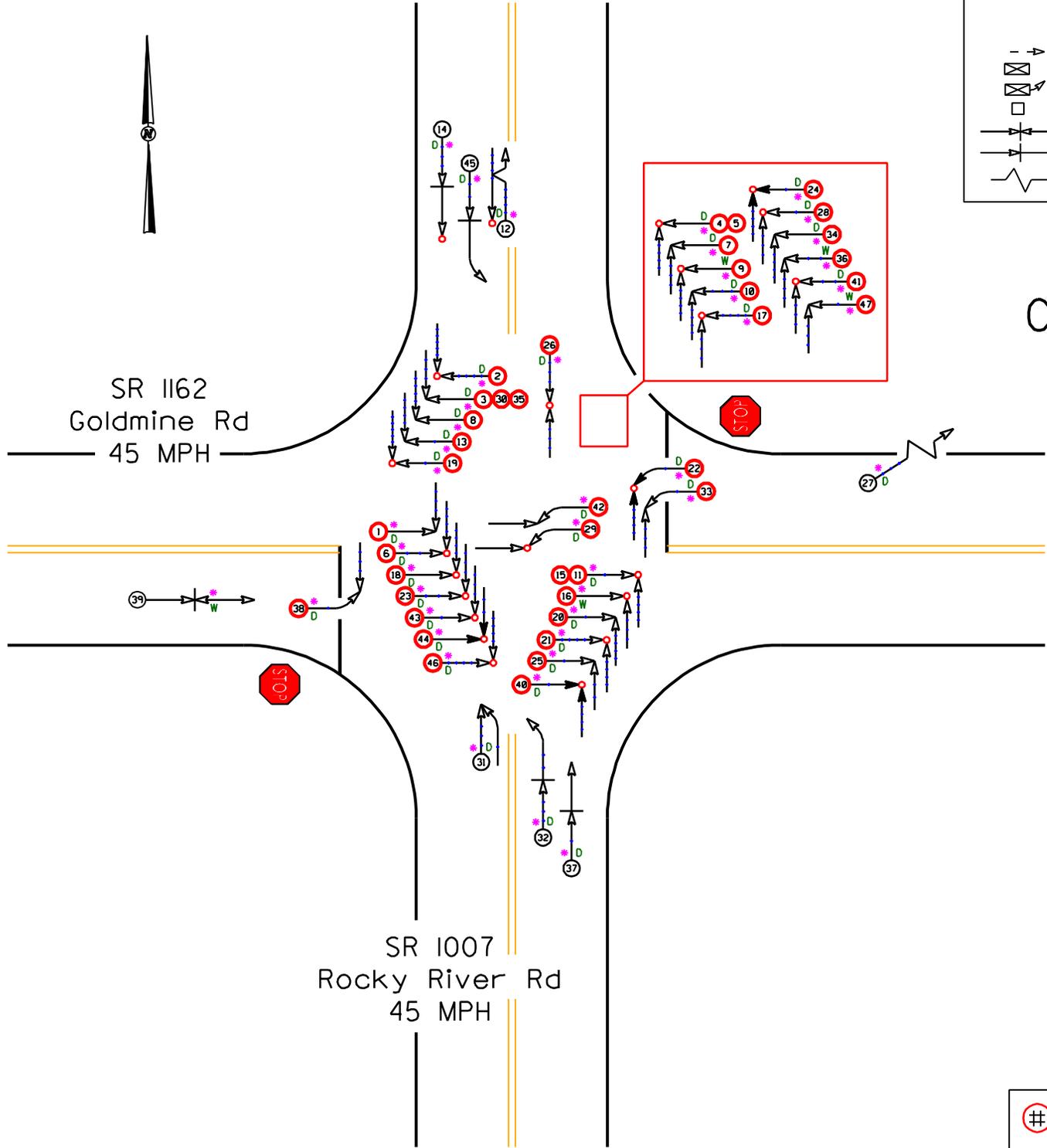
SR 1162
Goldmine Rd
45 MPH

SR 1007
Rocky River Rd
45 MPH

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		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 SNOW
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				TO AND UP		

