

Hazard Elimination Project Evaluation

Order # 41000018502

Hazard Project # W-4418

**Hazard Elimination Project Evaluation of the
Left Turn Lanes and Traffic Signal Installation
SR 2565 (Hicone Road) at SR 2732 (Hines Chapel Road)
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



Jason B. Schronce

3-26-2012

Date

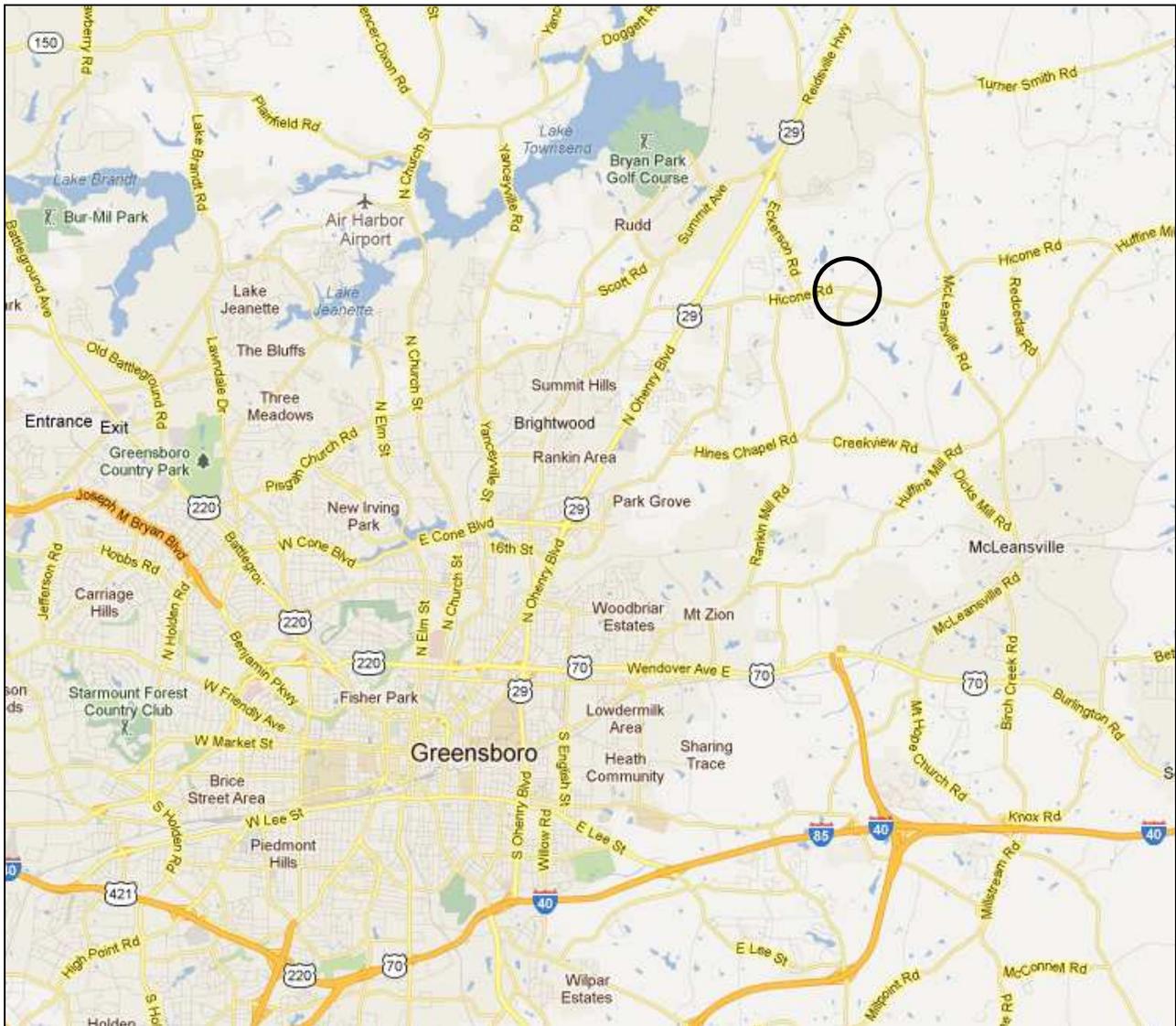
Traffic Safety Project Engineer

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project Number W-4418 located at the Intersection of SR 2565 (Hicone Road) at SR 2732 (Hines Chapel Road) in Guilford County, northeast of Greensboro.

The Sig ID is 07-1225 for this newly installed traffic signal.



Provided from Google Maps



Aerial Image provided from BING Maps

Project Information and Background from the Project File Folder

The hazard elimination project improvement countermeasures chosen for the subject location were the installation of an intersection traffic signal and left turn lanes on all four approaches. SR 2565 (Hicone Road) and SR 2732 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 stop signs on the SR 2732 (Hines Chapel Rd) in the before period and a standard overhead intersection flasher.

