

# Spot Safety Project Evaluation

Project Log # 200906073

Spot Safety Project # 03-02-217

**Spot Safety Project Evaluation of the Signal Phasing Modifications  
SR 1406 (Piney Green Rd) and SR 1403 (Country Club Rd)  
City of Jacksonville, Onslow County**

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

7-1-2009

Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 03-02-217 located at the Intersection of SR 1406 (Piney Green Road) and SR 1403 (Country Club Road) in Onslow County, City of Jacksonville.

The Sig ID is 03-0235 for traffic signal at this intersection.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the revising of signal phasing to allow eastbound SR 1406 protective/permissive phase and to split the SR 1403 and SR 1708 side street phasing. SR 1406 (Piney Green Rd) and SR 1403 / 1708 (Country Club Rd) are both two lane roadways that widen to provide dedicated left turn lanes at this crossroads intersection. The speed limit is 45 mph for the SR 1406 and SR 1403 approaches with a 25 mph residential speed limit on SR 1708. Also, a Circle K Convenience Store is located in the southeast quadrant of this intersection.

The original statement of problem was the current accident patterns involving left turn same roadway type collisions on multiple approaches and the southbound SR 1708 yellow trap situation. The intended purpose of these improvements was to alleviate the existing crash patterns. This intersection was listed on the 2001 Highway Safety Improvement Program.

The initial crash analysis was completed from May 1, 1998 to May 31, 2001 with fifty-eight (58) reported crashes, six (6) of which were deemed correctable including one fatality crash. The final completion date for the improvement at the subject intersection was on March 18, 2003 with a total cost of \$10,000.

## 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 was the month of March 2003. The before period consisted of reported crashes from February 1, 1997 through February 28, 2003 (6 years and 1 month); and the after period consisted of reported crashes from April 1, 2003 through April 30, 2009 (6 years and 1 month). 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 Left Turn; Same Roadway collisions involving Eastbound SR 1406, Northbound SR 1403, and Southbound SR 1708 motorists were the target crashes for applied signal modifications.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	118	112	- 5.1 %
Total Severity Index	5.75	3.11	- 45.9 %
Target Crashes	20	0	- 100.0 %
Target Crash Severity Index	11.91	0.00	- 100.0 %
Volume	28,500	28,800	1.1 %

<b><u>Injury Crash Summary</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	2	0	- 100.0 %
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	9	7	- 22.2 %
Class C Injury Crashes	36	26	- 27.8 %
Total Injury Crashes	48	33	- 31.3 %

The naive before and after analysis at the treatment location resulted in a 5 percent decrease in Total Crashes, complete elimination of Target Crashes, and a 46 percent decrease in the Total Severity Index. The before period ADT year was 2000 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 a 5 percent decrease in Total Crashes and a 100 percent reduction in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the eastbound SR 1406 and northbound SR 1403 left turn crash patterns in the before period were completely eliminated in after period, including one fatality collision. The phase changes were successful in eliminating their desired collision reductions and resulted in a positive benefit cost ratio of 106.99, as described below. Also, left turn different roadway collisions involving vehicles leaving the Circle K and accessing SR 1403 (Country Club Road) southbound gained an additional improvement from the split side street phasing. These motorists were provided with a short gap to conduct their movement without opposing vehicles approaching in the after period; thus a crash reduction by 75 percent from 24 collisions in the before period to 6 crashes in the after period.

However, overall crashes at this location only decreased by 5 percent even considering the target crash elimination in the after period. The following table shows changes from the before to the after period of different specific patterns identified at this location.

<b><u>Other Specific Crash Pattern Details</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Leaving Circle K, left onto Country Club	24	6	- 75.0 %
Entering Circle K from WB Piney Green	7	3	- 57.1 %
Intersection Angle (Red Light Run)	4	3	- 25.0 %
WB Piney Green Left Turn; Same Rd	10	20	100.0 %
NB Country Club Rear-End	5	13	160.0 %
Right Turn; NB 1403 to EB 1406	1	9	800.0 %
Right Turn; Circle K to EB 1406	1	5	400.0 %
Leaving Circle K, left onto Piney Green	4	5	25.0 %

As described in the table above and seen on the collision diagrams, westbound SR 1406 left turn same roadway collisions increased by 100 percent and northbound SR 1403 rear-end collisions increased by 160 percent from the before to the after period. These crash patterns of increase still provided this intersection with over 100 crashes over the 6 year and 1 month after period or 18.4 crashes per year.

