

Spot Safety Project Evaluation

Project Log # 200712060

Spot Safety Project # 02-99-231

**Spot Safety Project Evaluation of the Signal Phase Changes
and Offset Left Turn Lane Installation at the Intersection of
US 70 and SR 1141 (Hibbs Road)
Carteret 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

3-3-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-99-231 located at the Intersection of US 70 and SR 1141 (Hibbs Road) in Carteret County, near the City of Newport.

The Signal ID for this location is 02-0349.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of offset left turn lanes and protected-permissive left turn signal phase revisions on US 70. In the before period, SR 1141 (Hibbs Road) was a 2 lane roadway that presented a dedicated left turn lane on the eastbound approach. During these intersection improvements, both approaches were widened to provide egress lanes including a left turn lane, a through lane, and a right turn slip lane. US 70 is a four lane divided facility including both left and right turn lanes at the intersection with SR 1141 and previously had protected side street phasing. All approaches to the subject location have a 55 mph speed limit. In November 2007, a "Prepare to Stop" digital sign was installed on the northbound US 70 approach under Regional Project # 02-05-212.

The original statement of problem was that existing US 70 protected split phasing was unnecessary and reduced the efficiency of the traffic signal. Also, future development in the surrounding quadrants of the intersection and modifications to the Newport Thoroughfare Plan will overload the existing lane configuration causing additional congestion and delay.

The initial crash analysis was completed from June 1, 1996 to May 31, 1999 with eleven (11) reported crashes, six (6) of which were deemed correctable. The final completion date for the improvement at the subject intersection was during the second half of 2001 with a total cost of \$100,000.00.

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 was from August 1, 2001 to October 31, 2001. The before period consisted of reported crashes from September 1, 1995 through July 31, 2001 (5 years and 11 months); and the after period consisted of reported crashes from November 1, 2001 through September 30, 2007 (5 years and 11 months). The ending date for this analysis was determined by the installation of Regional Project # 02-05-212 which installed a "Prepare to Stop" digital sign on the northbound US 70 approach.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data in Table 1 depicts the Naive Before and After Analysis for the treatment location. Please note that Left Turn-Same Roadway Crashes were the target crashes for the applied countermeasures of offset left turn lanes and protected-permitted signal phasing.

Table 1

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	24	39	62.5 %
Total Severity Index	8.48	8.49	0.1 %
Target Crashes	0	14	200+ %
Target Crash Severity Index	0.00	11.17	200+ %
Volume	21,900	28,100	28.3 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	2	200.0 %
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	5	10	100.0 %
Class C Injury Crashes	9	9	0.00
Total Injury Crashes	15	21	40.0 %

The naive before and after analysis at the treatment location resulted in a 62.5 percent increase in Total Crashes, an establishment of a Target Crash pattern, and no change in the Total Severity Index. The before period ADT year was 1998 and the after period ADT year was 2004.

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 62.5 percent increase in Total Crashes and the creation of Left Turn Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have significantly increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the intersection crash patterns remained similar from the before to the after periods with only the addition of the left turn target crashes. By the removal of the protected phasing for US 70 left turning motorists, northbound vehicles especially have issues crossing both lanes of traffic to make the movement safely. An after period fatal did occur with this directional movement, however it was a delayed fatality and a fatal investigation was not completed. The first after period fatality crash at this location occurred from a southbound US 70 vehicle running the red light and colliding with a left turning motorists from SR 1141. No roadway improvements were deemed necessary after the investigation was completed.

The calculated benefit to cost ratio for this project is **(-6.19) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-6.71)**. 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.

Table 2 below consists of reported crashes from November 1, 2007 to December 31, 2008 (1 year and 2 months) which constitutes crashes since the installation of Regional Project # 02-05-212. The ending date of this analysis was determined that available crash data at the time of analysis.