The original statement of problem concluded that limited sight distance on the west side of the intersection due to the vertical and horizontal alignment was contributing to frontal impact crashes. Also, the lack of left turn storage was causing rear-end collisions in the queue.

The initial crash analysis was completed from January 1, 1998 to December 31, 2000 with twelve (12) reported crashes, six (4) of which were angle collisions. The final completion date for the improvement at the subject intersection was on November 1, 2004 with a total cost of \$314,000.

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 2004. The before period consisted of reported crashes from June 1, 1997 through July 31, 2004 (7 years and 2 months); and the after period consisted of reported crashes from December 1, 2004 through January 31, 2011 (7 years and 2 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 and aerial map 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 Signal Target Crashes and Rear-End Collisions (approaching the intersection) were the Left Turn Lane Target Crashes for the applied countermeasures. 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	30	12	- 60.0 %
Total Severity Index	7.23	4.08	- 43.6 %
Frontal Impact (Signal) Target Crashes	17	9	- 47.1 %
Frontal Target Crash Severity Index	9.38	5.11	- 45.5 %
Rear-End (Turn Lanes) Target Crashes	11	1	- 90.9 %
Rear-End Target Crash Severity Index	5.04	1.00	- 80.2 %
Volume (2000, 2008)	10,800	11,200	3.7 %
Total Crash Rate	106.10	40.93	- 61.4 %

<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	4	2	- 50.0 %
Class C Injury Crashes	11	3	- 72.7 %
Total Injury Crashes	16	5	- 68.8 %

The naive before and after analysis at the treatment location resulted in a 60 percent decrease in Total Crashes, an 64 percent decrease in Combined Target Crashes, and a 44 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented three distinct crash patterns including rear-end collisions approaching the intersection, angle crashes, and left turn same road collisions turning north onto SR 2732 (Hines Chapel Road). The rear-end collisions experienced the most improvement with 91 percent reduction from eleven (11) crashes in the before period to only one (1) in the after period.

The angle/left-out crashes reduced from eleven (11) to five (5) through the study with all five after period crashes caused by vehicles running the red light. Also, the left turn same roadway crashes on SR 2565 (Hicone Road) reduced by half from six (6) to three (3) with the installation of the all-permissive traffic signal.

The calculated benefit to cost ratio for this project is **2.34 considering total crashes**. The benefit to cost ratio **considering the combined target crashes is 2.34**. 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.

As the Safety Evaluation Group completes additional hazard elimination 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.

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 2565 at SR 2732		BY: JBS						
COUNTY: Guilford		DATE: 3/19/2012						
FILE NO.: W-4418								
DETAILED COST:	TYPE IMPROVEMENT - 4 Left Turn Lanes & Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$314,000	10	0.149	\$46,795			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$314,000	10	0.149	\$46,795			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$51,295			
	TOTAL COST OF PROJECT=				\$314,000			
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	7.17	1	0.14	15	2.09	14	1.95	\$138,103
AFTER	7.17	0	0.00	5	0.70	7	0.98	\$18,145
						Annual Benefits from Crash Cost Savings		\$119,958
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$68,663		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	2.34		
TOTAL COST OF PROJECT		-	\$314,000	COMPREHENSIVE B/C RATIO		-	2.34	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