The calculated benefit to cost ratio for this project is **150.23 considering total crashes**. The benefit to cost ratio **considering only target crashes is 106.99**. 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 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 1708 (Country Club Rd / Subdivision Entrance)



Looking North on SR 1403 (Country Club Rd)



Traveling West on SR 1403 (Piney Green Road)



Traveling East on SR 1406 (Piney Green Road)

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: Piney Green at Country Club		BY: JBS						
COUNTY: Onslow		DATE: 7/1/2009						
FILE NO.: SS 03-02-217		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Signal Phase Changes							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$10,000	10	0.149	\$1,490			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$10,000	10	0.149	\$1,490			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$1,840			
	TOTAL COST OF PROJECT=				\$10,000			
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	6.08	3	0.49	45	7.40	70	11.51	\$424,836
AFTER	6.08	0	0.00	33	5.43	79	12.99	\$148,372
						Annual Benefits from Crash Cost Savings		\$276,464
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$274,624		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	150.23		
TOTAL COST OF PROJECT		-	\$10,000	COMPREHENSIVE B/C RATIO		-	150.23	

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: Piney Green at Country Club		BY: JBS						
COUNTY: Onslow		DATE: 7/1/2009						
FILE NO.: SS 03-02-217		NOTES: Target Crashes - EB, NB, SB Left Turn Same Roadway						
DETAILED COST:	TYPE IMPROVEMENT - Phase Changes							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$10,000	10	0.149	\$1,490			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$10,000	10	0.149	\$1,490			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$1,840			
	TOTAL COST OF PROJECT=				\$10,000			
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	6.08	2	0.33	9	1.48	9	1.48	\$196,891
AFTER	6.08	0	0.00	0	0.00	0	0.00	\$0
						Annual Benefits from Crash Cost Savings		\$196,891
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$195,051		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	106.99		
TOTAL COST OF PROJECT		-	\$10,000	COMPREHENSIVE B/C RATIO		-	106.99	

