

Spot Safety Project Evaluation

Project Log # 200811082

Spot Safety Project # 05-02-210

**Spot Safety Project Evaluation of the Traffic Signal Upgrade
At the Intersection of US 501 / NC 57 (Durham Rd) and
SR 1123 (Dick Holeman Rd) / SR 1715 (Helena Moriah Rd)
Person County, Town of Timberlake**

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

4-21-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-02-210 located at the Intersection of US 501 / NC 57 (Durham Rd) and SR 1123 (Dick Holeman Rd) / SR 1715 (Helena Moriah Rd) in Person County.

The Sig ID is 05-1713 for the subject intersection.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of protected left turn phasing for US 501 on the existing traffic signal. US 501 / NC 57 is a four-lane median divided facility with left and right turn lanes at the subject intersection. SR 1123 and SR 1715 are both two-lane facilities at the subject intersection with right turn slip lanes added in the after period signal revisions. The subject location is a crossroads type intersection with speed limits of 55 mph on all approaches.

The intended purpose of this Spot Safety Project was to alleviate the accident problem occurring on the permissive signal phase. In the first quarter of 2004, the US 501 left turn lanes were additionally upgraded to positive offsets by the maintenance department under NC Moving Ahead Project MA05017R.

The initial crash analysis was completed from March 1, 1999 to February 28, 2002 with twenty-four (24) reported crashes, fifteen (15) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on March 17, 2003 with a total cost of \$20,000.00.

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 for both countermeasures was from February 1, 2003 to May 31, 2004. The before period consisted of reported crashes from June 1, 1998 through January 31, 2003 (4 years and 8 months); and the after period consisted of reported crashes from June 1, 2004 through January 31, 2009 (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 US 501 Left Turn; Same Roadway Type Crashes were the target crashes for the applied countermeasure. Ran-off Roadway crashes as a preventive measure to avoid a Left Turn, Same Roadway collision were also included in the Target Crashes.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	40	18	- 55.0 %
Total Severity Index	10.94	5.93	- 45.8 %
Target Crashes	28	2	- 92.9 %
Target Crash Severity Index	11.17	8.40	- 24.8 %
Volume	14,900	18,200	22.1 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	2	0	- 100.0 %
Class B injury Crashes	10	5	- 50.0 %
Class C Injury Crashes	13	7	- 46.2 %
Total Injury Crashes	26	12	- 53.8 %

The naive before and after analysis at the treatment location resulted in a 55 percent decrease in Total Crashes, a 93 percent decrease in 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