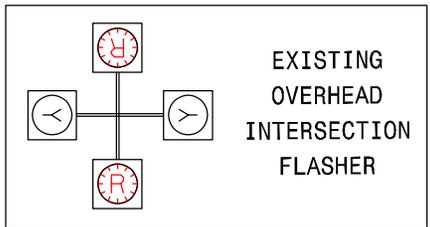
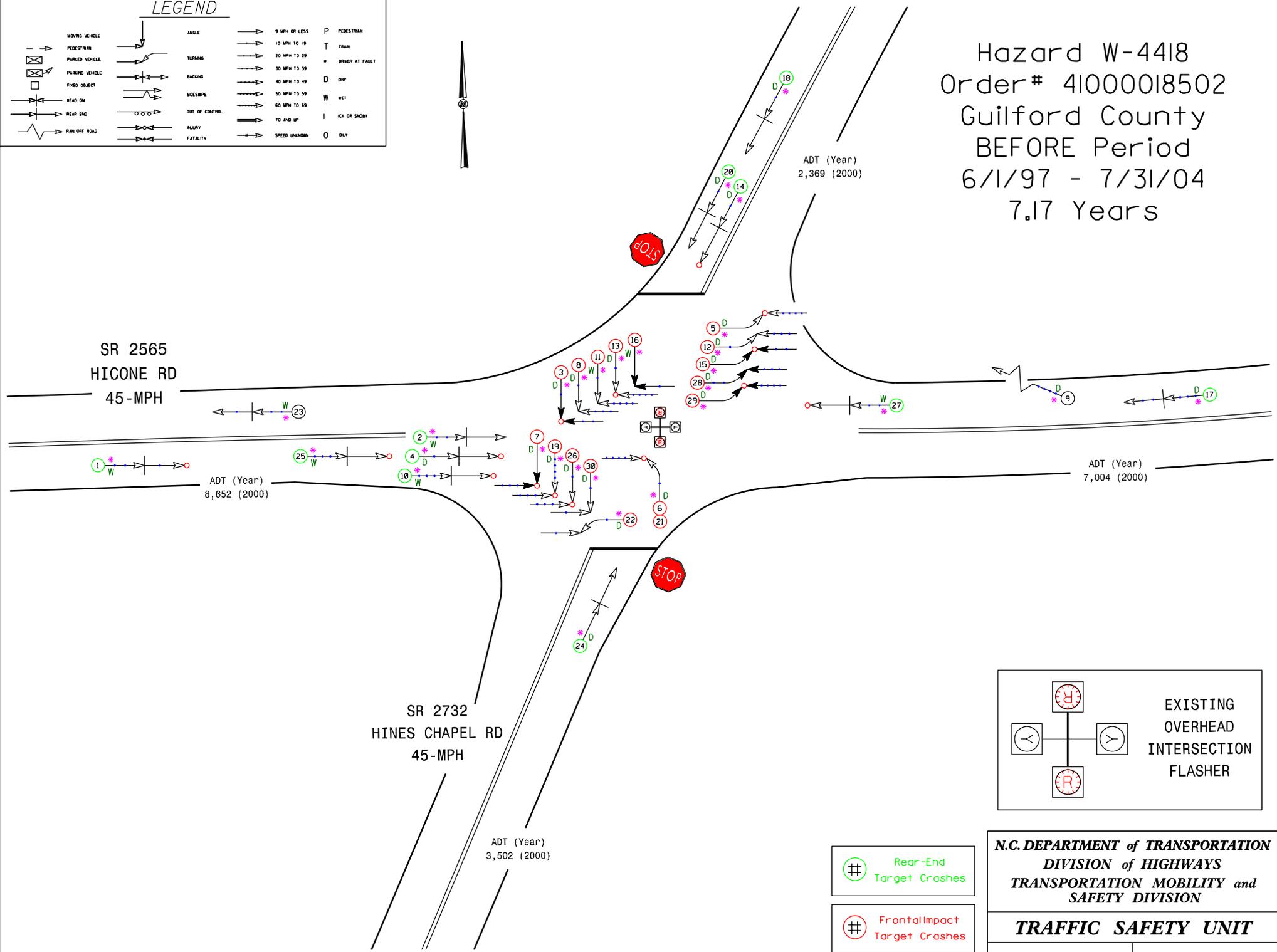
LOCATION: NC 2565 at SR 2732		BY: JBS						
COUNTY: Guilford		DATE: 3/19/2012						
FILE NO.: W-4418		Combined Targets - Frontal & Rear-End						
DETAILED COST:	TYPE IMPROVEMENT - 4 Left Turn Lanes & Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$314,000	10	0.149	\$46,795			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$314,000	10	0.149	\$46,795			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$51,295			
	TOTAL COST OF PROJECT=				\$314,000			
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	7.17	1	0.14	15	2.09	12	1.67	\$136,904
AFTER	7.17	0	0.00	5	0.70	5	0.70	\$16,946
						Annual Benefits from Crash Cost Savings		\$119,958
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$68,663		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	2.34		
TOTAL COST OF PROJECT		-	\$314,000	COMPREHENSIVE B/C RATIO		-	2.34	

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		D DRIVER AT FAULT
	PAKED 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 ICE OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		O OILY
	RAN OFF ROAD				70 AND UP		
					SPEED UNKNOWN		



Hazard W-4418
 Order# 41000018502
 Guilford County
 BEFORE Period
 6/1/97 - 7/31/04
 7.17 Years