Table 2

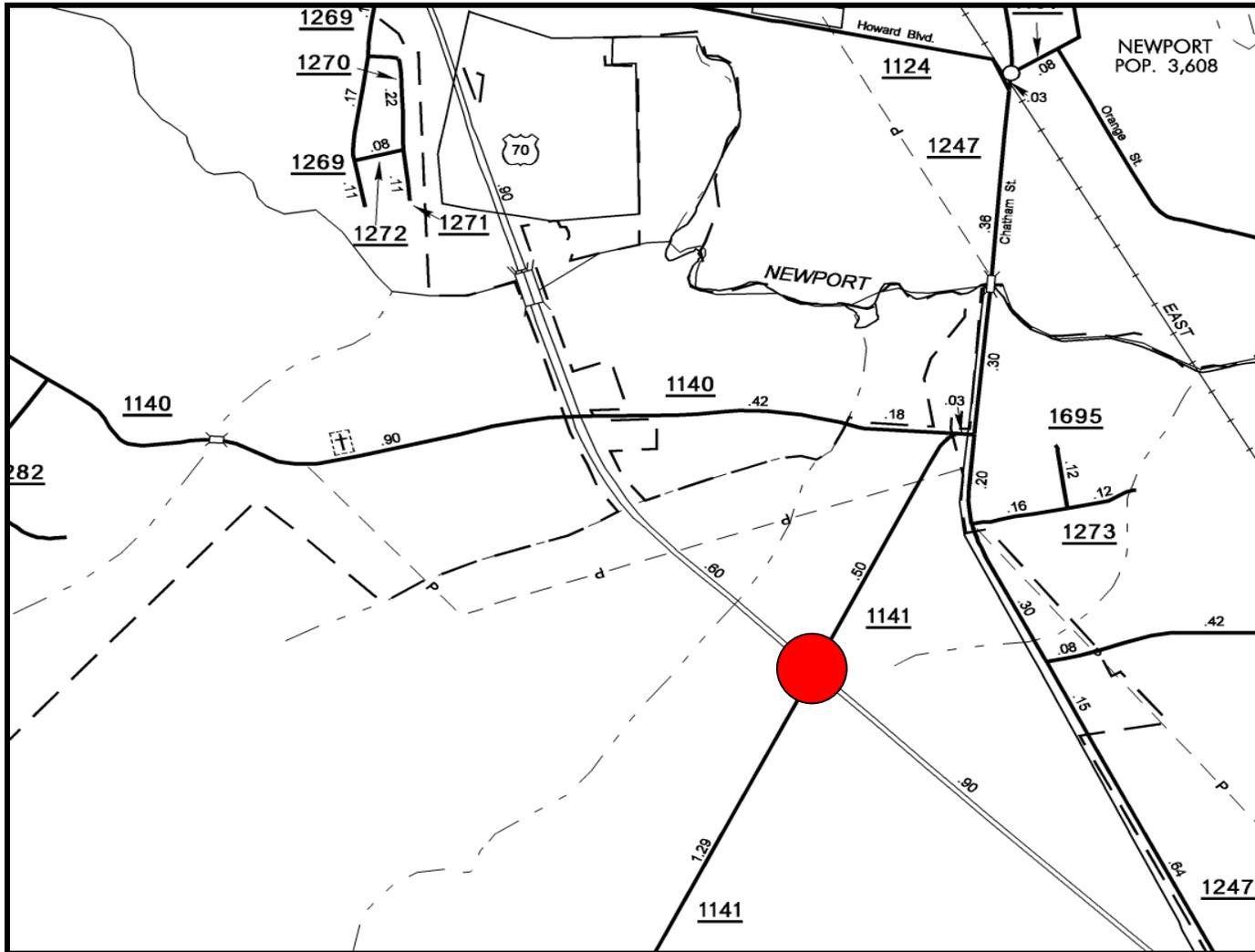
Regional Project # 02-05-212	
	1.16 yrs
Total crashes	6
Total Severity Index	4.70
Northbound US 70	
Northbound US 70 Red Light Run	0
Northbound US 70 Rear End	1
Injury Crash Summary	
Fatal injury Crashes	0
Class A injury Crashes	0
Class B injury Crashes	0
Class C Injury Crashes	3
PDO Crashes	3

As mentioned above, table 2 shows the 1.16 years of crash data since the installation of “Prepare to Stop” digital sign for northbound US 70 vehicles. The sign is located 550 feet from the stop bar at the subject intersection. From table 2, the data does not indicate any red light run crashes from this direction and only one (1) rear-end collision since the installation of this sign. The Safety Evaluation group plans to monitor this location and the sign’s performance until 3 years of after data is obtained.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, along with the documentation of the US 70 “Prepare to Stop” sign as explained in the *Project Background* section.