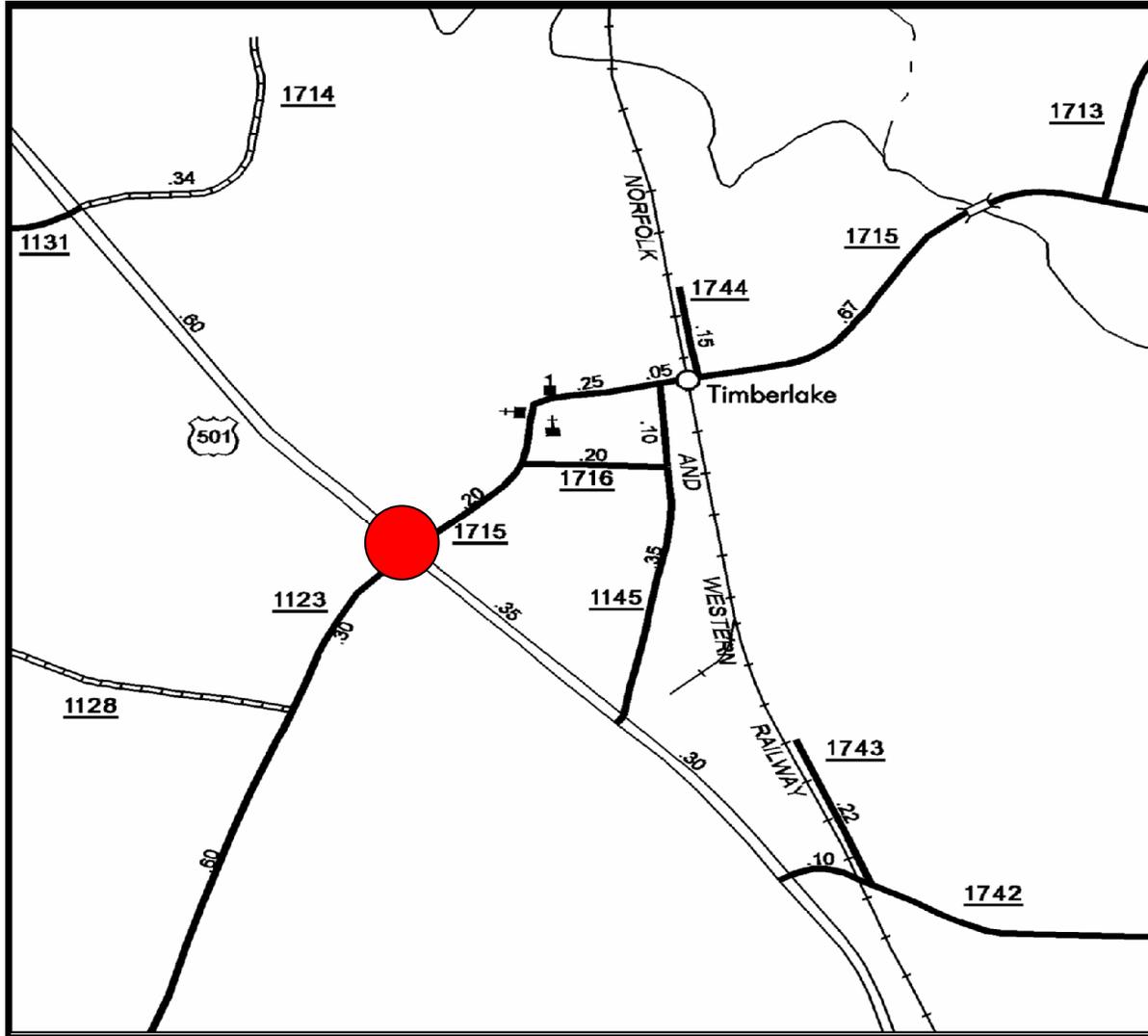
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 55 percent decrease in Total Crashes and a 93 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, a large portion of crashes at the intersection in the before period (28 of 40) were the result of a vehicle turning left onto the side streets from US 501. After the signal phase changes and positively offsetting the left turn lanes, this pattern was significantly reduced to just two (2), which resulted from vehicles on US 501 running the red light. In the before period only one (1) collision resulted from a red light running southbound US 501 vehicle and the rest were gap acceptance issues from the left turning motorists.

The calculated benefit to cost ratio for this project is **104.88 considering total crashes**. The benefit to cost ratio **considering only target crashes is 80.01**. 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.

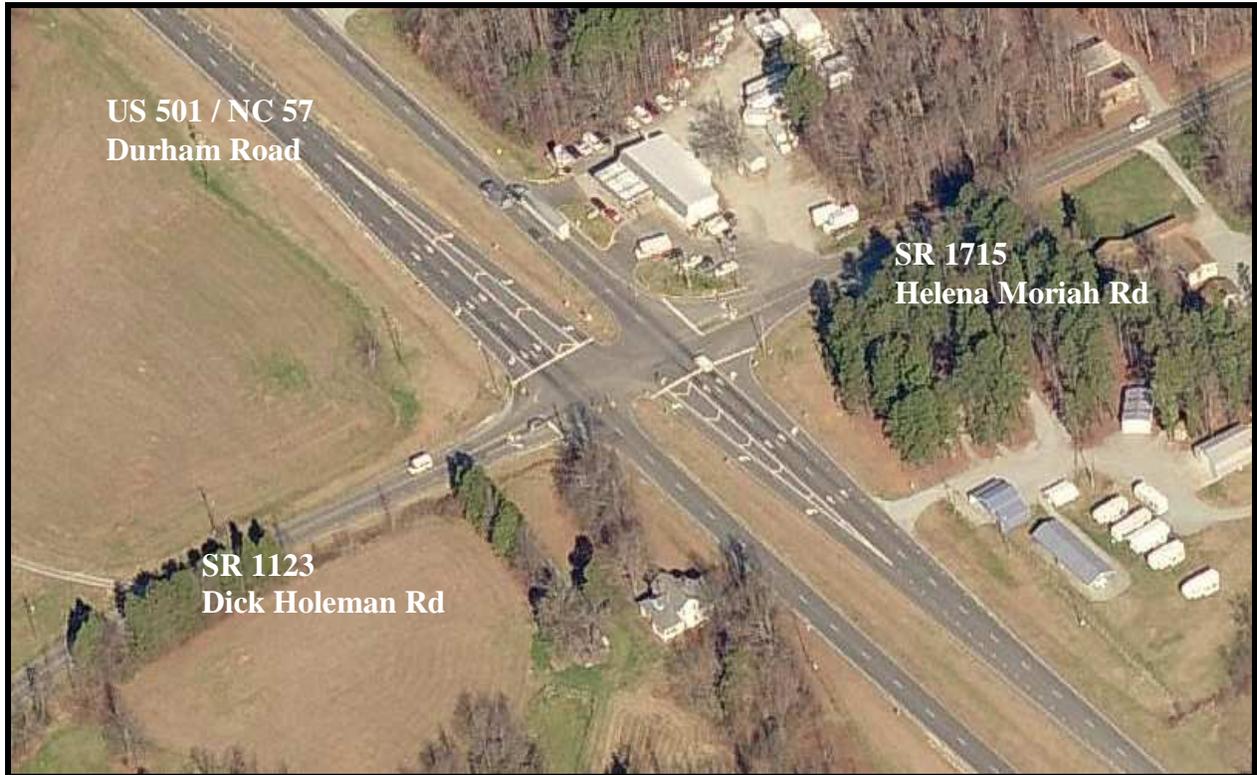
Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Person County, Town of Timberlake
Evaluation of Spot Safety Project # 05-02-210