Rear-End Target Crashes

Frontal Impact Target Crashes

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

TRAFFIC SAFETY UNIT

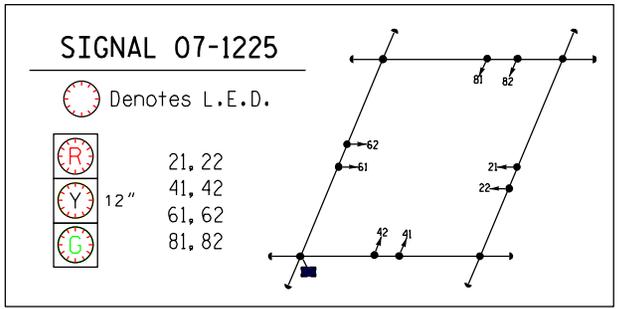
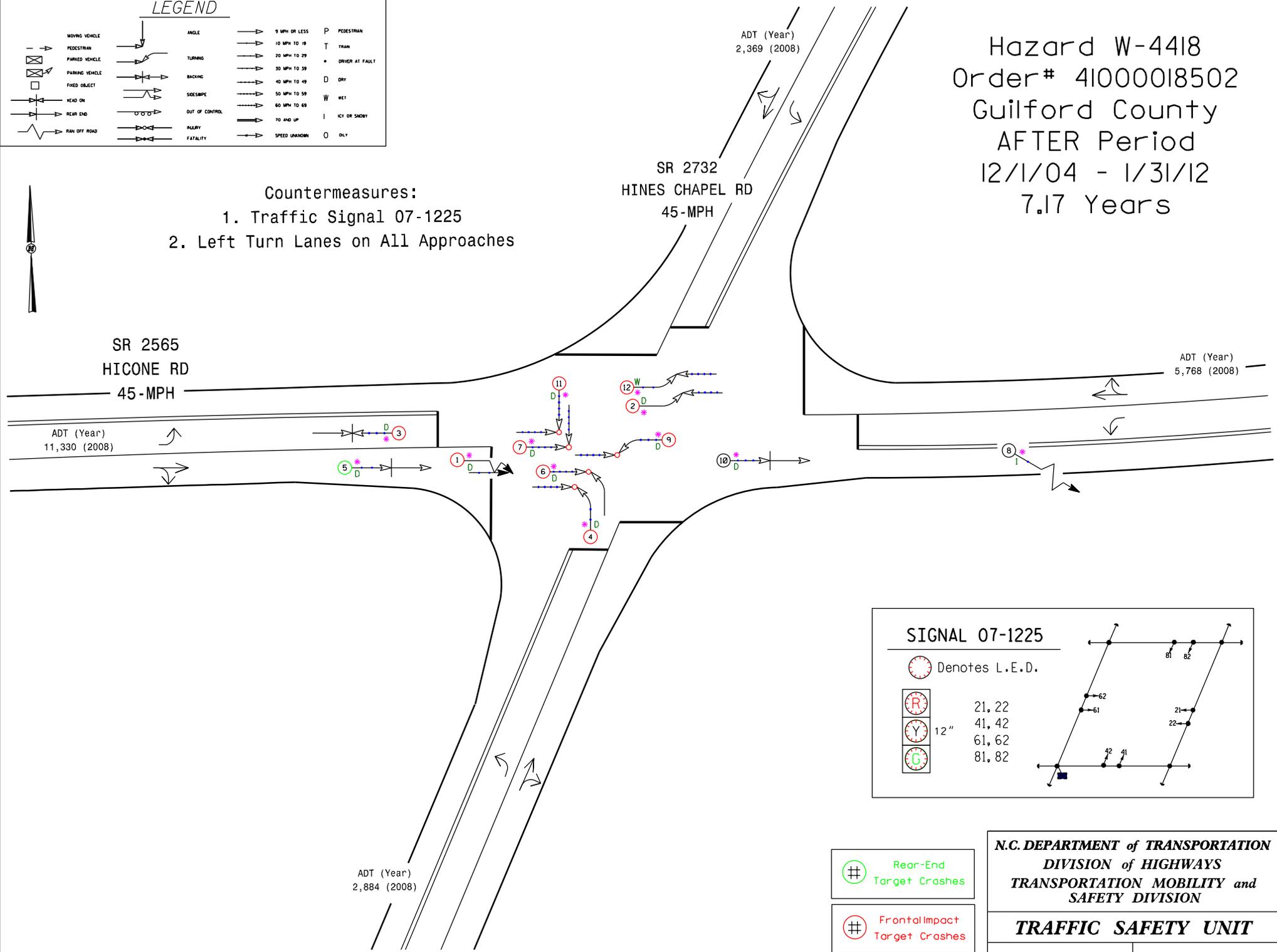
Date: 3-16-2012 Prepared By: J. Schrone

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		* DRIVER AT FAULT
	PAKED 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		O OLY
	RAN OFF ROAD				70 AND UP		

Hazard W-4418
 Order# 41000018502
 Guilford County
 AFTER Period
 12/1/04 - 1/31/12
 7.17 Years

- Countermeasures:
 1. Traffic Signal 07-1225
 2. Left Turn Lanes on All Approaches



- Rear-End Target Crashes
- Frontal Impact Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 3-16-2012 Prepared By: J. Schronce