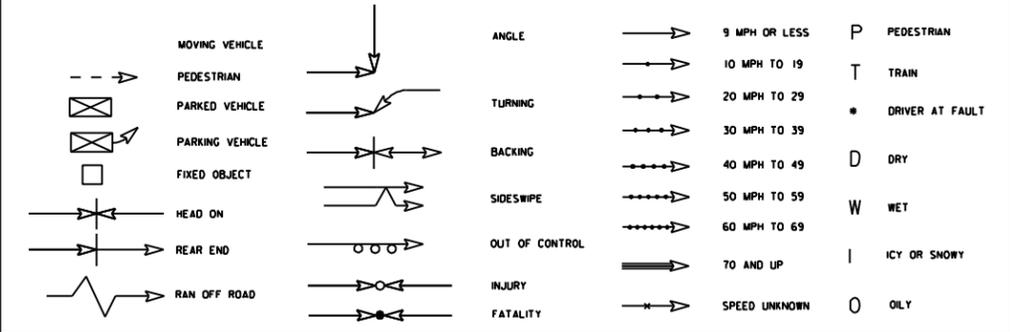
SR 1708  
(Subdivision)  
25 MPH

SR 1406  
Piney Green Rd  
45 MPH

SR 1403  
Country Club Rd  
45 MPH

Circle K  
Corner Market

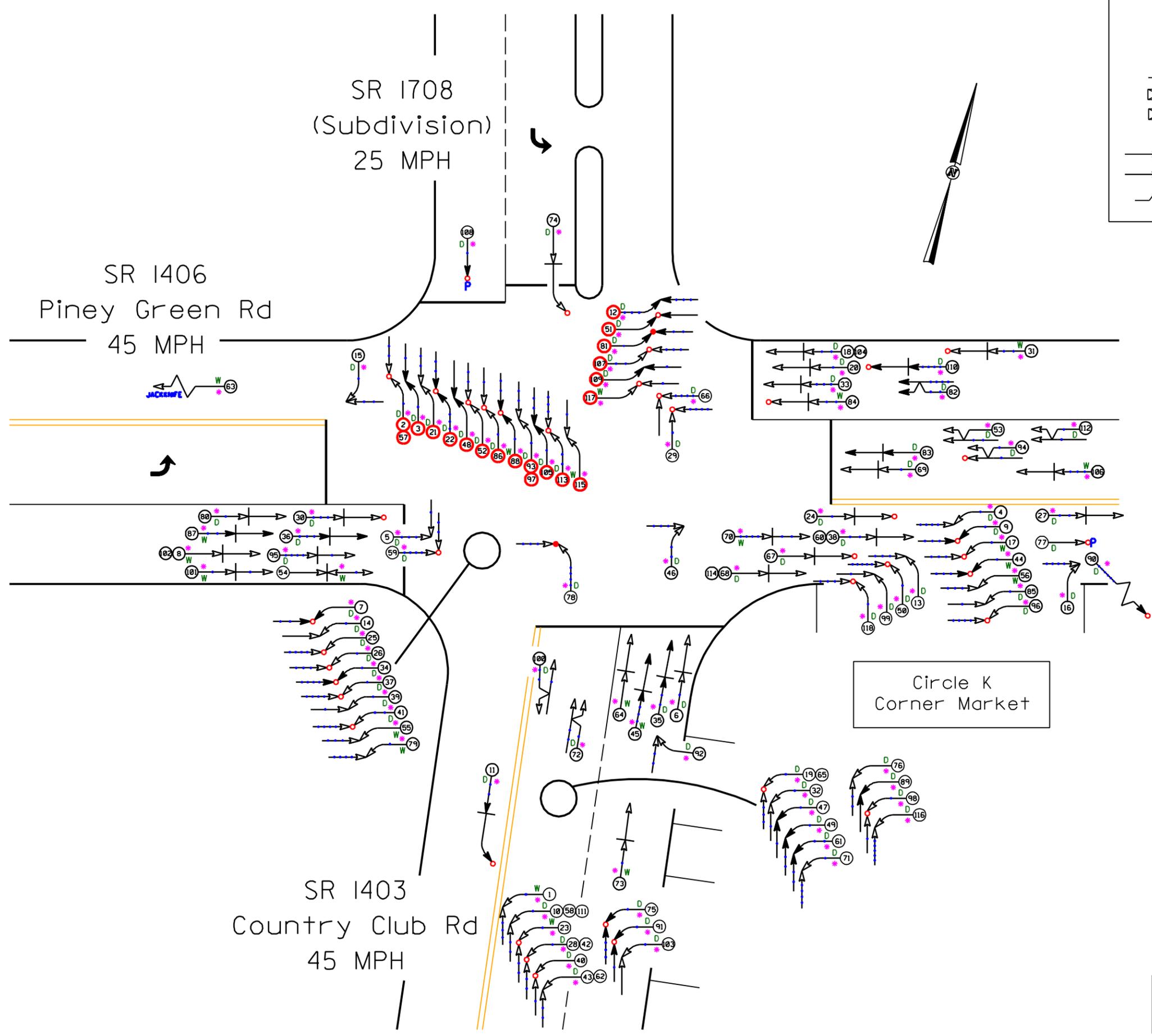
LEGEND



SS# 03-02-217  
Onslow County  
City of Jacksonville  
BEFORE Period  
2/1/97 - 2/28/03