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
Carteret County
Evaluation of Spot Safety Project # 02-99-231**



Treatment Location: US-70 at SR 1141 (Hibbs Road) near the City of Newport

TREATMENT SITE PHOTOS TAKEN 8/6/2008



Traveling North on US 70



Traveling North on US 70



Traveling South on US 70



Traveling South on US 70



Traveling East on SR 1141 (Hibbs Rd)



Traveling East on SR 1141 (Hibbs Rd)



Traveling West on SR 1141 (Hibbs Rd)



Traveling West on SR 1141 (Hibbs Rd)



Traveling North on US 70
“Prepare to Stop” Sign Installation – Regional File # 02-05-212



Sign located 550' from intersection stop bar

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US-70 at Hibbs
 COUNTY: Carteret County
 FILE NO.: SS 02-99-231

BY: JBS
 DATE: 3/3/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Offset Lefts and Phase Changes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$100,000	10	0.149	\$14,903
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$100,000	10	0.149	\$14,903

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$150
 TOTAL ANNUAL COST= \$17,053
 TOTAL COST OF PROJECT= \$100,000

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	5.92	1	0.17	14	2.36	9	1.52	\$132,956
AFTER	5.92	2	0.34	19	3.21	18	3.04	\$238,547

Annual Benefits from Crash Cost Savings (\$105,591)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$122,644)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -6.19

TOTAL COST OF PROJECT - \$100,000 COMPREHENSIVE B/C RATIO - -6.19

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US-70 at Hibbs
 COUNTY: Carteret
 FILE NO.: SS 02-99-231

BY: JBS
 DATE: 3/3/2009
 NOTES: Target Crashes - Left Turn, Same Roadway

DETAILED COST: TYPE IMPROVEMENT - Offset Lefts / Phase Changes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$100,000	10	0.149	\$14,903
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$100,000	10	0.149	\$14,903

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$150
 TOTAL ANNUAL COST= \$17,053
 TOTAL COST OF PROJECT= \$100,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

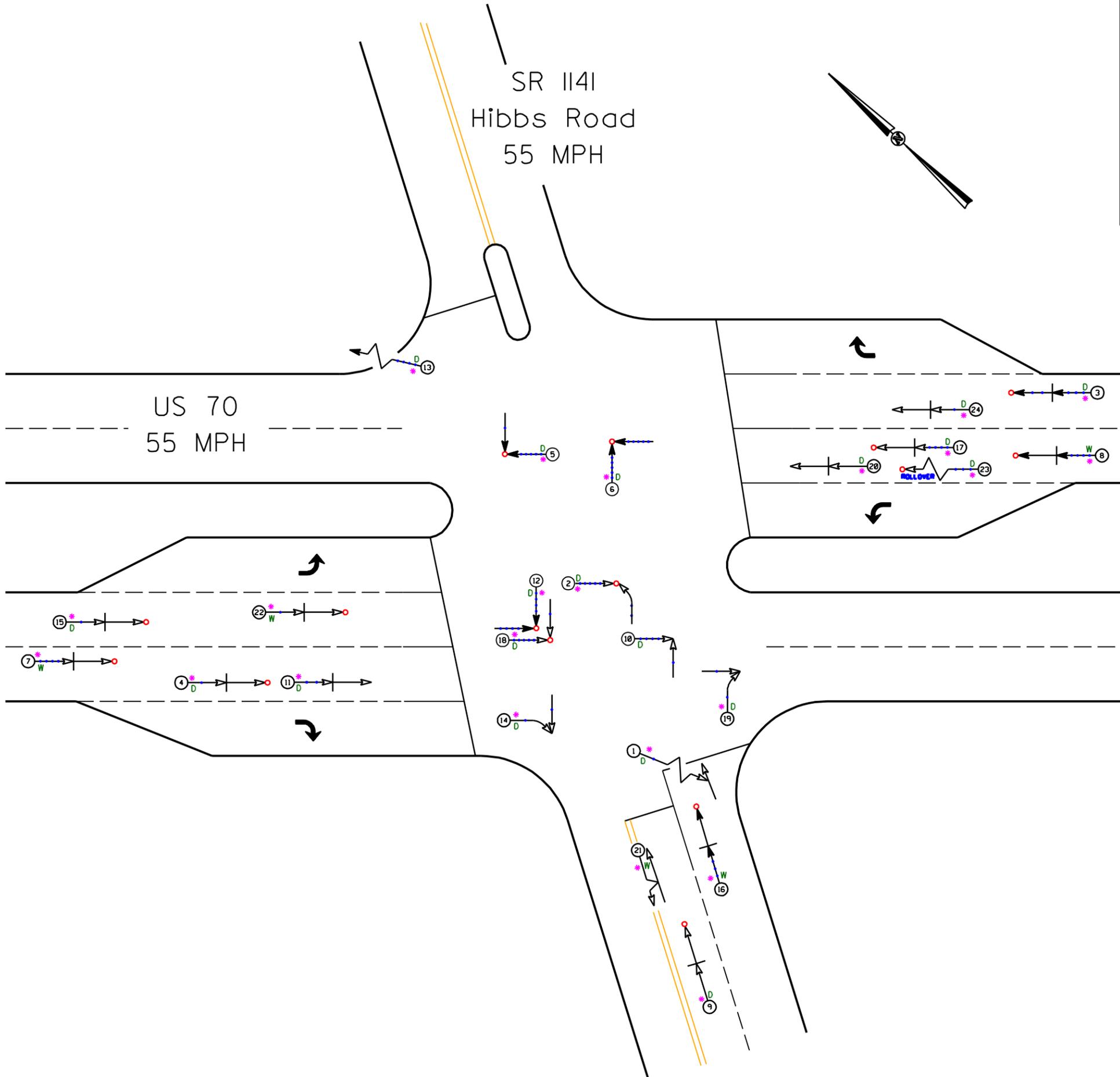
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.92	0	0.00	0	0.00	0	0.00	\$0
AFTER	5.92	1	0.17	9	1.52	4	0.68	\$114,459