SS# 10-02-210
Order# 41000006395
Union County
BEFORE Period
4/1/01 - 7/31/05



Existing
Intersection
Flasher

Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

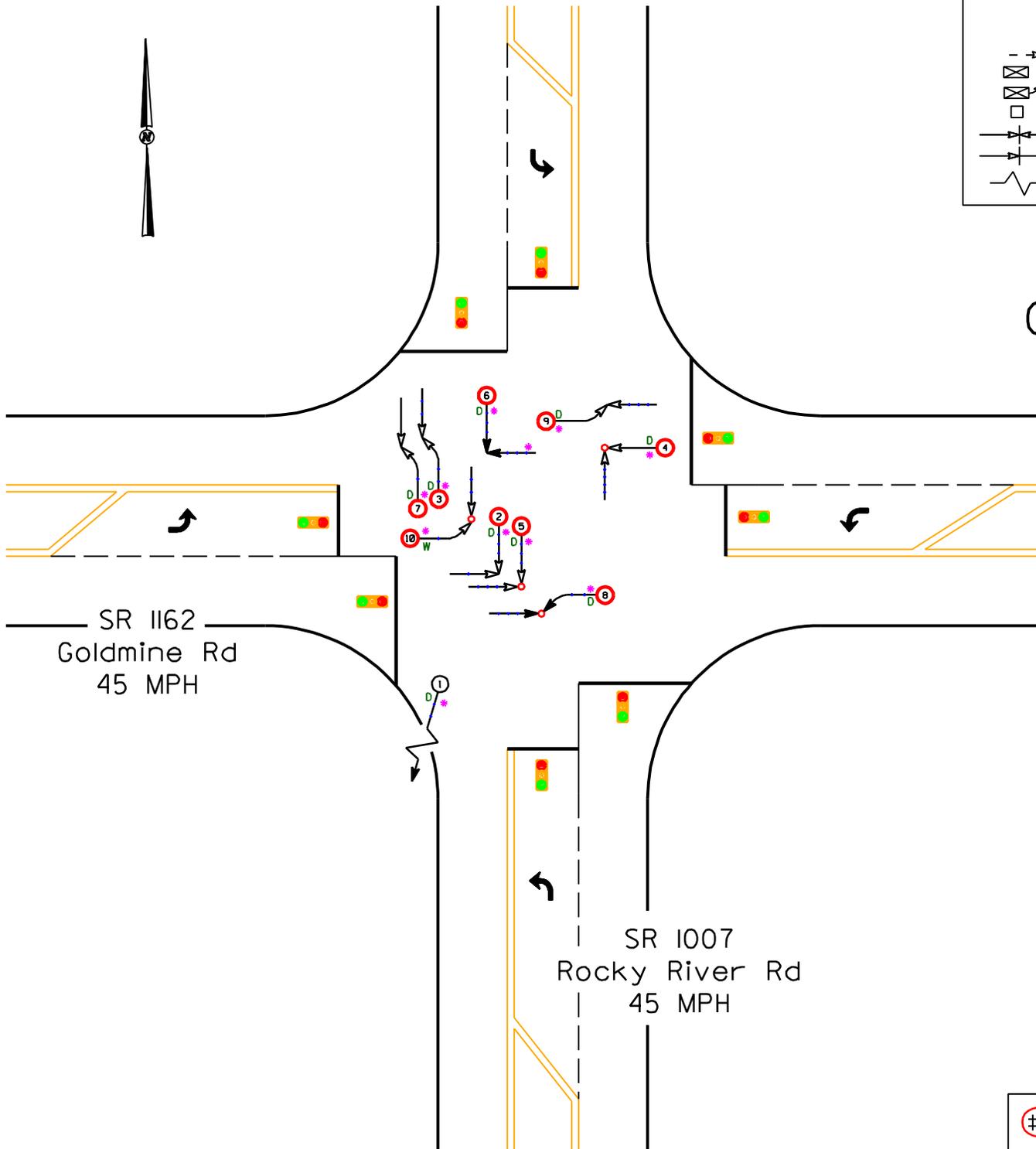
Date: 7-30-2010 Prepared By: J. Schronce



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	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		HURT		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		TO AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH OR MORE		ONLY

SS# 10-02-210
 Order# 41000006395
 Union County
 AFTER Period
 12/1/05 - 3/31/10



New Signalized
 Intersection
 Sig ID 10-0933



Frontal Impact
 Target Crashes

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

TRAFFIC SAFETY UNIT

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