**Treatment Location: US 501 / NC 57 (Durham Rd) at
SR 1123 (Dick Holeman Rd) / SR 1715 (Helena Moriah Rd)**

**SS# 05-02-210 Aerial Map
Person County**



TREATMENT SITE PHOTOS TAKEN 1/27/2009



Traveling North on US 501 – Dual Posted Signal Ahead



Traveling North on US 501 – Offset and Protected Left Turn



Traveling South on US 501 – Dual Posted Signal Ahead & Vertical Curve



Traveling South on US 501



Traveling East on SR 1123 (Dick Holeman Rd)



Traveling East on SR 1123 (Dick Holeman Rd)



Traveling West on SR 1715 (Helena Moriah Rd)



Traveling West on SR 1715 (Helena Moriah Rd)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 501 at SR 1123/1715
 COUNTY: Person
 FILE NO.: SS 05-02-210

BY: JBS
 DATE: 4/13/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Protected Left Turn Signal Phasing

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$20,000	10	0.149	\$2,981
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$20,000	10	0.149	\$2,981

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$150
 TOTAL ANNUAL COST= \$3,531
 TOTAL COST OF PROJECT= \$20,000

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	3	0.64	23	4.93	14	3.00	\$421,542
AFTER	4.67	0	0.00	12	2.57	6	1.28	\$51,263

Annual Benefits from Crash Cost Savings \$370,278

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$366,748

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 104.88

TOTAL COST OF PROJECT - \$20,000 COMPREHENSIVE B/C RATIO - 104.88

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 501 at SR 1123/1715
 COUNTY: Person
 FILE NO.: SS 05-02-210

BY: JBS
 DATE: 4/13/2009
 NOTES: Target Crashes - Left Turn, Same Roadway

DETAILED COST: TYPE IMPROVEMENT - Protected Signal Phasing

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$20,000	10	0.149	\$2,981
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$20,000	10	0.149	\$2,981

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$150
 TOTAL ANNUAL COST= \$3,531
 TOTAL COST OF PROJECT= \$20,000

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	2	0.43	18	3.85	8	1.71	\$290,193
AFTER	4.67	0	0.00	2	0.43	0	0.00	\$7,709

Annual Benefits from Crash Cost Savings \$282,484

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$278,953

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 80.01

TOTAL COST OF PROJECT - \$20,000 COMPREHENSIVE B/C RATIO - 80.01

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		OILY
	RAN OFF ROAD				70 AND UP		
					SPEED UNKNOWN		

US 501 / NC 57
Durham Rd
55 MPH

SR 1123
Dick Holeman Rd
55 MPH

SR 1715
Helena Moriah Rd
55 MPH

SS# 05-02-210
Person County
BEFORE Period
6/1/98 - 1/31/03



Existing
Traffic Signal
Sig ID 05-1713

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA: 1
	STUDY PERIOD: 6/1/1998 - 1/31/2003	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-9-2009		
LOG NUMBER: SS* 05-02-210 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	I	ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69	0	OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SR 1123
Dick Holeman Rd
55 MPH