Annual Benefits from Crash Cost Savings (\$114,459)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$131,512)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -6.71

TOTAL COST OF PROJECT - \$100,000 COMPREHENSIVE B/C RATIO - -6.71



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		SPEED UNKNOWN		70 AND UP		

SS# 02-99-231
 Carteret County
 BEFORE Period
 9/1/95 - 7/31/01
 US 70 at SR 1141

R	EXISTING
Y	TRAFFIC
G	SIGNAL

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

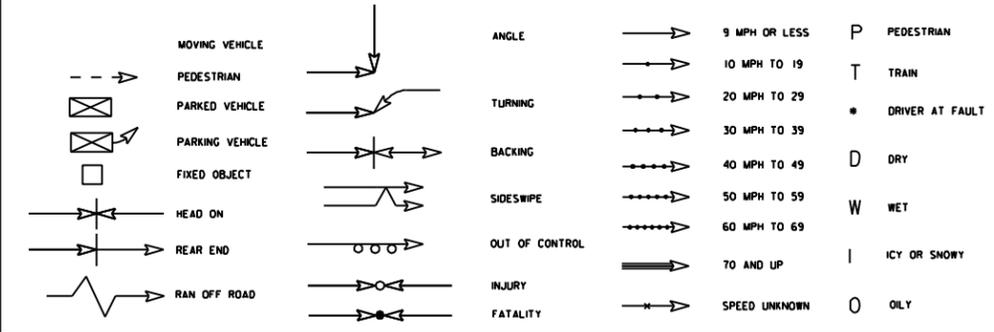
		COLLISION DIAGRAM
		DIVISION: 2 AREA: 1
		STUDY PERIOD: 9/1/1995 - 1/31/2001
		DISTANCE: Y-LINE : 150FT
		ANALYSIS PREPARED BY: JBS
		ANALYSIS CHECKED BY: BR
		DIAGRAM PREPARED BY: JBS
		DIAGRAM REVIEWED BY: ST
		SCALE: NOT TO SCALE
		DATE: 2-25-2009
		LOG NUMBER: SS* 02-99-231 BEFORE

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

SR 1141
Hibbs Road
55 MPH

US 70
55 MPH

LEGEND



SS# 02-99-231
Carteret County
AFTER Period
11/1/01 - 9/30/07
US 70 at SR 1141

 EXISTING
 TRAFFIC
 SIGNAL

Offset Left Turns
Egress Lanes on SR 1141
Protected / Permitted US-70

 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 2	AREA:
	STUDY PERIOD: 11/1/2001 - 9/30/2007	
	DISTANCE: Y-LINE : 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 2-25-2009		
LOG NUMBER: SS* 02-99-231 AFTER		

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