Existing  
Traffic Signal  
Sig ID 03-0235

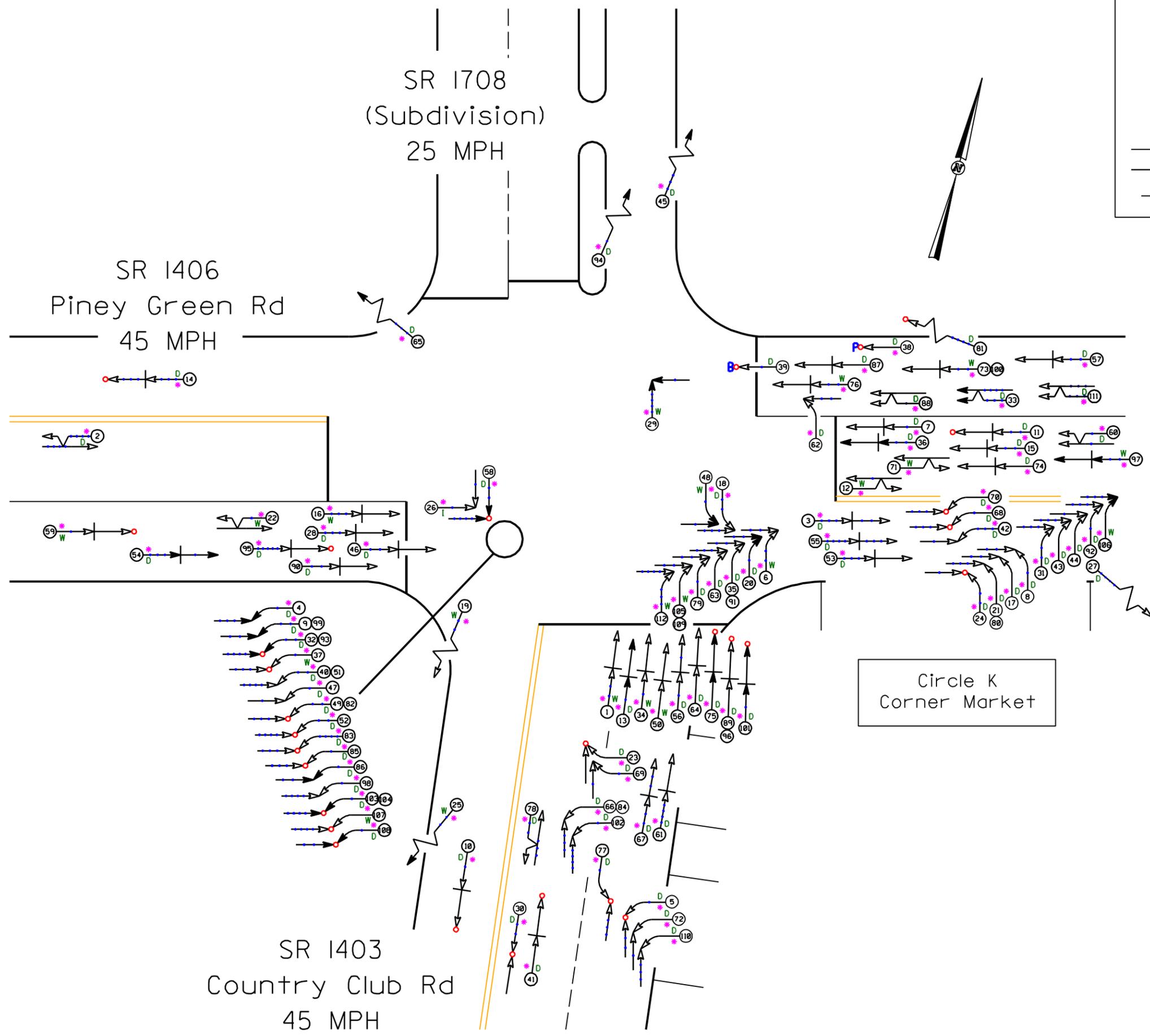


⊕ Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 2/1/1997 - 2/28/2003	
	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: 6-23-2009		
LOG NUMBER: SS* 03-02-217 BEFORE		

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



**LEGEND**

→	MOVING VEHICLE	↘	ANGLE	→	9 MPH OR LESS	P	PEDESTRIAN
- - -	PEDESTRIAN	↙	TURNING	→	10 MPH TO 19	T	TRAIN
⊠	PARKED VEHICLE	↔	BACKING	→	20 MPH TO 29	*	DRIVER AT FAULT
⊠	PARKING VEHICLE	↔	SIDESWIPE	→	30 MPH TO 39	D	DRY
□	FIXED OBJECT	↔	OUT OF CONTROL	→	40 MPH TO 49	W	WET
→	HEAD ON	↔	INJURY	→	50 MPH TO 59		ICY OR SNOWY
→	REAR END	↔	FATALITY	→	60 MPH TO 69	0	OILY
→	RAN OFF ROAD	→		→	70 AND UP		
		→		→	SPEED UNKNOWN		

SS# 03-02-217  
 Onslow County  
 City of Jacksonville  
 AFTER Period  
 4/1/03 - 4/30/09

**R** Signal Upgrade  
**Y** Phase Changes  
**G** Sig ID 03-0235

Circle K  
 Corner Market

⊠ Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 4/1/2003 - 4/30/2009	
	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: 6-29-2009		
LOG NUMBER: SS* 03-02-217 AFTER		

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