US 501 / NC 57
Durham Rd
55 MPH

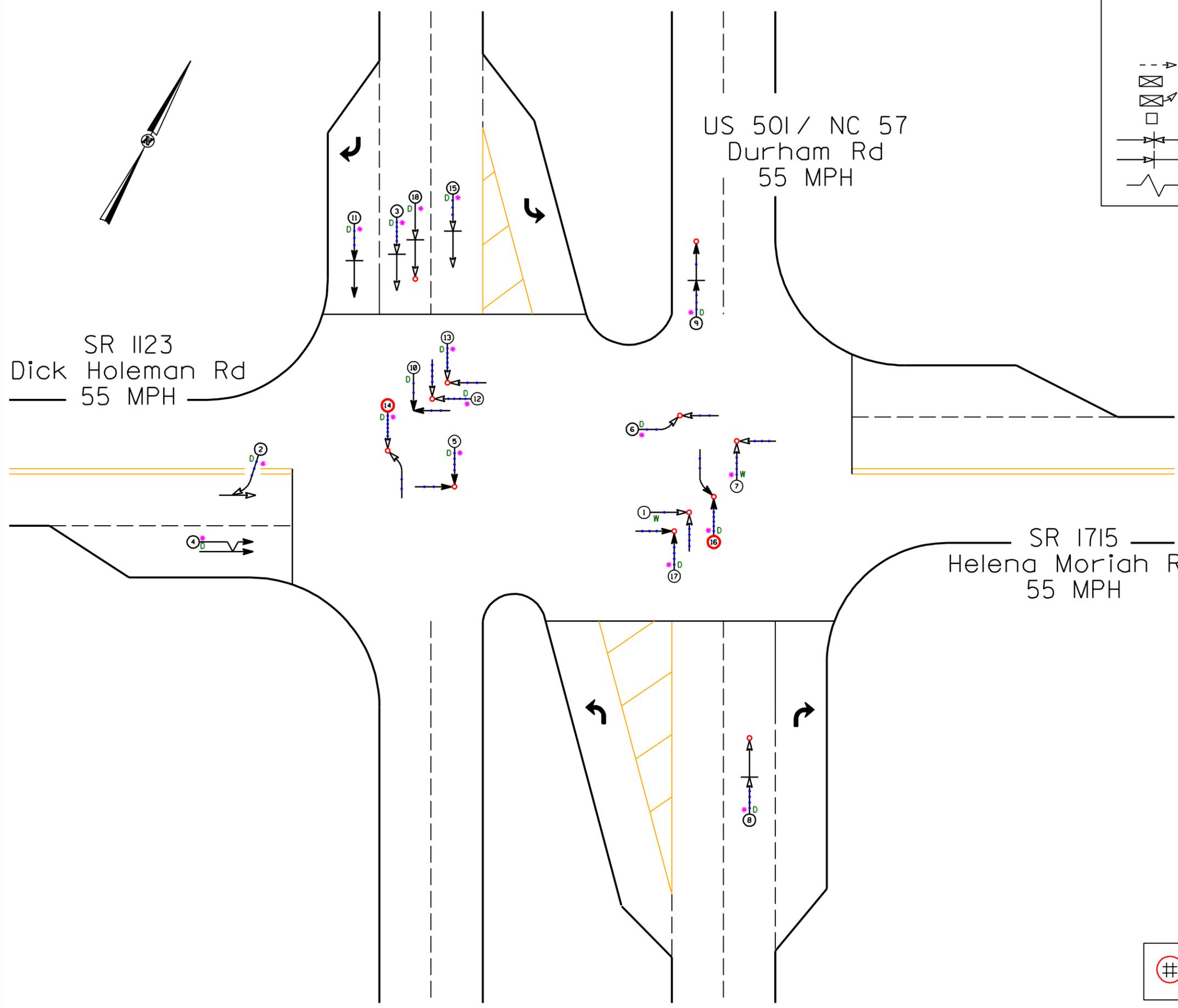
SR 1715
Helena Moriah Rd
55 MPH

SS# 05-02-210
Person County
AFTER Period
6/1/04 - 1/31/09



Updated
Traffic Signal
Sig ID 05-1713

(US 501 Protected
and Offset Lefts)



Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 6/1/2004 - 1/31/2009	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-13-2009		
LOG NUMBER: SS* 05-02-210 AFTER		

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